Testing the Nonlinear Relationship Between Market Concentration and Advertising: Evidence from Turkish Banking Industry

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Abstract: This paper investigates the nonlinear relationship between market concentration and advertising intensity in the Turkish banking industry over the 2006q4:2015q2 period. Using system generalized method of moments method, we find evidence towards a U-shaped relationship between market concentration and advertising intensity, implying that over the more concentrated periods, banks tend to allocate more on advertising. The persistent characteristic of advertising intensity and positive impact of profitability on bank advertising are further findings of this paper.

Keywords: Advertising intensity, market concentration, Turkish banking industry, system GMM

JEL Codes: C23, D21, D40, G21, L11

1. Introduction

The dynamic and tough competitive environmental conditions have led firms to adopt various tools to gain greater market share and profit. Advertising is one of the most popular ways of non-price competition. Either informative or persuasive, many firms allocate vast resources to use for advertising purposes. The growing importance of advertising intensity of firms has also attracted the attention of the industrial organization literature. However, the empirical evidence on the relationship between advertising intensity and market structure has not provided unanimous and convincing results. Moreover, empirical research asserts that the relationship between advertising intensity and market concentration is generally non-linear. On the one hand, a part of existing studies finds inverted U-shaped relationship, implying that more concentrated industries invest in advertising more than competitive industries (see for example Lee, 2002[i]). However, another line of research finds U-shaped or almost J-shaped relationship between advertising intensity and market concentration (see for example Willis and Rogers, 1998; Lee, 2002[ii]).

Most of the exisiting research on the advertising intensity-market structure relationship is based on non-financial industries (see for example Häckner and Nyberg, 2008; Squalli, 2010; Sa', 2015; Chandra and Weinberg, 2015; Chen and Lin, 2015). However, advertising is a crucial way of non-price competition in the financial system. Rhoades (1980), Kohers and Simpson (1981), Scott (1978), Wolken and Derrick (1986), Ors (2003) have focused on this relationship in the context of banking. To contribute to

the existing literature on the banking industry, this paper focuses on the Turkish banking industry and aims to investigate the impact of market concentration on the advertising intensity of Turkish banks. A limitation of the previous studies is that, advertising intensity and market concentration may incorporate two-way causality. To overcome this problem, this paper utilizes system Generalized Method of Moments (GMM) estimation technique for the panel of 24 deposit banks over 35 periods. To the author's best knowledge, this is the first study that analyzes the nonlinear relationship between advertising intensity and market concentration in Turkish banking industry. The sample is a balanced panel covering 2006q4:2015q2 period. The rest of the paper is organized as follows: data, model and methodology issues are outlined in Section 2. The empirical results are presented in Section 3 and Section 4 is devoted to conclusions.

2. Data, Model and Methodology

The first theoretical model that investigates advertising intensity-market structure relationship goes back to Dorfman and Steiner (1954). While the original version of this model has analyzed the optimal advetising level as a function of market demand and structure, it has been elaborated by several researchers (such as Cable, 1972, Waterson, 1984) in a way that profit maximizing advertising level of a firm depends on the price-cost margin and market concentration. Theoretically, the higher the price-cost margin is, the greater chance firm will have to invest in advertising. However, the role of market concentration on advertising is not very clear. The general belief about the impact of market concentration on advertising intensity is that as a market becomes more concentrated, reliance on non-price competition methods become more popular. However, it is also debated that firms operating in highly competitive industries also spend vast amount of money on advertising, supporting the "complementary function" of advertising[iii]. Moreover, the relationship between market structure and advertising intensity is not necessarily linear. The inverted-U hypothesis asserts that advertising intensity increases as market concentration increases up to a critical point and after an inflection point, firms cut their relative advertising expenditures with greater market concentration. In other words, firms in markets of intermediate competition involve in advertising activity more significantly. However, in some industries the, inverted-U hypothesis is not valid; instead one can observe a U-shaped relationship between advertising intensity and industry concentration (Lee, 2002).

To test the relationship between advertising intensity and market concentration in the Turkish banking industry, the model specified in Equation 1 is used:

$$ADV_{it} = \beta_0 + \beta_1 ADV_{i,t-1} + \beta_2 PCM_{it} + \beta_3 CONC_{it} + \beta_4 CONC_{i,t}^2 + \beta_5 SIZE_{it} + \beta_6 FOR_i + \beta_7 CRIS_t + \varepsilon_{it}$$

$$(1)$$

The indices i and t denote the banks and time, respectively. The dependent variable, ADV, is the advertising intensity, measured as the ratio of advertising expenses to total expenses (i.e. sum of interest expenses and other operating expenses) of a bank. One lagged value of the dependent variable is used to control the persistent characteristic of the advertising intensity. PCM indicates the price-cost margin and measured as the ratio of difference between interest income and interest expenses to total assets[iv]. Market concentration (CONC) is measured by four-firm concentration ratio (CR4) and

Herfindahl-Hirschman Index (HHI). These two measures are calculated using both total assets (TA) and total deposits (TD), separately to check robustness of the results. To account for possible non-linear relationship between market concentration and advertising intensity, the quadratic form is used. Size is also another important factor determining the competitive strategies of a bank. Hence, natural logarithm of total assets of each bank is used to control this impact and denoted as SIZE in the model. Foreign bank penetration in the Turkish banking industry has attracted significant attention over the last decade. Foreign banks and domestic banks compete in the same industry, however they may have different inherent missions and strategies. Hence, FOR, is the dummy variable controlling the ownership structure of the bank. FOR assumes the value 1 for the foreign banks[v]. Global financial crisis, has created a fragile economic environment. Hence, banks have been also affected over this period. To control the impact of the recent global financial crisis, the time dummy variable, CRIS, is used in the model. CRIS variable assumes value 1 for the period following 2009q1. ε_{it} indicate the random disturbances, with zero mean and constant variance. All bank-specific micro-data are collected from Turkish Banking Association Database. The sample is a balanced panel covering 2006q4:2015q2 period. Banks included in the sample are determined according to the data availability. Banks with non-positive total assets, equity, loans, deposits and advertising expenses have been excluded whereas only the banks that appear at least five consecutive periods were included. Data set is described at the Table 1 below.

Table 1. Descriptive Statistics

Variable	Mean	Std. Dev.	Min.	Max.	Obs.
ADV	0.93	0.009	0.058	5.939	840
PCM	0.029	0.022	-0.0106	0.280	840
CR4(TA)	0.563	0.019	0.516	0.601	840
CR4(TD)	0.560	0.019	0.514	0.584	840
HHI(TA)	0.110	0.009	0.097	0.139	840
HHI(TD)	0.114	0.009	0.098	0.140	840
SIZE	16.342	1.807	12.325	19.459	840
ROA	0.91	0.009	0.009	-0.046	840

Note: ADV and PCM are measured in percentages. CR4(TA) and CR4(TD) are four-firm concentration ratios measured using total assets and total deposits, respectively. HHI (TA) and HHI (TD) are Herfindahl-Hirschman indices based on total assets and total deposits, respectively.

Equation 1 is formulated under the assumption that price-cost margin is a factor determining the advertising intensity of the banks. However, causality may also operate in the reverse direction. This bidirectional causality may lead to endogeneity problems in the estimation of the model. Moreover, one-lagged version of the dependent variable is also included in the model, hence the model has a dynamic structure. To overcome these problems and obtain reliable estimates, we use System Generalized Method of Moments technique. The significant contribution to develop a consistent and efficient estimator for dynamic panel data (DPD) models was made by Arellano and Bond (1991). They developed the dynamic Generalized Method of Moments (GMM) method which rests on using lagged levels of endogeneous varaiables and strictly exogeneous

variables as instruments. Arellano-Bond (1991) estimation method is based on first differencing of the regression equation. However, Blundell and Bond (1998) criticized the first-differenced DPD estimator to have poor finite sample properties when series are persistent. To solve this problem, recently, Arellano and Bover (1995) and Blundell and Bond (1998) offered a system GMM method in which a system of first-differenced GMM and the level equations are estimated. Blundell and Bond (1998) and Blundell, Bond and Windmeijer (2000), using Monte Carlo methodology, indicate that the system GMM estimator produces more efficient estimates for finite samples. There are two post-estimation diagnostics for this method. First, using Sargan test of overidentifying restrictions, the assumption of no correlation between the error term and the instruments can be tested. This test statistic has a χ^2 distribution with j-k degrees of freedom, where j is the number of instruments and k is the number of endogenous variables. The other diagnostic is checking whether differenced residuals exhibit significant second order autocorrelation, i.e. AR(2). In case of second order autocorrelation, it will not be appropriate to use the second lags of endogeneous variables for their current values.

3. Empirical Results

The estimation results are reported in Table 2. The estimation results in Table 2 are reported in four panels. In the first two panels, TA based market concentration measures are used in the model whereas in panels 2 and 4, TD based concentration measures are employed. First, we observe that in each model, lagged dependent variable has a positive and statictically significant coefficient, indicating the persistence of advertising intensity. The estimated coefficient of the price-cost margin (PCM) is positive and statistically significant in each model, as expected. This is in line with the existing literature and theoretical predictions that greater profit implies greater intensity to advertise.

The coefficients of concentration measures except for the asset-based measures of HHI, are statistically significant and the signs provide evidence towards the U-shaped relationship between market concentration and advertising intensity. The turning point level of market concentration is denoted by λ [vi]. These turning point values are reported in Table 2. The results indicate that advertising intensity declines with the increase in market concentration at initial phases of concentration whereas banks are inclined to allocate more to advertising as concentration becomes more powerful. Bank size has a significant and positive impact on the advertising intensity only in deposit-based models (panels 3 and 4). The coefficient on the variable, FOR, implies that the advertising intensity of foreign nd domestic banks do not vary significantly. Another finding is about the control variable denoting the impact of the recent global financial crisis on banks' advertising decisions. Coefficient of the CRIS variable in each model is negative however significant only in the first and third models, indicating the adverse effect of the crisis on the advertising expenses of the banks.

Sargan test and Arrelano-Bond test statistics exert the validity of the models and instruments. Moreover, F-statistic fro each model denotes that the models are overall significant.

Table 2. Estimation Results

Variables	(1)TA	(2)TA	(3)TD	(4)TD
ADV(-1)	0.758*	0.756*	0.734*	0.758*
	(0.021)	(0.021)	(0.021)	(0.021)
PCM	0.0315*	0.035*	0.033*	0.097*
	(0.006)	(0.005)	(0.005)	(0.016)
CR4	-0.635**	-	-1.621*	-
	(0.281)		(0.333)	
$CR4^2$	0.577**	-	1.488*	-
	(0.252)		(0.303)	
HHI	-	-0.029	-	-0.474**
		(0.386)		(0.226)
HHI^2	-	0.184	-	2.009**
		(1.716)		(0.968)
SIZE	-0.002	0.0001	0.004*	0.0001*
	(0.002)	(0.002)	(0.001)	(0.0002)
FOR	-0.003	0.0002	0.001	0.0009
	(0.009)	(0.0009)	(0.009)	(0.0009)
CRIS	-0.007**	-0.0004	-0.002*	-0.0004
	(0.003)	(0.0003)	(0.0003)	(0.0003)
Constant	0.179**	-0.001	0.437*	-0.027**
	(0.079)	(0.024)	(0.091)	(0.014)
λ	0.550	788.04	0.544	1179.69
Sargan test (p-value)	15.968 (1.000)	17.172(1.000)	16.335 (1.000)	15.215 (1.000)
Arellano–Bond test for AR(1)	Prob>z=0.0019	Prob>z=0.00560	Prob>z=0.0026	Prob>z=0.0022
Arellano–Bond test for AR(2)	Prob>z=0.1902	Prob>z=0.3539	Prob>z=0.1550	Prob>z=0.1590
F-statistic	1531.73	1538.21	1614.15	1479.15

Note: The numbers in parentheses denote the standard errors. *, **, *** indicate significance at 1, 5, and 10 percent levels, respectively. The estimation results for the models in which CR4 is used as the market concentration measure are reported in Panel 1 and Panel 3. Panel 2 and Panel 4 are devoted to the results for the models in which HHI is used as the market concentration measure. λ indicates the turning point level of the market concentration.

Overall, the results reveal that there is a U-shaped relationship between the market concentration and advertising intensity of the banks. Particularly, advertising intensity of Turkish banks become stronger over the periods of higher concentration. Expectedly, more profitable banks tend to allocate more to advertising. Our results are

similar to the findings of Willis and Rogers (1998) in the way that advertising intensities are higher in case of higher concentration and greater price-cost margins.

4. Conclusions

This paper investigates the existence of non-linear relationship between advertising intensity and market concentration in the Turkish banking industry. Data set covers the sample of deposit banks over the period 2006q4:2015q2.

We have estimated four different models using two different measures of market concentration (namely CR4 and HHI) based on total assets and total deposits. To take into account the persistent characteristic of advertising intensity, one lagged value of the dependent variable is also used in the models. Estimations results obtained through System GMM support the persistent characteristic of advertising intensity. Moreover, there exists a non-linear relationship between advertising intensity and the results indicate a U-shaped relationhip. U-shaped relationship implies that advertising intensity declines with market concentration in low levels of concentration. However, as the banking market becomes more concentrated, banks tend to allocate more on advertising. Another important finding is that more profitable banks invest more on advertising. The results of the paper also suggest that there is no significnat difference between foreign and domestic banks in terms of advertising intensity whereas recent global financial crisis has led to a small but negative impact on advertising expenses of Turkish banks.

The profit motivation of the banks in a competitive environment has led to greater interest in non-price competition methods. Overall, the findings of the paper reflect that, advertising, a popular non-price competition mechanism, has become one of the important sources of expense for Turkish banks. Moreover, this effect has been obvious particularly over the periods of intense concentration.

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[i] Lee (2002) find such a characteristic for consumer good industries.

[ii] Lee (2002) find such a characteristic for producer good industries.

[iii] As stated by Ors (2003) and Becker and Murphy, 1993) complementary view suggests that since advertising complements the consumption of the good it should be considered in the consumer's utility function as another argument.

[iv] Another measure of price-cost margin is also calculated using the ratio of difference between interest income and interest expenses to total loans. Similar results are obtained and the findings are available upon request.

[v] [v] A bank is defined as "foreign" if more than 50 percent of total assets are owned by foreigners.

[vi] λ gives the turning point concentration ratio where advertising intensity is at minimum. λ is calculated as $\lambda = \beta_3 / 2\beta_4$.