SOME FACTORS INFLUENCING AGRICULTURAL CREDIT USE AMONG PEASANT FARMERS IN ETHIOPIA: A CASE STUDY OF TWO DISTRICTS

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ABSTRACT. This study has used discriminant function analysis to identify the most important farm household characteristics that influences agricultural credit use at the farm level, and thus serve to distinguish credit users from non-users from a sample survey. The results have shown that the level of education, farm size, the use of improved technology, investment expenses, age of farm household head, product price security as well as marketing and extension service arrangements are the most important variables that can be used to differentiate borrowers from non-borrowers. The policy implication of this result is that if credit is to be productively used in the process of agricultural development, an integrated approach which takes into account these and other socio-economic variables is necessary.

1. INTRODUCTION

Peasant agriculture has always been the main stay of the Ethiopian people, where more than 85 percent of the population lives by farming at a subsistence level. Developing this sector is, therefore, a crucial problem, policy issues should focus at in order to meet the ever growing demand for food and raw materials. A necessary and important ingredient in the development process of subsistence agriculture is the introduction of improved technology and land management practices. However, there exist no significant margin for income that can be channeled into the sector for such developmnental activities. An expanding viable agricultural credit system is, thus, needed particularly for subsistence farmers for the purchase of tools and farm impliments; adopt new and productive

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technology and improve their agricultural productivity.[1] Farm credit is a necessary, if not sufficient conditon for increased agricultural productivity and increased incomes. However, it is understood that the availability of suitable agricultural credit by itself does not solve all the problems of subsistence agriculture.

Although much efforts have been made to establish a rural credit system which will meet the credit needs of agriculture in Ethiopia, the credit needs of peasant farmers have been largely unsatisfied.[2] The volume of assistance in relation to the demand has not been sufficient.

A recent survey indicated that private peasants using agricultural credit (fertilizer loans) did not exceed 13.6 percent of the whole peasants at any one time in the past.[3] Because of limited capacity and other factors the AID Bank, which is the main source of agricultural credit in Ethiopia, has not been able to meet the credit needs of the peasantry. For instance, out of 212 million Birr which was disbursed by the Bank during the 1979/80 crop year, only onefifth went to peasant associations and cooperatives.[4] Except for some short term - credit from the Ministry of Agriculture for input procurement peasant farmer's agricultural credit use is still of a rudimentary nature. In the light of these facts it would be desirable to explore the factors that contribute to the low level of credit use by subsistence farmers. Accordingly this study attempts to determine the socioeconomic factors which influence agricultural credit use by private peasant farmers. Since the detailed information base necessary to forward an explanation for the low level of credit use is not readily available, the case study method has been considered to find such details.

2. CONCEPTUAL FRAMEWORK

As it has been mentioned the main thrust of this study is to identify a set of farm household characteristics that can be used to differentiate between those who use credit and those who do not use credit. To this end it would be important to explore first those factors that would either increase or decrease the demand for funds among small farmers. The farmers demand for credit

is the excess demand for funds over the supply of internal funds that are available in the household. It is anticipated that the demand for funds, the supply of internal funds and the costs associated with the use of external funds are each affected by a set of social, economic and political factors.

The scale of operations of the farm as determined by the amount of land owned by the household is one of the important factors that is believed to have an important bearing on the farmer's decision to use or not to use external funds. Farm size has been found to be a significant determinant of credit demand in many countries. Farmers who borrowed and attempted to improve their work conditions were those with relatively higher operational area.[5]

Another important variable that will have an impact on the productivity and resources acquired with credit is the level of education attained by the farmers. The level of education will have an important impact on the farmer's ability to understand and execute sophisticated changes and practices. In this regard Baum has pointed out that education and capital should be considered as technical compliments in agricultural production.[6] Borrowers in Bolivia were found to have higher levels of education than those who did not use agricultural credit.[7] Higher level of education will not, however, influence the borrowing behavior of farmers if farmers do not have easy access to modern technology as observed in Jamaica.[8]

Another point raised by researchers is the association between credit use and farming experience. The number of years a farmer has been operating a farm may be indicative of his managerial ability and willingness to utilize economic opportunities credit may provide. According to Heffernan and Pollard, the likelihood of a farmer being a borrower increases as the number of years he has managed a farm increases.[9] Other studies have, however, indicated that farming experience is inversely related with the demand for credit.[10] A possible explanation for this is that farmers might have accumulated wealth through longer years of farming experience and hence have become economically independent.

3

The use of improved technology is another important variable that has received wide coverage in the literature. A higher level of this variable is expected to increase the demand for agricultural credit. Sarma and Prasad obtained a significant and positive relationship between the use of improved technology and credit use.[11] Studies in Bolivia also showed that borrowers were strongly differentiated from non-borrowers by their greater use of improved technology.[12] Other studies in India have also shown that the demand for credit increased as a result of the adoption of new technology.[13]

On farm investment activities of the farmer also influences his credit activity. Higher and long-term investment expenses show the level of sophistication of the farming business and the degree of commitment to the farming occuption. Farmers who exceeded the borrowing threshold and used credit have been mostly found to have higher investment expenses than those who did not use credit.[14]

The supply of internal funds is expected to be affected primarily by the farmer's liquidity position as determined by the cash flows and asset level available in the household. Greater liquidity allows for a larger supply of equity of funds which is expected to increase with the farmer's age. Since assets are usually accumulated over time the need for credit could be less for older farmers than it is for the younger ones. Moreover older farmers could become less eager to expand production particularly if their children are grown up and moved away from the farm. Several studies have shown that the requirement for credit declined as the farmer advances in age and his ability to farm diminishes.[15]

Farmers who have a reliable stream of income from off-farm activities; i.e., farmers who do not have to rely only on farming to subsist, may be under less pressure to increase farm production. Income from off-farm employment increases the farm household's internal liquidity providing more capital with which to undertake farm level activities or innovations as confirmed by the Jamaica case study.[16]

The level of wealth a farmer possess also affects the behavior of the farmer. Farm households with more income and land have been observed to be credit users. Miller and Ladman observed that borrowers had more cattle than non-borrowers in Bolivia.[17]

The degree of expected variation in product prices and the efficiency of marketing and extension services may have some implications on the farmer's borrowing behavior. A price risk can be an important reason for not using agricultural credit. Similarly, pocr market arrangements and inefficient extension services may also restrict the borrowing potential of the farmer. In Bolivia, borrowers were found to be highly concerned about product price variations as well as accessibility to markets.[18]

A greater distance from market centers and extension offices may also increase borrowing costs in terms of higher expenses in travel and time commitment. Consequently farmers living closer to extension offices and market centers are anticipated to be borrowers. Important production limitations such as shortage of land, labour, oxen, etc., may also characterize agricultural credit users as confirmed by Miller and Ladman.[19]

3. DATA AND METHODOLOGY

The data for this study was obtained from micro-level field surveys in the months of March and April 1986 from two districts of Shoa Administrative Region. The two districts were purposively selected on the basis of their experiences with the use of improved technology.[20] The two districts are Lume district, with wider experience in terms of using improved technology and which has more proximity to the capital and Kewet district from Yifat and Timuga province, which is relatively far from the capital and has lesser experience in the use of improved technology. From each district two peasant associations were randomly selected. A simple random sample of farm household heads was drawn from the selected peasant associations. Information on selected farm and family characteristics was collected through a structured questionnaire. Overall 205 farm household heads, 102 from Lume district and 103 frcm Kewet district, were interviewed.

The multivariate statistical technique of discriminant analysis has been used to classify the farmers as borrowers and as non-borrowers according to selected socio-economic characteristics observed on them. Discriminant analysis is a statistical technique that helps to study differences between mutually exclusive groups with respect to several variables simultaneously. The technique is particularly useful in studies for which the standard regression analysis cannot be used because the dependent variable is nominal rather than continues and involves group membership rather than a score along a continuum. The linear Discriminant Function (LDF), which is the most widely used method in classifiction problems, relates the independent variables (discriminating variables) to the dependent variables (groups) to determine a linear function and establish an optimal classification rule.[21]

The technique of discriminant analysis has been used quite extensively by psychologists, political scientists, geographers, economists, taxonomists and others. For instance, David Durand used the method to identify good credit risks from poor credit risks on the basis of demographic and economic variables.[22] Pandy and Muralidharam also used the method to distinguish defaultors from non-defaultors in agricultural finance in terms of their socioeconomic characteristics.[23] Discriminant analysis was also used to identify the most feasible strategy out of a range of possible strategies that underdeveloped areas might adopt to promote their economic development.[24] It was this technique which enabled Adleman and Morris to develop an objective criteria for selecting underdeveloped countries with immediate development potential.[25] Many other investigators have also used the method to classify individuals according to their observed characteristics into one of several mutually exclusive groups.[26] In this study also the LDF technique has been used to identify the most important socio-economic variables that influence the borrowing behavior of farmers.

4. EMPIRICAL RESULTS

The sampled farmers were classified into two groups; borrowers and non-borrowers according to the observed status of the household

heads. The necessary information on the predetermined variables influencing credit use was collected and analysed. For the agricultural year studied the mean household income was 984 Birr and 575 Birr for Lume and Kewet districts respectively. In addition more than 95 percent of the total income was derived from crops and livestock productions. The average farm size alloted to the farmers is very small. Most of the sampled farmers occupied less than 2 hectares of land. Teff, maize, wheat, sorghum and barely are the dominant crops grown in the districts.

The level of education of the sampled farmers is generally low. Less than five percent of the sampled farmers have more than four years of formal education. In fact over 30 percent of the household heads were illiterate. Over 50 percent of the household heads had more than twenty years of farming experience in the districts since farmers in Ethiopia enter into the farming occuption while they are still young and it would be difficult for them to change this occupation.

A close lock at the t-values demonstrate that six of the hypothesised variables have significant group mean differences for both districts. There exist significant differences between the means for the two groups of farmers for the variables age, level of education, the use of improved technology, investment experses, need for more land and workers for Lume district (Table 1). On the other hand significant differences exist between the mean for farming experience, farm size, education, the need for more oxen, age and investment expenses for Kewet disrict (Table 2).

Once the potential power of each variable in discriminating between groups is assessed, it would also become desirable to examine the relative conribution of each variable. This could be achieved by entering all variables into the discriminant function analysis simultaneously. When the variables are standardized, the absolute size of the coefficients indicate the relative importance of the associated variables.[27]

7

TABLE 1

Group Means of Differentiating Characteristics
Between Borrowers and Non-Borrowers

For Lume District

Variables	Borrowers	Non-Borrowers	t-values	
Age (X_1)	40.05	46.59	1.99	**
Farming Experience (X_2)	23.41	28.42	1.55	
Education (X_3)	2.23	1.91	2.67	***
Farm Size (X_4)	2.48	2.26	1.22	
Distance from Extension Office (X_5)	58.03	67.56	1.59	
On-farm Income (X_6)	958.60	897.20	0.66	
Off-farm Income (X_7)	48.30	28.90	0.96	
Investment Expenses (X_8)	122.85	52.51	2.15	**
Livestock (X_9)	879.85	929.76	0.49	
Improved Technology (X_{10})	0.98	0.39	8.97	***
Need for more land (X_{11})	0.56	0.29	2.71	***
Need for more labour (X_{12})	0.38	0.29	1.83	*
Need for more oxen (X_{13})	0.48	0.42	0.60	
Price security (X_{14})	0.13	0.09	1.23	
Market and Extension Service (X_{15})	0.28	0.22	0.93	
Number of Observation	61	41		

Significance level of 1 percent (***) 5 percent (**) and
10 percent (*).

The set of 15 variables was entered into the analysis in order
to obtain a single discriminant function for each study area
separately. The standardized coefficient obtained by considering
all the hypothesised variables for the two districts are given in
Table 3.

TABLE 2

Group Means of Differentiating Characteristics Between Borrowers and Non-Borrowers for Kewet District

Variables	Borrowers	Non-Borrowers	t-values	
Age (X_1)	35.38	43.07	3.68	***
Farming Experience (X_2)	21.09	26.86	2.60	***
Education (X_3)	0.87	0.61	3.19	***
Farm Size (X_4)	1.83	1.38	3.12	***
Distance from Extension Office (X_5)	101.56	105.69	0.54	
On-farm Income (X_6)	497.59	526.71	0.74	
Off-farm Income (X_7)	43.64	36.00	0.59	
Investment Expenses (X_8)	110.89	38.54	1.91	***
Livestock (X_9)	563.02	560.38	0.02	
Improved Technology (X_{10})	00.22	0.12	1.38	
Need for more land (X_{11})	0.38	0.31	0.71	
Need for more labour (X_{12})	0.04	0.07	0.52	
Need for more oxen (X_{13})	0.80	0.64	1.81	*
Price Security (X_{14})	0.12	0.10	0.39	
Market and Extension Services (X_{15})	0.36	0.24	1.33	
Number of Observations	45	58		

Significance level of 1 percent (***), 5 percent (**) and 10 percent (*).

The discriminant function for each district is significant at the 0.001 level as seen from the high x^2 values suggesting that there are indeed distinct differences in farm household characteristics between borrowers and non-borrowers. However, while the low value of lambda for Lume district (0.4329) indicates that the variables employed have a fairly good discriminating power, the relatively high value of wilk's lambda for Kewet district (0.6279) suggests that the potential power of discrimination of the variables is fairly low. This fact is reinforced by the values of the cannonical

correltion, which gives the percent of variation explained between the groups when squared. In the case of Lume district the function explained 56.71 percent of the variation between the groups while only 37.2 percent of the variance was explained for Kewet district.

The extent of usefulness of a given disriminant function depends not only upon the reasonableness of the variables employed or selected and upon the percentage of discriminable variance. It also depends on the extent of separation among the groups. With respect to this criterion, the mean discriminant score for the borrowers and non-borrowers group in Lume district are 5.95 and 14.25 respectively. This shows us that the two groups are relatively distinct with respect to the combined effect of the variables. The distance between the mean scores for the two groups of farmers in Kewet district is however, small.

An examination of the discriminant function coefficients show that level of education, the use of improved technology, farm size, product price security, adequacy of markets and extension services, age, the need for more oxen and labour contribute over three-fourth of the total distriminating power for Lume district. More than 65 percent of the total discriminating power of the function produced for Kewet district is contributed by farm size, age, level of education, investment expenses, the use of improved technology, price security, and the adequacy of market and extension services. The contribution of the remaining variables is relatively insignificant.

The results of the analysis show that older farmers are characterized as non-borrowers in both districts as the coefficients for the variable age are negative.[28] This is one of the most important factors influencing credit use by farmers in Kewet district. It is anticipated that older farmers have accumulated more assets and wealth relative to their operational requirements and thus have less need for external financing. However, Table 1 and Table 2 have clearly demonstrated that farmers with more useable land and higher income are credit takers. In a subsistence agricultural sector such as the Ethiopian case it is extremely doubtful for subsistence farmers to accumulate wealth and become economically independent. The most probable explanation why older farmers

TABLE 3

Discriminant Analysis Results for the Borrower's Group

Variables	Standardized discriminant function Coefficients	
	Lume	Kewet
Age	−0.1954	−0.4459
Farming Experience	0.0070	0.0813
Education	0.4295	0.3209
Farm Size	0.3598	0.5590
Distance from Extension Office	0.0459	−0.2422
On-farm Income	0.0545	−0.2021
Off-farm Income	−0.1059	0.0596
Investment Expenses	0.0504	0.4008
Livestock	−0.0806	−0.1633
Improved Technology	0.3907	0.3060
Need for more land	0.3366	0.1388
Need for more workers	0.1339	0.1929
Need for more oxen	0.2537	0.2496
Price Security	0.3124	0.2501
Market and Service	0.3421	0.2663
Constant Term	−3.1619	1.0170
Statistical Results		
Group centroids		
Borrowers	5.9513	1.5188
Non-borrowers	14.2528	0.3530
Eigen Value	1.3100	0.5926
Cannonical Correlation	0.7531	0.6101
Wilk's Lambda	0.9329	0.6279
x^2 (chi-square)	77.4455	43.5125

Significant at 0.001 level with 15 degrees of freedom.

were associated with the non-borrowers group could be because their ability to farm will decrease as they advance in age. Besides if their children are grown up and moved away from them, family consumption expenditure will reduce and leave the farmers with more internal liquidity to finance their personal consumption requirements. On top of these reasons the risk of death is so high for older farmers and hence become an impediment both for the lender and the borrower.

Farming experience has been observed to be directly related to credit use in both districts as expected. The results suggest that the more experienced farmers have realized the merits of using agricultural credit in improving agricultural productivity and are, therefore, induced to use credit. However, this variable is one of the least important variables considered in the analysis.

The high absolute size of the coefficient and the extremely significant differences in group means demonstrate that higher level of education is related to credit use. Infact education is the most important factor that helps to differentiate borrowers from non-borrowers in Lume district. This shows that the more educated farmers are more perceptive to the use of more productive technology than non-users of credits.

The variable for which there was no statistically significant mean differences between the two groups but that was one of the important factors differentiating credit users from non-users for farmers in Lume district is farm size. However, the difference between the group means was highly significant for the variable in Kewet district. This shows that borrowers or credit users have more useable land than non-borrowers. Hence farmers with larger operational area are tempted to borrow as a result of higher amount of production inputs needed to manage the farming business. External fund becomes necessary to finance the increased costs of production.

The use of improved technology is another important factor that discriminates between the two groups. Borrowers have shown considerably higher level of this variable when compared to the

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non-borrowers group. In Ethiopia, agricultural credit has been channelled to peasant farmers mostly in the form of modern production inputs i.e., fertilizers and improved seeds from public credit institutions. Consequently a higher level of the use of improved technology would mean a greater use of credit.

Farmers who took loans during the agricultural year under study are also distinguished from those who did not take loans by their higher level of investment expenses particularly in Kewet district. Peasants who undertook investment activities like the construction of roads, wells, irrigation facilities, etc., have been classified as borrowers. But, because it is difficult to expand production without increased financial outlays farmers would resort to borrowing to finance such expenditures as their internal financial capacity is limited. However, this variable is not as such an important variable in discriminating between the two groups of farmers in Lume district.

The variables designated as proxies for production limitations are found to be important in characterizing agricultural credit users and non-users. Borrowers are highly characterized as being highly concerned about product price security and about adequacy and efficiency of marketing facilities and extension services. Members of the borrowers group also showed strong desire for more land, oxen and labour.

Measures of the wealth that a farm household possess have not been of much use in separating credit users from non-users. Both the t-values presented in Tables 1 and 2 as well as the standardized coefficients exhibit that income as well as livestock do not have significant influence on credit use.

So far attempts have been made to examine the usefulness of the predetermined variables in discriminating agricultural credit users from non-users and the relative contribution of each in the classification process. However, we are not definately sure whether all of them are valuable and necessary because the theoretical foundations are not strong enough to specify the precise list of discriminating variables. Consequently, it becomes desirable to

eliminate the variables that are poor discriminators from the analysis as their presence only complicates the analysis.

To eliminate the unnecessary variables is to use a stepwise procedure. The procedure can work in the forward direction or in the backward direction to produce the optimal list of discriminating variables. There are several alternative measures that could be used by the stepwise procedure for selecting the important variable by maximizing group differences while at the same time minimizing variations within the groups. Wilk's Lamda ($\wedge$) is used as the criterion to produce the optimal set of discriminating variables in this study.[29] This statistic takes into consideration both the differences between groups and he cohesiveness or homogeneity within groups. It can be either transformed into an F statistic or into a chi-square value to test the significance of the function.[30]

The results of the analysis showed that a single disriminant function of only three variables; education, farm size and the use of improved technology accounted for over 60 percent of the discriminable variance between the groups out of the initial list of 15 variables for Lume district. The discriminant function produced for the district after the discriminant weights were standardized is given as:

$$D_L = -2.2643 + 0.7588 \, X_3 + 0.810 \, X_{10} + 0.3775 \, X_4 \quad \text{---}(1)$$

Where, X_3 = education, X_4 = farm size and

X_{10} = improved technology

In terms of the overall contribution to the discriminating power of the function, the use of improved technology is the most important variable followed by education and farm size, in that order.

The corresponding discriminant function produced for Kewet district also shows that age, farm size and investment expenses are the main contributors to the discriminable variance.

$$D_K = 0.5269 - 0.3278 X_1 + 0.4490 X_4 + 0.2795 X_8 \text{ ---- (2)}$$

Where, X_1 = age, X_4 = Farm size and X_8 = Investment expenses.

Farm size followed by age and Investment expenses contribute nearly 30 percent of the total discriminating power of the function.

TABLE 4

Classification Table for Farmers in
Lume District

Actual Group	Assigned Group	
	Borrowers	Non-Borrowers
Borrowers	59	2
Non-Borrowers	13	28
Total	72	30

TABLE 5

Classification Table for Farmers in
Kewet District

Actual Group	Assigned Group	
	Borrowers	Non-Borrowers
Borrowers	33	12
Non-Borrowers	14	44
Total	47	56

Like the standard regression analysis can be used for prediction purposes, the discriminant function can also be used to assign a farmer into the most likely group according to the set of

characteristics associated with that household. Thus to examine the appropriateness of the model in future analysis classification tables were produced for both districts.

The actual proportion of farmers correctly classified to the borrower's group were 96.72 percent and 73.33 percent for Lume and Kewet districts respectively. On the other hand over 68 percent and 75.86 percent of the non-borrowers were correctly assigned for Lume and Kewet districts respectively. The overall correct classification produced by the function for Lume district was, therefore more than 85 percent. The variables can be used with reasonable success to identify credit users from non-users. As the variation between the groups that remained unexplained by the function is relatively high the overall correct classification produced for Kewet district is only 74.8 percent. Thus the function in this case is less reliable.

5. CONCLUSIONS

The empirical evidence of this study generally support the proposition that agricultural credit use is influenced by a set of economic and demographic variables. The variables employed in the analysis have been useful in differentiating agricultural credit users from non-users. Borrowers are characterized by having higher levels of education, operational area and investment expenses. Farmers in this group also use improved technology more and are relatively more worried about product prices and market and extension services arrangements.

Therefore, a policy that aims at strengthening the agricultural credit system must also take into account these and other related factors that would affect the level of agricultural credit use. The productivity of credit can be significantly increased if a host of social, economic and political preconditions are met. Thus an integrated approach, which includes credit, input supply, awareness, a proper system of pricing and marketing facilities is needed.

NOTES

1. Several studies have treated this issue thoroughly, See, for instance, Heidhues (8), World Bank [24], Mosher [17] FAO (5).

2. Many authors have demonstrated that there has always been low level of credit use among peasant farmers in Ethiopia, Holmberg [9], Lakew Birke (12), Teshome Mulat (23), Tesfaye Tecle [22] Mamo Bahta and H. Robinson [13].

3. Ministry of Agriculture [16], p. 102.

4. FAO [6], p. 59.

5. Heffernan and Pollard [7], Miller and Ladman [15], Oluwassanmi and Alao [18].

6. Baum [2].

7. Miller and Ladman [15].

8. Heffernan and Pollard [7].

9. Heffernan and Pollard [7].

10. Oluwasanmi and Alao [18].

11. Sarma and Prasad [21].

12. Miller and Ladman [15].

13. See, for example Pandey [19], Parkash Mehta [14].

14. The issue has been well treated in Heffernan and Pollard [7] and Miller and Ladman [15].

15. Heffernan and Pollard [7] and Miller and Ladman [15].

16. Heffernan and Pollard [7].

17. Miller and Ladman [15].

18. Miller and Ladman [15].

19. Miller and Ladman [15].

20. Improved technology in the context of this study includes fertilizers, improved seeds, improved farm implements, herbicides, pesticides and improved farm management practices.

21. A linear classification procedure is optimal if the spread (variance) of the independent variables in group one are the same as the spread in group two and if the interrelations (correlations) among the independent variables in group one are the same as the interrelations in group two. For more details see Lachenbruch [11] and Klecka [10].

22. David Durand [4].

23. Pandey and Muralidharan [20].

24. Bromley [3].

25. Adleman and Morris [1].

26. Heffernan and Pollard [7], Miller and Ladman [15].

27. The variables are standardized if the original data all had standard deviation of 1.0 which could be obtained by converting the raw data into standard form.

28. The direction of association is shown by the sign of the standardized coefficients which are normally the same with the unstandardized coefficients.

29. Wilk's Lambda (Λ) is the the ratio of within groups cross products to the total cross products along the discriminant function.

$$\Lambda = \frac{\sum\limits_{i=1}^{n} (X_{Di} - \overline{X}_{DG})^2}{\sum\limits_{i=1}^{n} (X_{Di} - \overline{X}_{DT})^2}$$

30. The larger the value of lambda, the greater will be the within groups variations as a proportion of the total and the less successful is the discriminant function at separating the groups.

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