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## CHAPTER 44

# COMPARISON OF MINOR GROUP SAMPLES

### 1. DESIRABILITY OF TESTING MINOR GROUP SAMPLES

ALL of the characterization and appraisal of our several samples undertaken in the preceding chapter was in terms of their representativeness either for industrial divisions as a whole or as major groups. We did not discuss their presumptive validity for minor groups. But it will be recalled that in the use of the large corporations series we subdivided Manufacturing into 73 minor groups, Trade into 22 groups, Mining into 6 groups, and Finance into 5 groups. The small corporations samples were not susceptible of division into so many separate categories, but still a substantial breakdown into minor industrial groups was made.

It might, of course, be assumed that if a sample is good for purposes of major groups, it is also satisfactory for the analysis of minor groups, since the major groups are made up of minor group classifications. This conclusion, however, follows only if the distribution of corporations by each minor group is as relatively uniform and representative as for the major group. The fact that, both by industrial divisions and by major groups, our samples have met certain tests of typicalness fairly well affords a *presumption* in favor of believing that many of the minor group samples that comprise it are probably also representative of their own specific universes; but it affords no certitude that this

is so. We ought, therefore, to spare no effort to verify or disprove, to the fullest extent possible, the accuracy of this presumption.

The only decisive way to check the validity of these minor group samples would be to compare the results obtained from their use with similar data relating to their several universes.[1] Obviously, this is an impossible procedure, for were data for all of these universes available there would be no need to take samples. We are, however, fortunate in possessing certain more comprehensive samples for many groups than those which were made use of in some of our analyses, and in the case of a few groups we do possess virtually complete universes for all corporations with net incomes in such industries. Analysis of these data may now throw valuable light upon the general question of the probable validity of the data in our more restricted samples. For this purpose we have two sets of test data available for manufacturing. The first set enables us to check the accuracy of certain minor group samples in the large Manufacturing corporations series, while the second set makes possible the testing of certain samples in the small Manufacturing corporations series.

## 2. A TEST OF SAMPLES: LARGE MANUFACTURING CORPORATIONS

It will be recalled that our large corporations sample constitutes by number approximately a 4 per cent representation of the total number of manufacturing corpora-

[1] 'Universe' here is used, of course, in the sense of the complete minor group from which the sample is drawn: e.g., in the minor group, Bakery Products, comparison of the results in each of our samples would have to be made with the results for *all* corporations engaged in the manufacture of Bakery Products in the United States, similarly, with Package Foods, Castings and Forgings, etc., etc.

tions in the country with net incomes. For seven of the manufacturing minor groups we have available what amount to virtually complete universes of all the corporations in the country with net incomes in these groups. In some of these 'universes' the proportion of the total number of corporations in the country included runs as high as 95 per cent. The omissions are even slighter in terms of proportion of total investment and income represented than by number of corporations. Thus for practical purposes we may dismiss these deficiencies as negligible and may regard the 85 or 95 per cent representations that are available as constituting the whole of each of these seven industries.[2] The seven groups in question, together with the number of corporations in each for the sample and for the universe, are given below.[3]

| | Number of corporations | |
|---|---|---|
| *Minor group* | *In sample* | *In universe** |
| Tobacco | 23 | 150 |
| Cotton Spinning | 12 | 141 |
| Book and Music Publishing | 17 | 180 |
| Toilet Preparations | 9 | 104 |
| Textile Machinery | 18 | 112 |
| Engines and Parts | 11 | 103 |
| Railway Equipment | 25 | 142 |

* Average yearly number

[2] The sets of data which we shall here term 'universes' are described in the *Source-Book* (p. 102) as "Data for corporations in selected subgroups . . . samples which vary in the proportion in which they represent their respective universes, but . . . (referring to the samples we are now terming as universes) which range from 80 per centum to 95 per centum in this respect". Data for the minor groups to which the part of the supplementary caption here quoted pertains, appear on pp. 134 ff. of the *Source-Book*. The term 'subgroup' is not entirely synonymous with the term minor group throughout the tables of the *Source-Book* (see p. 6) but for the seven industries here discussed, the two terms are identical, i.e., the seven subgroups in question correspond with the seven minor groups that are being tested.

[3] The number of corporations in the sample is the same in each year, the large corporations series, the reader will recall, being one of identical corporations. That for the universe is not the same in each year; the number shown above is an annual average.

We may now undertake three comparisons of the two sets of data for the seven groups: (a) the absolute levels of profitableness in the sample and in the universe as measured by the percentage of net income to capitalization in each; (b) relative fluctuations in profitableness over a time period; (c) relative profitableness in terms of the standing of each group relative to the others.

*a. Absolute Profitableness of Samples and Universes*

If we examine the earnings rates on investment received by the corporations of the sample and those of the universe in each group,[4] we find little or no discrepancy in most years of the period 1919–28 in some groups and fairly substantial discrepancies in others. To illustrate, the Tobacco group shows almost identical data in every year for the two series of figures. In the five years 1924–28, for example, the large corporations sample of 23 companies in this group showed the following rates of return:

13.5 15.0 14.7 16.0 15.6;

while the figures for the universe were:

15.0 15.5 14.7 16.0 15.6.

On the other hand, in Toilet Preparations, which shows the greatest discrepancies, the returns for the nine corporations of the sample were:

37.6 32.4 28.8 28.1 25.4;

while for the universes the figures were:

25.1 24.0 23.5 18.5 19.7.

However, while the discrepancies are large the rate of return is consistently high in both the universe and the sample

[4] It need not, of course, be said that the figures for the universes include the figures for the respective samples in all cases.

as compared with that in most other manufacturing minor groups. This point will be touched upon again later.

Between these two extremes of a virtually perfect sample in the Tobacco group and a much less perfect one in Toilet Preparations, the other five of these seven groups are ranged. The two series of figures for the ten years for each group are given in Table 109. The critical reader should now ask: how serious are the several discrepancies, individually and *en masse*?

Perfect correspondence throughout, of course, was not to be expected, both because of the general law of probabilities and because the large corporations sample differs in several known respects from the universe from which it is drawn.[5] Too great differences, however, if characteristic of most groups, would invalidate the sample for purposes of minor group analysis. But what is meant by 'too great'? What general criteria of the permissible limits of tolerance might be set up?

In passing judgment on the satisfactoriness of the sample, the specific purposes of the inquiry must govern any standards that are adopted (*cf.* Ch. 1). For purposes of ascertaining whether the return on investment in a given industry much exceeds, or falls short of, the interest rate on free capital or long-time loanable funds, one standard of accuracy might be adopted. For ascertaining whether the

[6] As we have elsewhere pointed out it contains: (1) corporations of greater than average size; (2) only corporations that remained in business for at least a ten-year period; and (3) in each year a small proportion of companies with deficits instead of positive net incomes. For the third reason, it is, of course, a somewhat better sample of all manufacturing in the country than it would otherwise be, but is a less typical sample of all the corporations in the country with net incomes. However, this third qualification is not very important in the years other than 1921, since the proportion of companies with deficits, as discussed in Ch. 8, is but slight, and essentially the sample may be regarded as one of corporations with net incomes; indeed, mainly as one of corporations with net incomes of over $50,000, as discussed in Ch. 43.

## TABLE 109

### EARNINGS RATES UPON INVESTMENT FOR SEVEN GROUPS, SAMPLE AND UNIVERSE, 1919–28

*(samples from large corporations series)*[1]

| GROUP | *1919* | *1920* | *1921* | *1922* | *1923* | *1924* | *1925* | *1926* | *1927* | *1928* |
|---|---|---|---|---|---|---|---|---|---|---|
| *Tobacco* | | | | | | | | | | |
| Sample | 14.0 | 11.7 | 13.1 | 14.2 | 13.4 | 13.5 | 15.0 | 14.7 | 16.0 | 15.6 |
| Universe | 13.3 | 11.4 | 12.8 | 14.6 | 12.5 | 15.0 | 15.5 | 14.7 | 16.0 | 15.6 |
| *Cotton spinning* | | | | | | | | | | |
| Sample | 47.0 | 37.4 | 10.4 | 16.0 | 13.8 | 7.6 | 12.3 | 10.1 | 10.4 | 9.5 |
| Universe | 32.3 | 25.8 | 9.5 | 12.3 | 12.4 | 8.2 | 9.4 | 7.9 | 9.5 | 9.6 |
| *Book and music publishing* | | | | | | | | | | |
| Sample | 17.6 | 13.8 | 13.5 | 20.4 | 18.3 | 18.9 | 16.9 | 14.9 | 11.4 | 12.1 |
| Universe | 14.5 | 14.7 | 12.2 | 23.2 | 15.6 | 15.2 | 15.7 | 13.0 | 13.9 | 14.4 |
| *Toilet preparations* | | | | | | | | | | |
| Sample | 39.3 | 19.6 | 29.2 | 53.2 | 35.5 | 37.6 | 32.4 | 28.8 | 28.1 | 25.4 |
| Universe | 20.5 | 15.7 | 18.4 | 25.7 | 20.3 | 25.1 | 24.0 | 23.5 | 18.5 | 19.7 |
| *Textile machinery* | | | | | | | | | | |
| Sample | 27.4 | 17.2 | 22.6 | 22.3 | 18.3 | 10.6 | 14.8 | 14.4 | 15.9 | 14.6 |
| Universe | 25.2 | 21.3 | 19.0 | 17.4 | 18.1 | 13.7 | 16.2 | 15.8 | 14.3 | 13.0 |
| *Engines* | | | | | | | | | | |
| Sample | 28.0 | 19.2 | 9.4 | 10.6 | 14.6 | 28.0 | 9.2 | 14.1 | 11.1 | 6.9 |
| Universe | 26.6 | 13.0 | 10.8 | 11.9 | 10.2 | 10.0 | 13.7 | 12.7 | 21.0 | 13.5 |
| *Railway equipment* | | | | | | | | | | |
| Sample | 17.0 | 10.6 | 4.3 | 7.2 | 13.5 | 8.4 | 5.3 | 7.6 | 5.6 | 3.4 |
| Universe | 16.1 | 10.6 | 7.4 | 10.5 | 14.1 | 9.7 | 10.5 | 11.6 | 9.2 | 7.5 |

[1] See text for explanation.

tendency towards an equality of profit rates in different industries over a period is realized, another standard might be adopted. For ascertaining such fluctuations in profits and profit rates as are significant in endeavoring to throw light upon the cyclical movements in the several industries, still other standards might serve; and so on.

But no one absolute arithmetical measure of difference between the sample datum and the universe datum for the rate of earnings will serve even a specific purpose. We could not, for example, say that in these percentages of income to capitalization figures a difference of two points (2 'per cent') would indicate that the sample was either satisfactory or unsatisfactory. In an industry that showed a 4 per cent return for the sample, but a 6 per cent return for the universe, a two-point discrepancy might be regarded as more than negligible; for not only is the 6 per cent return one-half again as great as the 4 per cent, but also is equal to a so-called normal interest rate for capital employed in manufacturing industries, while the 4 per cent return is not. On the other hand, in an industry for which the sample data show a return of 22 per cent, whereas that for the universe is 20 per cent, the two-point discrepancy amounts to a difference of only one-tenth, instead of one-half, in profitableness and makes no real difference at all with respect to the economic and financial problems of the industry.

But if no absolute arithmetical measure of difference will serve, neither will a straight proportional or logarithmic formula suffice. One might, for example, be tempted to say that no discrepancy that approached anything like a 33 per cent difference in the datum of the sample and that of the universe should be permitted; yet again qualification is necessary. As between two such rates of return as 2 and 3 per cent upon investment, there is no significant difference; both are unsatisfactory returns; either datum shows that

the industry is unprofitable, stands relatively low in the scale, and does not earn as much as an ordinary interest rate on either working or permanent capital. But in the case of two such figures as 10 and 15 per cent, the one datum shows a very different situation than the other, even though their relation is exactly the same as that between 2 and 3 per cent. The industry earning 10 per cent, as we have seen in previous chapters, may be below the general average return, whether arithmetic mean or median be taken, for either the major group or industrial division to which it belongs; whereas the one earning 15 per cent may stand in most years in the forefront of the various industrial groups with which it is classed. Thus there is little to choose between an absolute measure or a straight proportional measure of the differences we are seeking to evaluate.

We therefore leave this question without an attempt at definite answer. We could set up an arbitrary scale of differences (an irregular, non-proportional sliding scale), apply it to the several samples, and thus summarize the situation quantitatively. This procedure has indeed been followed experimentally, on several bases. But the arithmetical results achieved depended mainly upon the assumptions made in drawing up such scales. The summarizing of the differences shown in Table 109, and the drawing of conclusions as to their significance, are therefore left to the reader.[6]

*b. Time Fluctuations in Samples and Universes*

But whether substantial absolute differences between the earnings rates of any particular sample and those of the

[6] The significance of the samples might, of course, be more elaborately tested by an application of the calculus of probabilities to our data. No effort is made to apply such mathematical technique in these chapters; however, basic data that would make possible a partial analysis of samples and universes appear in Appendix B.

universe are present, we may inquire concerning the comparative trends of the two sets of figures during the period 1919–28.

In general the earnings rates of the sample show the same trend as those for the universe in nearly all groups. The only conspicuous exception is Engines and Parts, where a correspondence between the two series prevails for the first three years of the period, but none is evident between 1922 and 1927.

No extended comment is called for in connection with the conclusion that these samples are fairly satisfactory indicators of *fluctuations* in the earnings rates of the industries which they represent. This generalization holds somewhat less well for the Toilet Preparations and for the Book and Music Publishing groups during parts of the period than for the others; but the several curves of Chart 67 indicate that on the whole, in most of these seven groups, the sample data follow the same general direction as those for the universe.

*c. Relative Profitableness of Samples and Universes*

Having discussed the 'absolute profitableness' of each industry, as well as the trends of each series of figures, we may now ask how good or bad these seven samples are with respect to the relative profitableness of one minor group compared with the others. For it will be recalled that much of the analysis in the earlier chapters of this volume was concerned not with absolute profit rates, but with the standing of particular minor groups, in any one year and over a period, relative to other groups and to average figures for an industrial division as a whole.

First, as to the standing of the sample datum and the universe datum for each group in any one year, relative to the other groups. If we take an arithmetic average of the

CHART 67

EARNINGS RATES OF SEVEN MINOR GROUP SAMPLES AND THEIR UNIVERSES

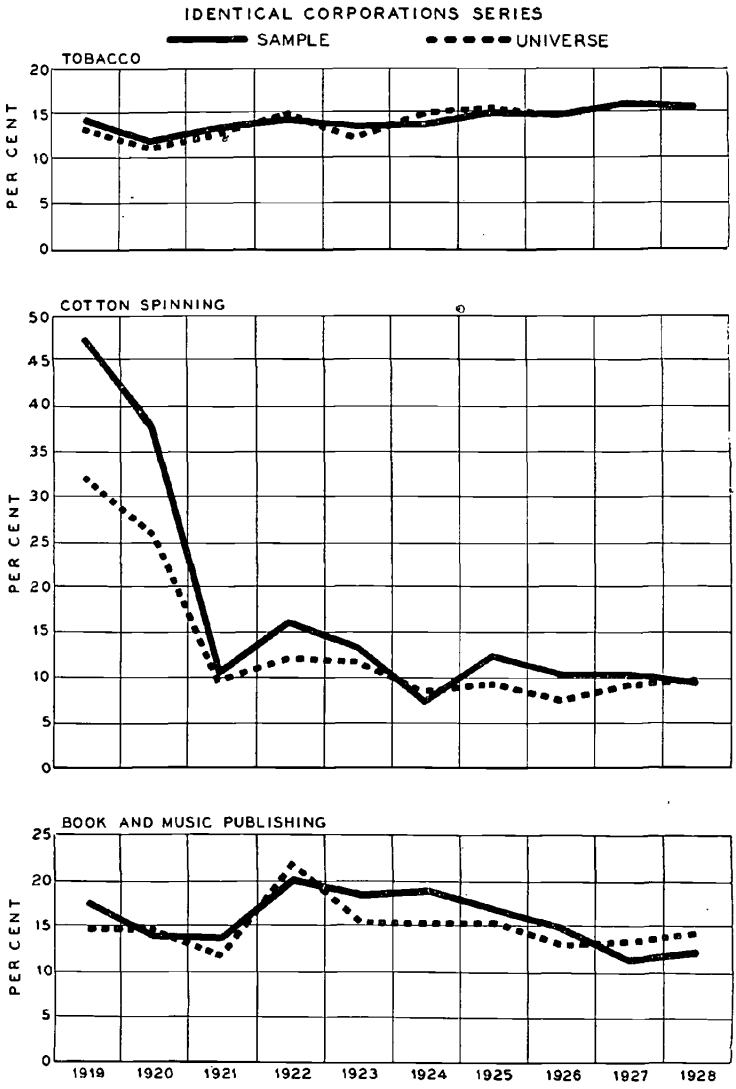


CHART 67 (CONT.)

EARNINGS RATES OF SEVEN MINOR GROUP SAMPLES AND THEIR UNIVERSES

IDENTICAL CORPORATIONS SERIES

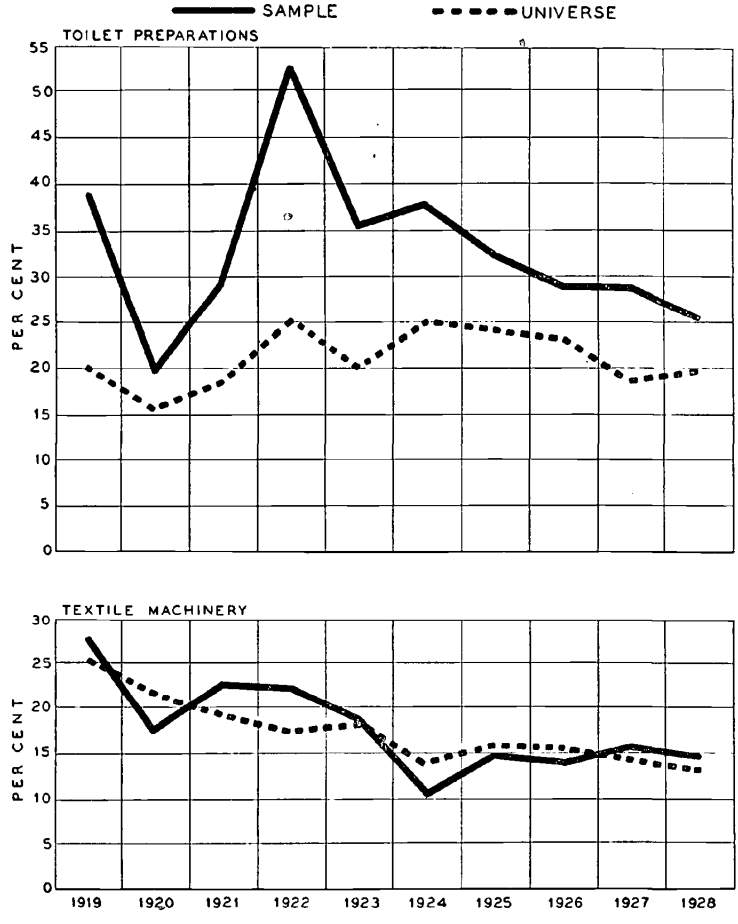
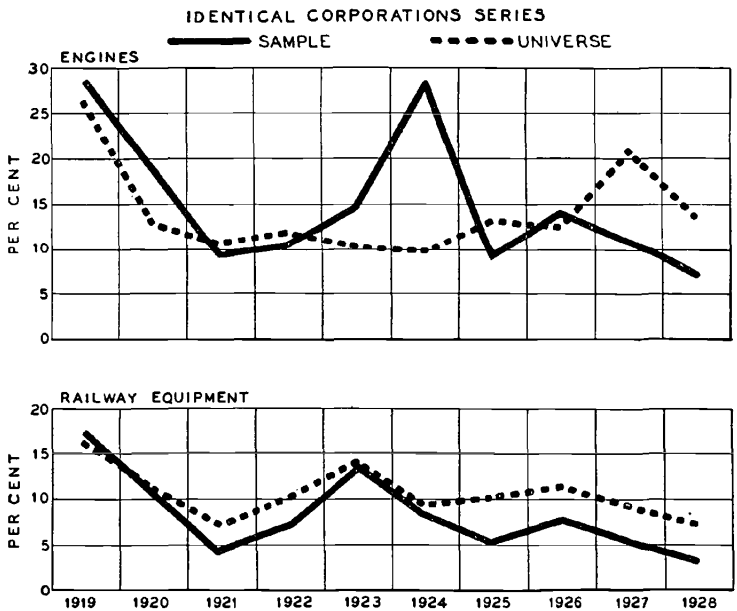


CHART 67 (CONT.)
EARNINGS RATES OF SEVEN MINOR GROUP SAMPLES AND THEIR UNIVERSES




mean rates of return for each of our seven minor groups in, for example, 1928, we find that the average earnings rate upon investment for the seven universes is 13.3 per cent. We then compute the deviations of the individual figures for the seven universes from this average. Similarly, the average figure in the same year for the seven samples is 12.5 per cent; and we compute the deviations of the several samples from it. The results are given below.

| | Deviations* | |
|---|---|---|
| *Group* | *Universe* | *Sample* |
| Tobacco | 2.3 | 3.1 |
| Cotton Spinning | −3.7 | −3.0 |
| Book and Music Publishing | 1.1 | −0.4 |

| Group | Deviations* Universe | Sample |
|---|---|---|
| Toilet Preparations | 6.4 | 12.9 |
| Textile Machinery | −0.3 | 2.1 |
| Engines and Parts | 0.2 | −5.6 |
| Railway Equipment | −5.8 | −9.1 |

* Absolute points or 'percentages'

It is to be observed that in most instances a negative deviation in the universe is accompanied by a negative deviation in the sample; and a positive deviation in the universe by a positive deviation in the sample. Where this is not so, the deviation that is of the opposite sign is very slight; and in a longer array of groups the discrepancies involved, even where the signs are different, would probably not affect appreciably the common height above—or common level below—the median of the 73 manufacturing groups at which both sample datum and universe datum would stand. This conclusion may not hold entirely for Toilet Preparations in 1928; here the deviations are both positive, but that for the sample is larger than that for the universe. But in all other instances these comparative deviations, if a larger array were involved, suggest that no great discrepancies in the relative standing of the groups would take place as between the use of complete universe data (were they available) and the use of the sample data for the large corporations series, when cast into minor groups. The same general conclusion applies to the observations of most other years of the period, the deviations for which are given in Table 110.

But even greater interest attaches to summary figures for the period as a whole, in these same terms; for our inquiry in Chapter 3 concerned the equality or non-equality of profit rates in different industries over a time period. With this in mind, we may compare the deviation of the *average of the ten annual earnings rates* for each sample group from the

## TABLE 110

### DEVIATIONS FROM MEAN EARNINGS RATE UPON INVESTMENT, 1919–28, AND FROM TEN-YEAR AGGREGATE RATE, SEVEN MINOR GROUPS

*(samples from large corporations series)*[1]

| GROUP | *1919* | *1920* | *1921* | *1922* | *1923* | *1924* | *1925* | *1926* | *1927* | *1928* | *1919–28*[2] |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | MEAN RATES | | | | | |
| *All seven groups* | | | | | | | | | | | |
| Samples | 27.2 | 18.5 | 14.6 | 20.6 | 18.2 | 17.8 | 15.1 | 14.9 | 14.1 | 12.5 | 17.4 |
| Universes | 21.2 | 16.1 | 12.9 | 16.5 | 14.7 | 13.8 | 15.0 | 14.2 | 14.6 | 13.3 | 15.2 |
| | | | | | | DEVIATIONS FROM MEAN RATES | | | | | |
| *Tobacco* | | | | | | | | | | | |
| Sample | –13.2 | –6.8 | –1.5 | –6.4 | –4.8 | –4.3 | –0.1 | –0.2 | 1.9 | 3.1 | –3.3 |
| Universe | –7.9 | –4.7 | –0.1 | –1.9 | –2.2 | 1.2 | 0.5 | 0.5 | 1.4 | 2.3 | –1.1 |
| *Cotton spinning* | | | | | | | | | | | |
| Sample | 19.8 | 18.9 | –4.2 | –4.6 | –4.4 | –10.2 | –2.8 | –4.8 | –3.7 | –3.0 | 0.1 |
| Universe | 11.1 | 9.7 | –3.4 | –4.2 | –2.3 | –5.6 | –5.6 | –6.3 | –5.1 | –3.7 | –1.5 |
| *Book and music publishing* | | | | | | | | | | | |
| Sample | –9.6 | –4.7 | –1.1 | –0.2 | 0.1 | 1.1 | 1.8 | 0.0 | –2.7 | –0.4 | –1.6 |
| Universe | –6.7 | –1.4 | –0.7 | 6.7 | 0.9 | 1.4 | 0.7 | –1.2 | –0.7 | 1.1 | 0.0 |
| *Toilet preparations* | | | | | | | | | | | |
| Sample | 12.1 | 1.1 | 14.6 | 32.6 | 17.3 | 19.8 | 17.3 | 13.9 | 14.0 | 12.9 | 15.5 |
| Universe | –0.7 | –0.4 | 5.5 | 9.2 | 5.6 | 11.3 | 9.0 | 9.3 | 3.9 | 6.4 | 5.9 |
| *Textile machinery* | | | | | | | | | | | |
| Sample | 0.2 | –1.3 | 8.0 | 1.7 | 0.1 | –7.2 | –0.3 | –0.5 | 1.8 | 2.1 | 0.4 |
| Universe | 4.0 | 5.2 | 6.1 | 0.9 | 3.4 | –0.1 | 1.2 | 1.6 | –0.3 | –0.3 | 2.2 |

TABLE 110 *(continued)*

DEVIATIONS FROM MEAN EARNINGS RATE UPON INVESTMENT, 1919–28, AND FROM TEN-YEAR AGGREGATE RATE, SEVEN MINOR GROUPS

*(samples from large corporations series)*[1]

| GROUP | *1919* | *1920* | *1921* | *1922* | *1923* | *1924* | *1925* | *1926* | *1927* | *1928* | *1919–28*[2] |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | DEVIATIONS FROM MEAN RATES | | | | | | | | | | |
| *Engines* | | | | | | | | | | | |
| Sample | 0.8 | 0.7 | −5.2 | −10.3 | −3.6 | 10.2 | −5.9 | −0.8 | −3.0 | −5.6 | −2.3 |
| Universe | 5.4 | −3.1 | −2.1 | −4.6 | −4.5 | −3.8 | −1.3 | −1.5 | 6.4 | 0.2 | −0.9 |
| *Railway equipment* | | | | | | | | | | | |
| Sample | −10.2 | −7.9 | −10.3 | −13.4 | −4.7 | −9.4 | −9.8 | −7.3 | −8.5 | −9.1 | −9.1 |
| Universe | −5.1 | −5.5 | −5.5 | −6.0 | −0.6 | −4.1 | −4.5 | −2.6 | −5.4 | −5.8 | −4.5 |

[1] Ten-year aggregate.
[2] See text.

ten-year rates for each universe with a similar average of all seven universe groups.[7] These deviations, from the ten-year average earnings rates of 15.2 per cent and 17.4 per cent for the seven universes and samples respectively, are:

| | Deviations of ten-year averages | |
|---|---|---|
| *Group* | *Universe* | *Sample* |
| Tobacco | –1.1 | –3.3 |
| Cotton Spinning | –1.5 | 0.1 |
| Book and Music Publishing | 0.0 | –1.6 |
| Toilet Preparations | 5.9 | 15.5 |
| Textile Machinery | 2.2 | 0.4 |
| Engines and Parts | –0.9 | –2.3 |
| Railway Equipment | –4.5 | –9.1 |

Much the same things are to be said of this comparison as of that for the single year 1928 which was undertaken above. Even the broad discrepancy in Toilet Preparations exercises but little effect upon its relative standing: in any array either of samples or of universes it would stand as one of the most profitable minor groups. We cannot, of course, present such an array for the universes of our 73 manufacturing groups in contrast with that for our samples; but study of the deviations—'median difference coefficients'—discussed in Chapter 3, in conjunction with the data of the present section, confirms the conclusion just set forth.

As of restricted interest in this connection, we may finally rank the seven minor groups under discussion in terms of the earnings rates of the samples and universes respectively. The earnings rates themselves for the ten-year period are given in Table 110, but these are the ranks:

[7] These are not strictly 'ten-year aggregates' of the sort employed in previous chapters in the measurement of earnings rates for the period, as they are averages of the annual percentages of return on investment and not derived from a ten-year accumulation of the original investment and original income data. It seems wiser here to avoid the weighting that would result from the latter procedure, since in no group would the universe consist of the same number of corporations in successive years in the period. The differences that result, however, probably will not be large in any case.

| *Group* | Rank among all seven groups, the most profitable being first: *Universe* | *Sample* |
|---|---|---|
| Toilet Preparations | 1 | 1 |
| Textile Machinery | 2 | 2 |
| Book and Music Publishing | 3 | 4 |
| Engines and Parts | 4 | 5 |
| Tobacco | 5 | 6 |
| Cotton Spinning | 6 | 3 |
| Railway Equipment | 7 | 7 |

It is obviously unnecessary to compute a coefficient of rank correlation between these two series of ranks when ordinary inspection indicates the high positive character of the correspondence; but were arrays of this character available for all 73 manufacturing groups, the coefficient would be high indeed if the same general relationships prevailed. Our assumption that such is the case is, of course, based only upon our knowledge of these seven groups. But it may be pointed out that the groups are selected quite at random; they merely happen to be ones in which universe data are available and which, with respect to the industrial classification of corporations within each group, chance to correspond with specific minor groups of the large corporations series sample.

### 3. A TEST OF THE SMALL MANUFACTURING CORPORATIONS SERIES

We may now proceed to test in the general manner of the preceding section several of the minor group samples in the small non-identical corporations series for Manufacturing. The number of minor groups for which 'universes' are available here chances again to be seven. But we must point out at the beginning that these seven universes are not of the same virtually complete character as those with which we compared the large corporations samples in the

preceding section. As a matter of fact, they are simply greatly enlarged samples, to which we may impute a higher degree of stability and representativeness than to the samples of our small corporations series. This calls for some further explanation.

In originally compiling the small corporations sample for the *Source-Book,* it was sought first to isolate the manufacturing corporations with net incomes of more than approximately $50,000;[8] then, for each year of the period studied, to assemble about a 5 per cent representation of the manufacturing corporations in the country with net incomes of from $2,000 to $50,000. The manufacturing sample thus drawn was then divided into 73 minor groups. In originally drawing this 5 per cent sample, however, it was anticipated that because of the varying sizes of the specific universes in the several minor groups, the minor group samples would be less good for some groups than for others. To illustrate, there are fewer corporations engaged in the manufacture of Railway Equipment or Textile Machinery than in the manufacture of Men's Clothing or Hardware and Plumbers' Supplies. A 5 per cent sample in the case of minor groups in which the absolute number of corporations in the universe was as low as 150 or 200 corporations, and in which the concentration of industry was marked, might yield a very much less reliable result than one in which the absolute number of corporations was 1,500 or 2,000. For this reason, the general 5 per cent sample of All Manufacturing corporations in the country (with incomes of between $2,000 and $50,000) was supplemented by larger samples of from about 50 to 100 corporations each in 24 specific manufacturing industries. Of these 24 specific manufacturing industries for which such larger samples were drawn (such industries being termed subgroups in the *Source-*

[8] This group was represented by the large corporations series.

*Book*), 17 represented—in terms of the industrial classification of activities included—less comprehensive divisions than the minor groups into which these activities were classified when the small corporations sample was later divided into 73 minor groups. The remaining seven, however, correspond exactly in this respect with certain minor groups of the small corporations sample; and we may accordingly subject them to the same processes of analysis that were employed in the preceding section.

Furthermore, these seven larger samples were actually employed in the minor group analyses of the earnings rates of small manufacturing corporations as presented in Book III, simply because they are presumably somewhat better samples than the smaller ones. Smaller samples were employed in Book III for minor groups for which such larger samples were not available—presumably in industries in which not the same need existed for bigger samples because of a larger number of corporations in the original universe or for other reasons such as a greater homogeneity of types of enterprise and activity within the minor group. It is, therefore, apparent that the comparison of these seven larger samples about to be undertaken is *with samples that were not used* in our analysis because they rest upon *a more slender* basis of probable accuracy than in the case of the several smaller samples (the 5 per cent representations) that were used, and that it was to safeguard against the probable defects in these seven samples that larger bodies of data were drawn for the same minor groups. We may thus feel quite certain that whatever the extent to which these small samples that were *not* used turn out to be representative of the larger bodies of data which they represent, this degree of excellence of 'fit' will be exceeded (or poorness of 'fit' will be lessened) in the smaller samples actually employed.

Our procedure now is to add together the original data for the corporations in the sample and in the larger sample in each of these seven groups, and for convenience to call the combination of these two sets of figures the 'universe' for the minor group in question. Actually it is in some instances not so large a proportion of the original total number of corporations in the industry as it was of the universes discussed in the preceding section; but comparison with those other data will be facilitated by adopting the same terminology. We then compare the data of the small samples with these 'universe' data.

The seven groups thus about to be discussed, together with the number of corporations in each for the sample and for the universe, are given below.

| | Number of corporations* | |
|---|---|---|
| *Minor group* | *In sample* | *In universe* |
| Bakery Products | 25 | 114 |
| Flour | 32 | 122 |
| Dairying | 47 | 135 |
| Knit Goods | 24 | 113 |
| Lumber | 49 | 137 |
| Paints | 20 | 66 |
| Castings and Forgings | 46 | 140 |

* Average yearly number

*a. Absolute Profitableness of Samples and Universes*

Comparing the rates of return upon investment earned by the corporations of the samples and of the universes in the years between 1919 and 1928, we find that in some minor groups scarcely any differences are perceptible, whereas in others the absolute discrepancies in some years are substantial. As an example of nearly perfect correspondence, we may take the minor group Dairying, in which the earnings rates of the sample in the five years 1924–28 are:

15.6 14.6 16.2 13.5 13.2;

while the figures for the universe are:

15.4 14.6 14.7 13.0 12.0.

On the other hand, about the poorest case of correspondence is Bakery Products, where for the sample the figures are:

12.9 22.3 17.1 10.1 17.1;

while in the case of the universe they are:

12.8 14.5 13.8 12.7 14.8.

It is to be observed that the figures given second in Bakery Products in both series (the 1925 figures) are far apart indeed, although the discrepancies are not so serious in the other four years. The correspondence of the two sets of figures for this minor group is somewhat better for the first five years of the period 1919–23, the figures for which, together with those for all other groups, are given in Table 111.

*b. Time Fluctuations in Samples and Universes*

But examining not merely the absolute levels of earnings rates in the small manufacturing corporations samples and the universes, we may observe the two sets of curves over the ten-year period and we may ask how well the trends in the one set correspond with those in the other (Chart 68).

In four of the seven minor groups the correspondence is quite close: in Flour, Dairying, Castings and Forgings, and Lumber. In a fifth group, Bakery Products, the correspondence in the direction taken by the curves is fairly close in all but two or three years. In the two remaining groups, Knit Goods and Paints, correspondence for most of the period is absent; but in Paints it happens that for the period as a whole—that is, from 1919 to the end of 1928—

## TABLE 111

EARNINGS RATES UPON INVESTMENT FOR SEVEN GROUPS, SAMPLE AND UNIVERSE, 1919–28

*(samples from small corporations series)*[1]

| GROUP | *1919* | *1920* | *1921* | *1922* | *1923* | *1924* | *1925* | *1926* | *1927* | *1928* |
|---|---|---|---|---|---|---|---|---|---|---|
| *Bakery products* | | | | | | | | | | |
| Sample | 26.5 | 10.0 | 12.6 | 9.0 | 15.4 | 12.9 | 22.3 | 17.1 | 10.1 | 17.1 |
| Universe | 16.6 | 14.6 | 11.6 | 11.4 | 15.4 | 12.8 | 14.5 | 13.8 | 12.7 | 14.8 |
| *Flour* | | | | | | | | | | |
| Sample | 20.2 | 6.3 | 8.6 | 9.8 | 11.5 | 8.1 | 8.9 | 9.7 | 8.7 | 10.8 |
| Universe | 21.0 | 8.5 | 9.0 | 10.5 | 9.9 | 9.7 | 9.5 | 9.1 | 8.8 | 10.3 |
| *Dairying* | | | | | | | | | | |
| Sample | 18.0 | 16.8 | 18.8 | 17.3 | 11.2 | 15.6 | 14.6 | 16.2 | 13.5 | 13.2 |
| Universe | 17.9 | 14.7 | 16.4 | 16.0 | 13.0 | 15.4 | 14.6 | 14.7 | 13.0 | 12.0 |
| *Knit goods* | | | | | | | | | | |
| Sample | 15.1 | 11.0 | 15.7 | 15.4 | 15.0 | 13.2 | 12.4 | 10.2 | 9.8 | 8.7 |
| Universe | 15.0 | 11.0 | 13.6 | 14.4 | 12.0 | 10.8 | 12.1 | 12.6 | 10.4 | 12.7 |
| *Lumber* | | | | | | | | | | |
| Sample | 11.7 | 13.0 | 6.9 | 9.0 | 14.9 | 6.8 | 5.4 | 7.4 | 11.7 | 19.6 |
| Universe | 13.5 | 12.7 | 6.1 | 7.1 | 12.9 | 8.8 | 6.7 | 8.0 | 10.5 | 11.3 |
| *Paints* | | | | | | | | | | |
| Sample | 27.1 | 23.3 | 10.8 | 11.9 | 11.8 | 16.1 | 17.8 | 12.1 | 13.8 | 12.1 |
| Universe | 24.5 | 16.7 | 10.9 | 16.8 | 13.9 | 12.8 | 12.7 | 12.2 | 13.2 | 12.0 |
| *Castings and forgings* | | | | | | | | | | |
| Sample | 16.7 | 13.8 | 8.2 | 13.1 | 14.7 | 8.5 | 8.1 | 14.3 | 12.8 | 14.5 |
| Universe | 16.2 | 12.8 | 8.5 | 15.3 | 12.7 | 9.6 | 11.5 | 14.5 | 12.5 | 12.2 |

[1] See text for explanation.

## CHART 68

### EARNINGS RATES OF SEVEN MINOR GROUP SAMPLES AND THEIR UNIVERSES

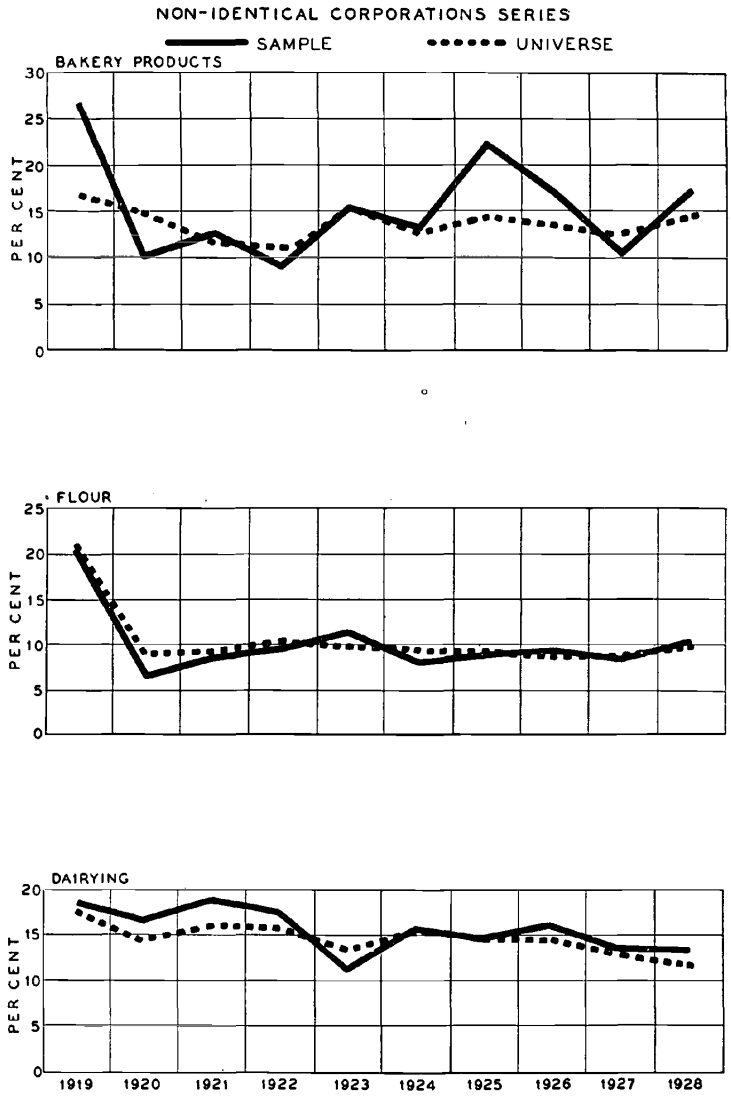
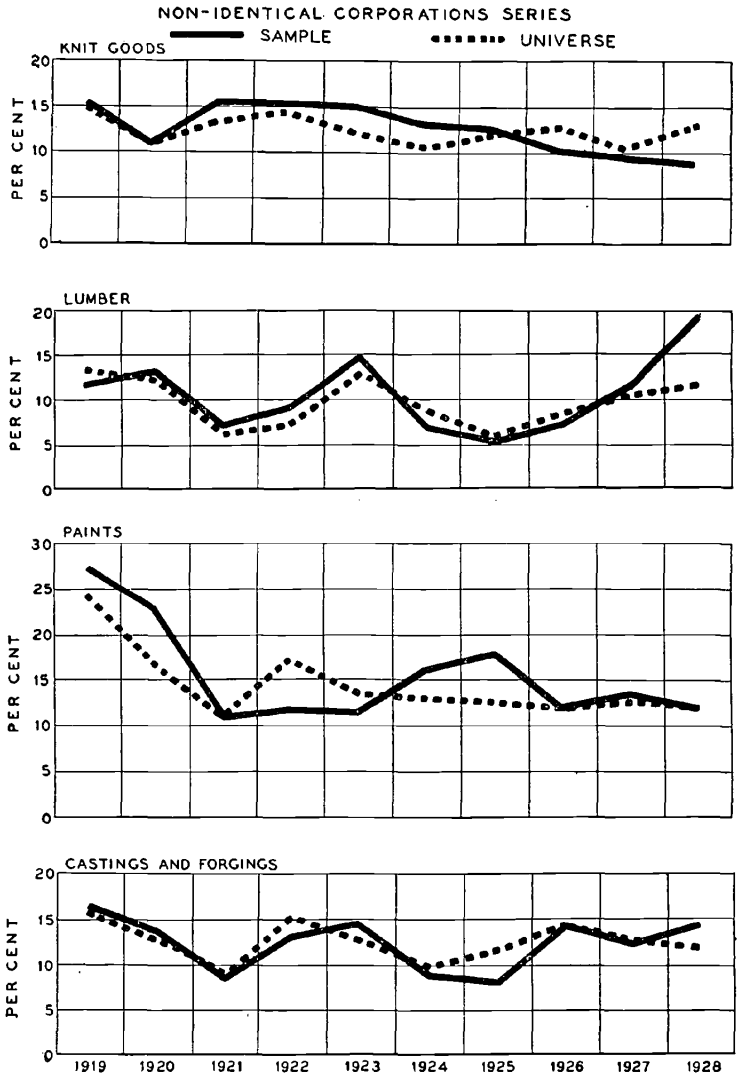


CHART 68 (CONT.)

EARNINGS RATES OF SEVEN MINOR GROUP SAMPLES AND THEIR UNIVERSES



the two curves record roughly the same general decline in the rate of earnings. The interim courses of the sample curve and of the universes are very different between 1921 and 1926, however.

*c. Relative Profitableness of Samples and Universes*

If we now survey the differences between these samples and the universes in relative rather than absolute terms, we shall obtain some indication of the probable validity or invalidity of the samples for purposes of minor group comparisons with the general average figures for the major groups and industrial divisions to which they belong. As in a preceding section, our first approach to the problem is to obtain an arithmetic average rate of return for all seven minor groups in the samples and in the universes, and compare the figures for the sample and the universes of each minor group with these averages. The year 1928 may be taken as an example.

For the seven universes the general average return on investment is 12.2 per cent. We compute the deviations of each of the seven minor group universes from this average. Data appear in Table 112.

It will be observed either that the deviations have the same sign or if one of them is negative, the other deviation is fractional in all instances save one, Lumber, in which the discrepancy chances to be greatest in 1928. What is true of 1928 holds generally for the other years of the period. In no instance is a marked positive deviation accompanied by a marked negative deviation; and in most instances the sizes of the two deviations accord fairly closely.

In a similar manner, we may summarize the situation with respect to the average earnings rates of each group for the period as a whole. The ten-year average return on investment for the seven universes is 12.7 per cent, while

## TABLE 112

### DEVIATIONS FROM MEAN EARNINGS RATE UPON INVESTMENT, 1919–28, AND FROM TEN-YEAR AGGREGATE RATE, SEVEN MINOR GROUPS

*(samples from small corporations series)*[1]

| GROUP | *1919* | *1920* | *1921* | *1922* | *1923* | *1924* | *1925* | *1926* | *1927* | *1928* | *1919–28*[2] |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | MEAN RATES | | | | | |
| *All seven groups* | | | | | | | | | | | |
| Samples | 19.3 | 13.5 | 11.7 | 12.2 | 13.5 | 11.6 | 12.8 | 12.4 | 11.5 | 13.7 | 13.2 |
| Universes | 17.8 | 13.0 | 10.9 | 13.1 | 12.8 | 11.4 | 11.7 | 12.1 | 11.6 | 12.2 | 12.7 |
| | | | | | | DEVIATIONS FROM MEAN RATES | | | | | |
| *Bakery products* | | | | | | | | | | | |
| Sample | 7.2 | –3.5 | 0.9 | –3.2 | 1.9 | 1.3 | 9.5 | 4.7 | –1.4 | 3.4 | 2.1 |
| Universe | –1.2 | 1.6 | 0.7 | –1.7 | 2.6 | 1.4 | 2.8 | 1.7 | 1.1 | 2.6 | 1.1 |
| *Flour* | | | | | | | | | | | |
| Sample | 0.9 | –7.2 | –3.1 | –2.4 | –2.0 | –3.5 | –3.9 | –2.7 | –2.8 | –2.9 | –2.9 |
| Universe | 3.2 | –4.5 | –1.9 | –2.6 | –2.9 | –1.7 | –2.2 | –3.0 | –2.8 | –1.9 | –2.1 |
| *Dairying* | | | | | | | | | | | |
| Sample | –1.3 | 3.3 | 7.1 | 5.1 | –2.3 | 4.0 | 1.8 | 3.8 | 2.0 | –0.5 | 2.3 |
| Universe | 0.1 | 1.7 | 5.5 | 2.9 | 0.2 | 4.0 | 2.9 | 2.6 | 1.4 | –0.2 | 2.1 |
| *Knit goods* | | | | | | | | | | | |
| Sample | –4.2 | –2.5 | 4.0 | 3.2 | 1.5 | 1.6 | –0.4 | –2.2 | –1.7 | –5.0 | –0.5 |
| Universe | –2.8 | –2.0 | 2.7 | 1.3 | –0.8 | –0.6 | 0.4 | 0.5 | –1.2 | 0.5 | –0.2 |
| *Lumber* | | | | | | | | | | | |
| Sample | –7.6 | –0.5 | –4.8 | –3.2 | 1.4 | –4.8 | –7.4 | –5.0 | 0.2 | 5.9 | –2.6 |
| Universe | –4.3 | –0.3 | –4.8 | –6.0 | 0.1 | –2.6 | –5.0 | –4.1 | –1.1 | –0.9 | –2.9 |

TABLE 112 *(continued)*

DEVIATIONS FROM MEAN EARNINGS RATE UPON INVESTMENT, 1919–28, AND FROM TEN-YEAR AGGREGATE RATE, SEVEN MINOR GROUPS

*(samples from small corporations series)*[1]

| GROUP | *1919* | *1920* | *1921* | *1922* | *1923* | *1924* | *1925* | *1926* | *1927* | *1928* | *1919–28*[2] |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | DEVIATIONS FROM MEAN RATES | | | | | | | | | | |
| *Paints* | | | | | | | | | | | |
| Sample | 7.8 | 9.8 | –0.9 | –0.3 | –1.7 | 4.5 | 5.0 | –0.3 | 2.3 | –1.6 | 2.5 |
| Universe | 6.7 | 3.7 | 0.0 | 3.7 | 1.1 | 1.4 | 1.0 | 0.1 | 1.6 | –0.2 | 1.9 |
| *Castings and forgings* | | | | | | | | | | | |
| Sample | –2.6 | 0.3 | –3.5 | 0.9 | 1.2 | –3.1 | –4.7 | 1.9 | 1.3 | 0.8 | –0.7 |
| Universe | –1.6 | –0.2 | –2.4 | 2.2 | –0.1 | –1.8 | –0.2 | 2.4 | 0.9 | 0.0 | –0.1 |

[1] Ten-year aggregate.
[2] See text.

that for the seven samples is 13.2 per cent. Ten-year rates for each minor group are computed and the results given below.

| | Deviations of Ten-year Averages | |
|---|---|---|
| *Minor group* | *Universe* | *Sample* |
| Bakery Products | 1.1 | 2.1 |
| Flour | –2.1 | –2.9 |
| Dairying | 2.1 | 2.3 |
| Knit Goods | –0.2 | –0.5 |
| Lumber | –2.9 | –2.6 |
| Paints | 1.9 | 2.5 |
| Castings and Forgings | –0.1 | –0.7 |

Again a close correspondence in both the direction and the extent of the deviations between samples and universes may be pointed out. Unquestionably, as in large corporations samples tested, any one of these samples would occupy much the same relative position in an array of 73 manufacturing groups as would the corresponding minor group universe, were it possible to obtain such an extended list of universe groups.

The final test relates to the rank of these seven group samples and universes respectively, among themselves. The arrangement by rank is given below.

| | Rank among all seven groups, the most profitable being first | |
|---|---|---|
| *Minor group* | *Universe* | *Sample* |
| Dairying | 1 | 2 |
| Paints | 2 | 1 |
| Bakery Products | 3 | 3 |
| Castings and Forgings | 4 | 5 |
| Knit Goods | 5 | 4 |
| Flour | 6 | 7 |
| Lumber | 7 | 6 |

It may be reaffirmed that were series for 73 manufacturing groups available, the coefficient of rank correlation would be very high, if the rank relationships in the larger array were generally of the same sort as between these seven groups.