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IMPACT OF CHARACTERISTICS OF SMALL AUSTRALIAN ACCOUNTANTS USED BY SMALL BUSINESSES

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This paper uses discriminant analysis to test for differences in the characteristics of small Australia accountants that differentiate between small businesses that use services of outside accountant and small businesses that do not. The study covers a sample of 139 Small businesses. The analysis uses ten characteristics of accountants.

The results of the two-group discriminant analysis indicate that small businesses which use services of outside accountants attach great importance to academic qualifications; academic location, academics willing to contact; business improvement, prompt service; quick responses and service connection while small businesses that do not use services of outside accountants attach great importance to fees charges; tax payments and service connection.

I. INTRODUCTION

A number of authors claim that small businesses that seek services of a suitable accountant expect that the accounting tasks are to be performed by a person or persons having adequate technical training and proficiency as an accountant. These small businesses also expect that in all matters relating to the assignment, independence in mental attitude is to be maintained by the accountants. Furthermore, the small businesses expect due professional care to be exercised in the performance of the accountants and the preparation of the report. For this reason, a number of small business appoint outside accountants. This may confirm with views that the appointment of a particular accountant would depend on the used techniques to decide how much relative reliance to place on controls and substantive tests in gathering evidence. This paper uses discriminant analysis to find out if it is possible to separate small businesses that use services of outside accountants and those that do not, on the basis of the characteristics of the accountants.

The aim of this paper is to test if there are differences in the characteristics of outside accountants that are used for services of small businesses. The paper is divided into six sections. Following the introduction, section two gives a view of characteristics of accountants. Section three outlines the discriminant model. Section four shows the assessment of the sample size. Section five gives the results of the discriminant analysis. Finally, section six summarizes the main conclusions of the paper.

II. CHARACTERISTICS OF ACCOUNTANTS

As mentioned before, not all small businesses use services of outside accountants. It was found that 117 out of the 139 (84.2%) small businesses covered by the random sample appoint outside accountants to audit their accounts. The rest of the small businesses (15.8%) do not use services of outside accountants.

Sydney small businesses were requested to indicate the degree of importance regarding various characteristics of the selected accountants to find out if these characteristics discriminate between users and non-users of outside accountants by small businesses.

To find out if it is possible to separate different small businesses (users and non-users of services of outside accountants) on the basis of the characteristics of accountants the following data were used:

1. Groups

Group 1: Small businesses that use outside accountants: 117 businesses

Group 2: Small businesses that do not use outside accountants: 22 businesses

2. Predictors

V1: Academic qualifications

V2: Academic location

V3: Fees charges

V4: Quick responses

V5: Request of tax payments

V6: Engagement with small businesses

V7: Willing to contact

V8: Business improvement

V9: Service connection

V10: Prompt service

III. THE MODEL

Discriminant analysis is a multivariate statistical technique used to identify the relative importance of variables that indicate the respondents belong to the same or different group by analyzing data with a categorical dependent variable and interval scaled independent variables (Myers and Mullet, 2003).

Suppose we have N small businesses for which we have observations on K attitude variables and we observe that N_1 of them expressed interest to use services of a outside accountant and N_2 did not express this interest, where $N_1 + N_2 = N$. We want to construct a linear function of the K variables that we can use to predict that some company belongs to one of the two groups. This linear function is called the linear discriminant function.

Let us define a linear function

$$Z = \lambda_0 + \sum_{i=1}^{k} \lambda_i x_i$$

Then it is intuitively clear that to get the best discrimination between the two groups, we would want to choose the λ_i so that the ratio:

$$\frac{\text{between} - \text{group } \mathbf{var}\text{iance of } Z}{\text{within} - \text{group } \mathbf{var}\text{iance of } Z} \text{ is a } \mathbf{max}\text{imum}$$

Fisher (1936) suggested an analogy between this problem and multiple regression analysis. He suggested that we define a dummy variable:

$$y = \frac{n_2}{n_1 + n_2} \text{ if the observation belongs to the first group}$$

$$y = -\frac{n_1}{n_1 + n_2} \text{ if the observation belong to the second group}$$

If we estimate the multiple regression equation

$$y = \beta_o + \beta_1 x_1 + \beta_2 x_2 + \ldots + \beta_k x_k + \upsilon$$

and obtained the sum of squares RSS, then

$$\beta_I = \hat{\lambda}_i \frac{RSS}{n_1 + n_2 - 2}$$

Thus, once we have the regression coefficients and the residual sum of squares from the dummy dependent variable regression, we can very easily obtain the discriminant function coefficients (Maddala, 2000).

The technique can be generalized to more than two groups. (Lattin, Carroll and Green, 2003) explained this derivation as follows:

Suppose there are G groups, i = 1, 2, ……, G, each containing n_i observations on k independent variables x_1, x_2 …… , x_k and assume the following notations:

N = Total sample size = $\sum_{i=1}^{G} n_i$

W_i = Matrix of mean corrected sum of squares and cross-products for the ith group

W = Matrix of pooled within-groups mean correlated sum of squares and cross-products

B = Matrix of Between-groups mean corrected sum of squares and cross products

T = Matrix of total mean corrected sum of squares and cross-products for all the N observations (= $W + B$)

$\overline{x}_i$ = Vector of means of observations in the ith group

$\overline{x}$ = Vector of grand means of the N observations

λ = Ratio of between groups to within-group sums of squares

b = Vector of discriminant coefficients or weights

then:

$$T = \sum_{i=1}^{G} \sum_{j=1}^{n_i} (x_{ij} - \overline{x})(x_{ij} - \overline{x})'$$

$$Wi = \sum_{j=1}^{n}(x_{ij} - \bar{x}_i)(x_{ij} - \bar{x}_i)'$$

$$W = W_1 + W_2 + W_3 + \ldots + W_G$$
$$B = T - W$$

Define the linear composite $D = \mathrm{b}_i'$ x or

$$D = b_0 + b_1x_1 + b_2x_2 + \ldots + b_k x_k$$

Where D = discriminant score

$b's$ = discriminant coefficients or weights

$x's$ = predictor or independent variables.

Then with reference to D, the between-groups and within groups sums of squares are, respectively, given by $\mathrm{b}_i' B$ b and b_i' Wb. In order to maximally discriminate between the groups, the discriminant functions are estimated to maximize the between-group variability. The coefficients b are calculated to maximize λ , by solving

$$\text{Max } \lambda = \frac{b'Bb}{bWb}$$

Taking the partial derivative with respect to λ and setting it equal to zero, with some simplifications, yields:

$$(B - \lambda W)b = 0$$

To solve for b, it is more convenient to pre-multiply by W^{-1} and solve the following characteristic equation:

$$(W^{-1} B - \lambda \text{ I}) B = 0$$

The maximum value of λ is the largest eigenvalue of the matrix $W^{-1}B$ and b is the associated eigenvector (Morrison, 2005). The elements of b are the discriminant coefficients, or weights, associated with the first discriminant function. In general, it is possible to estimate up to smaller of G - 1 or k discriminant functions, each with its associated eigenvalue. The discriminant functions are estimated sequentially.

IV. SAMPLE SIZE

Small businesses included in this sample are companies operating in construction, chemists, real estate, restaurants, medical practitioners and retail and mixed business.

The sample size was determined using the following hypotheses:

1. It is assumed that 90% of Sydney small businesses use services of auditors. This assumed proportion (p) reflects the maximum possible variation in the population.
2. A confidence level of 95% will be used. This corresponds to a Z value of 1.96
3. A precision rate (e) of +.05 will be applied.

Under these assumptions, the sample size will be given by:

$$n = \frac{Z^2 \ p(1-p)}{e^2}$$

$$n = \frac{(1.96)^2(.9)(.1)}{(0.05)^2}$$

$$\approx 139$$

A questionnaire was prepared and given to various companies. Sample control, speed and obtaining sensitive information were the main factors, which the researcher took into consideration when deciding on the survey method.

V. RESULTS OF DISCRIMINANT ANALYSIS

Tables 1 to 12 give the discriminant analysis results. The following comments can be made about these results:

1. An examination of the group means given in Table 2 indicates that the variables: V5 (request of tax payments), V9 (service connection), and V3 (fees charges) separate the two groups more widely than the other seven variables.
2. The differences in the standard deviation given in Table 2, are largest for V4 (Quick responses) and V5 (request of tax payments)
3. Table 3 shows that the pooled within-groups correlation matrix that is computed by averaging the separate covariance matrices for all groups indicates low correlation coefficients between predictors. Hence there is no serious problem of multicollinearity (Lachenbruch, 1975).
4. The significance attached to the univariate F ratios given in Table 4 indicates that when the predictors are considered individually, all of them are significant in discriminating between the two groups (Myers, and Mullet (2003).
5. The level of significance of *Box's M* is given in Table 5. This table suggests that we should not reject the null hypothesis that the covariance matrices are equal (Metwally, 2000).
6. Table 6 shows that the eigenvalue for the discriminant function is 1.708. and it accounts for 100% of the explained variables. The canonical correlation of the discriminant function is 0.844. Hence, the proportion of total variability explained by differences between groups is 71.2% (Hair, Anderson, Joseph, Tatham and. Blach, 2004).
7. The Wilks' lambda associated with the discriminant function, given in Table 7 is 0.385. This transforms to a chi-square value of 370.663, which is statistically significant at .0000 level (Morrison, 1969 and 2005). Since the value of Chi-square of the discriminant function is statistically significant beyond the 5% level, we reject the null hypothesis that the means of both functions are equal. Hence, the discriminant function contributes to group separation (Manly, 1994 and Lattin, Carroll and Green 2003).
8. Table 8 gives the standardized canonical discriminant function coefficients. The results indicate a large positive coefficient for V7 (willing to contact the accountant), V4 (Quick responses), V1 (Academic qualifications) and V6 (engagement with small businesses). The standard canonical discriminant function coefficients also indicate a large negative coefficient for V3 (fees charges) and V5 (request of tax payment accounts).

9. The structure matrix, which reflects pooled within-groups correlations between discriminating variables and standardized canonical discriminant functions is given in Table 9, The results suggest that V7 (willing to contact the accountant), V4 (Quick responses), V1 (Academic qualifications), V6 (engagement with small businesses) and V10 (Prompt service) possess the highest positive rank. The structure matrix also indicate a large negative coefficient for V3 (fees charges) and V5 (request of tax payment accounts). These results also indicate a negative coefficient for V9 (auditing cost) and V8 (past experience with same accountant). These results do not differ much from those reflected in the standardized function. These results also seem to confirm with the studies of demand for accountants (Benston, 1985 and Gray and Jenkins, 1993).
10. The unstandardized canonical discriminant function coefficients given in Table 10 reveal the following discriminant function:

Z = -10.693 + 0.387 V1+ 0.275 V2 - 0.376 V3 + 0.370 V4 - 0.201 V5 + 0.632 V6 + 0632 V7 +0.367 V8 - 0.220V9 + 0.270 V10

The canonical discriminant function evaluated at group means (group centroid) is given in Table 11. It can be seen that group 2 (users of services of outside accountants), has a positive value, while group 1 (non-users of services of outside accountants) has a negative value.

Since V1, V2, V4, V6, V7, V8 and V10 have large positive values in the standardized canonical discriminant function; this suggests that small businesses which use services of outside accountants attach great importance to academic qualification; academic location; quick responses, engagement with small businesses; willing to contact; business improvement and prompt service. Since V3, V5, and V9 have negative values in the standardized canonical discriminant function, this suggests that small businesses that do not use services of outside accountants attach great importance to fees charges, request of tax and Service connection.

The results of the canonical discriminant function evaluated at group means (group centroid) and of the unstandardized canonical discriminant function coefficients can be used for predicting group membership for a newly established small companies whose group membership is undetermined (i.e. whether that company will use the services of outside editors).

11. Table 12 gives the classification results based on the analysis sample. It shows a hit ratio equal to 92.8%. This suggests that 92.8 per cent of the cases are correctly classified.
12. In order to obtain a better picture on the relative importance of the outside accountants, the relative discriminating power of each predictor was calculated using the ideas of Manly (1994) and Lattin, Caroll and Green (2003):

   $I = | k_j (X_{j1} - X_{j2})$; Where:

   I_j = the relative discriminating power of the jth variable

   k_j = unstandardized discriminant coefficient of the jth variable

   X_{jk} = mean of the jth variable for the kth group.

The relative importance weight may be interpreted as the portion of the discriminant score separation between the groups that is attributable to the jth variable (Hair, Anderson, and Joseph 2004). Since a relative importance value shows the value of a particular variable to the sum of the importance values of all variables.

The relative importance of a variable (R) is given by:

$$R_j = I_j \,/\, \Sigma^{n}{}_{j=1}\, I_j$$

The relative discriminating power of the predictors is given in Table 6. 13. It can be seen that quick responses: fees charges, academic qualifications ; : Service connection of accountants play relatively more important role in discriminating between the two groups than other predictors.

Table 1
Analysis Case Processing Summary

Unweighted Cases		*N*	*Per cent*
Valid		139	100.0
Excluded	Missing or out-of-range group codes	0	.0
	At least one missing discriminating variable	0	.0
	Both missing or out-of-range group codes and at least one missing discriminating variable	0	.0
	Total	0	.0
Total		139	100.0

Table 2
Group Statistics

Group		*Mean*	*Std. Deviation*	*Valid N (listwise)* *Unweighted*	*Weighted*
1.00	V1	4.8182	.7327	22	22.000
	V2	3.7273	.8270	22	22.000
	V3	4.2273	1.3428	22	22.000
	V4	3.5909	.5903	22	22.000
	V5	5.8636	.8888	22	22.000
	V6	4.1818	.3948	22	22.000
	V7	4.5000	.5976	22	22.000
	V8	5.4091	.5903	22	22.000
	V9	4.6364	.9535	22	22.000
	V10	3.1818	.3948	22	22.000
2.00	V1	5.4957	.9250	117	117.000
	V2	4.2735	.8265	117	117.000
	V3	3.4701	1.3619	117	117.000
	V4	4.1966	1.2123	117	117.000
	V5	4.8120	1.4138	117	117.000
	V6	4.5726	.5304	117	117.000
	V7	5.2479	.7417	117	117.000
	V8	5.7863	.5698	117	117.000
	V9	3.8462	1.1493	117	117.000
	V10	3.6410	.6360	117	117.000
Total	V1	5.3885	.9287	139	139.000
	V2	4.1871	.8476	139	139.000
	V3	3.5899	1.3821	139	139.000
	V4	4.1007	1.1566	139	139.000
	V5	4.9784	1.3960	139	139.000
	V6	4.5108	.5298	139	139.000
	V7	5.1295	.7693	139	139.000
	V8	5.7266	.5874	139	139.000
	V9	3.9712	1.1543	139	139.000
	V10	3.5683	.6261	139	139.000

Table 3
Pooled-within-Group Matrices

		V1	*V2*	*V3*	*V4*	*V5*	*V6*	*V7*	*V8*	*V9*	*V10*
Correlation	V1	1.000	.069	.215	-.029	-.197	.119	-.016	-.056	-.069	.115
	V2	.069	1.000	.061	.010	-.097	.030	.038	.082	.029	.008
	V3	.215	.061	1.000	.250	.080	.143	.059	-.050	.102	.016
	V4	-.029	.010	.250	1.000	.124	.018	-.028	.051	-.016	.147
	V5	-.197	-.097	.080	.124	1.000	-.009	-.015	-.023	-.142	-.075
	V6	.119	.030	.143	.018	-.009	1.000	-.012	.067	-.028	.055
	V7	-.016	.038	.059	-.028	-.015	-.012	1.000	.030	-.068	.074
	V8	-.056	.082	-.050	.051	-.023	.067	.030	1.000	.062	.029
	V9	-.069	.029	.102	-.016	-.142	-.028	-.068	.062	1.000	.021
	V10	.115	.008	.016	.147	-.075	.055	.074	.029	.021	1.000

Table 4
Tests of Equity of Group Means

	Wilks' Lambda	*F*	*df1*	*df2*	*Sig.*
V1	.929	10.538	1	137	.001
V2	.944	8.086	1	137	.005
V3	.960	5.749	1	137	.018
V4	.963	5.234	1	137	.024
V5	.924	11.293	1	137	.001
V6	.927	10.793	1	137	.001
V7	.873	19.897	1	137	.000
V8	.945	8.027	1	137	.005
V9	.937	9.193	1	137	.003
V10	.928	10.658	1	137	.001

Table 5
Box's Test of Equality of Covariance Matrices

Log Determinants

Group	*Rank*	*Log Determinant*
1.00	10	-11.325
2.00	10	-3.196
Pooled within-groups	10	-3.495

The ranks and natural logarithms of determinants printed are those of the group covariance matrices.

Test Results

Box's M		129.802
F	Approx.	1.931
	df1	55
	df2	4611.638
	Sig.	.000

Tests null hypothesis of equal population covariance matrices.

Table 6
Eigenvalues

Function	*Eigenvalue*	*% of Variance*	*Cumulative %*	*Canonical Correlation*
	1.708	100.0	100.0	.844

a First 1 canonical discriminant functions were used in the analysis.

Table 7
Wilk's Lambda

Test of Function(s)	*Wilks' Lambda*	*Chi-square*	*df*	*Sig.*
1	.385	370.663	10	.000

Table 8
Standardized Canonical Discriminant Function Coefficients

	Function
	1
V1	.348
V2	.227
V3	-.512
V4	.421
V5	-.270
V6	.323
V7	.456
V8	.211
V9	-.247
V10	.164

Table 9
Structure Matrix

	Function
	1
V7	.453
V5	-.341
V6	.334
V10	.331
V1	.333
V9	-.308
V2	.289
V8	.288
V3	-.243
V4	.232

Pooled within-groups correlations between discriminating variables and standardized canonical discriminant functions Variables ordered by absolute size of correlation within function.

Table 10
Canonical Discriminant Function Coefficients

	Function
	1
V1	.387
V2	.275
V3	-.376
V4	.370
V5	-.201
V6	.632
V7	.632
V8	.367
V9	-.220
V10	.270
(Constant)	-10.693

Unstandardized coefficients

Table 11
Functions at Group Centroids

	Function
Group	1
1.00	-1.926
2.00	.362

Unstandardized canonical discriminant functions evaluated at group means

Table 12
Classification Results[a]

		Group	Predicted Group Membership		Total
			1.00	2.00	
Original	Count	1.00	15	7	22
		2.00	3	114	117
	%	1.00	68.2	31.8	100.0
		2.00	2.6	97.4	100.0

a 92.8% of original grouped cases correctly classified.

Table 13
Relative discriminating Power of the Demographic Predictors

Predictors	*Relative importance (per cent)*
V4: Quick responses	21.7
V3: Fees charges	20.8
V1: Academic qualifications	17.5
V9: Service connection	12.3
V2: Academic location,	8.2
V6: Engagement with small businesses	6.5
V8: Business improvement	5.1
V10: Prompt service	3.9
V7: Willingness to contact	2.7
V5: Request of tax payments	1.3
Total	100.0

VI. CONCLUSIONS

The main findings of this paper may be summarized in the following:

1. The appointment of a particular accountant would depend on the used techniques to decide how much relative reliance to place on controls and substantive tests in gathering evidence.
2. Discriminant analysis shows that using services of outside accountants by small businesses depend on the characteristics of the accountants.
3. Small businesses which use services of outside accountants attach greater importance to ; the academic location; willing to contact; quick responses; engagement with small businesses; business improvement and prompt service. Small businesses that do not use services of outside accountants attach greater importance to fees charges, high request of tax payments and service connections.

4. The structure matrix, which reflects pooled within-groups correlations between discriminating variables and standardized canonical discriminant functions, suggest that the easy contact of the accountant, the performance of the accountant and the quick response to small business possess the highest rank.
5. The results of the canonical discriminant function evaluated at group means (group centroid) and of the unstandardized canonical discriminant function coefficients c predict more use of accounts services by small businesses if f fees charges are not too much, request of tax payments is well organized and service connection is not complicated.

References

Benston, G. J. (1985), "The Market for Public Accounting Services: Demand, Supply and Regulations", *Journal of Accounting and Public Policy*, Vol. 4, pp. 33-79.

Dillon, W. R. and M. Goldstein (1984), *Multivariate Analysis: Methods and Applications*, New York, J. Wiley.

Fisher, R. A. (1936), "The Use of Multiple Measurements in Taxonomic Problems" *Annals of Eugenics*, pp. 179-188.

Gray, A. G. and W. I. Jenkins (1993), "Codes of Accountability in the New Public Sector" *Accounting, Auditing and Accountability Journal*, Vol. 6, No. 3, pp. 52-67.

Hair, Jr, R. E. Anderson. R.L. Joseph, F., Tatham and W.C. Blach (2004), *Multivariate Data Analysis with Readings*, 10th ed., New York, Macmulton.

Kemsley, E. K. (1998), *Discriminant Analysis and Class Modeling of Spectroscopic Data*, New York, John Wiley &Sons.

Klecka, W. R. (1980), *Discriminant Analysis*, Beverly Hills, CA: Sage.

Lachenbruch, P. A. (1975), *Discriminant Analysis*, New York, Hafner Press.

Lattin, J, J. D. Carroll and P. E. Green (2003*), Analyzing Multivariate Data*, Mason, USA, Thomson.

Maddala, G. S. (2000), *Introduction to Econometrics*, 2nd ed., Engelwood Cliffs, Prentice-Hall.

Malhotra, N. K. (2004), *Marketing Research: An Applied Orientation*, New York, Prentice-Hall.

Manly, B. F. J. (1994), *Multivariate Statistical Methods*, 2nd. Ed., London, Champon & Hall.

Morrison, D. G. (1969), "On the Interpretation of Discriminant Analysis" *Journal of Marketing Research*, Vol. 6, pp. 156-63.

Morrison, D. F. (2005), *Multivariate Statistical Methods*, 4th ed., London, Duxbury Advanced Series.

Metwally, M. M. (2000), *Applied Multivariate Statistical Techniques*, Wollongong, FE publishing.

Myers, J. H. and G. M. Mullet (2003), *Managerial Applications of Multivariate Analysis in Marketing*., Mason, USA, Thomson.