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SOME CHARACTERISTICS OF TECHNICAL ENTREPRENEURS

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Some Characteristics of Technical Entrepreneurs

by

Edward B. Roberts* and Herbert A. Wainer†

ABSTRACT

Sixty-nine technical entrepreneurs were studied emphasizing description of several of their characteristics such as family background, education, and motivation. The results indicate that entrepreneurial fathers are more likely to produce entrepreneurial sons. An individual's home environment and attitudes that seem to be embodied in his religious background are likely to have strong influences on his goal orientation, education, and whether or not he becomes an entrepreneur. In addition, those technical entrepreneurs whose fathers had high occupational status were educated sooner and to a higher level than those whose fathers had low occupational status. At the same time it was determined that the technical entrepreneurs who had self-employed fathers were educated usually to around the Master of Science degree level, the median education of the entire sample. The predominance of such educational behavior for entrepreneurial sons may be explained by their goal orientation. Low levels of education usually do not provide sufficient knowledge to run effectively a technically-based enterprise. Higher levels of education appear not to be necessary and may be regarded as over-preparation by a would-be entrepreneur.

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INTRODUCTION

Why does an individual become an entrepreneur? What are some of the factors in an individual's life that contribute to and manifest his entrepreneurial orientation? These are intriguing questions particularly when one addresses them to the field of technical entrepreneurship. Clearly, technical entrepreneurs are a subset of the general group of entrepreneurs and have characteristics attributable to the aggregate. At the same time they have special attributes that enable them to start technical enterprises.

One might propose a simple model of the development of a technical entrepreneur as follows. The first influence on an individual is his family background, which affects the development of his goal orientation and motivation. Family background also probably affects the educational level attained by the offspring. Both of these intermediate factors, goal orientation and motivation and educational level, in turn also influence whether or not an individual becomes an entrepreneur. These several variables can be considered in terms of both contributions and manifestations. For instance, a particular goal orientation is a manifestation of aspects of family background while it probably contributes to the fact of entrepreneurship. The following diagram indicates the hypothesized overall relationship between the variables.

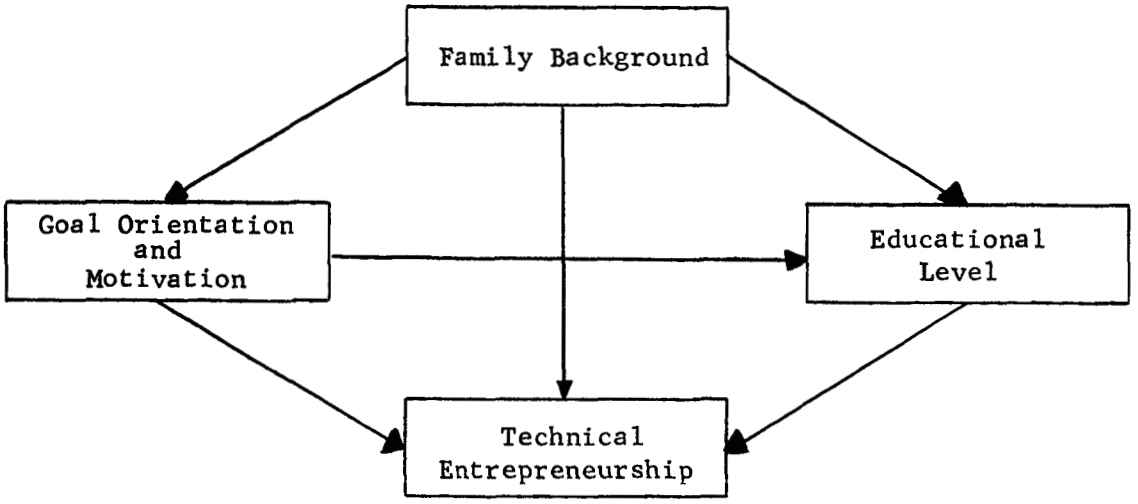

Figure 1. Model of Factors Influencing the Development of an Entrepreneur

This simple model[1] is discussed in the following paper, in which understanding is sought of how certain factors relate to entrepreneurship and make its occurrence more likely.

Current research[2,3,4] in the M.I.T. Sloan School of Management on

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[1]Throughout this paper associational relationships are discussed that implicate cause and effect as indicated in Figure 1. Of course, cause and effect cannot be established statistically. It might be reasonable to argue, for example, that the relationship between educational level and motivation may run in a direction opposite to that indicated in Figure 1, or at least that feedback exists between the two variables.

[2]Teplitz, Paul V., "Spin-off Enterprises From a Large Government-Sponsored Laboratory" (unpublished Master of Science thesis, Alfred P. Sloan School of Management, Massachusetts Institute of Technology, June, 1965).

[3]Wainer, Herbert A., "The Spin-off of Technology from Government-Sponsored Research Laboratories: Lincoln Laboratory" (unpublished Master of Science thesis, Alfred P. Sloan School of Management, Massachusetts Institute of Technology, September, 1965).

[4]Roberts, Edward B., "The Dynamics of Research and Development", in Proceedings of R&D Symposium (Washington, D.C.: National Security Industrial Association, November, 1965), pp. 25-38.

the formation and growth of new technical enterprises suggests the potential importance to company success of the characteristics and attitudes of the technical entrepreneur. Although much information has been collected on each of the companies studied so far, unfortunately relatively little emphasis had been placed until recently on entrepreneurial characteristics. Despite this relative paucity of information on the entrepreneurs themselves, data have been gathered on such things as the entrepreneur's religion, his father's occupation, his educational experience, and his motivations and attitudes.

This paper presents some findings based on the analysis of data collected from 69 individual entrepreneurs (each has founded or participated in the founding of a new enterprise). The data have been drawn from the files that the authors have assembled on enterprises formed by former employees of the M.I.T. Instrumentation Laboratory and the M.I.T. Lincoln Laboratory. (Approximately two-thirds of the individuals were former Lincoln Laboratory employees and one-third were former Instrumentation Laboratory employees.) The actual sample size used in the following analyses varies due to incomplete information.

It should be made clear that the results reported in this paper are not necessarily general to the population of technical entrepreneurs. The study group was not drawn as a sample of a broad population and thus, in a strict sense, relates only to those individuals studied. The authors feel that, in spite of this obvious limitation in the data base, the hypotheses tested may have validity with reference to the more general population of technical entrepreneurs. Future analyses using broader populations will permit more extensive examination of the hypotheses suggested and reported in this paper.

HOME ENVIRONMENT - THE ENTREPRENEUR'S FATHER AND HIS RELIGION

The first influence to which an individual is exposed and which is likely to be important in molding his personality, attitudes, and orientation is his home environment or family background. Clearly, the end product of the man is the result of a complicated interaction of many factors. As a result one would be hard pressed to identify a deterministic model of the relationship between family background and later individual behavior based on an analysis of two or three factors. Yet, certain background factors (i.e. religion) that are really labels applied to groups of attitudes and practices may be fruitful in partially explaining why an individual becomes an entrepreneur.[5]

The following section considers paternal occupational status and religion, two background factors that identify broad groups of environmental influences. These variables are discussed in terms of their interaction with each other and with other factors such as educational level and the incidence of entrepreneurship in offspring.[6]

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[5]McArthur, Charles C., "Career Choice: It Starts at Home", Think, March-April, 1966, pp. 15-18.

[6]The hypothesized effects of father's occupational status and religion on educational level and the incidence of entrepreneurship in offspring are probably not independent of each other. To treat them as such affects the level of sophistication of the analysis rather than its validity. The authors caution that the statements made based on analysis of the variables as independent of each other are first order approximations of the relationships.

The Entrepreneur's Father

A male offspring's measure of personal success may be strongly related to the level of achievement attained by his father. High achievement motivation is usually associated with entrepreneurship or self-employment because of the nature of the reward system inherent in this type of endeavor. Several research results have indicated that the attitudes of parents have a definite effect on the development of a strong or weak achievement motivation in children.[7,8] In addition, it may be that simple familiarity with a business environment increases the probability that an offspring will become an entrepreneur. In other words an individual's occupational choice may be strongly influenced by his home environment particularly as reflected by his father's occupational status.[9,10,11]

These hypotheses have motivated the inquiry into the effects of the entrepreneur's father on his behavior. Although the hypotheses are testable given proper information, in the present study they represent only speculation. However, the information that is available indicates that the hypotheses are reasonable.

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[7]McClelland, David C., The Achieving Society, D. Van Nostrand Company, Inc., Princeton, 1961, p. 46.

[8]Hagen, Everett E., On the Theory of Social Change, The Dorsey Press, Inc., Homewood, Illinois, 1963, p. 136.

[9]Super, Donald E., The Psychology of Careers, Harper and Brothers, New York, 1957, p. 243.

[10]Roe, Anne, The Psychology of Occupations, John Wiley & Sons, Inc., New York, 1956, p. 107.

[11]Vollmer, Howard M. and Mills, Donald L., Professionalization, Prentice-Hall, New Jersey, 1966, pp. 73-81.

Two pieces of information were collected that relate to the entrepreneur's father. One is the father's occupational status group[12] available in the categories used in the Census statistics. The second is simply whether or not he was in his own business.

It can be seen from Table 1 that an approximately equal percentage of technical entrepreneurs were sons of professional and managerial fathers as were sons of laborers, salesmen, and farmers. On the basis of these data alone it is difficult to say anything about which paternal occupational status groups are more likely to produce technical entrepreneurs. In addition, the table indicates that an equal percentage of the entrepreneurs had fathers who were in their own businesses as did not.

In further exploring the relationship between a father's occupational group and whether or not he was in his own business, one discovers that 57% of the professional and managerial fathers were in their own businesses compared with 39% of the rest. Further, the table indicates that 33% of the professionals (technical and non-technical), 80% of the managers (technical and non-technical), 25% of the salesmen, and 35% of the skilled and unskilled laborers were in their own businesses. To be sure, the large percentages of professional and managerial fathers who had their own businesses are reasonable (see column of Census statistics in Table 1). In addition, one might expect a high percentage of farmers to be in their own businesses (75% in this sample). However, 35% of the

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[12] A strong argument can be made that placement of the Farmer group at the bottom of this hierarchy is unreasonable. However, only four of the entrepreneurs had fathers who were farmers. Therefore, no attempt was made to replace that group properly. A more reasonable placement would probably be within the "Managerial" classification.

TABLE 1

Paternal Occupational Status and Self-Employment:
Comparison with Census Statistics

Occupational status group		Total included in each group #	Total included in each group %	# whose fathers were in their own businesses	A % in each group whose fathers were in their own businesses	B U.S. Census 1960* age: 45 & over % self-employed within each group	Ratio A/B
Professional	non-technical	7	52%	2	33%	22%	1.5
	technical	8		3			
Managerial	non-technical	12		11	80%	45%	1.8
	technical	3		1			
Clerical and sales		4	48%	1	25%	26%	1.0
Skilled labor		15		5	35%	9%	3.7
Unskilled labor		5		2			
Farmer		4		3	75%	--	---
TOTAL		58		28			

* All figures reported from the census are totals for the self-employed individuals in the 45 years and over age group. It was felt that most of the entrepreneur's fathers included in the study sample would fall into this age grouping.

skilled and unskilled labor group had their own businesses. This seems fairly high, given the Census figure of 9% for the comparable laborer group. It can be observed in Table 1 that the largest discrepancy between the census and the study sample is in the laborer group.

The inordinate number of self-employed fathers may explain the large group of entrepreneurs who were offspring of the laborer group. It is unfortunate that the data collected in this study do not include more family background information. However, one might attempt to explain some of the study research findings by suppositions based on other research, particularly as discussed by McClelland. As mentioned in the introductory paragraphs to this section, high n-achievement is often associated with entrepreneurship or self-employment. In addition, research by Winterbottom[13] has associated the attitudes of parents with the development of achievement motivation in offspring. The fact that a large number of fathers, whose occupational status grouping is not usually associated with achievement motivation, had their own businesses may indicate that these did in fact have a high n-achievement. This in turn may have been instilled in their sons and thus account for the unexpected incidence of new enterprises from this group.

One further analysis utilizing the census data might be meaningful. In the absence of a control group for comparison between the study sample and a sample of non-entrepreneurs, use of the census data may indicate in general terms whether or not self-employed fathers produce entrepre-

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[13]McClelland, D., op. cit., p. 46.

neurial sons to a disproportionate extent. One can observe from Table 1 the breakdown of the entire sample by percentages falling into each of the paternal occupational status groups. The table also indicates the percentage of each occupational status group from the general population (45 years old and over) who are self-employed. If one were to apply these percentages (Census) to the aggregate percentages of fathers falling into each of the occupational status groups (study sample), one would be able to determine roughly the expected percentage of the study sample fathers who have their own businesses. This analysis follows in Table 2. Table 1 indicates that 50% of the study sample had entrepreneurial fathers. Comparison of this figure with the 24% that would normally be expected (see Table 2) yields the strong suggestion that entrepreneurial fathers produce entrepreneurial sons disproportionately.

TABLE 2

A Comparison of the Study Sample Fathers with the Expected Frequency of Self-employment as Indicated by Census Figures

Occupational status group	% in study[14] sample (1)	Expected % self-employed (from census) (2)	Expected self-employed % from sample (1) x (2)
Professional	25%	22%	5.5
Managerial	29%	45%	13.0
Clerical & Sales	8%	26%	2.1
Laborers	38%	9%	3.4
TOTAL	100%		24.0%

[14]The total sample for this analysis was not inclusive of the farmer group.

This hypothesis was tested by means of a Chi-square analysis. The two samples, the expected frequency as indicated by the 24% (Table 2) and the actual study sample frequency (based on the full sample) which was 50%, were split on self-employed and not self-employed fathers. The following contingency table was derived from these figures.

TABLE 3

Relationship of Expected to Actual Number of Self-Employed Fathers

	Self-employed fathers	Non self-employed fathers
Expected frequencies as indicated by the census figures	15	49
Actual frequencies as observed from the study sample	32	32

The Chi-square statistic calculated from this table was 8.60 which is significant at less than the .01 level (one-tail).

The Entrepreneur's Religion

Differences in religious background should produce differences in the behavior and character of offspring. This statement is supported by McClelland,[15] Terman,[16] and Super.[17] For instance, McClelland speci-

[15]McClelland, D., op. cit., p. 362.

[16]Terman, Lewis M., and Oden, Melita H., The Gifted Child Grows Up, Stanford University Press, Stanford, California, 1947, pp. 298-299.

[17]Super, Donald E., op. cit., p. 243.

fically states that Jewish boys have a higher n-achievement than the rest of the population.[18]

In addition, Mayer and Sharp[19] indicate that there are differences among the three religions with respect to family income, self-employment, occupation status, and educational level. Their results[20] are presented in summary form in the following table.

TABLE 4[21]

Income, Self-employment, Occupational Status, and Educational Level for the Three Major Religions*

Religion	% with income above (median + $2000)	% self-employed (of total in each group)	% in high status occupations (of total in each group)	Median school year completed
Protestant	28%	10%	29%	11.6
Catholic	27%	7%	19%	10.0
Jewish	42%	41%	62%	12.5

*Source: Mayer & Sharp, American Sociological Review

[18]McClelland, D., op. cit., p. 364.

[19]Mayer, Albert J., and Sharp, Harry, "Religious Preferences and Worldly Success", American Sociological Review, April, 1962, Vol. 27, No. 2, pp. 218-227.

[20]The sample of over 7000 people utilized in the study was collected from the adult population of Greater Detroit. Mayer and Sharp imply that it is representative of all non-institutionalized adults in the community. However, the sample was drawn from a population which may not be representative of the general population. The present authors' purpose in utilizing this analysis is to indicate possible differences among religious groups.

[21]Mayer and Sharp, op. cit., p. 224.

It is possible to calculate, utilizing the percentages in the table, whether or not any of the religions are significantly differentiated from each of the others or all of the others by any of the first three factors. The last factor, median school year completed, is not in a form that permits such an analysis to be performed. In any case, observation of the figures indicates that the Jewish group had 2.5 years of education beyond that of the Catholics and approximately one year more than the Protestants. The Protestants had 1.6 years of education beyond that of the Catholics. The other three factors can be analyzed in more detail by use of a Chi-square analysis. The data utilized in this analysis were calculated by applying the percentages found in Table 4 to the sample sizes to which they refer. The main findings of the analyses are:

1. Jews were differentiated from each of the other two religious groups by having higher income levels.

2. Jews were differentiated from each of the other two religious groups by having more self-employed individuals.

3. Jews were differentiated from each of the other two religious groups by having higher occupational status. Protestants had higher occupational status than Catholics.

As one might expect from the above references, there are some interesting differences in characteristics and background of the entrepreneurs that seem to be explained by religious differences. The reader will note that some of the findings from the present study relate to and are consistent with the findings of the above analysis.

One of the most interesting findings from the analysis of data on the technical entrepreneurs is that relating the percent of entrepreneurs'

fathers who were in their own businesses to religious background. Eighty percent of the Jewish fathers had their own businesses, at least 20% more than any other group (see Table 5). The second largest group in terms of the percent of fathers in their own businesses consisted of those who said they had "no religion". Several factors suggest that many of the members of this group were also of Jewish parentage.

A Chi-square analysis of the differences between the three major religious groups and whether or not the entrepreneur's father was in his own business indicates that the Jewish group had significantly more fathers who were in their own businesses. No other religious group was significantly differentiated from the others by the criterion of fathers in own business.

This result has more meaning when one considers the relative percentages of number of entrepreneurs by religion (See Table 5). The Jewish group contained 16% of entrepreneurs studied, yet had 27% of the fathers who were in their own businesses. On the other hand the Catholic and Protestant groups supplied correspondingly less of the self-employed fathers than their share of the total number of entrepreneurs would indicate.

As will be mentioned in a later section, the entrepreneurs included in the study are generally highly educated.[22] However, some interesting educational differences show up when the sample is split by religious

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[22]This is an interesting contrast to the finding of Collins, Orvis F., et. al., The Enterprising Man, Michigan State University, Michigan, 1964, pp. 70-80. In that study only about 40 percent of the entrepreneurs had had any education beyond high school.

TABLE 5

Percent in Each Religious Group and Percent of Fathers in Own Business

Religion	Total # of entrepreneurs in each group	% of total entrepreneurs in each group	# of fathers in own business	% of each religious group whose fathers were in own business	% of total entrepreneurs whose fathers were in their own businesses supplied by each group
Protestant	29	46	11	38	37
Catholic	14	22	6	43	20
Jewish	10	16	8	80	27
None	5	8	3	60	10
Other	5	8	2	40	7
TOTAL	63	100%	30		101% (round off error)

background. Table 6 represents the cross-classification of religion and educational attainment within each religious group. The median level of educational attainment for the total sample is a Master of Science degree. The percentages of each religious group falling on either side of the entire sample's median are indicated in the table. The Protestant and Catholic groups show a mild trend toward the lower educational levels, these two groups being slightly less educated than the median of the entire sample. On the other hand the Jewish group shows a strong trend toward the higher levels of education and is significantly differentiated from the total of all other religious groups by educational level (Mann-Whitney U test one tail probability = .05, Jewish = 10, non-Jewish = 54). These results are consistent with the findings of Terman, 1947.[23] Terman studied 1467 gifted children over a period of 20 years, 152 of which were of Jewish background. He found that

> The proportion taking one or more graduate degrees was 62.5 percent of the Jewish men who completed college, as against 46.2 percent of the non-Jewish. The difference is fairly reliable. The trend is consistent in the direction of more education for Jewish subjects.

The split of occupational status groupings by religion also indicates some differences. Table 7 represents the cross-classification of religions of the entrepreneurs and the occupational status of their fathers. It shows the number of entrepreneurs whose fathers had a particular occupational status within each religious group. The median level of occupational status for the total sample is managerial (technical).[24]

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[23] Terman, Lewis M., and Oden, Melita H., op. cit., pp. 298-299.

[24] Managerial (technical) and managerial (non-technical) should not be differentiated in the occupational status hierarchy. However, the median falls just into the managerial group from the clerical group. As a result the split was made slightly lower than the actual median indicated by the sample.

TABLE 6

Religion Related to Educational Level

Educational level	RELIGION										TOTAL
	Protestant		Catholic		Jewish		None		Other		
	#	% above or below median	#	% above or below median	#	% above or below median	#	% above or below median	#	% above or below median	
PhD or greater	3		2		4		1		1		11
Professional EE	3	45%	0	46%	0	68%	0	50%	0	20%	3
M.S. & courses	4		4		2		1		0		11
M.S. median	7		1		3		1		0		12
B.S. & courses	6		6		1		1		3		17
B.S.	1		0		0		0		1		2
College without any degree	5	55%	1	54%	1	32%	1	50%	0	80%	8
No school beyond high school	1		0		0		0		0		1
TOTAL	30		14		11		5		5		65

TABLE 7

Religion Related to Occupational Status of Entrepreneur's Father

Occupational Status of Entrepreneur's Father		RELIGION: Protestant #	Protestant % above or below median	Catholic #	Catholic % above or below median	Jewish #	Jewish % above or below median	None #	None % above or below median	Other #	Other % above or below median	TOTAL
Professional	non-technical	4	52%	1	31%	1	61%	1	50%	0	80%	7
	technical	4		0		1		0		3		8
Managerial	non-technical	5		3		3		1		1		13
	technical	2		0		1		0		0		3
Clerical & Sales		3	48%	0	69%	0	39%	0	50%	1	20%	4
Skilled labor		6		4		2		2		0		14
Unskilled labor		0		4		1		0		0		5
Farmer		3		1		0		0		0		4
TOTAL		27		13		9		4		5		58

As in the analysis of educational levels, the percentages of each religious group falling on either side of the median are indicated in the table. The Protestant group has an approximately equal percentage on either side of the median. The Catholic group, however, shows a strong tendency toward the lower occupational status groupings. (Mann-Whitney U test one-tail probability = .01, Catholics = 13, non-Catholics = 45). And the Jewish group shows a more mild but definite trend toward the higher occupational status groupings. However, the trend in the Jewish group toward the higher occupational status groupings is not strong enough to be statistically significant.

THE ENTREPRENEUR'S EDUCATION

One should expect that the technical entrepreneurs included in this study would be highly educated relative to the general public. Probably the most important reason for this is the basis for inclusion in this study, i.e. the nature of the source laboratories at which they had worked prior to their enterprise formation. Both labs are technically-based requiring special knowledge usually associated with at least a bachelor's degree level of education. A comparison of the educational backgrounds of the entrepreneurs comprising this sample with the general population as well as with business leaders follows in Table 8.[25] The general population and business leader statistics are about 10 years old, making them reasonably comparable to the study sample. Table 8 indicates that the study

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[25]Warner, W. Lloyd, and Abegglen, James C., Big Business Leaders in America, Harper and Brothers, New York, 1955, p. 35.

TABLE 8

Educational Distribution of Technical Entrepreneurs, Compared to Others

	General Population	Business Leaders	Technical Entrepreneurs Sample
Less than High School	58%	4%	0%
Some High School	15%	10%	0%
High School Graduate	15%	11%	1.5%
Some College	5%	20%	12.1%
College Graduate	5%	55%	86.4%

sample relates to the general population in the same direction as do the business leaders. However, its distribution is much more heavily skewed toward the higher levels of education.

Almost all of the entrepreneurs have at least a college degree. The fine breakdown of education levels for the study sample (Table 9) indicates that the median level of educational attainment is an M.S. degree.

In an earlier section of this paper the occupational status groupings of the fathers of the entrepreneurs were presented. When this variable is correlated with the educational level of the entrepreneur, one observes a strong positive relationship (Kendall tau one-tail probability equal to .06, sample size = 58). This means that the higher the paternal occupational status, the higher the level of education attained by the entrepreneur.

TABLE 9

Detailed Breakdown of Education of Technical Entrepreneurs

Education Level	#	% of total
No school beyond high school	1	1.5
College without any degree	8	12.1
B.S.	2	3.0
B.S. plus additional course work	17	25.8
M.S.	13	19.7
M.S. plus additional course work	11	16.7
Professional Engineer's Degree	3	4.5
PhD or greater	11	16.7
TOTAL	66	100.0%

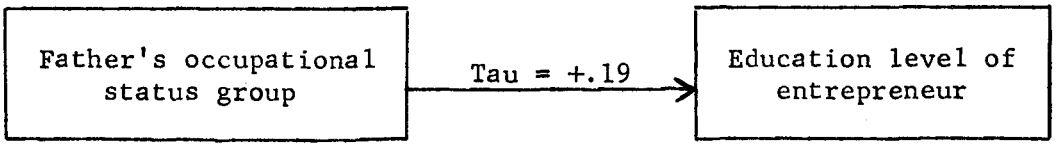


Figure 2. Relationship between Fathers' Occupational Status and the Educational Level of the Entrepreneur

No data were collected in this study that would permit attributing levels of income to the various occupational status levels. However, one should expect these status levels generally to reflect differences in income. If this is valid, then one can explain the positive correla-

tion with educational level on an economic basis. It is suggested that those entrepreneurs who came from lower occupational status families did not have enough money to go to college as early as or for as long as did those from higher status groups. Support for this position can be derived in the inverse relationship found between paternal occupational status and the age of the entrepreneur when he finished his B.S. and M.S. degrees. This means that the entrepreneurs who came from lower occupational status families received their B.S. and M.S. degrees at older ages than did entrepreneurs from higher occupational status families.

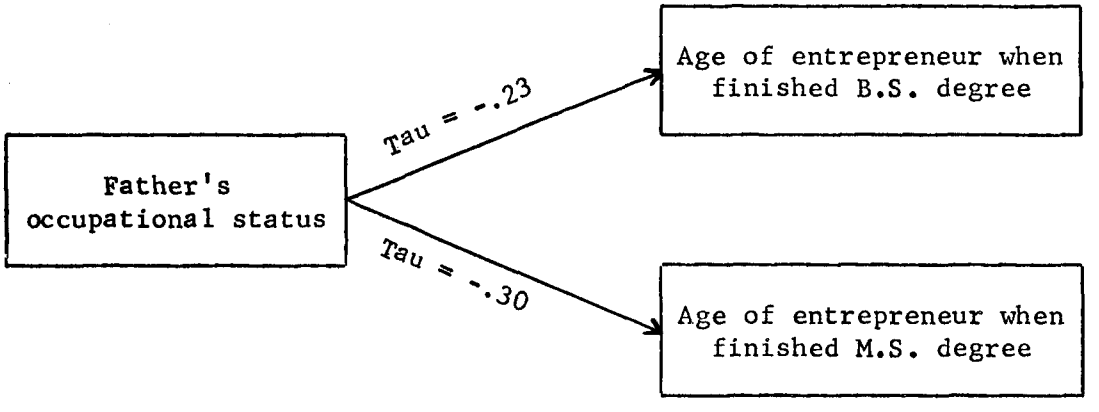


Figure 3. Relationship between Father's Occupational Status and the Age of the Entrepreneur when he Finished his College Degrees.

Both of these relationships are significant with one-tail probabilities of less than .01.

At the same time one does not find a direct relationship between the fact that the entrepreneur's father was in business for himself and his educational level (Mann-Whitney U one tail probability = .43, n_1 = 32, n_2 = 32). This is very interesting given the hypothesis above concerning the economics of going to college. Table 10 and Figure 4 indicate the

TABLE 10

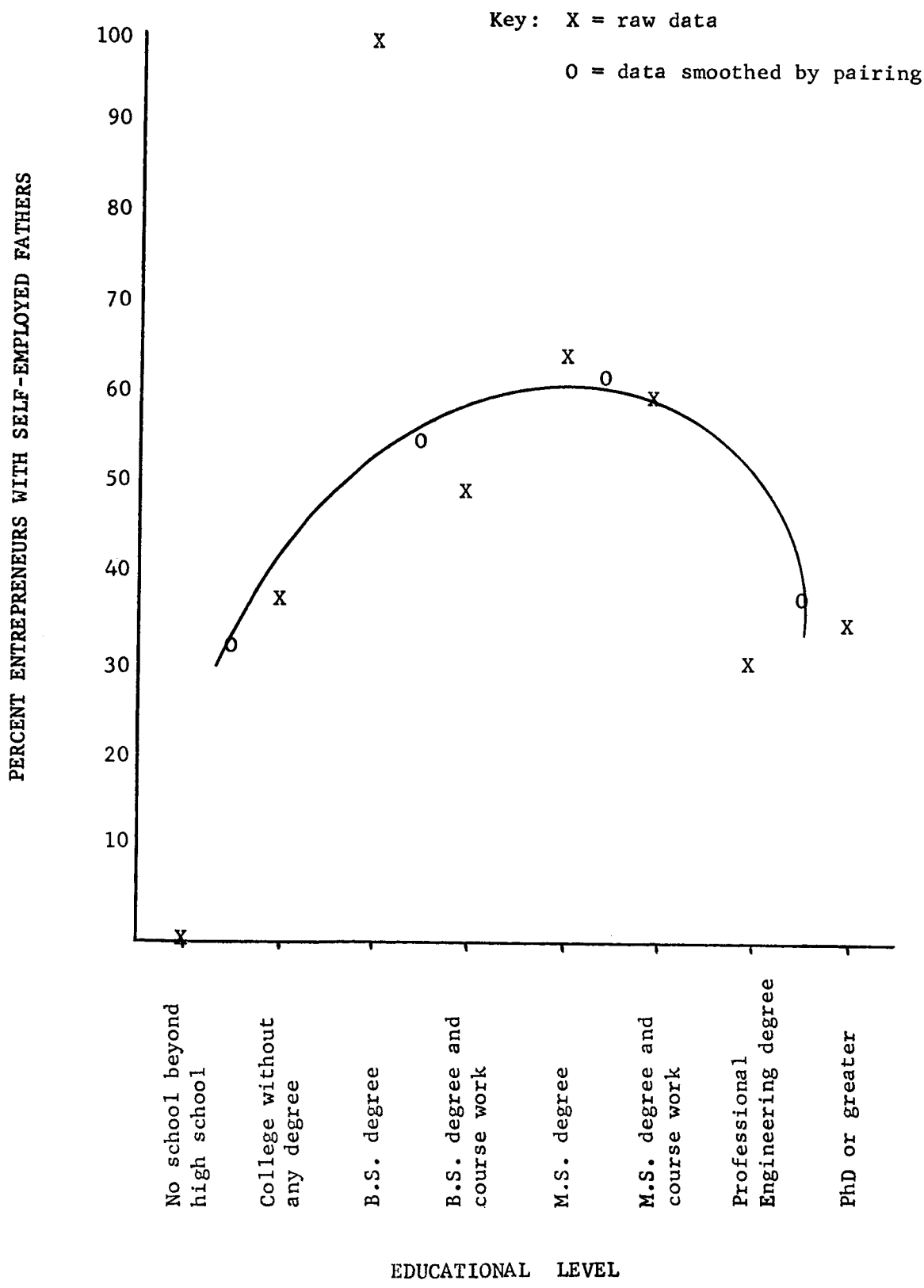
Number of Entrepreneurs within each Educational Level whose Fathers were Self-Employed

Educational level	# of entrepreneurs in each educational group	# whose fathers were in own business	% of total	Percentile combination of paired groups
No school beyond high school	1	0	0	33%
College without any degree	8	3	38	
B.S.	2	2	100	56%
B.S. and course work	16	8	50	
M.S.	13	8	62	61%
M.S. and course work	10	6	60	
Professional Engineering degree	3	1	33	36%
PhD or greater	11	4	36	
TOTAL	64	32	50%	

nature of the relationship between the two variables. Table 10 indicates for entrepreneurs at each level of educational attainment the number and percent of all fathers who were in their own businesses. Figure 4 is a plot of these data. The curve represents a smoothed plotting, derived by pairing adjacent educational level groups.

It is clear, especially from the curve, that there is a nonlinear relationship between whether or not an entrepreneur's father was in his

Figure 4. Percent of Entrepreneurs whose Fathers were Self-Employed vs. Educational Level of the Entrepreneur



own business and the educational level of the entrepreneur. In order to test the statistical validity of this relationship, a Chi-square test was run with the population split on the basis of whether or not the entrepreneur's father was in his own business and on whether or not the educational level of the entrepreneur was at least a B.S. and not more than a M.S. and course work. The relationship was found to be significant at the .07 level (one-tail). See Table 11.

TABLE 11

Father in Own Business vs. Educational Levels

	Father in Own Business		
	Yes	No	Significance Level (X^2)
B.S. degree through M.S. degree & courses	24	19	
No college degree and Prof. Engr. degree or greater	8	15	$\sim$.07

One possible explanation for this finding is that those technical entrepreneurs whose fathers were in their own businesses were planning to go into business for themselves from an earlier age. These entrepreneurs might have planned to educate themselves to that level necessary to establish a technically-based enterprise. Further education than the B.S. or M.S. was not believed necessary because these sons of entrepreneurs long had in mind the specific goal of starting a company, not of doing research or teaching or any other activity that might demand still higher education. Data were collected on the time lag between when the

entrepreneur first thought of going into business for himself and when he actually started his company. However, the information was available in only 12 instances, less than 20 percent of the total sample. In any case, it was determined that prior to going into business for themselves, those entrepreneurs whose fathers were self-employed had thought about it for a longer period of time than did those whose fathers were not self-employed (Mann-Whitney U one-tail probability equal to .10, $n_1 = 5$, $n_2 = 7$). The large number of non-respondents and the mild significance level suggest that one should not place much reliability on this finding. As more data are collected from other entrepreneurs the relationship will be reanalyzed and hopefully will permit a more definite statement.

ENTREPRENEURIAL MOTIVATION

Some of the preceding analysis had utilized the concept of achievement motivation to explain various patterns of behavior. For example, the level of education attained by the entrepreneur was hypothetically related to his level of n-achievement. However, achievement motivation is not necessarily the only motivation that may have a strong influence on an entrepreneur's behavior and performance. Clearly anything that drives him, whether it be a need for power, a need to be loved, a need to make money, a need for security, or other factors, will affect his behavior. In addition he might be motivated by more than one drive each of which might become primary at one time or another.

An entrepreneur's motivation for starting a new enterprise is an important area for study because of its probable effect on the kind of

company he starts, the company's growth pattern, and the entrepreneur's behavior within the company. His motivation is most likely the result of the interaction of a number of factors some of which are his family background, his education (both level and type), his age when he starts his company, and his relationship with his family at the time he starts his company. For instance, one plausible hypothesis is that an individual who has been poor all of his life may have as his prime motivation for starting a company the opportunity to make a large amount of money. Or, the entrepreneur who is highly educated in a particular field may be most strongly motivated by a desire to engage in research unrestricted by a supervisor's demands and directives.

Unfortunately only one question of the study relates to the entrepreneur's motivation for starting his own business.

> At the time you started your new enterprise what features of going into business for yourself did you consider most attractive? (Check all which apply, then rank those you have checked, 1, 2,... with 1 being the most important.)

√	Rank	
____	____	Salary
____	____	Being own boss--independence
____	____	Challenge--do something others could not
____	____	Challenge--taking on and meeting broader responsibilities
____	____	Freedom to explore new areas
____	____	See things through to completion
____	____	Other_____

The distribution of the answers (without regard to rank) is shown in Table 12.

TABLE 12

Features of Going into Business for Oneself

FEATURE	#*	%
Salary	24	19
Being own boss--independence	27	22
Challenge--do something that others could not	23	18
Challenge--taking on and meeting broader responsibilities	11	9
Freedom to explore new areas	15	12
See things through to completion	8	6
Other	17	14
TOTAL	125	100%

*Note: the total number of answers is in excess of the sample size due to multiple answers.

A rank ordering of the frequencies of all answers from the above table yields the following.

1. Being own boss--independence
2. Salary
3. Challenge--do something that others could not
4. Other
5. Freedom to explore new areas
6. Challenge--taking on and meeting broader responsibilities
7. See things through to completion

Some of the entrepreneurs ranked their answers. The combination of their first and second choices yields the following rank ordering.

1. Salary
2. Being own boss--independence
3. Freedom to explore new areas
4. Challenge--do something that others could not

5. See things through to completion
6. Other
7. Challenge--taking on and meeting broader responsibilities

Two aspects of these rank orderings are conspicuous. First, the motivation of challenge, with respect to taking on and meeting broader responsibilities, is at or near the bottom of the ordering on both lists. Initially, this seemed a bit strange, for such activities are exactly what one does when one has his own business. However, further consideration indicated that, even though this is true, many of the entrepreneurs already had important responsibility as indicated by the level of their positions at the M.I.T. laboratories. To be sure the nature and urgency of the responsibility for running one's own business is different from the responsibility one would have working for someone else. Yet the data collected in this study indicate that such motivation is not a primary drive. Second, the motivations of salary and being one's own boss are at the top of both lists. This seems reasonable. For the most part people who are not self-employed have a ceiling on how much they can earn (either salary or equity). In addition, an employee's independence is limited no matter how high up in an organization he is.

The analysis of the entrepreneur's motivation in relation to other factors such as his religion, educational level, and his father's occupational status produces very little in terms of explainable differences. This leads one to question the applicability of the means utilized to measure motivation. It may be that motivation is really a subliminal aspect of the entrepreneur's character and as such cannot be measured effectively by means of an objective test. Observation of the list of motivators included in the question indicates that the three most fre-

quent answers may be the socially acceptable or "pat" responses. In addition, the entire list seems to reflect manifestations of motivation rather than the motivation itself. For example, an individual who indicates salary as his motivation for starting a new enterprise may really be indicating his need for power or higher social status. His answer may reflect his need to provide for his family better than did his father. In other words, the real range of motivations that might be associated with any of the items included in the question is large. Without a more specific indication of the true motivation of the entrepreneur, statements relating motivation to background factors or behavior cannot be made. In terms of the model stated at the beginning of this paper, the motivation link is weak for the reasons mentioned above. It is hoped that the experience of analyzing the question will enable the researchers to design future data gathering in ways more appropriate for obtaining the information desired.

SUMMARY

This paper has sought to identify some of the factors in an individual's life that contribute to and manifest his entrepreneurial orientation. The proposed model hypothesizes that such orientation is derived originally from family background. The derivation is perhaps indirect in that family background strongly affects intermediate variables such as education, and goal orientation and motivation which also affect or at least manifest entrepreneurial orientation.

The findings in this paper support the general model proposed. These findings are summarized below:

1. Entrepreneurial fathers are more likely to produce entrepreneurial sons, both because of exposure in the home to a business-oriented atmosphere and because of the goal orientation that may be instilled in a son by an entrepreneur-father.

2. An individual's home environment and attitudes that seem to be embodied in his religious background are likely to have strong influences on his goal orientation that in turn will affect his level of education. Both directly and indirectly through the development of goal orientation and motivation, these environmental and attitudinal factors have effects on whether or not an individual becomes an entrepreneur.

3. Those technical entrepreneurs whose fathers had high occupational status were educated sooner and to a higher level than those whose fathers had low occupational status. At the same time it was determined that the technical entrepreneurs who had self-employed fathers were educated usually to around the Master of Science degree level, the median education of the entire sample. The predominance of such educational behavior for entrepreneurial sons may be explained by their goal orientation. Low levels of education usually do not provide sufficient knowledge to run effectively a technically-based enterprise. Higher levels of education appear not to be necessary and may be regarded as over-preparation by a would-be entrepreneur.

4. The motivation link in the model is probably very important to the development of an entrepreneur. However, the measurement techniques utilized were ineffective, thus precluding any conclusive findings that relate specific motivations to family background or entrepreneurship.

The authors emphasize that this paper is a preliminary report. More extensive analyses of the variables discussed and other measures being built into the data collection phase of the continuing study should be fruitful in further explaining the phenomenon of entrepreneurship.

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