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Chapter 2. Scope and Methods of the Study

Industrial Sectors Studied

Merger activity will be examined only for the manufacturing and mining sectors of the economy. The study was undertaken to learn more about the merger boom at the turn of the century, and it was found, as anticipated, to have been dominated by manufacturing and mining. A concentrated investigation of these two areas was selected as more promising than an attempt to cover all sectors, in some of which (services, for example) results might be inconclusive or unimportant anyway.

An equally important reason for limiting the study to the manufacturing and mining industries was availability of data. Much of the information on mergers was obtained from financial newspapers and other business reporting services. Aside from the transportation, public utilities, and finance industries, the only ones for which information was at all adequately reported were manufacturing and mining. This was probably because the average firm size in those industries was larger than in the trades, services, construction, and agriculture. It is likely, too, that relatively more of the companies in manufacturing and mining achieved national importance. Another factor may be the greater prevalence of the corporate form of organization in manufacturing and mining. Incorporation required periodic reporting of information.

Previous Merger Series

In only a small minority of merger studies have comprehensive time series of merger activity been compiled.[1] The purpose of this study is to augment these comprehensive series in two ways, as reflected in Table 2. First, it represents an examination of the large turn-of-the-century merger wave more complete than those of existing studies, which contain serious deficiencies. Second, it bridges the gap in comprehensive merger series between 1904 and 1919. Up to now the pattern of merger activity in this period has been a mystery.

Of the four lists that were available for study of the first large merger movement, two end in the middle of the huge 1898–1902

[1] For a detailed description and survey of merger literature see: Jesse Markham, "Survey of the Evidence and Findings on Mergers," in *Business Concentration and Price Policy*, Princeton University Press for National Bureau of Economic Research, Special Conference series No. 5, 1955, pp. 141–182.

TABLE 2

Comparison of Comprehensive Time Series of Mergers in Manufacturing and Mining

Compiler	*Period Covered*	*Time Unit*	*Measure of Mergers by Number of—*	*Measure of Size of Mergers by—*	*Industrial Breakdown*
Bureau of Census	Pre-1887 to mid-1900	Q (derived)	Consolidations	Capitalization of consolidations	13 broad categories
Conant	Pre-1887 to 1900	A	Consolidations	Capitalization of consolidations	None
Moody	Pre-1887 to 1903	A	Consolidations	Capitalization of consolidations	None
Watkins	1890 to 1904	A	Consolidations	Capitalization of consolidations	None
Nelson	1895 to 1920	A & Q	Consolidations, firm disappearances by consolidation, and firm disappearances by acquisition	Capitalization of consolidations, estimated capitalization of acquisitions	Two-digit SIC categories
Thorp	1919 to 1939	A & Q	Consolidations, firm disappearances by consolidation, and firm disappearances by acquisition	No size data	10 broad categories, 1919–1928; none, 1929–1939
Federal Trade Commission	1940 to 1954	A & Q	Firm disappearances (those by consolidation and by acquisition not segregated)	Detailed breakdowns by size of acquiring and acquired firms	Two-digit SIC categories

A=annual; Q=quarterly.

For the various series, see:

Twelfth Census of the United States, 1900, Bureau of the Census, Volume VII, Part 1, pp. xxv ff.

Luther Conant, "Industrial Consolidations in the United States," *Publications of the American Statistical Association, 1901.*

John Moody, *The Truth About the Trusts*, Moody, 1904, pp. 453–469.

Myron Watkins, *Industrial Combinations and Public Policy*, Houghton Mifflin 1927, pp. 317–324.

Willard L. Thorp, in *Recent Economic Changes in the United States*, National Bureau of Economic Research, Volume 1, 1929, pp. 181–187; and "The Merger Movement," in *The Structure of Industry*, Temporary National Economic Committee, Monograph No. 27, 1941, Part III, pp. 231–234.

For 1940–1947, *The Merger Movement, A Summary Report*, Federal Trade Commission, 1948; for 1948–1954, *Report on Corporate Acquisitions and Mergers*, Federal Trade Commission, 1955. The quarterly series for 1948–1954 may be derived from the list of mergers compiled by the FTC and presented in the *Interim Report of the Antitrust Subcommittee* (No. 5), 1955, of the House Committee on the Judiciary, 84th Cong., 1st sess., pursuant to H. Res. 22 on corporate and bank mergers.

wave—Conant's at the end of 1900, and the Census Bureau's in mid-1900. Comparison of the four compilations on a name-by-name basis revealed considerable differences, attributable in part to the different time periods covered: Conant's from pre-1887 through 1900; Moody's from pre-1887 through 1903, Watkins's from 1890 through 1904; and the Census Bureau's from pre-1887 through mid-1900.

Comparison of the four series made for the years common to all showed differences in the number of consolidations listed. In Table 3, for the period 1890 through 1900, it will be seen that the lists

TABLE 3

Comparison of Four Merger Series for 1890–1900

Consolidations Common to—	*Number of Consolidations*		*Percentage of Total*	
Four lists:				
Moody, Conant, Watkins, and Census		62		18.7
Three lists:				
Moody, Conant, and Watkins	16		4.8	
Moody, Conant, and Census	23		6.9	
Moody, Watkins, and Census	3		0.9	
Conant, Watkins, and Census	26	68	7.8	20.4
Two lists:				
Moody and Conant	5		1.5	
Moody and Watkins	5		1.5	
Moody and Census	3		0.9	
Conant and Watkins	27		8.1	
Conant and Census	13		3.9	
Watkins and Census	3	56	0.9	16.8
One list:				
Moody	48		14.5	
Conant	37		11.2	
Watkins	24		7.2	
Census	37	146	11.2	44.1
Total		332		100.0

were more different than they were similar. Of the 332 consolidations listed for the period, 202 consolidations, or 61 per cent of the total, were found on only one or two of the lists; while 130, or 39 per cent, were found on three or on all four of the lists. Only 62 were common to all four lists, whereas 146 appeared on only one list.

ADMISSION CRITERIA

The differences result in part from the different modes of constructing the lists. Each compiler made his own rules governing inclusion and exclusion. The criteria for inclusion in each of the lists are shown in Table 4.

TABLE 4
Admission Criteria of Four Lists of Merger Activity

Criterion	*Moody*	*Conant*	*Watkins*	*Census*
Minimum size of consolidation	$1,000,000	$1,000,000	$1,000,000	No apparent limit
Authorized or issued capital	Issued	Authorized	Authorized	Not relevant
Capital types required	Equity and debt	Equity	Equity and debt	Not relevant
Geographical areas included	Local and National	Local and National	National	Local and National
Legal forms included	Wide variety	Wide variety	Wide variety	Narrow definition

The Moody list, moreover, differed markedly from the others in not being presented as a time series. It listed all the consolidations in alphabetical order and with dates given by the year in which the latest incorporation of each company took place. Thus the date might refer to a true consolidation of independent firms, a consolidation of already controlled corporations into a tighter corporate structure,[2] or simply a reorganization for some other reason.[3] Thereby, also, it excluded from mention all previous consolidations that had entered into subsequent consolidations.[4] This last bias in the Moody list has two effects. First, it understates the number of mergers over any extended period of years. Second, it produces an apparent time lag. This pattern is demonstrated in Table 5, comparing Moody's series with Watkins's. Of the two, the Moody series has a larger percentage of its consolidations in the later years of the 1890–1903 period.

ERRORS AND OMISSIONS IN THE EARLIER LISTS

In explaining differences among the four lists, the factor of accuracy in reporting is probably more important than the criteria

[2] For example, Consolidated Tobacco, incorporated in 1901 and listed by Moody for that year, was not a true consolidation. It merely replaced a loose community of interest controlling various tobacco companies by a holding company.

[3] For example, General Asphalt, listed for 1903. This was the reorganization, with no new acquisitions, of National Asphalt which was a 1900 incorporation succeeding the Asphalt Company of America, an 1899 consolidation.

[4] For example, Moody lists U.S. Steel for 1901. He does not list the previous consolidations of American Steel and Wire (1898), National Tube (1899), Federal Steel (1900), etc., all of which were consolidated into U.S. Steel in 1901.

TABLE 5

Mining and Manufacturing Consolidations, 1890–1903, as Compiled by Moody and Watkins

	Moody		Watkins	
Year	*Number*	*Percentage of total*	*Number*	*Percentage of total*
1890	2	0.71	11	4.80
1891	7	2.49	13	5.68
1892	7	2.49	12	5.24
1893	7	2.49	5	2.18
1894	3	1.06	0	0.00
1895	6	2.13	3	1.31
1896	5	1.77	3	1.31
1897	5	1.77	6	2.62
1898	12	4.26	18	7.86
1899	74	26.24	78	34.06
1900	27	9.57	23	10.04
1901	46	16.31	23	10.05
1902	63	22.33	26	11.35
1903	18	6.38	8	3.50
	282	100.00	229	100.00
1890–1893		8.18		17.90
1894–1898		10.99		13.10
1899–1903		80.83		69.00

Detail may not add to totals because of rounding.

just discussed. All four overstated the number of consolidations, to a degree varying among lists and with different years. The chief cause of overstatement was the inclusion of projected but never consummated consolidations.[5] Another cause was the inclusion of nonmanufacturing and nonmining mergers in the lists.[6] A third cause of overstatement was the inclusion of both an original consolidation and its subsequent reincorporation, with no further acquisitions, in a later year.[7]

[5] For example, Watkins lists Federal Sewer Pipe as an 1899 consolidation. This proposed merger was never consummated, and many of the companies involved were consolidated in 1900 as American Clay Manufacturing. He also lists American Vinegar as an 1899 consolidation, but early in 1900 the *Chronicle* commented that it was "now counted as one of the dead projects of the year."

[6] Great Lakes Towing, for instance, listed by Moody, Conant, and Watkins for 1899, is a transportation company; United Gas Improvement, listed by Watkins in 1895, is a public utility; Consolidated Lake Superior, listed by Moody in 1897 and Conant in 1899, is a consolidation of three power companies and of one steel company. The bonds of the steel company were underwritten by the Ontario government.

[7] For example, Conant listed for 1895 American Spirits Manufacturing, incorporated that year. This was merely a reorganization of Distilling and Cattle Feeding, a consolidation of distilleries, incorporated in 1891 and listed by Conant for that year also.

In addition to these shortcomings, the four lists lacked completeness in the description of other dimensions of the merger movement. They enumerated consolidations only, without the names or numbers of firms disappearing into these consolidations. As to time units, only the Census list gave the dates of consolidation more precisely than by year of occurrence. Classifications by industry were not undertaken, nor were classifications by geographical location or by type of market.

To list only consolidations meant that the important practice of merger-by-acquisition was excluded, with very few exceptions. While it is true that the simultaneous consolidation of a number of firms into one company was the most common form of merger in this period, there were some important exceptions. The acquisition, one at a time, of independent firms over an extended period of time was characteristic of several important industries, notably the tobacco, meat packing, and gunpowder and explosives industries. The four lists lumped all this activity, if mentioned at all, at the date of a formal incorporation or consolidation, and hence to some extent distorted the true time pattern of the merger movement.

The New List

In view of the demonstrated differences among the four existing lists, and their errors and inadequacies, it was felt that an independent list should be assembled, which could serve as a check on the four and as a source for mergers possibly omitted in them. The fifth list contains both consolidations and acquisitions, and includes consolidations whose size was less than $1 million.[8]

The new list covers the period from 1895 through 1920. The research was originally planned to deal with the period from 1903 through 1920, that is, the period following the large wave of mergers between 1897 and 1903. As the inadequacies of the data on the large wave became apparent, a more complete re-examination of the period of intense activity seemed necessary. The year 1895 was chosen as the starting point because it was a time of low merger activity between the smaller 1887–1893 wave and the larger 1897–1903 wave of mergers.

The principal source of data for the new list was the weekly *Commercial and Financial Chronicle.*[9] All items on mergers from

[8] The $1 million lower cut-off limit, used in three of the existing lists was considered ambiguous for reasons discussed later in this chapter.

[9] Moody, Conant, and Watkins used this source also. I decided to use the same source to test the apparently too uncritical acceptance of it as completely reliable.

the investment news pages of this paper from 1895 through 1920 were recorded, and supplemented by information from special government reports on the steel, tobacco, and meat packing industries.[10] The new list and the four existing lists of mergers consolidated into one were used to compile a verified list of mergers.

VERIFICATION

Every consolidation was verified by a standardized follow-up procedure. The subsequent record of the firm was obtained by checking its activities as reported in the *Chronicle* and by reference to Moody's Manual, and Poor's Manual, so far as available for the year of the consolidation and the four following years. In this way one could determine with some confidence whether a consolidation had in fact been consummated, and had continued for a definite period of time. One could also usually obtain indications whether the merging firms had been independent or whether control had been in effect before the merger. This process of verification, alone, was clearly inadequate. The financial reporting services, for industrial companies at least, were in their infancy during most of the period covered. The first Moody's Manual was published in 1900, the first Thomas's Register in 1905–1906, and the first Poor's Register in 1910. Some of the consolidations were closely held corporations which would appear in the news columns only once, at the time of consolidation. Their absence from later financial news reports signified only that the business was keeping its affairs private, and not that the consolidation had not been consummated. Moreover, company name changes were not always reported by the financial news services. Therefore, news reports for the period immediately after the merger must be searched to discover name changes and dropping from public view. In the later years of the period the financial reporting services could be relied on more, as having achieved more nearly universal coverage of industrial firms.

A secondary verification procedure was therefore necessary. The companies excluded from the list in the first follow-up check were checked successively in Moody's and Poor's Manual for 1919, in the list of consolidations that Livermore[11] used in his test of the success of industrial mergers; and in the 1907–08, 1909–10, 1914,

[10] *Report of the Commissioner of Corporations on the Tobacco Industry*, Part I, Bureau of Corporations, 1909. *Report of the Federal Trade Commission on the Meat Packing Industry*, Federal Trade Commission, 1919. *Steel—Acquisitions, Mergers and Expansion of 12 Major Companies 1900–1950*, Hearings before the House Select Committee on Small Business, 81st Cong., 2d. sess., March 10, 1950.

[11] Shaw Livermore, "The Success of Industrial Mergers," *Quarterly Journal of Economics*, November 1935, pp. 68–96.

1921, 1923–24, and 1925–26 issues of Thomas's Register of Manufacturers. The secondary test added twenty-five consolidations to the list from among 110 excluded in the first verification procedure. Further verification attempts were believed likely to produce sharply diminishing returns.

Verification of mergers-by-acquisition was necessarily less thorough because detailed information on a year-by-year basis for subsidiary and legally merged firms was scanty. However, corroboration of a substantial fraction of acquisition disappearances was accomplished by reference to brief firm histories commonly included in the annual reports of acquiring firms listed in subsequent financial manuals. If such corroborating information was lacking, the rule was to take at face value definite statements of an acquisition in the financial news, and to reject news items phrased in the indefinite terms of rumor and prospective consummation. A substantial proportion of the acquisitions listed were in the tobacco, meat packing, steel, and explosives industries for which there was ample corroborative evidence in the form of special government reports.

DETAIL IN DESCRIPTION

One of the valuable products of this system of verification was the accumulation of detailed information about the various consolidations and acquisitions included in the recompiled list of mergers. The news items in the *Chronicle* and the brief histories and financial statements presented in the various reporting services afforded a cross-check. In this way the names and other information about acquired and acquiring firms could be checked, dates could be verified, and the real or pseudo independence of merging firms could be more clearly determined. In each merger an attempt was made to list the names of all the acquired companies. This was largely successful, but not completely so. Occasionally a consolidation would be reported as having acquired a number of companies whose names were given, accompanied by the phrase "and several more," or "and a few others," or "and many others." The word "few" was taken to mean two firms, while "several" and "many" were taken to mean three firms. There were gratifyingly few instances in which no names at all were available.

Care was used in examining lists of acquired firms to avoid counting as two or more companies those apparently under the same control. The rule was to look for identical firm names or for the reappearance, in a different title, of the same owner's name for firms located in the same city or in different cities in the same geographical region. Each consolidation represented a minor piece of detective work, and often a bit of guesswork. However, the writer thinks that, by and large, very little of such double counting got into the merger series.

A further word about the sources of data is in order. The three major sources of detailed information about the various mergers were the *Commercial and Financial Chronicle, The Truth about the Trusts,*[12] and Moody's Manual. The *Chronicle* contains in its investment news pages not only prospectuses of many projected consolidations but also the annual reports filed by those firms with the New York Stock Exchange to qualify for listing. In *The Truth about the Trusts,* Moody described the particulars of approximately 115 consolidations, and his Manual also provides a wealth of information, probably drawing heavily upon the *Chronicle.* Used in conjunction with the weekly news items about the activities of a firm under examination, these sources often contributed to rounding out the picture of a merger.

INDUSTRY CLASSIFICATION

Another product of the verification procedure was complete enough description of companies to permit detailed classification by industry. The Standard Industrial Classification system of the Bureau of the Budget, as revised in 1945 for manufacturing and 1949 for mining,[13] served as the basis of classification. More than 95 per cent of the mergers were described in sufficient detail to permit classification into three-digit categories. The main problem of classification was created by companies engaged in both manufacturing and mining. If data were sufficient, such a company was placed in the industry of its major activity; if not, the classes described in Table 6 were used. Table 6 should not be interpreted as a selection of industries in which vertical mergers were important. It refers only to those where it was not possible to determine whether manufacturing or mining was the major activity.[14]

CHRONOLOGICAL ACCURACY

One of the purposes of re-examining the early merger movement was to improve the accuracy with which the dates of the mergers

[12] John Moody, *The Truth about the Trusts,* Moody, 1904.

[13] *Standard Industrial Classification Manual* (Bureau of the Budget, Technical Committee on Industrial Classification), Vol. I, Part 1, November 1945; Vol. I, Part 2, December 1945; and Vol. II, May 1949.

[14] The level of industry classification to which mergers were assigned was the three-digit level. These groupings were used as the basis for later assembly of two-digit classes. As the three-digit groups generally included relatively broad categories of industries, classification by industry usually presented no serious problem.

TABLE 6

Assignment of Industry Classes to Mixed Manufacturing and Mining Companies

Manufacturing Category		*Mining Category*		*Classification Adopted*
Activity or product	*SIC number*	*Activity or product*	*SIC number*	*SIC number*
Coke products	293	Bituminous coal	121	121
Granite products	328	Granite quarrying	141	141
Cement	324	Cement quarrying	142	142
Lime	327	Limestone quarrying	142	142
Talc refining	329	Talc mining	149	149
Iron and steel	331	Iron ore	101	331
Salt refining	289	Salt mining	147	289

were recorded, so that a more detailed time series, permitting more exact comparisons with business cycle data and other sub-annual time series data, could be presented.

The rule used in assigning dates was to record the date when control of the acquired company passed to the acquiring company, whenever this date was given. For a consolidation the date of incorporation was used if the date of transfer of control was not specifically mentioned. For a merger-by-acquisition lacking specific information, the procedure was: the month was determined by the appearance of a news item in the *Chronicle*; if the news item appeared after the tenth of the month, that month was recorded; if before the tenth day, the preceding month was recorded. This rule was waived, however, if indirect reference in the news item ("recently," or "some months ago," or a season of the year) indicated a different date of merger. Estimating the date of transfer of control was often furthered by a succession of news items describing various legal and financial actions leading to a merger, such as stockholders' meetings, the filing of applications for capitalization change, and settlement of minority shareholder suits.

These date-of-merger data, in sub-annual form, are presented as a quarterly series. A time unit as short as three months, it is believed, will do no great violence to the facts, while still permitting comparisons with other sub-annual data.

ADJUSTMENT FOR NUMBER AND SIZE OF ACQUISITIONS

The only merger-size data approaching universal availability were those of the authorized equity capitalization of consolidations. More detailed data of consolidation sizes, describing issued capitalization (either including or excluding debt), or gross assets, or sales, were found for only relatively few consolidations. Accordingly, authorized equity capitalization, though subject to many limitations, was adopted as the measuring stick of size.

In making interindustry and intertemporal comparisons of merger activity, the size of consolidations, taken alone, could be misleading, because the relative importance of mergers-by-acquisition varied between industries and between time periods. To make such comparisons more accurate, the consolidation capitalizations were adjusted by the number and size of acquisitions.

These "written-up" capitalizations are called here "merger capitalizations." Conceptually this designation comes closest to being the sum of the sizes of the merging firms. It thus includes all firms entering multifirm consolidations, where all firms are assumed to have been subordinated to the newly created corporation. It also includes firms disappearing into larger firms through direct acquisition of control. The consolidation data would be made more comparable to the acquisition data if one could deduct from the capitalization of consolidations the size of the largest firm entering each consolidation, the largest firm being assumed to have acquired all of the smaller firms. This adjustment was not possible, however, because of the lack of pre-merger size data for firms entering consolidations.

Estimates of the size of firms disappearing into mergers-by-acquisition were based on limited data collected as a by-product of the compilation and verification procedure. Frequently mention was made in the various financial news services of the gross assets, capitalization, or purchase price of such a firm. These data were used as the basis for estimating the size of acquired firms. The estimates are thus based on a mixture of measures of firm size, on the assumption that all the measures were roughly equivalent.

The series of merger capitalizations was built up as follows. The consolidation capitalization of a given three-digit product group for a given quarter-year was written up by the actual amount of the acquisition, if available. An acquisition for which no size was given was assigned a value equal to the average of the observed sizes in the product group, or, lacking more than one observation, a value equal to the average of the observed sizes for the two-digit industry of which it was a part.

The question of fluctuation of capital prices naturally arises. Available price indexes of manufacturing and mining capital indicate that capital prices fluctuated within relatively narrow limits in the period 1895–1914, and then rose rapidly in the period 1915–1920. To reduce the error that arises when prices taken from both periods are included in the average, the 1895–1914 consolidations were written up by values based upon the observed sizes of 1895–1914 acquisitions, and the 1915–1920 consolidations by values based upon 1915–1920 acquisitions. Size data were available for 464 of the 974 disappearances by acquisition in the period 1895–1914, and for 167 of the 536 acquisition disappearances of 1915–1920. The industrial representation of acquisitions with size data was quite wide for both periods, and permitted the writing up of consolidation capitalizations at the three-digit product group level in most cases.

CONSOLIDATION CAPITALIZATIONS VERSUS GROSS ASSETS

The measure of consolidation size adopted in this study was authorized equity capitalization. The vast majority of consolidations of this period—all of them until 1913—used par-value common stock. After 1913 no-par common stock became more popular; of the 133 consolidations of 1913–1920 having size data, 46 issued no-par common stock. To achieve a more exact estimate of authorized equity capitalization than that provided by authorized par-value preferred stock capitalization alone, the gross assets of the consolidation were used as the estimate of authorized capitalization.

A limited empirical test indicates that the adoption of gross assets as an approximation of "total" authorized equity capitalization probably distorts the capitalization series very little. The seventy 1895–1920 consolidations for which data on both authorized par-value common stock equity capitalization and gross assets are available show a surprisingly high degree of similarity between the two measures. Apparently there was a rough compensation process at work, with the difference between issued and authorized equity capital being roughly matched by issued debt capital. Since the balance sheets described the condition of the firm at the time of the consolidation or shortly after, the effect of earnings on the asset–capital ratio could not appear on the balance sheet at that point.

This description of the assembly of the capitalization data would be incomplete without a warning concerning their reliability. Often an asset value for a business greatly in excess of its true value was suggested by the amount of authorized (and issued) capital. Stock watering was commonplace at the turn of the century, and the popularity of such financial chicanery may have varied with the intensity of stock speculation. While it seems reasonable to expect that such manipulation might affect all industries in a roughly similar way, groups of promoters commonly being active in many industries at the same time, it is not certain that stock watering was uniform over time. Thus we cannot be sure that the capitalization series provides a wholly accurate picture of the amplitude of changes in merger activity.

If issued capitalization data had been available generally—rather than for only a few consolidations—it would have been a more accurate measure of merger size for consolidations than the authorized capitalization. While issued capital stock might be substantially watered, at least the consolidation size would not be overstated to the extent of the unissued stock. With issued capitalization for so few consolidations, it was not possible to make an appropriate adjustment of the authorized capitalization data. It is the author's impression—and it cannot be offered as anything but a very general impression—from these procedures that the turn-of-the-century consolidations usually issued all or nearly all of their authorized stock, while later ones often left a substantial part of it unissued. Greater success might be expected in times of heavy speculation than in times of more orderly market activity. If these suppositions are correct, this would have the effect of offsetting the overstatement of turn-of-the-century merger activity caused by excessive stock watering.

TOTAL VERSUS INCREMENTAL MEASURES

There are two ways of quantitatively describing merger activity, each suited to shed light on a particular set of economic problems. One expresses merger activity in terms of the total number and size of firms in which merger activity took place. The other measures it by the increase in the size of firms through merger; that is, merger activity is measured relative to the size of the to-be-merged firms at the beginning of the period under study. The most plausible rule for assigning size increases is to regard the larger of two merging firms as the acquiring firm, and the smaller of the two as the acquired firm.

For the 1895–1920 period of merger activity, a description only in terms of the first or "total" dimension is possible. The other approach must be foregone because the available data are not of sufficient detail to reveal the sizes of acquiring and acquired firms. Approximately 70 per cent of those that disappeared during the period were absorbed into multifirm consolidations, for which size data on subsidiary companies are notably sparse. Of the remaining 30 per cent that disappeared through merger-by-acquisition, more than half (58 per cent) had no size description.

Therefore, a measure based on the "total" dimension, or the total number and sizes of merging firms, was adopted to express merger activity.

CUT-OFF LIMIT

The reliance of this study on the financial reporting services as the source of data introduces certain sampling biases. It is quite certain that many smaller mergers escaped the attention of the financial news reporters. We are thus dealing with a relatively more complete listing of large than of smaller mergers.

To handle a sampling bias of this kind the device of the lower cut-off limit is commonly used. The function of the cut-off limit, which excludes from the list all mergers below a given size, is to give the investigator reasonable assurance that his sample represents a fairly complete list of large mergers, or at least a list permitting a reasonably satisfactory analysis of biases. This in turn permits reliable description of various dimensions of the merger movement, for mergers above the given size level. It also makes possible more reliable intertemporal comparisons of merger activity—an important consideration when the reporting procedures and biases may not be comparable for different merger studies and different periods in history.

A cut-off limit was not employed in assembling the data on mergers in this study, for two reasons. First, a cut-off limit that would attempt to omit mergers in which the acquiring (larger) firm was below a given size was precluded by the lack of data on pre-merger firm sizes. Second, no matter whether acquiring-firm size or merged-firm size were used, the predominance of simultaneous multifirm mergers in the early movement would introduce a considerable amount of ambiguity into the cut-off procedure and result in a dubious exclusion policy. For example, assuming a cut-off limit for merged-firm size of $1,000,000, the acquisition of a $350,000 firm by a $640,000 firm would be excluded, while the simultaneous consolidation of three $340,000 firms would be included. If a cut-off limit for acquiring-firm size of $500,000 were used, the three-firm merger would be excluded, and the two-firm merger would be included. In neither case does it seem desirable to include one of the mergers and not the other.

The data, when assembled, give some indication that smaller mergers were not nearly as fully reported as larger ones. There appears to be a fairly sharp drop in the number of reported mergers below certain sizes.[15] Moreover, the cut-off size shifts upward in the last six years of this period, roughly matching the rise in capital prices.[16] Whether this reflects a policy by the *Chronicle* of excluding mergers below a constant real size cannot be known. Perhaps it reflects an unstated upward revision, in the face of rising prices, in the money value of what represented a newsworthy merger.

STANDARDIZATION

In the light of the apparent large degree of underreporting of small mergers, and of a substantial rise in capital prices in the last six years of the period, certain adjustments in the data were required to make the series comparable over the whole twenty-six-year period. This was done by eliminating from the series the mergers below the points in the size scale at which the consolidations and acquisitions series "cut themselves off." Since the dollar size of the shift in the "built-in" cut-off limits between 1895–1914 and 1915–1920 roughly corresponded to the increase in the capital price level, this also had the effect of eliminating firms below the same physical size level. Thus the standardized series is at least partially free from the distortions produced by the shifting of reporting coverage and of price levels.

Consolidations less than $1,000,000 in size were eliminated in

[15] The following table shows the size distribution of reported consolidations and acquisitions for which some measure of size is given:

Consolidations			*Acquisitions*		
Size range (thousands)	*Average number of consolidations per $500,000 class interval* 1895–1914	1915–1920	Size range (thousands)	*Average number of acquisitions per $130,000 class interval* 1895–1914	1915–1920
$ 0– 499	5	1	$ 0– 14	52	0
500– 999	17	5	15– 34	65	7
1,000– 1,499	33	5	35– 64	104	13
1,500– 1,999	22	2	65– 134	78	22
2,000– 3,499	25	6	135– 264	40	11
3,500– 6,499	16	4	265– 434	38	8
6,500–13,499	7	2	435– 564	31	8
13,500–36,499	2	0.4	565–1,164	25	7
			1,165–2,834	6	3
			2,835–4,164	3	2
Cut off point	$1,000,000	$2,000,000		$35,000	$65,000

[16] The 1919 price index of the book value of manufacturing capital was 75 per cent above its value for 1904, the mid-year of the earlier period 1899–1914; and 86 per cent above its value for 1900, the central year of the short 1898–1902 period of greatest merger activity. These figures are given by Daniel Creamer, in *Capital and Output Trends in Manufacturing Industries, 1880–1948* (National Bureau of Economic Research, Occasional Paper 41, 1954), p. 52, Chart 4.

the period 1895–1914, and those less than $2,000,000 in the later 1915–1920 period. Acquisitions smaller than $35,000 were removed from the 1895–1914 series, and the cut-off point for the 1915–1920 series was $65,000.

The large disparity between the cut-off limits for consolidations and acquisitions is somewhat disturbing; for both periods the cut-off limit for consolidations is about 30 times that for acquisitions. To some extent, the disparity might be expected. The acquisition data probably contain less overstatement of the real sizes of acquired firms than the data for consolidations. While much of the acquisition purchase-price data no doubt contains water, the amount of water is probably not as excessive as in the consolidation data. Also, the overstatement of consolidation size by the excess of authorized over issued capitalization was not as likely to be present in the acquisition data, in which purchase prices commonly represented the issued capital of the acquiring firm. Then, too, it could be argued that the merging activity of firms would be more likely to take the form of a consolidation if the acquired firm were large relative to the acquirer, and the form of an acquisition if the acquired firm were small. Thus we might expect to find disappearing firms systematically larger in consolidations than in acquisitions. Without dependable guides for adopting any particular ratio of consolidation to acquisition cut-off limits, it was decided to adopt those values at which the two series "cut themselves off."

Comparison of the New List with Previous Studies

The process of compilation used in this study has produced a list of mergers much more comprehensive than the four previous ones. Mergers-by-acquisition were included for the first time, and more mergers-by-consolidation than were in the other lists (see Table 7). Moreover, the additional consolidations were almost all in the above $1 million size group covered by the previous lists.

Detailed comparisons reveal that, in terms of net disappearances into mergers, the new list describes a merger wave about 27 per cent larger than the largest of the previous estimates; in terms of the adjusted capitalization of mergers, a merger wave about 20 per cent larger than the largest of the previous lists.

As the degree of understatement for number of consolidations was greater than that for capitalizations, the additional consolidations on the recompiled list are smaller, on the average, than the original consolidations taken from the old lists. This is also a

TABLE 7

Comparison of Number of Consolidations in the Four Previous Lists with Number in the New List, 1895–1904

Year	*New List*	*Census*	*Conant*	*Moody*	*Watkins*
1895	5	2	4	2	2
1896	5	2	2	2	3
1897	10	7	4	7	6
1898	26	17	19	17	14
1899	106	74	80	79	59
1900	42 (27)[a]	(10)	23 (14)	25 (14)	18 (11)
1901	53			33	15
1902	48			38	17
1903	15			8	4
1904	9				1
Totals:					
1895–Mid-1900	179	112	123	121	95
1895–1900	194		132	132	102
1895–1903	310			211	138
1895–1904	319				139

The four lists were corrected for errors and inaccuracies.
[a] Data in parentheses apply to the first half of 1900 only.

reflection of the disproportionate share of total capitalization accounted for by extremely large consolidations, almost fully reported on the four lists.

A relatively few very large consolidations swelled the capitalization totals. Of the total capitalization of $6.03 billion, for the 319 recompiled consolidations for 1895–1904, $2.41 billion or 40.0 per cent is accounted for by twenty-nine consolidations (9.3 per cent of the total) each with authorized capitalization of $50 million or more. Thus only one-eleventh of the consolidations accounted for two-fifths of the total capitalization. One consolidation, U.S. Steel, with a capitalization of $1.37 billion, alone accounted for 23 per cent of the total capitalization.

The recompiled list added no consolidations capitalized at $50 million or over; the main additions to the early lists were of consolidations capitalized at between $1 million and $50 million (Table 8). Comparison of consolidations capitalized at less than $1 million would be meaningless because of the cut-off limits imposed by the early compilers. The Watkins list was omitted, in Table 8, because of its exclusion of regional or local mergers, which made its understatement of the merger movement much greater than the others. The reason for the high understatement for the

TABLE 8
Ratio of Various Measures of Consolidation Activity as Recorded in Recompiled List to Those of Early Lists

Early List	Period Covered	Size Measured by— Capitalization	Net Disappearances	Number of consolidations
$50 million-and-over consolidations				
Moody	1895–1903	1.000	1.000	1.000
Conant	1895–1900	1.000	1.000	1.000
Census	1895-mid-1900	1.143	1.030	1.027
$1-to-$50 million consolidations:				
Moody	1895–1903	1.157	1.318	1.445
Conant	1895–1900	1.174	1.192	1.445
Census	1895–mid-1900	1.425	1.321	1.631

Census list as to capitalization ratio is its puzzling exclusion of the prominent Distilling Company of America consolidation in 1899, capitalized at $125 million.

The 1895–1920 Merger Series Compared with Subsequent Series

The comprehensive series of merger activity covering the years following the 1895–1920 series was compiled by Willard H. Thorp and continued after 1939 by the Federal Trade Commission (see Table 2). For many purposes it would be desirable to splice the two series, to provide a directly comparable, unbroken measure of merger activity over the whole period from 1895 to the present. Such a splicing procedure is valid only if the statistical bases for the two series are the same or can be made the same by appropriate adjustment. An attempt was made to evaluate the differences between the 1895–1920 and the Thorp series to determine whether a reliable splice might be made.

The basic sources of merger news for the two series were different: for the 1895–1920 series, the weekly *Commercial and Financial Chronicle*; for the Thorp series, the *Standard Daily Trade Service*, first published in late 1914. The Thorp series, for the two years of overlap, 1919 and 1920, includes about three times as many firm disappearances as the 1895–1920 (Nelson) series (Table 9).

A name-by-name comparison of the two series could not be made because the Thorp series does not provide this information, and the worksheets underlying its tables have been lost. Tables 9 and 10, therefore, show the results of indirect means for comparing the completeness of coverage of the two series. The number of firms

TABLE 9

Comparison of Thorp and Nelson Merger Series for 1919 and 1920

Year	*Number of Consolidations*			*Gross Consolidation Disappearances*			*Acquisition Disappearances*		
	Thorp	*Nelson*	*Ratio*[a]	*Thorp*	*Nelson*	*Ratio*[a]	*Thorp*	*Nelson*	*Ratio*[a]
1919	89	44	0.494	292	137	0.470	235	97	0.413
1920	173	22	0.127	474	78	0.164	459	156	0.340
1919–20	262	66	0.252	766	215	0.281	694	253	0.365

[a] Nelson to Thorp.
Source: Appendix B and Thorp, cited in Table 2.

disappearing into the "average" consolidation are presented in Table 10 for both series. The "unreported" consolidation category was derived by dividing the difference between the Thorp and Nelson gross consolidation disappearances by the difference in number of consolidations.

The two tables show that, first, the coverage of the new series relative to Thorp's declined sharply from 1919 to 1920, and second, the average size of the Thorp consolidations declined from 1919 to 1920, while Nelson's rose. Both findings are consistent with the "end effect" phenomenon. The coverage of the Nelson series would fall in the last year, as mergers accomplished in late 1920 would in some cases not be reported until 1921. (The Nelson series showed a fairly sharp decline in the last two quarters of 1920). The advance reporting in late 1918 of 1919 mergers would cause the Thorp series coverage to fall in early 1919. Smaller consolidations, usually reported only once, are especially susceptible to leads and lags in reporting. We should therefore expect the average size of Thorp's consolidations to be large in early 1919, and that of Nelson's to be large in late 1920, when, in each case, the reporting of smaller consolidations would be low.

TABLE 10

Average Gross Number of Firms Disappearing into a Consolidation, 1919 and 1920

	First Quarter 1919	*Full Year* 1919	*Full Year* 1920	*Fourth Quarter* 1920	1919–20
Thorp	3.67	3.28	2.74	2.64	2.92
Nelson	2.00	3.12	3.54	4.80	3.26
Thorp "unreported" by Nelson	4.50	3.45	2.62	2.35	2.81

Source: Table 9 and worksheets.

For the full two-year period, the average size of Thorp's consolidations was smaller than that of Nelson's. As the number of firms entering consolidations is only a very crude measure of consolidation size, these findings must be regarded with caution. However this can be taken as at least presumptive evidence that the Nelson sample included a larger proportion of large consolidations, and that most of the additional consolidations in the Thorp series were taken from a lower stratum of the merger population.

The number of firms in both series entering the average consolidation for seven broad industry categories were compared with the proportion of establishments in central office groups and the proportion of establishments owned by corporations in 1919 (Table 11). The Nelson sample shows relatively high rank correlation between number of firms in the average consolidation and the percentage of industry establishments in central office groups; it shows low correlation between average consolidation size and percentage of establishments owned by corporations. The reverse picture was found for the Thorp sample. This finding, while not

TABLE 11

Average Number of Firms Entering a 1919–1920 Consolidation, with Percentage of Establishments in Central Office Groups and Percentage of Establishments Owned by Corporations in 1919, for Seven Industries

(ranks in parentheses)

Industry	*Average Number of Firms Entering a Consolidation*[a]		*Percentage of Establishments*	
	Thorp	*Nelson*	*In central office groups*[b]	*Owned by corporations*[c]
Chemicals	4.66 (1)	3.25 (2)	19.7 (1)	86.9 (1)
Nonferrous metals	3.42 (2)	2.50 (7)	4.2 (7)	50.8 (4)
Food	2.75 (3)	3.75 (1)	7.4 (4)	27.8 (6)
Textiles	2.58 (4)	2.67 (5)	9.9 (2)	67.0 (3)
Iron and steel and products	2.49 (5)	2.84 (3)	8.0 (3)	75.4 (2)
Motor vehicles	2.45 (6)	2.57 (6)	5.0 (6)	30.3 (5)
Lumber and paper	2.23 (7)	2.75 (4)	5.1 (5)	22.1 (7)

Rank correlation between average number of firms entering a consolidation and:

	Thorp	Nelson
Percentage of establishments in central office groups	+0.357	+0.643
Percentage of establishments owned by corporations	+0.571	+0.107

[a] Table 10.

[b] Willard L. Thorp, *The Integration of Industrial Operation*, Census Monographs III, Dept. of Commerce, 1924, p. 107, Table 43.

[c] Derived from *Fourteenth Census of the United States, 1920*, Bureau of the Census, Vol. 10, *Manufactures, Reports of Selected Industries.*

statistically significant, is at least consistent with the evidence that the added consolidations of the Thorp sample were largely drawn from a lower stratum of the merger population.[17]

THORP AND NELSON SERIES NOT COMPARABLE

The crude comparisons presented above lend support to the assumption that the larger number of disappearances in the Thorp sample was due primarily to a more complete reporting of small mergers rather than to a more complete reporting of large mergers, though the Thorp series probably contained a somewhat more complete list of large mergers also. It seems reasonable to conclude that the 1895–1920 series includes mergers drawn largely from the upper strata of the merger population, and that it is therefore relatively free from the capricious errors that an indiscriminate mixing of merger sizes might produce.

This conclusion does not permit splicing of the two series, however. The 1895–1920 series represents a merger movement among large firms, whereas the 1919–1939 Thorp series probably represents a merger movement among large and near-large firms. As size data for 1919–1939 mergers are lacking, crude inflation of the 1895–1920 series by the ratio of firm disappearances would overstate the early merger movement. Moreover, the reporting coverage of the *Commercial and Financial Chronicle* may have undergone large changes between 1895 and 1920, a possibility we have no way of investigating. Furthermore, underlying changes in the business population, had the *Chronicle* maintained a constant reporting policy, could have caused the degree of coverage to change over time.

There is some reason to believe that turn-of-the-century merger activity was more fully reported than that of some two decades later. The leading form of merger at the turn of the century was the consolidation of many small and medium-sized firms into one

[17] The percentage of establishments in central office groups is not perfectly correlated with the percentage of establishments owned by corporations. Therefore, the additional Thorp consolidations could have been drawn from a lower stratum of the merger population in which the representation of central office groups was much lower, and yet one in which the representation of corporate enterprise was still quite large. The broadened merger coverage of Thorp would thus tend to produce a higher correlation with corporate ownership and a lower correlation with central office group control. One would expect some correlation between the large merger and central office group data as a large merger is more likely to result in the creation of a new central office group. This correlation probably affects our comparisons only slightly, however, as the central office statistics represent accumulated totals over many years while mergers represent additions over only two years.

big one; 75 per cent of 1895–1904 firm disappearances took place by the consolidation of five or more firms. In the later years of our period, 1915–1920, only 14 per cent of firm disappearances occurred through such consolidation. The many-firm consolidation was more likely to be publicly noted than the merger of only two or three small firms. As a consequence, many small firm disappearances that would otherwise not have gained public attention were probably included in the early series by virtue of the importance of the many-firm merger.[18] Other developments from the turn of the century until 1919–1920 may also have caused a shift in merger news coverage. The direction of shift is by no means clear, however. The rise in the corporate form of organization may have caused a greater coverage in the later period, since corporation news tends to be more fully reported than that of unincorporated business. On the other hand, the corporate form of organization facilitates merging; hence, in the earlier period, when fewer businesses were incorporated, a smaller part of the business population may have actually participated in mergers, and coverage may have been better than later.

In the light of these considerations, no serious attempt was made to splice the two series. Had it been done, the number of firms disappearing in the five peak years of turn-of-the-century merger activity, 1898–1902, would have been written-up by a factor of 3.2. The 2,653 disappearances would have been raised to over 8,400. The number for the five peak merger years of the late twenties, 1926–1930, was 4,838, and that for the five highest post-World War II years 2,068. By these crude comparisons the turn-of-the-century merger wave was in absolute numbers approximately 1.75 times as large as that of the 1920's; and 4.2 times as large as that of the highest postwar years.

The above comparisons, while valueless for purposes of precise description, do provide a rough idea of the importance of the turn-of-the-century merger wave, which—even after a generous allowance for overstatement—ranks in absolute size with that of the late 1920's. Set against the background of an economic system decades younger and much smaller, its importance relative to later movements becomes even more apparent.

[18] Set against this is the difference between the two series in the coverage of the principal source. The 1919–1955 series employed the daily reporting service of the Standard Statistics Company, and the 1895–1920 series employed the weekly news columns of the *Commercial and Financial Chronicle*. Had the Standard Statistics service existed before 1914 it is likely that its daily coverage of merger news would have been larger than the weekly coverage of the *Chronicle*.

Coverage of Iron and Steel Mergers in the New List

An independent test of the coverage of mergers in the iron and steel industry—one of the few for which reasonably complete independent data are available—was made for a further indication of the stratum in the merger population covered in the news columns of the *Commercial and Financial Chronicle.* The list assembled from the *Chronicle* was compared with lists in the *Directory of the Iron and Steel Works of the United States and Canada,* published by the American Iron and Steel Institute.[19] Before 1916 the *Directory* was in the process of developing its lists toward the more complete coverage of later editions. Accordingly, two comparisons were made, one for the period before 1908, and one for 1916–1920.

COVERAGE BEFORE 1908

The 1908 *Directory,* with listings as of November 1907, contains (Part I) complete data for 101 companies, including corporate structure, officers, details of number, size, and type of iron and steel works, and merger activities. A second listing (Part II) contains all iron and steel works, including those owned by the 101 companies (Part I) along with the others. The data in the second part are extremely sparse, apart from description of the size and type of works, and it was not possible to determine whether mergers had occurred among the firms listed there. Thus the comparison of coverage was carried out with the 101 companies—a substantial proportion of the iron and steel industry, as is shown in Table 12.

TABLE 12
Share of Iron and Steel Industry Equipment Owned by 101 Firms, 1907

	Amount		
	101 Firms	*Industry*	*Percentage*
Number of blast furnaces	275	448	61.5
Number of steel works and rolling mills	215	598	36.0
Blast furnace capacity[a]	27,071	34,834	77.8
Steel ingot capacity[a]	27,868	34,140	81.8

[a] Thousands of gross tons.
Source: *Directory of Iron and Steel Works of the United States and Canada,* American Iron and Steel Association, Seventeenth Edition, 1908, Preface and Part I.

[19] Before 1913, the American Iron and Steel Association. See Seventeenth Edition, 1908; 1910 and 1912 Supplements to the Seventeenth Edition; Eighteenth Edition, 1916; and Nineteenth Edition, 1920.

From the table it is safe to infer that all of the major steel companies are represented in the list of 101. It contains ten of the twelve largest steel companies later described by Schroeder,[20] the missing two being Sharon Steel (organized in 1900 and still very small in 1907) and National Steel (not organized until 1929).

Of the 101 firms 30 were subsidiary companies, and one was listed twice in the index, leaving 70 independent iron and steel companies in the *Directory* list, 20 of which exhibited no merger activity in this period. In the fifty mergers there were 441 (gross) disappearances of firms, of which 17 were not found on the list compiled from the *Chronicle*. Thus, for those firms for which the independent check was possible there is a coverage of 96.2 per cent in this study.

Of the 50 companies in which mergers occurred 10 were not principally in the iron and steel industry (S.I.C. 33), but as classified in the compilation were either in the fabricated metal products (34), machinery (35), or transportation equipment (37) industries. However, most of them did own blast furnaces or rolling mill facilities, or both, and thus were included in the *Directory*. If these are excluded from the comparison the gross number of disappearances is reduced to 385. Since no disappearances into these 10 companies were among those omitted from the recompiled list, the number of omissions remains 17, and the completeness of coverage in that list for companies engaged primarily in the production of basic iron and steel products is thus 95.6 per cent.

COVERAGE FROM 1916 THROUGH 1920

By 1916 the *Directory* provided detailed data as submitted by all the iron and steel companies listed alphabetically by name. By comparing the 1920 and 1916 listings in the *Directory*, it was possible to compile a list of mergers which could be taken as complete. Capitalization and capacity data for many acquired firms were also given, which permitted a separate comparison of the coverage for large and small acquisitions. The *Directory* reports 81 acquisitions in the period 1916–1920;[21] for 54 of them the size of the acquisition as measured by capacity is given, and for 44 the size measured by capitalization. Of the 81 acquisitions found in the two editions of the *Directory*, 40 were also found in the

[20] Gertrude G. Schroeder, *The Growth of Major Steel Companies, 1900–1950*, Johns Hopkins Press, 1953.

[21] The eighty-one acquisitions taken from the directory were exclusively iron and steel companies, and did not include machinery producers, transportation equipment makers, and other fabricators having blast furnace and rolling mill facilities.

Chronicle, among which 29 had capacity data and 25 had capitalization data.

The completeness of coverage for large and small acquisitions is summarized in Table 13. The *Directory* listed 18 acquisitions

TABLE 13

Coverage of Large and Small Iron and Steel Company Acquisitions, 1916–1920

Size of Acquisition	Number Listed in Iron and Steel Directory (1)	Number in Col. 1 also listed in Chronicle (2)
Capitalization:		
$1,000,000 and over	18	17
Less than $1,000,000	26	8
Size not given	37	15
	81	40
Capacity:[a]		
70,000 tons and over	16	16
Under 70,000 tons	38	13
Size not given	27	11
	81	40

[a] Capacity data in tons of pig iron, or steel ingots, or both.

Source: American Iron and Steel Institute, directories for 1920 and 1916, cited in text footnote 19; and worksheets.

capitalized at $1 million and over, 17 of which were mentioned in the *Chronicle*. The coverage of acquisitions of less than $1 million capitalization was much lower, with the *Chronicle* mentioning only 8 of the 26 found in the *Directory*. For those having no size data, presumably small firms, the *Chronicle* coverage was also small. The average capacity of a $1 million firm appeared to be about 70,000 tons, with considerable variation among firms. Use of that figure as a size boundary indicates much the same pattern of coverage as shown by the capitalizations data.