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# Investigation the Effect of using Different form of Advertising on Success of Companies for Increasing Market Share (A Case Study: Manufacturer of Smart Homes and Offices of Tehran)

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**Abstract**
An empirical investigation of the relationship between advertising, market share and firm profitability was carried out. Cross section analysis was used over 13 companies that produce smart homes and offices, for the year 2008 - 2012. Using the panel data and pooled models, this paper analyses the effect of different form of advertising on success of companies at increasing market share in manufacturer of smart homes and offices of Tehran. Most of the studies in this area indicate that in developed countries, this technology has a positive and meaningful effect on productivity and market power. For this reason, Author discussed and examined the relationship between different form of advertising and market share in manufacturer of smart homes and offices industries in Tehran. This paper finds that market share has a positive impact on firm profitability and market share. The results show the meaningful relationship between different form of advertising and market share and also the relationship between different form of advertising and decrease in marginal cost in these firms at the period.
**Keywords:** Advertising, Market share, Manufacturer of smart homes and offices, Panel data.

## 1. Introduction

"A long-standing debate in the economics of advertising is the effect of advertising on market performance. One school of thought, articulated in the contributions of Kaldor (1950) and Bain (1956), advocates that advertising serves primarily a persuasive role. According to this view, advertising increases product differentiation and deters entry by contributing recognition and prestige to advertised goods, thereby inflating the market power of firms selling advertised goods and bracing prices. A second school of thought, formalized by Ozga (1960), Stigler (1961), Telser (1964) and Nelson (1970, 1974), points to the important role of advertising in providing price and product quality information. Informative advertising reduces the costs associated with consumer search and facilitates substitution possibilities between products, resulting in lower prices and superior market performance" (Zoe Ventoura, 2005).

"Since competition among firms is growing, their main goal is to define their strategies in order to achieve maximum performance, resulting in greater profit. Hence, it seems that manufacturing industries are focused on the impact of advertising and market share on the profitability. The relationship between market share and profitability is perhaps the most-studied single phenomenon in business policy. Although, it has been some decades since the first published studies report a positive market share profitability association (Gale, 1972, Shepherd 1972), the nature of this relationship continues to receive a great deal of attention. While we observe that many practitioners hold the view that higher market share leads to higher profits, research findings indicate that the market share-profitability association is dependent upon strategic and competitive settings, and spurious effects account for at least a sizable component of the measured association" (Zoe Ventoura, 2005).

From all these, the following question arises: is the pursuit of market share an appropriate strategy for the increase of firms' profit? Business strategists are divided on this issue. Some studies indicate that low share businesses can be quite profitable (Woo, 1982, Schwalbach 1991). Moreover, a spurious correlation between market share and industry profitability has been found by Jacobson (1988a), Rumelt and Wensley (1981) and Jacobson and Aaker (1985). On the other hand, the dominant finding of prior research is a significant positive relationship between market share and profitability. O'Regan Nicholas (2002) has shown that firms with increased market share are likely to have higher performance and in particular achieve enhanced financial performance, greater customer satisfaction and retention. This applies to all firm sizes. To ensure competitive advantage, firms need to consider market share in conjunction with overall profits. Companies can increase their profits by raising barriers of entry. Advertising is a source of product differentiation, and therefore, a source of competitive advantage in oligopoly industries. Successful advertising contributes to a company's sales in two ways, by expanding the demand for the product and by reducing the size of product elasticity. Product differentiation can be measured by several proxies such as the percentage of the patent and trademark expenditures in total productions and by the advertising intensity (Mata, 1993, Gisser 1991, Milgrons and Roberts, 1986). The way in which advertisement affect demand depends on how consumers learn about product's characteristic (Nelson, 1974). The factors mentioned above reinforce the market share of the

 

companies leading to an increase of their profits (Zoe Ventoura, 2005).
According to the literature (Schmallensee 1987) and the Lerner index of market power for a firm i, the degree of monopoly power in terms of the effectiveness can be measured by:

$$(P - MC) / P = 1 / e \quad (1)$$

where P is the price, MC is firm's marginal cost and e is the price elasticity of the demand. Taking into account the constant return to scale (Martin 1993), the marginal cost equals to average cost which is the normal rate of return of investment.

This study is guided by the following research questions: What is the relationship between advertising indexes and market share in manufacturer of smart homes and offices industries in these selected firms? Does advertising have significant effect on these firms' market share in the short-run and in the long-run?
Accordingly, the following hypotheses are considered:
Hypothesis 1: There is a long-run relationship between advertising indexes and market share.
Hypothesis 2: Improvement in advertising indexes leads to increase in market share.

In this paper the relationship between advertising indexes and market share in manufacturer of smart homes and offices industries is tested by using panel data of 13 selected firma in Tehran over the period 2008 - 2014. This paper consists of four sections. Section 1, discusses the introduction, in which the background and rationale of the study is outlined. Section 2, covers the details of the data and research methodology employed in this study. Section 3, reports the findings and discussions. The final section contains the conclusions.

## 2. Data and Methodology

Firm level data was used to analyze the relationship between the price-cost margin advertising to sales ratio and market share mainly in smart homes and offices industries. Smart homes and offices industries have been chosen among other industries for two main reasons: a) They are dynamic and advertised sectors in Iran economy and b) there are many relative international enterprises. The input data were selected from various sources. The market-share was used as an appropriate strategy leading to a competitive advantage. Finally, advertising data which are still unpublished came from an advertising company. The sample of the present study refers to the year 2008-2012 and consists of 13 companies. The sample consists of few firms since there are advertising data only for big and especially internal firms. Despite the small size of the sample, the obtained results can be considered as quite representative, because the studied firms can be termed as leading firms in the industry with a sufficiently great effort for the Tehran market.

### 2.1. Model specification

We first start estimating the effects of each independent variables on the dependent variable "market power" by using pooled ordinary least squares model. We create a pooled data by combining time series and across section data for manufacturer of smart homes and offices industry. The pooled regression model doesn't estimate the impact of variables separately on each firm, but instead yields an overall measure of each variables on the group of firm. If we find large standard errors for variables, the next step is testing the fixed and random effect which are more advanced models if the pooled one was not appropriate.

Panel data provide a large number of point data, increasing the degrees of freedom and reducing the collinearity between regressors. Therefore, it allows for more powerful statistical tests and normal distribution of test statistics. It can also take heterogeneity of each cross-sectional unit into account, and give "more variability, less collinearity among variables, more degrees of freedom, and more efficiency" (Baltagi, 2001).

In this paper, regressions are based on data concerning a group of 13 firms in manufacturer of smart homes and offices of Tehran over the period 2008 - 2014. Data for advertising expenditure, total cost in each firm, total output, wage, capital cost, price of production for 13 firm in these industry come from the each firm data base.

In this paper we pool cross-section and time series data to study relationships between advertising and market share.

### 2.2. Estimation Procedure

In order to investigate the possibility of panel cointegration, first, it is necessary to determine the existence of unit roots in the data series. For this study we have chosen the Im, Pesaran and Shin (IPS, hereafter), which is based on the well-known Dickey-Fuller procedure.

Im, Pesaran and Shin denoted IPS proposed a test for the presence of unit roots in panels that combines information from the time series dimension with that from the cross section dimension, such that fewer time observations are required for the test to have power. Since researchers have found the IPS test to have superior test power for analyzing long-run relationships in panel data, we will also employ this procedure in this study. IPS begins by specifying a separate ADF regression for each cross-section with individual effects and no time trend:

 

$$\Delta y_{it} = \alpha_i + \rho_i y_{i,t\,1} + \sum_{j=1}^{pi} \beta_{ij} \Delta y_{i,t\,j} + \varepsilon_{it} \quad (1)$$

Where $i = 1, \ldots, N$ and $t = 1, \ldots, T$

IPS use separate unit root tests for the $N$ cross-section units. Their test is based on the Augmented Dickey-fuller (ADF) statistics averaged across groups. After estimating the separate ADF regressions, the average of the *t*-statistics for $p_1$ from the individual ADF regressions, $t_{iTi}(p_i)$

$$\bar{t}_{NT} = \frac{1}{N} \sum_{i=1}^{N} t_{iT}\,(p_i \beta_i) \quad (2)$$

The *t*-bar is then standardized and it is shown that the standardized *t-bar* statistic converges to the standard normal distribution as N and $T \longrightarrow \infty$. IPS (1997) showed that *t-bar* test has better performance when N and T are small. They proposed a cross-sectional demeaned version of both test to be used in the case where the errors in different regressions contain a common time-specific component (Nor'Aznin and et al, 2010).

The next step is to test for the existence of a long run relationship among the variables. A common practice to test for cointegration is Johansen's procedure. However, the power of the Johansen test in multivariate systems with small sample sizes can be severely distorted. To this end, we need to combine information from time series as well as cross-section data once again. In this context three panel cointegration tests are conducted.

First, we use a test due to Levin and Lin (1993) in the context of panel unit roots, to estimate residuals from (supposedly) long run relations. Levin and Lin (1993) consider the model

$$y_{it} = \rho_i y_{i,t-1} + z_{it}' \gamma + u_{it} \quad (3)$$

Where $z_{it}$ are deterministic variables, $u_{it}$ is iid$(0,\sigma^2)$ and $\rho_i = \rho$. The test statistic is at t-statistic on $\rho$ given by

$$t_\rho = \frac{(\hat{\rho}-1)\sqrt{\sum_{i=1}^{N}\sum_{t=1}^{T} \tilde{y}_{i,t-1}^2}}{s_e} \quad (4)$$

Where

$$\tilde{y}_{it} = y_{it} - \sum_{s=1}^{T} h(t,s) y_{is}, \quad \tilde{u}_{it} = u_{it} - \sum_{s=1}^{T} h(t,s) u_{is} \quad h(t,s) = z_t' \left( \sum_{t=1}^{T} z_t z_t' \right) z_s,$$

$$s_e^2 = (NT)^{-1} \sum_{i=1}^{N} \sum_{t=1}^{T} \tilde{u}_{it}^2,$$

And $\hat{\rho}$ is the OLS estimate of $\rho$. It can be shown that if there are only fixed effects in the model, then

$$\sqrt{N}T(\hat{\rho} - 1) + 2\sqrt{N} \rightarrow N(0, \sigma^2)$$

Second, we use the unit root tests developed for Eq. (2) by Harris and Tzavalis (1999). It must be noted that Levin and Lin (1993) tests may have substantial size distortion if there is cross-sectional dependence (O'Connell, 1998). Also, Harris and Tzavalis (1999) find that small T yields Levin and Lin tests which are substantially undersized and have low power. A drawback of the Levin and Lin or Harris and Tzavalis tests is that they do not allow for heterogeneity in the autoregressive coefficient, $\rho$.

Finally, to overcome the problem of heterogeneity that arises in both tests we use Fisher's test to aggregate the p-values of individual Johansen maximum likelihood cointegration test statistics, see Maddala and Kim (1998). If $p_i$ denotes the p-value of the Johansen statistic for the ith unit, then we have the result $-2\sum_{i=1}^{N} \log p_i \sim \chi_{2N}^2$. The test is easy to compute and, more importantly, it does not assume homogeneity of coefficients in different countries (Christopoulos and Tsionas, 2004).

The next step is to test for the existence of a long-run cointegration market share and the independent variables using panel cointegration tests suggested by Pedroni (1999 and 2004). We will make use of seven panel cointegration by Pedroni (1999), since he determines the appropriateness of the tests to be applied to estimated residuals from a cointegration regression after normalizing the panel statistics with correction terms (Nor'Aznin and et al, 2010).

The procedures proposed by Pedroni make use of estimated residual from the hypothesized long-run regression of the following form:

$$y_{i,t} = \alpha_i + \delta_i t + \beta_{1i} x_{1i,t} + \beta_{2i} x_{2i,t} + \cdots + \beta_{Mi} x_{Mi,t} + \varepsilon_{i,t} \quad (5)$$

For t = 1,…..,T; I = 1,….,N; m = 1, …., M,

Where $T$ is the number of observations over time, $N$ number of cross-sectional units in the panel, and $M$ number of regressors. In this set up, $\alpha_i$ is the member specific intercept or fixed effects parameter which varies across individual cross-sectional units. The same is true of the slope coefficients and member specific time effects, $\delta_i t$ .

Pedroni (1999 and 2004) proposes the heterogeneous panel and heterogeneous group mean panel test statistics to test for panel cointegration. He defines two sets of statistics. The first set of three statistics $Z_{\hat{v},N,T}$, $Z_{\hat{\rho},N,T\ 1}$ and $Z_{tN,T}$ are based on pooling the residuals along the within dimension of the panel. The statistics are as follows

$$Z_{\hat{v},N,T} = T^2 N^{3/2} \sum_{i=1}^{N} \sum_{t=1}^{T} \hat{L}_{11i}^2 \hat{e}_{i,t\,1}^2 \quad (6)$$

$$Z_{\hat{\rho},N,T\ 1} = T\sqrt{N} \sum_{i=1}^{N} \sum_{t=1}^{T} \hat{L}_{11i}^2 \hat{e}_{i,t\,1}^2 \quad \sum_{i=1}^{N} \sum_{t=1}^{T} \hat{L}_{11i}^2 (\hat{e}_{i,t\ 1} \Delta \hat{e}_{i,t\ } \hat{\lambda}_i) \quad (7)$$

 

$$Z_{tN,T} = \tilde{\sigma}_{N,T}^2 \sum_{i=1}^{N}\sum_{t=1}^{T} \hat{L}_{11i}^2 \hat{e}_{i,t\ 1}^{2\ \ 1/2} \sum_{i=1}^{N}\sum_{t=1}^{T} \hat{L}_{11i}^2 (\hat{e}_{i,t\ 1}\ \Delta\hat{e}_{i,t}\ \hat{\lambda}_i) \quad (8)$$

Where $\hat{e}_{i,t\ 1}$ is the residual vector of the OLS estimation of Equation (5) and where the other terms are properly defined in Pedroni. The second set of statistics is based on pooling the residuals along the between dimension of the panel. It allows for a heterogeneous autocorrelation parameter across members. The statistics are as follows:

$$\tilde{Z}_{\hat{\rho}N,T\ 1} = \sum_{i=1}^{N}\sum_{t=1}^{T} \hat{e}_{i,t\ 1}^{2\ \ 1} \sum_{t=1}^{T}(\hat{e}_{i,t\ 1}\ \Delta\hat{e}_{i,t}\ \hat{\lambda}_i) \quad (9)$$

$$\tilde{Z}_{tN,T\ 1} = \sum_{i=1}^{N}\sum_{t=1}^{T} \hat{e}_{i,t\ 1}^{2\ \ 1/2} \sum_{t=1}^{T}(\hat{e}_{i,t\ 1}\ \Delta\hat{e}_{i,t}\ \hat{\lambda}_i) \quad (10)$$

These statistics compute the group mean of the individual conventional time series statistics. The asymptotic distribution of each of those five statistics can be expressed in the following form:

$$\frac{X_{N,T}\ \mu\sqrt{N}}{\sqrt{V}} \rightarrow N(0,1) \quad (13)$$

Where $X_{NT}$ is the corresponding form of the test statistics, while $\mu$ and $v$ are the mean and variance of each test respectively. They are given in Table 2 in Pedroni (1999). Under the alternative hypothesis, Panel $v$ statistics diverges to positive infinity. Therefore, it is a one sided test were large positive values reject the null of no cointegration. The remaining statistics diverge to negative infinity, which means that large negative values reject the null (Al-Awad and Harb, 2005).

## 3. Estimation Result

In order to investigate the possibility of panel regression, it is first necessary to determine the existence of unit roots in the data series. Panel unit root tests are similar, but not identical to unit root tests carried out on a single series. The literature suggests that a panel-based unit root test enhances the power of the unit root test as it allows for greater efficiency by providing more degrees of freedom and for heterogeneity across individual series. For this study we have chosen the Im, Pesaran and Shin (IPS), which is based on the well-known Dickey-Fuller procedure. Investigations into the unit root in panel data have recently attracted a lot of attention.

Table 1 presents the panel unit root tests. At a 5% significance level. The p-values corresponding to the IPS values calculated for all variable except market power index are larger than 0.05. This indicates that these series of variables are non-stationary at 5% level of significance and thus these variables are non-stationary. At first differences, however, the null is strongly rejected in all cases. We conclude that these series are integrated of order one *I*(1) in the constant plus time trend of the panel unit root regression and other variable is stationary in level. Therefore, we can conclude that some of the variables are non-stationary in with and without time trend specifications at level by applying the Panel unit root test which is also applied for heterogeneous panel to test the series for the presence of a unit root.

Table 1 – Panel unit root tests

| Variables | IPS Statistic | Prob |
|---|---|---|
| Public Service Advertising | 0.48 | 0.99 |
| Direct advertising | 0.66 | 0.76 |
| Multimedia advertising | -0.23 | 0.54 |
| Online advertising | -0.87 | 0.65 |
| Total cost of production | 0.38 | 0.65 |
| Administrative expenditure | -0.005 | 0.49 |
| Firm's profit | 1.33 | 0.90 |
| Public service costs to customers | 1.78 | 0.96 |
| Income | 1.96 | 0.97 |
| Market share indexes | -8.29 | 0.00 |

*Note:* Levels and first order differences denote the IPS t-test for a unit root in levels and first differences respectively. Number of lags was selected using the AIC criterion. We use the Eviews software to estimate this value.

We can conclude that the results of panel unit root tests reported in Table1 support the hypothesis of a unit root in all variables across firms, as well as the hypothesis of zero order integration in first differences. At most of the 1 percent significance level, we found that all tests statistics in both with and without trends significantly confirm that all series strongly reject the unit root null. Given the results of IPS test, it is possible to apply panel data method in order to test for the existence of the stable long-run relation among the variables.

 

Table 2: The Pedroni Panel Cointegration Test

| Test | Constant trend | Constant + Trend |
|---|---|---|
| **Panel *v*-Statistic** | 1.000 | **1.000** |
| **Panel *ρ*-Statistic** | 0.999 | **1.000** |
| **Panel *t*-Statistic: (non-parametric)** | 0.002 | **0.001** |
| **Panel *t*-Statistic (*adf*): (parametric)** | 0.000 | **0.002** |
| **Group *ρ*–Statistic** | 0.000 | **0.000** |
| **Group *t*-Statistic: (non-parametric)** | 0.001 | **0.000** |
| **Group *t*-Statistic (*adf*): (parametric)** | **0.002** | **0.005** |

*Note:* All statistics are from Pedroni's procedure (1999) where the adjusted values can be compared to the N(0,1) distribution.

By using the cointegration test, results show that the variables move together in the long run. That is, there is a long-run steady state relationship between our variables for a cross-section of firms. The next step is an estimation of such a relationship.

The main goal of the paper is to measure the effect kinds of advertising on market share using an available panel dataset. The main hypothesis in to test that kinds of advertising has a positive significant on market share. If this is true, then we will be able to measure the effect of kinds of advertising on the market share.

For our panel data pooled OLS, fixed and random effect estimation techniques will be used. However, there are few important econometric issues which need to be addressed. First, having several proxies of macroeconomic stability may result in the multi-collinearity in the explanatory variables. However, this issue can be tackled by computing the correlation between the corresponding variables. If the correlation is large, it means that these explanatory variables contain similar information and should not be both included in the regression.

Another more important problem is the possible problem of endogeneity between the capital flight and growth, as we cannot state for sure which variable determines which. Even though the regressions are very likely to have country- or region specific effects, we will start the estimation from the OLS procedure. The coefficients for the Pooled OLS regression have the expected sign. However, we know that the Pooled OLS is very restrictive. Choosing between Pooled OLS and fixed effect procedure is based on F test, we analyzed the statistics from the F-test for common intercept, which favored the fixed effect estimation.

The main results are presented in Table 3. As we have noted earlier, all explanatory variables are taken in level. As was noted above, we discuss the results, obtained with the fixed effect model. After we estimate the model by using Pooled and fixed effect we use F test. Four models based on assumptions about how the fixed term is are used so as to predict the relationship between the variables. These are "pooled regression" (pooled OLS) and "fixed effects". The first phase in choosing the correct method is carrying out the F test which tests the homogeneity of the firm's effects. The null hypothesis in which fixed effect model is redundant versus pooled regression model. According to the result, the model is predicted through Pooled OLS method first, the hypothesis that presents that fixed affects are invalid altogether is also rejected in F tests. According to the results of test, fixed effects model provides are not reliable predictions and we use Pooled model.

Table 3. Pooled Regression results

| Dependent Variable: LERNER | | | | |
|---|---|---|---|---|
| Method: Pooled Least Square | | | | |
| | | | | |
| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
| C | -0.041632 | 0.156198 | -0.266533 | 0.790 |
| Public Service Advertising | 0.035249 | 0.029191 | 1.355367 | 0.082 |
| Direct advertising | 0.149366 | 0.032365 | 5.543997 | 0.000 |
| Multimedia advertising | 0.111279 | 0.031278 | 3.847656 | 0.001 |
| Online advertising | 0.128004 | 0.034816 | 4.350024 | 0.000 |
| Income | 0.085804 | 0.032752 | 2.603570 | 0.007 |
| | | | | |
| R-squared | 0.346575 | Mean dependent var | | 7.844755 |
| Adjusted R-squared | 0.345674 | S.D. dependent var | | 5.668565 |
| S.E. of regression | 5.644564 | Sum squared resid | | 6.369026 |
| F-statistic | 2132.000 | Durbin-Watson stat | | 1.879655 |
| Prob(F-statistic) | 0.000000 | | | |

Each firms we are studying have some individual characteristics which may influence the independent variables. Therefore, we can assess the net effect of each independent variable on market share. We estimate the above

 

regression with Pooled OLS. The empirical results support a short-run co-integration relationship after allowing for the heterogeneous manufacturer of smart homes and offices industry effect.

The result of estimation indicates a positive effect from kinds of advertising on market share in long run and short run. In this model the coefficient of kinds of advertising equal 0.03, 0.14, 0.11 and 0.12 respectively which shows that a unit of increase in kinds of advertising such as public Service advertising, direct advertising, multimedia advertising and online advertising lead to 0.03, 0.14, 0.11 and 0.12 respectively percent increase in market share. Also we find that the coefficient of firm income, equal 0.08 which shows that a unit of increase in firm's income, lead to 0.08 percent increase in market share. The Durbin Watson statistic showed error terms are correlated. Also, we test between pooled regression and OLS fixed effect in which null hypothesis states fixed effect is redundant. Regarding to dataset which was available, F-stat and Chi-square cannot reject the null hypothesis so we don't need to consider the individual effect of manufacturer of smart homes and offices industry on market share.

## 4. Conclusion

This paper is an empirical study on the effect of kinds of advertising on success of companies for increasing market share, a case study: Manufacturer of smart homes and offices of Tehran. For that reason we use the panel cointegration approach. The unit root test (IPS) is used to confirm the stationarity of all variables before the cointegration test can be performed. After confirming that all variables are non-stationary at level, the panel cointegration approach is applied. Using Pedroni's, the long run cointegration test is performed to investigate the existence of the long run cointegration among the variables. Results obtained indicate the presence of the long run and the short run relationship between ICT tools and market share for 13 firm. Four models based on assumptions about how the fixed term is are used so as to predict the relationship between the variables. These are "pooled regression" (pooled OLS) and "fixed effects". The first phase in choosing the correct method is carrying out the F test which tests the homogeneity of the firms' effects. The null hypothesis in which fixed effect model is redundant versus pooled regression model. According to the result, the model is predicted through Pooled OLS method first, the hypothesis that presents that fixed affects are invalid altogether is also rejected in F tests. According to the results of test, fixed effects model provides are not reliable predictions and we use Pooled model. The result of estimation indicates a positive effect from kind of advertising on market share in long run and short run. The obtained results show that market share greatly influences profitability. This fact was expected since market share establishes strong entry barriers and creates oligopolistic markets, which was proved in previous empirical and theoretical studies. To further determine the contribution of market share and advertising to sales ratio the partial F – test was used. It was deduced that advertising to sales ratio was less significant than market share. These results also verify the t – test results for the advertising to sales ratio.

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