EXPLORING CONSUMERS' PERCEPTIONS OF AUTOMOBILE BRANDS IN TURKEY THROUGH MULTIDIMENSIONAL SCALING

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The purpose of this study is to investigate the consumers' preferences towards various automobile brands in Turkey. Multidimensional Scaling (MDS) algorithm known as ALSCAL and a number of other complementary techniques (PREFMAP and PROFIT) is performed to transform consumers' preference evaluations into geometric distance for a multidimensional configuration for studying the subjects' perception of automobile brands. Subjects are sampled from consumers who use or have an opportunity to use cars, and who goes to car galleries. The main results of this study are summarized as follows: (1) safety and advertising campaigns are the two important attributes in consumers' auto brand preferences (2) Mercedes perceived favorably in both dimensions and the ideal point is directed at the location of Mercedes.

Keywords: Multidimensional scaling, PREFMAP, PROFIT, automobile industry.

Özet: Bu çalışmanın amacı Türkiye'deki tüketicilerin otomobil markalarına yönelik tercihlerinin araştırılmasıdır. Tüketicilerin otomobil marka tercihlerini belirlemek için, tüketicilerin tercih değerlendirmelerini çok boyutlu bir yapılandırma için geometrik uzaklıklara çeviren Çok Boyutlu Ölçekleme Algoritmalarından ALSCAL ve diğer tamamlayıcı teknikler olan PREFMAP ve PROFIT uygulanmıştır. Çalışmanın örneklemini otomobil sahibi olan veya otomobil kullanma şansına sahip olan veya oto galerilerine giden tüketiciler oluşturmaktadır. Çalışmanın temel sonuçları şu şekildedir: 1) Tüketicilerin otomobil markası tercihlerinde önemli olan iki özellik güvenlik ve reklam kampanyalarıdır 2) Mercedes bu her iki boyutta da iyi olarak algılanmıştır ve analiz sonucunda elde edilen ideal nokta da Mercedes markasına işaret etmektedir.

Keywords: Çok Boyutlu Ölçekleme Analizi, PREFMAP, PROFIT, otomobil endüstrisi, Türkiye.

1. INTRODUCTION

Automobile industry is one of the major industries in Turkey. Competition among firms in the Turkish automobile market has been growing since the 1990s as a result of new firms entering the market. With this occurrence in mind, it has become imperative for automobile firms to develop appropriate marketing strategies to meet the challenges of the emerging competitive market.

To effectively create a marketing strategy, it is important to understand how one's brand and those of competitors are perceived. One approach to identifying consumer perceptions is *Multidimensional scaling.* Multidimensional scaling (MDS) refers to a set of spatial models and associated numerical techniques for estimating these models to obtain a multidimensional spatial representation of the structure in various types of data (e.g. proximity data, such as brand switching data). For the past decades, MDS has assisted marketing managers and researchers in depicting market structure, market segmentation (Cooper, 1983), resolving issues in product design and positioning, and understanding relationships among consumer perceptions and choice. Green, Carmone, and Smith (1989), and Carroll and Green (1997) have summarized the major application areas of the various forms of MDS in marketing research, including such areas/studies as competitive market structure, product/service positioning, market segmentation, pricing, branding and image, advertising, new products, and so forth. Here, we identify how products are perceived on two or more "dimensions," allowing us to plot brands against each other. It may then be possible to attempt to "move" one's brand in a more desirable direction by selectively promoting certain points.

The overall purpose of this study is to investigate the Turkish consumers' preferences towards various automobile brands by using a particular Multidimensional Scaling (MDS) algorithm known as ALSCAL and a number of other complementary techniques (PREFMAP and PROFIT)

2. METHODOLOGY

MDS enables us to map objects (brands) spatially, so that the relative positions in the mapped space reflect the degree of perceived similarity between the objects (the closer in space, the more similar the brands). When the map has been generated, the relative positioning of the brands, together with knowledge of the general characteristics of the brands, allow the analyst to infer the underlying dimensions of the map. There are two main approaches to multi-dimensional scaling. In the *a priori* approach, market researchers identify dimensions of interest and then ask consumers about their perceptions on each dimension for each brand. This is useful when (1) the market researcher knows which dimensions are of interest and (2) the customer's perception on each dimension is relatively clear. In the *similarity rating* approach, respondents are not asked about their perceptions of brands on any specific dimensions. Instead, subjects are asked to rate the extent of *similarity* of different pairs of products (e.g., How similar, on a scale of 1-7, is BMW's to Mercedes). Using a computer algorithm (ALSCAL), the computer then identifies positions of each brand on a map of a given number of dimensions. The

computer does not reveal what each dimension means that must be left to human interpretation based on what the variations in each dimension appears to reveal. Since in this study it was not clear what the variables of difference are for the brand category we used MDS algorithm known as ALSCAL and a number of complementary methods PROFIT to attribute meaning MDS dimensions and PREFMAP to find the ideal point/vector in the same MDS space.

2.1. Sampling

The assumptions of MDS deal primarily with the comparability and represen-tativeness of the stimuli and the respondents. The objects chosen in this analysis should be quiet comparable, and should have a high level of representativeness considering the diversification. The respondents should also be aware of the stimuli and the objectives of the study. Keeping all these in mind, 130 people who use or have an opportunity to use cars, and who goes to car dealers ("galleries" in Turkish context) were chosen from Aydın, Kuşadası, İzmir, Denizli, İstanbul, and Bursa. The convenience sampling method was employed based on participant availability.

	BMW	Ford	Toyota	Renault	Opel	Fiat	VW
BMW	,00						
Ford	1,89	,00					
Toyota	2,11	3,42	,00				
Renault	1,76	3,65	3,21	,00			
Opel	2,51	3,93	4,03	3,45	,00		
Fiat	1,48	3,57	2,40	4,36	3,02	,00	
VW	3,70	3,30	3,59	2,90	3,95	2,14	,00
Mercedes	5,43	2,88	2,32	1,77	2,93	1,82	3,40

Table 1: Average Perceived Similarity Between Automobile Brands

2.2. Questionnaire Design

The survey instrument was made up of three sections. The first section is a similarity form. In this section respondents were asked to rate the similarity of a pair of car brands on a 7-point Likert scale with 1 representing the "least similar" and 7 representing 'the most similar". Since the survey forms were prepared for the comparison of eight different car

brands (Mercedes, BMW, Volkswagen, Fiat, Opel, Ford, Renault, Toyota) there were 28 (n (n-1)/2 where *n* is equal to the number of objects) pairwise similarity judgments to be completed by the respondents.

The second section of the questionnaire contains questions about particular attributes that have generally been used to identify cars. In this section respondents ask to evaluate the car brands on a scale 1 to 7 (1 being very bad and 7 being very good) based on the brand attributes like safety, prestige, price, after sale services, second hand sales, spare part, and advertising campaigns. In the last section respondents are expected to provide a rank order of the eight car brands in terms of preference.

3. RESULTS

3.1. Common Space As Seen by the Average Consumers

In order to see the common space as seen by the average consumer, the 130 responses from the customers were averaged in order to get an average value of perceived similarity between the cars. Table 1 shows the average perceived similarities between the cars in the lower rectangular format.

All of the 28 possible pairs are presented here. Table 1 show that the respondents perceived Fiat and BMW (1.48) as the least similar and Mercedes and BMW (5.43) as the most similar car brands. In order to get a two-dimensional perceptual map of the cars as seen by the customers, ALSCAL (Young & Harris, 1990) program (a part of SPSS 13.0 data analysis package) was used. Since ALSCAL only accepts dissimilarities and this research data is originally similarities, the 7 point scale was reverted such that 7 corresponded to most dissimilar and 1 corresponded to most similar. After this necessary transformation, ALSCAL was used to obtain a two-dimensional solution. The resulting map is given in Figure 1.

It is evident here the most safety cars form a distinct group at the top right corner of the map. Fiat, which is actually found to be very dissimilar from all other cars, occupies a distinct location on the upper left corner. The next section outlines a more formal approach in naming the dimensions. It is worthwhile to point out any reflection, rotation or translation of the points would not change the Euclidean distances hence would give essentially the same solution.

The fit of the solution is generally good. There are a number of ways of determining how well the two-dimensional solution suits the average similarities calculated from the 130 subjects (Table 1). The scatter plot of distances calculated from the solution given in Figure 1 against the dissimilarities used as input to the ALSCAL procedure (generally called "disparities", these would be the values given in Table 1, except the scale is reversed). The smoothness of the graph given in Figure 2 indicates good fit.

The square of the correlation between the disparities and the distances (R^2) indicates how much of the variation in the disparities is explained by the distances calculated from the configuration found by the MDS procedure. The R^2 value here is 61.44 %, which is reasonably high. There are two other measures, often called "badness of fit" functions (Kruskal & Carroll, 1969), as lower values indicate better fit, namely Kruskal's STRESS formula 1 (Kruskal, 1964a,1964b), and Young's SSTRESS (the measure that ALSCAL -

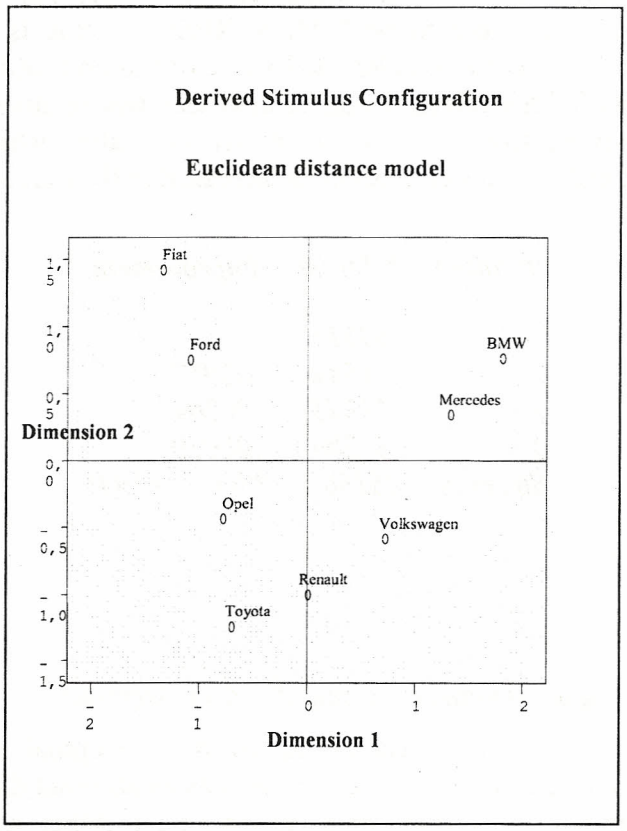

Figure 1: Two-dimensional Perceptual Map of Average Similarities

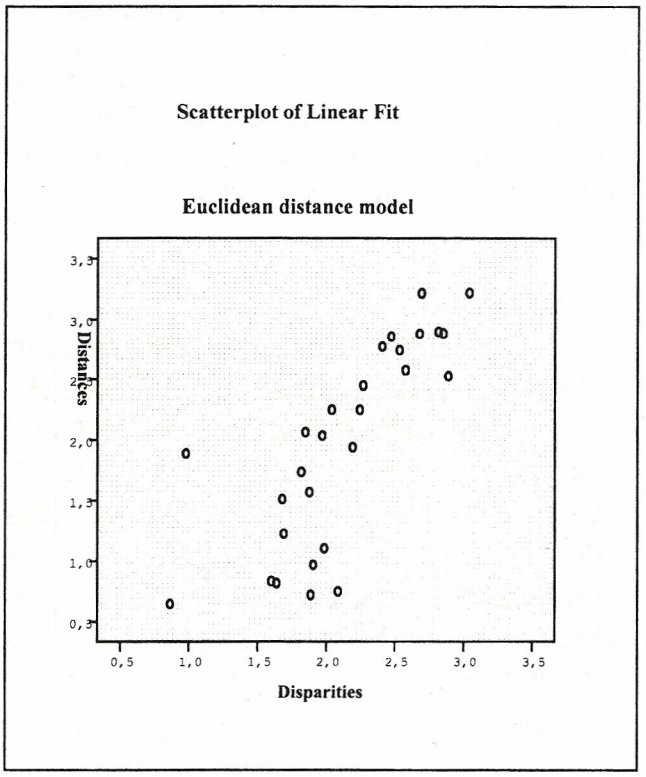

Figure 2: Distances vs. Disparities

program tries to minimize). For both measures "0" represents perfect fit. Young's SSTRESS in this study turns out to be 0.25. STRESS 1 value is somewhere between "good" and "excellent" fit according to Kruskal's rule of thumb (Lattin et al., 2003). When it is looked at these SSTRESS values, it can be also seen that relatively best improvement is achieved when moving from one to two dimensions after which the improvement diminishes somewhat and remains consistent as increased in the number of dimensions.

Iteration	*S-Stress*	*Improvement*
1	*,34516*	
2	*,31549*	*,02967*
3	*,31345*	*,00204*
4	*,31286*	*,00059*
Stress =	*,25199*	*RSQ = ,61441*

3.2. Attributing Meaning to Dimensions Using PROFIT Approach

PROFIT uses the coordinates of car brands on the perceptual map and the average attribute ratings of 130 respondents for each car brands as an input data and provides both original ratings and projection values for each attribute together with the plot of these values on the X and Y axes as output.

Table 2 provides the average ratings of the 8 cars on the 7 attributes. In order to name the dimensions, it is needed to look for the direction cosines of fitted vectors in normalized space. These values will help to give names to dimensions. The first dimension is most highly correlated with safety, prestige, and price. The second dimension is negatively correlated with advertising campaigns and spare parts. If the second dimension is multiplied by -1 (a reflection) these correlations will be positive. The computer program PROFIT -short for property fitting-(Chang & Carroll, 1989b) is helpful in determining the dimensions that are highly correlated with the attribute ratings.

	Safe	Pres	Pric	Af.S	Se.H	Spa.	Adv.
BMW	6.52	6.34	4.81	5.82	5.13	3.66	4.71
Ford	6.42	6.40	5.07	5.65	4.96	3.98	4.73
Toyota	5.00	4.88	4.80	4.83	4.88	4.63	5.31
Renault	4.80	4.66	4.72	4.67	4.73	4.71	5.02
Opel	4.25	4.16	4.67	4.80	5.09	4.97	4.85
Fiat	3.50	3.48	4.44	4.31	4.77	4.92	4.82
VW	5.08	5.17	5.01	4.99	4.82	4.54	5.28
Merced.	5.89	5.79	5.11	5.44	5.29	4.63	5.68

Table 2: Averages Attribute Ratings of the Car

	D1	D2
Safety	.9634	.2682
Prestige	.9557	.2944
Price	.9580	-.2867
After S.	.8738	.4862
Seco.H	.8602	.5099
SpareP.	-.7603	-.6495
Advert.	.5749	-.8182

Table 3. PROFIT Output: Directional Cosines of Fitted Vectors

It employs a more sophisticated technique than the one explained in the previous paragraph. PROFIT takes the coordinate values from the ALSCAL output and also the average attribute ratings on the five attributes as input. The highest value for the first dimension is safety.

As for the second dimension the highest value is advertising campaign. Figure 3 provides a plot of the original stimulus coordinates and the directional vectors. The directions of the 2 vectors (safety and prestige) are towards the first quadrant (the quadrant where Mercedes is located). The directions of the other 2 vectors (after sale and second hand) are towards the BMW. Spare parts are related with the Opel. Advertising is attributed to Renault and Volkswagen. Price is also attributed to Volkswagen.

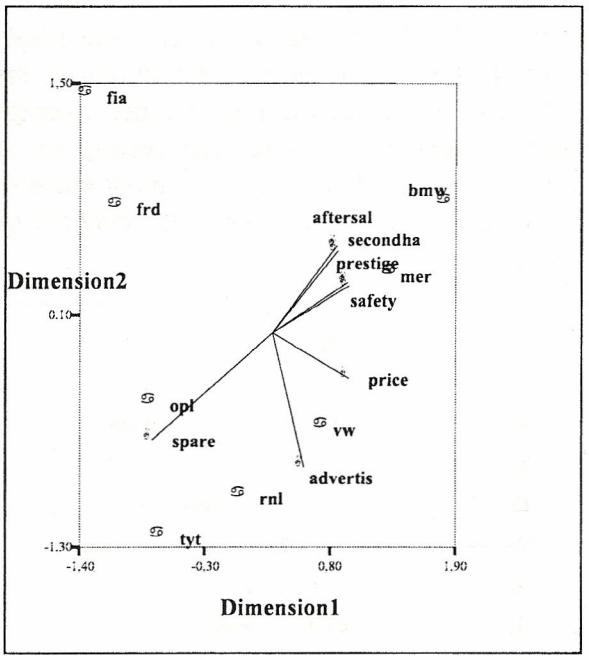

Figure 3 Direction Vectors of Attributes and Universities (PROFIT)

3.3. Preference Scaling Using PREFMAP

The computer program PREFMAP (Chang & Carroll, 1989a) takes preference data, and the stimulus coordinates obtained from an MDS analysis as input, and provides the

"ideal point" in the same coordinate space as output. Hence, the so called "ideal car" can be visualized in terms of the coordinate space already generated for the perceptual map of the cars. The program inputs include the coordinates of universities in the aggregate perceptual map (ALSCAL output) and the average preference values for each car computed from the answers to 3rd section of the survey. The average preference values for the universities are given in Table 4.

	Preference	Rank
Volkswagen	3.42	3
Fiat	6.75	8
Merc	2.84	2
Renault	5.84	7
BMW	2.68	1
Toyota	4.34	4
Ford	5.38	6
Opel	4.67	5

Table 4. Average Preference Values of Cars

It is seen here (Table 4) that BMW has the highest average preference. Mercedes, Wolkswagen, Toyota, Opel, are all around the same average preference rating and Ford, Renault and Fiat are the least preferred cars. There are a number of different models (point based and vector based) that PREFMAP uses to display the ideal points relative to the MDS produced coordinates. In this study, point representations are decided to use, that result in the derivation of ideal points for the respondents' average preferences, plus an ideal point for the average of these preferences. The results are shown in the Figure 4 below. It is seen from the figure that, Mercedes is the most closets car brand to the ideal point. Another finding of this analysis is that, most of the cars are quiet far away from the average ideal point.

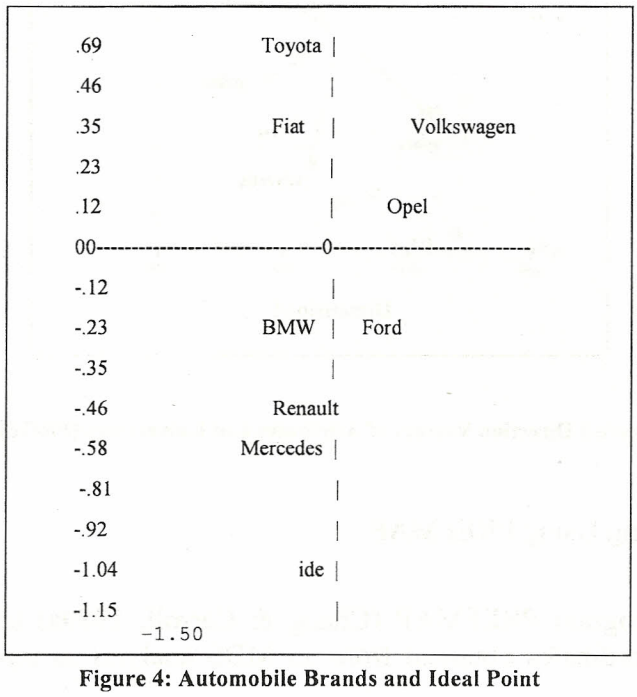

Figure 4: Automobile Brands and Ideal Point

4. CONCLUSION

The aim of this study is to provide a better understanding of the consumers' perceptions about automobile brands that help automobile industry managers to establish more effective marketing strategies. Using multidimensional scaling method, the proposed study promotes marketers to analyze their brands' position in the market and modify the marketing-mix based upon the current consumer preference.

This study starts with the similarity judgments of consumers as to their preferences for automobile brands. The aim of this analysis is to identify the underlying dimensions behind these judgments. The results of this analysis highlight the importance of safety and advertising campaigns in consumers' auto brand preferences. In the second part of the study respondents asked to evaluate one brand to another in terms of certain attributes. Results showed that BMW, Ford and Mercedes perceived favorably in safety. In terms of advertising campaigns Mercedes, Toyota and Volkswagen considered to be good. These findings also consistent with the consumers' preferences map that shows the consumer ideal point. Since Mercedes perceived favorably in both dimensions in the previous analysis it is not surprising that the ideal point is directed at the location of Mercedes.

REFERENCES

Allyn, B. and V.R. Rao (1972), Applied Multidimensional Scaling: A Comparison of Approaches and Algorithms. New York: Holt, Rinehart, and Winston

Cooper, L.G. (1983), "A Review of Multidimensional Scaling in Marketing Research," Applied Psychological Measurement, 7 (4), 427-50.

Carroll, J. D. and Paul E. Green (1997), "Psychometric Methods in Marketing Research: Part 11, Multidimensional Scaling," Journal of Marketing Research, 34 (May), 193-204.

Chang, J.J. and Carroll, J.D. (1989a), "How to Use PREFMAP – A Program that Relates Preference Data to Multidimensional Scaling Solutions," in

P.E. Green, F.J. Carmone, and S.M. Smith (eds.), *Multidimensional Scaling: Concepts and Applications*: 303–317. Newton, MA: Allyn and Bacon.

Chang, J.J (1989b), "How to Use PROFIT – A Computer Program for Property Fitting by Optimizing Nonlinear or Linear Correlation," in P.E. Green, F.J. Carmone, and S.M. Smith (eds.), *Multidimensional Scaling: Concepts and Applications*: 318–331. Newton, MA: Allyn and Bacon.

Green, P. E. (1975), "Marketing Applications of MDS: Assessment and Outlook," Journal of Marketing, 39 (January), 24-31

Green, FJ. Carmone Jr., and S.M. Smith (1989), Multidimensional Scaling: Concepts and Applications. Boston: j

Kruskal, J.B. (1964a), "Multidimensional Scaling for Optimizing a Goodness of Fit Metric to a Nonmetric Hypothesis," *Psychometrika*, 29: 1-27.

Kruskal, J.B. (1964b), "Nonmetric Multidimensional Scaling: A Numerical Method," *Psychometrika*, 29:115-129.

Kruskal, J.B., and Carroll, J.D. (1969), "Geometrical Models and Badness-of-Fit Functions," in P.R. Krishnaiah (ed.), *Multivariate Analysis*, 2: 639–671. New York: Academic Press.

Lattin, J.M., Carroll, J.D., and Green, P.E. (2003), *Analyzing Multivariate Data*. Pacific Grove: Brooks/Cole.

Wind, Y. (1982), Product Policy: Concepts, Methods, and Strategy. Reading, MA: Addison Wesley.

Young, F.W. and Harris, D.F. (1990), "Multidimensional Scaling: Procedure ALSCAL," in J.J.Norusis (ed.), *SPSS Base System User's Guide*: 396-461. Chicago, IL: SPSS Inc. Reprinted in J.J. Norusis (ed.), *SPSS Professional Statistics*, (1994): 155-222. Chicago, IL: SPSS Inc.

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