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Barriers to Entry as a Measure of a Firm's Monopoly Power

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I. Introduction

Past work by Professors Bain [2] and Mann [9, 10] has demonstrated a strong positive correlation between a firm's rate of return and the barriers to entry (BTE) into the industry of that firm's principal output. This paper refines, extends, and updates their work.

The primary refinement made concerns diversification by large corporations. Most previous studies in industrial organization have acknowledged the existence of this diversification but have only partially allowed for its importance in attempted uses of concentration ratios or BTE.[1] For example, Mann describes his procedure as follows:

> "In order to minimize the effect of diversification by firms, an attempt was made to select firms which received at least 50 per cent of their sales revenue from the product of the industry in which they were placed. For most of the firms in the sample, there was no problem. However, there were a few, notably the tire and tube companies, which barely met the criterion. The results should, therefore, be interpreted with this limitation in mind." [10, p. 298]

In the present study, Mann's procedure could not be followed because many firms were included which did not satisfy the criterion of 50 per cent of their sales in one industry. It was believed that a firm with only 49 per cent of its sales in its principal industry might well have a degree of

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monopoly power (for which BTE is a proxy) similar to that of a firm with 51 per cent of its sales in the same industry. In order to correct for this problem, a different criterion had to be devised.

Related to the above problem is the potential bias which could result from the assignment of each firm to only one industry. Such a procedure overlooks the monopoly power a firm may possess by way of its operations in industries from which less than 50 per cent of its total revenue is derived. As an example, consider the two hypothetical firms, A and B. Suppose that firm A has 51 per cent of its sales in an industry with very high (VH) BTE and 49 per cent in an industry with substantial (S) BTE, while firm B has 49 per cent of its sales in a VH-BTE industry and 51 per cent in an S-BTE industry. Mann would have placed firm A in the VH category and firm B in the S category, even though the difference between the two is minimal. Ideally one would like to eliminate these potential problems in studying the relationship between monopoly power and profitability.

II. Procedure

The sample[2] of firms studied was Fortune's list of the 500 largest industrial firms in 1965. Profit rates and sales information for each of these firms were taken from Moody's Industrial Manuals, 1961-1970, and Value Line, 1971.[3] Information concerning the height of BTE into the industries in which these firms operated was obtained from Bain [2], Mann [9, 10] and Shepherd [14]. For industries about which these three economists disagreed or for which none of them estimated the heights of BTE, independent estimates were made (see Appendix A). To allow for multi-industry output of the firms, a scheme was devised which weighted the percentage of a firm's sales in each industry by that industry's BTE. Industries with moderate-to-low (M-L) barriers

were assigned the value of zero; with S barriers, 0.5; and with VH barriers 1.0. Next the per cent of a corporation's sales in each industry was multiplied by the value assigned to that industry's BTE, to measure the amount of monopoly power obtained by a firm from each of the industries in which it had sales.[4] Then these weighted measures were summed to obtain B, a measure of each corporation's overall monopoly power.

Statistical contrasts were used to test the relationship between B and rates of return for several reasons: (1) the strong likelihood of measurement errors in determining industries' BTE's and corporations' sales in each industry could be mitigated by dividing the B measure into classes;[5] (2) the original BTE estimates were made in terms of classes; and (3) the possible presence of heteroscedasticity[6] could be corrected for using contrasts. Each contrast could be tested by subdividing the total error sum of squares into just that portion due to each contrast.

> "Such a procedure insures that any particular treatment comparison will be tested against the appropriate error. That is, the expected value of the 'error mean square for testing C_k' will contain the same components of variance (other than treatment effects) as the expected value of the mean square associated with C_k. In other words, if we are faced with different variances σ_{ij}^2 (i=1,...,b; j=1,...,t), the procedure of subdividing E_{YY} [the error mean square] will insure that the expected mean squares for a particular comparison and its associated error will each contain the <u>same</u> linear combination of the σ_{ij}^2. This, of course, provides us with unbiased tests for the comparison under investigation." [13, p. 377].[7]

The classes used for these contrasts were

B_1: $1.000 \geq B > .667$

B_2: $.667 \geq B > .333$

B_3: $.333 \geq B \geq 0$.

To take account of the changing product mix of many firms over the nine-year period studied, especially due to merger activity during the latter half of that period, the sample period was subdivided into two periods, 1961-1965 and 1966-1969. B was calculated for each firm for each period,[8] as was the average rate of return.

Finally, because of the unequal number of observations in each class, the appropriate degrees of freedom for the denominator of the F tests is not immediately obvious. In this study, Satterthwaite's approximation was used to calculate these.[9]

III. Results and Conclusions

The average rates of return for each class of monopoly power were $\bar{B} = 12.36$, $\bar{B}_2 = 10.59$, and $\bar{B}_3 = 9.96$. The results of contrasts between these averages are presented in Table 1. Firms with the highest degree of monopoly power, B_1, had significantly higher average rates of return than firms with a medium degree of monopoly power, B_2. And although firms with a medium degree of

Table 1. Contrasts testing the relationship B and average rates of return.

Contrast	df	F
B_1 vs. B_2	9	11.321*
B_2 vs. B_3	3	2.337
B_1 and B_2 vs. B_3	13	13.944*

*indicates significant at the five per cent level or better.
Note: df are calculated using Satterthwaite's approximation.

monopoly power had higher average rates of return than firms with a low degree of monopoly power, B_3, this difference was not statistically significant.

However, when the B_1 and B_2 classes were combined in a contrast against B_3, a significant difference was found. In general, it appears that firms in the B_1 class have enough monopoly power to substantially increase their rates of return, while those in the B_2 class do not necessarily have such power.

Of course these results must be viewed with care. As Mann warned his readers,

> "But rates of return may be inadequate indicators of price-cost margins, the particular barrier-to-entry classification into which an industry was placed may be incorrect, the period [1961-1969] may be a short run for some of the industries in the sample, and some important sufficient conditions for the exercise of monopolistic pricing may not be fulfilled." [10, p. 300]

In particular, these potential problems may explain the lack of a clear conclusion with regards to firms in the B_2 class of monopoly power.

Finally, it must be emphasized that these results are statistical results. Any one firm may have a rate of return quite different from the average rate of return for all firms in its class.

Footnotes

[1]A well-known exception is the work by Hall and Weiss [7], in which concentration ratios were weighted by the per cent of a firm's total employment in each industry.

[2]If one is merely interested in the relationship between profits and monopoly power for 1961-1969, then the firms studied are a population, not a sample. In that case statistical inference tests like the ones used in this paper are unnecessary; the observed numbers and distributions are sufficient evidence on which to base conclusions.

If, though, one wishes to predict this relationship for another point in time, assuming that other conditions are approximately equivalent, the 1965 list of the 500 largest firms can be thought of as a sample from all possible lists over time. Alternatively, the 1965 list might be viewed as a sample from a conceptual population of all possible lists which might have existed in 1965, assuming that random elements determined the composition of the observed list for that year (cf. Gibrat's Law). If either of these latter lines of thought is adopted, statistical inference tests are not only justified, but they are mandatory for the drawing of conclusions from the observed data.

[3]Because of data unavailability and because of mergers and acquisitions, not all 500 firms could be included in the sample. See Appendix B.

[4]Ideally, in studying the relationship between profits and BTE, one would like to weight the fraction of a corporation's profits generated in each industry by that industry's BTE. Unfortunately such a disaggregation of profits is only rarely reported, possibly because of the indeterminacy arising from joint products.

[5]See Johnston [8, p. 149].

[6]See Hall and Weiss [7].

[7]An explanation of the procedure is provided by Ostle [13, p. 378].

[8]The data on B are provided for each firm in Appendix B.

[9]See Ostle [13, pp. 302-303].

[10]W. G. Shepherd, private communication, May 17, 1971.

References

[1]Advertising Age 40, no. 42: 49-60, "Magazines 1969." 1969.

[2]Bain, J., Barriers to New Competition. Cambridge, Mass., Harvard University Press, 1965.

[3]Federal Trade Commission, Bureau of Economics, "Comparable Concentration Ratios for 213 Manufacturing Industries Classified by Producer and Consumer Goods and Degree of Product Differentiation 1947, 1954, 1958, and 1963." Washington, D.C., 1967.

[4]Financial World 130, no. 14: 11-12, "Regional Brewers Battle for Survival." 1968.

[5]Forbes 104: no. 6: 95, "Battle for Survival." 1969.

[6]Fortune 74, no. 2: 232-249, "The 500 Largest U.S. Industrial Corporation." 1966.

[7]Hall, M. and Weiss, L., "Firm Size and Profitability." R. E. Stat. 49: 319-331. 1967.

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[9]Mann, H., "Asymmetry, Barriers to Entry, and Rates of Return in Twenty-six Concentrated Industries, 1948 to 1957." Western Economic Journal. 8: 86-89. 1970.

[10]_____, "Seller Concentration, Barriers to Entry, and Rates of Return in Thirty Industries, 1950-1960." R. E. Stat. 48: 296-307. 1966.

[11]Marketing / Communications 298, no. 1: 26-29, "Schlitz sets pace for beer's big 3." 1970.

[12]Moody's Industrial Manual, 1961-1970.

[13]Ostle, B., Statistics in Research (2nd ed.). Ames, Iowa, The Iowa State University Press, 1963.

[14]Shepherd, W., Market Power and Economic Welfare. New York, Random House, Inc., 1970.

[15]Standard and Poor's Industry Surveys, 1971.

[16]The Value Line Investment Survey, 1971.

Appendix A. Barriers to Entry to Various Industries

Whenever possible, previous studies were relied upon to provide information on barriers to entry to these industries. The four primary sources were Bain [2], Mann [9, 10], and Shepherd [14]. Supporting evidence was frequently drawn from a Federal Trade Commission (FTC) study done in 1967 [3].

Bain and Mann discuss four basic types of barriers to entry. These are

1. scale barriers. The cost curves for firms in a particular industry may be downward sloping until a very large rate of output is reached. This rate of output may be so large relative to the total demand for the product that only a few firms can profitably exist in the industry. Entry by another firm would reduce the market shares of all firms and raise their average costs so that none of them could be profitable. Potential entrants, recognizing this state of affairs, will try to avoid unprofitable entry, but the incumbents may still be enjoying monopoly profits.

2. product differentiation barriers. If consumers are strongly attached to existing brands of a product, either because they find the relevant information difficult to acquire or comprehend or because of large advertising expenditures, entrants to this industry will be forced to sustain burdensome advertising expenditures if they wish to capture a profitable share of the market.

3. absolute cost barriers. If one firm or a few firms control necessary patents or natural resources or have special technical secrets, entry into this industry will be effectively impeded.

4. capital barriers. In undertaking a business venture, a firm will require capital in the form of plant, equipment, and inventories. If the capital market is imperfect, large capital requirements in an industry may be a barrier to entry.

This basic framework of analysis has been followed in this appendix whenever necessary and / or possible.

In the following tables are listed industries with very high (VH), substantial (S), or moderate-to-low (M-L) barriers to entry, respectively. The codes in parentheses following each industry refer to the source(s) in which the classification was made. These sources and their codes are:

B.	Bain	[2]
MR.	Mann	[10]
MW.	Mann	[9]
Sh.	Shepherd	[14]
P.	Palmer, this study.	

An asterisk following an industry indicates a disagreement among sources as to the appropriate class for that industry. Resolutions of these disagreements along with explanations of all classifications coded "P" follow these first three tables. When asked his opinion of the disagreements, Shepherd responded, "I regard all estimates of entry barriers as unavoidably subjective in some degree..."[10] After attempting the estimates himself, one can only agree.

Table 2. Industries with Very High Barriers to Entry

1. automobiles (B, MR, MW, Sh)
2. farm machinery and equipment, integrated line or heavy equipment (*)
3. cereal (*)
4. chewing gum (*)
5. distilled liquor (B, MR, MW, Sh).
6. cigarettes (*)
7. pulp mills (Sh)
8. newspapers (Sh)
9. sulphur (MR, MW)
10. nickel (MR, MW)
11. copying equipment (Sh)
12. soft drink flavorings (MW)
13. ethical drugs (MR, Sh)
14. proprietary drugs (*)
15. soap and other detergents (*)
16. explosives (Sh)
17. flat glass (MR, MW, Sh)
18. primary copper (*)
19. integrated copper operations (*)
20. razor blades and razors (Sh)
21. computing and related machines (Sh)
22. transformers (Sh)
23. switchgear and switchboards (Sh)
24. electric motors and generators (Sh)
25. industrial controls (Sh)
26. carbon and graphite products (MW, Sh)
27. buses (Sh)
28. electric lamps (Sh)
29. telephone and telegraph apparatus (Sh)
30. aircraft engines and parts (Sh)
31. aircraft (Sh)
32. shipbuilding and repairing (Sh)
33. locomotives and parts (Sh)
34. photographic equipment (Sh)
35. aerospace and defense (P)
36. iron ore (P)
37. copper ore (P)
38. network broadcasting (P)
39. utilities (P)
40. precious metals (P)

Table 3. Industries with Substantial Barriers to Entry

1. light farm equipment (*)
2. blended and prepared flour mixes (Sh)
3. bread and related products (*)
4. chocolate and cocoa products (Sh)
5. sanitary paper products (Sh)
6. periodicals (*)
7. alkalies and chlorine (MW, Sh)
8. industrial gases (Sh)
9. intermediate coal tar products (Sh)
10. inorganic pigments (Sh)
11. other inorganic chemicals (Sh)
12. organic chemicals (Sh)
13. synthetic rubber (Sh)
14. other man-made fibers (Sh)
15. toilet preparations (Sh)
16. petroleum refining (B, MR, Sh)
17. tires (*)
18. other pressed and blown glass (*)
19. cement (*)
20. blast furnaces and steel mills (*)
21. cold-finished steel shapes (*)
22. steel pipe and tube (*)
23. primary zinc (Sh)
24. primary aluminum (MR, MW, Sh)
25. copper rolling and drawing (*)
26. aluminum rolling and drawing (Sh)
27. nonferrous wire drawing, etc. (Sh)
28. metal cans (*)
29. shoe machinery (MR, MW)
30. sugar (MW, Sh)
31. steel power boilers (Sh)
32. safes and vaults (Sh)
33. steam engines and turbines (Sh)
34. internal combustion engines (Sh)
35. construction machinery (Sh)
36. elevators and escalators (Sh)
37. industrial trucks and tractors (Sh)
38. rolling mill machinery (Sh)
39. paper industries machinery (Sh)
40. typewriters (*)
41. household cooking equipment (Sh)
42. household refrigerators (Sh)
43. household laundry equipment (Sh)
44. beer (*)
45. lumber (Sh)
46. fertilizers (Sh)
47. radios and televisions (Sh)
48. broadcasting equipment (Sh)
49. electron tubes (Sh)
50. cathode ray picture tubes (Sh)
51. storage and primary batteries (Sh)
52. X-ray apparatus (Sh)
53. hard surface floor coverings (*)
54. heavy industrial machinery (Sh)
55. air conditioning and heating equipment (P)
56. plastic production (P)
57. natural gas (P)
58. heavy auto parts (P)
59. paperboard (P)
60. local broadcasting (P)
61. vehicle rental (P)
62. natural resources (P)
63. office machines (P)
64. insecticides (P)
65. steamship operations (P)
66. lawn and garden equipment (P)
67. guns (P)
68. soup (P)
69. baby food (P)
70. computer software (P)
71. credit cards (P)
72. refractory materials (P)
73. mobile homes (P)
74. cigars (P)
75. silverware and plated ware (P)

Table 4. Industries with Moderate-to-Low Barriers to Entry

1. small metal products (Sh)
2. wooden furniture (Sh)
3. fluid milk (Sh)
4. wet corn milling (Sh, MW)
5. biscuits, crackers and cookies (*)
6. rayon (*)
7. flour (B, MR, Sh)
8. footwear (Sh)
9. sewing machines (Sh)
10. woolen and cotton textiles (MR, Sh)
11 clothing (MR, Sh)
12. glass containers (*)
13. brick and structural tile (Sh)
14. gypsum products (*)
15. abrasive products (Sh)
16. electrometallurgical products (Sh)
17. foundries (Sh)
18. secondary non-ferrous metals (M-L)
19. canned fruits and vegetables (B, MR, Sh)
20. bituminous coal (MR)
21. transportation equipment, hardware (Sh)
22. metal plumbing fixtures (Sh)
23. ball and roller bearings (Sh)
24. household vacuum cleaners (Sh)
25. books (*)
26. corrugated containers (Sh)
27. engine electrical equipment (Sh)
28. surgical appliances and supplies (Sh)
29. meatpacking (B, MR, Sh)
30. printing (Sh)
31. quarrying (P)
32. plastic fabrication (P)
33. paperboard products (P)
34. packaging materials (P)
35. light auto parts (P)
36. dairy products (P)
37. asbestos (P)
38. real estate (P)
39. adhesives (P)
40. tape and allied products (P)
41. advertising services (P)
42. educational and training services (P)
43. protection systems (P)
44. leisure products (P)
45. retailing (P)
46. crafts, games, and toys (P)
47. printing ink (P)
48. restaurants (P)
49. insurance (P)
50. finance (P)
51. rugs and carpets (P)
52. writing equipment (P)
53. ophthalmic goods (P)
54. soft drink bottlers (P)

Farm machinery and equipment (VH2, S1). Bain [2] and Mann [9, 10] place this industry in the substantial category, but Bain's discussion suggests that the industry could well be segmented as was done here. For heavy farm equipment such as tractors, combines, etc., the optimal scale of operations is ten to fifteen percent of the national market [2, p. 260], a very high scale barrier, and there are significant multiplant economies [2, p. 262]. There also appear to be some economies for full-line integrated operations, but the barriers to entry are lower for small machinery [2, p. 262].

Cereal (VH3). The product differentiation barrier is so high that the industry is placed in the VH class. From Mann, "The marketing of new brands is very expensive. One estimate indicates that approximately 47% of the sales revenue earned in the first year on fourteen new brands introduced between 1957 and 1961 was spent on advertising in the major media" [9, unpublished appendix]. Shepherd placed cereals in the substantial barrier class.

Chewing gum (VH4). Mann [10] indicates a VH product differentiation barrier which is high enough to pull the industry into the VH over-all class. Shepherd placed chewing gum in the substantial class.

Soap and detergents (VH15). Bain decided that the product differentiation barrier is VH and the capital barrier is substantial (p. 169). He suggested that since innovation is quite likely in this industry, an avenue for entry was available through new products. This possible means of entry was sufficient, he thought, to put the firm in the substantial class rather than the VH class.

Shepherd's classification of VH was accepted for the present study because new firms do not seem to have used the innovation route very successfully during the 1960's. In fact, the proliferation of enzyme products was begun by Colgate-Palmolive, leading one to believe that perhaps innovation and research and development may be used by incumbents to create another barrier to entry.

Cigarettes (VH6). Here again the indication [2, pp. 286-288] is that the VH product differentiation barrier is sufficient to term this industry as having VH barriers, but Shepherd termed the barriers substantial.

Proprietary and ethical drugs (VH13, VH14). Mann [10] and Shepherd both place ethical drugs in the VH category. Proprietary drugs were placed there also because of their high product differentiation barrier.

Copper and copper products (VH18, VH19, S25). Bain (p. 171) places all copper operations in the substantial class, but allows for the possibility that due to scarcity and the close control of natural resources, the absolute cost barrier may be VH. He further points out that because of economies of vertical integration, and optimal scale of a firm is 10% of the national output (p. 248). On the basis of this evidence, Shepherd was followed to some extent in the present study with primary copper and integrated operations placed in the VH class, and copper rolling and drawing in the substantial class. The control of ore deposits has less impact on the secondary copper

operations because of reclamation and use of scrap copper.

Bread and related products (S3). Mann [10] called the barriers M-L in this industry even though, "For entrants other than grocery chains, economies of scale are a very important barrier to entry, largely because the relevant markets are small relative to the optimal size plant," [p. 304]. This high scale barrier coupled with the fact that the number of bakeries had declined from 5,984 in 1947 to 4,339 in 1963 [3, p. 1] led to agreement with Shepherd that the barriers to entry in the bread industry probably substantial.

Periodicals (S6). There is a serious problem in the periodicals industry of defining the relevant market. Women's magazines probably do not compete much with children's magazines or financial magazines, but they all probably compete, to some extent with newspapers, television, radio, and perhaps even general news magazines. Shepherd at one point (p. 126) places "general periodicals" in the VH class, but at another point (pp. 274-275) places periodicals in the substantial class.

The problem is further compounded by evidence [1] that in each specialized area the number of periodicals has increased rapidly during the past decade, but this growth has been due to specialization and product differentiation. It may still be that the barriers to entry into the subindustry of general, nationwide news and consumer magazines are very high. This possibility has been rejected in the present study because these general periodicals must compete on nearly equal terms with various specialized periodicals (and other news and entertainment sources) for the readers' time as well as money.

Tires (S17). Bain put this industry in the M-L class partly because of its low scale barrier (p. 238), and partly because of the comparative ease of entry to the replacement field. The industry was moved up a class in this

study because of the possible control of natural resources, because of the growth of the product differentiation barrier, and because of the high barrier (acknowledged by Bain) to the original equipment field. This last factor will grow in importance in the future because of the development of longer-lasting polyester cord tires, decreasing the demand for replacement tires.

Pressed and blown glass (S18). Shepherd placed this industry in the VH category. The evidence provided by the FTC, however, was judged as insufficient to justify placing the industry above the upper range of the substantial category:

Table 5. Some Structural Characteristics of the Pressed and Blown Glass Industry [3, p. 9]

Year	Number of Firms	concentration ratios		
		4-firm	8-firm	20-firm
1947	107	51	65	80
1954	255	67	77	88
1958	111	64	79	90
1963	75	68	81	93

Cement (S19). Although the cement industry was placed in the M-L class by Bain, Mann [10] reports that the optimal scale of operations had grown so much relative to the regional markets during the 1950's that cement probably now belongs in the substantial class.

Steel, cold-finished steel shapes, steel pipe and tube(S20, S21, S22). Shepherd estimates the barriers in these industries as VH, but the evidence from Bain and the FTC on the steel industry overwhelmingly support Bain's estimation of only substantial barriers.

The only evidence that supports placing steel in the VH class is the possibly VH barriers due to scarcity and the control of natural resources [2, p. 271]. Offsetting this possibility are the small optimal plant size [2, p. 236], only slight multiplant economies [2, p. 254], only slight product differentiation barriers [2, p. 265], and low selling costs [2, p. 179]. Furthermore, from 1958 to 1963 (the only years for which data are available in the FTC study), the number of firms in the steel industry increased from 148 to 162. During that same time period, the 4-firm concentration ratio in the steel industry declined from .53 to .50 [3, p. 10].

In opposition to Shepherd's estimates, the secondary steel industries included here are placed in the substantial category. The reasons for this classification are that steel producers (into which the barriers to entry are only substantial) should find vertical entry into these industries relatively easy. In addition, these secondary industries are frequently able to use scrap metal and are, therefore, less dependent on a closely held natural resource. A final piece of supporting evidence is that the concentration ratios in these industries (.34 and .26, respectively) are even lower than that of the basic steel industry [14, p. 274].

Metal Cans (S28). Before 1950, Bain thought, the metal can industry might have had substantial barriers to entry. The anti-trust suit of that year forbidding tying contracts, he believed, would lower these barriers enough so that they would only be moderate. As can be seen from Table 6, this belief was probably not borne out.

Table 6. Some Structural Characteristics of the Metal Can Industry [3, p. 11]

Year	Number of Firms	concentration ratios		
		4-firm	8-firm	20-firm
1947	102	78	86	94
1954	109	80	88	96
1957	84	80	89	97
1963	99	74	85	95

The structure of the metal can industry does not seem to have changed much since 1947.

It should be pointed out, too, that the concentration ratios significantly understate the monopoly power of the firms in this industry. Because metal cans are bulky, their high transportation costs relative to their value makes their relevant market regional rather than national in scope. Within each region the concentration ratios may be much higher and the barriers to entry may also be higher.

Typewriters (S40). The placement of the typewriter industry by Shepherd into the M-L category is not supported by the FTC data in Table 7. The persistently small number of firms and large concentration ratios suggest

Table 7. Some Structural Characteristics of the Typewriter Industry [3, p. 13]

Year	Number of Firms	concentration ratios		
		4-firm	8-firm	20-firm
1947	23	.79	.96	1.00
1954	15	.83	.99	1.00
1958	15	.79	.99	1.00
1963	17	.76	.99	1.00

the existence of at least substantial barriers to entry. It seems unlikely that such an industry structure could be maintained for long without the existence of significant barriers to entry.

Beer (S44). Mann [10] placed this industry in the M-L class because only insignificant scale economies seemed evident and because, "One consumer survey indicates that beer-drinkers do not show a marked preference for nationally advertised beers" (p. 305). Additional facts cast some doubt on this decision and suggest that the beer industry has substantial barriers to entry.

Most important of these facts are the data from the FTC in Table 8 showing that the big brewers are becoming bigger while the small brewers are finding it difficult to remain profitable. Suggested reasons for this phenomenon are price wars, seasonal fluctuations, high fixed expenses, and encroachment by industry giants [4]. These reasons further suggest that the capital barrier (as opposed to the scale barrier) is fairly high because of seasonally fluctuating inventories. They also suggest that the product differentiation barrier is growing as the nationwide industry giants encroach upon the regional markets of the small brewers.

Additional evidence of growing barriers to entry to the beer industry are that the top two firms accounted for 31% of beer sales in 1969 [11] and that regional brewers find it difficult to go national [5].

Table 8. Some Structural Characteristics of the Malt Liquor Industry [3, p. 2]

Year	Number of Firms	concentration ratios		
		4-firm	8-firm	20-firm
1947	404	21	30	44
1954	263	27	41	60
1958	211	28	44	68
1963	171	34	52	78

Hard surface floor coverings (S53). Mann [9] is unconvincing in his reasons for having placed this industry in the substantial class. He says that the optimal scale of operations may be around 10% of the national output, but he also points out that, "The cost curves below minimum optimal scale in these three product lines may be fairly shallow, though, because the major study of this industry does not list economies of scale to the plant or to the firm as a significant deterrent to entry and there is no apparent tendency for small plants to disappear over time" [9, unpublished appendix].

Mann further says that the product differentiation barrier seems important, but there appears to be no sizeable absolute cost barrier and capital requirements are only moderate. One is tempted, on the basis of these facts, to agree with Shepherd that the barriers to entry here are only M-L.

The FTC data (Table 9) are strong enough, though, to tip the scales in Mann's favor. On the theory that small numbers and high concentration ratios cannot long exist in an industry without significant barriers to entry, one must finally place the hard surface floor covering industry in the substantial category.

Table 9. Some Structural Characteristics of the Hard Surface Floor Coverings Industry [3, p. 16]

Year	Number of Firms	concentration ratios		
		4-firm	8-firm	20-firm
1947	14	.80	.95	1.00
1954	10	.87	.96	1.00
1958	11	.83	.96	1.00
1963	15	.87	.98	1.00

Biscuits, crackers, and cookies (M-L5). Mann's classification of this industry as having substantial barriers to entry is questionable. He states that, "...economies of scale appear to be unimportant" [10, p. 304], and that capital requirements are moderate [p. 304]. It also would seem that the absolute cost barriers are low. The only substantial barrier in this industry is that of product differentiation. As stated, this evidence is not convincing on whether the industry has substantial or moderate-to-low barriers. The argument for M-L (Shepherd's choice) is more persuasive when it is realized that biscuits, etc., are less perishable than bread. As a result, a potential entrant must capture a smaller share of the market to be profitable in biscuits than in bread. He can ship his product farther, and it will last longer on the shelves.

Rayon (M-L6). The barriers in the rayon industry were termed substantial by Shepherd, but Bain's classification of the industry as M-L was given more weight in the present study. There may have been some absolute cost barrier to entry due to secret techniques as the industry was developing [2, p. 155], but by 1960, these techniques were fairly readily available. There are no product differentiation barriers [2, p. 137].

Glass containers (M-L12). Mann [10] put this industry in the M-L category because "Economies of scale do not seem to be important..." [p. 304], and there is "...little room for product differentiation" [p. 304]. He mentions also that the patent control, which provided a very high barrier, was effectively diminished by an anti-trust suit in 1946. If these statements are correct, there is no reason for Shepherd's classification of VH.

Gypsum products (M-L14). Shepherd placed the gypsum industry in the substantial class, but after U.S. Gypsum was required to desist from exclusively licensing its patents in a 1951 anti-trust suit, the absolute cost

barriers became negligible [2, pp. 266-268].

Books (M-L25). Shepherd classed the barriers substantial here, but this classification was rejected because, while through copyright laws each title has its own monopoly, there are generally many competitors in each subject area. This widespread competition is evidenced by the FTC data presented in Table 10.

Table 10. Some Structural Characteristics of the Book Industry [3, p. 6]

Year	Number of Firms	concentration ratios		
		4-firm	8-firm	20-firm
1947	635	.18	.29	.48
1954	804	.21	.32	.51
1958	883	.16	.29	.48
1963	936	.20	.33	.56

Aerospace and defense (VH35). This industry was placed in the VH class because of its obvious similarities to the aircraft industry (VH31).

Iron and copper ore (VH36, VH37). The control of scarce natural resources [2, p. 171] seemed sufficient to justify placing these industries in the VH class.

Network broadcasting (VH38). The economies of scale seem to be such that the existing firms in this industry have nearly natural monopoly power. The failure of recent attempts to enter it also suggest a VH classification.

Utilities (VH39). These are assumed to have natural or state-endowed monopoly power.

Precious metals (VH40). The general technology in these industries is similar to that of primary copper (VH18), and their smaller markets increases their scale barriers.

Air conditioning and heating equipment (S55). These products were deemed sufficiently similar to heavy industrial machinery (S54) and large consumer appliances (S41, S42, S43) that they were placed in the substantial class.

Plastic production and fabrication (S56, M-L32). Plastic production was equated with chemicals (S11, S12) and put in the class with substantial barriers. Plastic fabrication, though, depends less on patents, secret technologies, and scale barriers to entry. Consequently its barriers were termed M-L.

Natural gas (S57). The conditions in this industry were believed to be enough similar to those in the petroleum industry (S16) to justify placing it in the substantial class. One significant difference, though, is that natural gas is sold in large amounts to regional distributors who have natural monopolies. This situation gives rise to bilateral monopoly conditions, which may or may not, depending on relative bargaining powers, affect the performance in the natural gas industry.

Auto parts (S58, M-L35). This industry was segmented into the two groups because heavy auto parts more closely resemble heavy industrial equipment (S54) and internal combustion engines (S34). Light auto parts are likely to be similar to engine electrical equipment (M-L27) and small metal products (M-L1).

Pulp, paper, and paper products (VH7, S5, S59, M-L26, M-L33, M-L34). These various subindustries are quite troublesome. Shepherd's placement of pulp mills in the VH class was accepted. So was his placement of sanitary paper products in the substantial class. The rest of the products seemed to fall into the two broad groups of paper or paperboard manufacturing and paper or paperboard products. The former group was placed in the substantial class because of its closer vertical connection with lumber supplies and its greater scale barriers than the latter.

Local broadcasting (S60). The growth of the markets, the increasing use of UHF channels, and the recent license changes by the FCC were all factors influencing the decision to place this industry in the substantial class.

Vehicle rental (S61). The barriers to entry into this industry were judged to be substantial rather than VH because the product differentiation and capital barriers are lower than those in the automobile industry.

Natural resources (S62). This industry is such a conglomeration of activities that an estimation of its barriers to entry must be tenuous at best. This estimation was attempted only because no further sales disaggregation is provided for IT and T. The substantial classification was finally decided upon because most ore activities are VH (VH36, VH37), while lumber and cement are substantial (S45, S19), and gypsum (M-L14) and asbestos (M-L37) are M-L. Substantial seemed a reasonable average of these barriers.

Office machines (S63). Office machines were considered similar to typewriters (S40) and were placed in the same category.

Insecticides (S64). These appear to be related to chemicals (S11, S12) and fertilizers (S46) and consequently were assigned to the substantial category.

Steamship operations (S65). This industry was finally assumed to have substantial barriers because of its capital requirements, but its international market and competition may be strong enough that it should have been placed in the M-L category.

Lawn and garden equipment (S66). Because light farm equipment (S1) and large consumer appliances (S41, S42, S43) were all in the substantial class, the lawn and garden equipment industry was put there, too.

Guns (S67). This industry also seemed similar enough to the large consumer appliance industries (S41, S42, S43) that it was placed in the substantial class.

Soup and baby food (S68, S69). Bain, Mann (1966), and Shepherd all agree that generally canned fruits and vegetables (M-L19) belong to the M-L category. These two products seemed different, though, because of specialized product differentiation, and were elevated by this study to the substantial category. In both cases there are only two firms controlling very large shares of the market.

Computer software (S70). Since computer software consists basically of paper products and paperboard products, it might upon initial consideration be assigned to the M-L class, but the tying contracts of software to hardware throughout much of the 1960's suggested that it should properly be placed in the substantial class, at least for that time period.

Credit cards (S71). The capital barriers and the problems of establishing an organization for the clearance of accounts were deemed sufficiently significant to justify the placement of the credit card industry in the substantial category.

Refractory materials (S72). The declining number of firms in this industry and its slightly increasing concentration ratios led to the decision to assign it to the substantial barrier class (Table 11).

Table 11. Some Structural Characteristics of the Clay Refractories Industry [3, p. 9]

Year	Number of Firms	concentration ratios		
		4-firm	8-firm	20-firm
1947	108	.41	.57	.76
1954	113	.43	.60	.79
1958	104	.43	.61	.81
1963	80	.41	.60	.83

Mobile homes (S73). This industry was put in the substantial class rather than the VH class because its scale and product differentiation barriers are more nearly like those of the truck industry (S37) than the automobile industry (VH1).

Cigars (S74). The cigar industry has experienced a sizeable decrease in the number of firms and a sizeable increase in its concentration ratios (Table 12). The relatively large number of remaining firms and the lower product differentiation barriers here than in the cigarette industry were nevertheless deemed sufficient for placing cigars in the substantial class.

Table 12. Some Structural Characteristics of the Cigar Industry [3, p. 9]

Year	Number of Firms	concentration ratios		
		4-firm	8-firm	20-firm
1947	765	.41	.57	.76
1954	375	.44	.64	.80
1958	247	.54	.75	.86
1963	164	.59	.81	.92

Silverware and plated ware (S75). The only slightly declining number of firms (increasing since 1954) and the declining concentration ratios shown in Table 13 suggest that the barriers to entry to this industry may be substantial but are not high enough to be termed VH.

Table 13. Some Structural Characteristics of the Silverware and Plated Ware Industry [3, p. 15]

Year	Number of Firms	concentration ratios		
		4-firm	8-firm	20-firm
1947	221	.61	.72	.82
1954	190	.61	.72	.83
1958	198	.54	.67	.79
1963	201	.55	.66	.81

Quarrying (M-L31). Because the number of firms in the cut stone and stone products industry has increased from 624 in 1947 to 857 in 1963 [3, p. 10], and because the control of scarce natural resources seems unimportant, this industry was placed in the M-L class.

Dairy products (M-L36). This industry was related to fluid milk (M-L3), biscuits, etc., (M-L5), and canned fruits and vegetables (M-L19) and placed in the M-L category.

Asbestos (M-L37). While there is some control of the natural resources of this industry, and there are some attempts at product differentiation, the general structure of the asbestos industry probably does not differ significantly from that of the gypsum industry (M-L14).

Real estate (M-L38). Land development may have some semblance of natural monopoly powers associated with any single development, but the range of substitutes seems broad enough, especially for firms operating on a nationwide basis, to merit the assignment of this industry to the M-L class.

Adhesives (M-L39). These seemed somewhat similar to abrasives (M-L15) and were placed in the same category. This decision was also based on considerations of different types of adhesives (e.g., chemical, biological), all of which compete to some extent.

Tape and allied products (M-L40). This industry appears to be related to that of plastic fabrication (M-L32) and hence was assigned to the M-L class.

Advertising, educational, and training services (M-L41, M-L42). These various services were placed in the M-L barrier class because of their low capital, scale, and absolute cost barriers. Product differentiation, though it exists, also seems unimportant as a barrier to entry.

Protection systems (M-L43). Protection systems are constructed primarily of small metal products (M-L1) and metal plumbing fixtures (M-L22), placing them in the M-L class of barriers to entry.

Leisure products (M-L44). On the assumption that generally these involved small metal parts (M-L1), textiles (M-L10), or plastic fabrication (M-L32), leisure products were for the most part assigned to the M-L category. Exceptions were made in the cases of guns (S67), boats, and bowling alleys and pinsetters because these more nearly represented large consumer appliances (S41, S42, S43) or heavy industrial machinery (S54).

Retailing and restaurants (M-L45, M-L48). The barriers to entry to these industries were termed M-L because of their relatively low capital, scale, and absolute cost barriers. The growth of chain outlets and franchises may have foreclosed entry slightly, but a growing and shifting population provides a constantly growing and changing source of demand to be tapped by potential entrants.

Crafts, games, and toys (M-L46). This industry consists primarily of small metal products (M-L1), paperboard products (M-L33), and plastic fabrication (M-L32). Additional evidence from the FTC concerning the games and toys industry is relevant:

Table 14. Some Structural Characteristics of the Games and Toys Industry [3, p. 15]

Year	Number of Firms	concentration ratios		
		4-firm	8-firm	20-firm
1947	830	.20	.29	.44
1954	872	.18	.25	.40
1958	845	.13	.22	.35
1963	767	.15	.25	.43

Printing ink (M-L47). The number of firms in this industry is no higher than the number of firms in some of the industries assigned to the substantial class, but the growth in the number of firms, shown in Table 15, and the declining concentration in the industry strongly support the decision to assign it to the M-L class.

Table 15. Some Structural Characteristics of the Printing Ink Industry [3, p. 8]

Year	Number of Firms	concentration ratios		
		4-firm	8-firm	20-firm
1947	151	.57	.69	.81
1954	188	.54	.65	.79
1958	193	.53	.65	.78
1963	216	.48	.63	.77

Insurance (M-L49). This industry was tentatively put in the M-L class because insurance firms seem abundant, with small ones entering regional markets with relative ease.

Finance (M-L50). In a very general sense, this industry includes banks, savings and loan institutions, credit unions, finance companies, loan sharks, and insurance companies. While entry into some of these forms of financial institutions is impeded by federal and state regulations, entry into other competing segments of the industry is relatively easy.

Rugs and carpets (M-L51). Because furniture (M-L2) and textiles (M-L10) were classed in the M-L category, so were rugs and carpets.

Writing equipment (M-L52). Bain (p. 169) thought that the only significant barrier to entry into the high-quality fountain pen industry was that of product differentiation. The writing equipment industry of the 1960's involved primarily ball-point pens, though, and in this case the scale and capital

barriers are even lower than they were for fountain pens. Product differentiation still appears to have some importance, but the proliferation of little-known brands has been significant enough that the industry barriers were classified as M-L.

Ophthalmic goods (M-L53). Product differentiation in this industry appears to be relatively unimportant [3, p. 15]. The data on the number of firms and concentration are mixed (see Table 16), but the final decision was to place the industry in the lowest class.

Table 16. Some Structural Characteristics of the Ophthalmic Goods Industry [3, p. 15]

Year	Number of Firms	concentration ratios		
		4-firm	8-firm	20-firm
1947	175	.58	.69	.80
1954	223	.54	.63	.75
1958	216	.52	.62	.74
1963	211	.53	.62	.77

Soft drink bottlers (M-L54). In addition to being somewhat related to other food processing industries, the bottling industry was placed in the M-L category because of its large number of firms and low concentration ratios. The data in Table 17 suggest that the barriers are growing in this industry, probably because of franchising by more popular national brands, but the sheer numbers involved still seem to warrant this decision.

Table 17. Some Structural Characteristics of the Soft-Drink Bottling Industry [3, p. 2]

Year	Number of Firms	concentration ratios		
		4-firm	8-firm	20-firm
1947	5169	.10	.14	.20
1954	4334	.10	.14	.21
1958	3989	.11	.15	.22
1963	3569	.12	.17	.24

APPENDIX B. The Firms Studied and Their Monopoly Power in 1965 and 1969

Corporation	Rank by Sales 1965	B 1965	B Classes 1965	B 1969	B Classes 1969
General Motors	1	.95	1	.95	1
Ford	2	.89	1	.89	1
Standard Oil (NJ)	3	.50	2	.50	2
General Electric	4	.65	2	.67	2
Chrysler	5	.90	1	.90	1
Mobil Oil	6	.50	2	.50	2
U.S. Steel	7	.50	2	.50	2
Texaco	8	.50	2	.50	2
IBM	9	.90	1	.90	1
Gulf Oil	10	.50	2	.50	2
Western Electric	11	1.00	1	1.00	1
Dupont	12	.51	2	.51	2
Swift	13	.15	3	.15	3
Bethlehem Steel	14	.52	2	.52	2
Shell Oil	15	.50	2	.50	2
Standard Oil (Ind)	16	.47	2	.47	2
Standard Oil (Cal)	17	.50	2	.50	2
Westinghouse	18	.68	1	.68	1
International Harvester	19	.66	2	.66	2
Goodyear	20	.38	2	.38	2
Union Carbide	21	.57	2	.58	2
Armour	22	.17	3	.21	3
Procter and Gamble	23	.65	2	.65	2
RCA	24	.82	1	.76	1
General Telephone	25	.83	1	.83	1
Boeing	26	1.00	1	1.00	1
Kraftco	27	.00	3	.00	3
North American Rockwell	28	.95	1	.76	1
Lockheed Aircraft	29	.98	1	.98	1
ITT	30	.59	2	.59	2
Firestone	31	.40	2	.40	2
General Foods	32	.22	3	.22	3
General Dynamics	33	.93	1	.93	1
Monsanto	34	.50	2	.52	2
Eastman Kodak	35	.97	1	.97	1
Phillips Petroleum	36	.50	2	.50	2
Continental Oil	37	.45	2	.45	2
United Aircraft	38	.92	1	.92	1
Caterpillar Tractor	39	.50	2	.50	2
Borden	40	.11	3	.11	3

Appendix B - continued

Corporation	Rank by Sales 1965	B 1965	B Classes 1965	B 1969	B Classes 1969
Republic Steel	41	.50	2	.50	2
Burlington Industries	42	.00	3	.00	3
International Paper	43	.65	2	.65	2
Sinclair Oil	44	.50	2	-	-
American Can	45	.40	2	.40	2
Sperry Rand	46	.80	1	.80	1
Union Oil	47	.50	2	.50	2
Continental Can	48	.26	3	.26	3
Uniroyal	49	.41	2	.41	2
Cities Service	50	.50	2	.50	2
Armco Steel	51	.50	2	.48	2
Dow Chemical	52	.46	2	.46	2
Alcoa	53	.49	2	.49	2
Allied Chemical	54	.31	3	.40	2
National Steel	55	.50	2	.50	2
Tenneco	56	.41	2	.50	2
McDonnell Douglas	57	1.00	1	1.00	1
Reynolds Tobacco	58	.95	1	.66	2
W. R. Grace	59	.30	3	.27	3
3M	60	.21	3	.15	3
Anaconda	61	.88	1	.88	1
Jones and Laughlin	62	.50	2	.50	2
American Motors	63	.95	1	1.00	1
B. F. Goodrich	64	.50	2	.50	2
Singer	65	.29	3	.29	3
CPC International	66	.00	3	.00	3
Inland Steel	67	.50	2	.50	2
Ralston Purina	68	.00	3	.00	3
General Tire and Rubber	69	.62	2	.62	2
FMC	70	.59	2	.59	2
Sun Oil	71	.52	2	.52	2
Litton	72	.62	2	.62	2
PPG Industries	73	.72	1	.72	1
Deere	74	.92	1	.92	1
Olin	75	.50	2	.49	2
Coca-Cola	76	.90	1	.90	1
American Cyanamid	77	.57	2	.57	2
Celanese	78	.50	2	.50	2
Colgate-Palmolive	79	.98	1	.98	1
Grumman	80	.98	1	.98	1

Appendix B - continued

Corporation	Rank by Sales 1965	B 1965	B Classes 1965	B 1969	B Classes 1969
Textron	81	.51	2	.48	2
Owens-Illinois	82	.18	3	.18	3
Wilson	83	.00	3	-	-
Borg-Warner	84	.50	2	.50	2
Youngstown-Lykes	85	.50	2	.50	2
Douglas Aircraft	86	1.00	1	-	-
J. P. Stevens	87	.00	3	.00	3
National Lead	88	.32	3	.32	3
Bendix	89	.69	1	.76	1
American Home Products	90	.63	2	.53	2
Reynolds Metals	91	.50	2	.50	2
National Cash Register	92	.55	2	.55	2
Weyerhauser	93	.50	2	.50	2
Allis-Chalmers	94	.72	1	.72	1
Campbell Soup	95	.50	2	.50	2
Crown Zellerbach	96	.37	2	.37	2
American Brands	97	1.00	1	.84	1
Tidewater Oil	98	.50	2	-	-
Genesco	99	.00	3	.00	3
Eaton Yale and Towne	100	.56	2	.56	2
Honeywell	101	1.00	1	1.00	1
Morrell	102	.00	3	-	-
Atlantic Richfield	103	.50	2	.50	2
Beatrice Foods	104	.10	3	.10	3
Signal Companies	105	.50	2	.58	2
Kennecott Copper	106	.95	1	.95	1
TRW	107	.60	2	.60	2
Pullman	108	.10	3	.10	3
White Motor	109	.58	2	.58	2
Standard Brands	110	.10	3	.10	3
St. Regis Paper	111	.28	3	.44	2
Whirlpool	112	.50	2	.50	2
National Biscuit	113	.00	3	.00	3
American Smelting and Refining	114	.83	1	.83	1
Martin Marietta	115	.75	1	.78	1
Standard Oil (Ohio)	116	.50	2	.50	2
Kimberly-Clark	117	.50	2	.50	2
Kaiser Aluminum and Chemical	118	.50	2	.50	2
Georgia Pacific	119	.55	2	.54	2
United Merchants and Manufacturers	120	.04	3	.04	3

Appendix B - continued

Corporation	Rank by Sales 1965	B 1965	B Classes 1965	B 1969	B Classes 1969
General Mills	121	.48	2	.46	2
American Standard	122	.26	3	.26	3
Marathon Oil	123	.50	2	.50	2
Mead	124	.50	2	.34	2
Pfizer	125	.73	1	.73	1
Kaiser Industries	126	.49	2	-	-
Carnation	127	.00	3	.00	3
Hercules	128	.38	2	.34	2
Continental Baking	129	.50	2	-	-
H. J. Heinz	130	.15	3	.15	3
Motorola	131	.50	2	.50	2
Pepsico	132	.78	1	.78	1
Rockwell-Standard	133	.00	3	-	-
Ogden	134	.42	2	.42	2
National Distillers and Chemical	135	.75	1	.74	1
Raytheon	136	.50	2	.50	2
Sunray DX	137	.50	2	-	-
Babcock and Wilcox	138	.75	1	.75	1
Johns-Manville	139	.00	3	.00	3
Hygrade Food Products	140	.00	3	.00	3
American Metal Climax	141	.45	2	.45	2
Zenith	142	.50	2	.50	2
Central Soya	143	.00	3	.00	3
Quaker Oats	144	.65	2	.65	2
Scott Paper	145	.45	2	.45	2
Phelps Dodge	146	.98	1	.98	1
Philip Morris	147	1.00	1	.98	1
Burroughs	148	.89	1	.89	1
Lever Brothers	149	-	-	-	-
McGraw-Edison	150	.50	2	.50	2
Time	151	.42	2	.42	2
U.S. Plywood-Champion Papers	152	.50	2	.44	2
Ashland Oil	153	.50	2	.50	2
Hunt Foods	154	.05	3	-	-
Budd	155	.40	2	.40	2
Pillsbury	156	.11	3	.11	3
Avco	157	.38	2	.41	2
Hormel	158	.00	3	.00	3
Ingersoll-Rand	159	.54	2	.54	2
Texas Instruments	160	.50	2	.50	2

Appendix B - continued

Corporation	Rank by Sales 1965	B 1965	B Classes 1965	B 1969	B Classes 1969
Johnson and Johnson	161	.00	3	.00	3
American Sugar	162	.50	2	.50	2
Del Monte	163	.00	3	.00	3
Champion Papers	164	.50	2	-	-
Anheuser-Busch	165	.50	2	.50	2
Boise Cascade	166	.50	2	.42	2
Otis Elevator	167	.50	2	.50	2
Container Corp. of America	168	.00	3	-	-
Combustion Engring.	169	.50	2	.50	2
Dana	170	.50	2	.50	2
Xerox	171	1.00	1	1.00	1
Clark Equipment	172	.45	2	.45	2
Interco	173	.00	3	.00	3
Bristol-Myers	174	.58	2	.68	1
Fruehauf	175	.00	3	.00	3
AMF	176	.40	2	.40	2
Warner-Lambert	177	.78	1	.78	1
IPL	178	.00	3	-	-
Air Reduction	179	.52	2	.54	2
Timken	180	.00	3	.00	3
Armstrong Cork	181	.45	2	.45	2
Koppers	182	.50	2	.50	2
Crane	183	.25	3	.25	3
Mack Trucks	184	.50	2	-	-
Kellogg	185	1.00	1	1.00	1
Agway	186	-	-	-	-
Dart Industries	187	.23	3	.23	3
A. O. Smith	188	.50	2	.50	2
Foremost Dairies	189	.00	3	-	-
Dresser Industries	190	.50	2	.50	2
Seagram and Sons	191	1.00	1	1.00	1
Avon	192	.50	2	.50	2
Carrier	193	.50	2	.50	2
Amerada Hess	194	.50	2	.50	2
Rohm and Haas	195	.52	2	.52	2
Pet	196	.00	3	.06	3
Sherwin-Williams	197	.45	2	.45	2
Diamond International	198	.50	2	.48	2
Worthington	199	.70	1	-	-
General American Transportation	200	.05	3	.05	3

Appendix B - continued

Corporation	Rank by Sales 1965	B 1965	B Classes 1965	B 1969	B Classes 1969
Corning Glass Works	201	.50	2	.50	2
Northrop	202	.87	1	.87	1
Gillette	203	.55	2	.55	2
LTV	204	.46	2	.46	2
Allegheny-Ludlum	205	.50	2	.50	2
Owens-Corning Fiberglass	206	.50	2	.50	2
Magnovox	207	.42	2	.42	2
Merck	208	.78	1	.78	1
Cerro	209	.50	2	.50	2
Stauffer Chemical	210	.50	2	.50	2
Westvaco	211	.75	1	.75	1
Archer-Daniels-Midland	212	.03	3	.00	3
Kerr-McGee	213	.50	2	.50	2
Int'l. Multifoods	214	.00	3	.00	3
West Point-Pepperell	215	-	-	.00	3
Eli Lilly	216	1.00	1	1.00	1
Consolidated Coal	217	.00	3	-	-
Brunswick	218	.15	3	.15	3
Richfield Oil	219	.50	2	-	-
Crucible Steel	220	.50	2	-	-
Cudahy	221	.02	3	.02	3
Ethyl	222	.50	2	.50	2
Kaiser Steel	223	.50	2	.50	2
Oscar Mayer	224	.00	3	.00	3
U.S. Gypsum	225	.09	3	.09	3
ACF Industries	226	.00	3	.00	3
Glidden	227	.29	3	-	-
Sterling Drug	228	.92	1	.84	1
General Cable	229	.50	2	.50	2
Libby McNeill and Libby	230	.08	3	.08	3
Admiral	231	.50	2	.50	2
Essex International	232	-	-	.53	2
Grinnell	233	.00	3	-	-
Midland-Ross	234	.50	2	.50	2
Land O'Lakes Creameries	235	-	-	-	-
Pacific Car and Foundry	236	.05	3	.05	3
Liggett and Myers	237	1.000	1	.62	2
P. Lorillard	238	1.00	1	-	-
Lowenstein and Sons	239	.00	3	.00	3
Revere Copper and Brass	240	.75	1	.75	3

Appendix B - continued

Corporation	Rank by Sales 1965	B 1965	B Classes 1965	B 1969	B Classes 1969
Philadelphia and Reading	241	.00	3	-	-
Flintkote	242	.11	3	.10	3
Union Camp	243	.28	3	.28	3
Collins Radio	244	1.00	1	1.00	1
Cummins Engine	245	.50	2	.50	2
H. K. Porter	246	.49	2	.49	2
Cannon Mills	247	.00	3	.00	3
Libbey-Owens-Ford	248	1.00	1	1.00	1
Rath Packing	249	.00	3	.00	3
Newport News Ship-building	250	.95	1	-	-
Skelly Oil	251	.50	2	.50	2
Westinghouse Air Brakes	252	.40	2	-	-
J. I. Case	253	1.00	1	1.00	1
Norton	254	.08	3	.08	3
Wheeling-Pittsburgh Steel	255	.50	2	.50	3
Addressograph-Multigraph	256	.50	2	.50	2
Scovill Manufacturing	257	.05	3	.05	3
Brown Shoe	258	.00	3	.00	3
Consumers Co-op Assn.	259	-	-	-	-
Inmont	260	.14	3	.14	3
Int'l. Minerals and Chemicals	261	.46	2	.46	2
Interlake	262	.48	2	.45	2
Abex	263	.00	3	-	-
National Gypsum	264	.36	2	.36	2
North American Philips	265	1.00	1	1.00	1
Crown Cork and Seal	266	.40	2	.40	2
American Bakeries	267	.50	2	.50	2
Cluett, Peabody	268	.00	3	.00	3
Eltra	269	.48	2	.48	2
Cone Mills	270	.00	3	.00	3
Emerson Electric	271	.70	1	.70	1
Springs Mills	272	-	-	.00	3
Tecumseh Products	273	.08	3	.08	3
Joseph Schlitz Brewing	274	.50	2	.50	2
Evans Products	275	.00	3	.18	3
Dan River	276	.00	3	.00	3
Revlon	277	.50	2	.60	2
Hooker Chemical	278	.50	2	-	-
Hoover	279	.10	3	.10	3
Smith Kline and French	280	.86	1	.86	1

Appendix B - continued

Corporation	Rank by Sales 1965	B 1965	B Classes 1965	B 1969	B Classes 1969
Foster Wheeler	281	.50	2	.50	2
Upjohn	282	.86	1	.86	1
General Precision	283	.50	2	-	-
Kayser-Roth	284	.00	3	.00	3
Kelsey-Hayes	285	.00	3	.00	3
Abott Laboratories	286	.51	2	.51	2
Englehard Industries	287	.95	1	.95	1
Ryan Aeronautical	288	.95	1	-	-
Times-Mirror	289	.55	2	.55	2
Di Giorgio	290	.00	3	.05	3
CFI Steel	291	.50	2	.50	2
Sunbeam	292	.10	3	.10	3
Campbell Taggert	293	.50	2	.50	2
USM	294	.39	2	.39	2
R. R. Donnelley and Sons	295	.00	3	.00	3
Parke Davis	296	.70	1	.70	1
Stokely-Van Camp	297	.00	3	.00	3
A. E. Staley Mfg.	298	.00	3	.00	3
Schenley Industries	299	1.00	1	1.00	1
McLouth Steel	300	.50	2	.50	2
McGraw-Hill	301	.18	3	.18	3
GAF	302	.62	2	.62	2
Federal Mogul	303	.00	3	.00	3
Richardson-Merrell	304	.95	1	.95	1
Link-Belt	305	.50	2	-	-
Chemetron	306	.50	2	.50	2
Hershey Foods	307	.50	2	.50	2
Amerada Petroleum	308	.50	2	-	-
Diamond Shamrock	309	.50	2	.50	2
Peabody Coal	310	.00	3	-	-
Ex-Cell-O	311	.44	2	.52	2
Beech-Nut Life Savers	312	.50	2	-	-
Potlatch Forests	313	.50	2	.50	2
Carborundum	314	.25	3	.25	3
Bemis	315	.32	3	.32	3
Polaroid	316	.95	1	.95	1
Sunshine Biscuits	317	.00	3	-	-
Cincinnati Milacron	318	.26	3	.26	3
ESB	319	.62	2	.62	2
Colt Industries	320	.62	2	.62	2

Appendix B - continued

Corporation	Rank by Sales 1965	B 1965	Classes 1965	B 1969	B Classes 1969
Lone Star Cement	321	.50	2	.50	2
Gerber	322	.50	2	.50	2
Cotton Producers Assn.	323	-	-	-	-
American Enka	324	.50	2	.50	2
Studebaker	325	.20	3	-	-
Cutler-Hammer	326	.69	1	.69	1
Lear Siegler	327	.44	2	.44	2
Stanley Warner	328	.49	2	-	-
Fairmont Foods	329	.00	3	.00	3
Indian Head	330	.02	3	.01	3
Emhart	331	.34	2	.34	2
Amsted Industries	332	.20	3	.40	2
Eastern Gas and Fuel	333	.22	3	.22	3
Hupp	334	.42	2	-	-
Rockwell Manufacturing	335	.01	3	.01	3
Sharon Steel	336	.50	2	.50	2
Bell and Howell	337	.60	2	.60	2
Iowa Beef Packers	338	.00	3	.00	3
Blaw-Knox	339	.50	2	-	-
Pittsburgh Steel	340	.50	2	-	-
Gulf and Western	341	.07	3	.25	3
McCall	342	.25	3	-	-
Fairchild Camera	343	.50	2	.50	2
Outboard Marine	344	.50	2	.50	2
Mohasco Industries	345	.12	3	.12	3
Pabst Brewing	346	.50	2	.50	2
Square D	347	1.00	1	1.00	1
Castle and Cooke	348	.05	3	.05	3
Chicago Bridge and Iron	349	.00	3	.00	3
Purex	350	.35	2	.45	2
Thiokol Chemical	351	.60	2	.60	2
Cyclops	352	.50	2	.50	2
Interstate Brands	353	.50	2	.48	2
Murphy Oil	354	.50	2	.50	2
Simmons	355	.00	3	.00	3
Ward Foods	356	.26	3	.26	3
Anchor Hocking	357	.00	3	.00	3
Rayonier	358	.90	1	-	-
American Chain and Cable	359	.40	2	.40	2
Granite City Steel	360	.42	2	.42	2

Appendix B - continued

Corporation	Rank by Sales 1965	B 1965	Classes 1965	B 1969	B Classes 1969
Thomas J. Lipton	361	-	-	-	-
Stanley Works	362	.00	3	.00	3
Hart Schaffner and Mara	363	.00	3	.00	3
Eagle-Picher	364	.40	2	.40	2
Hewlett-Packard	365	1.00	1	1.00	1
Kendall	366	.08	3	.08	3
Trane	367	.50	2	.50	2
Hammermill Paper	368	.75	1	.75	1
Kern County Land	369	.00	3	-	-
Harsco	370	.00	3	.00	3
Control Data	371	1.00	1	1.00	1
Beaunit	372	.17	3	.17	3
Fieldcrest Mills	373	.00	3	.00	3
Jim Walter	374	.02	3	.02	3
Pocolet Industries	375	.00	3	-	-
Rohr	376	.91	1	.91	1
General Host	377	.50	2	.48	2
Pennwalt	378	.53	2	.53	2
Houdaille	379	.33	3	.33	3
U.S. Pipe and Foundry	380	.50	2	-	-
American Petrofina	381	.50	2	.50	2
Keystone Consolidated	382	.35	2	.35	2
Jonathan Logan	383	.00	3	.00	3
National Can	384	.50	2	.47	2
Ampex	385	.58	2	.58	2
Ruberoid	386	.10	3	-	-
Falstaff Brewing	387	.50	2	.50	2
Stewart-Warner	388	.45	2	.45	2
Universal American	389	.00	3	-	-
SCM	390	.35	2	.35	2
Joy Manufacturing	391	.50	2	.50	2
ITE Imperial	392	1.00	1	1.00	1
Standard Packaging	393	.60	2	.60	2
Cessna Aircraft	394	1.00	1	1.00	1
Curtiss-Wright	395	.70	1	.70	1
Hanna Mining	396	1.00	1	1.00	1
Allied Mills	397	.00	3	.00	3
Armstrong Rubber	398	.50	2	.50	2
Koehring	399	.50	2	.50	2
Vulcan Materials	400	.50	2	.50	2

Appendix B - continued

Corporation	Rank by Sales 1965	B 1965	Classes 1965	B 1969	B Classes 1969
Witco Chemical	401	.50	2	.50	2
Consolidated Cigar	402	.50	2	-	-
Arvin Industries	403	.22	3	.22	3
New York Times	404	.97	1	.97	1
Rex Chainbelt	405	.43	2	.43	2
Ideal Basic Industries	406	.50	2	.50	2
Inland Container	407	.15	3	.15	3
Chesebrough-Pond's	408	.53	2	.53	2
Western Publishing	409	.00	3	.00	3
Keebler	410	.00	3	.00	3
Miles Laboratories	411	.77	1	.77	1
Lukens Steel	412	.50	2	.50	2
Riegel Paper	413	.48	2	.48	2
Cowles Communications	414	.67	1	.67	1
St.Joe Minerals	415	.50	2	.50	2
Kellwood	416	.00	3	.00	3
Clark Oil	417	.50	2	.50	2
Rheem Manufacturing	418	.18	3	-	-
Calumet and Hecla	419	.55	2	-	-
Grolier	420	.00	3	.00	3
Sybron	421	.00	3	.15	3
Woodward	422	.45	2	-	-
Maremont	423	.50	2	.50	2
Warnaco	424	.00	3	.00	3
KUP Sutherland	425	.75	1	-	-
Copperweld Steel	426	.50	2	.50	2
Champion Spark Plug	427	.00	3	.00	3
American Optical	428	.00	3	-	-
Needham Packing	429	.00	3	.00	3
Fibreboard	430	.33	3	.33	3
Chicago Pneumatic Tool	431	.25	3	.25	3
Handy and Harman	432	.88	1	.88	1
Endicott Johnson	433	.00	3	.00	3
Cabot	434	.50	2	.50	2
Canada Dry	435	.80	1	-	-
Wrigley	436	1.00	1	1.00	1
E. W. Bliss	437	.50	2	-	-
Crowell Collier and Macmillan	438	.00	3	.00	3
Bucyrus-Erie	439	.50	2	.00	2
American Biltrite Rub.	440	.50	2	.50	2

Appendix B - continued

Corporation	Rank by Sales 1965	B 1965	Classes 1965	B 1969	B Classes 1969
Insilco	441	.21	3	.21	3
Harris-Intertype	442	.50	2	.50	2
Interpace	443	.18	3	.18	3
U.S. Industries	444	.24	3	.15	3
Warwick Electronics	445	.50	2	.50	2
Great Western Sugar	446	.50	2	-	-
Collins and Aikman	447	.00	3	.00	3
Roper	448	.37	2	.37	2
U.S. Smelting	449	.83	1	.83	1
Miehle-Goss-Dextor	450	.50	2	-	-
Certain-teed Products	451	.20	3	.20	3
Harbison-Walker	452	.10	3	-	-
H. H. Robertson	453	.30	3	.30	3
Howmet	454	.25	3	.25	3
Gardner-Denver	455	.50	2	.50	2
Hobart Manufacturing	456	.50	2	.50	2
Morton International	457	-	-	-	-
Reichold Chemicals	458	.50	2	.50	2
Curtis Publishing	459	.50	2	-	-
Beech Aircraft	460	1.00	1	1.00	1
Hoover Ball and Bearing	461	.07	3	.10	3
Colorado Milling	462	.00	3	-	-
Air Products and Chemicals	463	.50	2	.50	2
Commonwealth Oil	464	.50	2	.50	2
Wagner Electric	465	.88	1	-	-
Maytag	466	.50	2	.50	2
Standard Pressed Steel	467	.00	3	.00	3
Olivetti Underwood	468	-	-	-	-
Trans Union	469	.05	3	.05	3
Black and Decker	470	.00	3	.00	3
Farmers Union Central	471	-	-	-	-
Rheingold	472	.20	3	.20	3
Federal Pacific Elec.	473	1.00	1	1.00	1
Coastal States Gas	474	.50	2	.50	2
Schering	475	1.00	1	1.00	1
Carpenter Technology	476	.50	2	.50	2
Cooper Industries	477	.50	2	.50	2
Ceco	478	.50	2	.50	2
Dorr-Oliver	479	.50	2	.50	2
Clevite	480	.20	3	-	-

Appendix B - continued

Corporation	Rank by Sales 1965	B 1965	Classes 1965	B 1969	B Classes 1969
Green Giant	481	.00	3	.00	3
Fairchild Hiller	482	1.00	1	1.00	1
U.S. Shoe	483	.00	3	.00	3
Warner and Swasey	484	.50	2	.50	2
Brockway Glass	485	.00	3	.00	3
Hanes	486	.00	3	.00	3
Northwestern Steel and Wire	487	.50	2	.50	2
Harnischfeger	488	.67	1	.67	1
Blue Bell	489	.00	3	.00	3
Mead Johnson	490	1.00	1	-	-
Wyandotte Chemicals	491	.50	2	-	-
Electrolux	492	.00	3	-	-
Great Northern Nekoosa	493	.25	3	.25	3
Bunker-Ramo	494	.50	2	.50	2
AMP	495	.50	2	.50	2
Pitney-Bowes	496	.50	2	.50	2
Signode	497	.50	2	.50	2
Reeves Brothers	498	.10	3	.10	3
Detroit Steel	499	.50	2	.50	2
Island Creek Coal	500	.00	3	-	-