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Entrepreneurship, wrote Schumpeter, is carrying out new combinations: introducing new goods or new methods of production, opening new markets, developing new sources of supply, and implementing new forms of industry organization [1911, pp. 66,74]. The Schumpeter of 1911 saw these changes occuring in new firms "which generally do not arise out of the old ones but start producing beside them" [1911, p. 66]. By 1942, Schumpeter's view of the entrepreneurial process had altered. Fearful that innovation might become bureaucratically routinized, he nevertheless perceived that new economic combinations could be carried out in large corporations and that, indeed, such organizations might even provide a peculiarly propitious environment for the origination of change.

This paper taps three rich data sources to map some contours of change in the largest U.S. manufacturing corporations. The specific aspect of change analyzed here is diversification, or the entering of new industrial fields by established corporations. Entry (as well as exit), we shall see, occurs in impressive quantities. We then explore the nature of large companies' entry into new fields,

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Use is made of Line of Business data collected by the Federal Trade Commission. A review by FTC staff has determined that individual company data are not disclosed. The conclusions are the authors' and not necessarily those of the FTC.

and in particular, the role of mergers and acquisitions as compared to internal growth. The paper is deliberately descriptive. Later papers will test hypotheses concerning causes and financial consequences.

I. Data and Methodology

How the range of products manufactured by individual U.S. corporations changed over a quarter of a century can be ascertained by linking two Federal Trade Commission data sets: the so-called "Corporate Patterns" survey covering 1950 sales of the thousand largest manufacturing companies [FTC, 1972], and the Line of Business survey for 1975 [FTC, 1981], which collected information on sales and many other financial variables from 471 large corporate entities.

In order to compare the extent of a company's diversification between two fairly widely-separated dates, a homogeneous categorization of industrial activity is needed. No such benchmark is readily available. The U.S. Standard Industrial Classification has been extensively revised over time. The more detailed product line classification into which 1950 Corporate Patterns reports were coded included approximately 1,000 different "five-digit" manufactured product categories. By 1972, the analogous classification had 1,293 subdivisions. The FTC's Line of Business reports are organized on a different, broader basis. At a level of detail intermediate between the three-digit and four-digit subdivisions of the Standard Industrial Classification, it includes 261 manufactured product categories. Because the Line of Business categories were designed to strike the best possible compromise between detail and economic meaningfulness and also because aggregation is relatively easy while disaggregation

is virtually impossible, the Line of Business classification was adopted as the basis for measuring the number of lines in which companies operated.

The 1950 sales data of the 200 corporations with the largest U.S. manufactured product sales were recoded to Line of Business categories so that a comparison with 1975 figures could be made. However, further difficulties had to be surmounted. The 1950 data were reported on a relatively pure "product line" basis. The 1975 Line of Business reporting requirements, on the other hand, permitted companies to include some secondary product "contamination" in the data for designated business segments. Thus, if a company sold fresh meat (FTC code 20.01) but also canned some of its left-overs as pet food (code 20.10), it could report its pet food activities in the same segment as meat packing provided that the amount of contaminating activity did not exceed 15 percent of total segment sales. The average amount of such "contamination" was 3 percent of total reported sales [FTC 1981, p. 42]. Surveyed firms were also permitted to integrate vertically related activities; e.g., if market prices could not be ascertained for the logs (FTC code 24.01) transferred to a company's paper mills (code 26.02), the two activities could be reported together. The 1950 data were recoded to mirror as closely as possible the reporting conventions adopted by each 1975 Line of Business sample company. The methodology is described more fully in Appendix A. Some ambiguity could not be avoided, and so alternate computations were performed to test for the sensitivity of results to different classification assumptions.

The research objective was to determine not only how the breadth of companies' product line offerings changed between 1950 and 1975,

but also to ascertain how the changes occurred -- i.e., through merger as distinguished from internal growth. Therefore, an attempt was made to identify and trace to individual reporting lines of business (LBs) all mergers and acquisitions made between 1950 and 1975 that survived to (i.e., were not spun off by) 1975. Three sources were employed: an integrated compilation of the FTC's annual Statistical Report on Mergers and Acquisitions, the company histories printed in Moody's Industrials Manual, and the information on individual plants and subsidiaries provided by companies as an annex to their Line of Business reports. Nearly two thousand mergers were traced to the reporting LBs.

II. Changes in Diversification Among the 200 Largest Companies

The main focus of analysis is the group of 200 corporations identified as having had the largest manufacturing product sales (or more technically, value of shipments) originating in the United States during 1950. The count shrank to 199 with the consolidation of the related Kaiser-Frazer and Kaiser Steel Corporations. A listing of the 1950 "Top 200" corporations, along with a description of their subsequent fate, is available from the authors.

The obvious introductory question is, what happened to those leading manufacturers of 1950? Some survived (often with a name change) and remained large enough to be among the Top 200 in terms of domestic manufactured product sales for the FTC's 1975 Line of Business sample, which attempted to include all of the largest U.S. manufacturing enterprises. Some survived but were relegated to lower positions within the FTC sample or failed even to make it into the

sample. As the acquired entities in mergers, 44 others lost their independence. A more detailed breakdown follows:

	Number of Companies
Survived to 1975 as member of the leading 200 manufacturers in the Line of Business sample	121
Survived to 1975 as a lower-ranked member of the Line of Business sample	27
Survived to 1975, but not in LB sample	7
Acquired by a company among the Top 200 in the 1975 LB sample	15
Acquired by another 1975 LB sample member	24
Acquired by a company not included in the 1975 LB sample	5
Total	199

The disappearance of 78 enterprises on 1950's Top 200 list from the analogous list for 1975 implies an average exit rate of at least 3.12 companies per year.[1] For the 148 companies that survived and were included in the 1975 LB sample, there was a considerable degree of rank stability. The Spearman correlation between the 1950 sales ranks of those 148 and their 1975 ranks is +0.58 (t= 8.66).

Tables 1 and 2 begin the analysis of changes in diversification between 1950 and 1975. Two measures of diversification were computed. One is a straight count of the number of FTC manufacturing line of business categories (LBs) (out of a possible total of 262) in which a company reported during 1975, or in which it would have reported had it filed an analogous Line of Business form for 1950. The other is a numbers equivalent index NE derived by inverting the Herfindahl-Hirschman index:

Table 1

Distribution of Company LB Counts:
1950 Top 200 Compared to 1975 Top 200*

Number of LBs per Company	Number of Companies 1950	Number of Companies 1975	Percent of Companies 1950	Percent of Companies 1975
1	25	5	13	3
2-3	74	14	37	7
4-5	37	27	19	14
6-9	44	64	22	32
10-14	13	47	7	23
15-20	(↓	21	(↓	11
21-25	(6	9	(3	4
More than 25	(↑	13	(↑	7
Total	199	200	100	100

*Two affiliated companies were consolidated into one for the 1950 sample, so the total is only 199. Entries with ↓ and ↑ are consolidated into the next diversification category to avoid disclosing individual company data.

Table 2

Distribution of Company Numbers Equivalent Values:
1950 Top 200 Compared to 1975 Top 200*

Numbers Equivalent Index Range	Number of Companies 1950	Number of Companies 1975	Percent of Companies 1950	Percent of Companies 1975
1.00-1.49	98	41	49	21
1.50-1.99	29	22	15	11
2.00-2.99	38	34	19	17
3.00-3.99	22	21	11	10
4.00-4.99	8	22	4	11
5.00-7.49	(↓	30	(↓	15
7.50-9.99	(4	20	(2	10
10.00 and more	(↑	10	(↑	5
Total	199	200	100	100

*See the footnotes to Table 1.

$$NE = \frac{1}{\Sigma S_i^2},$$

where S_i is the i^{th} reporting segment's share of total company domestic manufacturing LB sales. NE has its minimum value of 1.0 when the company reports in only one line of business. NE rises with increases in the number of equal-sized reporting segments, but for a given number of segments, the increase in NE is attenuated, the more unequal the segments are in size. Thus, a company with many LBs, but with most of its activity concentrated in one segment, is likely to have a relatively low value of NE.

All three tables reveal that there was a substantial increase in diversification among the Top 200 manufacturers of 1975 as compared to the analogous cohort for 1950. In 1950, half of the Top 200 companies would have reported manufacturing activity in three or fewer LBs; by 1975, only 10 percent of the companies exhibited such narrow specialization. The median number of reporting LBs increased from 3.5 in 1950 to 9 in 1975. The distribution of reporting LBs by company is highly skewed, and so the mean number is higher, rising from 4.76 in 1950 to 10.89 in 1975. Because the typical company's sales are not evenly divided among lines of business, the numbers equivalent indices show less diversification than does a raw count of reporting units. Only 2 percent of the 1950 Top 200 companies had a numbers equivalent index of 5.00 or more; by 1975, the comparable share had risen to 30 percent. The median numbers equivalent value rose from 1.51 for the 1950 sample to 3.29 for the 1975 sample. The mean values increased from 2.06 to 4.22. Thus, the numbers equivalent indices suggest an approximate doubling in the degree of diversification among the largest 200 manufacturers of 1950 as compared to the largest 200 of

1975. The straight LB counts reveal an even greater increase, indicating that relatively small units were proliferated more rapidly than large units.

Table 3 arrays the companies' diversification indices into sales volume quintiles, each quintile set reflecting the sales rank order of the Top 200 companies for that year. Two further insights emerge. First, increases in diversification were much more pronounced for the smaller companies than for the largest corporations. The largest 40 manufacturers (not necessarily identical between years) increased their diversification by some 60 percent when measured by a reporting LB count and 46 percent when measured by the numbers equivalent average. For the smaller companies, the indicated degree of diversification doubled or even tripled. Second, with the more rapid increase in diversification of lower-ranked companies, the sharp differences evident in 1950 between the largest and smaller companies had faded by 1975. Indeed, companies populating the highest sales volume quintile for 1975 had the lowest average numbers equivalent index of the five groups.[2] What evidently happened between 1950 and 1975 is that the largest companies added new lines, but they were small relative to their principal lines, while companies that "made it" into the lower quintiles of the Top 200 for 1975 added lines more evenly proportioned in size to their principal lines.

Of the companies included among the Top 200 for 1950 and 1975, only 121 are common to both years. One hundred forty-eight 1950 Top 200 firms maintained sufficient manufacturing sales to enter the 1975 Line of Business company sample. To begin the analysis of whether and how newcomers differed from surviving and exiting firms,

Table 3

Diversification Measures by Sales Quintiles:
1950 Top 200 Compared to 1975 Top 200*

Current Year Sales Quintile	Mean LBs per Company		Mean Numbers Equivalent	
	1950	1975	1950	1975
Largest Companies	8.10	12.95	2.52	3.69
Second Quintile	5.03	11.83	2.07	3.95
Third Quintile	3.53	11.43	1.88	4.83
Fourth Quintile	3.15	9.18	1.75	4.28
Smallest Companies	4.00	9.08	2.02	4.32
All Companies	4.76	10.89	2.05	4.22

*The companies are grouped into quintiles in descending order of domestic manufacturing sales in each of the two years for which the analyses are presented.

we focus on those 148 "constant-membership" corporations. The first step is taken in Table 4. Each diversification index for 1950 now has two variants: a lower-bound estimate that does not count 1950 activities disappearing in 1975 into a low-sales "catch-all" (FTC code 99.99) category, or that were reported in 1975 as secondary product contamination with sales of less than $10 million; and an upper-bound estimate that does count such activities. For details, see Appendix A. The 148 companies are assigned to sales quintiles for both years according to their quintile position among the 200 largest manufacturers in 1950. Thus, the cohorts compared are identical across years.

Once again, we observe increases in diversification between 1950 and 1975, the more so for smaller enterprises than for the largest entities. However, the changes are somewhat less pronounced than when non-constant Top 200 sets were compared. For all 148 companies, the mean increase in the number of LBs per company lay in the range of 62 to 87 percent; the mean numbers-equivalent index increased by between 55 and 66 percent. The median numbers equivalent value (not separately reported in a table) rose from a range of 1.77 to 1.84 in 1950 to 2.79 in 1975, or by 52 to 58 percent. The median number of LBs per company increased from 4.5 to 5 in 1950 to 8 in 1975.

These differences between variable-membership Top 200 lists and the tally for 148 constant-membership companies suggest that newcomers to the 1975 list may have been more diversified than both the firms remaining on the list and the exiting companies they replaced. This is readily verified. The 78 newcomer companies in 1975 reported on average in 11.77 manufacturing LBs; the median value was nine lines. This exceeds the comparable figures for 148 constant-

Table 4

1950 and 1975 Diversification Indices by Sales Quintiles for 148 of 1950's Top 200 Surviving in the 1975 Line of Business Sample*

1950 Sales Quintile	Mean Number of LBs			Mean Numbers Equivalent Index		
	1950 Estimates			1950 Estimates		
	Low	High	1975	Low	High	1975
Largest Companies	8.17	9.57	11.91	2.69	2.87	3.60
Second Quintile	5.19	6.14	8.72	2.14	2.27	3.51
Third Quintile	4.11	4.59	9.19	2.13	2.31	3.57
Fourth Quintile	3.54	3.92	9.04	1.93	1.98	3.84
Smallest Companies	4.00	4.46	9.62	2.05	2.31	4.00
All 148 Companies	5.22	6.01	9.74	2.22	2.38	3.68

*The companies are placed in the same 1950 sales rank quintiles as in Table 3. Thus, the quintiles in this table are populated by differing numbers of companies, ranging from 24 to 36.

membership companies of 9.77 and eight lines respectively. Similarly, the newcomer companies had a mean 1975 numbers-equivalent index of 5.02 and a median of 3.77, compared to 3.68 and 2.79 respectively for the constant-membership enterprises. Judged by their numbers equivalents, the 1975 newcomers were more diversified than even the most diversified quintile of the constant-membership group.[3]

The 44 companies that were on the 1950 Top 200 list but exited by being acquired some time during the ensuing quarter century were less diversified in 1950 than their surviving compatriots. Their mean count of 1950 LBs (upper-bound estimate) was 3.64; their mean 1950 numbers-equivalent index was 1.59. In both instances, these values are below the lowest 1950 values for any constant-membership company quintile.

The moral in hindsight seems plain. Smaller enterprises that grew aggresively, among other things through diversification, tended to survive and move into the ranks of the leading manufacturers. Those that lacked diversification tended to be takeover victims. To this statistical generalization there are of course exceptions, e.g., involving narrowly-specialized companies that escaped the takeover net. Yet the broad pattern associates corporate rank advance and survival with increasing diversification.

III. The Paths to Diversification

To determine how diversification occurred, we extend our analysis of the 1950 Top 200 companies that survived and were included in the 1975 Line of Business sample. Their diversification can have increased in two main ways: through entry into new lines by internal

growth, e.g., resulting from the development of new products, services, and channels of distribution; and through the acquisition of other firms already operating in lines outside the acquirer's original scope. It must be recognized that the original Top 200 companies also exited from some of the lines they occupied in 1950, in which case their diversification efforts had to be all the more energetic to reach the LB counts observed for 1975. Table 5 pinpoints and summarizes the relationships among these changes.

One important finding is that appreciable amounts of exit in fact occurred. Of the 773 lower-bound count LBs operated by the 148 constant-membership companies in 1950, 181, or nearly a fourth, had disappeared completely from the companies' portfolios by 1975. In addition, 116 LBs (those tallied to achieve the upper-bound count) had sales of at least $2 million in 1950, but grew so slowly that their sales were less than $10 million in 1975, and they were either relegated in Line of Business reports to miscellaneous category 99.99 or were submerged as contaminating activity within larger lines.

Among the 592 LBs continuing from 1950 and covered by separate 1975 segment reports, there was a nearly even split between those that experienced no acquisitions and those that made one or more acquisitions.

By 1975, the 148 constant-membership companies reported in 1,442 lines of business: an increase of 850 LBs relative to the 592 LBs continuing from 1950, or an increase of 821 if we add to the count of continuing LBs those not initially tallied because their 1950 sales fell below $2 million.[4] Through a detailed analysis of mergers consummated between 1951 and 1975, an attempt was made to determine

Table 5

Accounting for Changes in the Number of Lines of Business for the 148 Top 200 Companies of 1950 Continuing into 1975

Upper bound count of 1950 LBs		889
Less: LBs that disappeared into 1975 contamination or a catch-all category	116	
Lower bound count of 1950 LBs		773
Disappearances of lower bound count LBs from the 1975 reports		181
1950 LBs continuing to report in 1975		592
Of which:		
LBs without any observed acquisitions	294	
LBs that made one or more acquisitions	298	
1975 LBs with 1950 antecedants whose sales were less than $2 million and hence not counted as 1950 LBs		29
Of which:		
LBs that grew from a small start without acquisitions	13	
LBs with one or more acquisitions	16	
Total LBs reporting in 1975		1,442
Additions to LBs continuing from 1950		821
New LBs attributed to internal growth	191	
New LBs from internal growth plus acquisition	11	
New LBs attributed to acquisitions	578	
Others (complicated by vertical integration or secondary product contamination)	41	
With acquisitions	35	
Without acquisitions	6	

the extent to which the additions to the count of LBs (i.e., those without clear 1950 antecedants) were attributable to acquisition as distinguished from internal growth.

Some 191 lines of business appeared in 1975 reports without 1950 sales antecedants and without any indication of intervening mergers. Eleven other LBs were new to the 1975 report and had intervening mergers, but there was evidence that the companies had first entered the fields de novo and only later added to them through merger. Thus, the sum of 191 + 11 = 202, or a fourth of the new lines entered, provides an approximation of the extent to which diversification occurred through internal growth. It is approximate in part because the merger data were incomplete, and some acquisitions that led to a new line for the constant-membership companies may have been overlooked.

One means by which new lines are entered is through research and new product development. The 202 new "internal growth" LBs were on average considerably more strongly oriented toward the performance of R&D than LB sample members generally. With each of the 202 LBs counted separately, mean and median industry R&D/sales ratios (including both company-financed and contract R&D) were as follows:

	R&D as a Percentage of Industry Sales	
	Mean	Median
202 new internal growth LBs	4.20	2.00
All manufacturing industries	1.92	0.88

The differences are highly significant statistically. Only 51 of the 202 new "internal growth" LBs were in industries with R&D/sales ratios below the all-manufacturing industry median. A possible bias might intrude because three of the most R&D-intensive industry categories --

semiconductors, guided missiles, and photocopying equipment -- had no antecedants in the 1950 product field classification. LBs in those industries during 1975 were necessarily counted as "new," although (for those with a merger history) not necessarily as stemming from internal growth. When the 19 new "internal growth" LBs in those three categories are deleted from the sample, the mean and median R&D/sales ratios of the remaining LBs continue to be significantly higher than the corresponding values for all manufacturing industries but the three.

Of the LBs unambiguously occupied in 1975 but not in 1950, 578 were associated with one or more acquisitions between 1951 and 1975. These we provisionally designate as cases of diversification through acquisition. This too can be only an approximation. It is possible that a company commenced operations de novo in some field after 1950 and only later added to its activity through acquisition. In the absence of supplementary evidence, such cases would be wrongly classified as cases of diversification through merger. That such classification errors have been made is certain. However, information on subsidiary names and locations filed in companies' Line of Business reports, the company histories included in Moody's Industrials manual, and other sources, all suggest that the number of misclassifications made in this way was small -- surely not more than 20 percent of the 578 cases counted as diversification by acquisition. Very many acquisitions, it is clear, do launch the acquiring company into what for it is a new line of business.

Table 5 includes a residual category of 41 new LB appearances classified as "other." These entailed complex circumstances in which only contaminating or vertically integrated parts of the company's 1975 activity had 1950 antecedants. Although the cases defy any

simple categorization, they resemble the more straightforward cases in the preponderance of intervening mergers and acquisitions observed.

Table 6 offers further perspective on the incidence of diversification by acquisition as compared to internal growth. It shows the proportion of companies' 1975 reporting LBs attributed to those two diversification modes as a function of company size, with the 148 constant-membership corporations grouped into their original 1950 sales ranking quintiles. There is no clear size-correlated pattern in the incidence of LBs added through internal growth. For diversification by acquisition, however, a pattern emerges: the smaller Top 200 companies of 1950 were much more active in adding new lines by acquisition than the largest companies.[5] Indeed, fully half of their 1975 lines appear to have been added through acquisitions. Why this behavioral difference occurred can only be speculated. One possibility is that that the largest corporations were discouraged from aggressive expansion through merger by antitrust fears, although the legal constraints on conglomerate (i.e., diversifying) merger activity were sufficiently weak that this seems implausible. Another possibility is that the largest corporations were more satisfied with (or more cowed by) their size and were less eager than smaller enterprises to seek growth aggressively. On these and other conjectures, no satisfactory evidence is available.

From Table 5, it can be seen that acquisitions were made in 298 continuing lines of business, 11 LBs attributed to internal growth, 578 LBs classified as originating from merger, and 51 LBs of a more complex character. In all, then, 938 LBs had some acquisition history in the quarter century studied. Among the corporations acquired by

Table 6

"Internal Growth" LBs and LBs Attributed to Acquisition as a Percentage of All 1975 LBs for 148 of 1950's Top 200 Companies Surviving into the 1975 Line of Business Sample

1950 Sales Quintile	Percentage of 1975 LBs Attributed to Internal Growth	Percentage of 1975 LBs Classified as Acquired
Largest Companies	15.8	25.2
Second Quintile	16.6	35.8
Third Quintile	11.0	50.4
Fourth Quintile	10.2	57.9
Smallest Companies	14.0	50.4
All 148 Companies	14.0	41.1

the 148 constant-membership companies were 15 original 1950 Top 200 companies and 104 of the firms ranked 201-1,000 on the FTC's listing of the thousand largest 1950 manufacturers. Many of these acquisitions spanned more than a single line of business. In fact, 176 LBs of constant-membership companies stemmed from the acquisition of one or more original 1950 Top 1,000 company units, implying an average of at least 1.48 (i.e., 176 / 119) LBs per acquired Top 1,000 company. Acquisitions of firms not in the original 1950 Top 1,000 tended much more frequently to encompass only a single reporting LB.

Many LBs made no acquisitions during the 1951-75 period; others made a single acquisition; and some made several. Table 7 provides a frequency distribution of the number of recorded acquistions per LB among those LBs that made acquisitions, differentiating further between LBs already in existence by 1950 (or in a few de novo entry cases, later) and those apparently added through acquisition. The distributions are quite similar: highly skewed, with roughly half of all acquiring LBs making only a single acquisition during the period covered.[6] Altogether, the 148 constant-membership companies had attributed to their reporting LBs some 1,969 acquisitions. Making a rough correction for the fact that some acquisitions were attributed to multiple LBs, we conclude that the constant-membership companies probably acquired at least 1,800 previously independent enterprises during the period studied.

IV. The Sources of Acquisition Candidates

From the evidence assembled here, it would appear that much entrepreneurial activity in large U.S. corporations consists of bringing about diversified growth through the acquisition of other

Table 7

Distribution of 1950-75 Acquisitions by Line of Business:
Original 1950 Lines vs. Lines Emerging Since 1950

Number of Acquisitions per LB	Percentage of All LBs with Acquisitions	
	In Original Lines	In Acquired Lines
1	50.6	55.9
2	21.6	23.7
3	9.5	10.0
4	4.9	3.3
5	5.5	2.5
6	2.7	1.8
7	1.8	0.7
8 or more	3.4	2.0
Total LBs with Acquisitions	328	598
Total Acquisitions Counted	789	1180

corporations, large and small. For a conference honoring Joseph A. Schumpeter, we must probe further and ask: from where do the acquired companies come? What is the generating mechanism?

Since parallel papers on entrepreneurial behavior in West Germany and Japan are also being presented, it bears emphasizing that here may lie one of the most profound differences among the three economies. In the United States, the small and medium-size business sector is extraordinarily dynamic. Large corporations sometimes build de novo, more often acquire and develop, and sometimes, alas, acquire, fail to develop, and subsequently divest. All the while, there is a seemingly limitless flow of characteristically small candidates for acquisition -- often consisting of entities nurtured by founder-owners advancing in age and anxious to diversify and make their asset portfolios more liquid. As distant observers, we have the impression that the process is different in Germany and Japan. More de novo development appears to be concentrated in the largest corporations, and the small business sector is more of an orphan child, little loved by organized capital markets.[7]

According to the U. S. Internal Revenue Service, there were in the United States during 1980 some 2.7 million active business corporations of all types [1983, p. 50]. This reflects growth, despite tens of thousands of mergers, in the number of corporations from 1.1 million in 1960 and 1.7 million in 1970. In manufacturing industry alone, there were 242,550 active corporations in 1980 -- 6,514 with assets in excess of $10 million, i.e., prime candidates for sizeable acquisitions, and 44,581 with assets of $1 million or more.

The birth of new corporations into this population and their subsequent growth are sustained by capital markets that, despite problems resulting from relatively low U.S. savings rates, actively serve both large and small corporations. At the pinnacle of the U.S. capital markets are the eleven organized stock exchanges, on which in 1980 some 3,663 common and preferred stocks issued by 3,082 different corporations were actively traded [Securities and Exchange Commission, 1980, pp. 128-130]. The total value of such traded common stocks outstanding at the end of 1979 (a year of market depression) was nearly $1 trillion (i.e., 10^{12}), of which 93 percent came from stocks traded on the New York Stock Exchange.

From the standpoint of new venture formation, an even more noteworthy and perhaps unique feature of U.S. capital markets is the role played by venture capital firms -- that is, firms specializing in creating diversified portfolios of investments in new and characteristically small enterprises, often but not always oriented toward the development of new technologies. In 1980, such firms, of which approximately 600 existed, raised $900 million in capital for new ventures. During the first half of 1981, the flotations of the 33 leading venture capital firms alone amounted to $705 million. See [Leach, 1981] and [Venture Capital Journal, 1982]. Although long-term statistics are not available, the venture capital market appears to have been subject to sharp fluctuations. It experienced a boom during the second part of the 1960s, was dormant through much of the 1970s, and entered another boom beginning in the late 1970s. The recent upsurge appears to have been propelled in part by regulatory reforms and reductions in capital gains tax rates beginning in 1978. Changes

in expectations about the attractiveness of emerging new technologies may also have been influential.

U.S. venture capital firms, it is estimated, have in recent years financed approximately 4,000 new ventures or "deals" per year. See [Leach, 1981, p. 58]. This of course is only a small fraction of the new enterprises established each year in the United States. The remaining ventures are financed in more traditional ways: through the personal savings of the founders, through loans from a vast diversity of financial institutions (including insurance companies and pension funds as well as banks), and through informal personal contact networks. The informal network approach may also be uniquely well-developed in the United States, especially for high-technology ventures. As an entrepreneur acquaintance remarked to one author recently, he could have financed his latest new venture simply by making a bicycle trip to visit affluent, risk-seeking potential investors in the vicinity of his Palo Alto, California, home.

These institutions play a critically important role in the American economic system. They make it possible to carry out many of the "new combinations," technological and otherwise, that precipitate economic progress. They are also midwives to the birth of countless new enterprises that, having survived their period of early growth, become the focus of diversification-increasing acquisitions by much larger corporations. If the U.S. economy is to continue sustaining the entrepreneurial dynamism on which Schumpeter correctly placed so much emphasis, the organized and informal venture capital markets will deserve a considerable portion of the credit.

V. Conclusion

This exploration of diversification by the largest American manufacturing enterprises has reinforced some initial expectations and yielded some surprises. That those enterprises became considerably more diversified in the quarter century from 1950 to 1975 was well known, but the extent, incidence, and mechanisms are now illuminated more clearly. Perhaps most striking is the disproportionate role found for mergers and acquisitions, especially in corporations that were large but not among the very largest in 1950. The impact of mergers in transforming the structure of acquisition-prone corporations is clear. What is less clear is whether growth by acquisition will succeed in maintaining the flow of new products and new production methods initially pioneered by the acquired enterprises, and whether operating units within large organizations can sustain the high motivational level characteristic of small, independent firms. Those are questions for further, more ambitious work to follow.

FOOTNOTES

1. This is a minimum estimate, since companies could have left the Top 200 in one year and rejoined it in another.

2. The standard error for comparing differences in numbers equivalent means across two samples of 40 is approximately 0.80. Thus, the means are not significantly different at conventional confidence levels.

3. The standard error for comparing differences in numbers equivalent means between the constant-membership sample and the sample of newcomers is approximately 0.54. With a t-ratio of 2.47, the differences are significant at the .01 level in a one-tail test.

This is not to say that all of the newcomers were highly diversified. In fact, the distribution of numbers equivalents was almost bimodal. Numerous new entrants into the Top 200 list were fairly narrowly specialized in such rapidly growing fields as petroleum, chemicals, electronics, and aerospace.

Of the 78 newcomers, only six were completely new firms in the sense that they began operations after 1950.

4. This is a minimum estimate, since lines could have been entered and exited without showing up in our analysis of structure at the end-points of the 25-year period. There is evidence that during the 1970s, divestitures amounted to as much as half the number of new mergers consummated.

5. The standard error for comparing quintile acquired proportion means is on the order of 0.12 (i.e., 12 percent). Thus, for a comparison between the first and third quintiles, the t-ratio is 2.10.

6. This count includes only acquisitions that survived through 1975. More acquisitions per line would have been observed if spun-off units were also counted.

7. For evidence that small businesses contribute a smaller proportion of significant innovations in Germany and Japan than in the United States, see Scherer [1984]. On the paucity of organized venture capital sources outside the banking system in Germany, see "West German Venture Capital," New York Times, June 6, 1983.

REFERENCES

Christopher A. Leach, "Venture Capital: The Billion Dollar Gamble," Inc., September 1981, pp. 57-64.

F. M. Scherer, "Technological Change and the Modern Corporation," in Betty Bock et al, ed., The Modern Corporation (Columbia University Press, forthcoming in 1984).

Joseph A. Schumpeter, The Theory of Economic Development (original German language edition 1911; citation here to the Redvers Opie translation, Harvard University Press, 1934).

Joseph A. Schumpeter, Capitalism, Socialism, and Democracy (Harper, 1942).

U. S. Federal Trade Commission, Statistical Report: Value of Shipmeents Data by Product Class for the 1,000 Largest Manufacturing Companies of 1950 (Washington: January 1972).

U. S. Federal Trade Commission, Statistical Report: Annual Line of Business Report, 1975 (Washington: September 1981).

U. S. Internal Revenue Service, 1980 Statistics of Income: Corporation Income Tax Returns (Washington: May 1983).

U. S. Securities and Exchange Commission, Annual Report: 1980 (Washington: 1981).

Venture Capital Journal, Special Report - Capital Transfusion 1982, July 1982.

Methodological Appendix A

to

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GROWTH BY DIVERSIFICATION: ENTREPRENEURIAL BEHAVIOR IN LARGE-SCALE UNITED STATES ENTERPRISES

This appendix describes more fully the methods used to match 1950 Federal Trade Commission Corporate Patterns report data with 1975 Line of Business data in order to compare diversification levels between those two years.

The reference point was the FTC's 1975 industry category list and the 1975 Line of Business reports filed by 148 corporations that were also among the top 200 manufacturers of 1950. In all but three cases, two significant and one minor, companies' 1975 activity breakdowns were accepted without change from the original LB reports. The two main exceptions involved companies that reported levels of secondary product "contamination" so high as to misrepresent seriously their true scope of operations. These were recoded using more detailed sales data filed in an ancillary schedule (II) of the LB reports.

All 1950 manufactured product value of shipments data were aggregated to match 1975 Line of Business categories as closely as possible. In doing this, steps had to be taken to compensate for three potentially important differences between the reporting criteria guiding the 1975 as compared to the 1950 surveys. All three stemmed from differing objectives. The 1950 survey sought value of shipments (roughly, sales) data only and was designed to track Census Bureau conventions as closely as possible. In contrast, the 1975 survey sought information on financial performance, including profits,

and had to be structured so as to strike a good balance between meaningfulness and consistency with company books of account.

The 1975 survey permitted respondents optionally to consolidate the activity of lines with sales of less than $10 million into a "miscellaneous" category (FTC code 99.99). A majority of the firms exercised this option. A corresponding procedure had to be implemented in recoding the data for 1950 retrospectively. Two alternatives were considered. One was to adjust the 1975 $10 million figure downward only for GNP deflator inflation; this would have put the 1950 "miscellaneous" threshold at $4.25 million. The other was to adjust for both nominal and real GNP growth, amounting to a factor of 5.4 between 1950 and 1975. An approximation to the latter rule was implemented: 1950 sales (agregated to the LB level) totalling less than $2 million were consigned to a miscellaneous category.

Results of the analysis were tested in two main ways for sensitivity to this handling of the low-sales line problem. For one, not counting low-sales lines in 1950 as full-fledged lines of business might cause an overestimation of the degree to which 1975 lines were new as contrasted to continuing. However, there were only 29 cases in which 1950 activities relegated to the miscellaneous category grew so rapidly that they became full-fledged LBs in companies' 1975 reports. See Table 5. Also, it is arguable whether a 1950 activity with sales of more than $2 million, and hence satisfying the criteria for being treated as a full-fledged LB, should be viewed as a "disappearance" when the company continued to make sales in that field in 1975, but at such modest levels that the activity was reported in category 99.99.

Such cases, of which there were 48, were counted as full-fledged 1950 LBs in the upper-bound or "high" tallies of Tables 4 and 5 but not in the "low" tallies. The differences, one can see, are not large.

A second option permitted 1975 Line of Business survey respondents was to include in their reports for an LB activities that did not truly belong there, as long as the sales of those "secondary product contamination" activities did not exceed 15 percent of individual LB sales. The purpose of this convention was to avoid forcing companies to make breakdowns finer than what their books of account could adequately support. Companies exercised the option sparingly; secondary product contamination amounted to 3 percent of total 1975 manufacturing LB sales. To make the recoded 1950 data as comparable as possible, the lower-bound counts of Tables 4 and 5 excluded 68 cases in which activities otherwise qualifying to be counted as separate 1950 LBs (e.g., with sales over $2 million) were reported only as contamination with sales of less than $10 million in 1975. The upper-bound counts include all such 1950 LBs. As one can discern in Table 4, the "high" and "low" estimates do not differ greatly, and so the results are not very sensitive to the conventions adopted in homogenizing 1950 and 1975 contamination and 99.99 treatments.

A third significant option permitted Line of Business survey respondents was to report on an integrated basis vertically related activities. Indeed, in certain specified industries -- notably, those in which most sales tended to be intra-company, or in which market-

oriented transfer prices were otherwise difficult to establish -- respondents were instructed that they should integrate vertically-related activities. When companies made such integrations in their 1975 reports, the 1950 data were similarly integrated. In those cases, neither the 1950 LBs nor their sales were included in computing 1950 LB counts and numbers-equivalent indices. Eliminating vertically integrated sales in this way avoids the double-counting problem that occurs under product line reporting (e.g., when shipments from a parts plant to an auto assembly plant are counted once, and then the sales of the assembly plant are counted again).

Comparing 1975 and 1950 LB counts posed certain additional problems of an even more complex character. For example, a company might report shipments of more than $2 million in line X for 1950 and have no activity in line Y. In 1975, an LB report is submitted for line Y, and sales of X appear only as contamination or vertical integration. Should line Y be considered a new line, or one with 1950 antecedants? Such cases and others so complex that only the author's research assistant understands them were consigned to the "others" category in Table 5. They numbered 41 in total.

Detailed 1950 value of shipments data for several aircraft producers and the Hercules Powder Company were not published in the FTC's 1972 Corporate Patterns report, apparently because the underlying records were lost. An earlier report revealed that the aircraft companies were for the most part very narrowly specialized in their principal line. For one non-conforming case and Hercules Powder, LB counts and an approximation to the numbers-equivalent index were

reconstructed using qualitative information, including plant output descriptions, published in the 1951 edition of Moody's Industrials manual.