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An International Comparison of the Determinants of Industrial Marketing Expenditures

This paper presents an international study of industrial marketing communications spending. The study compares the results of data collected from 55 European companies on 80 products with a sample of 131 products from 29 companies representing the ADVISOR study sample in the United States. The results show that the overall relationship between the strategic variables and advertising and marketing spending levels is not different between the U.S. and Europe. Although some differences exist in the importance of individual strategic variables between the two regions, those differences are generally small.

THIS paper examines whether the results of the ADVISOR project (Lilien 1979) on the determinants of industrial marketing budgeting practices apply to European products. We consider whether the original ADVISOR results apply to a sample of products collected several years later on a different continent. Our results show that the original ADVISOR results generally appear applicable: the overall relationship between strategic variables and spending levels is not significantly different between the original (U.S.) sample and the European sample.

Background

Companies selling industrial products all face the same marketing mix decision: How much should be spent and how should funds be allocated for such activities as direct sales, customer service, and marketing communications (advertising and other customer directed promotions)? Each company brings experience and thought to setting budgets and plans for industrial marketing expenditures; however, to a large extent these decisions are based on impressions rather than fact. Galper and Lilien (1981) review the state of knowledge about the effectiveness of industrial marketing communications and conclude that little is known about the relative effectiveness of industrial marketing communications vehicles.

On the positive side, many marketers have been making decisions for a long time and, in a "survival of the fittest" sense, they have been successful. In a pragmatic way, on average, they have converged through experience on reasonable decisions: the approach of using such experience to provide business operating norms has been applied in the PIMS program (Schoeffler, Buzzell, and Heany 1974). The PIMS data have also been used by Buzzell and Farris (1976) and Farris and Buzzell (1979) to infer communications spending norms.

The ADVISOR studies were an attempt to apply the concept of shared experience explicitly to industrial product situations. Reported work on the ADVISOR project covered five years, included 200 industrial products, and involved nearly 30 participating companies. That research effort found that a significant fraction of the variation in advertising and marketing spending could be explained by a few product and market characteristics.

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An appropriate model form to explain the spending patterns was found to be a varying percentage-of-sales model, with the percentage varying as a function of product, market, and environmental characteristics. That percentage, ceteris paribus, should also permit *decreasing* returns to scale (Lilien 1980a). Following these arguments, the models used to describe advertising and marketing spending both have the following log linear structure:

$$B_t = \beta_0 S_{t-1}^{\beta_1} U_{t-1}^{\beta_2} \left(\prod_i C_{var_i}^{\beta_i}\right)\left(\prod_j \beta_j^{D_{var_j}}\right) \qquad (1)$$

where

- B = marketing or advertising spending budget
- S = sales dollars (prior year's values are included because they provided a somewhat better fit than contemporaneous values)
- U = number of individuals the marketing program must reach
- C_{var_i} = continuous, independent variable i, transformed to be greater than 1
- D_{var_j} = 0–1 indicator for discrete, independent variable j

Generality of Results

The ADVISOR study is one of several aimed at developing a quantitative understanding of industrial marketing budget setting behavior. A key question must be asked concerning generality of the results (Farris and Buzzell 1980): How much do the results reflect the peculiarities of the sample as opposed to more general phenomena? In particular, are the results specific to the companies involved in the study? Are the results time dependent? Are the results U.S.–specific?

To the extent that the ADVISOR models represent a description of U.S. budgeting practice, this last question is of special interest. Cross-cultural research on management practices has been aimed at distinguishing "culture bound" behavior from "universal behavior" (Weinshall 1977). A major value of such research has been in investigating opportunities for learning from others (Schein 1981, Sorensen 1972). Marketing scientists have also viewed the international environment as a laboratory, investigating the applicability of concepts and the stability of supply-demand relationships and management practices across cultures (Carson 1967; Farley, Hulbert, and Weinstein 1980; Hakanson 1982). The continued internationalization of marketing operations has led to the conjecture that some management practices might well be transportable across national borders (Buzzell 1968, Sorensen and Weichman 1975).

Currently, the rather meager set of observations on decision processes has permitted few international comparisons in a marketing setting.

ADVISOR–Europe

A specially collected data base has allowed an investigation of some of the questions raised above. This study, called ADVISOR–Europe and sponsored by INSEAD, solicited data from its affiliated companies and marketing executives participating in the European marketing program. The companies who responded (55 in all) provided usable data on 80 products. As with the original ADVISOR project, no direct control over the representativeness of the product-sample was possible. Participating companies were firms that marketed solely in Europe as well as European divisions of U.S.-based firms. Participating European-based firms included EMI Medical, ICL, Wiggins Teape, Ciba Geigy, AGA Gas, KLM Cargo, Bekeart, Robert Bosch, ICI, and Siemans.

Data

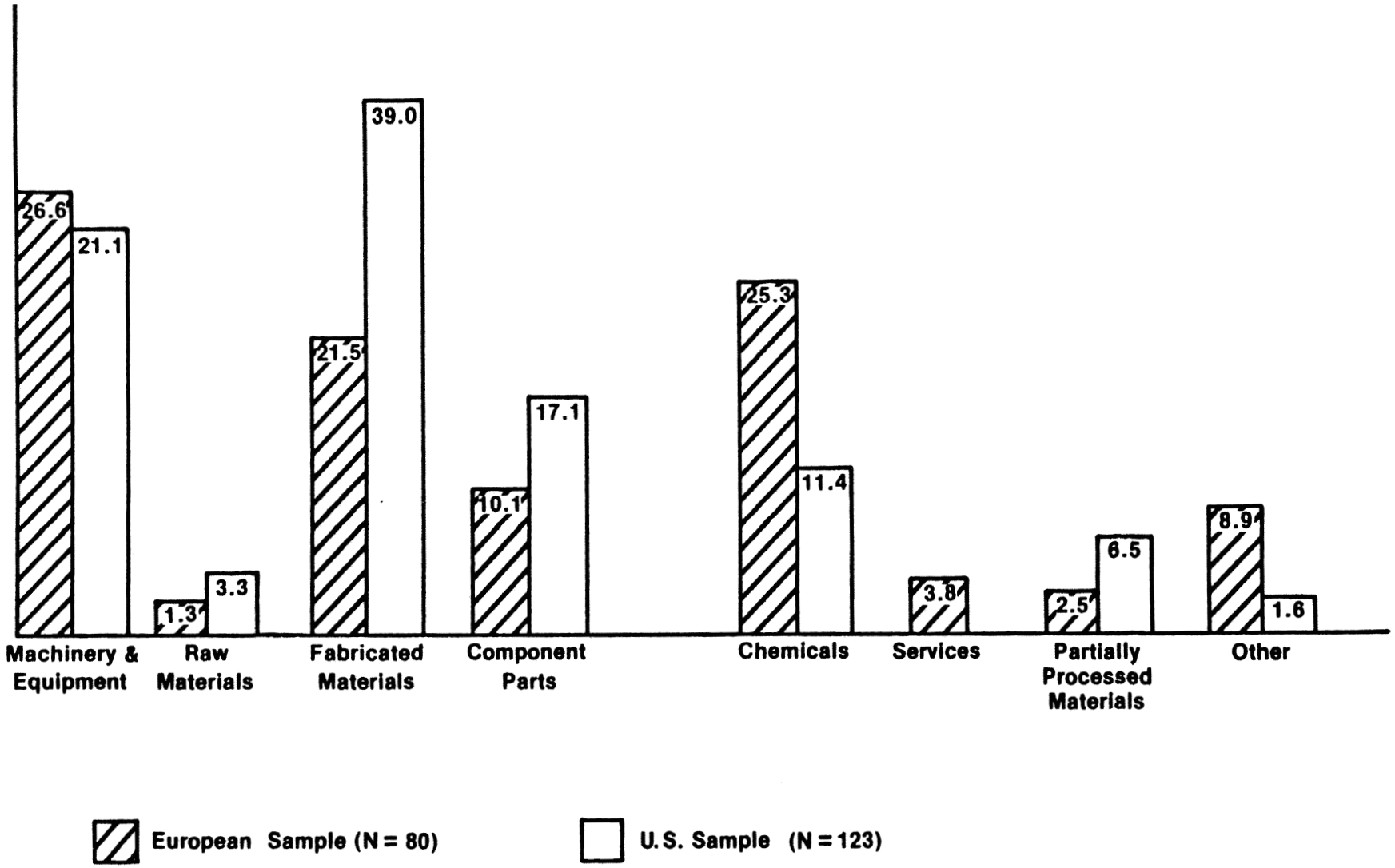
ADVISOR–Europe used those questions from the U.S. questionnaire that were found to be significant in explaining marketing budgeting behavior. Table 1 shows that most major European countries are represented. About eight of the questionnaires pertained to products that compete all across Europe instead of country by country. Figure 1 compares product categories between the sample, with a somewhat different mix of product categories in the European sample.[1] The major differences are the larger share of fabricated material and components products in the American sample as opposed to chemical and machinery firms in Europe. Table 2 compares other sample statistics. In terms of stage in the life cycle (introduction and decline products are not analyzed), the samples are remarkably similar. The European markets appear to be a bit more concentrated than U.S. markets. Market shares of the European sample are somewhat higher than the shares of the U.S. products. Both the marketing/sales ratio and the advertising/sales ratio are somewhat higher for the European than for the U.S.

[1]Differences in distributions were tested using a χ^2 test; this difference was found significant at the .001 level.

TABLE 1
European Sample Distribution by Country

Austria	1	Great Britain	17
Germany	11	France	13
Finland	2	Spain	12
Norway	1	Denmark	2
Sweden	1	Switzerland	1
Holland	5	Belgium	1
Italy	4	Europe-wide	8

FIGURE 1
Principal Product Category[a]



$\chi^2 = 25.20$, $p \simeq .001$

TABLE 2
U.S.–Europe Sample Comparisons

	U.S. Sample	European Sample	$\chi^2(r-1)$[a]
Stage in the life cycle (proportion in growth stage)	37.3	44.3	.83
Fraction of sales to 3 largest customers			
mean	.17	.25	10.30[b]
median	.07	.15	
Market share			
mean	.25	.31	13.91[b]
median	.20	.21	
Marketing/sales			
mean	.12	.16	12.39
median	.07	.11	
Advertising/sales			
mean	.020	.028	12.72
median	.0074	.011	
Advertising/marketing			
mean	.18	.17	7.26
median	.11	.08	
Mean perceived product quality (1–7 scale)	5.20	5.50	19.88[c]
Number of purchases/year (mean)	7.90	10.50	15.17[c]
Fraction of volume produced to order (mean)	0.33	0.35	23.92[c]
Percentage of sales to independent resellers (mean)	0.41	0.23	24.48[c]
Number of purchase influences (mean)	3.00	2.40	12.61[c]
Mean importance of technical service (1–7 scale)	5.00	5.10	7.25[b]
Number of major competitors (median)	6.00	5.30	8.25[b]
Fraction of industry sales by three largest customers (mean)	0.17	0.25	27.50[c]

[a]r refers to the number of categories in the frequency distributions. The test is for differences in distribution, not in means.
[b]difference significant at .1 level.
[c]difference significant at .01 level.

sample, although not significantly so. In general, the European products see lower levels of sales; the original ADVISOR model predicts higher M/S and A/S ratios with lower levels of sales (Lilien 1979, 1980a). Advertising/marketing ratios are quite similar between the samples.

Table 2 also summarizes some other data comparisons between the U.S. and European data, and provides the χ^2 statistic used in testing the differences between the two sets of distributions.

Formal Hypotheses

A number of variables have been suggested as having important effects on industrial marketing spending practice. For example, products early in the life cycle can be expected to spend more on marketing, ceteris paribus (Buzzell 1966); the more users there are, the more messages are required to reach them, and, consequently, the more will be spent on marketing communications. Farris and Buzzell (1979) and Lilien (1979) provide more complete justification for the selection and hypothesized sign of the variables included in the ADVISOR models:[2]

For Size of Advertising Budget

- sales (+)
- number of users and other DMU participants (+)
- customer concentration (−)
- fraction of sales made to order (−)
- stage in life cycle (−)
- product plans (+)

For Size of Marketing Budget

- sales (+)
- number of users and other DMU participants (+)
- customer concentration (−)
- fraction of sales made to order (−)
- prospect-customer attitude differences (−)

[2]For operational definitions of variables, see Appendix.

TABLE 3
ADVISOR USA and Europe Norm Models for Marketing and Advertising Budgets

Independent Variable	Marketing Budget		Advertising Budget	
	U.S. Sample Regression Coefficient (+t value)	Eur. Sample Regression Coefficient (+t value)	U.S. Sample Regression Sample (+t value)	Eur. Sample Regression Coefficient (+t value)
Constant[a]	0.187	−0.469	−0.342	−1.312
Sales	0.710 (12.72)	0.681 (9.49)	0.576 (9.08)	0.528 (5.34)
Number of users	0.079 (3.00)	0.106 (2.39)	0.105 (3.95)	0.214 (3.25)
Customer concentration[a]	−1.634 (3.18)	−0.579 (0.82)	−1.650 (2.81)	−2.193 (2.15)
Fraction of sales made to order[a]	−0.997 (2.81)	−0.100 (0.26)	−1.711 (4.21)	0.213 (0.37)
Prospect-customer attitude difference[a]	−0.206 (1.11)	−0.018 (0.06)	[b]	[b]
Proportion of direct sales	0.179 (0.52)	0.166 (0.31)	[b]	[b]
Stage in life cycle[a]	−0.428 (2.07)	−0.242 (0.89)	−0.864 (3.79)	−0.805 (2.18)
Product plans[a]	0.814 (3.87)	0.526 (1.99)	1.197 (4.87)	0.511 (1.29)
Product complexity[a]	0.548 (2.64)	0.841 (3.37)	[b]	[b]
Adjusted R^2	0.69	0.67	0.55	0.45
Sample size	112	75	109	75
Chow test statistic	0.847		2.046	

[a]Note that here, as in Lilien (1979), the coefficients reported for the discrete independent variables are the natural logarithms of the β's in equation 1.
[b]Variable excluded from this relationship in Lilien 1979, original ADVISOR analysis.

- proportion of direct sales (+)
- stage in life cycle (−)
- product plans (+)
- product complexity (+)

Since these variables are strategic in nature, we hypothesize that they reflect the behavior of performance driven managers in a free enterprise, Western economy. European managers are also performance driven and operate in a similar economic environment. As the technologies used in the industries represented in our samples are similar and the proportion of industries represented are similar as well, the manager must deal with similar contingencies (Webber 1968, Child 1981), suggesting similar decision making styles.

Formally:

Hypothesis I: The overall relationships between advertising and marketing as dependent variables and their corresponding explanatory variables will not be significantly different between the U.S. sample and the European sample.

Hypothesis II: There will be no significant differences between the roles of individual independent variables in how they explain the variation of marketing and advertising budgets in the two samples.

Results—Hypothesis I: Explanation by Strategic Variables

Table 3 presents the U.S. norm models for marketing and advertising spending alongside the corresponding U.S. specified models based on European data. In order to compare the regression equations for the two samples formally, we use the approach suggested by Chow (1960).[3] The test statistic is not statistically significant at the 10% level either for advertising or for marketing. We therefore cannot reject the null hypothesis of general overall structural equivalence between the U.S. and the European budgeting processes.

Results—Hypothesis II: Differences between Individual Coefficients

Our lack of ability to reject the hypothesis of general overall structural equivalence between the two samples does not mean that the impact of each individual

[3]If we call e the vector of disturbances in the pooled sample, e_{US} the errors in the U.S. sample, and e_{EUR} the vector of errors in the European sample, then under the null hypothesis:

$$C = \left[\frac{e'e}{(e'_{US}e_{US} + e'_{EUR}e_{EUR})} - 1\right] \cdot \frac{N - 2k}{k}$$

is distributed as F with k and N − 2k degrees of freedom where N = pooled sample size and k = number of parameters to be estimated.

variable on the respective budgeting equation is the same. This requires further analysis.

A test for significant differences between individual regression coefficients was proposed by Gujarati (1970). It employs a dummy variable, D (1 if European, 0 if U.S.) in a pooled sample of both European and U.S. data. The dummy variable was then introduced in order to detect differences for the intercept and for each of the independent variables. A separate run was made for each individual independent variable. The idea is to add a variable (say D•LIFECYCLE) to the original model, where D is the dummy variable defined above. A test of the significance of the coefficient of this variable tells whether the corresponding model-coefficient needs to be adjusted if the product is European.

Table 4 displays the pooled marketing and advertising models alongside the models that were respecified following detection of significant differences between coefficients in the individual runs. The coefficient for fraction of sales made to order was the only variable in the marketing model showing a significant difference for the two samples. The relatively low level of significance of the variable, however, makes it more a hypothesis for further research than a clear difference. It reflects a higher spending response to the fraction of sales made to order in Europe, since the coefficient for the U.S. is −0.792 and is changed to −0.792 + 0.648 = −.144 in Europe. This statistic indicates that marketing budgets in Europe seem less sensitive to the fraction of sales made to order than are U.S. budgets.

For advertising budgets there are statistically significant differences for the intercept and for number of users, fraction of sales made to order, and product plans. The difference in the intercept is small and only occurs in conjunction with the other differences. The fraction of sales made to order has an effect as in the marketing equation: it reduces the amount of sensitivity in the advertising budget to the fraction of sales made to order in Europe. Thus for U.S. products, advertising spending is reduced considerably with a higher "made to order" fraction (−1.704). Europeans show little sensitivity, 1.890 − 1.740 = 0.186, or essentially zero. Looking at the corresponding coefficients for the independent samples in Table 3, we can see that the coefficient there is statistically significant for the U.S. and not for Europe. We conclude that this variable appears to be considered in the U.S. but not in Europe.

TABLE 4
Pooled ADVISOR Model with and without Detected Coefficient Difference

	Marketing Budget		Advertising Budget	
Independent Variable	A[a] Regression Coefficient (+t value)	B[a] Regression Coefficient (+t value)	A[a] Regression Coefficient (+t value)	B[a] Regression Coefficient (+t value)
Constant	−0.005	−0.043	−0.627	−0.111
Sales	0.690 (16.32)	0.706 (10.12)	0.546 (10.12)	0.553 (10.08)
Number of users	0.080 (3.63)	0.079 (3.58)	0.139 (5.17)	0.104 (3.45)
Customer concentration	−1.228 (3.25)	−1.329 (3.43)	−1.890 (3.58)	−1.871 (3.53)
Fraction of sales made to order	−0.481 (1.94)	−0.792 (2.57)	−0.696 (2.05)	−1.704 (3.65)
Prospect-customer attitude difference	−0.104 (0.72)	−0.120 (0.84)	—	—
Proportion of direct sales	0.216 (0.80)	0.149 (0.55)	—	—
Stage in life cycle	−0.340 (2.27)	−0.327 (2.19)	−0.873 (4.32)	−0.845 (4.21)
Product plans	0.649 (4.12)	0.693 (4.37)	0.809 (3.74)	1.197 (4.24)
Product complexity	0.675 (4.45)	0.633 (4.14)	—	—
D (constant)[b]	—	—	—	−0.019 (2.83)
D (number of users)[b]	—	—	—	0.114 (1.92)
D (fraction of sales made to order)[b]	—	0.648 (1.68)	—	1.890 (2.81)
D (Product plans)[b]	—	—	—	−0.702 (1.66)
Adjusted R^2	0.70	0.72	0.50	0.53
Sample size	187		184	

[a]Model A is a simple, pooled model; model B is the pooled model, augmented by statistically significant coefficient adjustments for the European sample.
[b]Variables are adjustments to individual coefficients in the pooled equation when the product is "European."

The second difference we see is for the number of users. Here the U.S. coefficient of 0.104 is augmented by 0.114 to .218 in Europe. This is similar to the results in Table 3. We conclude that Europeans are more sensitive to the size of the audience they try to reach than are Americans. This is reasonable since advertising in Europe is more interpersonally-oriented (shows and exhibitions) than in the U.S. where it is more impersonal, using space advertising more heavily.

The third significant difference is in product plans. This variable is a highly sensitive consideration in the U.S., yet not significant in Europe, according to Table 3. Here again the definition of the variable may have posed a measurement problem (see Lilien 1979, 1980a). However, advertising spending does seem to be increased more with aggressiveness of product plans in the U.S. than in Europe; in the U.S. the coefficient is 1.197, while in Europe the coefficient is reduced by .702 to 0.495.

On net, our conclusions here cause us to reject the second hypothesis of no significant differences between the U.S. and Europe. For one variable in the marketing equation and three variables in the advertising equation, small but statistically significant differences are present.

Assessment and Uses

The results presented here suggest that (a) the overall relationship between strategic variables and spending levels is not significantly different between the U.S. and Europe, and (b) some differences do exist in the importance of individual strategic variables between Europe and the U.S.

Result (a) suggests that the ADVISOR results appear to have both cross-cultural applicability and cross-temporal stability since the European data were collected 3–4 years more recently than the U.S. data. The cross-temporal and cross-cultural effects are confounded here though, and while the lack of significant differences between the samples suggests neither type of effect is present, this observation should be checked in further research.

The advertising model results suggest that there may be a different style of advertising use in Europe where product plans and fraction of sales have less effect (product-company factors) while the budget adjusts more radically to a key market factor, the number of users. European industrial market structure, with the heavier use of shows and sales promotion, has most likely led to these differences. Note that while statistically significant, these differences are more "the exception that proves the rule," in that the major determinants of U.S. and European advertising and marketing spending patterns appear remarkably similar.

Note that the data collected in Europe were only for those variables previously found important in the U.S. and, thus, did not permit identification of new explicit factors important in Europe but not in the U.S. In addition, as with ADVISOR USA, the data represent a convenience sample, precluding more formal hypothesis tests and stronger conclusions.

This research provides an updated set of advertising and marketing budgeting norms with general cross-cultural stability. They suggest that further in-depth study of European industrial marketing budgets, although possibly useful, is more likely to be of marginal value since the explanation of variation in spending, as measured by R^2 values in Table 3, is comparable to that found in the U.S. A useful direction for further research would be a replication in a few years and/or for other types of products (new products and industrial services in particular).

As with the prior ADVISOR analyses, the models can be used in a variety of ways to help support industrial marketing decision making. A key use is as a tool for generating norms for managerial control. This and other uses are discussed in Lilien (1980b).

Conclusions

An objective of this research has been to determine whether significant differences in the determinants of industrial marketing budgeting behavior exist between Europe and the U.S. By and large we found those differences to be small. We conclude that there appear to be a small number of strategic factors that influence budgeting behavior in the U.S. as well as in Europe and that spending differences probably stem largely from differences in circumstances. The identification and measurement of the impact of those factors is a step toward developing a general, quantitative understanding of and guidance for industrial marketing decision making.

Appendix: Variable Definitions

Sales	Product $ sales (lagged 1 year; in $1000s)
Number of users	Number of industry downstream specifiers + number of industry users + number of industry independent resellers first year

Customer concentration	LN (fraction of industry dollar sales purchased by industry's three largest customers)
Fraction of sales made to order	LN (fraction of product's dollar sales produced to order + 1)
Prospect-customer attitude difference	Difference between how current customers and prospective customers perceive product quality relative to industry average =0, prospective customers perceived quality higher than current customers =1, otherwise
Proportion of direct sales	LN (fraction of sales volume made direct to users + fraction of sales volume made to users via company owned resellers + 1)
Stage in life cycle	Stage in product life cycle =0, growth =1, maturity if missing, product is in introduction or decline
Product plans[4]	=1, if product plans are "positive," i.e., if respondent indicated increase in market share as an objective, say =0, otherwise
Product complexity	Product complexity =1, if the product is machinery and equipment or component part =0, otherwise

[4]See Lilien 1980a for complete operational definition.

REFERENCES

Buzzell, Robert D. (1966), "Competitive Behavior and Product Life Cycles," in *New Ideas for Successful Marketing*, J. S. Wright and J. L. Goldstucker, eds., Chicago: American Marketing, 46–48.

——— (1968), "Can You Standardize Multinational Marketing?," *Harvard Business Review*, 46 (November–December), 102–113.

——— and Paul W. Farris (1976), "Industrial Marketing Costs," working paper, Marketing Science Institute.

Carson, David (1967), *International Marketing: A Comparative Systems Approach*, New York: Wiley.

Child, John (1981), "Culture, Contingency and Capitalism in the Cross National Study of Organizations," in *Research in Organizational Behavior*, 3, Barry M. Staw and Larry L. Cummings, eds., Greenwich, CT: JAI Press.

Chow, Gregory C. (1960), "Test of Equality between Subsets of Coefficients in Two Linear Regressions," *Econometrica*, 28 (July), 591–605.

Farley, John U., James M. Hulbert, and David Weinstein (1980), "Price Setting and Volume Planning by Two European Industrial Companies: A Study and Comparison of Decision Processes," *Journal of Marketing*, 44 (Winter 1980), 46–54.

Farris, Paul W. and Robert D. Buzzell (1979), "Why Advertising and Promotional Costs Vary: Some Cross-Sectional Analyses," *Journal of Marketing*, 43 (Fall), 112–122.

——— and ——— (1980), "A Comment on 'Modeling the Marketing Mix for Industrial Products'," *Management Science*, 26 (January), 97–100.

Galper, Morton and Gary L. Lilien (1981), "Industrial Marketing Communications: Present Status and Research Needs," *Proceedings, AMA Workshop on Industrial Marketing*.

Gujarati, Damodar, "Use of Dummy Variables in Testing for Equality between Sets of Coefficients in Two Linear Regressions: A Note," *American Statistician*, 24 (February), 50–52.

Hakanson, Hakan, ed. (1982), *International Marketing and Purchasing of Industrial Goods, An International Approach*, Chichester: Wiley.

Lilien, Gary L. (1979), "ADVISOR 2: Modeling the Marketing Mix Decision for Industrial Products," *Management Science*, 25 (February), 191–204.

——— (1980a), "Reply to Farris and Buzzell," *Management Science*, 26 (January), 101–105.

——— (1980b), "Keeping Up with the Marketing Joneses," *Industrial Marketing*, 65 (March), 76–84.

Schein, Edgar H. (1981), "Does Japanese Management Style Have a Message for American Managers?," *Sloan Management Review*, 23 (Fall), 55–68.

Schoeffler, Sidney, Robert D. Buzzell, and Donald F. Heany (1974), "Impact of Strategic Planning on Profit Performance," *Harvard Business Review*, 52 (March–April), 137–145.

Sorenson, Ralph Z., II (1972), "U.S. Marketeers Can Learn from European Innovators," *Harvard Business Review*, 50 (September–October), 89–99.

——— and Ulrich E. Weichman (1975), "How Multinationals View Marketing Standardization," *Harvard Business Review*, 53 (May–June), 138–167.

Webber, Ross A. (1968), *Culture and Management: Text and Readings in Comparative Management*, Homewood, IL: Irwin.

Weinshall, Theodore T., ed. (1977), *Culture and Management*, Harmandsworth: Penguin.