UNITED STATES DEPARTMENT OF LABOR
Frances Perkins, *Secretary*
BUREAU OF LABOR STATISTICS
Isador Lubin, *Commissioner*

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Productivity of Labor in the Cotton-Garment Industry

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Letter of Transmittal

UNITED STATES DEPARTMENT OF LABOR,
BUREAU OF LABOR STATISTICS,
Washington, D. C., November 30, 1938.

THE SECRETARY OF LABOR:

I have the honor to transmit herewith a report on Productivity of Labor in the Cotton-Garment Industry, prepared under the direction of Boris Stern of the Bureau of Labor Statistics.

ISADOR LUBIN, *Commissioner.*

HON. FRANCES PERKINS,
Secretary of Labor.

PREFACE

This study on labor productivity in the cotton-garment industry is one of a series of surveys on labor productivity under the direction of Boris Stern made by the Bureau of Labor Statistics in cooperation with the National Research Project under the direction of David Weintraub of the Works Progress Administration. In obtaining the original material for this survey, the Bureau depended upon the voluntary cooperation of manufacturers for the opportunity to examine their pay rolls and production records. The task of enlisting such cooperation was greatly facilitated by the wholehearted support of the International Association of Garment Manufacturers. The possibilities for this study were originally brought to the attention of the Bureau by the Statistical Service Bureau of the I. A. G. M., and when the study was definitely scheduled this agency fully carried out its pledge of cooperation, placing all its facilities, including lists of manufacturers in the cotton-garment industry, at the disposal of the Bureau.

Several of the leading men in the industry were most helpful in securing the cooperation of individual manufacturers. It would be impossible to enumerate them all. However, particular mention should be given to the following officers and directors of the International Association of Garment Manufacturers: Mr. Oscar J. Groebl, Levi Strauss & Co., Inc., San Francisco, Calif., chairman of the board of directors; Mr. Benjamin F. Berman, Crown Overall Manufacturing Co., Cincinnati, Ohio, president; Mr. R. Smith Payne, Cluett, Peabody & Co., Troy, N. Y., vice president; Mr. E. E. Murphy, Rice-Stix, St. Louis, Mo., treasurer; and Mr. A. F. Allison, secretary. Other I. A. G. M. officials or directors whose cooperation was most helpful included Mr. S. I. Miller, president, Southwestern Work Clothes Manufacturers Association and director-at-large of the I. A. G. M.; Mr. Ralph Hunter, president of Hall-Hartwell & Co. and a director of the I. A. G. M.; and Mr. Arthur T. Davenport, general manager of Sweet-Orr & Co.

In the cotton-dress field, Mr. S. L. Hoffman, president, and Mr. Irwin Feldman, secretary, of the National Association of House Dress Manufacturers, extended valuable cooperation, as did Mr. Charles Jacobs, treasurer of the National Association of Nurses' and Maids' Uniforms Manufacturers, and Mr. Robert J. Noren, secretary of the Union-Made Garment Manufacturers Association. Mr. Fred

Pruter, managing director, Pacific Coast Garment Manufacturers Association, was most helpful in placing the facilities of his office in San Francisco at the disposal of the Bureau in its survey of California plants and in giving information and advice on that section of the country.

Mr. Thomas A. Rickert, president of the United Garment Workers of America; Dr. Gladys Dickason, research director of the Amalgamated Clothing Workers of America; and Dr. Lazare Teper, research director of the International Ladies' Garment Workers' Union, were most helpful in furnishing information and guidance in the course of the survey and in offering valuable suggestions in the final preparation of the report.

The Singer Manufacturing Co. has made a most valuable contribution by preparing a succinct review of the development of the sewing machine during the past four decades. Credit is particularly due to Mr. M. C. Lightner, vice president of the company; Mr. J. Bader, sales manager; and Mr. I. F. Webb, machinery expert of the company. The Union Special Machine Co. was likewise helpful in furnishing considerable information on the subject of sewing machines.

Mr. Folkert Allan Schmidt, president, Prodexto Corporation, and the patentee of the straight-line system, took infinite pains in submitting data and in critically examining the manuscript of the chapter in this report bearing on the straight-line system.

In conclusion, credit is due to the authors of this report and to the men on the staff whose interest in and devotion to their work made possible whatever results the survey was able to achieve. While this is true of practically the entire staff, special mention should be made of the following who rendered most valuable service in the field operations and in the preparation of the final report: Messrs. Reuben Holland, Sidney Sameth, Glenn Newton, Maurice Shapiro, Harry Cobrin, John Klawin, Hyman Feiner, and Miss Mildred H. Krohl.

ISADOR LUBIN,
Commissioner of Labor Statistics.

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Productivity of Labor in the Cotton-Garment Industry

Chapter I

Summary

Scope of Survey

The object of this study was to determine the changes in labor productivity resulting from technological changes which have taken place in recent years in the manufacture of cotton garments, and to ascertain, as far as possible, the nature of these changes and their effects on labor cost and wages, as well as on the volume of employment in the industry.

The sample of 116 plants studied does not contain an adequate number of small plants, of plants paying low wages, and of plants manufacturing cheap products, to be considered fully representative of the more than 3,700 plants in the cotton-garment industry. Failure to cover a more representative sample of plants was due largely to absence of adequate records, particularly in the smaller plants. As a result, the output per man-hour, the wages, and the efficiency of management in most of the factories studied are probably substantially above the average for the industry. The average earnings of the workers covered are probably from 10 to 20 percent higher than the average for the industry as a whole.

The scarcity of records also made it impossible to have the study cover a period as long as was originally intended. Even in the plants where proper records are now kept, these are seldom preserved for more than 1 or 2 years. It was therefore difficult even to find 116 plants with suitable records extending as far back as the beginning of the N. R. A., when the keeping of production, employment, and man-hour records became obligatory. As a result, this study covers only the brief period of 4 years.[1]

Effects of Machine Changes

No changes of a startling character have occurred in the machines used by the industry during the 4 years covered by the study. As a

[1] See appendix 1 on problem and approach.

matter of fact, there have been no significant machine changes during the 20-year period which has elapsed since the World War.

The sewing department of a factory absorbs approximately 75 percent of all its productive labor. The remaining 25 percent is made up of pressers (about 10 percent), examiners (about 9 percent), and cutters and their helpers (about 6 percent). In these departments, in most branches of the cotton-garment industry, machines had generally displaced the shears in cutting and the hand iron in pressing before the war, and no changes which would have any appreciable effect on the production per man-hour in these departments have taken place since then.

The outstanding peculiarity of the industry is that the sewing machine, unlike the machines used in other industries (such as the weaving loom, the paper-making machine, or the automatic bottle machine), is not a machine that automatically governs the output, with the operator functioning as a mere machine tender. In contrast, it is the sewing-machine operator who controls the output of the sewing machine which she uses as a tool. Besides, the time required in handling work and in manipulating the parts of the garment under the sewing-machine needle in fashioning the garment is from two to seven times as great as the time spent in the actual work of sewing. Tests made by industrial engineers show that the sewing time consumes from 15 to 33 percent of the entire time spent by an operator in fashioning a garment and that from 67 to 85 percent of the operator's time is spent in handling her work and manipulating the garment. As a consequence, while the greater speed of the modern sewing machine is conducive to greater production, the amount of handling required sets definite limits to its effects on labor productivity.

The sewing machine is essentially a power-driven needle. A modern machine is capable of operating at the rate of 4,500 revolutions per minute. Translated in terms of work done, this means 4,500 stitches per minute or 75 stitches per second made by the needle. It taxes the capacity of the human eye and the human hand to keep up with such a speed while exercising the necessary skill in moving the garment about under the needle to fashion it into the necessary shape. This largely accounts for the lack of impressive changes in output per man-hour in the cotton-garment industry which could be ascribed to improvements in sewing machinery during the 4-year period covered by the study.

Even where developments of special machines used have resulted in a decided increase in labor productivity on the particular operation, their effect on the aggregate output as a whole has been negligible. A machine which causes a 50-percent increase in man-hour output on 1 of the 30 sewing operations required to make a shirt will increase

the productivity of the sewing department to a very small extent, probably less than 2 percent.

Driving or transmission machinery has, however, caused an appreciable increase in man-hour production in the past few years. The improved type of transmission machinery brings about the quicker stopping and starting of the sewing machine. Since the work of the sewing-machine operator consists of short spells of sewing, interspersed by longer intervals of handling, and the number of stops and starts runs into several hundred per hour, the reduction in the time spent on stopping and starting the machine has had a perceptible effect on the man-hour output of sewing-machine operators. In instances covered by the study, this has resulted in an increase in productivity of sewing-machine operators from 12 to 16 percent.

Straight-Line System of Production

The most significant technological development in the cotton-garment industry in recent years has been the adoption of a new system of shop production known as the "straight-line system." It is the result of the application of the principles of scientific management by a disciple of Frederick Taylor. The essential feature of the straight-line system is that it does away with the so-called "bundle process" which has been in existence since the beginning of the factory system.

The bundle originates in the cutting department of the factory. With the aid of mechanized cutting equipment, scores of layers of cloth are cut according to pattern in one operation, and each of the various parts which make up a garment are kept together in one pile or bundle, which forms the unit of work throughout the entire factory.

From the cutting department, the bundle is delivered to the individual operator, who performs her operation (such as making sleeves, or collars, or pockets, etc.) on the garments contained in the bundle, which is then turned over as a unit to other operators for subsequent operations, until the entire set of garments in the bundle is completed.

Under the straight-line system, the machines are arranged in short parallel rows in the order of the sequence of operations, and as an operator completes her operation on an individual garment or part of a garment, she places it within reach of the next operator. The individual garment or part thus replaces the bundle as a unit of work. The new system saves much of the effort wasted in the useless carrying of bundles from one end of the shop to the other and the lifting by the operators of tons of garments in the course of the day. It also enables operators to concentrate more on their work and results in more effective shop management and planning. (See ch. IV.)

The system is still in its beginning and was found only in a small proportion of the plants covered by the study, where it has resulted

in substantial increases in labor productivity. As a rule, the introduction of the line system is accompanied by the installation of new machinery, which, together with the concentration of the line method of operation on a more simple garment, contribute to the greater man-hour output possible on the line.

In addition to higher man-hour output, the straight-line system results in many other savings to plant owners. It greatly reduces the shop inventory or the amount of work in process, with a resultant saving in the capital tied up in stock and the carrying charges connected therewith. It makes possible savings in floor space, in clerical work, and in general overhead expenses due to more rapid turn-over in production.

Weekly earnings of workers have increased about 10 percent in line plants, due to the better utilization of working time under the line system and the avoidance of lay-offs, which are common under the bundle system. This gain in weekly earnings has occurred despite generally reduced hourly earnings in the plants studied. The line system was installed after the termination of the N. R. A., when average hourly earnings were generally reduced in both line and bundle plants. However, average hourly earnings in line plants declined somewhat less than in bundle plants. A comparison of straight-line and bundle plants shows that, on the average, weekly earnings in line plants were about $1 above those in bundle plants working the same scheduled hours.

As a matter of general policy, the United Garment Workers Union has opposed the introduction of the straight-line system in the plants under its jurisdiction. The severe competition which union plants were encountering from nonunion straight-line plants resulted in a persistent demand from union manufacturers for introduction of the system. Negotiations between the Union-Made Garment Manufacturers Association and the United Garment Workers Union resulted in an agreement to install the system as an experiment in a small plant owned by one of the largest union manufacturers in the country. At the time of the submission of this report, the matter was still in the experimental stage. The principle agreed upon calls for the sharing of the benefits of increased productivity between management and workers on a 50–50 basis. If the experiment proves a success, it promises to furnish a basis for the solution of the problem which has been vexing employers and the union and may throw the union work-clothing plants open to the introduction of the system.[1]

[1] In the course of the study, six union plants were found to be operating the line system. Three of these were under the Amalgamated Clothing and three under the United Garment Workers Union.

Since the submission of this report, the experiment having proved successful, an agreement was signed between the United Garment Workers Union and the Union-Made Garment Manufacturers Association providing for the use of the line system in all plants under the jurisdiction of the United Garment Workers Union.

Hours of Work

Under the N. R. A. (during 1933 and 1934) working hours in the cotton-garment industry were 40 per week. In December 1934, they were reduced to 36. Upon the termination of the N. R. A. in May 1935, the industry generally went back to the 40-hour week. In the South, 43 percent of the plants studied lengthened the week beyond 40 hours, the hours running from 44 to 54. One plant was found to operate on a 60-hour week. Two nonunion plants in California were found to maintain a 36-hour week.

Available data show that three-fourths of the northern plants and 57 percent of the southern plants were operating on a 40-hour week in 1936. The remainder worked in excess of 40 hours.

Earnings of Sewing-Machine Operators

The N. R. A. established a minimum wage of $13 a week or 32.5 cents per hour in the North and $12 a week or 30 cents per hour in the South. On January 21, 1935, 2 months after the 36-hour week went into effect, piece rates were raised so as to maintain the weekly earnings which prevailed under the 40-hour week. Upon the termination of the N. R. A., when the hours were increased to 40 or more, piece rates were generally reduced. The general aim was to reduce rates 10 percent, so as to restore the weekly earnings as they existed before the introduction of the 36-hour week. However, one-fourth of the southern plants covered by the study had increased their hours beyond 40 and reduced their hourly rates in proportion to the longer hours.[2]

Average figures on earnings for the industry as a whole conceal distinct and considerable differences in wage levels between large and small towns, between the North and the South, and between union and nonunion shops. Another point to bear in mind is that the plants covered by the study were of a distinctly higher type than the average of the industry and that the actual wages prevailing in the industry were probably from 10 to 20 percent less than the figures presented in this report.

Over 80 percent of the northern plants covered by the study showed average hourly earnings of not less than 32.5 cents, which was the minimum required under the N. R. A. code. Only 30 percent of the southern plants covered averaged as much as or more than 30 cents, which was the code minimum for the South.

Earnings by Region and Size of Town

There are no significant variations in the hourly earnings of sewing-machine operators in the different branches of the cotton-garment industry—shirts, pants, work clothing, or dresses. Geographical

[2] See p. 129.

distribution, the size of the town, and the existence of a union agreement are the principal factors to be considered in analyzing earnings of the workers employed. Among the various regions, highest wages were found to prevail in the far West. The average for that region was 43.0 cents, followed by 39.2 cents in the Midwest, 38.3 cents in the East, and 28.0 cents in the South.[3]

Classifying the plants studied by size of towns and dividing the cities into three large groups of 100,000 population and over, 10,000 to 100,000, and under 10,000, earnings of sewing-machine operators were found to vary with the size of the town in the northern area. The averages for the three groups of cities in the North were 40.4 cents, 38.0 cents, and 35.8 cents per hour, respectively. In the South, the towns of over 100,000 population showed an average of 27.2 cents, while the middle group of 10,000 to 100,000 showed a higher average of 29.6 cents and the smallest towns, under 10,000, showed the lowest earnings, 26.2 cents per hour.

Earnings in Union and Nonunion Plants

On the average, workers employed in union plants have higher earnings than those in nonunion plants. In the sample covered by the study, 39 union plants showed average hourly earnings of 45.6 cents, as compared with an average of 31.7 cents in 85 nonunion plants. The union plants may be divided into two groups—those turning out products covered by the union label and those having no label. The products of the first group consist almost entirely of work clothing, such as overalls, work pants, dungarees, and work shirts. Because of the protected market which is offered to union manufacturers, the union is in a position to command higher wages. On the other hand, in plants manufacturing house dresses, nurses' uniforms, and dress shirts[4] a union label is of little market advantage and union wages in those plants are distinctly lower than in the union-label plants. The average hourly earnings for the various union and nonunion groups are as follows: Union-label plants producing work clothing, 47.6 cents as against 33.6 cents in nonunion plants in the North and 26.6 cents in nonunion plants in the South; in dress-shirt manufacture, 38.4 cents in union plants in the North as against 37.0 cents in nonunion plants in the North and 29.7 cents in the South.

Conclusions

In spite of the comparatively small sample, restricted to the upper fringe of the industry, and the short period of time covered by the study, certain definite conclusions may be drawn from the data obtained.

[3] For details, see pp. 126–129.

[4] The term "dress shirt" is used in this report in contradistinction to "work shirt" and not in the commonly accepted sense of a shirt used for evening-dress wear.

(1) During the 4 years covered by the study and probably during the 20 years since the World War, there have been no significant changes in machines used in making cotton garments. Whatever improvements were made in the special sewing machines affected only a few minor operations and had no perceptible influence on the man-hour output of sewing departments and of factories as a whole. On the other hand, improvements in transmission machinery have resulted in an increase of labor productivity in excess of 10 percent.

(2) The outstanding technological change in the industry has been the installation of the straight-line system in a number of plants in both the North and South, with a resultant increase in labor productivity, accompanied by increases in weekly earnings. This system is a recent development, but its successful application in the manufacture of shirts, work clothing, semidress pants, and other products indicates its effectiveness as a labor-saving device. It is gaining wide acceptance in the industry, especially in the field of standardized products.

Chapter II

Characteristics and Background of Cotton-Garment Industry

The cotton-garment industry employs about 200,000 workers in nearly 3,700 plants, which are owned by some 3,300 firms and scattered in more than 900 cities and towns in 42 States and from the Atlantic to the Pacific and the Lakes to the Gulf. It is the largest of the apparel industries.

Historically, the industry had its beginning about 1832 with the manufacture of men's shirts for stock, but it soon spread to include work clothing. In recent years it has expanded rapidly into a wide variety of fields. Its principal products, in the order of number of workers employed, are men's shirts, women's cotton dresses, overalls, work pants, work shirts, semidress pants, and pajamas. These products absorb over three-fourths of the labor of the industry and account for nearly three-fourths of the value of its output.[1]

TABLE 1.—*Employment and production in the cotton-garment industry, 1934*

Product	Employment [1]	Value of production (in thousands) [2]
Total, cotton- garment industry	200,000	$534,462
Men's and boys' shirts	54,000	113,713
Cotton dresses	37,000	99,748
Overalls	22,400	56,964
Work pants	20,500	47,937
Work shirts	14,400	31,826
Semidress pants	7,600	29,536
Men's and boys' pajamas	6,000	19,614
Total, principal products	161,900	399,337
All other products	38,100	135,125

[1] Based on reports submitted to the Cotton Garment Code Authority for the second week of each month in 1934 and averaged for the year. Data are from Statistical Service Bureau of the International Association of Garment Manufacturers.
[2] United States Census of Manufactures, 1935.

The cotton-garment industry has been from its very beginning a low-wage industry. The average weekly and hourly earnings of the workers on cotton garments are among the lowest, not only of all the apparel industries, but also of all the manufacturing industries

[1] Other products of the industry include men's collars, boys' shirts, play suits, lumberjacks, sheep-lined and leather garments, men's wash suits, washable service apparel, boys' wash suits, children's wash dresses, aprons, smocks, hoovers, women's undergarments, children's undergarments, women's and children's pajamas and nightwear, oiled cotton garments, and nurses' and maids' uniforms.

in the United States. The principal characteristics of the cotton-garment industry are:

(1) The industry is more decentralized than any other apparel industry.

(2) More than 80 percent of all the workers on cotton garments are women, who constitute 95 percent of all the sewing-machine operators in the industry.

(3) The industry has been the least unionized among the apparel industries, although considerable extension of unionization has taken place since the creation of the N. R. A.

(4) The industry is subject to the competition of prison labor to a greater extent than any other industry. This applies particularly to work shirts and work pants.[2]

In addition, the cotton-garment industry differs from the other apparel industries in that—

(1) It is less seasonal and furnishes more steady employment throughout the year than any other apparel industry.

(2) Only a very small proportion of the industry, covering less than 3 percent of all the employees, is located in New York City.

(3) The contract system is developed to a lesser extent in cotton garments than in any other apparel industry.

(4) The style factor is of minor importance resulting in steadier employment and greater productivity of labor.

Size of Plants

The 3,300 firms in the cotton-garment industry average approximately 60 employees each, and 2,702 of these concerns employ fewer than 100 persons each. The average employment of these small firms is fewer than 18 workers each, and combined they employ fewer than 50,000 workers, or approximately one-fourth of the total for the industry.

The plants employing 100 workers or more each constitute nearly one-fifth of the total number of establishments but employ three-fourths of all the workers in the industry. In this group 396 plants employ from 100 to 249 workers each, 140 plants employ from 250 to 499 each, 39 employ from 500 to 999, and 23 employ 1,000 or more workers each.

Table 2 shows the distribution of the 3,300 firms according to size and the products they manufacture.

The most marked concentration of employment in a few large units occurs in the case of dress shirts, work shirts, and overalls. In each of these fields the style factor is of minor importance, while brand names

[2] Much of the prison labor competition has been greatly reduced in recent years by Federal and State legislation.

and national advertising play major roles in the dress-shirt market. In the case of overalls, the growth of large producers has been favored by the possibility of obtaining large orders from mail-order houses, chain stores, and other mass distributors. In the work-shirt industry only large-volume mass production could compete with cheap prison-labor products.

TABLE 2.—*Distribution of 3,300 cotton-garment firms, by number of employees, 1934* [1]

Product [2]	All firms	Number of firms having—				
		Under 100 employees	100 to 249 employees	250 to 499 employees	500 to 999 employees	1,000 employees and over
Total	[3] 3,300	2,702	396	140	39	23
Men's dress shirts	400	263	111	9	8	9
Cotton dresses	1,100	981	75	32	7	5
Overalls	400	362	13	14	9	2
Work pants	175	120	35	11	7	2
Work shirts	125	96	13	9	2	5
Semidress pants	125	92	27	5	1	----
Men's and boys' pajamas	60	44	13	2	1	----
Other products	915	744	109	58	4	----

[1] Data are from the Statistical Service Bureau of the International Association of Garment Manufacturers.
[2] The number of shirt, pajama, overall, etc., producers is greater than that given in each case, as many firms manufacture more than 1 product.
[3] The number of factories is 3,700 if one counts the 400 branch plants as separate factories.

In the case of pajamas, semidress pants, and cotton dresses the concentration of employment and production among a few large manufacturers, while still present, is appreciably less in degree. It is probable that this is due to the importance of the style factor in each of these products. The difficulty of standardizing production helps the survival of the smaller manufacturer.

Geographical Distribution

Unlike other needle industries, such as women's coats and suits, silk dresses, etc., the distinguishing feature of the cotton-garment industry is the lack of concentration in a few large centers like New York, Chicago, Philadelphia, etc. The industry is scattered all over the country and is most frequently located in small towns.

The distribution of cotton-garment production by States and by major geographical regions is shown in table 3. This table is computed on the basis of unit volume of production as shown by the sale of labels by the Cotton Garment Code Authority under the N. R. A. If the distribution were on the basis of dollar volume of production, the relative importance of the Eastern and Far Western States would be materially increased, since these regions produce, in general, garments superior in quality and higher in price than those produced in the rest of the country.

The two States showing the largest concentration of cotton-garment production are Pennsylvania, with 16.0 percent, and New York, with 11.8 percent. The East as a whole accounts for nearly 43 percent. The South and the Middle West account for approximately 26 and 28 percent, respectively, while the Far West produces slightly less than 4 percent of the total unit volume.

An interesting and unusual feature of the work-clothing division of the industry is its fairly even distribution throughout the country, although the South has more than its share of the industry in proportion to its population. The Eastern States, with 28.3 percent of the total population, produce 18.2 percent of all the work clothing; the South, with 30.6 percent of the population, produces 46.5 percent; the Midwest, with 30.2 percent of the population, produces 30.0 percent; and the Far West, with 8.3 percent of the population, produces 5.3 percent (see table 3).

The men's dress-shirt industry is highly concentrated in the East. More than one-half of the total unit production is in Pennsylvania and New York and nearly three-fourths is in the Eastern States. Work-shirt manufacture, on the other hand, is concentrated in the South, which area accounts for the production of approximately 59 percent of all work shirts. Three Southern States, Kentucky, Mississippi, and Tennessee, together account for over 36.8 percent of the total, while New York accounts for only 2.6 percent.

TABLE 3.—*Distribution of cotton-garment production, by States* [1]

[Based on label shipments in 1934]

State	United States population	Total cotton garments	Men's shirts	Work clothes [2]	Wash dresses	Work shirts
	Percent	*Percent*	*Percent*	*Percent*	*Percent*	*Percent*
East	28.3	42.7	74.6	18.2	42.5	13.8
Pennsylvania	7.8	16.0	[3] 29.6	8.6	11.1	10.2
New York	10.3	11.8	[3] 25.2	4.0	11.9	2.6
New Jersey	3.3	5.8	8.2	1.7	10.1	.6
Massachusetts	3.5	5.2	2.8	2.6	5.5	.1
Connecticut	1.3	2.7	7.2	.4	2.8	
Others	2.1	1.2	1.3	.9	1.1	.3
South	30.6	25.9	13.6	46.5	11.0	58.9
Maryland and District of Columbia	1.7	3.9	3.9	5.4	2.3	7.5
North Carolina	2.6	3.1	1.0	7.3		3.4
Texas	4.7	2.7	.3	6.2	1.9	2.1
Georgia	2.4	2.6	.6	8.0	1.2	.3
Virginia	2.0	2.6	1.0	6.5	.1	3.7
Kentucky, Mississippi, and Tennessee	5.8	7.4	3.8	9.1	.9	36.8
Others	11.4	3.6	3.0	4.0	6.7	5.1
Midwest [4]	30.2	27.6	11.3	30.0	40.0	26.8
Far West	8.3	3.8	.5	5.3	6.5	.5
California	4.6	3.1	.4	4.4	4.7	.4
Washington	1.3	.4		.4	.9	
Others	2.4	.3	.1	.5	.9	.1

[1] Data are from Statistical Service Bureau of the International Association of Garment Manufacturers.
[2] Includes overalls, work pants, semidress pants, heavy outerwear, and children's play suits.
[3] The men's shirt label shipments to the State of New York are somewhat higher than actual production and likewise label shipments to Pennsylvania somewhat lower. Two of the largest shirt producers whose factories were principally located in Pennsylvania shipped labels to their New York City offices.
[4] Includes Illinois, Indiana, Iowa, Michigan, Missouri, Ohio, and others.

Considering the industry as a whole, it is apparent that, despite the concentration of production of certain garments in a few States, virtually every State contributes an appreciable share. This wide dispersion probably reflects the tendency of producers to locate near potential markets. In the case of work clothing particularly, the Nation-wide character of the demand is reflected in a wide dispersion of plants.

Distribution by Size of Towns

The trend toward decentralization is accompanied by an equally marked tendency toward location of plants in nonmetropolitan centers. About 64 percent of the plants, employing approximately 50 percent of the workers, are located in cities of more than 100,000 population or in their suburbs. The tendency of larger plants to locate in nonmetropolitan areas is revealed by the fact that the percentage of workers in large cities is appreciably less than the percentage of plants.

TABLE 4.—*Distribution of cotton-garment factories, by size of town, 1934* [1]

Population of town	Number of towns	Number of plants	Estimated number of workers
Total	905	3,663	204,700
1,000 or unincorporated	106	148	8,600
1,000 to 2,500	111	142	9,600
2,500 to 5,000	129	189	18,100
5,000 to 10,000	119	192	17,500
10,000 to 25,000	158	279	21,000
25,000 to 50,000	78	203	14,200
50,000 to 100,000	60	173	19,600
100,000 to 250,000	57	304	19,100
Over 250,000 (including suburbs)	86	1,683	71,000
New York City [2]	1	350	6,000

[1] Data are from the Statistical Service Bureau of the International Association of Garment Manufacturers.
[2] Includes the 5 boroughs of Greater New York, Manhattan, Brooklyn, Bronx, Queens, and Richmond; does not include the remainder of the metropolitan area, which is defined as the area within a 40-mile radius from the city hall.

Expansion of Industry During the Depression

Unlike virtually all leading industries in the recent depression, cotton-garment production and employment in 1933 were sustained at the 1929 level. Cotton-garment retail prices fell almost as rapidly as did consumer income. Unemployed workers and impoverished farmers purchased overalls instead of suits of clothes. This is strikingly reflected in table 5, which shows how the decline of production in the men's clothing industry was accompanied by an increase in production of work clothing.

TABLE 5.—*Indexes of production of work clothing and men's clothing, 1929–33* [1]

[1929=100]

Year	Work clothing	Men's clothing
1929	100	100
1930	86	74
1931	96	71
1932	104	58
1933	110	66

[1] Data are from United States Census current monthly production reports. Index computed by Statistical Service Bureau of the International Association of Garment Manufacturers.

The output of overalls and work pants was higher in 1933 than in 1929, although the production of dress shirts and work shirts declined (table 6). However, the reduction in output of work shirts was more than made up by increases in prison-labor production.[3] The sharp declines in the total value of most products and in the average wholesale price per dozen garments from 1929 to 1933 were due to reduced wages, falling prices of cotton cloth, substitution of lower grades of merchandise, and competition of prison-labor products.

TABLE 6.—*Production and value of cotton garments, by major products,* [1] *1929 and 1933* [2]

Product	Total production (in thousands)			Total value (in thousands)			Average value per dozen		
	1929	1933	Change, 1929–33	1929	1933	Change, 1929–33	1929	1933	Change, 1929–33
Dress shirts (men's and boys')	*Dozen* 13,448	*Dozen* 11,932	*Percent* −12.3	$163,921	$93,352	*Percent* −43.1	$12.19	$7.82	*Percent* −35.9
Work shirts	5,918	5,000	−16.5	47,129	23,350	−51.4	7.96	4.71	−41.8
Overalls	6,450	7,500	+16.3	79,691	55,931	−29.4	12.35	7.46	−39.6
Work pants	2,095	3,510	+72.3	29,212	37,002	+26.7	13.94	10.54	−24.4
Semidress pants	[3]	1,626	[3]	[3]	18,704	[3]	[3]	11.50	[3]
Women's wash dresses	[3]	6,740	[3]	[3]	82,784	[3]	[3]	12.28	[3]
Men's and boys' pajamas	1,847	1,868	+1.1	24,219	16,847	−30.5	13.11	9.02	−31.2

[1] Only products covered in this survey are included; prison-labor production is omitted for both years.
[2] Data are from United States Census of Manufactures.
[3] Data not available.

Employment held its ground during the depression, along with production. The 1933 Census of Manufactures reported an increase of 6 percent in employment on shirts and work clothing over 1929.[4]

Machine capacity increased even more rapidly than production. Records of 947 factories reporting to the Cotton Garment Code Authority showed 122,500 machines in March 1933, as compared with 108,475 machines in July 1929, or a gain of 13 percent (see table 9).

[3] U. S. Bureau of Labor Statistics Bull. No. 595. Washington, 1933.

[4] Employment figures on shirts and work clothing from the United States Census of Manufactures are not strictly comparable for 1929 and 1933. A decline in employment was recorded between 1929 and 1931. Product classifications were modified between 1931 and 1933. A special census tabulation of identical establishments recorded an increase in employment between 1931 and 1933, more than offsetting the decrease between 1929 and 1931, and amounting to a net gain of 6 percent in employment from 1929 to 1933.

All of the seven principal products studied reported more sewing machines in the depression year 1933 than in 1929. Hundreds of new cotton-garment factories commenced operation during the depression. The Code Authority had knowledge of 347 new plants established during the depression period between July 1929 and July 1933; these plants had 27,536 machines. Pennsylvania had the largest number of new machines in any individual State—3,833, installed in 37 new factories. One-third of the new machines were installed in the South.

Drift of Industry to Small Towns and to South

An increasing proportion of the production of the cotton-garment industry has moved South since the termination of the N. R. A. This long-term trend of several decades was accelerated during the recent depression, slightly retarded under N. R. A., but substantially advanced in the last few years. Lower wages, nonunion labor conditions, and often subsidies from local communities and from chambers of commerce in small southern towns proved inviting to northern manufacturers. The $5 or $6 weekly wages which were offered by newly migrated garment factories to southern agricultural workers and share croppers were substantially above their usual earnings, but far below the wages paid by competing cotton-garment manufacturers, not only in Northern States, but also by some of the older southern producers of cotton garments.

TABLE 7.—*Percentage distribution of total plants and machines in operation*[1] *in North and South, 1929, 1933, and 1934*

Population of region and city	Machines in operation			Plants		
	July 1929	July 1933	March 1934	July 1929	July 1933	March 1934
North	84.7	78.9	79.6	87.1	84.4	84.9
Over 100,000	48.0	44.6	46.1	54.6	54.9	56.8
10,000–100,000	23.1	18.7	18.2	18.0	14.9	14.0
Under 10,000	13.6	15.6	15.3	14.5	14.6	14.1
South	15.3	21.1	20.4	12.9	15.6	15.1
Over 100,000	5.2	7.4	6.6	5.7	7.5	7.3
10,000–100,000	6.1	7.1	7.4	3.5	4.1	4.0
Under 10,000	4.0	6.6	6.4	3.7	4.0	3.8

[1] Based on reports to the Cotton Garment Code Authority from firms employing about 70 percent of all the workers in the industry. Data are from the Statistical Service Bureau of the International Association of Garment Manufacturers.

Northern cities of over 100,000 population employed 48.0 percent of the sewing-machine operators in the industry in July 1929 and only 44.6 percent in July 1933 (table 7). Plants located in towns in the North with between 10,000 and 100,000 population likewise lost heavily in their proportion of sewing-machine operators between 1929 and 1933. At the same time, substantial gains were registered by factories in towns of less than 10,000 population in the North.

The proportion of machines in towns of all sizes in the South went up from 15.3 percent to 21.1 percent of the total. In towns below 10,000 population in the South the increase was from 4.0 percent in 1929 to 6.6 percent in 1933.

The gravitational pull of low-wage States in the recent depression is revealed in table 8, which records changes in employment in the shirt and work-clothing industries between 1929 and 1933. The three States with highest annual earnings—California, New York, and New Jersey—lost in employment, while gains in employment were registered in the States where earnings averaged between $300 and $500 per year. These gains in most instances were recorded south of Mason and Dixon's line, in the Middle West, and also in the low-wage area of Pennsylvania. With the exception of Indiana, which gained 56 percent in employment, no Northern State has registered gains comparable with the leading Southern States. Kentucky gained 38 percent; North Carolina, 58 percent; Virginia, 60 percent; Tennessee, 61 percent; and Alabama, 79 percent.

TABLE 8.—*Average employment and annual earnings in shirt and work-clothing industries, 1933, and percentage change in employment, 1929 to 1933* [1]

State	Average number of employees, 1933	Average annual earnings, 1933	Change in employment, 1929–33
			Percent
California	2,474	$646	−12
New York	11,124	565	−32
New Jersey	5,162	542	−10
Connecticut	3,148	532	+27
Ohio	3,904	518	+10
Maryland	4,311	496	+37
Illinois	3,573	494	+23
Indiana	9,174	472	+56
Missouri	7,072	458	+4
Pennsylvania	22,727	459	+24
Texas	3,873	445	+7
North Carolina	3,261	393	+58
Virginia	3,351	385	+60
Georgia	2,970	384	+12
Tennessee	3,725	373	+61
Kentucky	2,089	368	+38
Alabama	1,422	358	+79

[1] Data are from United States Census of Manufactures, 1929 and 1933. Only States reporting 1,000 or more employees are included. Massachusetts, Minnesota, and Wisconsin are not considered, as classification from 1929 to 1933 is not comparable.

No figures are available on the extent of the drift of plants and employment to small southern towns since the end of the N. R. A. However, there are indications that in the 2 years 1934 to 1936 several dozen large northern concerns have either moved southward [5] or established additional plants in the South.

The major changes in the cotton-garment industry since the termination of the N. R. A. thus were a moderate trend toward longer hours and lower wages, the movement of plants in the North to the small towns and to the South, and a decline of prison labor.

[5] Based on reports in the Daily News Record, a textile-garment daily published in New York.

Outside Sources of Supply

Puerto Rico and the Philippines

Duty-free imports from Puerto Rico and the Philippines have made these islands a part of the economic system of the United States. Their manufacture of cotton garments for the United States market has been growing rapidly. In 1936, shipments from Puerto Rico were valued at over $17,000,000 and from the Philippines at over $4,750,000. These imports constitute about 4 percent of the total production in the United States.

Prison Labor

Another source of supply of cotton garments outside the industry proper is furnished by prison labor. Although competition from prisons had existed in the cotton-garment industry for many decades, cotton-garment production in prisons nearly doubled between 1926 and 1932. Prisoners employed on cotton garments for sale in the open market rose from 7,000 in 1926 to 13,000 in 1932.[6] The prison output of work shirts and work pants, the two largest items of prison production, amounted to 23 percent and 20 percent, respectively, of the total production in the country in 1932.

However, largely as a result of the Hawes-Cooper Act, followed by the Sumners-Ashurst Act, prohibiting the shipment of prison-made goods into States which prohibit the manufacture of prison-made goods for sale in the open market, several States discontinued the production of such goods for the market, and the number of prisoners so employed declined from 13,000 in 1932 to 3,700 in 1934. Their production of work shirts declined during the same period from 1,650,000 to 238,000 dozen, and of work pants from 569,000 to 242,000 dozen.[7]

W. P. A. Sewing Rooms

Since 1935, approximately 10,000 W. P. A. sewing rooms, providing emergency work for some 250,000 unemployed women, have been producing about 5,000,000 dozen garments annually. However, none of this production is sold in competition with the industry's products, the garments being distributed free among the unemployed.

Child Labor

The extent of child labor in the cotton-garment industry was relatively large, even before the depression, as the April 1930 census recorded 3.7 percent of all wage earners on shirts and work shirts as under 16 years of age. In Pennsylvania [8] minors 14 and 15 years old

[6] U. S. Bureau of Labor Statistics Bull. No. 595. Washington, 1933.

[7] Data are from unpublished reports of Research and Planning Division of the N. R. A.

[8] Pennsylvania Department of Labor and Industry. Pennsylvania Labor and Industry in the Depression. Harrisburg, 1934, p. 39.

employed in cotton-garment factories averaged $2.67 per week in April 1933, as against an average wage of $8.38 for minors in 1926. Three-quarters of the minors in 1933 were paid less than $5 per week, 50 percent received below $3 per week, and 20 percent were paid less than $2 per week.

Hours of work of 14- and 15-year-old children in cotton-garment factories in Pennsylvania increased during the depression, as 79 percent of these child workers operated their sewing machines more than 49 hours a week in 1932, as compared with 47 percent working over 49 hours in 1926.[9]

Hours of Work

In the early history of shirt manufacturing, in the middle of the nineteenth century, hours were excessively long. For the period 1877 to 1900, the most common working hours in the cotton-garment trade were 60 per week.[10] In 1923 average weekly hours of 72 shirt and overall factories employing 7,650 women in 11 widely scattered States were from 48 to 50.

Hours of work increased considerably during the depression. The average weekly hours increased from 45.6 in 1929 to 48.6 in 1933. Of the 304 firms reporting to the International Association of Garment Manufacturers, 55.8 percent had working hours in 1933 exceeding 48 and up to 60. Under the N. R. A., hours were first reduced to 40 per week. From December 1934, until the termination of the N. R. A. on May 28, 1935, the weekly hours were 36. After its termination hours went back to 40 per week in most of the plants in the North and in the majority of the plants in the South. In a large number of nonunion plants in the South, as well as some in the North, the weekly hours of work are in excess of 40—from 44 to 48 and in a few instances from 50 to 60.

Wages

In the prosperous year of 1929, the cotton-garment industry paid the lowest average annual wage of any major industry reported in the United States Census of Manufactures. As shown in table 9, 111,210 workers in 947 identical plants averaged in 1929 $13.42 per week ($14.20 in the North and $10.05 in the South) and 29.4 cents per hour (31.4 cents in the North and 21.4 cents in the South).

A birds-eye statistical view of the decline in cotton-garment wages during the depression is revealed in the same table. Average hourly wage rates fell 30 percent in the North to 22.0 cents, and 27 percent

[9] Pennsylvania Department of Labor and Industry. Labor and Industry, Harrisburg, February 1933, p. 3: Hours and Earnings of Men and Women in the Textile and Clothing Industries of Pennsylvania.

[10] New York State Bureau of Labor Statistics, Eighteenth and Nineteenth Annual Reports. Albany, 1901 and 1902.

in the South to 15.6 cents. This severe drop in wages between July 1929 and March 1933 in southern factories occurred in spite of an increase in employment of 16 percent, and an expansion in the number of sewing machines of 22 percent.

TABLE 9.—*Machine capacity, employment, hours of work, and earnings in cotton-garment industry, 1929 and 1933* [1]

Item	947 cotton-garment plants			780 northern plants			167 southern plants		
	July 1929	March 1933	Change 1929–33	July 1929	March 1933	Change 1929–33	July 1929	March 1933	Change 1929–33
			Percent			*Percent*			*Percent*
Number of machines	108,475	122,501	+12.9	87,913	97,364	+10.8	20,562	25,137	+22.3
Number of employees	111,210	107,167	−3.8	90,388	82,897	−8.3	20,822	24,210	+16.3
Average weekly hours	45.6	44.6	−3.5	45.2	43.6	−3.5	46.9	45.5	−3.0
Average weekly earnings	$13.42	$9.01	−32.9	$14.20	$9.56	−32.7	$10.05	$7.12	−29.2
Average hourly earnings (cents)	29.4	20.5	−30.3	31.4	22.0	−29.9	21.4	15.6	−27.1

[1] Data are from the Statistical Service Bureau of the International Association of Garment Manufacturers.

Wages represent an unusually high proportion of the value added by manufacture (50 percent) in the production of cotton garments.[11] Therefore, a slash in wages has always been the easiest means for the cotton-garment manufacturer to cut costs and undersell his competitor.

The downward spiral of cotton-garment wages began early in the depression, even at the time when most industries were still trying to maintain the predepression rates. Even as early as May 1930, the United States Bureau of Labor Statistics' index for dress and work shirts had recorded a drop in weekly earnings of 13 percent as compared with the same month in 1929. By December 1930, the wage index had fallen 17 percent below December 1929. By March 1933 the decline in hourly earnings was from 25 to 33 percent in most of the branches of the cotton-garment industry, according to figures of the Cotton Garment Code Authority. The United States Census of Manufactures recorded a decline in the average annual earnings of 105,613 cotton-garment workers employed on work clothing and shirts from $714 in 1929 to $596 in 1931 and to $458 in 1933. Some factories reported to the Cotton Garment Code Authority that their average wages in 1933, prior to the N. R. A., had been as low as 8 cents per hour on a 60-hour week.

Drastic wage-cutting practices in the shirt industry were also reported in the United States Department of Labor survey in 1933 of 129 factories employing 20,000 workers.[12] Busy weeks were selected,

[11] Based on computations from shirt and work clothing and other industry figures of the United States Census of Manufactures, 1935.

[12] U. S. Bureau of Labor Statistics, Monthly Labor Review, September 1933: Labor in the Shirt Industry, 1933.

so that the reported wages would approximate full-time earnings of the workers. The median weekly wage of the 129 factories was $7.40, while in Pennsylvania the median was $6.10 and in Maryland $5.60. The majority of these plants had scheduled working hours of over 48 per week.

TABLE 10.—*Percentage distribution of wages of woman shirt workers, 1933* [1]

Weekly earnings	United States	Pennsylvania	Maryland
	Percent	*Percent*	*Percent*
Under $2	4	8	7
$2 to $3.99	10	16	22
$4 to $5.99	21	26	28
$6 to $7.99	24	25	22
$8 and over	41	25	21
Total	100	100	100

[1] Data are from U. S. Bureau of Labor Statistics, Monthly Labor Review, September 1933, p. 508.

Since many factories had moved to small Pennsylvania towns to take advantage of the cheap labor supply of wives and daughters of unemployed mill workers and miners, the low wages paid in small towns are significant. In towns of less than 2,500 population 12 percent of the employees received less than $2, 43 percent less than $4, and 77 percent less than $6 weekly.[13] The following figures show the wide divergence in wages and competitive advantages in the shirt industry just prior to the N. R. A.:

Population of town	*Median weekly wage* [1]
Under 2,500	$4. 30
2,500 to 10,000	5. 60
10,000 to 50,000	7. 50
50,000 and over	8. 20

[1] Data are from Monthly Labor Review, September 1933, pp. 503–504.

Under the N. R. A., wages in the cotton-garment industry rose from an average of 19.3 cents per hour in March 1933 to 41.8 cents per hour in April 1935, a gain of 117 percent in 2 years.

Average Hourly Earnings, by Occupations

In the average cotton-garment factory, 75 percent of the productive workers are sewing-machine operators, about 10 percent are pressers, 9 percent are examiners, and some 6 percent are cutting-room employees.[14] The cutters are relatively well paid, averaging 47.5 cents per hour before the N. R. A., or substantially above the minimum wage later set by the code. Pressers are usually paid slightly higher wage rates than operators, and examiners receive a little lower rate.

[13] Monthly Labor Review, September 1933, p. 503.

[14] The percentage varies with the nature and quality of the products.

Table 11 records average hourly earnings, by occupations, of cotton-garment workers in 311 plants in the North and 78 plants in the South. (July 1934 was an unusually slow month and should not be used as an example for weekly hours and weekly wages.) Over the 12-month period, July 1933–July 1934, the average hourly earnings of operators rose from 21.0 cents to 38.9 cents in the North and from 16.8 cents to 33.1 cents in the South. In 1 year, the hourly earnings of operators, examiners, and pressers, both in the North and South, increased 85 percent to 97 percent.[15] This increase occurred in spite of the fact that July 1934 was an unusually slow month, as in slack production hourly earnings generally suffer.

TABLE 11.—*Wages and hours in northern and southern plants* [1]

Occupation	Number of employees		Average weekly hours		Average hourly earnings	
	July 1933	July 1934	July 1933	July 1934	July 1933	July 1934
Northern plants					*Cents*	*Cents*
Total, all occupations	32,631	26,194	42.2	28.7	23.6	40.9
Total, regulars	31,461	25,657	42.3	28.7	24.0	41.5
Cutters	1,221	1,021	45.1	33.0	47.9	66.2
Other cutting department employees	747	565	45.0	31.8	28.7	40.9
Operators	20,896	16,067	41.6	27.0	21.0	38.9
Examiners and trimmers	1,996	1,751	43.0	26.9	18.8	36.5
Pressers	2,520	1,929	41.7	27.5	22.3	40.3
Other manufacturing employees	1,206	1,165	43.8	31.6	29.6	43.8
Nonmanufacturing employees	1,939	2,127	45.5	35.3	33.7	46.4
Office employees	936	1,032	44.7	36.3	37.6	46.4
Total, learners	1,170	537	38.9	27.5	12.3	29.9
Learner operators	1,026	423	38.2	26.9	12.5	29.5
Other learners	144	114	43.7	29.4	11.6	31.1
Southern plants						
Total, all occupations	11,441	7,531	44.6	26.4	18.0	34.3
Total, regulars	11,073	7,408	44.7	26.5	18.3	34.9
Cutters	209	189	49.2	34.2	37.9	50.1
Other cutting department employees	153	92	48.0	29.9	20.6	33.8
Operators	8,304	5,294	44.1	24.7	16.8	33.1
Examiners and trimmers	671	377	44.1	26.3	15.5	32.2
Pressers	571	414	45.2	27.0	15.5	33.1
Other manufacturing employees	352	250	46.7	28.6	25.2	37.3
Nonmanufacturing employees	591	609	49.1	34.2	24.7	40.6
Office employees	222	183	46.1	38.7	36.5	43.4
Learner operators	355	93	42.4	25.1	8.3	22.1
Other learners	13	30	35.3	23.4	13.3	23.6

[1] Data are from the Statistical Service Bureau of the International Association of Garment Manufacturers.

Increase in Productivity of Workers Under N. R. A.

Working hours in the cotton-garment industry averaged 44.4 per week in March 1933 and 45.8 in July 1933, both months prior to the N. R. A., compared with 36.7 hours in March 1934 under the 40-hour

[15] For the trend of earnings after the N. R. A., see p. 1, ch. V.

week of the cotton garment code. Scheduled factory hours were principally 48 and 52 hours per week in 1933, but some plants reported that their scheduled hours had been 54 and 60 hours per week prior to the N. R. A. Despite the general expectation that a 25-percent reduction in working hours would result in a large increase in employment, employment in 1934 under the 40-hour week and in 1935 under the 36-hour week remained virtually the same as in 1933 on scheduled working hours ranging from 40 to 60 per week.

Since the volume of production was virtually the same under the code, the decrease in working hours could be compensated by only one factor; namely, an increase in production per hour of factory operators. Plants were able to turn out as much in 40 or 36 hours a week, as they had previously in 48 to 52 hours, due to the advance in efficiency of management and workers in this industry.

Because of the sharp increases in labor and overhead costs imposed by the minimum wage and shorter hours under the code, radical changes became necessary in the operation of many backward factories. Some of these were: (1) Obsolescent machinery had to be replaced; (2) efficiency systems were installed in a number of plants; management also saw to it that many hours of wasted time, which formerly were spent by girls idly waiting for bundles of cut goods to be delivered were eliminated; (3) 8,000 child workers and numerous other inefficient operators were replaced by more capable workers; (4) some employees who formerly had worked 60 hours per week at 8 cents per hour were stimulated to greater productivity under the better wage and hour standards of the cotton-garment code.

Labor Organizations

Attempts to establish a labor organization among shirt operators, particularly in New York City, have been recorded as far back as 1846, the year of the invention of the first sewing machine.

A mass meeting of the New York seamstresses was announced early in September 1846. It was reported that these women were obliged to make shirts at 4 cents apiece.

Early in the summer of 1851 an attempt to relieve the necessities of some 6,000 shirt sewers in the city of New York led to the formation of the Shirt Sewers' Cooperative Union. They implored the public to remember that thousands of these women were "sewing at once, with a double thread, a shroud as well as a shirt." Many of these, they said, were young and friendless orphans; others were widows depending upon the needle for the support of helpless children.[16]

Although several shirt factories in the New York City district became unionized toward the end of the nineteenth century, no headway was achieved by labor unions in the shirt industry until the start of

[16] U. S. Bureau of Labor. Report on Condition of Women and Child Wage Earners, vol. 10: History of Women in Trade-Unions, by John B. Andrews and W. D. P. Bliss. Washington, 1911, pp. 36-38.

the N. R. A. in 1933. The Amalgamated Clothing Workers became active in the cotton-garment industry in the spring of 1933 with a general drive to unionize Pennsylvania shirt workers. Prior to 1933, virtually only New York City shirt workers had been organized by the Amalgamated. By that year, however, only cutting establishments remained in New York City in most cases, since all leading shirt manufacturers who had been located in New York City had moved their sewing rooms up-State in New York or to New Jersey, Pennsylvania, Maryland, etc.

During 1933–35 the union was successful in organizing a majority of the employees of both manufacturers and contractors in Pennsylvania, New York, Connecticut, and New Jersey. Some shirt factories were unionized in other parts of New England and a few plants in the Midwest, but no headway was made in the South. The Amalgamated Clothing Workers organized most of the employees of the sheep-lined and leather-garment and heavy-outerwear factories in the Eastern States and also of some producers of semidress pants. By 1935 this union was reported to have enrolled 40,000 workers in the cotton-garment industry. About half of the workers on men's shirts were reported as belonging to the union.[17]

The overall industry had a completely different labor organization background. As far back as 1891 an agreement was signed between the largest overall manufacturer and the United Garment Workers of America, the principles of which continue in practice among union-made work-clothing producers at the present time. Outstanding among the provisions was a uniform scale of piece rates applicable throughout the country in all plants organized by the union, and a union label to be sewed on all garments to identify them to the consumer as a union-made product, manufactured under union wage and working standards. This union label has been a powerful factor in maintaining the United Garment Workers Union in the work-clothing field. However, a large quantity of overalls are now produced for consumers outside of the field of organized labor, such as farmers and nonunion workers, and these are manufactured in large nonunion plants. By 1936 the United Garment Workers was reported to have approximately 20,000 members in the cotton-garment industry.[17]

Another labor organization which has become a factor in the cotton-garment industry is the International Ladies Garment Workers Union. Between 1910 and 1930 it made several efforts to organize

[17] National Recovery Administration. The Cotton Garment Industry, by J. W. Hathcock. Evidence Study No. 8. Washington, p. 31.

At its twelfth biennial convention, in May 1938, the Amalgamated Clothing Workers reported a total membership in the cotton-garment industry of approximately 55,000. Of these, 40,000 workers were employed on men's shirts and 7,500 on work clothing. Since 1936 considerable progress in organizing cotton-garment workers has also been made by the United Garment Workers and the International Ladies Garment Workers Unions.

cotton-dress workers in New York City. The center of the cotton-dress industry, however, shifted away from New York, leaving only about 8 percent of the production in New York City in 1935. The International Ladies Garment Workers Union was reported to have enrolled during the N. R. A. period about 15,000 members in the cotton dress, apron, and nurses' uniform division of the cotton-garment industry.[18]

It is estimated that at the present time about one-third of the cotton-garment employees in the entire country are organized in the three major apparel unions—the Amalgamated Clothing Workers, the International Ladies Garment Workers, and the United Garment Workers. Most of the organized workers are in the North, where the proportion of workers in the three unions is much larger than one-third. In the South the proportion of organized workers is very small.

[18] See footnote on p. 22.

Chapter III

Development of Machinery in the Cotton-Garment Industry

Evolution of the Sewing Machine

The modern sewing machine, capable of producing a "lock stitch," dates from 1846 when it was invented by Elias Howe, an American. Frederick G. Bourne [1] says:

Prior to Howe, all the sewing machines patented made the chain or tambour stitch, or attempted to imitate sewing by hand, making what might be called the backstitch.

Howe used an eye-pointed needle and a shuttle, passing the shuttle through the loop of the needle-thread and producing a lock-stitch alike on both sides of the material, with the lock or intertwining loops of the two threads pulled to the center; this might very appropriately be called a woven stitch in contradistinction to the chain or knitted stitch.

The first attempts to introduce the machine are described as follows by Charles R. Gibson:[2]

Elias Howe was an enthusiast and he devoted himself to his work until he produced a machine which could sew a seam. He soon satisfied his benefactor that the machine was reliable, for he sewed all the seams in two suits of cloth—one for his sponsor, Mr. Fisher, and one for his own use. This first machine of Howe's had a curved needle, with an eye near its point, and the action of the needle was not unlike that of a pickaxe.

With the aid of a shuttle beneath the cloth it formed a lock stitch in the manner already described. The principle was identical with that of Hunt's, and yet Howe produced his machine quite independently.

We can imagine Howe, the enthusiast, patenting his machine, and then hastening to make it public, and we can sympathize with him when he found that its exhibition only gave amusement to those who examined it. It was looked upon as a mere curiosity. But Howe had plenty of confidence in the machine. He challenged any five sewers to do as much work as his one machine. This bold challenge was accepted, and the five most expert needlewomen in a large factory were selected for the trial. Ten garments were cut, each garment being exactly alike, and five of these were given to the machine while each of the sewers took one of the other five. The race was begun and anyone watching these experts would have thought the machine was undertaking an impossible task in proposing to sew five times as quick as one of these sewers. But before these experts had about half of their garments done, the machine cried a halt, having completed the whole of its similar task.

[1] Bourne, Frederick G., American Sewing Machines, in One Hundred Years of American Commerce edited by Chauncey M. Depew, New York, 1895, vol. 11, p. 525.

[2] Gibson, Charles R.: The Romance of Modern Manufactures. London, 1915.

One would have expected an immediate demand for Howe's machines, but prejudice was too great. The tailors were up in arms against the introduction of machinery—a foolish spirit which, however, is not dead today.

The application of power to the sewing machine presents an interesting evolution:

Power was applied at first by a hand crank, but soon a man named Singer conceived the idea of using a foot treadle similar to the one on the spinning wheel. Somewhat later, he added a balance wheel on the upper shaft for increasing the momentum, leaving both hands of the machine operator free to guide and control the cloth.[3]

From the foot treadle to the power-driven shaft connecting with the sewing machine by means of a leather belt was but another step. So long as steam was the source of power, the arrangement of the sewing machines in long rows running the length or the width of the room, each machine driven by an individual belt and all deriving their power from the single shaft, was the only feasible and economical arrangement. With the advent of electricity as the source of mechanical power in industry, it became possible and more economical to supply each machine with an individual motor. This, in turn, made possible the grouping of the machines in accordance with the special needs of the shop, instead of the traditional, long-row, shaft-driven arrangement of the machines. It was the individual electric motor as the source of power for the individual sewing machine that made the realization of the straight-line system possible (see ch. IV).

After the perfection of the general-utility sewing machine came the development of special machines, performing a single function, such as the buttonhole machine, the button-sewing machine, the off-the-arm-sleeve setting machine, the double-needle lock-stitch machine, the multiple-needle machine (in which from three to nine, and even more needles sew simultaneously a corresponding number of rows of stitching), etc. The development of the numerous attachments (running into the thousands), which enable the operator to do certain operations, forms another chapter in the evolution of the sewing machine. Many of these operations, which previously required great skill and had to be done with great care and therefore slowly, can now be done much faster with the aid of attachments such as the hemming attachment, the attachment for taping edges, and numerous others.

By 1900 a sewing machine was produced with a capacity of 4,000 stitches per minute, which is only 500 stitches per minute below the fastest machine produced in the present day.

Stitching machines were first operated in the clothing trade by foot power at a speed of 800 to 900 stitches per minute. The construction was clumsy and hard to operate. Gradually, machines were built with less motion and friction in the parts

[3] Cleveland (Ohio) Board of Education. Bureau of Educational Research. The Clothing Industry in Cleveland. Cleveland, 1928, p. 4. (Occupational Information Series No. 2.)

and were able to attain a greater number of stitches per minute with less motion, but still operated by foot power. * * * Machines operated on mechanical power were able to be operated on a speed of about 1,200 to 1,500 stitches per minute. Later, machines with a speed of 2,000 stitches per minute came into general use. In 1895 a machine was put on the market permitting a speed of 2,800 stitches per minute, and finally in 1900 first-class results were obtained on a machine with a speed of 4,000 stitches. During all these changes the desire has been to get as little motion in the machine and confine the mechanism to as few parts as possible.[4]

As shown later in this chapter, the effect of the substitution of the sewing machine for hand labor on the productivity of labor was stupendous. The percentage increase in labor output per man-hour ran into several hundreds and on individual operations into the thousands. However, the bulk of these changes was effected by the end of the nineteenth century. The changes which have occurred since 1900 have been in the nature of perfecting and refining details.

No important changes have taken place in the last few years, the period covered by the present study. Moreover, the increased productivity resulting from the improved sewing machines is far from being equal to the increase in the speed of the new machines. Several factors are responsible for this result:

1. The actual time of sewing is only from 15 to 33 percent of the total time spent by the machine operator in performing her operation.

2. If a machine is applicable to only one of the approximately 30 operations required to do the garment, the increase in productivity on that one operation will have the effect of increasing the productivity of the entire sewing department by only one-thirtieth of the increase on the individual operation.

3. There are additional factors which tend to reduce the effect of the increased speed of the machine. Sewing machines are seldom set to revolve at their theoretical maximum. Even if they are so set, a loose shaft, the fluctuation of voltage on the line, the slipping of the belt, etc., will all contribute to the reduction of the rated speed of the machine.

4. The efficiency of the individual workers frequently introduces factors which may counterbalance all or part of the increased speed of the machine, such as the following:

(*a*) A change in the location of a machine, such as moving it from a light place near a window to a dark area, or vice versa, will affect the productivity of the worker.

(*b*) A change in the lighting equipment, improving the lighting of the shop, will contribute to the productivity of the operator.

(*c*) The substitution of a ready-wound bobbin for the ordinary bobbin, which has to be rewound by the operator about once an hour, will affect her productivity.

[4] Pope, Jesse E.: The Clothing Industry in New York. University of Missouri, Columbia, 1905, pp. 75–76.

(*d*) An improvement in the ventilation and air-conditioning of the shop, particularly in warm weather, will increase the personal efficiency of the worker.

(*e*) An increase in working hours per day will add to the fatigue of the worker, particularly in the last hour or two of her workday. By the same token, a reduction in hours is likely to bring about a greater productivity per hour.

(*f*) An improvement in the management of the shop, such as the introduction of floor boys or floor girls to relieve the operator of the task of carrying the bundle or of doing simple operations such as turning parts inside out, etc., will affect the productivity of the operator.

These factors and others too numerous to mention, are not accounted for in the ordinary records of a plant, making it impossible to trace their effect on labor productivity in the shop. Any or all of these changes will either increase or reduce the hourly productivity of the worker, as the case may be, and will tend to confuse the effect of the machine factor as such.

5. Increased speed of the sewing machine is frequently utilized in improving the quality rather than in increasing the quantity of output. An increase of 25 percent in the speed of the machine (say from 3,600 to 4,500 revolutions per minute), if accompanied by a corresponding increase in the number of stitches per inch (say from 12 to 16), will result in no increase in productivity as measured by the number of garments produced.

Improved Transmission Equipment

In marked contrast to the mingled effects of improved sewing machines is the clear-cut increase in productivity resulting from the installation of improved transmission machinery, known as safety tables or high-speed transmitters. The improved transmission equipment shortens the interval of time it takes to start and stop a sewing machine; in other words, it saves some of the nonsewing time, which has been shown to absorb from 67 to 85 percent of the total working time of the operator.

Mechanization of Cutting

Improvements in the sewing machine were followed by mechanization in the cutting department of garment factories, where men exclusively were employed. This development is thus described by William C. Browning: [5]

> It was not until some years after the war—perhaps about 1870—that cutting machines were first introduced into the wholesale manufacture of clothing. The long knife was the first improvement upon the old-fashioned shears of former

[5] Browning, William C.: The Clothing and Furnishing Trade, in One Hundred Years of American Commerce, edited by Chauncey M. Depew, New York, 1895, vol. 2, p. 562.

years, and this, operating something like a saw, made possible the cutting of some 18 thicknesses of clothing to 1 thickness cut by shears. The Fenne and Worth cutting machines came later, the blade being a circular disc, revolving rapidly and cutting as many as 24 thicknesses of clothing with the speed and accuracy of a buzz-saw.

By 1924 it was possible to cut as many as 240 thicknesses of cloth in a single operation.[6]

Pressing Machinery

Pressing plays an important part in the manufacture of a garment. Prior to the invention of pressing machines all pressing was done with an ordinary hand iron, heated over a gas flame. Later came the hand iron wired inside with electric wires and heated by electricity. This development greatly enhanced productivity, since electricity keeps the iron at an even temperature, doing away with the necessity of reheating the iron, with its consequent interruptions of work.

By far the most important development, however, was the invention of the steam-heated pressing machine. This machine has a bed shaped to fit the particular garment or part of a garment for which it is to be used. The bed and the "head," or the top part, are piped for steam. When the garment is placed on the bed of the machine, the operator brings down the head or top on the garment, which is thus caught between the top and the bed and pressed and steamed at the same time. Since the quality of the pressing is greatly improved by letting the garment remain in the machine for a few minutes, a presser is usually given two to five machines to operate. By the time the presser has made the round of the machines, placing in each a garment to be pressed and clamping down the top, the garment in the first machine is fully pressed and ready to be removed from the machine. A new one is then put into the machine and the process is repeated with each machine.

The pressing machine was perfected in the early part of the present century and introduced into garment factories before 1910. No changes which in any way increase the productivity of pressing labor have developed in the years covered by this survey.

Effects of Mechanization During the Past Half Century

Recent technological changes in the cotton-garment industry point to comparative refinements in processes of production rather than broad, fundamental, spectacular increases in man-hour output. The increase in productivity due to these refinements, while impressive, is not nearly so startling as that which occurred when production first changed from hand to machine sewing.

[6] Cincinnati. Public Schools. Vocational Bureau. The Garment Industries in Cincinnati, by Jessie B. Adams. Cincinnati, 1924. P. 25.

A study made by the United States Department of Labor of hand and machine labor, the results of which are contained in the Thirteenth Annual Report of the Commissioner of Labor in 1898, seems to cover about all the existing data on productivity by earlier hand methods.

In this study, comparisons are made of productivity by hand and machine methods in several identical firms. The data for hand methods in several instances are based on the performances of single persons, and the entire information was obtained from only a limited number of firms. Caution must necessarily be used in drawing conclusions from so narrow a base. However, the rates of change are impressive, as they seem to have occurred with regularity as between the several firms and as between the processes involved.

In the production of men's shirts, four firms were covered, two of which manufactured work shirts; one, dress shirts; and one, evening-dress shirts. Taking all the processes into consideration, the change from hand to machine methods of making work shirts resulted in an increase of productivity of about 500 to 750 percent. Considering the sewing departments alone, the rate of increase was slightly higher, averaging from 600 to 900 percent.

TABLE 12.—*Productivity of labor by hand and machine methods*

MEN'S SHIRTS

Year	Method of operation	Work shirts		Dress shirts		Bosom shirts	
		Minutes per dozen	Shirts per man-hour	Minutes per dozen	Shirts per man-hour	Minutes per dozen	Shirts per man-hour
		All departments [1]					
1853	Hand					7,195	0.100
1870	do	3,600	0.200				
1894	do	3,600	.200	5,880	0.122		
1895	Machine	417	1.730	841	.856	941	.765
1895	do	601	1.200				
		Sewing department only [2]					
1853	Hand					6,730	0.107
1870	do	3,420	0.211				
1894	do	3,420	.211	5,580	0.129		
1895	Machine	330	2.180	754	.955	891	.808
1895	do	475	1.520				

[1] United States Commissioner of Labor. Thirteenth Annual Report. Hand and Machine Labor. Washington, 1898, vol. 1, pp. 46, 47.
[2] Idem, vol. 2, pp. 1090–1097.

Under the hand method, sewing consumed so much of the total operating time that cutting and pressing together accounted for but a small proportion thereof, ranging from 5 percent for the work shirt to 6½ percent for the bosom shirt. With the introduction of machine

methods, although the actual time required for cutting and pressing was materially reduced, these savings in time were generally overshadowed by the enormous savings in sewing time. As a result, except for bosom shirts, the ratio of cutting and pressing time to total production time increased with the introduction of the machine process.

In the case of work shirts, cutting and pressing under the hand method took 180 minutes per dozen, while under the machine method these operations took 87 minutes in one plant and 126 minutes in another. For negligee dress shirts, hand cutting and pressing required 300 minutes per dozen as against 87 minutes under the machine method. However, due to the much sharper decrease in sewing time, the ratio of cutting and sewing time to total production time increased in the case of work shirts from 5 percent to 21 percent, and for negligee dress shirts from 5.1 percent to 10.3 percent. In the case of bosom shirts, however, cutting and pressing time declined from 465 minutes per dozen under hand methods to 50 minutes under machine methods. This decline was even sharper than that in sewing time, and as a result the ratio of cutting and pressing time to the total production time in making bosom shirts declined from 6.5 percent to 5.3 percent.

TABLE 13.—*Productivity of labor by hand and machine methods*

MEN'S TROUSERS

Material	Minutes per dozen				Number of units per man-hour			
	Year	Hand method	Year	Machine method	Year	Hand method	Year	Machine method
	All departments [1]							
Cassimere	(2)	8,148	1895	3,008	(2)	0.09	1895	0.24
Do	(2)	7,186	1895	3,354	(2)	.10	1895	.22
Cottonade	1870	7,200	1895	742	1870	.10	1895	1.00
Do	1894	6,660	1895	804	1894	.11	1895	.90
	Sewing department only [3]							
Cassimere	(2)	3,962	1895	532	(2)	0.18	1895	1.3
Do	(2)	3,720	1895	712	(2)	.19	1895	1
Cottonade	1870	6,750	1895	572	1870	.11	1895	1.2
Do	1894	6,300	1895	660	1894	.13	1895	1.1

[1] United States Commissioner of Labor. Thirteenth Annual Report. Hand and Machine Labor. Washington, 1898, vol. 1, pp. 38, 39.
[2] Not reported.
[3] United States Commissioner of Labor. Thirteenth Annual Report. Hand and Machine Labor. Washington, 1898.

In the manufacture of men's trousers, four firms were considered, two of which produced woolen trousers and two cotton trousers. For the woolens, productivity increased 100 percent. This relatively low rate of increase was due to the fact that only a single sewing machine, a single buttonhole machine, and a single button-sewing machine, all operated by foot pedal, were introduced in a factory employing over

20 workers. The economy effected by these three machines, when spread over so many workers, concealed the true rate of increase due to the machines. In comparative operations, one by hand and the other by machine, the increase was from 400 to 600 percent. For cotton trousers, the increase was from 700 to 900 percent for all processes involved and approximately the same for the sewing department alone.

In the manufacture of overalls only one firm was studied. Here the increase was 900 percent for all processes involved and 1,150 percent for the sewing department alone.

TABLE 14.—*Productivity of labor by hand and machine method*

MEN'S OVERALLS

Year	Method of operation	Minutes per dozen	Number of units per man-hour
	All departments [1]		
1870	Hand	3,600	0.200
1895	Machine	356	2.020
	Sewing department only [2]		
1870	Hand	3,540	0.203
1895	Machine	283	2.400

[1] United States Commissioner of Labor. Thirteenth Annual Report. Hand and Machine Labor. Washington, 1898. Vol. 1, pp. 38, 39.
[2] Idem, vol. 2, pp. 912, 913.

While labor productivity on shirts rose 500 to 700 percent there were a few individual operations showing even more spectacular changes. For example,[7] the productivity on buttonholes increased 1,000 to 1,500 percent, cutting by machine 2,300 percent, and the making of cuffs by machine 6,600 percent. However, against the benefits of this increased productivity under machine methods, should be charged increased shop overhead required for supervision, preparatory and floor operations, etc., which were not necessary under simpler hand methods.

The rise in man-hour output has been accompanied by a decline in cost of production and a rise in wages. For work shirts, the labor cost fell by nearly two-thirds under the machine method of operation, declining from $3 per dozen by hand in 1894 to $1.05–$1.08 by machine in 1895. Similarly for dress shirts, the labor cost declined by nearly two-thirds, viz, from $6 per dozen by hand to $2.27 per dozen by machine. For bosom shirts, the decrease in labor costs was proportionately greater—from $15 by the hand method to $2.85 for the machine.[8]

[7] United States Commissioner of Labor. Thirteenth Annual Report. Washington, 1898, vol. 1, pp. 265, 266.
[8] Idem, pp. 46, 47.

For trousers, labor costs fell in about the same proportion. Woolen trousers showed decreased labor costs, from $23.74 and $23.61 per dozen by the hand method to $7.22 and $6.54 by machine—a decrease of about two-thirds. For cotton trousers, labor costs fell from $6 and $8.80 by hand methods to $2.03 and $1.80 by machine. For overalls, the same rate of decline took place—from $3 per dozen by hand to 93 cents by machine.[9]

This decline in the cost of production brought about by the enormous increase in the man-hour output due to mechanization was achieved in the face of a large increase in earnings. As will be seen from table 16 the change from hand to machine work in one plant producing shirts resulted in a 116-percent increase in hourly earnings between 1894 and 1895. In another plant during the same period the increase was 165 percent. Over the 25-year period between 1870 to 1895 the increase in hourly earnings of plant 2 was 204 percent.[10] In manufacturing overalls the increase in hourly earnings between 1870 and 1895 was 200 percent in one plant and 220 percent in another plant. In manufacturing trousers the increase in hourly earnings in 1894–95 was 30 percent and between 1870 and 1895, 70 percent. In two other plants, however, the introduction of the machine process was accompanied by lower hourly earnings, the decrease being 22 percent in one plant and 40 percent in another plant.

TABLE 15.—*Hourly earnings of sewing-machine operators, by hand and machine methods*

SHIRTS, TROUSERS, AND OVERALLS[1]

Product and process	Plant 1		Plant 2		Plant 3		Plant 4	
	Year	Average hourly earnings	Year	Average hourly earnings	Year	Average hourly earnings	Year	Average hourly earnings
Shirts		*Cents*		*Cents*		*Cents*		*Cents*
Hand	1853	12.5	1870	5.0	1894	5.0	1894	6.1
Machine	1895	18.2	1895	15.2	1895	10.8	1895	16.2
Percentage change		+146		+204		+116		+165
Trousers								
Hand	1870	10.0	1894	10.0	(2)	18.0	(2)	20.0
Machine	1895	17.0	1895	13.0	1895	14.0	1895	12.0
Percentage change		+70		+30		−22		−40
Overalls								
Hand	1870	5.0	1870	5.0				
Machine	1895	16.0	1895	15.0				
Percentage change		+220		+200				

[1] United States Commissioner of Labor. Thirteenth Annual Report. Hand and Machine Labor. Washington, 1938. Vol. 1, pp. 39, 46, 47.
[2] Not reported.

[9] Idem, p. 49.

[10] No information is available as to the changes in piece rates which must have taken place as a result of the revolutionary changes in methods of production. The figures cited here are significant as showing that the workers benefited in some measure as a result of increased productivity.

Since 1895, when these studies of machine productivity were made, further increases in productivity have taken place. These advances have been due not only to continuous improvements in machinery, but even more to newer methods of handling work and further subdivision of work, leading to greater specialization and consequent increase in output by the specialized machine operators. Changes in shop management have tended to eliminate lost motion, thereby also increasing productivity.

Some measure of this further increase in productivity during the past 40 years may be obtained by comparing the data for 1895 with those for 1936 secured in the present survey. In 1895 the sewing department averaged approximately 0.95 dress shirts per man-hour produced by machine. In 1936, for the 30 plants studied, the productivity of the sewing department averaged 2.67 dress shirts per man-hour, an increase of approximately 180 percent. The 1936 productivity is approximately 22 times that recorded for the hand method in 1894.

As sewing machines were introduced, finer subdivisions of labor took place. On work shirts, the number of operations under hand methods was 5; under machine methods it was from 10 to 13 in 1895. In 1936 the number increased to an average of 21. For the dress shirt, hand methods required 5 operations, while machine methods in 1895 required 10. In 1936, the number of operations ranged from 21 to 39, with an average of 29. For cotton trousers, the number of operations almost doubled—from 6 to 11 and to 13—immediately upon the introduction of machine methods. By 1936 these subdivisions of operations rose to approximately 50. For overalls the operations by 1895 had increased from 4 to 11. By 1936 they had risen to an average of almost 30.

The motive power used in 1895 for machines was still hand or foot, with only an occasional use of steam and electricity. Electrically driven high-speed machines, operated with economy of effort, have now almost universally replaced the hand- and foot-driven machines.

Concurrently, vast changes took place in wages. For shirt operators the average hourly earnings in the plant paying the highest wages in the 1895 study were 18 cents, as compared with corresponding average earnings of 53 cents per hour in a union work-shirt factory in 1936. The average hourly earnings in the plant paying the lowest wages in 1895 were 11 cents, as compared with a corresponding rate in 1936 of 17 cents in a factory in the South and 29 cents in the North.

Machine operators in the trouser factories studied earned from 11 to 16 cents an hour in 1895; in 1936, the range was from 19 cents in the South to 51 cents in a union plant in the North. In the production of overalls the hourly earnings of the operators were 15 cents an hour in the factory studied in 1895; in 1936 the hourly earnings

ranged from 22 cents in the South to 58 cents in a union plant in the North.

The following figures show the rise in the cost of labor since 1903. They represent the sum total of piece rates for sewing-machine operations in making a standard garment known as the railroad band-back bib overall, as contained in the Official Schedule of Minimum Piece Rates prevailing in United Garment Workers shops throughout the United States.

1903	$1.25	1918	$1.76
1904	1.35	1919	1.93
1909	1.35	1920	2.54
1912	1.35	1934	1.88
1913	1.42	1937	2.09
1917	1.52		

There were no changes in piece rates between 1920 and 1931. In January 1932 rates were reduced 20 percent. In February 1933 there was another reduction of 20 percent. In July 1933 under the N. R. A. rates were increased 20 percent. In 1934 there was a further increase of 12½ percent. However, on two operations the double-needle machine was substituted for the single needle, with a corresponding reduction in rates, so that the total piece rate for the garment was reduced to $1.88. In March 1937, there was a further increase of 11.1 percent, bringing the rate for the overalls up to $2.09 per dozen.

The following changes in work hours took place during this period in union plants operating under agreement with the United Garment Workers Union:

	Weekly hours
1904 to Oct. 31, 1907	54
Nov. 1, 1907, to Mar. 9, 1919	48
Mar. 10, 1919, to Dec. 31, 1931	44
Jan. 1, 1932, to Dec. 31, 1934	40
Jan. 1, 1935, to Aug. 12, 1935	36
Since Aug. 13, 1935	40

The trend of weekly hours and wages of sewing-machine operators from 1877 to 1900 follows:

TABLE 16.—*Hours and wages of sewing-machine operators, 1877–1900* [1]

Year	State	Sex	Average hours per week	Average wage rates	
				Per day	Per hour
		NORTH			
1885	California	Female	63	$1.00	$0.10
1886	do	do	54	1.25	.14
1887	do	do	61	1.11	.11
1888	do	do	59	1.00	.10
1892	do	do	55	1.06	.12
1885	Iowa	do	61	.72	.07
1886	do	do	60	1.01	.10
1887	do	do	55	1.06	.12
1895	do	do	54	.74	.08
1896	do	do	51	.91	.10
1885	do	Male	66	1.19	.11
1885	do	Female	66	.95	.09
1887	do	do	66	.89	.08
1888	Maine	do	60	1.42	.14
1889	do	do	60	1.25	.13
1892	do	do	60	.86	.09
1885	Michigan	do	60	.73	.07
1886	do	do	58	.91	.09
1896	do	do	58	.92	.09
1896	Nebraska	do	58	.90	.09
1881	New Hampshire	do	65	1.10	.10
1882	do	Male	66	.99	.09
1882	do	Female	66	.98	.09
1895	do	Male	60	1.18	.12
1895	do	Female	60	1.03	.10
1885	Wisconsin	do	60	.82	.08
1887	do	do	54	.83	.09
1887	Montana	do	60	.58	.06
		SOUTH			
1896	Alabama	Female	63	$0.70	$0.06
1884	Georgia	do	60	.86	.09
1888	do	do	55	.49	.06
1895	do	Male	66	.75	.07
1895	do	Female	66	.75	.07
1896	do	Male	66	1.00	.09
1896	do	Female	63	.85	.08
1899	do	do	60	.73	.07
1900	do	do	62	.65	.07
1887	Kentucky	do	58	.76	.08
1887	Louisiana	do	59	.75	.08
1895	do	do	60	.95	.10
1882	North Carolina	do	72	.50	.04
1883	do	do	60	.68	.07
1895	do	Male	68	.83	.08
1895	do	Female	60	.68	.07
1896	do	Male	69	.40	.04
1896	do	Female	68	.60	.06
1899	do	do	61	.79	.08
1900	do	do	61	.80	.08
1880	South Carolina	do	60	.81	.08
1882	do	Male	69	1.00	.09
1884	do	do	69	.75	.07
1888	do	do	66	.75	.07
1888	do	Female	60	.70	.07
1895	do	do	61	.80	.08
1896	do	Male	66	.88	.08
1882	Virginia	Female	54	1.16	.13
1884	do	do	55	.75	.08
1888	do	do	56	.53	.06
1895	do	do	55	.77	.09
1897	do	do	59	.73	.07

[1] Data are from U. S. Bureau of Labor Statistics Bull. No. 499 (pp. 200–221); History of Wages in the United States from Colonial Times to 1928. Washington, 1929.

Chapter IV

Systems of Shop Management in the Cotton-Garment Industry

A sewing machine in its essence is but a power-driven needle, and the same skill on the part of the tailor or seamstress which is required to ply the needle in fashioning a garment out of a fabric is required when the machine takes the place of the hand needle. In using the sewing machine, the tailor or the seamstress must still exercise the same craftsmanship as of old on the operation which he or she performs and, in addition, must acquire the skill of manipulating the garment under the high speed of the power-driven needle.

The importance of the human element is accentuated by another peculiarity of the industry. A cotton garment is made of many parts, and these parts are not produced by the machine automatically. They must be fitted together, and as the work progresses under the needle they must be manipulated and shaped by the deft fingers of the operator so as to assume the desired shape, and to insure accuracy and precision.

Handling Versus Sewing Time

As a result, more time is spent by the operator in handling the parts than in actual sewing. With the great speed which the modern sewing machines have attained running from 2,700 to 4,500 revolutions per minute (which means 2,700 to 4,500 stitches per minute), it takes but a few seconds to make a seam, so far as the actual stitching is concerned; but it takes a great deal more time to pick up the parts, put them together properly, place them under the needle, bring down the "foot" (the attachment which holds the work in place), and start the machine, and then to repeat the process for the next seam. It is estimated by engineers, on the basis of years of time studies, that the actual sewing takes only from 15 to 33 percent of the time taken by the worker to make the garment, depending on the length of the seam and the complexity of the operation. From 67 to 85 percent of the time is spent in handling and manipulating the garment.

Effect of Labor-Saving Machinery

It becomes clear, therefore, that the effect of improvement in machinery upon the time required for an operation is sharply limited

because of the comparatively low ratio of operating time to handling time. Suppose, for example, that for any specific operation 33 percent of the total time required is actual sewing time. If an improvement in machinery is introduced which reduces the actual sewing time by one-half, while the handling time per unit of product remains the same, the increased output for the operation per unit of time will not be 100 percent but only 20 percent. With actual sewing time only 15 percent of the total time spent on a garment, a 100 percent increase in the sewing-machine output would result in a total increase in output of only 8 percent, provided the amount of time spent on handling the garment remained unchanged.

If the effect of a change in machinery upon the productivity of an individual operation is thus limited, the influence of any change in a single machine upon the efficiency of the sewing department or the plant as a whole is extremely small. The manufacture of a dress shirt in the plants covered by this survey requires between 22 and 39 separate operations. In a plant in which the work is subdivided into say 30 operations, the foregoing estimate of the increase in productivity applied to a single operation would have to be reduced to about one-thirtieth of that figure in estimating the increase in the number of complete shirts per unit of time.

Systems of Shop Management

It was therefore to be anticipated that any changes which would reduce handling time or alter working habits would affect productivity far more appreciably than purely mechanical alterations. The most important of these changes is the introduction of the so-called line system of production in a number of cotton-garment plants. Its primary purpose is to reduce handling time, to stimulate the efficiency of the individual worker, and to permit more effective control by management. The introduction of this system is of fundamental importance in its effect on production and on industrial relations. This new technique of routing work in the shop is as much in the nature of a technical change as an improvement in machinery would be. Both are intended as labor-saving devices.

The Bundle System

Three main types or systems of shop management are in use in the cotton-garment industry today, which are known as the bundle system, the straight-line system, and the progressive-bundle system, The most prevalent type is the so-called bundle system, which has been in existence since the beginning of the factory system of production of cotton garments. The factory brought about the division of labor which has resulted in each worker's specializing in one or, at

the most, a few operations. In the making of dress shirts, for example, the labor in the sewing department alone, under the bundle system, is divided into from 22 to as many as 39 operations. In the manufacture of overalls, it runs from 24 to 31 operations, and of work pants from 31 to 41.

The old-time tailor or seamstress, with the aid of a pattern, marked on a piece of cloth the outlines of various parts of the garment, which were then cut out with a pair of shears, and the different parts sewed together.

With the introduction of the factory system of producing garments in quantity, instead of to the order of the individual user, the first labor saving occurred in the cutting room. A modern cutting room has rows of long tables, usually from 100 to 200 feet long, on which layers of cloth are piled one on top of the other, reaching 100, 200, and even more layers. This pile is then cut with a cutting machine according to pattern markings on the top layer.

After being cut out, the different parts—fronts, backs, sleeves, patches for pockets, collars, etc.—form individual piles, which are usually subdivided into smaller piles of convenient size, each tied into a bundle. Hence the name, "bundle system." The bundles are taken to the sewing room, where they are distributed among the different workers. In the sewing room, the bundles travel from operator to operator in the course of making the garment.

When a bundle is completed by an operator, it is either delivered by the operator to the foreman or to the work station or is taken away from the operator by the foreman or bundle boy, and then turned over to another operator for the next operation, or stored in a bin or shelf until it is given to a worker for the next operation.

The Straight-Line System

The straight-line system in the cotton-garment industry dates back only to 1932. It was originated in this country by Folkert Allen Schmidt, a well-known industrial engineer and disciple of Frederick Taylor, the originator of "scientific management." Mr. Schmidt first developed this system at the plant of the Stahl-Urban Co., Terre Haute, Ind., in cooperation with Mr. Henry Kramer of that company. In 1934 he was granted United States patents on his system and began to introduce it in other plants in the cotton-garment industry, as well as in some plants manufacturing woolen trousers. The system is still in an early stage of development, but is meeting with increasing favor in the cotton-garment industry.

The straight-line system differs from the so-called bundle system in that it substitutes a single part of a garment for the bundle as a unit of work assigned to individual workers, thus doing away with the bundle. The process of evolution has thus brought the industry

back to the original unit of one garment, as in the former days of the tailor and seamstress. However, while the old-time tailor made the complete garment, the line maintains the division of labor by operations even more minutely than under the bundle system.

Another important feature is a radical rearrangement of machines in the shop. Under the bundle system, sewing machines are usually arranged in parallel rows running the full length or width of the shop, without regard to the sequence of operations. Machines which can be used for several operations may be assigned to a certain operation and later reassigned to other operations. The reassignment may occur because of the introduction of a new type of garment which requires a larger number of machines on some operations, a smaller number of machines on another operation, and possibly the omission of still another operation altogether. As a result of these constantly recurring changes, even if the machines, when installed, are arranged with a view to sequence of operations, the sequence disappears in the course of time. The resultant haphazard arrangement of the machines in the plant causes the work to be shunted back and forth from one end of the shop to the other, as it passes from operation to operation.

Under the straight-line system, the machines are arranged in short rows of from one to three or four each, strictly according to the sequence of operations, so as to insure the direct progress of the work from one operation to the next.

As an additional means of increasing labor productivity, the straight-line system aims at the minutest possible subdivision of operations, as general observation has demonstrated that the more an operation is subdivided—that is, the smaller the number of work elements—the greater the speed which a worker develops in performing the operation. There is the further consideration that the more the work is subdivided, the less the skill required to do an operation and the easier it is to train new workers. This does not necessarily mean, however, that any great difference is to be found between the number of operations in line and bundle plants. Subdivision of operations in bundle plants has been carried so far that in some cases more operations are to be found in bundle than in line plants.

Table 18 shows the extent of the subdivision of work in 64 plants surveyed. They comprise 30 dress-shirt plants, of which 4 are operating on the line system; 17 overall plants, of which 4 are on the line; and 17 work-pants plants, of which 9 are on the line. The table shows the highest, lowest, and average number of operations in each group of plants which are used in making the parts and the body, and in the assembly of the garment.

TABLE 17.—*Comparison of division of labor in line and bundle systems*

Product and section	Number of operations			
	Bundle system		Line system	
	Maximum	Minimum	Maximum	Minimum
	26 plants		4 plants	
Dress shirts:				
Parts	17	6	12	9
Body	16	9	15	11
Assembly	8	5	7	5
Entire sewing department	41	20	34	25
	13 plants		4 plants	
Overalls:				
Parts	12	6	9	7
Body	13	7	17	11
Assembly	9	8	10	8
Entire sewing department	34	21	36	26
	8 plants		9 plants	
Work pants:				
Parts	12	7	12	7
Body	12	8	15	9
Assembly	17	13	20	13
Entire sewing department	41	28	47	29

Before installing the line system, a study is made to determine the time it takes each individual worker to perform the assigned task. The number of workers assigned to each operation is then so adjusted as to insure as close a balance of work on all operations as possible. To illustrate, if it takes 35 operations to make a shirt in a given plant, there will be a minimum of 35 workers on the line. However, if operation No. 2 takes twice as long as operation No. 1, there will be two operators on operation No. 2 to balance the work of a single operator on operation No. 1. There may be three or four operators on other operations, depending upon the time it takes an individual operator to complete the assigned work.

As the bundle comes from the cutting room, it (or a part of it) is placed at the side of the operator on operation No. 1. As fast as she completes her particular task on a part she places the garment on a bar or in a chute leading to the next operator, instead of retaining it until the entire bundle is completed, as is the procedure under the bundle system. The part is then picked up by operator No. 2 and after she completes her operation it is placed in a similar manner within reach of the worker on operation No. 3. Thus the individual garment or part of a garment progresses from operation to operation until it is completed. Such additional parts as are needed are prepared off the line and are supplied to the particular operators on the line as the garment proceeds from one operation to another.

Effect of Line on Efficiency of Labor

The advantages of the straight-line system are many. The most obvious is the elimination of handling, which under the bundle system absorbs a large part of the time of the foreman and his assistants, as well as of the worker. Under the bundle system, each worker must first get her bundle. Whether the bundle is brought to her by the foreman or a bundle boy, or whether she calls for the bundle at a central work station in the shop, there is inevitable loss of time in carrying the bundle to the sewing machine; in untying the bundle and arranging the work for the sewing machine; in assembling the bundle and tying it up when the operator has completed her work; in keeping track of the amount of work completed to make sure that she is paid for all the work she has done, etc. Finally, the repeated interruption in her work between bundles involves an inevitable loss of time in regaining momentum after each interruption. The amount of time thus spent in handling will vary from shop to shop, depending on the efficiency with which it is managed. Nearly all this handling is eliminated under the straight-line system—both management and worker saving much of the time lost in handling.

An analysis of the operations under the bundle system makes it evident that the greatest opportunity for economy of the operator's time is in the handling of the bundle rather than in the sewing operations. Starting from the moment when the bundle is delivered to the operator at the machine, there is untying the bundle, lifting one part at a time, putting two parts of a garment which have to be joined edge to edge so that they will be stitched in an even seam, placing it in position in the machine, lowering the foot,[1] starting the machine, doing the actual stitching, stopping the machine, raising the foot and the needle so as to release the garment, taking the garment out of the machine and placing it to the left of the operator, and then repeating the same cycle of motions and operations until the entire bundle has been completed. Each time a garment or its part is completed, it is piled on top of the preceding garment to the left of the operator until all the parts composing the bundle have been finished, when the bundle is tied up again and delivered to the bundle boy or to the work station. The operator has to go through approximately 10 operations of handling for each operation of actual sewing.

The proportion of the time spent in handling the bundle and manipulating the parts varies with the garment produced and with the parts which make up the garment. Handling, however, always takes more time than sewing, consuming on the average from 67 to 85 percent of the total time of the operator, as against 15 to 33 percent of the total time spent on sewing.

[1] The foot is an attachment on the sewing machine for holding the garment in place while the stitching is being done.

1. *Saving of time in handling.*—The inventor of the straight-line system recognized the severe limitations upon possible savings which can be effected through faster machines. He realized that so long as sewing machines do not work automatically, additional speed is checked by the capacity of human hands and nerves to handle them. The objective of the system is therefore to reduce as much as possible the lost motions in the handling of the work which account for the major part of the total working time of the operator.

Not all of the handling operations, however, are eliminated by the line system. Chart 1 illustrates the chief time- and energy-saving features of the straight-line system, as contrasted with the bundle

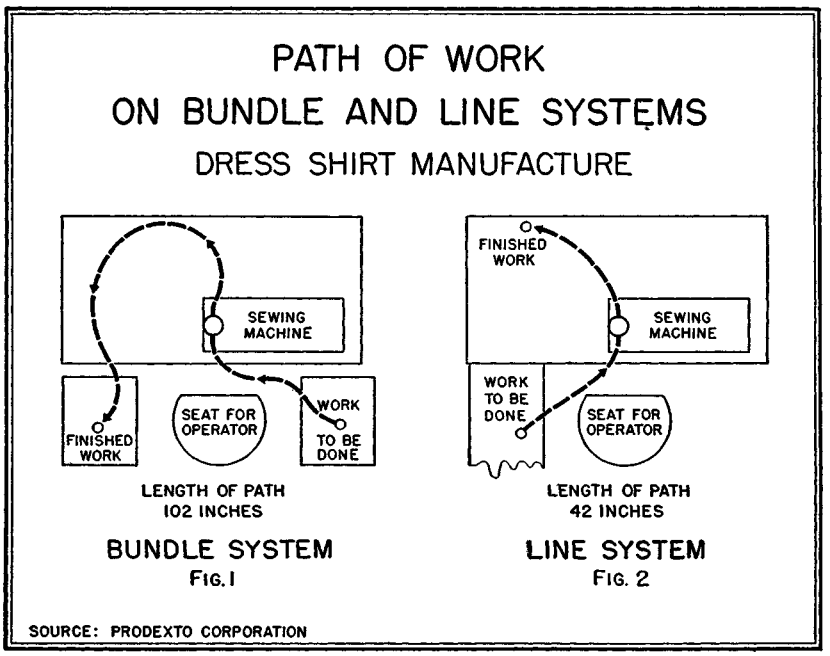

CHART 1

system. Figure 1 illustrates the position of the operator, the machine, and the work she is handling under the bundle system. The square to the right of the seat is the rack or workbench on which the bundle of work to be done is placed. The rack is usually placed about 18 inches below the sewing-machine table. In picking up the part to be sewed on, the operator must therefore lift the part vertically a distance of 18 inches. The dotted line shows the path followed by the part being put through the machine by the worker. The same path is described by each succeeding part, the finished work being piled one part on top of the other to the left of the operator until the entire bundle is completed. By actual measurement, Mr. Schmidt, originator of the

system, ascertained that the length of the path described by each part in a typical bundle plant, including both the horizontal and vertical movements, is 102 inches.

Figure 2 illustrates the path followed by the work under the straight-line system. The work rack to the right has disappeared. The work is picked up by the operator from a rack or a chute to her left, which is placed high enough to be near her elbow thus eliminating the lifting of each piece. The dotted line describes the path of the work under this arrangement. After being stitched, the part is merely pushed forward by the operator with her left hand, landing on a bar or a chute leading to the next operator. The new path is only 42 inches long, thus effecting a saving of 60 inches or 5 feet of path on each garment or part in each operation.

2. *Saving of effort in handling.*—As has been pointed out, the usual location of a workbench or work rack at the machine is approximately 1½ feet below the level of the sewing-machine table. This means that each time the operator picks up a garment, she has to lift it 18 inches and then bring it down 18 inches when it is completed, a total of 3 feet in a vertical direction. Under the straight-line system, the garment is picked up from a chute placed at the level of the operator's elbow, approximately 6 inches below the level of the sewing-machine table to the left of the operator.

In the case of an operator working on trousers, for example, the line system makes possible a great saving of effort. In the course of a day's work a worker must lift about 2,000 pounds, or 1 ton, of material into place for sewing. Under the bundle system she must lift this weight to a vertical distance of 18 inches, as against 6 inches on the line. The energy spent on lifting is therefore only one-third as great on the line.

The line makes possible an even greater saving of effort after the worker has finished the sewing operation. Under the bundle system she must lower the finished work a distance of 18 inches, while on the line the finished work is simply given a push to reach the next operator. Considering both lifting and lowering combined, under the line system the operator's effort is reduced to about one-sixth of that required on the bundle system.

There is also an important saving of energy in bringing bundles to the workplace. In a shirt factory a bundle may weigh approximately 50 pounds and each operator may be expected to complete about 20 bundles per day. Assuming that work is stored 10 feet from the operator, this means that 1,000 pounds of material must be carried 10 feet to the operator under either the bundle or the line system. Under the line system the bundles are delivered to the first operator only, and the individual parts which make up the bundle progress from operator to operator until the bundle is reassembled and taken away from the end

of the line. Under the bundle system the bundles are delivered to and taken away from each operator.

3. *Other labor savings on the line.*—A garment consists of symmetrical right and left parts. Under the bundle system the garments are cut by laying successive layers of cloth face to face so that the right and left parts alternate. As a result, when the bundle is given to an operator she is compelled to work alternately on right and left parts and must make a "mental somersault," to quote the originator of the straight-line system, in placing the parts of the garment under the needle and handling them alternately in reverse positions.

Under the straight-line system one group of operators handles all the right parts, while another group handles the left parts, the two parts being joined by a third group. Relieved of the necessity of making the "mental somersault" each time she changes parts, the operator develops greater speed with no greater effort. This is one of the important features of the straight-line system, constituting an essential claim in the patent.

4. *Better utilization of working time.*—In addition to increasing the productivity of sewing-machine operators while actually on the job in the shop, the line system enables them to put in more working time per week than is possible under the bundle system operating on the same schedule of weekly hours. Under the bundle system, work is seldom evenly distributed among the sewing-machine operators in the shop. Each operator handles her bundles more or less independently of the others and is free to leave the job at any time without greatly affecting the work of the other operators. Waiting for work is a common occurrence in a bundle shop and rather than remain idle for several hours in the shop, operators often prefer to check out for the balance of the day. During the N. R. A., in order to comply with the wage and hour provisions of the code, many employers required that workers punch the time clock at the beginning and at the end of their waiting periods. In this way, the idle time was excluded from the records of the total time registered on their time cards. The hours of attendance in a bundle shop as registered by the time cards therefore generally average from 3 to 5 hours per week less than the scheduled weekly hours.

Under the straight-line system the work is so rapidly distributed among all the employees on the line that no operator can be spared from her place and broken time is therefore reduced to a minimum. It has been estimated that as a result sewing-machine operators working on a 40-hour-per-week schedule can average about 10 percent more of working time on the line than under the bundle system. This is tantamount to an increase of about 10 percent in the production per operator per week on the line as compared with the bundle system.

Effect of Line on Efficiency of Management

The most important achievement of the straight-line system is the stimulating effect it has on management. Since every shortcoming is apt to cause a break-down in the line, management has to be particularly alert to avoid interruptions in production. For example a careless notching of a part of a garment in the cutting room [4] would, under the bundle system, cause some difficulty to the worker on the operation for which the notching is done. The worker affected may or may not complain, depending on whether she is sufficiently aggressive to do so, and if she does complain, she may or may not always get the prompt attention of the responsible foreman. However, on the line the absence of the necessary notch, causing the operator to take more time in sewing part to part, will slow down production on the particular operation and in turn will halt the rest of the line and compel the instant attention of the management. Not only will the defect be immediately remedied, but the management will see to it that it does not happen again, because every interruption in production is costly. The fact that labor on the line is usually paid by the hour, instead of by the piece, makes idle time caused by work interruption all the more costly.

Similarly, if a machine breaks down under the bundle system it may cause a temporary stoppage of work on the part of the one operator affected. A well-run establishment, in order to reduce overhead cost, will give immediate attention to the machine, but in practice such a break-down does not always receive immediate attention. Under the line system, the break-down of a single machine will halt the work of the entire line, forcing immediate attention. Management is, therefore, obliged to take the necessary steps to prevent such break-downs and to make necessary repairs in the shortest possible time, through maintaining its machinery in first-class condition, having a reserve of machine heads and spare parts, and having in attendance a competent machinist capable of repairing the damage in the quickest possible time. In the end, it means elimination or reduction of nonproductive time and consequent increase in production.

In general, the straight-line system directs management's attention to the necessity of securing the utmost coordination of every department—the buying and timely delivery of materials and supplies; the dovetailing of the work of the cutting room with that of the sewing department; the timing of the parts shop with the body and assembly divisions; the balancing of the individual operations on the line; the maintenance of equipment in such condition that it may be available for any task it is called upon to perform; the training of the workers on additional operations to prevent interruption in production through

[4] The parts are notched or marked by the cutter where the sewing is to begin and where to end in order to make a perfect fit of the parts.

absences of individual operators. Every one of these activities and many more must be looked after, if the line is to function, not only at its best, but to function at all.

Saving of inventory.—Another outstanding feature of the straight-line system is that it greatly reduces inventory or work in process. As already stated, there is no necessity to wait for the completion of the bundle by one operator before it is turned over to another operator for the next operation. Instead, each individual part travels from operator to operator as fast as each completes her part.

The saving of time effected by the turn-over may be illustrated as follows: Assuming 4 dozen or 48 garments in a bundle and 20 operations to complete each garment, and assuming it takes 1 minute to do each operation, it would take 48 minutes to do each operation on a complete bundle, or a total of 960 minutes to complete the 20 operations on the entire bundle.

Under the straight-line system, as soon as the first operation has been completed by operator No. 1 and the garment or part placed on the rack or in the chute leading to the next operator, it becomes available to operator No. 2; a minute later it is ready for operator No. 3, and so on. The first garment or part will, therefore, be completely finished at the end of 20 minutes. During the progress of the work only one bundle has to be in operation to keep the 20 operators busy, whereas under the bundle system it would be necessary to have 20 bundles in process of work.

Assuming no loss of time between the operations, it will take 20 minutes for the first garment to go through the entire set of operations. Each succeeding minute will see a new garment completed. Thus, it will take 20 plus 47, or 67, minutes for the entire bundle of 48 garments to pass through all the operations, as against 960 minutes under the bundle system.

The reduction of time is equivalent to saving of inventory. Between the time the last or forty-eighth garment of the first bundle leaves operator No. 1 and the time it is completed 20 minutes later by the last operator, 20 more garments of a new bundle will have been done by operator No. 1 and will be in process at all subsequent stages. The ratio of work in process between the line and bundle systems will therefore be 960 to 68, or practically 14 to 1. In other words, under the straight-line system only about one-fourteenth of the inventory or work in process is required as compared with the quantity of work that has to be kept in process under the bundle system. This does not take into account the time lost between operations while the bundles rest in the bundle rack in readiness for the operators, nor the saving of time due to the shorter path described in the chart on page 42 and the saving of time due to the elimination of tying, untying, and transferring of bundles. This results in the release of many thou-

sands of dollars of capital which is needlessly tied up in inventory under the bundle system.

Another advantage to management of the line system is the prompt filling of the retailer's orders. While an order from a retailer may take weeks on the bundle system, this can be reduced to days on the line.

Limitations of the Straight-Line System

1. *Rigidity.*—As already pointed out, the straight-line system calls for a very close balance of work between operations. This necessitates a definite arrangement of machinery in the order of the sequence of the operations, and the assignment of the exact number of machines to each operation necessary to insure a close balance of the work in process. There is thus imparted a certain rigidity to the straight-line system which makes it difficult, if not impossible, to use it for more than one product. A plant manufacturing a variety of products calling for different divisions of labor and for a different length of time for individual operations, cannot use the same line for more than one product. An arrangement of machines for different operations, once made, must be left undisturbed as long as the product for which it has been made continues to be manufactured. This difficulty can be overcome by having a separate line for each product. Insofar as the same variety of products is manufactured from month to month and season to season, such an arrangement is entirely feasible; but if frequent changes in the character of the products manufactured take place, the use of the line becomes impractical. In the case of such cotton-garment products as work clothing, this objection does not apply, since changes in style are not frequent. In a product like cotton dresses, where style is a factor, the difficulty would be more serious.[5]

2. *Vulnerability.*—Because of the close balance between operations, the absence of a single worker through illness or other cause is a much more serious matter under the line system than it is under the old-time bundle system. To avoid break-downs through this cause, there must always be a reserve of workers capable of stepping into the breach and taking the place of absentees. Such workers must be skillful and capable of doing any operation at the established rate of speed. Even if one operator leaves her machine for a few moments, it will cause the stoppage of the entire line unless there happens to be a reserve of work between the operations. No operator is, therefore, allowed to leave the line without a relief worker taking her place.

Frequently, to avoid additional expense, the forewoman on the line acts as relief worker. She can do that, however, only for brief inter-

[5] To meet these difficulties, the patentee of the system recommends the equipping of each sewing machine with a separate motor, so as to make it independent of any shafting. Another improvement is to make the machines rest on vacuum cups, which help to secure the machine fast to the floor and at the same time make it easy to move the machines to new positions when necessary.

vals. She cannot replace a worker who is absent for an entire day. In other plants, the service or repair worker acts as relief operator.

A more general method of eliminating the expense of maintaining a reserve of relief workers is the use of workers in the parts shop, off the line, as a reserve. Both for this reason and because the making of parts (such as pocket patches, flaps, collars, cuffs, etc.) does not fit in with the progression of the work and frequently can be done more advantageously outside the line than on the line, the parts are usually made off the line under the bundle system, and are fed into the line at the points where they have to be joined to the main body of the garment.

3. *Lack of perfect balance.*—While the straight-line system aims at and achieves a closer balance of work between operations than is possible under the bundle system, it is next to impossible to attain a complete balance, for the reason that it is seldom possible to adjust the number of workers on each operation to the exact ratio of time taken per operation. If a given operation requires the time of one worker and the next operation requires, say, 1.9 as much time, the only thing that can be done is to put two workers on the next operation. In that case, the workers on operation No. 2 will be idle approximately 5 percent of their time. Similar disproportions to a greater or lesser degree may occur on other operations. This introduces an element of loss of time which is not present in the old bundle system. where each operator works fairly independently of the rest. On the other hand, it provides odd moments of relaxation at frequent intervals which help to relieve the physical and nervous strain of continuous hard work on the line.

4. *Straight line less suitable for garments of high quality.*—There is a difference of opinion among manufacturers of quality garments as to the adaptability of the straight-line system to the handling of high-grade work. High-quality work calls for careful inspection at various stages of the manufacture of the garment. When the quality foreman inspects a bundle of work and finds it defective, he returns it to the operator to remove the imperfections. This may require the ripping of the seam and doing the work over. The operator takes the necessary time to do it.

Such a procedure, if attempted on the line, would disrupt the continuity of the work on the line and is manifestly impossible. As the work progresses rapidly in single units from operator to operator it is impossible to examine at any point a quantity of garments coming from one particular operator. The examination of the completed garments will help to eliminate a faulty garment, which may be sold as a "second," but in most cases it is too late at that stage for the operator who did the faulty work to correct it without undoing the work of several other operators, at great expense to the firm.

Nevertheless a number of concerns making a high quality of shirts and pants were found operating under the line system. In a plant manufacturing shirts of a very high grade there are several inspection points. Garments found to be defective are not returned to the operator for repair, since that would stop the line, but are given to a service or repair operator to fix. The operator responsible for the poor work is admonished to do better and her work is watched until she either improves the quality of her work or gives way to a better worker.

The Progressive-Bundle System

The straight-line system owes its origin to certain inherent weaknesses in the old production system which generally prevails in the cotton-garment industry. It is therefore but natural that other people besides the originator of the straight-line system should have given thought to the same problems and developed improvements both before and after the appearance of the line system.

One of these improvements is known as the progressive-bundle system, which is a modification of the straight-line system. It follows the same principle of work progression through the shop, except that the work moves in bundles instead of in single garments or parts. Although the idea of arranging the machines in the sequence of operations, to reduce the crisscrossing and repeated shunting of the bundles from one end of the shop to the other, found practical application in various parts of the country before the line system made its appearance, the development of the progressive-bundle system received a new impetus from the introduction of the line system, from which it has borrowed many ideas.

The elimination of the handling of work bundles by the foreman or his assistants is the same under the progressive-bundle system as under the straight-line system. The differences between the two systems are:

(1) The progressive-bundle system does not eliminate the handling of the bundle by the worker.

(2) It lacks the power of stimulation which the straight-line system exerts upon the individual worker;

(3) It lacks the stimulating effect upon management which the straight line exerts.

The powerful influence which the straight-line system exerts upon management springs from the use of the single garment as a unit of production and the paralyzing effect it produces upon production in the shop if any major or minor detail goes wrong. Management is forced to be constantly on its toes and to do its utmost to prevent interruptions in production.

This compelling power is no more inherent in the progressive-bundle system than under the ordinary bundle system. Under the progres-

sive-bundle system the bundle continues to serve as the unit, and the progressive system has all the weaknesses of the old-time bundle system, except that it relieves the shop management of the task of switching work from operation to operation. Nevertheless, the progressive-bundle system does eliminate much handling and, if intelligently applied, is capable of producing substantial results.

Effect of Line on Productivity of Labor

To what extent does the straight-line system increase labor productivity? Studies which have been made indicate that the effect of the line on labor productivity depends upon many factors. In order to obtain the maximum benefits, the system calls for the use of the best machines, close coordination of the work in the different departments, careful balancing of work on different operations in the sewing room, the arrangement of equipment to eliminate waste motion, both vertical and horizontal, the elimination of unnecessary handling and lifting of materials in the process of work, etc.

A circular of one of the engineering firms licensed to install the straight-line system states that one garment company increased production 50 percent, cut manufacturing costs 25 percent, reduced clerical work 33⅓ percent, and inspection costs 60 percent, saved 25 percent of the floor space, and vastly reduced inventory of goods in process. The circular does not state how efficient or inefficient the plant was before the introduction of the line. The percentages cited above depend not only on the results achieved but also on what the condition was prior to the installation of the new system.

An attempt to evaluate the effects of the straight-line system, in connection with the present study, has met with the usual difficulty of lack of sufficient records to make possible the allocation of gains to the various causes responsible for them. In almost all plants, the introduction of the straight-line system was accompanied by the installation of some new sewing machines. The effects of the new machines on increased labor productivity must therefore be taken into consideration in analyzing the productivity gains of the line.

The largest increase in man-hour output amounting to 28.8 percent was found in one of the dress-shirt plants. The increase in productivity is for the sewing department as a whole, covering both the production on the line and the production of parts not affected by the line system. The gain in production on the line was manifestly greater. In another plant, while the increase in productivity of the sewing department was less than 15 percent, the increase for the assembly operations alone, which are the only operations on the line in that plant, was much greater.[2] The saving in time on assembly operations was as follows: Before the introduction of the line, the

[2] In other plants the increase was much smaller, see ch. V.

total time required to do the assembly operations on a dozen garments was 1.20 man-hours. When 20 percent of the assembly department of the shop was put on the line, the time per dozen garments was reduced to 1.07 man-hours. When, later, the entire assembly department was put on the line, the time went down to 0.79 man-hour. This is a reduction of 34.2 percent from the time required under the bundle system.

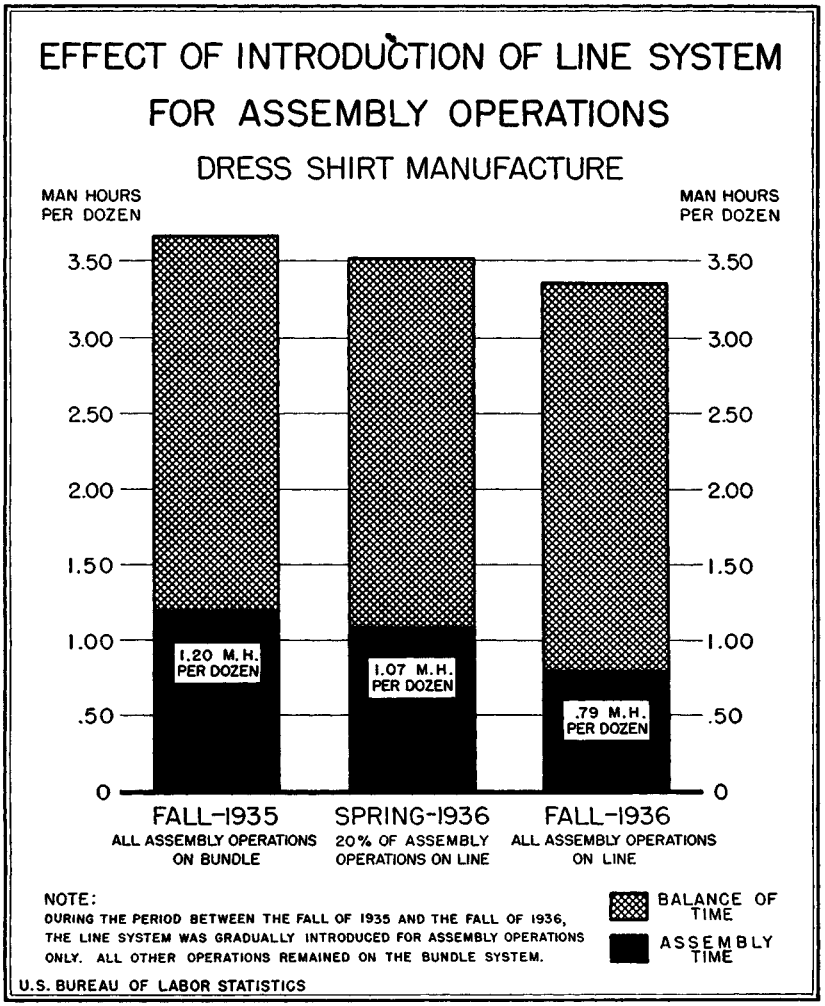

CHART 2

As shown in chart 2, after all the assembly operations had been put on the line, the remaining bundle operations took more time than they did before the introduction of the line. This was due to the fact that the best and fastest operators had been transferred to the line, leaving the slower operators to make the parts on the bundle system.

This is one of the rare instances where it is possible to isolate the effect of a single factor. In spite of the longer time it took to do the parts, after the introduction of the line, the height of the third column is still lower than that of the first, the difference between the two representing the net saving produced by the introduction of the line.[6]

As already indicated, not all the work in straight-line shops is done on the line. Some of it can be done more advantageously outside the line. Nor is there a uniform rule as to the proportion of work to be done on the line. In the most successful plants, about two-thirds of the sewing operations, requiring about 80 percent of the total time on all operations in the sewing department, are usually done on the line, the rest being done in bundles off the line.

Although the trend is toward more plants installing the line system, and expanding lines in plants which are already using the system, some firms have tried and abandoned the line system. Two firms reported

[6] The table below, furnished by the inventor of the line system, presents results obtained by him in some of the plants in which he installed the system. These plants have not been included in the survey and the figures are therefore presented as furnished by the inventor. Attention must be called, however, to certain features of these figures which distinguish them from the data gathered for the plants covered by the survey.

Productivity in Bundle and Straight-Line Plants

Article	Total machines operated	Hours per week	Total machine- or man-hours	Total dozens produced	Hours per dozen	Time saved	
						Hours per dozen	Percent of bundle time
Trousers:							
Bundle system	210	52	10,920	1,300	8.4		
Straight-line system	208	40	8,320	1,600	5.2	3.2	38
Work shirts:							
Bundle system	67	40	2,680	1,650	2.6		
Straight-line system	65	40	2,600	1,100	2.4	.2	7
Work pants:							
Bundle system	100	52	5,200	750	6.9		
Straight-line system	80	40	3,200	800	4.0	2.9	42
Wash coats, men's:							
Bundle system	117	40	4,680	223	21.0		
Straight-line system	102	40	4,080	300	13.6	7.4	35

(1) The figures given in the "hours per week" column are scheduled weekly plant-hours and not hours during which the workers were employed during those weeks. A line plant makes more complete use of the scheduled plant-hours than a bundle plant. It follows that of two plants having a 40-hour week, the line plant will have more hours of actual work than the bundle plant, and will therefore show a greater productivity per week and per scheduled hour even if the actual hourly output is the same in both. While this constitutes a legitimate advantage of the line plant, it introduces a factor which is absent in the survey based on the hours the workers are actually employed in the plant.

(2) In the trousers and work-pants plants recorded in the table, the hours were reduced from 52 to 40. A reduction of 12 hours a week or 2 hours per day is likely to result in a considerable increase in labor productivity because of the elimination of fatigue. At least, this is the common experience in industry. It is thus probably partly responsible for the fact that the highest increases in productivity in the table, viz, 42 and 38 percent, took place in plants which reduced weekly work-hours from 52 to 40.

(3) The next highest increase in man-hour output on the line is for wash coats. The figures happen to cover a season when wash coats were much in vogue. The concerns manufacturing them popularized lower-price products and had the advantage of a large volume of production, which is always conducive to high labor productivity. The 35 percent increase in productivity in this case may, therefore, be due in part to this factor.

While it is impossible to determine accurately the effects of the incidental factors just enumerated, it is probable that a substantial part of the increase is due to the straight-line system.

that the variety of styles made the line unsuitable. Two other firms, both nonunion, experienced opposition from the workers to the alleged driving regimentation of the line.

Another aspect of the line system is that in a number of plants which have continued to operate with part of their factory on the line and part under the bundle system, the bundle department has often recorded a decline in productivity. This may be due partly to the fact that some of the more simple and standardized garments had been removed from the bundle department and allotted to the line.

From records available in the average cotton-garment plant, it is next to impossible to isolate the effect of any single factor on the man-hour output of the plant. The individual skill of the operator, the speed and condition of the machine, the system of shop management, light and ventilation in the shop, and many other elements have a direct bearing on the productivity of the operator in the sewing room, and there is no system of records which would even attempt to account for the influence of any of these factors. This must be constantly borne in mind in attempting to trace or to evaluate the effects of any single factor, such as the system of shop management. Nevertheless, an examination of the figures of individual plants shows that the introduction of the line system produces a definite increase in the man-hour output of the plant.

Some idea of the direct increase in productivity on the operations which are put on the line can be obtained from table 18, showing productivity per man-hour on certain assembly operations for which data proved available in some dress-shirt plants. Data are given for plants on the straight-line system and for plants on the bundle system, and are expressed in terms of output in dozens of shirts per man-hour, and also in terms of man-hours per dozen shirts.

An examination of the figures in the table shows that there was a marked difference in productivity between the line and bundle plants, although exceptions in each group occurred due to differences in quality, in machinery, and other factors which could not be separately accounted for from the available records. Thus, in the operation of yoking (sewing yoke onto back) the productivity in the line plants ranged from 11.17 to 14.12 dozen per hour, while in the bundle plants, it ranged from 5.44 to 8.35 dozen.

In collar setting the productivity in the bundle plants fluctuated within the range of 2.56 to 4.19, while in the line plants it ranged from 2.56 to 4.10, the range in the two groups being practically the same. However, it should be pointed out that plant No. 72 in the straight-line group, which had the lowest figure of 2.56 dozen per man-hour, was a plant that deviated from the practice followed by most plants operated on the straight-line system. The management allowed work to accumulate between operations, and the plant was

TABLE 18.—*Productivity of labor on comparable operations in line and bundle plants, fall of 1936—Dress shirts*

Operation	Line plants				Bundle plants								
	Dozens of shirts per man-hour												
	No. 68	No. 1	No. 69	No. 72	No. 66	No. 3	No. 74	No. 6	No. 5	No. 31	No. 73	No. 79	No. 92
Yoking	------	14.12	13.53	11.17	8.35	6.58	8.26	7.94	6.77	7.26	5.44	------	------
Collar setting	4.10	3.52	------	2.56	------	2.61	2.80	4.19	3.24	3.87	3.05	------	2.56
Shoulder joining	8.20	7.04	10.47	5.44	4.41	5.27	4.59	5.46	5.82	5.82	------	------	4.45
Sleeve setting	8.21	7.04	10.34	7.04	5.29	6.08	5.83	6.47	7.16	7.15	4.64	6.31	6.61
Felling	8.21	7.04	11.53	6.96	5.68	5.29	4.71	6.26	6.09	6.96	4.95	4.53	4.86
Cuff setting	5.46	3.52	6.53	2.65	2.19	2.39	2.99	4.00	5.29	3.32	------	------	2.69
	Man-hours per dozen shirts												
Yoking	------	0.071	0.074	0.090	0.119	0.152	0.121	0.126	0.148	0.138	0.184	------	------
Collar setting	0.244	.284	------	.391	------	.453	.357	.238	.309	.258	.328	------	0.391
Shoulder joining	.122	.142	.096	.184	.227	.221	.218	.183	.170	.172	------	------	.225
Sleeve setting	.122	.142	.097	.142	.189	.168	.156	.154	.139	.139	.216	0.158	.151
Felling	.122	.142	.087	.144	.176	.189	.195	.159	.164	.144	.202	.220	.206
Cuff setting	.183	.284	.153	.377	.457	.431	.334	.250	.189	.301	------	------	.372
Total [1]	.793	.994	------	1.238	------	1.462	1.260	.984	.971	1.014	------	------	1.345

[1] Does not include yoking.

much closer to the progressive-bundle type than to the line type. Plant No. 1, with 3.52 dozen per hour, turned out a higher grade shirt, while plant No. 68, running on approved straight-line principles, showed the highest productivity, turning out 4.10 dozen per man-hour. While its productivity was slightly less than that of plant No. 6, which turned out 4.19 dozen per hour on the bundle system, the difference was due to quality, for plant No. 6 produced the cheapest grade of shirt of any of the plants recorded in table 18. Those bundle plants producing a shirt most like that of plant No. 68 in quality all had a lower output—plant No. 74, 2.80; plant No. 5, 3.22; and plant No. 31, 3.87 dozen per hour; or from 5.6 to 31.7 percent less than line plant No. 68.

In the operation of shoulder joining, the productivity in the bundle plants was within the narrow range of 4.41 to 5.82 dozen per hour, while in the line plants it was from 5.44 to 10.47 dozen. The two other plants on the line showed a productivity of 8.20 and 7.04 dozen, respectively. Since the latter plant turned out a higher grade of shirts than the other plants, its output as compared to the bundle plants' figure of 4.41 to 5.82 was really much greater than the mere difference in the figures implies. Similar conclusions can be drawn from the other operations, although, as stated, exceptions occurred here and there due to causes which could not be singled out from available records.

The data in table 18 on labor productivity expressed in terms of man-hours per dozen for separate operations also show that the time it took to turn out a dozen shirts for these specified operations ranged from 0.972 to 1.345 man-hours in the bundle plants and from 0.731 to 1.238 man-hours in the line plants. Disregarding plant No. 72 because it was not strictly a line plant, the line range was from 0.731 to 0.990 hour per dozen. The only plants on the bundle system which compared with these figures were plant No. 6 with a time requirement of 0.984 man-hour per dozen and plant No. 5 with 0.972 man-hour per dozen, which turned out lower grades of shirts than the plants on the line.

Effect of Line on Workers

Change from Individual to Team Work

Although the patentee of the straight-line system attaches the least importance to increased production resulting from the speeding up of the individual workers, it is nevertheless a fact that the system forces each individual worker on the line to concentrate on and to expedite her work. Under the bundle system, each worker operates independently. With the piece-work system in general use, she has the incentive to turn out as much work as possible in order to increase her earnings. However, being concerned with her individual bundle, she works for the time being in a little world of her own. A sense of fatigue, ill health, conversation with workers next to her, personal troubles which may occupy her mind while she goes on with her work, all affect her speed and tend to reduce the incentive to do her utmost.

Under the straight-line system the operator loses such independence. She is at all times keenly aware of the fact that if she falls behind in her work the operator in front of her is rendered idle, waiting for the garment on which she is working. She is aware of the fact that unless she completes her part promptly, this will hold up the rest of the line and the foreman will be there to find out what is the trouble.

The necessity of speed under these circumstances is obvious. The worker can no longer work at her own natural pace. She must adjust herself to the speed of her fellow workers, all of which undoubtedly results in increased individual productivity. When the workers are of a fairly uniform skill and equal tempo, the uniformly high speed of the work, while it may result in greater fatigue at the end of the work period, need not necessarily affect injuriously the health of the worker. But where no attention is paid to that factor, or still worse where, as a result of deliberate design, fast

workers are interspersed with workers of a naturally slower tempo, the health of the worker may be seriously affected.[7]

In one of the plants studied, management deliberately resorted to such an arrangement which caused the slower workers to strain themselves to the utmost. On the one hand, the slower worker was aware that work was piling up behind her from the fast worker on the preceding operation. On the other hand, she saw that the equally fast worker on the succeeding operation was waiting for her work. The result was a large increase in productivity by the individual workers, but at the cost of great physical and nervous strain on the part of the naturally slower workers. In the end, such an arrangement is bound to be harmful not only to the slower worker but to the efficient operation of the shop.

A plant managed in disregard of these elements will have a high labor turn-over, with inevitable loss of production while the new help is being trained or is trying to adjust itself to the work in the shop. Moreover, while the fast worker speeds up the slower, she is in turn slowed down by the latter. Since a slow worker cannot keep up an unnaturally fast pace indefinitely, it means that on the average the gain in production caused by the speeding up of the slow worker will be offset by the loss of production on the part of the fast worker through the failure of the slow worker to keep up with her pace.

Rest Periods

The necessity of working at her machine without let-up, under the conditions just described, creates a physical and nervous strain which must be relieved from time to time by rest periods. Under the bundle system, especially with piece work as the prevailing basis of compensation, a worker is free to stop at any moment to relax or to attend to her personal needs. In shops in which a central work station is provided, she must in addition leave her place each time the bundle is finished, take it to the station, wait until she gets the next bundle, and then walk back to her place. As the bundle is usually of a size to provide approximately an hour's work, she has an opportunity to make several trips to the work station in the course of the day. This provides a number of brief rest periods, at approximately equal intervals, which relieve the monotony and strain.

In shops working on the line system, there are usually two rest periods of 5 to 10 minutes each in addition to the lunch period—one

[7] In fairness to the originator of the system, it should be said that he is opposed to its abuse. He has publicly and emphatically stated that he is not interested in having it used "by those who would engage in its unsocial exploitation."

in the middle of the forenoon and another in the middle of the afternoon. The time devoted to the rest periods is approximately equal to the time taken by the worker under the bundle system, except that under the line system the rest is taken by all the workers together at definite periods of the day, whereas under the bundle system each worker follows her own inclination as to the time and length of relaxation.

Earnings of Sewing-Machine Operators

The effects of the straight-line system on earnings of sewing-machine operators have been influenced by a variety of cross-currents that have been operating in the industry since N. R. A. Most plants installed the line system after the termination of N. R. A. when average hourly earnings were reduced in proportion to the increases in work hours. Differences in record keeping of hours under N. R. A. and after are also apt to distort the wage picture. While the weekly earnings are an exact figure based on pay-roll records, the computed hourly wages in piece-rate plants frequently vary with changing time-clock regulations or failure of their enforcement. These limitations must be taken into consideration in analyzing the changes in the average hourly earnings since N. R. A., which are presented in table 19. The fall of 1936 is compared with the fall of 1934 because the entire cotton-garment industry was then operating on a uniform 40-hour week. Although the trend in average hourly earnings (computed by dividing the weekly earnings by the number of hours registered on the factory time clock) has been generally downward, the line plants, recorded smaller declines than bundle plants.

TABLE 19.—*Changes in average hourly earnings in the cotton-garment industry since N. R. A.*

Type of plant	Location	Number of plants	Percentage change, fall of 1936 compared with fall of 1934
Bundle plants, nonunion	North	20	−4.9
Line plants, nonunion	do	7	−2.6
Bundle plants, union	do	25	−2.8
Bundle plants, nonunion	South	16	−16.6
Line plants, nonunion	do	4	−8.9

During the same period weekly earnings of sewing-machine operators in 35 bundle plants changed slightly, decreasing 1.6 percent. On the other hand, the records of 13 plants which installed the line system and retained the 40-hour week show an increase in the weekly earnings of sewing-machine operators of approximately 10 percent.

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The effect of the line system on hourly and weekly earnings of sewing-machine operators may also be studied by comparing line and bundle plants for the fall of 1936. A comparison of hourly earnings of sewing-machine operators in nonunion plants comprising 11 line plants in the North and 12 in the South and 29 bundle plants in the North and 20 in the South shows that in both the North and the South average hourly earnings were slightly higher in line than in bundle plants. The average hourly earnings of sewing-machine operators in these nonunion plants under the line and the bundle systems in the fall of 1936 were as follows:

	Number of plants	*Average hourly earnings (cents)*
Line plants:		
North	11	36. 2
South	12	28. 6
Bundle plants:		
North	29	35. 2
South	20	27. 2

In analyzing weekly earnings care has been taken to select comparable nonunion plants under the bundle and line systems working on uniform weekly schedules. Twenty-two bundle plants and six line plants were found working on a 40-hour week. Both groups of plants manufacture various products, such as dress shirts, work shirts, etc. One-half of the 22 bundle plants and one-half of the 6 line plants are located in the South, so that the effects of the regional differences in wages were eliminated. Of these 28 plants the average weekly earnings of sewing-machine operators on the line were slightly more than $1 higher than for those under the bundle system.

From the point of view of line versus bundle system, it is significant to note that (1) following the installation of the line system weekly earnings of sewing-machine operators advanced sometimes even in the face of a decline in the hourly earnings in the same plants operating on the same schedule of weekly hours both before and after the installation of the line; and (2) in the fall of 1936 weekly earnings in line plants were about 10 percent higher than in bundle plants operating on the same schedule of weekly hours, while hourly earnings were only about 3 percent higher.

These apparently contradictory trends in weekly and hourly earnings in line plants can be explained only by the fact that the line system makes it possible for sewing-machine operators to put in more hours of actual work than can be done under the bundle system with the same schedule of weekly hours. The elimination of the idle time by the line is therefore tantamount to an increase in the weekly productivity of line plants separate and apart from the gains in the man-hour productivity in the course of actual work.

Effects of Line on Wage System

Under the bundle system workers are paid on a piece basis, the rate varying with the operation performed. Under the straight-line system, all workers on a line produce an equal number of garments, and all workers engaged on the same operation earn about an equal amount. This eliminates the need for the piece-work system and the workers are therefore paid, as a rule, on an hourly basis.

The hourly wage is generally determined by taking into consideration the weekly earnings of the workers and their output under the bundle system, when they were paid by the piece. As a rule, with the hourly wage goes a quota of minimum output on the line, which is usually based on time studies. If the total production for the week exceeds the quota the workers receive a bonus in addition to their regular hourly wage. This method of paying machine operators on the line has been found in operation in all nonunion plants. Of the two union line plants covered by the survey, one operates under the same system, while the other continues to pay by the piece as it did under the bundle system.

Experiment in a Union Shop

The rapid progress of the line system among nonunion manufacturers, with the consequent increased competition with which the union manufacturers were confronted, has led to a serious effort on the part of union manufacturers to bring about an arrangement which would remove the opposition of the union to the introduction of the system in union shops. As a result of negotiations between the Union-Made Garment Manufacturers Association and the United Garment Workers Union, it was agreed to undertake an experiment by adopting the system in a union plant under the joint supervision of the manufacturers and the union. Accordingly, the system was introduced in a small shop operated by a leading union manufacturer early in March 1937. A visit to the plant when it was completing its fourth week of operation under the system produced the following information: The workers in the shop were working under a quota system. The weekly quota was equal to the former production of the shop under the bundle system. The quota was exceeded after the first week of operation. During the fourth week production was nearly 10 percent in excess of the quota, yielding a bonus of 84 cents per week to each worker on the line. As the shop was just getting into its stride, both management and workers were looking forward to increased production and earnings.

During the month of April production exceeded the quota by 40 percent. A substantial part of this gain was due to: (1) Production of fewer styles under the line system as compared with the old bundle system; (2) installation of new machinery; (3) remodeling the plant by painting the walls white and improving ventilation, lighting, and heating equipment. However, management attributes the major part of the gain in productivity to the advantages of the line.

The 40-percent gain in weekly production was accompanied by an increase of 20 percent in weekly pay rolls, and a gain of 15 percent in the weekly earnings of sewing-machine operators.[8]

The method of adjusting the wages in this union shop aims at an equal division between management and labor of the benefits resulting from the system. Prior to the introduction of the straight line, the hourly rates for each worker had been agreed upon. These rates were fixed at the workers' previous earnings under the piece-work system. A weekly production quota under the new system was arrived at by adding the sum total of the wages thus agreed upon for a 40-hour week and dividing it by the former piece price per dozen.

Under the bundle system the sum total of piece rates per dozen was $1.775. It was agreed that on all production on the line in excess of the weekly quota, the workers of the shop were to get a bonus of 88.5 cents per dozen (3.8 cents per dozen for each operator) or one-half of the old piece rate. Under this arrangement the firm thus gets the benefit of reduced cost on all work done in excess of the production under the bundle system and the workers get the benefit of an equal gain in their earnings above the figure which they earned under the old system.

The experiment is being closely watched by the other union-label houses in the industry. If it comes to be generally adopted by the union manufacturers, it promises to remove the opposition of organized labor in the work-clothing industry to this latest phase of technological progress in the cotton-garment industry.[9]

Summary

Briefly, the results of the straight-line system may be summed up as follows:

1. Even after taking into account the increased productivity under the line system resulting from installation of new machinery and from the production of a more simplified garment, there is a net residual

[8] The difference in the last two figures is due to the fact that three employees formerly engaged in indirect labor when the plant was under the bundle system were transferred to productive work on the line.

[9] Since this report was written, an agreement was entered into between the Union-Made Garment Manufacturers Association and the United Garment Workers Union extending the arrangement in the experimental shop described above to all the union houses in the country under the jurisdiction of the union.

gain in output per man-hour attributable strictly to the line and additional gain in weekly output due to the more complete utilization of working hours.

2. The effect of the rise in labor productivity upon the weekly earnings of sewing-machine operators could not be accurately measured. Such data as are available, however, justify the conclusion that weekly earnings rose by about 10 percent.

3. The savings in cost to the manufacturer brought about by the line system are composed of two principal elements: (1) The reduction of work in progress, resulting in a very substantial decrease in inventory investment, and (2) savings in direct labor cost because of the higher productivity of labor on the line.

Chapter V

Productivity of Labor in the Principal Branches of the Cotton-Garment Industry

Dress Shirts [1]

The 32 dress-shirt plants covered by the survey for which labor productivity data were available showed considerable variation in the technique of manufacturing and in the manner in which the work was subdivided in the sewing department.[2] The number of individual operators required to sew a complete shirt, for instance, varied from 20 to 41. The widest range in the number of operations appeared in the production of minor parts, the number varying from 6 to 17. The preparation of body parts is done in from 9 to 16 operations, while the least variation in the number of operations is found in the assembly room. There is no apparent difference in this regard between bundle plants and plants using the line system.

In bundle plants, assembly consumes a substantially larger proportion of sewing time than might be assumed from the relatively small number of operations comprised therein. This is due to the fact that the average assembly operation requires more sewing time than the average part or body operation.

For line plants, however, the difference between the average time required in assembly and for parts and body operations is much narrower. The relative time required for body operations as compared with minor-parts operations is also reduced, since the line is not usually applied to the production of minor parts.

TABLE 20.—*Division of labor in sewing department—Dress shirts*

Division of work	Number of operations			
	26 bundle plants		4 line plants	
	Maximum	Minimum	Maximum	Minimum
Entire sewing department	41	20	34	25
Minor parts	17	6	12	9
Body	16	9	15	11
Assembly	8	5	7	5

[1] The term "dress shirt" is used here in contradistinction to "work shirt" and not in the commonly accepted sense of a shirt used for evening-dress wear.

[2] A description of the basic operations in making dress shirts is given in appendix 3.

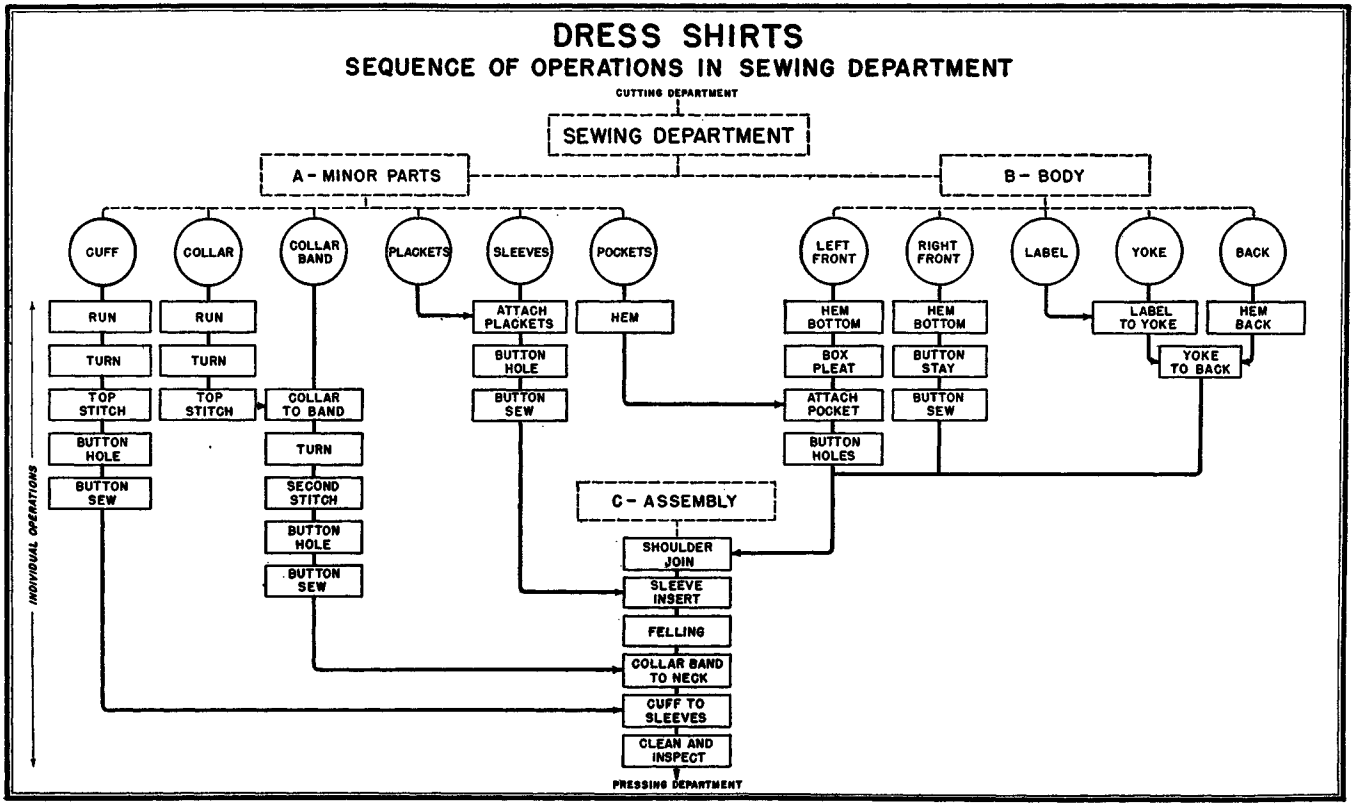

CHART 3

Characteristics of Plants Studied

Price groups.—On the basis of the price or quality of the product, the most important single element affecting labor productivity and labor cost in the manufacture of dress shirts, the plants in the sample studied fall into three groups: (1) "customized"; (2) high price; and (3) medium and low price. The first group covers two plants which manufactured shirts selling mostly over $2 retail and usually produced to specifications of individual retailers. The second group includes 16 plants producing shirts of high quality and retailing predominantly from $1.95 upward. The third group comprises 12 plants manufacturing shirts designed to retail between $1 and $1.95 each and 2 plants producing shirts retailing for $1 or less. The last 2 plants have been included in this group for convenience in treatment, as the character of their productivity and labor-cost data warrant such inclusion.

Systems of production.—Line production had been installed by 4 of the 32 plants covered. One of these plants, No. 1, was in the high-price bracket; three plants, Nos. 67, 68, and 72, were in the medium-price group.

Geographical location.—Each major geographical region is represented in the sample studied. Eighteen plants were located in the Northeast, of which five were in the Troy, N. Y., area. Seven were in the Midwest, two in the Far West, and five in the South.

Union and nonunion plants.—One plant in the customized group, four in the high-price group, and three in the medium-price group were union plants. Six of these had contracts with the Amalgamated Clothing Workers, and two with the United Garment Workers.

Productivity of Labor in Sewing Department

Major attention in this study was concentrated on the sewing department. This was dictated both by its predominant importance in the manufacturing process and by the fact that observed differences in equipment and productive technique related primarily to this department.

As will be seen from the figures in table 21 (supplemented by figures in table 22 for individual plants), production per man-hour fell into very distinct ranges, corresponding to the price and quality of the shirts manufactured. The average productivity per man-hour was 1.38 shirts for group 1 (customized). As the quality dropped, productivity rose to 2.44 for group 2 (high price), and to 3.15 for group 3 (medium and low price). There was a similar distinct variance in the minimum and maximum man-hour production for each group.

TABLE 21.—*Number of dress shirts produced per man-hour in sewing department, 1936*

Price group	Average[1]	Maximum	Minimum
Customized (2 plants manufacturing to retail specifications) [2]	1.38	1.66	1.10
High price (16 plants manufacturing shirts selling at $1.95 and up)[2]	2.44	2.76	1.88
Medium and low price (12 plants manufacturing cheaper garments) [3]	3.15	3.77	2.63

[1] These averages for a limited number of plants must not be given too broad a significance. They are presented to facilitate comparisons and to eliminate the instability of figures for the outer ranges.
[2] Based on figures for the spring of 1936 in table 33.
[3] Based on figures for the fall of 1936 in table 33.

The exceptionally low productivity of 1.1 shirts per man-hour in a plant in the customized group may be explained (1) by the superior quality of the shirts manufactured in this plant; (2) by the relatively large proportion of garments produced to specifications of individual retailers; [3] and (3) by the fact that it employed an unusually high proportion of older machine operators (over 40 percent were persons over 60 years of age).

The average productivity for the 16 high-price plants, manufacturing shirts retailing for $1.95 or more, was 2.44 garments per man-hour in the spring of 1936. With one exception, the range of productivity within this group was from 2.12 to 2.76. The higher figure for the group is only 13 percent above the average, and the lower, 23 percent below the average. The opposite extreme in this group is the one plant which falls below the range just given. The productivity of this plant was 1.88 garments per man-hour. This was probably due to the fact that it manufactured a variety of distinctly nonstandard garments, a fact which always reduces output per man-hour.

When the great number of factors which tend to raise or lower productivity in a factory is considered, this comparatively narrow range shows a marked uniformity for this section of the industry and makes it highly probable that the data obtained from the plants studied are fairly representative of the general experience among large producers in the manufacture of this quality of product.

The highest productivity in the high-price group—2.76 shirts per man-hour—was in a southern plant. This plant manufactured virtually a single-price line and used a progressive-bundle system of production. Although these two factors undoubtedly help to explain its high efficiency, the possibility of achieving a high degree of productivity with southern labor under competent management and proper working conditions is also indicated.

The four plants in this group showing the next highest productivity (table 22), ranging from 2.72 to 2.74 garments per hour, were all located in the North—three in the State of New York, and one in

[3] This interferes with work on a large scale, since each individual order must be made up separately, because of differences in the construction of the garment on each retail specification.

Pennsylvania. The product of one of these was virtually standard, being sold chiefly to a large mass distributor. In addition, this plant utilized the line system, and both of these factors are reflected in its high productivity.

Plants in the medium-price group show a somewhat wider range than that observed for the higher-price producers, though even here there was a marked consistency in the figures. The highest productivity observed—3.77 units per man-hour—was 19.7 percent greater than the average of 3.15. The lowest productivity—2.63—was 16.5 percent lower than this average.

At the upper extreme of this group are two plants whose productivity was 3.76 and 3.77 shirts per man-hour, respectively. Both plants used the line system, although in one, line production was confined to the assembly operations. In addition to these two, one other plant in the medium-price group (No. 72) used the line system. Its productivity was considerably lower—2.82 units per man-hour. This was not so much a reflection of lesser efficiency as of the higher quality of its product. A comparison of the operations performed in each of these three line plants shows that the last plant performed a considerable number of added operations, designed to improve quality, which were not performed in the other two.

Turning to the plants utilizing the bundle system, the three with the highest productivity, ranging from 3.26 to 3.48 garments per man-hour, were located in the New York metropolitan area and in Pennsylvania, and all used union labor. The similarity of the results for these three is very striking.

Effect of System of Shop Management

As pointed out in chapters III and IV, it was next to impossible to isolate the effects of any single factor on labor productivity. The operator working at her machine is subject all the time to all the factors that affect her productivity. Her individual skill, the speed and condition of her machine, the system of shop management, the light, the condition of the air in the shop, and many other factors all affect her productivity at the same time, and there is no system of records which even attempts to account for any of these factors. This fact must constantly be borne in mind in attempting to trace or evaluate the influence of any single factor, such as the system of shop management.

Table 22 presents data on labor productivity, expressed in terms of shirts per man-hour, for each of the 32 plants studied, covering the period between the fall of 1933 and the fall of 1936.

TABLE 22.—*Labor productivity of sewing department—Dress shirts, 1933–36*

Code No.	System of production	Price range	Shirts per man-hour							
			1933		1934		1935		1936	
			Spring	Fall	Spring	Fall	Spring	Fall	Spring	Fall
62	Bundle	Customized	-------	-------	1.85	1.85	1.62	1.52	1.66	1.60
21	do	do	-------	-------	-------	-------	-------	1.60	1.10	1.14
1	Line	High-price	-------	-------	-------	(1)	[2] 1.94	2.59	2.72	2.83
90	Bundle	do	3.16	-------	2.50	-------	2.06	-------	2.76	-------
3	do	do	-------	-------	3.01	2.88	2.68	2.64	2.59	2.65
93	do	do	-------	-------	2.76	-------	2.09	-------	2.59	-------
89	do	do	-------	-------	2.26	-------	2.28	-------	2.58	-------
64	do	do	-------	-------	-------	-------	2.58	2.34	2.74	2.42
88	do	do	-------	-------	-------	-------	-------	-------	2.72	2.42
75	do	do	2.38	2.26	2.48	2.11	2.23	2.16	2.16	2.41
60	do	do	2.30	-------	2.29	-------	2.03	-------	2.36	-------
91	do	do	-------	1.93	1.73	2.09	1.88	2.22	2.24	2.26
4	do	do	-------	2.88	2.71	2.78	3.26	2.75	2.74	2.22
65	do	do	-------	-------	-------	-------	2.15	2.47	2.24	2.21
61	do	do	-------	-------	-------	-------	1.82	2.32	1.88	2.18
63	do	do	-------	2.33	2.38	2.36	1.78	2.18	2.12	2.14
66	do	do	1.52	1.52	1.73	1.82	2.06	2.22	2.38	2.12
30	do	do	-------	-------	2.16	1.52	1.81	1.74	2.28	1.69
68	Line	Medium-price	-------	-------	-------	3.34	3.65	3.29	[1] 3.42	3.77
67	do	do	-------	-------	-------	2.92	(1)	3.54	-------	3.76
5	Bundle	do	-------	-------	3.58	3.36	3.28	3.29	3.35	3.48
31	do	do	-------	3.78	3.70	3.67	3.25	3.06	3.43	3.36
6	do	do	-------	3.11	3.11	3.17	3.44	3.46	3.30	3.26
71	do	do	-------	-------	3.04	3.08	2.76	3.22	3.30	3.04
74	do	do	2.46	2.83	2.95	2.81	2.90	2.93	3.01	3.04
73	do	do	-------	-------	-------	-------	-------	2.34	2.47	3.04
72	Line	do	-------	2.48	-------	2.69	(1)	2.51	-------	2.82
77	Bundle	do	-------	-------	-------	-------	3.12	3.53	3.37	2.80
79	do	do	-------	-------	-------	-------	3.50	-------	3.02	2.80
92	do	do	-------	-------	3.28	3.24	3.55	2.82	3.10	2.63
76	do	do	-------	2.58	2.53	2.66	2.70	-------	-------	-------
70	do	do	-------	-------	2.16	2.64	2.30	-------	-------	-------

[1] Season when line system was installed.
[2] First season of line system, also other difficulties in operation.

An examination of the figures for the individual plants shows that there was a definite increase in productivity during the period between 1933 and 1936 in the four plants which introduced the line system, and in four other plants, two of which introduced the progressive-bundle system. However, among plants that used the bundle system throughout the period 1934–36 there was no general and consistent change in productivity. This is shown in table 23 which covers identical plants in all the six seasons shown. These six plants in the high-price group and four in the medium-price group are the only bundle plants for which records are available for all the periods covered. In the case of neither the high-price nor the medium-price group was average productivity notably higher in 1936. The figures for the individual plants in table 22 indicate an irregular movement of productivity from season to season and from year to year.

TABLE 23.—*Productivity, labor costs, and hourly earnings for sewing department in identical bundle plants—Dress shirts, 1934–36*

Item	1934		1935		1936	
	Spring	Fall	Spring	Fall	Spring	Fall
6 plants in high-price group:						
Shirts per man-hour	2.20	2.11	2.17	2.21	2.32	2.14
Labor cost per dozen	$1.92	$2.14	$2.28	$2.09	$1.89	$2.10
Earnings per hour (in cents)	34.4	36.4	40.0	37.5	36.3	36.5
4 plants in medium-price group:						
Shirts per man-hour	3.24	3.20	3.12	3.01	3.21	3.02
Labor cost per dozen	$1.39	$1.49	$1.67	$1.63	$1.43	$1.65
Earnings per hour (in cents)	37.2	39.3	42.8	40.6	38.3	38.5

In contrast to this lack of a definite trend in the man-hour output of the sewing department in the bulk of the plants is the marked increase in labor productivity in the few plants which introduced major changes in shop management. One high-grade plant (No. 1) which introduced the line system early in 1935 experienced marked difficulty in the first season, but by the fall of 1936 had a higher output per man-hour than any other plant in its class. A medium-price plant (No. 67) which introduced the line system in the spring of 1935 increased its output from 2.92 shirts per man-hour in the fall of 1934 to 3.76 shirts in the fall of 1936, or 28 percent. This plant, together with another line plant (No. 68), exceeded the average of the four bundle plants in the medium-price group (table 23) by about one-quarter. It experienced a less pronounced rise when it went on the line system, but there appears to have been some gain, perhaps amounting to 10 percent. In the fourth plant (No. 72), also, the gain was apparently of about the same proportions, though the output of 2.82 shirts per man-hour in the fall of 1936 was less than in most bundle plants in this grade.

Analysis of Productivity by Operations

Table 24 presents a comparison of the labor time required for individual operations in the sewing department of 7 dress-shirt plants studied. For the five bundle plants included in this table, data are presented for each sewing operation and for the entire sewing department. For the two line plants, data were available only for those operations which were performed on the line. In plant No. 1 this included both body and assembly operations, while in plant No. 68 assembly operations only were covered.

TABLE 24.—*Labor productivity of sewing department, by operations in making dress shirts under bundle and line systems, 1936*

SEWING DEPARTMENT

Operation	Man-hours per dozen						
	Medium-price shirts					High-price shirts	
	Plants on bundle system				Plant on line system	Plant on bundle system	Plant on line system
	No. 74	No. 5	No. 31	No. 6	No. 68	No. 3	No. 1
Entire sewing department (100 percent)	3.468	3.207	3.528	3.000	(1)	4.088	(1)
Minor parts (approximately 35 percent of total)	1.185	1.130	1.220	1.101	(1)	1.395	(4)
Body parts (approximately 33 percent of total)	1.023	1.106	1.294	.915	(1)	1.231	0.956
Assembly (approximately 32 percent of total)	1.260	.971	1.014	.984	0.793	1.462	.994
Body and assembly combined (approximately 65 percent of total)	2.283	2.077	2.308	1.899	(1)	2.693	1.950
MINOR PARTS							
Total, minor parts	1.185	1.130	1.220	1.101	(2)	1.395	(2)
Collar making:							
Collar run	.156	.081	.087	.089	(2)	.120	(2)
Collar turning		.051	.084	.076	(2)	.094	(2)
Collar top stitching	.065	.079	.069	.070	(2)	.078	(2)
Collar banding:							
Collar insert	.259	.084	.139	.108	(2)	.241	(2)
Collar turn band		.028		.029			
Collar band beading		.040	.046	.052	(2)	.108	(2)
Collar double-row stitching		.052	[3] .078	.078			
Cuff making:							
Cuff run	.188	.093	.099	.062	(2)	.120	(2)
Cuff turning		.030	.035	.028			
Cuff second stitching		.057	[4] .117	.055	(2)	.073	(2)
Hemming cuff	.089	.105	.099	.075	(2)	[3] .092	(2)
Sleeve making:							
Lower facing	.428	.289	.241	.203	(2)	.469	(2)
Upper facing							
Placket		.141	.126	.176			
BODY PARTS							
Total, body parts	1.023	1.106	1.294	0.915	(2)	1.231	0.956
Attaching label	.065	.054	[4] .112	.050	(2)	.092	[2] .075
Yoke to back	.121	.148	.138	.126	(2)	.154	.071
Hemming back	.082	.064	.097	.066	(2)	.086	.071
Hemming fronts	.011	.091	.090	.064	(2)	.107	.071
Tacking	[3] .045	.047	.043	.044	(2)	[3] .045	[3] .045
Box pleat	.082	[5] .045	.085	.065	(2)	.092	.071
Button staying	.055	.046	.081	.049	(2)	.085	.071
Pocket:							
Making pocket	.209	.099	.064	.043	(2)	.045	[3] .063
Setting pocket		.185	.232	.140	(2)	.174	.142
Buttonholes:							
Collar band	.151	.027	.129	.022	(2)	.030	.142
Fronts		.097		.102	(2)	.106	
Cuff	.042	.054	.075	.036	(2)	.049	
Buttons sewed on:							
Collar band	.124	.036	.108	.015	(2)	.038	[3] .030
Fronts		.087		.072	(2)	.086	.071
Cuff	.036	.026	.040	.021	(2)	.042	[3] .033

[1] No data available.
[2] Data not available; operations not on line system.
[3] Estimated; figures based on average of other plants.
[4] Cuffs in this plant require extra row of stitching.
[5] No precise explanation available for wide variation from other plants.

TABLE 24.—*Labor productivity of sewing department, by operations in making dress shirts under bundle and line systems, 1936*—Continued

ASSEMBLY

Operation	Man-hours per dozen						
	Medium-price shirts					High-price shirts	
	Plants on bundle system				Plant on line system	Plant on bundle system	Plant on line system
	No. 74	No. 5	No. 31	No. 6	No. 68	No. 3	No. 1
Total, assembly	1.260	0.971	1.014	0.984	0.793	1.462	0.994
Shoulder joining:							
First stitching	.218	.079	.086	.090	.122	.221	.142
Second stitching		.091	.086	.092			
Sleeve setting	.156	.139	.140	.154	.122	.168	.284
Felling	.195	.164	.144	.159	.122	.189	
Collar setting:							
First stitching	.357	.124	.130	.238	.244	.453	.284
Second stitching		.185	.128				
Cuff setting:							
First stitching	.334	.100	.146	.132	.183	.431	.284
Second stitching		.089	.155	.118			

No data for operations on minor parts are shown for line plants in table 24, but the figures for the bundle plants in the same price group show, with few exceptions, a close agreement. Thus, the number of man-hours per dozen shirts on collar-making for three out of the four plants was 0.221, 0.240, and 0.235. The man-hours for collar banding in the same plants were 0.259, 0.263, and 0.267. For sleeve making, the figures for two plants were 0.428 and 0.430, and for two other plants, 0.367 and 0.379. The total time for the operations on minor parts for the four plants was 1.101, 1.130, 1.185, and 1.220 man-hours per dozen shirts. The range between the lowest and highest was only 10 percent, yet these plants were located in different parts of the country and were under separate ownership and management.

The data in table 24 on body parts offer a comparison between a very efficient plant on the bundle system and one on the line system in the high-price group. The reported figures for the separate operations show that, without a single exception, it takes less time to do an operation under the line system than under the bundle system. The total time for body operations was 1.231 man-hours under the bundle and 0.956 man-hour under the line system, a difference of 22 percent in favor of the line system.

No figures are available for making a similar comparison between line and bundle plants in the medium-price group. The four plants operating under the bundle system again show a fairly close agreement and a comparatively narrow range. Thus, the total time for body parts in the four plants in this group was 0.915, 1.023, 1.106, and 1.294 man-hours per dozen shirts or an average of 1.085 man-hours. The deviation of the lowest from the average was 16 percent and of the highest 19 percent.

A comparison of the time required for assembly operations in line and bundle plants, both in the medium and in the high-price groups, also appears in table 24. In the medium-price group, the time required in the line plant was much lower than in any of the bundle plants on all operations, with one exception—collar setting, for which one of the four bundle plants showed a lower figure than the line plant. The total assembly time in the line plant was only 0.793 man-hour, as against 0.971, 0.984, 1.014, and 1.260 in the four bundle plants, a difference of about 18 percent to 37 percent in favor of the line plant. It should be said, however, that the difference of 37 percent was due not alone to the advantages of the line system but also to the fact that the plant requiring 1.260 man-hours per dozen made mostly $1.95 shirts, while the line plant manufactured chiefly $1 shirts, although both are in the medium-price group.

In the high-price group, likewise, the time required to do each operation was invariably much shorter under the line than under the bundle system, the total for all the assembly operations being 0.994 man-hour for the line plant and 1.462 for the bundle plant, a difference of 32 percent in favor of the line plant. It should be added, however, that the line plant was manufacturing a uniform product on a large scale for a mail-order house, while the bundle plant manufactured a larger variety of garments in relatively smaller lots.

Productivity of Labor Under the Progressive-Bundle System

The progressive-bundle system is similar to the line system insofar as it aims at the automatic flow of work from operation to operation. Data for 3 such plants, Nos. 73, 89, and 90, are recorded in table 22. All three showed distinct increases in labor productivity due to the system. Plant No. 73 introduced an advanced form of the progressive-bundle system during 1936, which resulted in distinctly higher man-hour production. It rose from 2.34 shirts per man-hour in the fall of 1935 to 3.04 in the fall of 1936—an increase of 30 percent.

Similarly plant No. 89 showed a steady improvement over the three seasons for which data are available. In plant No. 90, while the progress lacked the same steadiness, productivity showed a decided improvement in 1936 over the preceding seasons except for the spring of 1933, when a less expensive shirt was produced.

Table 25 presents the man-hour output for a group of 12 operations in plant No. 73 before and after the change to the progressive-bundle system. The change was accompanied by the installation of new machinery. As a result, production per man-hour increased in 9 of the 12 operations. In seven of these the increase exceeded 25 percent. In three operations decreases were noted, but in each case these were less than 10 percent and may readily have reflected accidental circumstances, such as changes in the operations, changed personnel, etc. The total net increase for all 12 operations was about 20 percent.

TABLE 25.—*Effect of progressive-bundle system on labor productivity in plant No. 73—Dress shirts*

Operation	Dozens of dress shirts per man-hour		Percentage change, 1935-36
	Bundle system	Progressive-bundle system	
	Fall of 1935	Fall of 1936	
Sleeving	4.63	6.08	+31.3
Felling	4.95	5.52	+11.5
Collar setting	3.05	3.84	+25.9
Box pleat	10.52	14.75	+40.2
Button staying	13.68	18.10	+32.3
Sleeve facing	2.64	2.45	−7.2
Label	12.97	11.85	−8.4
Yoke setting	5.46	8.09	+48.2
Hemming	5.05	6.64	+31.5
Banding	8.22	8.29	+.9
Quilting	21.33	19.89	−6.7
Collar making	2.76	4.19	+51.8

Output per man-hour in the sewing department of plant No. 75 (table 22) also showed a substantial increase as the result of the introduction of the progressive-bundle system, accompanied by the substitution of new machines for old. The ratio of increase in this plant was not as striking as in the case of plant No. 73. The change took place in the fall of 1935. Productivity increased from 2.16 shirts per man-hour during that season to 2.41 in the fall of 1936, a rise of approximately 12 percent. It should be noted, however, that while this represented an advance over the preceding four seasons, the productivity in the spring of 1934 was 2.48 shirts per man-hour.

Productivity of Individual Workers

Frequent reference has been made to the influence of the skill and speed of individual workers on their productivity. Table 26 reflects the extent to which productivity of individual workers varies when performing similar operations on the same machines in the same plant under virtually identical conditions.[4] Ten or more operators

[4] The data here presented were taken from the records of a union plant. Unfortunately, there was no nonunion plant for which similar statistics proved available.

were employed on each of 10 selected operations. In each case, the average productivity for all the workers engaged on an operation was computed. This average was taken as 100 percent and the productivity of each worker was expressed as a percentage of this average.

While a few workers showed a productivity very much lower or higher than the average, the productivity of the majority tended to cluster about the mean. Sixty-four of the 160 workers, or 40 percent, showed productivity ranging between 90 and 110 percent of the average. Approximately 73 percent of the 160 workers (116) had a productivity ranging from 80 to 120 percent of the average. In this plant, therefore, wide variations between individuals are the exception. In a few cases, such as in collar turning and collar setting, the fastest operator may be more than three times as rapid as the slowest, but for the great majority the range is much narrower.

These individual variations in speed are, of course, reflected in corresponding variations in individual earnings, since piece work is the basis of payment. In this plant it is apparent that about three-fourths of the operators will be earning from 80 to 120 percent of the average pay for the operations upon which they are engaged. A few, however, will be earning as low as half the average, and a few more will be receiving wages more than 50 percent higher than the average.

TABLE 26.—*Frequency distribution of individual performance of specified operations of sewing department in plant No. 3—Dress shirts*

[Average for each operation=100 percent]

Percentage productivity of all workers	Number of workers whose individual productivity was specified percent of average productivity of all workers on operation										
	Collar turning	Sleeve setting	Felling	Cuff setting	Sleeve facing	Collar run	Collar banding	Top collar stitching	Shoulder joining	Collar setting	Yoke to back
Total	22	10	12	20	10	20	11	10	11	23	11
0–49.9											
50–59.9	2									1	1
60–69.9	3		1	1						2	
70–79.9		1	2	1	1			1		2	1
80–89.9	2	3	1	6	1	7	1	3	2	6	3
90–99.9	5	3		3	3	6	5	3	6	2	1
100–109.9	2		5	5	2	3	3	1	2	3	1
110–119.9	3	2	2		3	1	2	1		2	1
120–129.9	3		1	2						1	2
130–139.9	1			1		3			1	2	
140–149.9										1	
150–159.9		1						1			1
160–169.9				1							
170–179.9	1									1	

Lack of Seasonal Variation

Examination of tables 22 and 23 reveals the absence of any well-defined seasonal differences in the shirt industry affecting labor productivity. This was due to the fact that the material used in shirt

manufacturing was virtually the same during the spring and fall, any minor differences being insufficient to be reflected in changes in productivity. Of 16 plants for which both fall and spring figures are shown during 1934, 8 had higher productivity in the spring, 7 in the fall, and 1 remained unchanged. During 1935, 9 showed higher productivity in the spring and 11 in the fall. During 1936, 13 plants were higher in the spring and 11 in the fall.

Earnings of Sewing-Machine Operators

Table 27 presents average hourly earnings of workers in the sewing department for each of the plants studied during the period between the spring of 1933 and the fall of 1936. An examination of this table shows that earnings rose and fell uniformly throughout the industry during that period. These rises and declines were primarily influenced by the enactment of the N. I. R. A.; by approval of the cotton-garment code; by its later revision; and, finally, by the Supreme Court invalidation of the N. I. R. A. in 1935.

TABLE 27.—*Average hourly earnings of workers in sewing department—Dress shirts, 1933–36*

Plant No.	System of production	Price range	Average earnings per hour							
			1933		1934		1935		1936	
			Spring	Fall	Spring	Fall	Spring	Fall	Spring	Fall
			Cents	*Cents*	*Cents*	*Cents*	*Cents*	*Cents*	*Cents*	*Cents*
62	Bundle	Customized			39.9	39.5	40.9	29.6	37.5	38.4
21	do	do						33.7	30.4	28.7
1	Line	High price				(1)	38.6	40.5	42.2	42.7
90	Bundle	do	25.1		36.8		41.4		34.4	
24	do	do			37.1		43.9		37.4	
89	do	do			34.6		41.7		36.0	
64	do	do		39.3	40.2	34.1	44.1	42.1	41.7	39.6
88	do	do							38.4	35.7
75	do	do	26.4	36.1	40.0	39.7	41.7	38.5	40.5	42.5
60	do	do	26.3		37.9		44.5		39.9	
91	do	do		32.6	29.9	33.8	35.4	34.6	32.6	32.8
4	do	do		33.9	29.7	37.4	44.5	38.9	35.8	35.4
65	do	do		33.4	34.0	34.4	36.6	33.1	30.8	32.1
61	do	do			45.2	42.4	48.0	42.0	39.7	41.2
63	do	do		39.3	36.7	36.4	37.1	37.0	34.6	37.3
66	do	do	19.4	32.1	34.0	34.1	39.6	35.7	35.2	33.2
30	do	do		30.8	36.2	37.3	41.7	40.3	39.2	37.8
25	do	do					34.7	35.4	25.9	27.4
68	Line	Medium price				39.0	41.8	39.1	[1] 40.6	42.6
67	do	do		32.0		34.9	(1)	34.7		35.4
5	Bundle	do			42.1	41.0	44.1	41.0	41.6	43.3
31	do	do		34.8	36.5	38.0	39.3	38.9	37.2	36.8
6	do	do		39.3	38.9	39.4	44.6	43.9	44.2	44.2
71	do	do			37.9	37.8	47.7	42.0	41.0	42.9
74	do	do	22.1	36.2	37.8	41.6	42.5	42.9	40.6	40.2
73	do	do						32.9	34.3	30.4
72	Line	do		39.1		36.7	(1)	33.9		32.7
77	Bundle	do					32.3	28.3	27.5	23.8
79	do	do			31.2	31.9	35.9		32.6	32.3
92	do	do			36.7	40.0	41.2	38.7	34.4	34.2
76	do	do		31.9	32.5	34.4	38.2			
70	do	do			34.5	35.1	38.8			
2	do	do							36.0	36.9
29	do	do				34.1		28.2		

[1] Season during which line system was installed.

The adoption of the cotton-garment code in 1933 resulted in a very marked increase in average hourly earnings of shirt sewing-machine operators. Earnings continued to rise slightly between the fall of 1933 and the fall of 1934. This was probably due in large part to the progressive reduction of the number of learners and handicapped workers carried on the rolls in accordance with the provisions of the cotton-garment code.

Maximum hours under the code were reduced in December 1934 to 36, and piece rates were increased 11.1 percent in January 1935 in order to avoid any reduction in the weekly earnings of the workers. As a result of the elimination of code restrictions because of the Supreme Court decision in May 1935, the entire industry generally returned to the 40-hour workweek with corresponding reductions in piece rates.

Since changes in hourly earnings between the spring of 1933 and the fall of 1935 reflected general changes in Federal standards, it is only by examining the period between the fall of 1935 and the fall of 1936 that significant variations in individual plants can be detected. During this period, hourly wages increased in 9 plants and decreased in 15. Three of the five plants which introduced the line system and for which data were available were included in this group of nine in which earnings rose. Two others were union bundle plants.[5]

Direct Labor Cost

Table 28 shows the direct labor cost for the sewing department in the dress-shirt plants studied during the period between the spring of 1933 and the fall of 1936. In shirt making, as in the cotton-garment industry as a whole, labor is generally paid by the piece, Total sewing cost, therefore, is really equal to the sum of the piece rates for the individual operations. In the long run, however, labor cost is the result of the operation of two factors, hourly earnings and output. Piece rates are usually so established as to permit the average worker to earn a definite weekly wage at an assumed output per man-hour. A change in productivity generally leads to an adjustment of piece rates. An examination of the labor cost for the individual plants studied shows that they generally follow the same variations as hourly earnings. The same is true of the sample for which data were compiled in table 22. This parallel trend of costs and of earnings was to

[5] See ch. IV, pp. 57 and 58, for additional comments on changes in hourly and weekly earnings in straight-line plants in the dress-shirt industry. It is interesting to observe that while there is no exact correlation between hourly earnings and productivity, in some instances higher earnings are to be found in plants with higher productivity. Thus, comparing the figures in table 22 and 27, we find that in the high-price group the plants with the highest and lowest productivity respectively (plants 1 and 30) have a productivity of 2.83 and 1.69 shirts per hour, or a difference of 70 percent; the respective hourly earnings in the two plants are 42.2 and 39.2 cents, or a difference of nearly 8 percent. In the medium-price group, the respective productivity figures for the plants with the highest and lowest productivity (plants 68 and 92) are 3.77 and 2.63 shirts per hour, a difference of about 43 percent. The corresponding hourly earnings in the two plants are 42.6 cents and 34.2 cents, a difference of 24 percent.

be expected because of the lack of any well-defined trend in productivity during the period covered by the study.

TABLE 28.—*Direct labor cost of sewing department—Dress shirts, 1933–36*

Plant No.	System of production	Price range	Labor cost per dozen shirts							
			1933		1934		1935		1936	
			Spring	Fall	Spring	Fall	Spring	Fall	Spring	Fall
62	Bundle	Customized			$2.59	$2.56	$3.03	$2.36	$2.71	$2.52
21	do	do						2.53	3.32	3.03
1	Line	High				(1)	2.38	1.87	1.86	1.81
90	Bundle	do	$0.95		1.77		2.40		1.49	
24	do	do			1.61		2.53		1.74	
89	do	do			1.84		2.19		1.68	
64	do	do					2.05	2.16	1.83	1.96
88	do	do	1.06	$1.44	1.71	1.81	2.01	1.72	1.69	1.77
75	do	do	1.33	1.92	1.93	2.26	2.24	2.13	2.24	2.11
60	do	do	1.36		1.99		2.62		2.03	
91	do	do	1.36	2.02	2.08	1.95	2.25	1.87	1.75	1.74
4	do	do		1.41	1.31	1.61	1.64	1.70	1.57	1.91
65	do	do					2.05	1.61	1.65	1.75
61	do	do					3.16	2.18	2.53	2.26
63	do	do		2.02	1.85	1.85	2.49	2.03	1.96	2.09
66	do	do	1.53	2.53	2.36	2.25	2.30	1.93	1.78	1.88
30	do	do		2.03	2.01	2.93	2.77	2.79	2.06	2.69
68	Line	Medium				1.40	1.37	1.43	[1] 1.42	1.36
67	do	do				1.43	(1)	1.18		1.13
5	Bundle	do			1.41	1.46	1.62	1.50	1.49	1.49
31	do	do		1.11	1.19	1.24	1.45	1.53	1.30	1.32
6	do	do		1.52	1.50	1.49	1.55	1.52	1.61	1.63
71	do	do			1.50	1.47	2.07	1.57	1.49	1.70
74	do	do	1.08	1.54	1.54	1.78	1.75	1.76	1.61	1.59
73	do	do						1.69	1.67	1.20
72	Line	do		1.89		1.64	(1)	1.68		1.39
77	Bundle	do					1.24	.97	.98	1.02
79	do	do					1.23	1.46	1.29	1.39
92	do	do			1.34	1.48	1.39	1.65	1.33	1.56
76	do	do		1.48	1.54	1.55	1.69			
70	do	do			1.91	1.59	2.02	1.41	1.41	1.38

[1] Season when line system was installed.

Changes in labor costs are of interest in the four plants which introduced the line system and three plants changing to the progressive-bundle system, since these are the only factories in which major changes in labor productivity can be accounted for.

Plant No. 1 in the high-price group introduced the line system in the fall of 1934, but experienced difficulties in the experimental period, which lasted about 6 months through the spring of 1935. From the first recorded period of smooth operation on the line system in the fall of 1935 to the last available period in the fall of 1936, productivity increased 9.3 percent and stitching cost declined 3.2 percent (from $1.87 to $1.81 per dozen).

The chief explanation of the discrepancy between the increase in productivity and the decrease in labor cost seems to lie in the fact that hourly earnings also increased to the extent of 5.4 percent under the line system, the workers thus sharing in the benefit resulting from the increase of productivity. In this connection it should be added that the fastest operators were generally placed on the line, and

average hourly earnings in the bundle department therefore declined in the same period.

For the line and bundle departments combined, average hourly earnings of this plant declined 5.9 percent from the fall of 1935 to the fall of 1936. Despite this mixed trend in hourly earnings, owing to the placement of fast operators on the line while slow operators generally remained in the bundle department, weekly wages on the line increased from $13.10 in the fall of 1935 to $16.09 in the fall of 1936, an advance of 22.8 percent. In the line and bundle departments combined, average weekly earnings advanced 9.8 percent during the same period or from $11.60 to $12.74. Taking all other factors into consideration, the tendency toward increased weekly earnings on the line was therefore sufficiently marked to raise average weekly earnings in the entire plant or in line and bundle departments combined.

Plant No. 90 in the high-price group, which introduced the progressive-bundle system in 1934, recorded a gain of 10.4 percent in the output per man-hour between the spring of 1934 and the spring of 1936. At the same time, its labor cost per dozen declined 15.8 percent (from $1.77 in 1934 to $1.49 in 1936) and the hourly earnings dropped 6.5 percent.[6]

In the medium-price group, plant No. 67, which installed the line system in the spring of 1935, increased its man-hour productivity 28.7 percent from the fall of 1934 to the fall of 1936. At the same time, sewing labor cost fell 21 percent (from $1.43 per dozen to $1.13). Average hourly earnings rose 1.4 percent.[7]

Plant No. 68 in the medium-price group, which installed the line system in the spring of 1936, recorded an increase in productivity of 14.6 percent and a 4.9-percent decline in sewing cost (from $1.43 to $1.36 per dozen) from the fall of 1935 to the fall of 1936. At the same time, average hourly earnings increased 9 percent.

Plant No. 72 in the medium-price group, which installed the line system in the spring of 1935, recorded an increase in man-hour productivity of the sewing department of 4.8 percent from the fall of 1934 to the fall of 1936. At the same time, sewing labor costs declined 15.2 percent (from $1.64 to $1.39 per dozen). Average hourly earnings fell 10.9 percent.[8]

Plant No. 75 in the high-price group, which introduced the progressive-bundle system in the fall of 1935, showed an increase in

[6] Weekly earnings, however, increased 9.8 percent, from $10.35 in 1934 to $11.36 in 1936. This rise may be attributed to an increase in the actual hours of work made possible by the line system, bringing the hours of work nearer to the 40-hour full-time schedule in effect in both years.

[7] It should be added, however, that average weekly earnings increased from $11.47 to $13.46 per week, an advance of 17.3 percent.

[8] Weekly wages are not comparable because of increased scheduled plant hours.

productivity from the spring of 1935 to the fall of 1936 of 8.1 percent. At the same time, sewing cost declined 5.8 percent (from $2.24 to $2.11 per dozen). Average hourly earnings increased 1.9 percent in the same period.[9]

Plant No. 73 in the medium-price group, which installed the progressive-bundle system in the summer of 1936, recorded an increase in productivity of 23.1 percent from the spring of 1936 to the fall of 1936. At the same time, sewing cost declined 28.1 percent (from $1.67 to $1.20 per dozen). Average hourly earnings decreased 11.4 percent, and no comparison in weekly wages is available.

All of these seven plants increased productivity and reduced sewing costs after the installation of the straight-line or the progressive-bundle system. Workers shared the benefits in three of these plants through increases in average hourly earnings. In three additional plants the piece rates apparently were cut to such an extent as to cause a decline in hourly earnings, but the workers made up for this loss and registered a net gain in weekly earnings through the elimination of idle time during work hours under the line and progressive-bundle systems. In one plant, the workers experienced reductions in average hourly earnings despite the saving in labor costs to the management, and no increase resulted in weekly wages in this plant except from lengthened scheduled hours.

Work Shirts

The process of manufacturing a work shirt is basically the same as that of a dress shirt. The major difference between the two is in the subdivision of work. The work shirt is a utility product, made chiefly for durability, while dress shirts require particular attention to appearance. More stress is laid on strength than on fine detail in the making of a work shirt, and therefore a smaller number of operations is required.

This basic difference between the two types of shirts is reflected in the following features:

(1) The materials used in work-shirt manufacture—chambrays, coverts, and khakis—are somewhat heavier than the material used in the production of a dress shirt. It is questionable, however, whether this difference in the weight of the material has any marked effect on labor productivity.

(2) There are fewer stitches per inch in the typical work shirt than in the dress shirt.

(3) In the parts of the work shirt which call for extra strength or durability, such as attaching the yoke to the back of the shirt, setting sleeves into armhole, shoulder seams, etc., the machines used are two-needle machines, where single-needle machines are used in con-

[9] Weekly wages are not comparable, because the plant increased its scheduled hours.

nection with the dress shirt. This permits adding extra rows of stitching for strength at no added expenditure of labor.

(4) Although most work shirts are simpler in construction than dress shirts, this is by no means always true, particularly in the plants surveyed. Frequently, for example, a work shirt has two pockets instead of one, and the pockets themselves may have flaps and bellows and other special features which consume time in preparation.

(5) However, for the shirt as a whole, it takes a larger number of operations to make a dress shirt than a work shirt. As may be seen from table 29, the total number of sewing operations in work-shirt production ranges from 15 to 27 in 7 bundle plants, as against a range of 20 to 41 operations in the production of dress shirts in 26 bundle plants. The greatest difference occurs in the preparation of the body parts, where the number of operations on work shirts is very much smaller than on dress shirts.

TABLE 29.—*Division of labor in sewing department—Work shirts and dress shirts*

Division of work	Number of operations			
	Work shirts (7 plants)		Dress shirts (26 plants)	
	Maximum	Minimum	Maximum	Minimum
Entire sewing department	27	15	41	20
Minor parts	11	5	17	6
Body	9	6	16	9
Assembly	7	4	8	5

Work-shirt plants are located principally in the South and in small towns, while dress shirts are manufactured chiefly in the North in towns of all sizes. Less than 5 percent of the employees in work-shirt factories are unionized, while approximately 50 percent of the dress-shirt industry is organized.[10] Very seldom are work shirts and dress shirts made in the same factory.

Productivity of Labor in Sewing Department

Information for 11 work-shirt plants is contained in table 30. The survey originally covered four additional plants, but the data for these were unsuitable for analysis. Of the plants studied, four were union and the others were nonunion. All the union plants were in the North and all the nonunion plants were in the South. Four plants (Nos. 81, 84, 85, and 87) used the line system of production. The plants are arranged in the order of decreasing productivity during the fall of 1936. The price range for each plant is indicated in the table.

[10] This statement refers to the situation in 1936. It is understood that a considerably larger proportion of workers has been brought into unions since.

"Low" denotes a plant producing garments selling under 79 cents each at retail; "medium" comprises the range between 79 cents and $1; "high" refers to garments selling for more than $1.

TABLE 30.—*Productivity of labor in sewing department—Work shirts, 1934–36*

Code No.	System of production	Union status[1]	Price range	Shirts per man-hour					
				1934		1935		1936	
				Spring	Fall	Spring	Fall	Spring	Fall
81	Line	Nonunion	Low			[2] 5.72	5.91	4.90	4.68
82	Bundle	do	Medium		3.96	3.89	3.53	4.13	3.25
34	do	Union	High				3.11		3.20
86	do	Nonunion	Medium			2.72	2.99	3.62	3.01
83	do	do	do	2.57	3.11	2.27			2.98
27	do	Union	High	2.11	2.43	2.68	3.63	3.16	2.97
33	do	do	do	2.85	2.38				2.81
87	Line	Nonunion	do				2.94		[2] 2.64
84	do	do	Medium			2.63	2.22	[2] 2.32	2.46
85	do	do	do			(3)	2.48	2.38	2.20
28	Bundle	Union	High			2.42	2.98		

[1] All nonunion plants are located in the South; all union plants are located in the North.
[2] Season when line system was installed.

The large majority of work shirts are made of chambray, to retail from 39 to 69 cents. Only one plant in this survey, No. 81, produced shirts in this price line. Nine of the eleven producers studied manufactured work shirts as a side line to work pants and overalls. While each of these was a large- or medium-size company in its total manufacture of all products, none engaged as many as 100 employees on work shirts. Thus, with one exception, the plants surveyed made medium-price and high-price work shirts, which were not typical of the bulk of the industry's production.

In the plants studied, the work shirt was a less standard product than the dress shirt, and the manufacturing process varied considerably more from plant to plant. Style differences, such as two pockets instead of one or flaps or bellows on pockets, which were apparently minor, resulted in marked variations in production time.

One plant, No. 81, showed a productivity consistently higher than any of the others in this sample. During the fall of 1936, its productivity was 4.68 garments per man-hour as against a maximum of 3.25 for the next highest plant, and it was even higher in preceding seasons. This exceptionally high productivity may be explained by two factors—the plant produced a shirt cheaper than that manufactured by any of the other plants surveyed and, in addition, it apparently made efficient use of a 100-percent line system. During 1934, this plant used four distinct lines; during 1936, the number was increased to six. Productivity for these six lines ranged from 4.0 to 5.56 garments per man-hour during the fall of 1936.

Although the output per man-hour in the sewing department of plant No. 86 was considerably below that of plant No. 81, it was still quite high, in spite of the fact that it produced a considerably better shirt than did most of the other plants. This high productivity seemed to be largely due to efficiency of plant management. Although, strictly speaking, this plant did not use the line system, it had evidently adopted many of its features, including the use of a chute for passing work from one operator to the next.

The lowest productivity during the fall of 1936 was recorded for plant No. 85. This plant used the line system of production but apparently manufactured a distinctly elaborate product. Among its special features were the use of two pockets, both having flaps and bellows.

The output figures per man-hour (table 30) reveal no consistent trend during the period between 1934 and 1936. There are wider variations in the output of individual plants than were observed in the case of dress shirts, which was probably due to the fact that the work shirt in the plants studied, with one exception, is a less uniform product. Otherwise, however, the same considerations—the lack of any significant innovations in machinery or equipment during the period under study—account for the lack of any distinct trend in productivity.

No definite conclusions could be reached on the effects of the line system in work-shirt factories, since in only one instance was a bundle-line comparison available. This plant (No. 84) recorded a small gain in productivity on the line in the fall of 1936 over the fall of 1935, the season preceding the installation of the line, but did not achieve as high productivity as in the spring of 1935. The output per man-hour of the three other plants on the line system, Nos. 81, 87, and 85, was lower in the fall of 1936 than in a preceding season also on the line.

Although plant No. 81, a line plant which manufactured a cheaper product than any of the factories studied, was highest in productivity, line plants Nos. 87, 84, and 85 ranked as low as eighth, ninth, and tenth in productivity. Three of the four union bundle plants making a high-price garment exceeded these three line plants in productivity. Therefore, unlike dress-shirt plants, where the line system recorded positive increases in labor productivity, the results in work-shirt plants are inconclusive.

Labor Cost and Hourly Earnings

The six union plants for which data on earnings are available are all located in the North and manufacture a union-label work shirt retailing for $1 and higher. The sales of union-made work shirts have declined for many years and, as previously noted, represent less than 5 percent of the total unit volume in the industry. No change occurred

in piece rates in union plants between May 1, 1934, and March 1, 1937. Union plants pay all workers, including learners and handicapped workers, on a piece-rate basis. On the other hand, the cotton-garment code, by prescribing minimum wages for and limitations on the number of learners and handicapped workers, often required higher wages for these types of employees than were paid under union scales. Consequently, the abandonment of the code provisions was one of the major reasons for the slight decline in average hourly earnings in the union plants from the fall of 1934 under N. R. A. to the fall of 1936.

TABLE 31.—*Direct labor cost and average hourly earnings in sewing department—Work shirts, 1934–36*

Code No.	System of production	Union status [1]	Price range	1934		1935		1936	
				Spring	Fall	Spring	Fall	Spring	Fall
				Direct labor cost per dozen work shirts					
81	Line	Nonunion	Low			[2] $0.81	$0.72	$0.67	$0.65
82	Bundle	do	Medium		$0.91	.97	.70	.58	.64
34	do	Union	High				2.06		1.97
86	do	Nonunion	Medium			1.18	1.14	1.10	1.25
83	do	do	do	$1.50	1.20	1.62			.84
27	do	Union	High		2.21	2.26	1.71	1.93	1.88
33	do	do	do	1.85	2.52				2.18
87	Line	Nonunion	do				1.25		[2] 1.10
84	do	do	Medium			1.71	1.72	[2] 1.58	1.37
85	do	do	do			(2)	1.45	1.42	1.55
28	Bundle	Union	High			2.25	1.85		
				Average hourly earnings					
				Cents	*Cents*	*Cents*	*Cents*	*Cents*	*Cents*
81	Line	Nonunion	Low			[2] 38.8	35.7	26.4	25.5
82	Bundle	do	Medium		29.9	31.5	20.5	20.0	17.4
34	do	Union	High				53.3		52.7
86	do	Nonunion	Medium			26.8	28.3	33.1	31.5
83	do	do	do	32.2	31.1	30.8			20.8
27	do	Union	High		45.1	50.8	51.7	51.1	46.6
33	do	do	do	44.0	50.0	52.0	51.0	50.4	51.0
87	Line	Nonunion	do				30.5		[2] 24.3
84	do	do	Medium			35.8	30.6	[2] 30.4	27.9
85	do	do	do			(2)	30.0	28.2	28.4
28	Bundle	Union	High			45.6	46.0	40.6	43.4
32	do	do	Medium			48.4	46.1		44.0
48	do	do	High	36.7	42.0		45.2	39.8	40.7
80	do	Nonunion	Low		31.7		27.4	26.2	

[1] All nonunion plants are located in the South; all union plants are located in the North.
[2] Season when line system was installed.

Nonunion work-shirt plants in this sample are all located in the South, and the wages in these plants are affected by the competition of prison labor. The majority of the work-shirt employees are located in towns of less than 10,000 population. Under the cotton-garment code in 1934 a minimum wage of 30 cents per hour in the South was required on a 40-hour-week basis. At the end of January 1935, hours were reduced by Presidential decree to 36 and piece rates raised 11.1 percent. At the termination of the N. R. A., the 40-hour week was resumed in the industry and wages readjusted downward 10 per-

cent to the level existing in 1934. However, several southern nonunion plants studied increased hours beyond 40 and reduced wages substantially below the level existing in 1934. The six nonunion work-shirt plants with comparable figures record a decline of 16.5 percent in average hourly earnings in this period.

The difference in average hourly earnings between union and nonunion work-shirt plants, as shown in table 31, is striking. In 1936, in the union plants (all northern) they ranged from 40.7 to 52.7 cents, while in the nonunion plants (all southern), they ranged from 17.4 to 31.5 cents.[11] The trend in direct labor cost closely paralleled that of earnings as productivity showed little change over the period studied.

Overalls [12]

Overall manufacturers may be divided into three main groups: (1) Mass-volume producers of a cheap product selling to mass distributors; (2) small- and medium-size nonunion producers, selling to independent retailers; (3) union manufacturers using the union label.

Unfortunately, no data are available for any of the concerns in the first group. It comprises a few (about 10) very large companies utilizing mass-production methods and producing a $1 overall. These companies sell almost exclusively to the large stores and mail-order houses and account for about one-half of total unit overall production.

The second group includes a large number of nonunion plants of small or moderate size, generally producing garments of somewhat better quality than the first group. These range in price primarily from $1.29 to $1.95 and represent about one-fourth of the total production volume. The major market of these plants is the independent retailer. This group is represented in this study by seven plants.

The third group includes union-label manufacturers. They operate under agreements with the United Garment Workers' Union, and use the union label [13]—a privilege to which no other producers are entitled. This group accounts for the remaining one-quarter of total unit production and is represented in this sample by 13 plants.

The United Garment Workers' Union establishes uniform piece rates on a national basis, regardless of the location, price of merchandise, size, or efficiency of the individual manufacturer. The

[11] However, this difference is partly regional. No comparison between earnings and union and nonunion plants located in the same region is available.

[12] For the purposes of this analysis, the term "overall" will be restricted to the so-called "bib overall." This garment consists essentially of a pair of work pants, or dungarees, to which a bib is attached in the front, supported by shoulder straps crossed over the shoulders. This distinction is necessary because the trade frequently extends the term "overall" to include the so-called "waist-band overall." The latter product, usually known as the dungaree, is considered in connection with work pants (see p. 91), because it resembles work pants far more closely than it does the bib overall.

[13] The above statement refers to 1936. Since then the Amalgamated Clothing Workers have likewise adopted a union label.

labor costs of these union-label manufacturers are substantially higher than those of nonunion groups. Union plants are located predominantly in the North, although they probably embrace less than one-half of the workers employed in that section. The South is, with few exceptions, nonunion.

As a result of this disparity in wages, it has become virtually impossible for the union-label group to compete on a price basis with nonunion producers. The union label, however, furnishes to a certain extent a protected market to the union manufacturer. Workmen in organized trades buy union-label overalls despite the higher price at which they are sold. In part, however, the higher price is due to the superior quality of the union-made garment. Despite this limited protection, union manufacturers have suffered severely from a continued loss of business. Due to their increasing inability to compete successfully, except in a restricted area, they have resorted to many merchandizing schemes, such as the grant of generous premiums, in an effort to expand sales.

One effect of this progressive loss of business is pertinent. The difficulty of selling overalls has led to a greater diversification of products. Union overall manufacturers have turned to the production of semidress pants, work pants, lumberjacks, children's playsuits, work coats, and similar items, in an effort to regain volume. This tendency toward diversification is not confined to the union group. The increasing success of the mass producers has crowded many of the smaller nonunion manufacturers out of the cheap overall market and forced them to go into the manufacture of the products just mentioned, in which quality plays a more important part and lends itself better to the facilities of the smaller plant.

Table 32 shows the maximum and minimum number of separate operations found in plants manufacturing overalls on the bundle and line systems. The operations are grouped in three divisions—parts, body, and assembly. In the making of parts there are from 6 to 12 operations under the bundle system and from 7 to 9 under the line system. In the making of the body of the garment there are from 7 to 13 operations under the bundle and from 11 to 17 under the line system. The assembly operations do not vary much under either system, the minimum being 8 under both systems and the maximum 9 under the bundle and 10 under the line. The total number of operations varies from 21 to 34 under the bundle system and from 26 to 36 under the line. Table 32 also gives a comparison of the subdivision of work in union and nonunion bundle plants. There was a slightly greater subdivision of operations in the nonunion plants than in the union plants, the total operations being from 21 to 33 in union plants and from 25 to 33 in nonunion. The significant difference is between the bundle and line plants.

TABLE 32.—*Division of labor in sewing department in bundle and line system and in union and nonunion plants—Overalls*

Division of work	Number of operations							
	13 bundle plants		4 line plants		5 nonunion bundle plants		8 union bundle plants	
	Maximum	Minimum	Maximum	Minimum	Maximum	Minimum	Maximum	Minimum
Entire sewing department	34	21	36	26	33	25	33	21
Parts	12	6	9	7	12	7	11	6
Body	13	7	17	11	12	10	13	7
Assembly	9	8	10	8	9	8	9	8

Prior to considering productivity of labor in the manufacture of the bib overall in detail, certain important limitations inherent in the character of the data should be emphasized. While it might at first be assumed that the overall is a relatively standard product, and that any minor variation in the method of manufacture would not affect productivity appreciably, this is not the case. The superficial similarity of one overall to another conceals differences which are very important in any analysis of labor productivity.

In the first place the bib overall is not a uniform product, equally suited to the needs of all users. It is a garment produced for the convenience of the worker and carefully adapted to the varying needs of workers in different trades. The needs of the farmer, the carpenter, and the railroad engineer are quite different. The carpenter works on his knees to a great extent, and his overalls must be provided with special knee patches to prevent too rapid wear. Similar protection is not required for the railroad engineer. The latter, however, has his own peculiar requirements in the form of special pockets and the like. As a result, the variations between one overall and another are probably far greater and affect output more directly than variations between one dress shirt and another.

Some measure of the importance of these differences may be arrived at from the standard piece rates established by the United Garment Workers Union. In 1934, the sum total of the piece rates for making a complete "one-seam patch-pocket bib overall" was $1.05 per dozen. For making a "one-seam swing-pocket overall" the cost was $1.30 per dozen, while for making the "railroad band back-bib overall" the cost was $1.88. The railroad overall, therefore, shows a direct labor cost almost 80 percent higher than the simple bib overall. Since the piece rates are based largely on the time consumed by the different operations, it follows that variation in output parallels that in cost.

In addition to these variations between overalls adapted for the requirements of different trades, there are other differences caused by the efforts of rival manufacturers, who introduce modifications which are expected to prove attractive to the consumer. Thus, elastic backs may be substituted for the traditional diamond stitching, with corresponding variation in hourly output.

A further very important factor which complicates the study of productivity arises from the fact that the bib overall is rarely ever the only garment produced in any of the plants studied. Virtually all of these plants make both the waist-band overall and the bib overall. The proportion of each garment made varies with the year and the season. In recent years, for reasons which have been discussed elsewhere, these plants have been turning their attention increasingly to other products, such as semidress pants, work coats, and the like.

Any such variation of products within a plant necessarily affects productivity. The very fact that the same operators work on different garments from time to time, or that the same machines are used to perform somewhat different operations, cannot but affect labor productivity. It is evident that the figures which are here presented must be used with many reservations and much caution.

Productivity of Labor in Sewing Department

Table 33 shows productivity, as measured in garments per man-hour of the sewing department, for 20 overall plants for the period between the fall of 1933 and the fall of 1936. The data in the table are arranged in descending order of productivity during the fall of 1936.

With a few exceptions there was no well-defined trend toward increased or decreased productivity during the period under consideration. In some of the plants, including Nos. 39, 103, 95, 37, 41, 44, 43, and 42, there were wide fluctuations from period to period. All but one of these plants were affiliated with the United Garment Workers. It seems probable, in the absence of any definite information, that these fluctuations in union plants were due to changes in the type of garment produced. For example, a plant that produced a large number of railroad overalls during one season might produce more carpenters' overalls during the succeeding season, as the demand from these trades varies. It is probable that union-label plants produced a wider variety of garments especially made to fit the requirements of the unionized trades which constituted their markets, while the nonunion plants produced more staple products for the less specialized needs of nonunion groups, such as farmers, unskilled laborers, and the like.

TABLE 33.—*Labor productivity of sewing department—Overalls, 1933–36*

Code No.	Region	System of production	Union status	Overalls per man-hour						
				1933	1934		1935		1936	
				Fall	Spring	Fall	Spring	Fall	Spring	Fall
99	North	Bundle	Nonunion			2.92	3.22		3.47	3.80
98	do	do	do		2.95		3.43		3.41	
93	South	Line	do		(1)			2.80		3.30
39	North	Bundle	Union	2.63	2.60	2.87	2.36	2.33	1.91	2.87
97	do	do	Nonunion					3.00		2.81
35	do	do	Union	3.14	2.89	2.84	2.70	2.75	2.46	2.81
103	do	do	do	2.31	2.64	2.10	2.01	2.29	2.17	2.68
96	South	Line	Nonunion						[1] 2.46	2.60
95 [2]	do	do	do	3.35		2.78		3.49		[1] 2.58
37	North	Bundle	Union		2.93	2.14	2.57	2.21	2.15	2.42
45	do	do	do							2.38
94	South	Line	Nonunion				[1] 1.97	2.53	2.08	2.36
41	North	Bundle	Union				2.64	2.81	2.12	2.23
46	do	do	do			2.38		2.39		2.17
40	do	do	do			1.33		1.98		2.14
44	do	do	do		2.40	1.94	2.72	2.17	2.51	2.09
43	do	do	do		2.39	2.00	2.22	2.00	2.63	2.04
47	do	do	do				2.29	2.04	2.17	1.92
38	do	do	do						1.98	1.88
42	do	do	do	1.36	2.26	1.62	1.52	2.08	1.55	1.60

[1] Season when line system was installed.
[2] In the fall of 1936 the straight-line system was being installed, some learners were employed, and the plant was in an experimental stage of operation.

An analysis of the special factors which have affected productivity in certain of the plants studied is of considerable interest. Plant No. 99 showed the highest productivity of any during the fall of 1936. This was a southern plant which produced a cheap garment. Its productivity steadily increased from the fall of 1934 to the fall of 1936. About 2 years ago, this company hired a new production manager, who conducted a series of time studies with a view of reducing unnecessary handling to a minimum. These studies uncovered a considerable number of flaws in the general system of production and in the work habits of individual operators. These were carefully corrected, with the result that productivity rose from 2.92 overalls per man-hour in the fall of 1934 to 3.80 in 1936, or an increase of 30 percent.

Plant No. 98 had the next highest productivity. It was operated by a small company, and produced a comparatively cheap overall, retailing at about $1.29. It concentrated on a limited number of styles, and this uniformity of product undoubtedly contributed to its higher productivity.

The labor productivity of this company increased about 15 percent between the spring of 1934 and the spring of 1936. A considerable number of new machines purchased during the interim may partly explain this increase. With the long seams (several feet) on overalls, the proportion of sewing time to handling time is much greater than on garments with short seams measured in inches, and increased speed of machinery is therefore reflected to a greater extent in increased output.

The data in this study will not support any generalization as to the relative productivity of labor in union and nonunion plants. The survey, embracing only plants with adequate records, could not cover a full cross section of the industry. Especially there is probably inadequate representation of plants with low productivity, for it is believed that good records and good management are often associated. Furthermore, the wide range of productivity in union plants shown in table 33 is related to a correspondingly wide range in the quality of the product. On the other hand, variations of output in the same plant show the great influence of management and labor within the plant upon productivity. For example, the highest labor productivity of all union plants was in plant No. 39. This plant, located in the Middle West, was thoroughly modern and had excellent working facilities and competent supervision. Although the productivity of this company was higher than that of any other union plant in the fall of 1936, it was next to the lowest in the spring of 1936, largely due to difficulties relating to management personnel. Such evidence as is available indicates that the manner in which union regulations are applied by the particular union officers involved and the ability of the plant management to get along with the union officers are important factors in determining productivity.

Productivity of Labor in Line Plants

Plant No. 93, which has the next highest productivity, was located in a southern border State. It installed the line in the spring of 1934, but the only productivity data which proved available were for the fall of 1935 and 1936, so that no comparison can be made which would show the increase of productivity, if any, over the bundle system. However, the figures for the two fall seasons under the line system show a rise of productivity from 2.80 to 3.30 overalls per man-hour, or an increase of 18 percent. Although the third in the order of productivity among the overall plants studied, it manufactured a considerably better overall than did either plant No. 99 or No. 98. Its product retailed generally for about $2 each, or in the same price group as the product of the union plants.

Plant No. 97 was operated by the same company as plant No. 93, but used the bundle system, except for a small experimental line. Comparing these two plants, the bundle plant had a slightly higher productivity during the fall of 1935, but during the fall of 1936 the position was reversed. The low productivity of the line plant during 1935 was due to inadequate supervision of the operation of the line. This fault was remedied and output per man-hour in plant No. 93 on the line rose so that it was 18 percent higher than that of plant No. 97 during 1936.

The next line plant in the order of productivity is No. 96. This southern plant likewise lacks any productivity data for the period preceding the introduction of the line, making comparison of productivity under the two systems impossible. The line in this plant was installed in the spring of 1936 and there are no data showing productivity under the bundle system to serve as a basis for comparison.

The next line plant, No. 95, located in a southern border State, had installed the line system in the fall of 1936. Production usually falls off during the season when the line or any other system is being installed because of unavoidable interruptions in production due to installation, and the lack of familiarity with, and need of adjustment to, the new system on the part of the workers.

The remaining line plant, No. 94, had installed the line in the spring of 1935. Its record shows a fluctuating productivity under the line system from season to season. No figures are available for the period before the introduction of the line to make a comparison with productivity under the bundle system possible. It should be added that the firm did not succeed in eliminating idle time due to irregular flow of work.

In comparing line plants with other plants in the same price lines on the bundle system, plant No. 93 had a distinctly higher labor productivity in the fall of 1936 than any bundle plant producing a similar garment. However, plants Nos. 96 and 94 on the line were exceeded in productivity by several union bundle plants producing as high or even higher price garments. With the exception of plant No. 93, therefore, the effects of the line on productivity in overall plants are not conclusive, in view of its recent installation in the plants studied and the inadequate data at hand.

Labor Cost and Hourly Earnings

Table 34 presents direct labor cost for overall plants covered by the study, and also average hourly earnings during the period covered.

During the fall of 1936, direct labor cost for union plants ranged from $2.26 to $3.31 per dozen. In no nonunion plant did direct labor cost even approach this range. The highest nonunion labor cost was $1.49 and the lowest 79 cents per dozen. This wide gap between costs in union and nonunion plants, while due in part to the fact that union plants manufacture a higher grade of overalls, was largely due to the much higher wages paid in union plants. As will be seen from table 34, the average hourly earnings in union plants ranged from 40.6 to 58.0 cents; in nonunion plants they ranged from 21.8 to 33.9 cents. The highest hourly earnings in nonunion plants were thus more than 16 percent below the lowest in union plants, and on the whole were not much more than one-half the earnings in union plants.

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TABLE 34.—*Direct labor cost and average hourly earnings in sewing department—Overalls, 1933–36*

Code No.	Region	System of production	Union status	1933	1934		1935		1936	
				Fall	Spring	Fall	Spring	Fall	Spring	Fall
				Labor costs per dozen overalls						
99	South	Bundle	Nonunion			$1.63	$1.27		$0.80	$0.79
98	North	do	do		$1.36		1.31		1.02	
39	do	do	Union	$2.16	2.24	2.33	2.74	$2.75	3.28	2.32
97	do	do	Nonunion					1.49		1.45
35	do	do	Union	1.82	2.09	2.51	2.69	2.64	2.85	2.48
103	do	do	do	2.13	2.09	2.94	3.17	2.67	2.57	2.26
96	South	Line	Nonunion						[1] 1.49	1.43
95 [2]	North	do	do	1.42		1.60		1.09		[1] 1.01
37	do	Bundle	Union			2.76	2.41	2.86	2.73	2.74
45	do	do	do							2.34
94	South	Line	Nonunion				[1] 2.07	1.53	1.51	1.49
41	North	Bundle	Union				2.14	2.17	2.61	2.49
46	do	do	do			2.67		2.41		2.60
40	do	do	do			4.59		3.07		2.92
44	do	do	do		2.34	3.09	2.24	2.78	2.56	2.90
43	do	do	do		2.55	2.96	2.49	3.23	2.32	3.02
47	do	do	do				2.50	2.53	2.44	2.53
38	do	do	do						3.42	3.31
42	do	do	do	3.34	2.03	3.01	3.43	2.65	3.13	3.06
				Average hourly earnings						
				Cents	*Cents*	*Cents*	*Cents*	*Cents*	*Cents*	*Cents*
99	South	Bundle	Nonunion			39.5	34.2		23.1	25.0
98	North	do	do		33.4		37.4		29.0	
39	do	do	Union	47.4	48.6	55.7	53.4	53.9	52.3	55.6
97	do	do	Nonunion					37.3		33.9
35	do	do	Union	47.7	50.3	59.5	60.4	60.5	58.5	58.0
103	do	do	do	41.2	46.1	51.3	53.2	51.0	46.5	50.6
96	South	Line	Nonunion						[1] 30.6	30.9
95 [2]	North	do	do	39.7		37.2		31.8		[1] 21.8
37	do	Bundle	Union			49.1	51.5	52.6	48.8	55.3
45	do	do	do							46.4
94	South	Line	Nonunion				[1] 34.0	32.2	26.6	[1] 29.5
41	North	Bundle	Union				47.1	50.7	46.1	46.5
46	do	do	do			53.0		48.0		47.0
40	do	do	do			51.1		50.8		52.0
44	do	do	do		46.8	50.2	50.8	50.2	53.5	50.4
43	do	do	do		50.8	49.5	46.0	54.0	50.9	51.4
47	do	do	do				47.7	42.9	44.0	40.6
38	do	do	do						56.5	52.0
42	do	do	do	37.7	38.2	40.6	43.6	46.2	40.6	40.9
57	do	do	do	37.5	37.6		44.4	48.9	47.0	44.0
129	South	do	Nonunion	30.2		32.2	32.7		29.2	

[1] Season when line system was installed.
[2] In the fall of 1936 the straight-line system was being installed, some learners were employed, and the plant was in an experimental stage of operation.

Considering the union plants alone, the lowest hourly earnings (40.6 cents) were 30 percent less than the highest (58.0 cents). Labor costs for union plants show considerably wider variations, due to differences in style and in productivity. Piece rates remained the same in union overall plants from May 1, 1934, to March 1, 1937, yet, with few exceptions, the average hourly earnings in the fall of 1936 were slightly lower than in the fall of 1934, which was the last season under the N. R. A. on a 40-hour-week schedule. Twelve union plants, all in the North, recorded a slight decline of 3 percent in the average hourly earnings from the fall of 1934 to the fall of 1936. This was largely due to the abandonment of the learner and handicapped employee provisions of the cotton-garment code.

Among the nonunion overall plants, 6 northern plants recorded a decline of 3.7 percent as compared with a decline of 16 percent in the average hourly earnings of workers employed in 5 southern plants.[14]

Work Pants [15]

The same elaborate division of work which is followed in the manufacture of other cotton garments prevails in the work-pants industry

TABLE 35.—*Division of labor in sewing department—Work pants*

Division of work	Number of operations			
	8 bundle plants		9 line plants	
	Maximum	Minimum	Maximum	Minimum
Entire sewing department	41	28	47	29
Parts	12	7	12	7
Body	12	8	15	9
Assembly	17	13	20	13

The productivity of labor (in garments per man-hour) in the sewing departments of the work-pants plants studied, covering the period between the fall of 1933 and the fall of 1936, is shown in table 36. It includes the plants manufacturing dungarees as well as those manufacturing other types of work pants. Four of the five plants showing the highest productivity—Nos. 130, 138, 134, and 143—produce dungarees.

As in the case of the other garment products covered, there was no apparent definite trend either upward or downward for the group as a whole during the period covered by the study. In some plants, such as Nos. 130, 142, and 143, productivity increased consistently over a period of years. Others such as Nos. 134 and 133 showed a more or less consistent decline.

The line system was originally installed in a work-pants factory and is probably being more widely used on this product than on any other. Of the 16 nonunion plants covered, 9 operated under the line system, which was a greater number of line plants than for any other product surveyed. The data for two plants, Nos. 131 and 139, permit a comparison of labor productivity under the bundle and line systems within each plant, and each showed an increase in productivity on the line of approximately 10 percent.

[14] The nonunion overall plants in this study do not include any of the mass producers of overalls.

[15] The present analysis covers the production of the so-called waist-band overall or dungaree, together with the ordinary work pants. The essential similarity in the process of manufacture of these products warrants this inclusion. One distinction between the manufacture of the dungaree and that of work pants proper may be pertinent. Dungarees or waist-band overalls are most commonly produced in factories which also manufacture the bib overall. Work pants, on the other hand, although they are usually produced in overall plants, are also manufactured by plants which make other work clothes.

TABLE 36.—*Labor productivity in sewing department—Work pants, 1933–36*

Code No.	Region	System of production	Union status	Price range	Pants per man-hour						
					1933	1934		1935		1936	
					Fall	Spring	Fall	Spring	Fall	Spring	Fall
143	North	Bundle	Union	High	1.84		2.19	2.06	2.82	2.09	2.97
131	South	Line	Nonunion	do		2.33	2.62	2.68		[1] 2.96	2.90
132	do	Bundle	do	do						2.46	2.75
133	North	do	do	do			2.93		2.69		2.28
140	South	Line	do	do			(1)	2.52	2.93	2.82	2.23
137	do	do	do	do						[1] 1.90	1.76
145	North	Bundle	Union	do				2.30	2.32	2.47	1.74
142	do	Line	Nonunion	Medium					[1] 2.46		3.59
141	South	do	do	do			[1] 1.93		2.60		2.43
139	do	do	do	do	1.52		2.01		[1] 1.59		2.26
147	do	Bundle	do	do		1.81		2.64		2.20	
149	do	do	do	do	2.27	2.12	2.08	2.28	1.91		
136	do	Line	do	do						[1] 1.97	2.12
130	North	Bundle	do	Low		3.44		3.76		4.07	
138	do	Line	do	do			(1)	3.31	3.44	3.47	3.36
134	do	Bundle	do	do		3.80	3.47	2.22	2.63	2.17	3.08
146	do	do	Union	do		3.31	2.68	3.76	3.00	3.46	2.89
135	South	Line	do	do						[1] 2.15	2.71
144	do	Bundle	Nonunion	do						1.96	1.81

[1] Season when line system was installed.

An examination of table 39 shows that the 17-percent saving in labor cost in plant No. 131 greatly exceeded the increase in labor productivity. The fact that hourly earnings failed to keep up with the increased productivity, but, on the contrary, declined 10 percent after the change of hours from 36 to 40 after the N. R. A., accounts for the saving in cost in excess of the increase in productivity.

In four plants, Nos. 135, 136, 137, and 142, only the initial experimental period of installation of the line and the period in the fall of 1936 are available, so that no comparison of productivity and costs on the line and bundle systems is possible. For plants Nos. 140, 141, and 138, no records are available under the bundle system. After the initial line period is discounted, no trend was perceptible toward gains or decreases in productivity in these three factories.

At the same time a comparison of labor costs in the fall of 1936 (table 39) with the costs in the first season following the installation of the line in each plant shows a decline, which was apparently due chiefly to a reduction in hourly earnings following the adjustment of hourly rates upon the restoration of the 40-hour week after the N. R. A. A similar trend in hourly earnings is to be observed in the bundle plants, the decline in the bundle plants being somewhat greater than in the line plants.

In comparing labor productivity of line and bundle plants in the fall of 1936, the line plants appear more frequently, but not always, ahead. Among the seven high-price pants factories, line plants ranked second, fifth, and sixth in productivity in the fall of 1936, or

somewhat below the average. In the medium-price group of six pants factories, three out of the four line plants were in the lead in productivity. However, the two bundle plants were small factories in small southern towns. In the low-price group of six pants factories two line plants ranked second and fifth.

In the case of work pants, as with other products, in comparing labor productivity in line and bundle plants it is impossible to overlook the important factor of quality. The highest productivity in table 36 is shown by plant No. 130. This plant produced a cheap dungaree sold primarily to large jobbers and mail-order houses. The stable character of the product and the large scale on which it was produced accounted for the high productivity. The company had replaced old machinery with new over a period of years. This, as in the case of overalls, resulted in an 18-percent increase in the man-hour output of the plant. The decline in labor cost was considerably greater, viz, 26 percent, which was accounted for by a reduction in hourly earnings of nearly 13 percent.

The plant showing the next highest productivity is No. 142. This company manufactured a medium-grade product, considerably better than that manufactured by No. 130. It also sold the bulk of its product to mail-order houses and large jobbers, with a consequent minimum of style variations. Plant No. 142 introduced the line system for a part of its production during 1935. The youngest and least experienced workers were selected for the line. The line and the bundle sections are here listed as separate plants, the bundle section being plant No. 133. Comparing the bundle and line data, line production for the fall of 1935 was 2.46 garments per man-hour or substantially lower than the 2.93 garments under the bundle system during the fall of 1934, prior to the introduction of the line. It was also lower than the production for the bundle section of the plant during the fall of 1935, which was 2.69. This comparatively poor showing was due to the fact that the line had just been installed and necessary adjustments were in progress. By the fall of 1936, however, the line had begun to operate efficiently, and production showed a sharp increase, to 3.59 garments per man-hour, while productivity in the bundle section (plant No. 133) declined to 2.28. The decline in the bundle department was due to the fact that the staple styles which are easiest to produce were put on the line, leaving the parts and miscellaneous orders to the bundle department. While the figures at hand do not furnish a basis for estimating to what extent the increase in productivity on the line was due to the advantages of the line system and to what extent it was due to the assignment of the easiest work to the line, the management estimates that the line brought about a weekly increase in productivity of about 20 percent.

Plants Nos. 138 and 134 are the line and bundle departments, respectively, of a company in the West which produced a $1 dungaree. Comparing the line department with the bundle department shows line productivity was consistently higher after its installation. While productivity under the line had not reached the peak bundle production attained in the spring of 1934, the company ascribed this to the poor quality of the cloth received from the mill during that period, which accounted for the poor results in both the line and the bundle departments. The productivity in the line department, however, showed a steady increase from year to year and was consistently higher than in the bundle department each season. This was due (1) to the higher productivity on the line on the product which it manufactured, and (2) to the fact that only one uniform garment was made on the line, while a variety of products were made in the bundle department, which naturally reduced the labor productivity. No attempt was made by this company to transfer the younger or faster operators to the line department, as was done in other plants.

Plant No. 143, a union plant in the East, showed the highest productivity of any plant manufacturing a high-price product. It manufactured a waist-band overall retailing at $1.98. This plant used the bundle system. Its superior labor productivity was apparently due to steady addition of new machinery and to favorable working conditions in respect to heat, light, and ventilation. Since overalls and pants have long seams which can be stitched continuously without frequent interruptions, the speed of the sewing machine has a marked effect on labor productivity on these products.

Next in order of productivity was plant No. 131. This was a southern plant which introduced the line system between the fall of 1935 and the spring of 1936. It manufactured a diversified line with an average retail selling price of about $1.69. The introduction of the line system apparently resulted in a well-defined increase in productivity, the output per man-hour during 1936 being about 10 percent higher than in 1935 under the bundle system.

An interesting analysis of the effect of quality on productivity can be drawn from the data for plants Nos. 135, 136, and 137, all operated by the same company in the South and all using the line system since February 1936. The only difference was in the grade of the garment produced. Plant No. 135 made an 89-cent retailer; plant No. 136 a $1.39 retailer, and plant No. 137 a $1.95 retailer. Man-hour output in these plants dropped as the quality rose, and labor costs increased as the quality improved. Thus, productivity for the lowest grade during the fall of 1936 was 2.71 garments per man-hour, and the labor cost was $1.32 per dozen; for the next grade, productivity dropped to 2.12 garments and labor cost rose to $1.63. For the best grade, productivity was only 1.76 garments per man-hour and labor cost

went up to $1.74 per dozen. The controlling influence of quality is still further emphasized by the fact that the line making the best garments and showing the lowest productivity had the best and most efficient operators.

The first two of these plants showed a rise in productivity over the preceding season; the third plant showed a decline. Since the preceding season was the experimental period during which the line was introduced, which is always accompanied by a decline in productivity from the bundle system, the comparison with this season is of no significance. Unfortunately, there are no figures of production in this plant under the bundle system, and no conclusions can be drawn as to the effect of the introduction of the line in these three plants.

At the lowest end in the high-price group in 1936 is plant No. 145, a union plant in the Middle West, making $1.75 work pants. This plant showed consistently poorer results than the other union plants in table 36 which manufactured a similar grade of product. No change in machinery or methods of production had taken place in this plant for 15 years.

Productivity of Labor by Operations

The effect of the line on labor productivity can always be more clearly traced on individual operations. Table 37 presents such a comparison on similar operations in making work pants in a line and a bundle plant. The two plants shown were the only ones making products of a similar grade for which comparable data were available. The line plant, No. 131, was a nonunion plant located in the South, the bundle plant, No. 148, was a union plant in the North. Although the work pants produced by these two plants were in the same general price range, they were not, however, identical products. The line plant showed a marked reduction in sewing time for virtually every group of operations. For all the comparable operations combined, the line plant required 17.2 percent less labor time than was needed under the bundle system.

TABLE 37.—*Labor-time requirements, of operations in a line and a bundle plant—Work pants, 1933–36*

Line plant No. 131		Bundle plant No. 148	
Comparable operations by groups [1]	Man-hours per unit	Comparable operations by groups [1]	Man-hours per unit
Total time, all operations	0.3002	Total time, all operations	0.3624
Group 1		*Group 1*	
Total time, group 1	.1358	Total time, group 1	.1690
Sewing of fly facing, top pocket stitching [1]	.0071	Sewing back pocket facing	.0270
Setting of watch pocket and pocket facing in sides	.0143	Making back pocket welt	.0188
Welting facing on side pocket	.0143	Turning and bagging back pockets	.0232
Finishing side pockets	.0143	Turning and cording back pockets	.0204
Setting in hip pocket and back pocket	.0143	Making front pockets and sewing watch pocket	.0161
Finishing back pockets	.0143	Finishing front pocket	.0181
Welting back pockets	.0143	Bartacking pockets	.0232
Buttonholing hip pocket	.0143	Cutting back pockets	.0222
Tacking hip pockets	.0143		
Pocket tacking	.0143		
Group 2		*Group 2*	
Total time, group 2	.0500	Total time, group 2	.0595
Fly setting	.0143	Sewing on curtain	.0238
Setting fly curtains	.0143	Stitching down left fly	.0357
Finishing fly	.0143		
Sewing of fly facing and top pocket stitching [2]	.0071		
Group 3		*Group 3*	
Total time, group 3	.0429	Total time, group 3	.0427
Seaming of back seat	.0143	Joining front and back	.0171
Inseaming of leg	.0143	Cording crotch	.0256
Sewing crotch tape down	.0143		
Group 4		*Group 4*	
Total time, group 4	.0286	Total time group 4	.0376
Seaming outside leg	.0143	Outseams	.0204
Setting waistband	.0143	Sewing on waistbands	.0172
Group 5		*Group 5*	
Total time, group 5	.0429	Total time, group 5	.0536
Button sewing and tacking cuffs	.0143	Button sewing, band fly, hip	.0181
Serging of edges	.0143	Serging of backs	.0133
Serging and sewing of back dart	.0143	Serging of fronts	.0222

[1] While the individual operations are not in all cases identical in the 2 shops, the sum total of operations in the corresponding groups are comparable.

[2] The 2 operations marked are combined. For the purposes of this table it has been assumed that the time is divided equally between these two.

A time-study analysis of line plant No. 128, located in a small southern town, and which produced work trousers retailing at approximately $1.25 per garment, follows:

TABLE 38.—*Time-study analysis of operations in line plant No. 128—Work pants*

Operation	Standard hours per unit	Operation	Standard hours per unit
Total time, all operations	0.2582	Off line	0.0662
On line	.1920	Serging fly	.0009
		Serging watch pocket	.0014
Pairing front and back	.0041	Serging fronts	.0074
Setting front pocket, watch pocket, and fly	.0327	Serging backs	.0086
Setting back pockets	.0246	Cuff tacking	.0030
Bar tacking hip pockets	.0041	Making loops	.0018
Bar tacking (except hip pockets)	.0082	Ticket tacking	.0025
Closing front pockets	.0082	Facing watch pocket	.0014
Side seaming	.0082	Facing hip pocket	.0070
Sewing waist band and loops	.0164	Closing hip pocket	.0045
Sewing on curtain	.0164	Facing front pocket	.0046
Turning and stitching down curtain	.0164	Buttonhole, fly	.0033
Serging seat	.0035	Clipping	.0016
Seat seaming	.0041	Penciling	.0032
Joining crotch	.0041	Sewing crotch points	.0055
Taping crotch	.0041	Separating hip pockets	.0015
Sewing buttons, tacking outlet	.0082	Inspecting	.0080
Joining underseams	.0082		
Underpressing seams	.0082		
Hemming bottoms	.0082		
Buttonhole, band and hip pocket	.0041	Individual trousers produced per hour	3.88

Labor Cost and Hourly Earnings

Table 39 shows the direct labor cost in dollars per dozen for each of the plants studied, and also presents average hourly earnings. The higher labor cost of the three union plants is striking. It ranges from $2.10 to $2.84 per dozen and is for plants not only in the high-price but in the low-price group as well. In no nonunion plant does the labor cost exceed $1.74.

Since the labor cost of a garment consists of the sum total of the piece rates, and since piece rates in United Garment Workers shops are uniform throughout the country for identical operations, the higher cost in a plant can only be the result of the higher quality of the garments produced, calling for additional operations. This circumstance is reflected in the hourly earnings in these union shops, which are the highest of all the work plants covered by the survey and range from 41 cents to over 50 cents per hour.

Union-label work-pants and dungaree factories retained the 40-hour week and the basic wage scale of the cotton-garment code of 1934. Of the three northern union plants for which data are recorded, one had a decline in hourly earnings from the fall of 1934 to the fall of 1936 of 12 percent, another of 18 percent, and the third showed no change. The decline in the two first-mentioned plants was due in part to the increased employment of apprentices and in part to the changes after the termination of the N. R. A. in the mode of payment of handicapped workers and possibly in the method of recording the hours worked.

Four nonunion northern plants producing work pants and dungarees recorded a decline in average hourly earnings in the same period of 6.3 percent, while 6 nonunion southern producers reported decreases in average hourly earnings of 10.3 percent.

TABLE 39.—*Direct labor cost and average hourly earnings in sewing department—Work pants 1933–36*

Code No.	Region	System of production	Union status	Price range	1933	1934		1935		1936	
					Fall	Spring	Fall	Spring	Fall	Spring	Fall
					Labor cost per dozen work pants						
143	North	Bundle	Union	High	$2.46	$1.50	$2.56	$2.53	$1.96	$2.33	$2.26
131	South	Line	Nonunion	do	------	------	------	1.50	------	[1] 1.03	1.24
132	do	Bundle	do	do	------	------	------	------	------	1.53	1.35
133	North	do	do	do	------	------	1.55	------	1.41	------	1.57
140	South	Line	do	do	------	------	------	[1] 1.70	1.36	1.46	1.50
137	do	do	do	do	------	------	------	------	------	[1] 1.95	1.74
145	North	Bundle	Union	do	------	------	------	2.66	2.56	2.41	2.84
142	do	Line	Nonunion	Medium	------	------	------	------	[1] 1.65	------	1.19
141	South	do	do	do	------	------	[1] 2.08	------	1.51	------	1.35
136	do	do	do	do	------	------	------	------	------	[1] 1.87	1.63
149	do	Bundle	do	do	------	------	2.30	2.49	2.37	------	------
147	do	do	do	do	------	2.05	------	1.59	------	1.57	------
135	do	Line	do	Low	------	------	------	------	------	[1] 1.75	1.32
130	North	Bundle	do	do	------	1.17	------	1.22	------	.87	------
138	do	Line	do	do	------	------	------	[1] 1.45	1.28	1.30	1.38
134	do	Bundle	do	do	------	1.09	1.31	1.95	1.40	1.89	1.24
136	do	do	Union	do	------	1.70	2.24	1.62	2.01	1.85	2.10
144	South	do	Nonunion	do	------	------	------	------	------	1.18	1.25
					Average hourly earnings						
					Cents	*Cents*	*Cents*	*Cents*	*Cents*	*Cents*	*Cents*
143	North	Bundle	Union	High	37.7	38.2	46.8	43.6	46.2	40.6	40.9
131	South	Line	Nonunion	do	------	------	------	33.5	------	[1] 25.4	30.0
132	do	Bundle	do	do	------	------	------	------	------	31.3	31.0
133	North	do	do	do	------	------	38.0	------	31.6	------	29.9
140	South	Line	do	do	------	------	(1)	35.8	33.1	34.2	27.8
137	do	do	do	do	------	------	------	------	------	[1] 30.8	25.6
145	North	Bundle	Union	do	------	------	------	50.9	49.3	49.6	41.4
142	do	Line	Nonunion	Medium	------	------	------	------	[1] 33.9	------	35.6
141	South	do	do	do	------	------	[1] 33.5	------	32.8	------	27.4
147	do	Bundle	do	do	------	30.9	------	35.0	------	29.0	------
149	do	do	do	do	------	------	------	37.0	30.0	------	------
136	do	Line	do	do	------	------	------	------	------	[1] 30.7	28.8
130	North	Bundle	do	Low	------	33.7	------	38.2	------	29.4	------
138	do	Line	do	do	------	------	(1)	40.1	36.9	37.5	38.6
134	do	Bundle	do	do	------	34.5	37.9	36.0	30.6	34.4	32.0
146	do	do	Union	do	------	46.8	50.2	50.8	50.2	53.5	50.4
144	South	do	Nonunion	do	------	------	------	------	------	19.3	18.9
135	do	Line	do	do	------	------	------	------	------	[1] 31.2	29.8

[1] Season when line system was installed.

Semidress Pants [16]

The wide variation in semidress pants makes it necessary to use extreme caution in comparing the productivity of one plant with

[16] The term "semidress pants" as used here covers a wide variety of products, ranging in price from as low as $1 to as high as $8 each at retail, and using materials as varied as duck, twill, printed cord, khaki, flannel, gabardine, and wool.

Some of the pants in the upper-price ranges may properly be termed dress pants instead of semidress pants. However, for convenience, the single term has been generally applied. Strictly speaking, at least some of the products considered in this chapter are not cotton garments. They are included because of the fact that they are made in cotton-garment plants. Moreover, work pants and semidress pants are commonly made in the same factory. Since a certain type of semidress pants, especially those made of wool, do not have a large sale in the summer, work pants are frequently produced during that season in order to keep the workers busy. Frequently, it is difficult to draw a sharp line between good work pants and cheap semidress pants.

The fundamental difference between work pants and semidress pants lies in the quality of workmanship and usually in the character of the material used. A manufacturer who makes both work pants and semidress pants will pay more attention to the appearance of the latter, in order to increase their salability. As a result, there are far more operations involved in the making of semidress pants than in the making of work pants, even though the basic process is the same.

another or even the productivity of a single plant during different seasons. Even price range is not an adequate gage of comparability, since a higher price may reflect more expensive cloth rather than better workmanship.

Table 40 presents productivity, in garments per man-hour, in the sewing department for each of the semidress-pants plants included in this study. The range between the highest and lowest productivity is very wide. Plant No. 151, which had the largest man-hour output, produced almost four times as many garments per hour as did plant No. 164, with the lowest output. The product of plant No. 151, a small southern plant, was relatively cheap, the bulk of the output being made to retail at under $2. It is possible that in this case the advantage of the close personal supervision of a small plant also made for greater efficiency.

The next in order of productivity was plant No. 150. This was a union plant located in the Midwest, selling a relatively inexpensive product. The productivity of this plant was consistently high during the period studied.

TABLE 40.—*Labor productivity of sewing department—Semidress pants, 1933–36*

Code No.	System of production	Union status	Pants per man-hour						
			1933	1934		1935		1936	
			Fall	Spring	Fall	Spring	Fall	Spring	Fall
151	Bundle	Nonunion						2.82	2.58
150	do	Union	2.32	2.66	3.54	3.57	3.63	2.83	2.55
161	do	Nonunion					2.26		2.20
152	do	do				2.12			2.11
157	Line	do						[1] 2.15	2.08
159	do	Union							[1] 1.96
158	Bundle	do				1.36	1.46	1.19	1.91
153	do	Nonunion				2.36		1.86	1.84
166	do	do		1.34	1.63	1.61	1.60		1.41
154	do	do				1.08			1.38
162	Line	do			[2] 1.67		[1] 1.31		1.33
155	Bundle	Union			1.62		1.47		1.32
156	do	do			1.75	1.67	1.63	1.66	1.25
165	do	Nonunion				1.53	1.23	1.44	1.08
163	do	do					.91		.81
164	do	do						.78	.69

[1] Season when line system was installed.
[2] Work pants.

Plant No. 155 showed a distinct decline in the man-hour output from the fall of 1934 to the fall of 1936. During 1934, output was 1.62 garments per man-hour and during 1936 it was only 1.32. This company manufactured a garment retailing for $5 and up. The decline of productivity may be explained by the statement of the plant executive that after the N. R. A. lapsed, there was less emphasis on securing operators whose individual efficiency was high. Under the N. R. A. it had been necessary to pay the minimum hourly wage

to all operators regardless of efficiency, while at the time of the study, there was no similar penalty on the employment of slower workers.

The two concerns showing the lowest productivity were Nos. 163 and 164. Plant No. 163 manufactured an expensive trouser retailing at $5 and up. This company commenced manufacturing dress pants in 1934 and the management claimed to have had difficulties in perfecting its methods of production despite the fact that its machinery was of the latest type. It had also had three different production men since 1934 and apparently employed a considerable number of apprentices. All these factors may account for its low productivity. Plant No. 164, with the lowest labor productivity, employed chiefly Mexican labor, which is reputedly not highly efficient.

Productivity of Labor in Line Plants

Plants Nos. 159 and 156 represent two operating units owned by the same company, which operated a union shop. The company installed the line system between the spring and the fall of 1936. The line department is designated in the table as No. 159, while the bundle shop is designated as No. 156. Productivity on the bundle system in the spring of 1936 was 1.66 garments per man-hour. In the fall, productivity on the line was 1.96, or 18 percent higher, while productivity in the section of the plant which remained on the bundle system (No. 156) declined to 1.25 garments per man-hour. It should be added, however, that while the bundle department continued to use the same sewing machines of 2,800 revolutions per minute, the line was equipped with new machines of 4,200 revolutions per minute, a factor of importance in a product with long seams such as pants.[16]

This plant made pants of high quality, retailing for $5 and better, so that the high output of its line is striking. As the line, after its introduction, achieved smoothness in operation, output per man-hour rose rapidly. This increase is revealed by the following monthly productivity figures for the 4 months beginning in September 1936:

	Garments per man-hour
September 1936	1.73
October 1936	1.87
November 1936	2.02
December 1936	1.93

Changes in productivity in the two other line plants cannot be adequately measured. Plant No. 157 has no record of production under the bundle system with which to compare productivity on the line. Plant No. 162 changed its product from work trousers to semi-dress pants after changing to the line system therefore the figures are not comparable.

[16] See p. 87.

Productivity of Labor by Operations

Table 41 compares the labor time in the sewing department by individual operations for a typical line plant and a typical bundle plant, each manufacturing semidress pants of approximately the same price range. As will be seen from the table, the line plant shows a distinctly greater labor productivity.

The table shows three groups of operations which are comparable for the two plants. In the first group, the labor time required on the line was 35.5 percent less than in the bundle plant. In the other two groups, the reductions in the labor time in the line plant were 30.1 and 13.7 percent, respectively. For all the comparable operations, the line plant required 23.7 percent less labor time than the bundle plant.

TABLE 41.—*Labor-time requirement, by operations, in a line and a bundle plant—Semidress pants, 1936*

Line plant No. 159		Bundle plant No. 155	
Comparable operations by groups [1]	Man-hours per unit	Comparable operations by groups [1]	Man-hours per unit
Total time, all operations	0.332	Total time, all operations	0.4366
Group 1		*Group 1*	
Total time, group 1	.0740	Total time, group 1	.1147
Sewing on both side pockets and watch pockets	.0196	Facing and making watch pocket complete	.0165
Sewing on right and left fly and fly facing, front seat pieces, and watch pocket	.0196	Making side pockets with watch pocket	.0172
Closing side pocket, tacking top of side pocket	.0196	Sewing on fly-extension waist band	.0157
Making front middle corners of pockets, sewing down fly	.0196	Stitching down curtain and right fly	.0167
		Stitching fly pieces	.0208
		Bar tacking fly and 7 loops	.0278
Group 2		*Group 2*	
Total time, group 2	.0980	Total time, group 2	.1402
Sewing hip pocket facing and closing hip pocket facing and union label	.0196	Sewing back pocket facings	.0158
Sewing hip pocket to pants and sewing up dart back	.0196	Serging backs (including bottom)	.0198
Turning hip pocket and stitching around pocket and sewing seat pieces	.0196	Sewing in V's	.0250
Pocket welting, sewing down seat lining	.0196	Cutting back pockets	.0162
Serging both front and back edges	.0196	Making back pocket, sewing in crotch piece and lining	.0185
		Stitching back pockets	.0157
		Serging seats with crotch lining	.0145
		Serging front and sewing in crotch lining	.0147
Group 3		*Group 3*	
Total time, group 3	1.568	Total time, group 3	.1817
Sewing down waist band, putting in loops	.0196	Sewing on plain waist band and 6 belt loops	.0217
Inner seaming, clean thread	.0196	Inseaming	.0148
Button-hole making, waist band	.0196	Trimming lining and notching	.0142
Sewing fly and hip pocket buttons	.0196	Sewing curtain to left fly extension bands	.0235
Stitching pocket and side seam, stitching down crotch tape	.0196	Stitching down left fly	.0173
Top stitching waist band, sewing down white fly	.0196	Sewing on fly, hip and band for button holes	.0148
Seat seaming and joining staples	.0196	Buttonhole, hip and 1 in band	.0125
Tacking pockets	.0196	Stitching side of slash pocket	.0145
		Sewing on curtains, closing back	.0162
		Joining closed back	.0140

[1] While the individual operations are not in all cases identical in the 2 shops, the sum total of operations in the corresponding groups are comparable.

Labor Cost and Hourly Earnings

Table 42 presents labor cost, in dollars per dozen garments, and average hourly earnings, for the plants covered in the study. The range in cost, from a maximum of $6.02 to a minimum of $1.18 per dozen, was considerably wider than that in production per man-hour, being more than five to one as against slightly less than four to one in productivity. This was due to the fact that differences in production costs reflected not only differences in output per man-hour but also differences in wages.

The range in hourly earnings for union plants in the North during the fall of 1936 was from 37.6 to 48.6 cents, with an average of 43.5 cents. In only two nonunion plants, Nos. 163 and 154, both located in California, did the hourly earnings fall within that range. The range for all nonunion plants in the North was from 24.6 to 41.2 cents, with an average of 33.3 cents, and in the South from 21.3 to 29.7 cents, with an average of 24.8 cents.

TABLE 42.—*Direct labor cost and hourly earnings of sewing department—Semidress pants, 1933–36*

Code No.	System of production	Union status	1933	1934		1935		1936	
			Fall	Spring	Fall	Spring	Fall	Spring	Fall
			Labor cost per dozen semidress pants						
151	Bundle	Nonunion						$1.19	$1.18
150	do	Union	$2.12	$2.08	$1.70	$1.72	$1.56	1.76	2.22
161	do	Nonunion				2.66	1.71	1.80	1.80
152	do	do							1.28
157	Line	do						[1] 1.74	1.68
159	do	Union							[1] 2.30
158	Bundle	do				3.83	3.51	3.86	3.04
153	do	Nonunion				2.03		2.44	2.09
166	do	do		3.08	2.59	3.01	2.23		2.10
154	do	do				4.66			3.57
162	Line	do			3.06		[1] 3.21		3.31
156	Bundle	Union			2.81	3.37	3.28	3.52	4.25
165	do	Nonunion						2.00	2.78
163	do	do					5.72		6.02
164	do	do						3.37	3.64
			Average hourly earnings						
			Cents	*Cents*	*Cents*	*Cents*	*Cents*	*Cents*	*Cents*
151	Bundle	Nonunion						27.9	25.5
150	do	Union	41.1	46.1	50.1	51.3	47.4	41.6	47.1
161	do	Nonunion				39.6	32.4	33.8	33.3
152	do	do				35.5			22.6
157	Line	do						[1] 31.1	29.1
160	do	Union			(1)	41.8	41.3	40.0	
159	do	do							37.6
158	Bundle	do				43.4	43.0	38.3	48.6
153	do	Nonunion				40.0		37.9	32.0
166	do	do		34.3	35.3	40.3	29.7		24.6
154	do	do				42.1			41.2
162	Line	do			42.6		[1] 35.3		36.6
156	Bundle	Union			40.9	46.8	44.5	48.4	44.4
165	do	Nonunion					24.0		25.0
163	do	do					43.4		40.5
164	do	do					21.9		21.3

[1] Season when line system was installed.

House Dresses [17]

The past decade has seen the more or less shapeless and purely utilitarian house dress transformed into a smart garment conforming to the latest changes in style. It is probable that this metamorphosis was stimulated by the depression. The necessity for economy in household purchasing created an increasing demand for cheap frocks which combined utility with attractiveness in appearance.

The popular acceptance of the house dress, not only as a utility garment in the home, but also for street wear, brought with it a remarkable growth of the industry and of its constituent units. As was pointed out by the head of one of the largest dress plants in the country in an interview with a field representative in this survey, 20 years ago a house-dress factory with 74 sewing machines was considered a large unit. Today a few factories employ over a thousand workers each.

In contrast to the silk-dress manufacturing industry, which is concentrated in urban centers and primarily in the New York metropolitan area, house-dress factories are scattered in 40 States. While the number of factories and small shops in this industry exceeds 1,000, employing some 40,000 workers, 100 firms employ about two-thirds of all the workers. The volume of dresses retailing at $1 or less, to which this study has been confined, constitutes somewhat more than half [18] of the total of 100,000,000 [19] dresses produced in 1935. Most of the plants located in small towns are large in size, employing hundreds of workers and in a few cases over a thousand. The large cities contain both large and small plants, the latter forming the great majority.

The Style Factor

At the start of the study it was realized that the influence of style variations on labor productivity was very marked. An effort was made to minimize this problem by concentrating attention on dresses retailing at $1 or less each, with the hope of securing a sample in which the product was fairly uniform, showing little variation from time to time and from plant to plant. This limitation had, of course, the effect of confining the survey to a smaller number of plants. Usable production data were obtained for only seven factories owned by five different concerns. Two firms furnished productivity figures as shown by their time studies (table 44). Seven additional factories furnished wage data.

[17] A detailed and comprehensive study of the method of manufacture of house dresses is contained in a study by the National Reemployment Service, Atlanta Center of the Occupational Research Program, Local Job Descriptions for the Garment Industry, vol. 2: Manufacture of Women's Cotton Dresses, January 1937.

[18] Data are from Statistical Service Bureau of the International Association of Garment Manufacturers.

[19] Includes women's cotton dresses, hoovers, and smocks. Data are from United States Census of Manufactures, 1935.

Unfortunately, the experience of the survey demonstrated that even the limitation to the cheapest grade of wash dress did not succeed in eliminating the influence of the style factor. Style is today as much a characteristic of dresses selling for $1 or less as of more expensive garments. As a result, it is virtually impossible to draw any valid inferences as to the relative efficiency of the different plants studied, or as to any changes in efficiency during the period covered by the study.

Productivity of Labor in Sewing Department

The number of house dresses produced per man-hour in the sewing department of each of the plants studied, the direct labor cost per dozen, and the average hourly earnings of the sewing-machine operators, are shown in table 43. The period covered extends from the fall of 1933 to the fall of 1936.

An examination of these figures reveals a very marked seasonal variation. During 1936 each of the six plants for which comparable data were available showed distinctly higher productivity in the fall than in the spring. Similarly, during 1935, higher productivity is observed for four of the five plants for which comparable data were available. This was due primarily to the fact that the fall product was usually much simpler in style than that manufactured during the spring.

Variations in the man-hour output of individual plants during the period studied were considerable, even excluding the seasonal element. Thus the productivity of plant No. 112 during the spring of 1934 was 6.28 garments per man-hour as compared to 2.86 in the spring of 1936. The productivity for plant No. 11 in the fall of 1935 was 4.30 as against 6.30 in the fall of 1936. These marked changes in hourly output were not indications of changes in productive efficiency. They were due chiefly to changes in style.

During the fall of 1936, the lowest hourly output, that for plant No. 109, was 2.51 garments per man-hour; the highest was for plant No. 11, 6.30 garments per man-hour—a range of approximately 2½ to 1. Here again it seems clear that differences in style rather than in productive technique were the controlling factor. It is, however, significant that plant No. 11, which showed the highest productivity in the fall of 1936, and which was next to the highest in the spring of 1936, manufactured a $1 dress, whereas four of the other plants included in the sample made a 59-cent, a 69-cent, and a 79-cent product. This may reflect the higher efficiency of plant No. 11, though it may be partly due to skillful designing, aimed at elimination or reduction to a minimum of operations requiring much labor. The highest price range may conceivably be due to better material rather than to added style.

TABLE 43.—*Productivity, labor cost, and hourly earnings in sewing department—House dresses, 1933–36*

Code No.	Retail price or product	1933	1934		1935		1936	
		Fall	Spring	Fall	Spring	Fall	Spring	Fall
	Labor productivity (dresses per man-hour)							
11	$1.00		3.72		3.41	4.30	3.90	6.30
111	$0.69	3.60	6.64	5.36	5.18	6.13	5.11	5.45
112	$0.79	3.94	6.28		3.18	4.24	2.86	4.81
110	$0.59	3.53	6.14	5.59	4.33	4.69	3.56	4.55
114	$0.69					1.87	1.50	3.16
107	$1.00 up							2.62
109	$1.00 up		2.92	3.41	3.05	2.75	2.38	2.51
	Direct labor cost per dozen dresses							
11	$1.00	$1.30	$1.20	$1.30	$1.46	$1.28	$1.35	$0.79
111	$0.69	1.14	.63	.79	.96	.66	.74	.72
112	$0.79	1.04	.64		1.38	.87	1.15	.73
110	$0.59	1.10	.75	.77	1.05	.74	.78	.74
114	$0.69					2.47	2.93	1.24
107	$1.00 up							1.40
109	$1.00 up		1.19	1.17	1.31	1.42	1.49	1.39
	Average hourly earnings							
		Cents	*Cents*	*Cents*	*Cents*	*Cents*	*Cents*	*Cents*
11	House dresses		38.0		41.6	45.9	43.8	41.5
111	do	34.0	34.6	35.5	41.6	33.8	31.7	32.8
112	do	34.2	33.2		36.5	30.6	27.2	29.3
110	do	32.3	38.5	35.9	38.0	28.9	23.2	27.7
114	do					38.8	36.5	32.7
107	do							30.4
109	do	29.7	28.9	33.3	33.5	32.5	29.5	29.1
108	do				37.0			[1] 32.4
102	do		32.0	36.7	36.6		28.2	24.2
12	Nurses' uniforms	38.2	41.9	44.4	50.7	52.1	50.4	52.4
105	do						43.5	
106	do						40.1	39.8
104	do						32.4	31.8
115	Woven undergarments	29.6	33.1	33.3	39.9	35.7	36.8	35.6
113	Aprons						28.8	29.7

[1] Early part of January 1937.

Standard time for operations.—In addition to the data in table 43, which are based on actual operating results, time studies were secured from two plants, Nos. 115 and 126, listing the standard allowed time for each operation, and these are reproduced in table 44. As will be seen from these figures, plant No. 126 using the progressive-bundle system, showed a productivity standard of 4.27 garments per man-hour, while that for plant No. 115 was 3.31 garments per hour.

TABLE 44.—*Time study analysis of sewing operations—$1 house dresses*

Plant No. 126		Plant No. 115	
Operation	Man-hours per dozen	Operation	Man-hours per dozen
Total time, all operations	2.8110	Total time, all operations	3.6256
Making loops	.0268	Making belt	.1320
Turning belts	.0567	Turning belt	.0720
Making and setting cuffs	.3792	Making dart	.1716
Double-needle front and back panel	.3032	Buttonhole reinforcement	.1700
Making and setting pockets and loops	.5467	Seaming front gores	.3420
Joining shoulder and sleeves	.3142	Hemming bottom skirt	.2596
Making and setting collar	.2633	Shirring sleeve	.2000
Overlocking	.1667	Binding sleeves (armhole)	.1812
Tacking cuffs and pockets	.1527	Binding pocket	.0976
Hemming bottom	.1562	Setting pocket	.1566
Buttonholes	.0265	Seaming shoulders	.1086
Inspection and trimming	.4167	Seaming sides	.3214
		Binding neck	.2322
		Setting sleeves	.2947
		Tacking belt	.2000
		Buttonhole at back shoulder	.0960
		Button at shoulder	.0680
		Seaming back of skirt	.1261
		Examining and trimming	.3960
Output, 0.356 dozen or 4.27 garments per man-hour.		Output, 0.276 dozen or 3.31 garments per man-hour.	

Effect of Shop Management

The multiplicity of factors affecting productivity is well illustrated in the case of one of the plants studied. In 1934, this plant was organized into eight separate, self-contained shops of approximately 30 machines each. There were six foremen for the plant, four of whom supervised single shops, while the other two were in charge of two shops each. The four shops which enjoyed individual supervision showed a productivity of 4.12 garments per man-hour. The remaining four shops, which shared foremen, produced 3.55 garments per man-hour. Since both the machinery used and the character of the product were identical in all the shops, it seems reasonable to attribute the advantage of approximately 16 percent in productivity displayed by the individually supervised shops to the more immediate management control and responsibility in these shops.

In 1935, the four shops supervised by the two foremen were organized into one large unit, and the system of production was changed to strict section work. Simultaneously, an improved type of transmission machinery was introduced throughout that shop. A similar machine change was effected in the four individual shops during 1936. Because of this difference in equipment, the two portions of the plant cannot be compared during 1935.

During 1936, however, comparison is again possible. The four small shops continued to show a distinct advantage in productivity, with a man-hour output of 4.12 garments as against 3.65 for the large shop—a difference of 13 percent. Presumably, this again reflects the

closer supervision possible in the smaller shops and the greater handling time in the large shop.[20]

Labor Cost and Hourly Earnings

Table 43 also shows the direct labor cost in dollars per dozen garments for each of the plants studied. The range in labor cost was considerably narrower than that in productivity, largely due to the fact that plant No. 11, whose productivity was highest, also shows the highest hourly earnings.

Table 43 likewise shows the average hourly earnings for each of the plants for which productivity and labor costs are given and in addition, six other plants. These additional plants manufacture related products, such as nurses' uniforms, aprons, and women's woven undergarments. The difference in the character of the product was too great to warrant their inclusion in the comparison of labor productivity or of direct labor cost; they may, however, be properly included in a comparison of hourly earnings. The hourly earnings in these additional plants fall within the range of the other plants.

Men's Pajamas

The style factor may at first seem of little importance in the manufacture of men's pajamas. The plants covered by this study, however, demonstrated that labor productivity in pajama factories is very intimately affected by style variations. The presence or absence of a collar, or the type of collar used; variations in the cuffs, belts, and the like; the presence or absence of piping and similar parts—all have a marked effect upon the time required to produce an individual garment.

Eleven separate productive units representing nine plants and seven companies were surveyed. The data for 10 of these plants are presented in table 45 which shows productivity in units per man-hour for the period between the fall of 1933 and fall of 1936, the direct labor cost per dozen, and the average hourly earnings of operators. The figures secured in the eleventh plant were not of comparable character.

[20] An independent study conducted in this plant by Mr. N. I. Stone at the time of the change in transmission machinery measured the net advantage of the change under carefully controlled conditions. All elements of variation were carefully excluded, and the study confined to identical operators performing identical operations. This study revealed a net increase in productivity of 16 percent during the eighth week following the introduction of the improved transmission equipment.

TABLE 45.—*Productivity, labor cost, and hourly earnings in the sewing department—Pajamas, 1933–36*

Code No.	System of production	Retail price	1933	1934		1935		1936	
			Fall	Spring	Fall	Spring	Fall	Spring	Fall
		Labor productivity (pajamas per man-hour)							
122	Bundle	$1.49 up				5.41	5.78	5.46	5.73
123	do	$1.49 up	3.68		3.80		3.20		3.07
121	do	$1.95	2.29	2.88	2.90	2.95	2.72	2.48	2.60
125	Line	$1.69						(1)	2.19
117	Bundle	$1.95–$3.50		2.47	1.93	2.56	2.04	2.13	1.58
116	do	$1.00–$5.00					1.58	1.66	1.47
120	do	$1.95	1.54	1.72	1.56	1.50	1.34	1.30	1.16
119	do	$1.95	1.15	1.10	1.18	1.23	1.17	1.22	1.08
118	do	$3.50	1.02	.94	.90	1.05	.80	.90	.81
124	Line	$1.69				(1)	2.13		
		Direct labor cost per dozen pajamas							
122	Bundle	$1.49 up				$0.79	$0.75	$0.81	$0.75
123	do	$1.49 up	$1.14		$1.09		1.14		1.22
121	do	$1.95	1.83	$1.63	1.54	1.75	1.69	1.68	1.65
125	Line	$1.69						(1)	1.72
117	Bundle	$1.95–$3.50						2.19	2.90
116	do	$1.00–$5.00					2.54	2.81	2.78
120	do	$1.95	2.23	2.23	2.43	2.79	2.86	2.38	2.57
119	do	$1.95	2.96	3.28	3.16	3.43	3.29	2.97	3.25
118	do	$3.50	3.67	4.13	4.32	4.17	4.79	3.81	4.01
124	Line	$1.69				(1)	2.12		
		Average hourly earnings							
			Cents	*Cents*	*Cents*	*Cents*	*Cents*	*Cents*	*Cents*
122	Bundle	$1.49 up				35.8	36.4	36.8	35.9
123	do	$1.49 up	34.7		34.6		30.5		31.1
121	do	$1.95	34.9	39.1	37.1	43.0	38.3	34.6	35.8
125	Line	$1.69						(1)	31.4
117	Bundle	$1.95–$3.50						39.0	38.3
116	do	$1.00–$5.00					33.5	39.0	34.3
120	do	$1.95	28.9	32.0	31.6	34.8	31.9	25.8	24.9
119	do	$1.95	28.5	30.3	31.5	35.5	32.3	30.5	29.3
118	do	$3.50	31.1	32.6	32.4	36.8	32.3	29.8	27.1
124	Line	$1.69				(1)	37.7		

[1] Season when line system was installed.

The range in productivity revealed in table 45 exceeds that observed for any of the other cotton products studied. The highest productivity— 5.73 [21] garments per man-hour—is approximately 7 times as great as the lowest—0.81 garment per man-hour. The lowest productivity corresponds to the finest quality of product and the highest productivity to the cheapest. Similar price ranges for the other products studied, however, reflected no such striking differences in labor productivity. Apparently, differences in the style of pajamas affect labor productivity a great deal more than differences in styles of shirts or work clothing.

[21] The data for plants Nos. 122 and 123, both owned by the same company and both of which show exceptionally high productivity, were compiled by the management of their respective plants and were not checked by the field workers of the survey.

Plants Nos. 122 and 123 both manufactured garments in the same price range. Nevertheless, the productivity per man-hour of plant No. 122 (5.73 pajamas) was far higher than that of plant No. 123 (3.07 pajamas). This difference was explained by the management as being due to the texture of the material used rather than to the style factor. Plant No. 122 manufactured cotton pajamas, while plant No. 123 produced flannel pajamas.

The range in labor cost was somewhat narrower than that in productivity. The highest cost was $4.01 per dozen, while the lowest was $0.75 per dozen—a range of more than 5 to 1, as against 7 to 1 for productivity. This was due to the fact that the earnings in the plant with the highest productivity, plant No. 122, averaged 36 cents per hour, while average earnings in the plant with the lowest productivity, plant No. 118, were 27 cents per hour.

Table 45 reveals a rather marked consistency in man-hour output for each plant during the entire period studied. In a few plants, however, there seemed to be a rather definite trend toward lower productivity. This was true of plants Nos. 117, 120, and 123. This may have been due in part to an effort to improve the product as business improved and public purchasing power increased, and in part to the increase in weekly work hours to as much as 50, causing lower man-hour productivity.

Table 46 gives the standard time allowed for the different sewing operations on pajamas in one of the plants operating on the line system.

TABLE 46.—*Time study analysis of sewing operations on line—Pajamas, 1936*

Operation	Man-hours per dozen	Operation	Man-hours per dozen
Total time, all operations	4.279	Sew back yoke	.205
		Sew label	.068
Join shoulders	.109	Set front facing	.285
Set sleeves	.182	Set collar	.365
Set cuffs	.152	Piece sleeves	.120
Make and set pockets	.293	Stitch down front facing	.654
Button hole	.162	Make and turn collar	.181
Fell side seams	.235	Join crotch, make fly, set girdle	.476
Button sew	.114	Fell pants, side seam	.340
Hem bottom	.136	Hem bottoms	.202

The total standard time allowed for sewing operations on a dozen pajamas is 4.28 man-hours. This is equivalent to an output of 0.233 dozen or 2.80 garments per man per hour.

Appendix 1

Problems and Approach to the Study of Labor Productivity

Problems Encountered in Study

Statistical Aspects

A wide variety of statistical problems was encountered in the course of the survey. The major source of statistical data was necessarily the records kept by individual manufacturers. Obviously, however, the character of such records was primarily determined by their value to the individual company as aids to factory management and not by their potential value for a productivity survey. The adequacy and accuracy of the records kept by the various companies included in the survey varied considerably. In very few cases were usable records kept prior to 1933. Only a few out of approximately 100 companies covered by the survey maintained a system of records extending as far back as 1929.

With a very few exceptions, therefore, it was impossible to secure statistics for the period prior to the fall of 1933. A great impetus toward the maintenance of adequate systems of records in that year was furnished by the N. R. A. The necessity of complying with the requirements of code administration forced the individual plants to establish and maintain fairly complete hour and pay-roll records. Most companies abandoned these records when the N. R. A. passed out of existence. The survey was fortunate, however, in finding a sufficient number of companies which had been impressed with the value of adequate records as a managerial asset by their N. R. A. experience, so that the record system was maintained even after the code mandate had lapsed.

In order to determine man-hour productivity, two sets of figures are obviously needed—data as to actual physical production and corresponding man-hour figures. Productivity may then be computed by dividing the production recorded for any given period by the aggregate man-hours during that period.

Wage and piece-rate statistics were also secured wherever possible. In part, this was done to estimate production, when production records were lacking, by dividing earnings on individual operations by the piece-rates for those operations. In addition, wage data were secured because of the interest which the industry has manifested in a com-

parison of wages in different sections of the country, in large cities versus small towns, etc., and the effect of these wages on comparative labor costs.

Each of these sets of figures—production, man-hours, and wages—were subject to very serious inaccuracies and limitations. In some cases, it was possible to devise techniques to compensate or reduce the resulting inaccuracies and to permit the drawing of valid inferences in spite of the shortcomings of the raw data. In other cases, there was no feasible means for applying adequate corrections. As a consequence, unavoidable limitations were imposed upon the value of the data secured.

Production Records

The average plant does not attempt to maintain production records segregating every variety of article manufactured. In some cases, widely differing items are included in the same aggregate production figures. Thus, in a few plants the number of overalls produced was recorded, but there was no way of determining how many of these overalls were the so-called waist-band overalls—i. e., a dungaree or work pant—and how many were the common bib overall. The time required for the manufacture of a bib overall is considerably greater than that needed to produce the band overall. In cases of this sort, the lack of data as to individual products renders the production records well-nigh worthless and had to be discarded.

In most cases separate production records were maintained for major groups of products. However, this was rarely if ever true for similar products varying only in detail. Thus, dress shirts with one-piece sleeves were not separated from those for which sleeve gores or inserts were necessary; shirts with plain backs were included with those which had French gathers; shirts with plain cuffs were not separated from shirts with French cuffs; carpenters' overalls were included with railroad overalls, etc.

At first glance, these minor style variations may appear unimportant. However, they may readily result in differences in the operating time required of 5 percent or 10 percent and sometimes more, enough to impose very appreciable limitations on the accuracy of the results of the survey. Thus, an apparent increase in productivity displayed by one plant between two successive seasons may be explainable entirely by the different proportion of various styles included in the aggregate production during the two periods in question.

A second problem arose from the fact that production records are often kept on a monthly basis. Man-hour records, on the other hand, are usually kept by the week. In some cases, it was possible to apply corrections that would place both of these sets of figures on a comparable basis. In others, this was far more difficult and the results less reliable.

The major source of error in the production data arises from the fact that production records, as usually kept by manufacturing plants in the cotton-garment industry, take no account of the work in process. As a result, the nominal production in the sewing department may provide a very misleading criterion of the number of garments actually handled by that department during any specific period. Sewing production is usually recorded as the number of garments which passed final inspection during each week. Inspection is the last step through which the garments must pass before being transferred to the pressing department. As a result, there may be a large number of garments which have passed through every other stage and are 99 percent complete, and yet will not be included in the production record of that week. Any computation of man-hour productivity on that basis would be misleading. In one case, an apparent decrease in productivity of 15 percent during one of 4 successive weeks was traced to the fact that one of a group of three inspectors was absent for 3 days during that week. The full quota of garments were completed during that week, but those that failed to be inspected by the absent examiner were not recorded and the production record in consequence showed a falling off of 15 percent.

In order to minimize the error due to the work in process, the rule was followed of taking the average production for 4 consecutive weeks during the busiest period of the season.[1]

In some plants, in the absence of a record of the garments sewn, it was necessary to fall back on the records of garments cut or pressed, or the number boxed. If the flow of production through the plant is at all times uniform, or nearly so, variations of this sort are of no great significance. However, there are very few plants in which this condition prevails. In most cases, the number of garments cut during any week will differ appreciably from the number sewn, and that, in turn, will vary from the number pressed or the number boxed. In one plant where complete records are available, for example, over a period of 4 weeks, 9,152 garments were cut, 7,294 were sewn, and 8,173 were pressed. The extent of the variation is striking.

Moreover, there might be sharp variations within the sewing department itself. The average garment passes through the hands of some 20 to 40 sewing-machine operators in the course of its production. Ideally, of course, the same number of garments pass through each of these successive stages during any given period. In general, however, no two successive operations will show exactly the same number of garments handled during a week or during a month, except in a straight-line plant. One device for reducing the resulting inaccuracy was to compute the average production for a number of key operations, rather than merely to accept production figures based

[1] These need not necessarily be the same calendar weeks each year.

upon some final operation. This method could be used only for plants which had detailed production records for individual operations. The method helps to take account of the work in process and, if the production in the shop is fairly balanced, gives a much more accurate measure of production than the figure for the last operation, which is used by most plants to represent the production of the shop as a whole. However, if production is greatly unbalanced, even this method will not furnish an accurate picture of productivity.

For plants for which it was possible to obtain a complete set of data of production and hours for each operation, it was possible to compute the time required to perform each operation. By adding the time spent on these operations, the total time necessary to produce a garment in the sewing department was obtained. The reciprocal of the total production time is the number of garments produced per man-hour, which constitutes the measure of labor productivity. A typical comparison between productivity estimates calculated on these three bases follows:

(*a*) Calculated on the basis of a key operation (shirt closing), 0.340 dozen per man-hour.

(*b*) Calculated on the basis of an average of all standard operations, 0.286 dozen per man-hour.

(*c*) Calculated by adding up the time spent on the individual operation, 0.285 dozen per man-hour.

The closeness of the results obtained under (*b*) and (*c*) is striking. The margin of error of the figure obtained under (*a*) as checked by (*b*) and (*c*) is about 20 percent.

Man-Hour Records

The second element necessary for the computation of labor productivity is man-hours. Here, again, available records lack both adequacy and accuracy.[2]

A far more general problem arises from the fact that recorded hours are not always uniformly representative of actual working time. The hours were taken from the time clock cards as the closest approximation to the actual hours of work. They are not necessarily records of hours actually spent at work. Even as a record of hours in the shop, severe limitations must be placed upon the accuracy of time cards. The large majority of factories in this piece-rate industry installed time clocks during the N. R. A. to comply with the cotton-garment code by paying each worker the minimum hourly wage. During idle periods, the foreman would require workers to punch the time clock and leave the factory, so that the company

[2] In some instances, there was even a deliberate inaccuracy introduced. Thus, during N. R. A., a few plants maintained hour records that checked with the code requirements more closely than they did with the actual facts.

would not be liable to pay them for a few hours in the middle of the day during which they were not actually at work.

Since the termination of the N. R. A., the majority of factories discarded time clocks, although all concerns in the sample studied have continued the practice. No plants now require workers to check out of the factory if an hour or two of prospective idle time develops. Some companies require that time clocks be punched at the beginning and end of the day, while others also require workers to punch the time clock at the noon hour. No uniform practice prevails from plant to plant, and many plants reported that, since the termination of the N. R. A., workers have been negligent about punching the clock and the foreman frequently has to estimate the hours in such cases.

The differences in the practice of punching time clocks from period to period in the same plant and the variations from plant to plant in the methods of time-clock regulation are conducive to inaccuracies in the recording of the hours workers are employed in the shop. These inaccuracies could not be eliminated and are, therefore, inherent in the computations of both production per hour and hourly earnings.

In a factory employing from 100 to 200 workers on about 50 different operations, there will be an average of 2 to 4 workers per operation. The absence of a worker on an operation, through illness or any other cause, will result in the curtailment of production on that operation of 25 to 50 percent. Unless there is a considerable reserve of work in process on each operation, which is usually not the case, such a curtailment of production on a given operation will soon result in a shortage of work for the succeeding operations, thus creating a bottleneck which halts the operation of the factory on the remaining operations. There is thus a certain amount of idle time caused through no fault of the worker. The extent of idle time is in inverse ratio to the efficiency of the management. Unfortunately, there is hardly a concern in the industry which keeps a record of such idle time. The amount of idle time, or the proportion of idle time, will vary from week to week. In a seasonal industry, it is but natural that at the height of the season, when customers are impatiently calling for deliveries on their orders, management will use every effort to keep the plant going with as few interruptions as possible. On the other hand, in slack periods, when there is less pressure from customers and the plant is not working at capacity, management will be less concerned about the extent of idle time in the factory, knowing that it cannot keep the workers continuously busy anyway.

To reduce the element of error due to the impossibility of accounting for idle time it became necessary for this study to select a period during which idle time in a plant can be expected to be at a minimum. From this point of view, the one busiest week at the height of a season would have been the ideal period. However, as the production figures

for 1 week might have proved misleading because of the fluctuations in the quantity of work in process, a period of 4 consecutive weeks in the busiest period of the season was adopted as a base.

Allocation of Time to Different Products

Another set of problems arises from the multiplicity of products manufactured in a single plant. The accurate allocation of working time to each of these products is often not feasible. When each product is made in a separate shop, floor, or department having its own records, there is no problem. But if several products are made by the same workers, there are usually no separate hour-records for each. In cases of this sort, it was sometimes possible to allocate the man-hours to the different products by applying a formula based upon a comparison of direct labor costs of each product or of time studies. Necessarily, however, such estimates cannot be as accurate as actual time records.

Learners as a Source of Inaccuracy

An added source of inaccuracy arose from the fact that various plants employ different proportions of learners and physically handicapped help, and that the skill of this type of help relative to the normal operator varies considerably. Thus, the low productivity of one plant as compared to another may reflect merely the larger proportion of operators of substandard efficiency in the former. In the absence of adequate records it is impossible to account for this source of error.

Indirect or Floor Help

Finally, the treatment of indirect help presented considerable difficulties. The time of indirect help was not included in the computation of productivity, since, in the absence of adequate records, it could not be allocated to given products or operations; yet the presence or absence of such help and the role played by it may exercise an appreciable effect on the production in the plant. Thus, in one plant, the sewing operator may be required to call at some central spot for her bundle and return it. In other plants this may be done by floor boys whose pay would be classed under "indirect" labor. Insofar as separate figures for indirect help were available, they were excluded from the totals. The computation of man-hour productivity was subject to all of these specific sources of inaccuracy and to many minor ones impossible to list in detail.

Wage Records

Probably the most accurate records available are those with reference to earnings. The amount of weekly wages paid to each

individual worker is necessarily accurately recorded. Hourly earnings are obtained by dividing the wages paid by the recorded man-hours. Bearing in mind what was said as to the limitations of the time records, the hourly wages represent earnings per hour of attendance in the shop, rather than earnings per hour actually spent at work.

Labor Costs

Direct labor cost is computed by dividing the wages paid by the number of garments or parts made. In this case, while the wage data may be fairly reliable, the inaccuracy of the production figures already described affects the accuracy of the labor-cost data to an equal extent.

The limitations inherent in the character of the data secured have been discussed in detail in order to preclude extending unwarranted validity to the comparisons and conclusions which are presented. Despite these inaccuracies, however, it has been possible to discern certain trends and to draw certain inferences which may be presented with some degree of assurance.

Methods of Study

Selection of the Sample

The first step in the actual conduct of the study was the selection of a representative sample of plants to be surveyed. This involved two steps—the preparation of a tentative prospect list and the choice from that list of concerns willing to extend their cooperation and maintaining records adequate for the purpose.

The study was confined to the following products of the cotton-garment industry: (1) Men's dress shirts; (2) work shirts; (3) overalls; (4) work pants; (5) semidress pants; (6) house dresses retailing for $1 or less; and (7) pajamas.

A list of 300 likely prospects representing these product groups was first prepared from the records of the International Association of Garment Manufacturers. In preparing this list, it was first hoped to have the survey cover a period of about 10 years. Those firms were selected which were most likely to possess production and man-hour records prior to N. R. A.

During the code period, a questionnaire had been distributed by the International Association of Garment Manufacturers inquiring as to the character of records maintained by each firm in the industry. The large majority of those replying stated that there had been no time clocks installed in their factories prior to the approval of the cotton-garment code. Consequently, the prospect list originally prepared was confined to the minority of firms whose replies indicated

the probability that hour records had been maintained prior to the code period.

As the survey progressed, it became apparent, however, that very few firms, even of the limited sample chosen, had such man-hour records for the period prior to 1933 in accessible form. Other firms had destroyed them in order to economize on storage space or for other reasons.

In addition to selecting firms likely to maintain adequate records, an effort was made to secure a representative cross-section of the cotton-garment industry. The prospect list was therefore prepared to include manufacturers of each of the principal products; large, medium, and small producers; plants located in each major geographical area; plants located in cities, small towns, and rural areas; union and nonunion producers; and members and nonmembers of the International Association of Garment Manufacturers.

Contractors who make up garments from cloth furnished them by the manufacturers were excluded, because of the unlikelihood that they would show any degree of consistency in the character of products manufactured and because of the improbability that they would maintain adequate records.

Necessarily, this basis of selection presented an incomplete picture of the industry. In spite of the effort to secure an adequate sample of small firms, not more than a very few of the smaller producers were found to have records adequate for the purpose of the study.

Field Contacts

It was next necessary to call on each firm included in this prospect list to determine whether its records were adequate for the purpose of the survey and whether it was willing to extend its cooperation. In order to secure adequate geographic sampling, virtually every section of the country in which a substantial number of cotton-garment plants was located had to be covered.

Since the cooperation of the manufacturers in the survey was entirely voluntary, it was essential to arouse the interest of the company executive interviewed, by explaining its purpose and stressing its potential value to the industry as a whole and to his firm in particular. Eighty-five percent of the 300 manufacturers visited were cooperative. Most of the larger and more progressive concerns evinced great interest and displayed a thorough grasp of the possibilities inherent in a study of the character contemplated.

After a concern agreed to participate in the survey, it was left to the field representative to ascertain whether its records were adequate for study. For this purpose, he was required to fill out preliminary schedules designed to obtain certain summary information as to the

character and size of the concern, the nature of its product, the names of its responsible officers, its union affiliations, if any, and any other special features of interest. These schedules covered the period of available records, the possibility of segregating records for different products where more than one product was manufactured in a plant, the possibility of securing data by individual operations, and the extent to which recent changes in machinery, equipment, or method of operation would permit comparisons to be drawn as to the effect of such changes on productivity.

The information compiled from these schedules revealed that a majority of the plants visited were unsuitable for the survey. Many had records only for the year 1936. Others were rejected because they produced a diversified line without maintaining separate records for each type of product. In many other plants, only the crudest form of man-hour records were kept. In others, although both production and man-hour records were maintained, these were on bases so different that comparability was impossible. For these and a variety of other reasons, approximately 6 out of every 10 companies visited proved unsuitable for study despite their apparent willingness to cooperate.

Classification of Sample

The exclusion of firms unwilling to cooperate and of those whose records were inadequate for the purpose of the survey eliminated approximately 70 percent of the original prospect list. Records were actually secured from 85 firms, comprising a total of 116 plants.

Distribution by product.—The number of plants covered by the survey, classified by the products they produced, was as follows:

Dress shirts	41
Work shirts	16
Overalls	25
Work pants	19
Semidress pants	15
Pajamas	9
House dresses, nightgowns, aprons, nurses' uniforms	15
Total	[1] 140

[1] This total does not conform with the total number of plants surveyed (116) because many plants manufactured more than one product.

Geographic distribution.—The 116 plants studied were located in the following 27 States representing every geographical region:

Northeast	39
Connecticut	1
Massachusetts	2
New Jersey	9
New York	16
Pennsylvania	10
Rhode Island	1

Midwest	26
Illinois	4
Indiana	4
Michigan	1
Minnesota	1
Missouri (northern)	9
Ohio	6
Wisconsin	1
Far West	14
California	12
Colorado	1
Oregon	1
South [1]	37
Alabama	2
Georgia	2
Louisiana	3
Maryland	4
Mississippi	1
Missouri (southern)	9
North Carolina	1
South Carolina	1
Tennessee	2
Texas	7
Virginia	3
West Virginia	2
Total, all regions	116

[1] For the purposes of this compilation, the South was defined as including the entire area to which the lower wage differential was applicable under the cotton-garment code of N. R. A.

Size of town.—Sixty-five plants of the sample were located in cities of 100,000 or over, or in the suburban or metropolitan districts of such cities. Twenty-seven were located in towns of 10,000 to 100,000 population. The remaining 24 were located in places whose population was under 10,000.

Size of company.—Fourteen of the eighty-five companies surveyed employed more than 1,000 wage earners; 58 employed between 100 and 1,000 wage earners; the remaining 13 firms had less than 100 wage earners each.

Unionization.—Thirty-two of the 116 plants were unionized at the time of the survey.

Character of Sample

The sample of 116 plants studied did not contain an adequate number of small plants, of plants paying low wages, or plants manufacturing cheap products, to be considered fully representative of the 3,700 plants in the cotton-garment industry. The lack of records typically encountered among such firms made this inevitable. As a result, the survey definitely skimmed the cream of the industry; and the productivity, wages, and efficiency of management of most of the factories studied are probably substantially above the average for the industry.

Field Study

The actual plant investigation was conducted by a number of "teams." Each team consisted of two persons, one of whom was intimately acquainted with the technical aspects of garment manufacture, while the other acted as his assistant in recording the statistical data secured.

Technical study.—The first step in the plant survey was a technical study. This involved a complete analysis of the operations of manufacture. The exact character and the sequence of operations followed in each plant, the type of machinery and equipment used for each operation, the method of handling work, and all other details of the manufacturing process were obtained and recorded. The information was obtained partly through conferences with the responsible production managers of each plant, supplemented wherever possible by actual inspection of the plant itself.

The essential technical information was tabulated on a special form which permitted a detailed recording of the manner in which each operation was performed and of the machinery and equipment utilized. Wherever changes in machinery or equipment had occurred during the period covered by the survey, the schedule called for the date of the change in order to permit a comparison of labor productivity before and after the change.

In addition every effort was made to secure as complete a description as possible of the significant operating characteristics of each plant. The exact character of the system or production used, the nature of the labor supply, the characteristics of the management, any special operating problems, and any significant departures from the common procedure of the industry were all carefully noted.

Plant statistics.—The statistics pertaining to the operation of the plant were secured for two consecutive 4-week periods during each year, for as many years as data were available. An endeavor was made to select periods coinciding with the height of the busy season. Physical production, man-hours worked, the number of employees on the pay roll, and the wages paid were recorded in each case, and where obtainable, the number of indirect help and the indirect pay roll.

The number of employees, man-hours, pay roll, and production for each individual operation, where obtainable, were also recorded. In many cases, production figures for individual operations were not directly available, but pay-roll figures were. In these instances, the corresponding piece rates were obtained, since by dividing pay roll by piece rate, production could be computed. This method could be followed only on operations for which there was a single piece rate.

Problems encountered.—A wide variety of problems was encountered in the course of the field study, due to the differences in the manner in

which individual plants maintained their operating records. In a few instances, records both for the major departments and for individual operations were carefully and clearly kept, so that it was necessary to do virtually nothing but transcribe these data on the forms provided. In the majority of plants, however, this was not the case. Frequently, for example, pay-roll and man-hour data were recorded for each operator by name. It was necessary in such cases to determine exactly what each one of these operators had been doing during each of the periods covered by the survey. In many cases it was necessary to rely upon the memory of plant officials for this allocation.

It often happened that the same operator worked on a number of different operations during a single week. Here, again, it was necessary to devise some scheme for distributing operating time to its proper category. Frequently, no separate record had been maintained of the number of garments produced in the sewing department. In cases of this kind, it was sometimes possible to derive the volume of production by dividing the total pay roll for some key operation by the piece rate for that operation.

It is impossible to list in detail all the difficulties of this character which arose during the course of the field survey, nor could they have been anticipated in advance. Each plant presented its own individual problem, and its solution necessarily rested on the ability and resourcefulness of the research workers in the field.

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Appendix 2

Earnings in Cotton-Garment Plants

The wage sample in this study covers 124 plants.[1] Compared with the 3,700 plants in the industry as a whole, this limited sample is in no way intended to represent the entire industry. Moreover, the plants in this study were selected, on the basis of their superior records, as suitable for a labor-productivity analysis. This makes the sample distinctly one of higher wages, higher-price products, larger establishments, and more efficient management than the average, and the data on earnings presented here must be interpreted in the light of this fact.

Wages in sewing departments were obtained for all plants in the sample, but for the cutting and pressing departments, because of lack of uniformity in classification of employees, information was secured for less than half of the factories. Since the termination of the Cotton Garment Code Authority, occupational groups have not been accurately classified on many factory pay rolls. For example, examiners are sometimes included in the sewing department and sometimes in the pressing department. Some manufacturers count only sewing-machine operators in the stitching department, while others include indirect labor, such as floor girls. One cutting department listed several cutters' helpers, but no cutter; an inquiry developed that the foreman of the sewing department did the cutting in this plant. In another plant, the cutters' helpers were listed on the pay roll, but the cutter was classified under nonmanufacturing workers, since he was also the plant engineer. Wherever possible careful editing helped to remove most of these inconsistencies, but several plants had to be omitted for this reason.

Data on earnings were obtained only on such products as were included in the productivity analysis and not for entire factories. If, for instance, a plant employing 500 workers had approximately 200 employees engaged on the products surveyed, only the earnings for the latter employees were recorded. In determining the average earnings of the plants, therefore, no consideration was given to the number of workers covered in each plant. Each factory was considered as a unit irrespective of whether it employed 1,000 workers or 75. This method was found feasible because in some plants all the

[1] Only 116 plants were studied, but a few factories in which separate wage figures were collected for the different products, such as overalls, work shirts, and work pants, were counted more than once.

workers were included, while in other plants only a fraction of the total employees were covered. Besides it was decided to give the smaller plants, which predominate in the industry, but not in the sample, more adequate weight, and this could be accomplished by giving each small plant an equal weight with the large one.

The analysis was largely confined to average hourly earnings, as weekly earnings for the busiest months of the year, covered by this study, would not be indicative of the average annual weekly earnings. Likewise, since the industry is no longer on a uniform weekly schedule of hours, the weekly earnings would not be comparable between plant and plant.

Table 1 gives a distribution of the 124 plants by weekly hours, for the country as a whole and for the North and South separately. While nearly 71 percent of all the plants were found operating on the 40-hour or less schedule, 20 of the 87 plants, or 23 percent, in the North and 16 of the 37 plants, or 43 percent, in the South worked longer hours. Ten plants, or over 11 percent, in the North and 9 plants, or over 24 percent, in the South averaged more than 45 hours per week, while 4 plants in the South averaged between 54 and 60 hours per week. Two nonunion plants in California continued to work on the 36-hour schedule, in contrast to one southern factory which operated 60 hours per week.

TABLE 1.—*Scheduled weekly hours of work in cotton-garment factories, 1936*

Hours per week	Number of plants		
	United States	North	South
All plants	124	87	37
36 hours	2	2	0
40 hours	86	65	21
42–44 hours	17	10	7
45–48 hours	10	6	4
49–52 hours	5	4	1
54–60 hours	4	0	4

Average Hourly Earnings in Sewing, Cutting, and Pressing Departments

The average hourly earnings presented here refer to the fall of 1936. However, in a few factories where figures were not available for this period, the information is based on the spring of 1936 and in rare instances on the fall of 1935. In all cases, the average hourly earnings are for periods subsequent to the N. R. A.

In table 2 is presented a frequency distribution of average hourly earnings of sewing-machine operators in the 124 plants surveyed. In the fall of 1936, some plants averaged as low as 17 cents and others

as much as 58 cents per hour. In the 87 northern plants, the range was from 21 to 58 cents, while in the 37 southern plants the range was from 17 to 37 cents, except for one union-label plant which had higher average hourly earnings. In the North, the largest concentration, comprising 42 plants, was in the range of 35 to 45 cents per hour; in the South, the largest concentration, comprising 17 plants, was in the 25 to 30 cents per hour group. The 19 northern plants paying 45 cents per hour or more were all unionized. The lowest earnings in a union plant were 32.4 cents per hour, while the highest earnings in a nonunion plant were 42.9 cents per hour. In 26 of the 39 union plants, the workers earned more per hour than the highest earnings in the nonunion plants.

Comparing union with nonunion plants in the North, the earnings in the nonunion shops ranged from 27.5 to 42.9 cents per hour, while in the union shops they ranged from 32.4 to 58.0 cents per hour. In the South (all nonunion) the hourly earnings were from 17.0 to 37.5 cents.

TABLE 2.—*Distribution of 124 cotton-garment factories by average hourly earnings, 1936*

Average earnings per hour	North			South		
	Sewing	Cutting [1]	Pressing [1]	Sewing	Cutting [1]	Pressing [1]
Total plants	87	42	44	37	9	10
15.0–19.9 cents				2		
20.0–24.9 cents	3			7		
25.0–29.9 cents	5		5	17	1	4
30.0–32.4 cents	8		1	6		3
32.5–34.9 cents	10		8	3		
35.0–39.9 cents	21	1	8	1	1	2
40.0–44.9 cents	21	4	11		4	1
45.0–49.9 cents	5	5	4		2	
50.0–54.9 cents	11	1	1	1		
55.0–59.9 cents	3	6	2			
60.0–74.9 cents		19	2		1	
75.0–90.0 cents		6	2			

[1] Earnings of cutting and pressing departments were recorded in fewer factories than for sewing-machine operators.

Table 3 gives average hourly earnings of workers in the cutting and pressing departments of union and nonunion plants for the North and South separately.

Earnings in the cutting department, including both cutters and helpers, who were almost entirely male, averaged approximately 60 percent higher than those of sewing-machine operators, who were almost entirely female. Earnings in nonunion cutting departments in the North were approximately 18 percent below those in union plants, while earnings in cutting departments in the South (all nonunion) averaged approximately 22.5 percent lower than in nonunion northern plants. More than half of the plants studied averaged

60 cents or more per hour for cutting-department employees. Only 1 southern plant is included in this group, as against 25 plants in the North.

TABLE 3.—*Average hourly earnings in cutting and pressing departments, 1936*

Department and union status	North		South	
	Number of plants	Average hourly earnings	Number of plants	Average hourly earnings
		Cents		*Cents*
Cutting department	41	61.6	9	44.5
Nonunion plants [1]	27	57.4	9	44.5
Union plants	14	69.7		
Pressing department	44	42.2	11	31.4
Nonunion plants [1]	31	38.2	11	31.4
Union plants	13	51.6		

[1] Includes plants where the cutters or pressers or both groups belonged to a union, but the plant as a whole had no union contract.

Earnings in the pressing department averaged approximately 10 percent higher than those of sewing-machine operators. Pressers in nonunion northern plants were paid about 26 percent less than in union northern plants, while pressers in southern plants (all nonunion) averaged about 18 percent lower than in nonunion northern plants. These approximate differences in earnings in the cutting and pressing departments of union northern plants, nonunion northern plants, and nonunion southern plants were found to be true also in the sewing departments.

Earnings of Sewing-Machine Operators in Major Branches of the Industry

The majority of cotton-garment manufacturers make several products, but the records indicated a close similarity in average earnings for the major products of the cotton-garment industry, regardless of whether the product was shirts, pants, or dresses.

Hourly earnings of sewing-machine operators in higher-price ($1.95 up at retail) and medium-price dress-shirt plants (principally $1.00 to $1.65 at retail) were practically the same. The average earnings in 10 nonunion northern high-price dress-shirt factories were 36.6 cents per hour, as compared with 37.6 cents per hour for the 8 nonunion northern medium-price dress-shirt factories.

Six of the products fell within the narrow range of 32.6 (work pants) to 35.7 cents per hour (dress shirts). Workers in overall plants averaged considerably higher hourly earnings (41.3 cents), due to the inclusion in the sample of a large proportion of union-label producers. In general, hourly earnings varied less according to different products

than according to geographical distribution, size of town, union and nonunion relations, etc.

TABLE 4.—*Average hourly earnings of sewing-machine operators, by products, 1936*

Product	North		South	
	Number of plants	Average hourly earnings	Number of plants	Average hourly earnings
		Cents		*Cents*
All major products	87	39.5	37	28.0
Dress shirts	25	37.4	7	29.7
Pajamas	7	34.9	(1)	(1)
Work pants	5	41.6	9	27.6
Work shirts	6	47.2	8	25.2
Overalls [2]	20	44.6	7	31.7
Semidress pants	12	37.6	4	24.8
Dresses and nurses' uniforms	12	35.2	(1)	(1)

[1] Data for single plant not given, in order to avoid disclosure.
[2] For wage analysis, dungarees are included with overalls, since these garments are usually produced in the overall department.

Hourly Earnings of Sewing-Machine Operators, by Geographical Regions

As indicated in table 5, 16 plants in the Far West (California and Colorado) had the highest average hourly earnings of sewing-machine operators of any region. The average for these plants was 43 cents per hour. The next highest average hourly earnings were in the

TABLE 5.—*Average hourly earnings of sewing-machine operators, by States and regions, fall of 1936*

Region and State	Number of plants	Average hourly earnings
		Cents
East	40	38.3
Massachusetts, Rhode Island, and Connecticut	4	33.8
New York	17	37.6
New Jersey	10	39.7
Pennsylvania	9	40.0
Midwest	31	39.2
Ohio	8	38.6
Indiana and Illinois	6	35.5
Michigan, Wisconsin, and Minnesota	4	47.2
Missouri (North) [1]	13	38.9
Far West	[2] 16	43.0
California	14	41.6
South	37	28.0
Maryland and West Virginia	6	29.4
Virginia	3	35.4
North Carolina, South Carolina, and Georgia	5	29.9
Alabama, Mississippi, and Tennessee	3	25.4
Louisiana	3	24.0
Missouri (South) [1]	6	25.7
Texas	11	28.8

[1] The section of Missouri below the 38th parallel in latitude was classified as southern under the code. St. Louis and Kansas City and other Missouri towns north of the 38th parallel were allocated to the North, while several small towns near the Arkansas border operated under the southern wage scale.
[2] Figures for less than 3 plants located in a single State or related group of States were included in regional totals, but not by individual States.

31 plants in the Middle West (39.2 cents), followed by the 40 plants in the East (38.3 cents). The 37 plants in the South averaged the lowest hourly earnings (28 cents).

Average hourly earnings of factories in the East and the Midwest were fairly similar. The actual differentials in average hourly earnings between the North and South were 20.0 percent prior to N. R. A. and 11.3 percent under N. R. A (greater than the 7.7 percent minimum differential), since even under the cotton-garment code northern factories paid a larger proportion of their employees above the minimum than did southern plants. In this sample of 124 plants, the differential between northern and southern wages in 1936 was 30 percent. All of the northern States had an average above the former code minimum of 32½ cents per hour. Virginia was the only southern State where the average was above the southern minimum of 30 cents per hour.

For each metropolitan city area where three or more plants were surveyed, average hourly earnings are shown in table 6.

Average hourly earnings in large northern cities varied from 34.1 cents in St. Louis to 42.2 cents in New York City, while in two southern cities, New Orleans and San Antonio, the average was 24 cents.

TABLE 6.—*Average hourly earnings of sewing-machine operators in factories in metropolitan areas, 1936*

City	Number of plants	Average hourly earnings
		Cents
New York City	3	42.2
New York City suburbs in New Jersey and Connecticut [1]	4	38.3
Troy district [2]	4	37.3
Philadelphia	5	39.6
Cincinnati	3	41.3
Chicago and Indiana suburbs	4	35.0
St. Louis	5	34.1
San Francisco and Oakland [2]	5	40.3
Los Angeles County	6	42.0
San Antonio [3]	3	23.9
New Orleans	3	24.0

[1] Classified separately from New York City, because of the prevalent belief that wages are higher in the city proper.
[2] Suburbs included.
[3] 2 of the 3 plants in San Antonio employ Mexican labor. The average hourly earnings in these 2 plants combined are 20.1 cents. 1 of these factories ranks lowest in its product group in productivity while the other is next to the lowest.

Hourly Earnings of Sewing-Machine Operators, by Size of Town

The size of town was one of the most important factors determining the wage level of this industry both before and during N. R. A., since the cotton-garment industry was widely decentralized in 900 towns, with one-fourth of its workers located in communities of less than 10,000 population.

TABLE 7.—*Average hourly earnings of sewing-machine operators, by size of town and region, fall of 1936*

Region	Total, United States		Population of towns					
			Over 100,000 [1]		10,000 to 100,000		Under 10,000	
	Number of plants	Average hourly earnings	Number of plants	Average hourly earnings	Number of plants	Average hourly earnings	Number of plants	Average hourly earnings
		Cents		*Cents*		*Cents*		*Cents*
North	87	39.5	59	40.4	22	38.0	6	35.8
South	37	28.0	14	27.2	15	29.6	8	26.2

[1] And their suburbs.

In the North, the highest average hourly earnings (40.4 cents) were in the 59 plants located in cities of 100,000 population. In the South the highest average hourly earnings (29.6 cents) were in towns with a population of from 10,000 to 100,000. Both in the North and in the South, the plants located in small towns with populations under 10,000 had the lowest hourly earnings—35.8 cents in the North and 26.2 cents in the South. Six plants in small towns in southern Missouri averaged 25.7 cents per hour for earnings of sewing-machine operators, or nearly 10 percent less than 11 plants farther south, in Texas, all but one located in large cities, in which such earnings averaged 28.8 cents per hour.

Hourly Earnings in Union and Nonunion Plants

Sewing-machine operators in 39 union plants averaged 45.6 cents per hour as compared with an average of 31.7 cents per hour in 85 nonunion plants. Union northern plants averaged 45.5 cents per hour, or 30 percent above the 34.9 cents average in nonunion northern plants, and 67 percent above the 27.3 cents average in nonunion southern plants.

The greatest difference in earnings between union and nonunion plants was found in work clothing. The 28 union plants in the North averaged 47.6 cents per hour, or 41 percent above the 33.6 cents per hour average in the 15 nonunion plants in the North and nearly 80 percent above the 26.6 cents per hour average in 27 nonunion plants in the South. Sewing-machine operators in union-label work-clothing plants earned substantially more per hour than those in union dress-shirt, house-dress, and semidress-pants factories. The higher average hourly earnings of workers in union-label work-clothing plants are explained by the higher price level and the partially protected market which these manufacturers enjoyed in comparison with the other manufacturers in the industry. The earnings of workers in 24 union plants producing overalls, work shirts, and work pants averaged

48.6 cents per hour, or 19 percent more than the average of 40.9 cents in the 15 union plants producing dress shirts, house dresses, and semidress pants.

Changes in Average Hourly Earnings Since the N. R. A.

Approximately 30 percent of all the cotton-garment plants studied and 43 percent of the nonunion plants had increased their weekly work hours beyond 40 since the N. R. A. In these instances, weekly wages almost invariably remained the same, and the workers experienced a reduction in their average hourly earnings.

TABLE 8.—*Change in average hourly earnings of sewing-machine operators since the N. R. A.*

Product and region	Union plants				Nonunion plants			
	Number of plants	Average hourly earnings 1934	Average hourly earnings 1936	Change 1934–36	Number of plants	Average hourly earnings 1934	Average hourly earnings 1936	Change 1934–36
		Cents	*Cents*	*Percent*		*Cents*	*Cents*	*Percent*
Dress shirts:								
North	7	38.5	38.4	−0.3	16	37.4	37.6	+0.5
South					6	32.6	28.5	−12.6
Pajamas:								
North					4	36.5	33.6	−7.9
South					(1)			
Overalls:								
North	12	50.7	49.2	−3.0	6	35.0	33.7	−3.7
South					5	32.5	27.3	−16.0
Work pants:								
North	3	50.6	47.6	−6.0	(1)			
South					6	32.1	28.8	−10.3
Semidress pants:								
North	4	46.8	45.0	−3.9	4	36.5	34.3	−6.0
South					4	30.7	24.8	−19.2
Work shirts:								
North	6	47.8	47.2	−1.3				
South					6	29.8	24.9	−16.5
House dresses and nurses' uniforms:								
North	(1)				6	35.2	33.8	−4.0
South					(1)			
Total, North	34	46.3	45.3	−2.2	37	36.6	35.4	−3.3
Total, South					29	31.6	27.0	−14.6

[1] Fewer than 3 plants; data not shown separately, but included in totals.

Sewing-machine operators in union plants had experienced very minor changes in their hourly earnings since the termination of the N. R. A. The slight decline of 2.2 percent for 34 union plants shown in table 8 may have been due to the elimination of the stringent provisions of the cotton-garment code on employment of learners and handicapped workers, who after the N. R. A. were paid on a piece-rate basis and were not limited in numbers.

Average hourly earnings in northern nonunion plants had likewise declined very slightly, 3.3 percent, since N. R. A. However, southern nonunion factories showed substantial decreases in average hourly earnings, 14.6 percent, since N. R. A., and these reductions were consistent in every product group.

It must be emphasized, however, that the select sample of firms in this study should not be construed to be representative of the rank and file of the industry. The 100 or more plants covered by the study paid wages at least 10 percent higher than the average of the industry during the N. R. A. In March 1933, prior to the N. R. A., when no minimum wage existed, these producers paid wages 20 percent higher than the average of the industry.[2]

The reversion to lower wages following the termination of the N. R. A. occurred principally among the types of plants which were compelled to raise wages the most in 1933 to bring them up to the minimum set by the N. R. A. Nonunion factories located in towns of under 10,000 population reduced wages 10.3 percent in the North and 25.1 percent in the South. On the other hand, average hourly earnings in nonunion urban factories in the North changed very little after the N. R. A., and southern factories in towns above 10,000 population recorded a decline of less than half that experienced in the smallest communities.

TABLE 9.—*Changes in average earnings of sewing-machine operators in nonunion plants in towns of different sizes*

Population of town	Number of plants	Average hourly earnings		Decrease since 1934
		1934	1936	
		Cents	*Cents*	*Percent*
North	37	36.6	35.4	3.3
Over 100,000 and suburbs	22	37.0	36.4	1.7
10,000 to 100,000	11	35.0	33.8	3.4
Under 10,000	4	37.0	33.2	10.3
South	29	31.6	27.0	14.6
Over 100,000 and suburbs	14	29.2	25.8	11.6
10,000 to 100,000	10	33.7	29.7	11.9
Under 10,000	5	33.9	25.4	25.1

The tendency toward severe wage-cutting after the N. R. A. was most noticeable in factories located in the smallest communities, which may account for the persistent movement of plants to small southern towns.

Conclusions

An analysis of the select sample of 124 plants presents a picture of prevailing wages from 10 to 20 percent higher than in the industry as a whole, but detailed break-downs reveal certain trends operating in the 2 years following the termination of N. R. A.

(1) After the code minimum wage was abolished, the range in average hourly earnings varied from 17 to 58 cents per hour, even in this select sample.

[2] Data are from the Statistical Service Bureau of the International Association of Garment Manufacturers. Wages, Hours, and Employment in the Cotton-Garment Industry. 1929–35.

(2) Wages varied comparatively little according to the product manufactured.

(3) Earnings of workers in northern union-label work-clothing factories were substantially higher than in nonunion plants in the North and much higher than in nonunion plants in the South. However, earnings of workers in union dress-shirt factories were substantially below union work-clothing plants, which enjoyed the partial protection of the label. Earnings in union and nonunion dress-shirt plants in the North were considerably higher than in nonunion dress-shirt factories in the South.

(4) Substantial differences in earnings existed between geographical regions; southern earnings at the time of the study were 30 percent below those in northern plants, as compared with an actual differential of 11.4 percent during the N. R. A., the 7.7 percent differential allowed under the code minimum, and a prevailing differential of 20 percent, prior to N. R. A.

(5) Wages varied in a marked manner according to the size of the town in which the plant was located. The range was from 40.4 cents in cities of over 100,000 population in the North to 26.2 cents in small towns of under 10,000 population in the South. Small-town plants in both the North and South deviated most from the N. R. A. standards.

Appendix 3

Basic Manufacturing Operations

Dress Shirts

The average factory which produces dress shirts is composed of three distinct manufacturing departments—cutting, sewing, and pressing. The last is frequently called the laundry department. Supplementing the cutting department proper, there is the process of designing and pattern making, which, from a cost point of view, is usually charged to the cutting department.[1]

Pattern making.—The first step in the manufacture of a shirt is the preparation of a pattern. Since the design of dress shirts is subject to but minor style variations, patterns have become fairly standardized. A set of patterns is prepared for each style. These are graded in size to conform with the size variations of the finished shirt, which range normally from 14 to 17 or 17½.

The patterns are usually made of heavy cardboard, though wood-block patterns are also used. Some concerns make perforated stencils or dies for cutting out small parts and linings. The body of the shirt is outlined directly on the cloth with the aid of the pattern.

The process of pattern making and grading requires a high degree of skill and precision. Careful preparation is essential in order to insure that the parts will fit properly during the actual process of manufacture.

Cutting.—The first step in the actual handling of material is its stretching or "laying up" by spreaders on the cutting table. The tables are generally very long, commonly between 100 and 200 feet. The cloth is spread either by hand or by mechanical spreaders, though the latter are more common for the cheaper grades. Material is spread in successive layers, the total number varying from 6 to 240.

The size of the lay depends, first, on whether the cutting is done by hand or machine. There is also a tendency toward smaller lays for better grades of garments. Furthermore, concerns making stock garments will pile as high as the thickness, the degree of softness of the cloth, and the capacity of the cutting machine will permit. Concerns which make shirts to the specifications of their retail customers

[1] Sorting, boxing, packing, and the like are not strictly manufacturing processes and have not been considered in this survey.

must be governed by an additional limit upon the size of the "lay," viz, the size of the retailer's order.

After the material has been laid up, the patterns are either marked or stenciled upon a sheet on the top layer of cloth. Care must be exercised to arrange each part so as to hold down the waste of cloth to a minimum. In the process of hand cutting, the cutters use short, sharp knives, and where this method is employed, the thickness of the lay is usually restricted to somewhere between 40 and 48 ply. Insofar as hand cutting is used today, it is confined to manufacturers of high-grade shirts, who constitute a minority in the industry.

The newer process of cutting involves the use of electric cutting machines. These permit a far greater thickness of lay, commonly 150 to 200 and often up to 240 ply.

The large majority of shirt manufacturers use a combination of machine and hand cutting. The electrically driven circular or straight knife is used for the major parts and a short hand knife for the curves of the collar and the neck. For finer grades of shirts, when striped or checked materials are used, it is necessary to match the parts in order to secure uniformity of design in each garment.

The parts are next sorted as to size and tied into bundles, each containing a specified number of uniform parts. Each bundle is appropriately marked as to size, lot, and style, for later identification in the sewing department.

Sewing department.—By far the most important department in the production of a shirt, as judged either by labor time consumed or labor cost, is the sewing department. The sewing of a shirt may be divided roughly into three major sections—the preparation of the minor parts, the preparation of the major or body parts, and the assembling of both into a complete garment. The sewing of a typical shirt involves the following operations:

Minor Parts (8 to 17 Operations)

1. Collar making (2 to 4 operations):
   (1) *Collar running.*—This operation consists of stitching two pieces of material together with a lining between them. The pieces are stitched on their reverse sides.
   (2) *Turning.*—The collar is turned so as to have the right side on the outside. This is a hand operation, though some mechanical aid is commonly used.
   (3) *Top stitching.*—A second row of stitching is made along the outer edges of the collar.
2. Collar banding (1 to 5 operations):
   (1) The collar is inserted between a lower and upper piece of collar band and stitched all around its edges, taking in the ends of the collar band.
   (2) The collar band is turned.
   (3) The collar band is stiched to the collar.

3. Cuff making (1 to 4 operations):
   (1) *Cuff running.*—Two pieces of material are stitched together with a lining between them; as in the case of collar making, this stitching is on the reverse side.
   (2) *Cuff turning.*—The cuff is turned.
   (3) *Top stitching.*—The cuff is stitched with a row of stitching along its outer edges.
4. Pocket making (1 to 2 operations):
   (1) The outer edges of the pocket are hemmed and a welt stitch is usually made across the top of the pocket. Sometimes, instead of the operator turning in the edge of the pocket or other parts by hand in the hemming operation, the edges are turned by a creasing machine, resulting in a considerable saving of labor time.
5. Sleeve making (2 to 4 operations):
   The process of sleeve making varies somewhat with the quality of the shirt. In better garments, the sleeve is usually made in one piece. In the case of cheaper shirts, "gores," or inserts, are frequently stitched to the main body of the sleeve. The reason for the use of gores is to utilize strips of material left over from the cutting process which would otherwise be wasted.

   For all sleeves, plackets (reinforcement) are stitched on both sides of the sleeve vent.

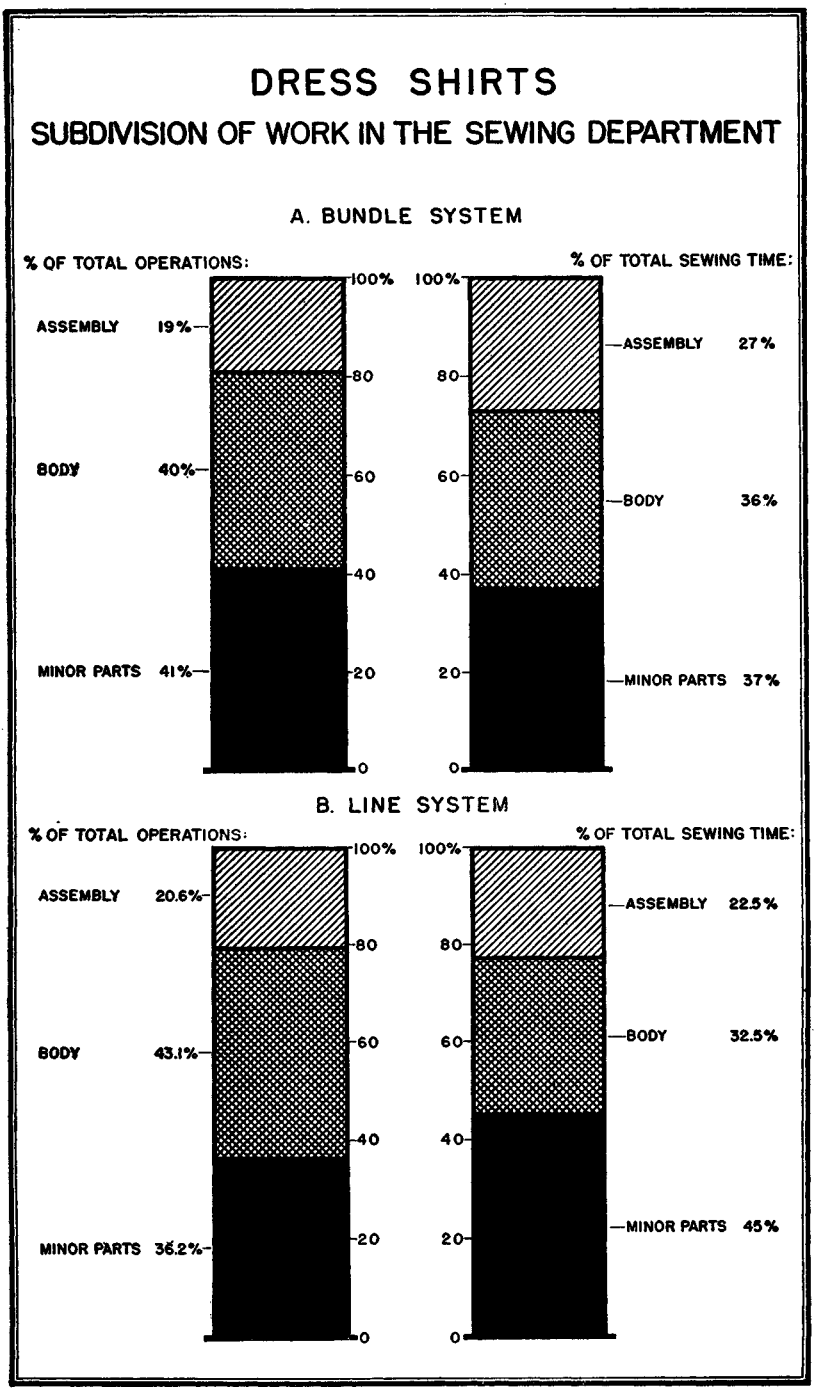
Major or Body Parts

1. The label bearing the trade mark is attached to the yoke of the shirt (1 operation).
2. The yoke is attached to the back of the shirt (1 to 2 operations).
3. The back of the shirt is hemmed around the bottom (1 operation).
4. Both fronts are hemmed around the bottom (1 to 3 operations).
5. A box pleat is stitched to the left front. This consists of a strip of material about 1½ inches wide. It is usually attached to the left front by a two-needle machine (1 operation).
6. *Button stay.*—Either the underfacing of the right front or a separate strip of lining is stitched down the front end of the right front to act as a button stay (1 or 2 operations).
7. The pocket is sewed onto the left front (1 to 2 operations).
8. Buttonholes are cut and stitched around in the box pleat of the left front and in the cuffs and collar band and, for some styles, in the sleeve (1 to 4 operations).
9. *Button sewing.*—Buttons are sewn on the right front, on the cuffs and collar band, and, if needed, on the sleeve (1 to 4 operations).

Assembly of Parts

Although there are many minor variations in the manner of producing the several major or minor parts, the assembly operations are performed in much the same manner in all plants and for all styles. These comprise:

1. *Shoulder joining* (1 to 2 operations).—The yoke with the attached back piece is joined to the right and left fronts.
2. *Sleeve inserting* (1 operation).—The open sleeves are stitched to the shirt at the armhole.
3. *Felling* (1 operation).—The shirts are now closed or felled. This involves closing the sleeves from the lower end to the armhole, and closing the side seams; that is, stitching together the edges of the fronts and the back from the armhole



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to the hem of the shirt. The closing of both the sleeve and side seams is usually done in a single operation.

4. The collar band is now attached to the neck. This involves inserting the body of the shirt between the upper and lower pieces of the collar band (1 to 2 operations).

5. *Cuffing* (1 to 2 operations).—Finally, the cuffs are attached to the sleeves; first the inner and then the outer part of the cuff being attached.

Overalls

As in the case of the other cotton garments, the sewing of an overall may be divided into three major steps—the preparation of the minor parts, the preparation of the major parts, and the assembly of the overall.

Minor Parts (6 to 12 Operations)

1. *Bib* (1 operation).—Two pieces of material of the same size are joined or felled to produce the bib.

2. *Bib pockets* (1 to 3 operations).—The edges of the pockets are first hemmed or serged to prevent raveling. In some plants the edges are turned in on a creasing machine. These pieces are then stitched onto the bib. A few minor variations may be noted in this process; for example, if a pencil or other special pocket is desired, an additional vertical row of stitching will be sewn after the pocket has been attached to the bib, thus forming the special compartment. Sometimes the pocket is lined before it is attached to the bib; in other cases it is unlined.

3. *Watch pocket* (1 to 2 operations).—The watch pocket may either be a compartment of the bib pocket or may be entirely separate. In the latter case, the material is first serged, hemmed, or creased and then attached to the bib. This completes the preparation of the bib.

4. *Side pockets* (1 to 2 operations).—Some overalls are made with regular side pockets instead of the more common front patch pockets. These pockets are made out of a piece of pocket lining and a narrow strip of the material used in the overall. The narrow strip is attached to the upper edge of the lining to serve as a facing. The lower edges are then closed with a serging stitch. In some cases, the lower edges of the lining are closed on a sewing machine that has a cutting attachment, thereby closing the pocket lining and cutting the raw edges outside of the seam in a single operation. The pocket is then stitched to the front part of the leg.

5. *Front patch pockets* (1 to 2 operations).—The pieces for this pocket are first hemmed, serged, or creased and then sewn to the top front of the legs.

6. *Front patch knee reinforcement* (1 to 2 operations).—Overalls made for certain types of workers are reinforced at the knee. Thus, carpenters, who use their knees to a great extent, require such reinforcement. The pieces which constitute the patches are hemmed or serged and then sewn to the knees.

7. *Fly making* (1 to operations).—The fly consists of two small pieces of material, one for each leg. These pieces are first serged or hemmed. Then the fly piece for the left front leg is buttonholed.

8. *Looping* (1 operation).—Some overalls have loops for the purpose of carrying hammers. Loops consist of a narrow piece of goods which is sewn to the back of the leg.

Body Parts

While the small parts are being made by one set of workers, another set is engaged on the body parts. In the plants studied, the preparation of these parts comprises between 7 and 13 operations in plants operating on the bundle system. In plants using the line system, the subdivision of work was considerably finer, ranging from 11 to 17 operations.

1. *Setting fly* (1 to 4 operations).—The right fly piece is first sewn to the top of the right front leg. The left fly piece (the one containing the buttonhole) is sewn to the top of the left front leg.

2. *Bib joining* (1 to 3 operations).—The bib is stitched to the two front legs. This operation is called banding. The three free edges of the bib piece are hemmed for reinforcing purposes. Sometimes small pieces are stitched to the bib at the points at which the buttons are to be sewed. In a few cases, instead of hemming, an inner tape is attached to the edges.

3. *Back-pocket making* (1 to 2 operations).—The pocket pieces are hemmed and then stitched to the back legs of the overall. Sometimes one of these back pockets is specially formed in order to hold a rule.

4. *Label sewing* (1 operation).—The identifying label is sewn to either the bib or the back of the overall, sometime during the manufacturing process. (14 of the plants studied sew the label to the back, two sew it to the bib, and one sews labels on both bib and back.)

5. *Suspender making* (1 to 3 operations).—The two suspender straps are stitched to the top of the back and then their edges are hemmed. Where the two straps cross (the diamond), an extra stitch is added for reinforcement.

6. *Buckle and loop* (1 to 2 operations).—In most cases, the metal buckles and loops for fastening the suspenders to the bib are attached to the straps mechanically. In a few instances, the buckle is stitched to the shoulder strap.

Assembly of Parts

The remaining process is one of assembly, which comprises from 8 to 10 operations.

1. *Outer seaming* (one operation).—The outer edges of the front and back of each leg are joined or seamed.

2. *Inner seaming* (one operation).—The inner edges of the two legs are stitched together. This consists of a single operation in which the operator starts from the bottom of the left leg, runs the garment to the crotch, and then stitches down the right leg.

3. *Seat seaming* (one operation).—The remaining open seams in the seat and crotch are stitched.

4. *Fork to fly* (one operation).—Reinforced with tape stitch from fly to crotch.

5. *Leg bottoms* (one operation).—The bottoms of the leg are hemmed or the edges are turned.

6. *Bar tacking* (one operation).—Any parts which will receive hard usage, such as the fly, the open end of the pockets, etc., are reinforced with a short extra seam, or bar seam, at right angles to the original seam; this is called bar tacking.

7. *Buttonholes* (two operations).—Buttonholes are cut and sewn around in the suspenders and sometimes in the bib pockets.

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8. *Button sewing* (one operation).—Buttons are attached to the fly, suspender, and at any other necessary points. In most cases, all buttons are sunk into the garment, but in a few cases the fly buttons are sewn.

Work Pants

The three major sections of a sewing department in a work-pants factory are the manufacture of minor parts, the manufacture of major parts, and the assembly.

Minor Parts

1. *The fly* (one to two operations).—The fly pieces are first serged around the edges and then a lining is attached for reinforcement. A buttonhole is made in the upper end of the piece which will be attached to the right leg.

2. *Belt looping* (two operations).—A narrow strip of the same material as that used in the pant is inserted into a gage attachment on the sewing machine. Through the aid of a cutting device, the loops are cut to the desired length and sewn. This device takes the place of scissors, which were formerly employed, and is a substantial timesaver.

3. *Side pockets* (two operations).—The side pocket is produced in exactly the same manner as that described in connection with overall manufacture.

4. *Watch pocket* (two operations).—The manufacture of a watch pocket comprises the same operations as those required in connection with the side pockets.

5. *Hip pockets* (two operations).—This process is the same as for the side pockets.

6. *Buckles and straps* (one operation).—If the pant is to have buckles and straps, these are first prepared in much the same manner as the belt loops. Four of the 17 plants studied perform this operation.

Body Parts

The body of the pant consists of four parts—the front and back of the right leg and the front and back of the left leg.

1. *Front of right leg* (1 to 4 operations).—For better garments, the edges of the material are serged in order to prevent raveling. This process is omitted for cheaper garments. (Eight of the 17 plants covered by the study perform this operation.) The side pocket and watch pocket are then attached.

2. *Front of left leg* (1 to 3 operations).—The process here is the same as for the front of the right leg, except that there is no watch pocket to attach.

3. *Back of right leg* (1 to 4 operations).—As in the case of the front of the right leg, the edges of better garments are first serged. The hip pocket is then inserted. This requires the cutting of an opening in the material. In some cases, this opening has already been prepared in the cutting room. In most cases, however, there is a special attachment on the machine which automatically cuts the opening at the same time that the pocket is sewn in. The edges of the opening are then restitched or welted.

4. *Back of left leg* (1 to 4 operations).—The process is identical with that for the back of the right leg.

5. *Fly joining* (1 to 3 operations).—The fly pieces are attached to the fronts of the right and left legs.

6. *Buckles and straps* (1 operation).—If the trouser has buckles and straps, these are attached to the back.

Assembly of Parts (13 to 20 Operations)

The final assembly operations are now performed.

1. *Outseaming* (1 to 2 operations).—The outer edges of the front and back of the right leg and then of the front and back of the left leg are joined. The side pockets, which have been previously attached to the fronts, are stitched to the backs and restitched or welted for strengthening.

2. *Waist band* (1 to 4 operations).—The waist band itself consists of two parts—an outer strip of the same material as the pant and an inner strip of lining for strengthening purposes. The outer strip is first sewn to the top of the front and back; the loop straps are then inserted at the proper intervals; and the corners at the top of the front at the fly opening are formed. The inner lining is then sewn to the top of the waist band and the lower edge of the lining stitched to the inner bottom of the waist band. This last row of stitching usually takes in the tops of the side pockets in order to keep them in place.

3. *Inseaming* (1 operation).—The inner edges of the front and back of the right leg are joined from the bottom to the crotch and then the stitching is continued down the inner seam of the left leg.

4. *Seat seaming* (1 to 2 operations).—The inner edges of the back of the right and left legs from the crotch upward are stitched together. A number of manufacturers serge the seam for reinforcement.

5. *Crotch taping* (1 to 2 operations).—The remaining open edges between the crotch and the bottom of the fly are now stitched together. A strip of lining, called the crotch tape, is sewn over this seam.

6. *Buttonholes* (1 operation).—Buttonholes are sewn on the hip pocket and on the left front of the waistband.

7. *Button sewing* (1 to 2 operations).—Buttons are attached to the fly, the waist band, and the hip pocket.

8. *Leg bottoms* (1 to 2 operations).—For better garments, the bottoms of the trousers are serged or overcast to prevent raveling. The bottom is then turned and sewn into a cuff.

9. *Bar tacking* (2 to 4 operations).—Since work pants are made for hard wear, it is necessary to reinforce the ends of various seams, such as those in the pockets, the fly, the loops, and the cuffs for strengthening. This strengthening stitch, called a bar tack, is usually at right angles to the regular stitch.