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APPENDIX I : ESTIMATING PROCEDURES

Data on assets of multiemployer and union funds for 1959 are derived from the survey described above. Of the 715 multiemployer and eight union funds surveyed, 85 were insured and 577 self-insured; information was not available on the remaining 61. The total asset figure used in the study represents an estimate for all self-insured funds, and the aggregate portfolio composition is that of all self-insured funds where asset breakdowns were available (561 funds).

The proportion of insured plans in this survey is approximately the same as that found by the Bureau of Labor Statistics.[16]

Data on assets and portfolio composition for subsequent years were derived from a stratified random sample of the funds included in the 1959 survey. Information on all of the funds that had more than $5 million in total assets at the end of 1959 was obtained. These 36 funds represented over 60 percent of the assets in all multiemployer and union funds in the 1959 survey. In addition a sample of 64 funds in the size classes below $5 million was drawn. (See table I–4 for data on the concentration of assets.) The sample size and the number of sampling units in each size stratum were based on a system of optimum allocation which takes into account not only the number of funds in each stratum of the population (N_h) but also the standard deviation of each stratum (S_h). The allocation of sampling units to each stratum was proportional to the product of the number of funds in each stratum and the standard deviation of the stratum $(N_h S_h)$.[17] A sample size of

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[16] Bureau of Labor Statistics, Bulletin 1326, p. 17.

[17] When optimum allocation is used, the sample size (n) for estimating a total, e.g., total assets for all funds, is given by the formula:

$$n = \frac{n_0}{1 + \frac{1}{V}\Sigma N_h S_h{}^2} ,$$

where

$$n_0 = \frac{(\Sigma N_h S_h{}^2)}{V},$$

or the sample size uncorrected for a finite population, and V is the desired variance in the sample estimate and is determined by the formula $V = (d \times T)^2$, where d is the acceptable margin of error or the half-width of the confidence interval (in this case .025) and T is the universe total (in this case the total assets of all funds with less than $5 million in 1959).
Thus

$$V = (.025 \times \$478,240)^2 = 142,945,936.$$

$$n_0 = \frac{(114,872)^2}{142,945,936} = 92.3$$

$$n = \frac{92.3}{1 + \frac{62,897,542}{142,945,936}} = 64.1$$

or a sample size of 64.

Allocated according to the ratio in each stratum of $\frac{N_h S_h}{\Sigma N_h S_h}$, the sample size in each stratum was:

Stratum	Total Assets (thousands of dollars)	Sample Size (n_h)
1	0–99	1
2	100–249	3
3	250–499	4
4	500–999	6
5	1,000–1,999	14
6	2,000–4,999	36
		64

Source: William G. Cochran, *Sampling Techniques,* New York, 1953, pp. 73–74, 87–90.

64 for the funds with less than $5 million in total assets will give an estimate of the aggregate assets in these funds, with a maximum error of 2.5 percent. Since each of the funds with assets over $5 million was surveyed, the resulting estimate for all multiemployer and union funds for years subsequent to 1959 would be in error by substantially less than plus or minus 2.5 percent.

The portfolio composition of multiemployer and union funds was determined by weighting the sample portfolio distribution for each stratum by the amount of assets in that stratum in 1959. The results of this calculation are show in table I–7.

Since the sample used to estimate aggregate assets and portfolio distribution was drawn from the universe existing in 1959, funds formed since that year are not included. No attempt was made to derive an independent estimate of the assets added by newly formed funds in the years 1960–64. This means that the aggregate assets figures may be too low, and the size of the error may tend to increase as the sample year moves farther from 1959.

However, there are two factors that may keep the error within reasonable bounds. First, the growth of funds in the sample is sometimes augmented by the merger of an existing fund not in the sample. This lends an offsetting upward bias, but probably not a very large one, to the estimate of aggregate assets. Second, new funds are likely to be relatively small in terms of assets for several years after their inception, even if they cover sizable numbers of persons, because past service liabilities are funded slowly.

On balance, it appears that the sample estimates are better for the earlier years. However, the figures for later years are not likely to be greatly in error.