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## Cover Page Footnote

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# Determinants of Competitive Advantage for Sport Firms: Using Public Big Data in Korea

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## Abstract

This study examines the determinants of competitive advantage with respect to economic performance of sport firms. Logit regressions estimated dependent variables of economic performance measures based on sales per capita of firms. Determinants of competitive advantage were estimated by efficiency indicators, organization characteristic indicators, and industry classification indicators. Increase in efficiency was a significant determinant of competitive advantage as well as organizational type, size of human resource, diversification of products, and sales growth rate. Operationalizing competitive advantage as outperforming the market average and better than the top 10%, the logit regression model provides means for sport firms to analyze industry data to evaluate their own performance. Namely, including efficiency estimates showed practical significance for market analysis.

**Keywords**: *competitive advantage, sport firms, economic performance*

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## Introduction

Competitive advantage of a firm arises when it creates better economic performance than its competitors in a specified market (Sigalas et al., 2013). Factors affecting competitive advantage were investigated in this study to better understand how certain sport businesses may gain a competitive advantage or their sport business rivals. Specifically, by helping a company harness their data and identify new opportunities, the application of big data analytics represents a significant area for better understanding the determinants (e.g., factors such as firm resources) of competitive advantage (George et al., 2016). Thus, the investigation of sport industry-wide data should contribute to a more thorough understanding of competitive advantage.

The main objective of this study is to understand the determinants of competitive advantage for sport firms and use this understanding to demonstrate how public big data represents a valuable source for analytic modeling that sport management scholars and practitioners can exploit. Public microdata provided by the Korean government was analyzed for the purpose of this study. By modeling sport firm performance, practical implications for market analysis should be gained by sport professionals.

Based on Barney's (1995) pivotal work of resource-based view (RBV), the current study focused on the micro-internal resources of a firm based on organizational characteristics and its efficiency. A RBV has been particularly useful to study heterogeneity of firms leading to competitive advantage (Bhawsar & Chattopadhyay, 2015; Powell & Lloyd, 2005). Hence, we a firm's micro-internal factors based on efficiency and organizational characteristics should predict competitive advantage.

A logit regression was used to estimate competitive advantage using dichotomous situations of firm performance as dependent variables on whether their (1) sales per capita was bigger than market average and (2) sales per capita was bigger than market's top 10%. Such operationalization of competitive advantage promotes the use of logit modeling for market analysis. Each dichotomous outcome of competitive advantage was estimated by 17 variables, consisting of efficiency indicators calculated by Data Envelopment Analysis (DEA), organization characteristic indicator variables (i.e., age, organization type, workers, growth rate, diversification, and profit characteristics), and dummy variables of industry classification.

## Modeling Method

The 2017 *Survey on the Sports Industries* consisted of 11,332 microdata collected by a stratified sampling method from a population of 95,387 sport firms (Statistics Korea, n.d.). *Survey on the Sports Industries* provides a special classification system for the sport industry where microdata is aggregated from 65 segmented fields. The latest accessible data with sufficient microdata of sport firms were the 2017 report due to the embargo periods of public data. The microdata reported in 2017 also included statistics based on the national economic census held in 2015 which in result provided rich information aggregating more than 12,000 firm information. The classification we used based on the large, middle, and small level categories are reported in Table 1. Sport information services categories were merged and then scrutinized to be excluded from the model to avoid the dummy trap (Gujarati, 2004).

**Table 1**
*Korean Sport Industry Classification and Available Data*

| Classification Categories | Code | Data |
|---|---|---|
| Sport facility | | |
| Sport facility operation | | |
| Arena and stadium operation | 10101 | 123 |
| Participation sport facility operation | 10102 | 3709 |
| Golf course and skiing facility operation | 10103 | 318 |
| Water sport facility operation | 10104 | 280 |
| Other sport facility operation | 10199 | 458 |
| Sport facility construction | | |
| Sport construction | 10200 | 266 |
| Sporting goods | | |
| Sport game & exercise goods | | |
| Sporting goods manufacturing | 20101 | 347 |
| Sport clothes & textile product manufacturing | 20102 | 246 |
| Sport bags and shoes manufacturing | 20103 | 119 |
| Sporting goods distribution & rental | | |
| Sporting goods wholesaling | 20201 | 500 |
| Sporting goods retailing | 20202 | 1769 |
| Sporting goods rental | 20203 | 85 |
| Sport services | | |
| Sport game services | | |
| Sport gaming | 30101 | 42 |
| Sport betting | 30102 | 35 |
| Sport marketing | 30103 | 327 |
| Sport information services | | |
| Sport media | 30201 | 25 |
| Other sport information services | 30299 | 1 |
| Sport educational institution | | |
| Sport education institution | 30300 | 2319 |
| Other sport services | | |
| Sport online/mobile game development and suppy | 39901 | 20 |
| Sport travel | 39902 | 343 |
| Total | | 11332 |

### Competitive Advantage Indicators

In line the studies that have used above-average performance as the dependent variable (Newbert, 2008; Schoemaker, 1990; Sigalas et al., 2013), two competitive advantage indicators were used as dependent variables. Sales average variable (*Sales_D_avg*) was generated based on whether an organization's sales per capita is bigger than the average sales per capita pooled from its respective classification category. Sales in top 10% variable (*Sales_D_10*) was generated based on whether an organization's sales per capita is bigger than a given industry's top 10%.

### Efficiency Indicators

An input-oriented Banker, Charnes, and Cooper (BCC) model (Banker et al., 1984) was used for efficiency indicators. This was done by using sales as the output and total production cost, total selling, general/administrative expenses, and number of workers as input variables. The input-oriented BCC model calculates efficiency based on how a unit can reduce inputs maintaining the level of output. This allows variability to the scale by adding a convexity constraint which is a sum of weight restriction. BCC model allows variability to the scale by adding a convexity constraint which is a sum of weight restriction of $\sum_k^n w_k = 1$ to the dual problem of the ratio model:

$$Min\ E_0 = \delta$$

$$s.t. \quad \sum_{k=1}^{n} w_k X_{ik} + S_i^- = \delta X_{i0}\,, \qquad i = 1, 2, \ldots, m$$

$$\sum_{k=1}^{n} w_k Y_{jk} + S_j^+ = Y_{j0}\,, \qquad j = 1, 2, \ldots, m$$

$$\sum_{k=1}^{n} w_k = 1$$

$$S_i^-, S_j^+, w_k \geq 0 \qquad \forall\, i, j, k$$

In provided equation, efficiency measure of $E_0$ is shown as an efficiency value of $\delta$, where $w_k$ is the weight for each decision making unit to exist on the frontier; $X_{ik}$ and $Y_{jk}$ are decision making unit *k*'s $i^{th}$ input and $j^{th}$ output; and $S_i^-$ and $S_j^+$ are slack variables for input and output. Rstudio IDE (Racine, 2012) version 1.3 was used to compute the indicators of efficiency (*Efficiency1*) and its squared value (*Efficiency2*). The squared value was added to examine whether the relation between efficiency and competitive advantage was linear or quadratic.

### Organization Characteristics Indicators

Organizational characteristic indicator variables are shown in Table 2. The firm's age was calculated by the difference between the survey year and the founding year of an organization (*Age*). There were five organization types: private/sole-proprietorship (*Form_Private*); incorporated company (*Form_Inc*); non-business corporation (*Form_NoBusiness*); unincorporated association (*Form_UnInc*); and governmental organization. The four available organization type variables were coded as dummy variables. For the number of workers, total number of workers *(lnWorkers*), female worker ratio (*Female_ratio*), and temporary worker ratio (*Temp_ratio*) were used. For growth rate, sales change compared to sales in the previous year (*Sales_growth*) was used. Product diversification had two variables: the number of product type (*Product_type_N*)

and product diversity dummy (*Product_Diverse*). Regional diversity had two variables: existence of export (*Export*) and the foreign sales ratio (*Forgn_sales_ratio*). There were two profit characteristics variables: profit margin ratio (*Profit_Marg_R*) and a dummy variable (*Profit_R_avg*) to check whether the profit margin ratio is bigger than a given market's average. Summary statistics of the variables are given in Table 3.

**Table 2**
*Variable List and Description*

| Variable | Description |
|---|---|
| ***Sales_D_avg*** | Organization's sales per capita is bigger than a given market average(1=Yes) |
| ***Sales_D_10*** | Organization's sales per capita is bigger than a given market's top 10%(1=Yes) |
| ***Age*** | Age of an organization in the survey year, 2017 |
| ***Form_Private*** | Organizational form is 'Individual proprietorship'(1=Yes) |
| ***Form_Inc*** | Organizational form is 'Incorporated company'(1=Yes) |
| ***Form_NoBusiness*** | Organizational form is 'Non-business corporation'(1= Yes) |
| ***Form_UnInc*** | Organizational form is 'Unincorporated association'(1=Yes) |
| ***lnWorkers*** | Logarithm of total workers in an organization |
| ***Female_ratio*** | Female worker ratio to the total number of workers |
| ***Temp_ratio*** | Temporary worker ratio to the total number of workers |
| ***Forgn_sales_ratio*** | Foreign sales ratio to total sales(%) |
| ***Sales_growth*** | Sales growth rate(%) reported in survey compared to previous year's sales |
| ***Product_type_N*** | Number of product type |
| ***Prduct_Diverse*** | Product diversification, whether the product type is more than 2(1= Yes) |
| ***Export*** | Foreign market diversification, whether there is export(1= Yes) |
| ***Efficiency1*** | Efficiency index(%) calculated by Data Envelopment Analysis(DEA) |
| ***Efficiency2*** | Square of the above efficiency index |
| ***Profit_Marg_R*** | Profit margin ratio, i.e., profits/sales |
| ***Profit_R_avg*** | A firm's profit margin ratio is larger than a given market average(1=Yes) |
| ***Mkt_s10101*** | Given market is 'Arena and stadium operation'(1=Yes) |
| ***Mkt_s10102*** | Given market is 'Participation sport facility operation'(1=Yes) |
| ***Mkt_s10103*** | Given market is 'Golf course and skiing facility operation'(1=Yes) |
| ***Mkt_s10104*** | Given market is 'Water sport facility operation'(1=Yes) |
| ***Mkt_s10199*** | Given market is 'Other sport facility operation'(1=Yes) |
| ***Mkt_s10200*** | Given market is 'Sport construction'(1=Yes) |
| ***Mkt_s20101*** | Given market is 'Sporting goods manufacturing'(1=Yes) |
| ***Mkt_s20102*** | Given market is 'Sport clothes & textile product manufacturing'(1=Yes) |
| ***Mkt_s20103*** | Given market is 'Sport bags and shoes manufacturing'(1=Yes) |
| ***Mkt_s20201*** | Given market is 'Sporting goods wholesaling'(1=Yes) |
| ***Mkt_s20202*** | Given market is 'Sporting goods retailing'(1=Yes) |
| ***Mkt_s20203*** | Given market is 'Sporting goods rental'(1=Yes) |
| ***Mkt_s30101*** | Given market is 'Sport game'(1=Yes) |
| ***Mkt_s30102*** | Given market is 'Sport betting'(1=Yes) |
| ***Mkt_s30103*** | Given market is 'Sport marketing'(1=Yes) |

**Table 2 Continued**

| Variable | Description |
|---|---|
| ***Mkt_s30300*** | Given market is 'Sport educational institution'(1=Yes) |
| ***Mkt_s39901*** | Given market is 'Sport online/mobile game development and supply'(1=Yes) |
| ***Mkt_s39902*** | Given market is 'Sport travel'(1=Yes) |

**Table 3**

*Summary Statistics for the Variables (N=11,332)*

| Variable | *M* | *SD* | Min | Max |
|---|---|---|---|---|
| ***Sales_D_avg*** | .280 | .449 | 0 | 1 |
| ***Sales_D_10*** | .096 | .294 | 0 | 1 |
| ***Age*** | 9.956 | 9.747 | 0 | 109 |
| ***Form_Private*** | .707 | .455 | 0 | 1 |
| ***Form_Inc*** | .213 | .409 | 0 | 1 |
| ***Form_NoBusiness*** | .044 | .206 | 0 | 1 |
| ***Form_UnInc*** | .012 | .109 | 0 | 1 |
| ***lnWorkers*** | 1.272 | 1.311 | -4.605 | 8.198 |
| ***Female_ratio*** | .339 | .325 | 0 | 1 |
| ***Temp_ratio*** | .100 | .221 | 0 | 1 |
| ***Forgn_sales_ratio*** | .609 | 5.847 | 0 | 100 |
| ***Sales_growth*** | -6.338 | 16.277 | -120 | 300 |
| ***Product_type_N*** | .544 | 1.127 | 0 | 5 |
| ***Prduct_Diverse*** | .117 | .322 | 0 | 1 |
| ***Export*** | .034 | .182 | 0 | 1 |
| ***Efficiency1*** | 31.088 | 24.943 | .511 | 100 |
| ***Efficiency2*** | 1588.57 | 2392.93 | .261 | 10000 |
| ***Profit_Marg_R*** | .100 | 2.057 | -139.94 | 0.9996 |
| ***Profit_R_avg*** | .428 | .495 | 0 | 1 |
| ***Mkt_s10101*** | .011 | .104 | 0 | 1 |
| ***Mkt_s10102*** | .327 | .469 | 0 | 1 |
| ***Mkt_s10103*** | .028 | .165 | 0 | 1 |
| ***Mkt_s10104*** | .025 | .155 | 0 | 1 |
| ***Mkt_s10199*** | .040 | .197 | 0 | 1 |
| ***Mkt_s10200*** | .023 | .151 | 0 | 1 |
| ***Mkt_s20101*** | .031 | .172 | 0 | 1 |
| ***Mkt_s20102*** | .022 | .146 | 0 | 1 |
| ***Mkt_s20103*** | .011 | .102 | 0 | 1 |
| ***Mkt_s20201*** | .044 | .205 | 0 | 1 |
| ***Mkt_s20202*** | .156 | .363 | 0 | 1 |
| ***Mkt_s20203*** | .008 | .086 | 0 | 1 |
| ***Mkt_s30101*** | .004 | .061 | 0 | 1 |
| ***Mkt_s30102*** | .003 | .055 | 0 | 1 |

**Table 3 Continued**

| Variable | *M* | *SD* | Min | Max |
|---|---|---|---|---|
| ***Mkt_s30103*** | .029 | .167 | 0 | 1 |
| ***Mkt_s30300*** | .205 | .403 | 0 | 1 |
| ***Mkt_s39901*** | .002 | .042 | 0 | 1 |
| ***Mkt_s39902*** | .030 | .171 | 0 | 1 |

### Emperical Models

The following empirical models were equated to estimate the determinants of competitive advantage. Logit regression was performed using maximum likelihood estimation.

(1) Sales_D_avg

$$=\beta_0+\beta_1\text{Age}+\beta_2\text{Form\_Private}+\beta_3\text{Form\_Inc}+\beta_4\text{Form\_NoBusiness}$$
$$+\beta_5\text{Form\_UnInc}+\beta_6\text{lnWorkers}+\beta_7\text{Female\_ratio}+\beta_8\text{Temp\_ratio}$$
$$+\beta_9\text{Forgn\_sales\_ratio}+\beta_{10}\text{Sales\_growth}+\beta_{11}\text{Product\_type\_N}$$
$$+\beta_{12}\text{Prduct\_Diverse}+\beta_{13}\text{Export}+\beta_{14}\text{Efficiency1}+\beta_{15}\text{Efficiency2}$$
$$+\beta_{16}\text{Profit}_{\text{Marg}_R}+\beta_{17}\text{Profit}_{\text{R}_{avg}}+\gamma_1\text{Mkt}_{s10101}+\gamma_2\text{Mkt}_{s10102}$$
$$+\gamma_3\text{Mkt}_{s10103}+\gamma_4\text{Mkt}_{s10104}+\gamma_5\text{Mkt}_{s10199}+\gamma_6\text{Mkt}_{s10200}$$
$$+\gamma_7\text{Mkt\_s20101}+\gamma_8\text{Mkt\_s20102}+\gamma_9\text{Mkt\_s20103}+\gamma_{10}\text{Mkt\_s20201}$$
$$+\gamma_{11}\text{Mkt\_s20202}+\gamma_{12}\text{Mkt\_s20203}+\gamma_{13}\text{Mkt\_s30101}+\gamma_{14}\text{Mkt\_s30102}$$
$$+\gamma_{15}\text{Mkt\_s30103}+\gamma_{16}\text{Mkt\_s30300}+\gamma_{17}\text{Mkt\_s39901}+\gamma_{18}\text{Mkt\_s39902}+\varepsilon$$

(2) Sales_D_10

$$=\beta_0+\beta_1\text{Age}+\beta_2\text{Form\_Private}+\beta_3\text{Form\_Inc}+\beta_4\text{Form\_NoBusiness}$$
$$+\beta_5\text{Form\_UnInc}+\beta_6\text{lnWorkers}+\beta_7\text{Female\_ratio}+\beta_8\text{Temp\_ratio}$$
$$+\beta_9\text{Forgn\_sales\_ratio}+\beta_{10}\text{Sales\_growth}+\beta_{11}\text{Product\_type\_N}$$
$$+\beta_{12}\text{Prduct\_Diverse}+\beta_{13}\text{Export}+\beta_{14}\text{Efficiency1}+\beta_{15}\text{Efficiency2}$$
$$+\beta_{16}\text{Profit\_Marg\_R}+\beta_{17}\text{Profit\_R\_avg}+\gamma_1\text{Mkt\_s10101}+\gamma_2\text{Mkt\_s10102}$$
$$+\gamma_3\text{Mkt\_s10103}+\gamma_4\text{Mkt\_s10104}+\gamma_5\text{Mkt\_s10199}+\gamma_6\text{Mkt\_s10200}$$
$$+\gamma_7\text{Mkt\_s20101}+\gamma_8\text{Mkt\_s20102}+\gamma_9\text{Mkt\_s20103}+\gamma_{10}\text{Mkt\_s20201}$$
$$+\gamma_{11}\text{Mkt\_s20202}+\gamma_{12}\text{Mkt\_s20203}+\gamma_{13}\text{Mkt\_s30101}+\gamma_{14}\text{Mkt\_s30102}$$
$$+\gamma_{15}\text{Mkt\_s30103}+\gamma_{16}\text{Mkt\_s30300}+\gamma_{17}\text{Mkt\_s39901}+\gamma_{18}\text{Mkt\_s39902}+\varepsilon$$

## Results and Discussion

Model estimation results are reported in Table 4. In interpreting the results, special attention should be given to the direction of the coefficients of explanatory variables as well as its statistical significance, as a positive sign means that the probability of belonging to the competitive advantage group increases due to the property of the logistic function. In other words, the direction of the probability is easily recognized from the logistic function property even though the specific marginal effect of an explanatory variable should be calculated again from the result. The calculated value of the marginal effect of a given explanatory variable in each model is reported in Table 4 as a column of dy/dx.

**Table 4**

*Estimation Result (N=11,332)*

| | ***Sales_D_avg*** | | | | ***Sales_D_10*** | | | |
|---|---|---|---|---|---|---|---|---|
| Variables | Coeff. | *SE* | *p* | dy/dx | Coeff. | *SE* | *p* | dy/dx |
| ***Age*** | -0.013 | 0.003 | 0.000 | -0.0023 | -0.010 | 0.004 | 0.007 | -0.0007 |
| ***Form_Private*** | -0.022 | 0.166 | 0.894 | -0.0038 | -0.193 | 0.260 | 0.458 | -0.0137 |
| ***Form_Inc*** | 0.802 | 0.169 | 0.000 | 0.1390 | 0.948 | 0.260 | 0.000 | 0.0675 |
| ***Form_NoBusiness*** | 0.080 | 0.191 | 0.675 | 0.0139 | 0.257 | 0.286 | 0.368 | 0.0183 |
| ***Form_Uninc*** | -0.651 | 0.308 | 0.034 | -0.1130 | -0.286 | 0.442 | 0.517 | -0.0204 |
| ***lnWorkers*** | 0.369 | 0.028 | 0.000 | 0.0641 | 0.303 | 0.038 | 0.000 | 0.0216 |
| ***Female_ratio*** | -0.046 | 0.072 | 0.523 | -0.0080 | 0.220 | 0.107 | 0.041 | 0.0157 |
| ***Temp_ratio*** | -0.370 | 0.117 | 0.002 | -0.0642 | -0.251 | 0.204 | 0.220 | -0.0179 |
| ***Forgn_sales_ratio*** | 0.0001 | 0.005 | 0.979 | 0.00002 | -0.003 | 0.007 | 0.691 | -0.0002 |
| ***Sales_growth*** | 0.012 | 0.002 | 0.000 | 0.0020 | 0.016 | 0.002 | 0.000 | 0.0011 |
| ***Product_type*** | -0.115 | 0.069 | 0.095 | -0.0199 | -0.061 | 0.112 | 0.585 | -0.0044 |
| ***Prduct_Diverse*** | 0.873 | 0.187 | 0.000 | 0.1515 | 0.614 | 0.302 | 0.042 | 0.0437 |
| ***Export*** | -0.120 | 0.168 | 0.474 | -0.0208 | -0.139 | 0.247 | 0.573 | -0.0099 |
| ***Efficiency1*** | 0.099 | 0.004 | 0.000 | 0.0171 | 0.135 | 0.006 | 0.000 | 0.0096 |
| ***Efficiency2*** | -0.001 | 0.000 | 0.000 | -0.0001 | -0.001 | 0.000 | 0.000 | -0.0001 |
| ***Profit_Marg_R*** | 0.144 | 0.056 | 0.010 | 0.0250 | 0.043 | 0.057 | 0.450 | 0.0031 |
| ***Profit_R_avg*** | -0.301 | 0.054 | 0.000 | -0.0522 | -0.672 | 0.084 | 0.000 | -0.0479 |
| ***Mkt_s10101*** | 1.104 | 0.526 | 0.036 | 0.1915 | 2.382 | 0.847 | 0.005 | 0.1697 |
| ***Mkt_s10102*** | 2.456 | 0.466 | 0.000 | 0.4259 | 4.018 | 0.772 | 0.000 | 0.2862 |
| ***Mkt_s10103*** | 0.470 | 0.479 | 0.327 | 0.0815 | 1.949 | 0.789 | 0.014 | 0.1388 |
| ***Mkt_s10104*** | 1.645 | 0.480 | 0.001 | 0.2854 | 2.579 | 0.794 | 0.001 | 0.1837 |
| ***Mkt_s10199*** | 1.430 | 0.472 | 0.002 | 0.2481 | 2.361 | 0.782 | 0.003 | 0.1682 |
| ***Mkt_s10200*** | 1.334 | 0.484 | 0.006 | 0.2314 | 2.184 | 0.797 | 0.006 | 0.1555 |
| ***Mkt_s20101*** | 1.994 | 0.487 | 0.000 | 0.3458 | 2.435 | 0.806 | 0.003 | 0.1735 |
| ***Mkt_s20102*** | 1.400 | 0.496 | 0.005 | 0.2428 | 1.761 | 0.817 | 0.031 | 0.1255 |
| ***Mkt_s20103*** | 0.586 | 0.515 | 0.255 | 0.1016 | 0.439 | 0.859 | 0.610 | 0.0312 |
| ***Mkt_s20201*** | 1.445 | 0.483 | 0.003 | 0.2506 | 2.499 | 0.797 | 0.002 | 0.1780 |
| ***Mkt_s20202*** | 2.771 | 0.479 | 0.000 | 0.4805 | 4.455 | 0.789 | 0.000 | 0.3173 |
| ***Mkt_s20203*** | 0.962 | 0.533 | 0.071 | 0.1669 | 1.576 | 0.882 | 0.074 | 0.1123 |
| ***Mkt_s30101*** | -0.379 | 0.575 | 0.510 | -0.0657 | -0.240 | 0.928 | 0.796 | -0.0171 |
| ***Mkt_s30102*** | -0.429 | 0.636 | 0.500 | -0.0743 | -0.089 | 1.028 | 0.931 | -0.0063 |
| ***Mkt_s30103*** | 1.161 | 0.488 | 0.017 | 0.2014 | 2.395 | 0.797 | 0.003 | 0.1706 |
| ***Mkt_s30300*** | 1.579 | 0.465 | 0.001 | 0.2739 | 2.841 | 0.771 | 0.000 | 0.2023 |
| ***Mkt_s39901*** | -0.351 | 0.688 | 0.610 | -0.0608 | 0.417 | 1.087 | 0.701 | 0.0297 |
| ***Mkt_s39902*** | 0.716 | 0.483 | 0.138 | 0.1242 | 1.748 | 0.792 | 0.027 | 0.1245 |
| ***Intercept*** | -5.296 | 0.512 | 0.000 | | -9.024 | 0.836 | 0.000 | |
| Model's Significance Test and Goodness of Fit | Log likelihood | | -5,899 | | Log likelihood | | -2,847 | |
| | LR $x^2$ (36) | | 1631.02 | | LR $x^2$ (35) | | 1464.71 | |
| | Prob>$x^2$ | | 0.000 | | Prob>$x^2$ | | 0.000 | |
| | Pseudo $R^2$ | | 0.1215 | | Pseudo $R^2$ | | 0.2046 | |

Note. 1. Coeff.=coefficients of the estimated models, *SE*=standard errors of the estimated coefficients, *P*=*p*-value of the estimated coefficients, and dy/dx=the marginal effect of the each variable in the models. 2. Model's significance test was done by Likelihood Ratio test (LR) and the model's Goodness of Fit was measured by pseudo $R^2$.

### Efficiency Indicators

The coefficient of *Efficiency1* was statistically significant and positive, indicating that an increase in a firm's efficiency increased the probability for the firm to be competitively advantageous. However, the negative sign of the square value, *Efficiency2*, indicates that this increase has a diminishing marginal effect so that efficiency increase is not linearly proportional to the competitive advantage. Hence, a unique quadratic variance is also explained in the current model when holding other variables constant. In this respect, a firm may need to first set a desired level of competitive advantage to meet a minimum level of efficiency.

### Organizational Characteristic Indicators

There were four statistically significant and positive organizational characteristic variables; *Form_Inc, lnWorkers, Sales_growth*, and *Product_Diverse*. There were also three statistically significant but negative indicators: *Age, Form_UnInc*, and T*emp_ratio*). The negative effect of *Age* implies that inertia caused by age may have a negative impact on the competitive advantage (Koch & Windsperger, 2017).

Organization type of being incorporated was a source of competitive advantage as incorporated companies had a positive impact and unincorporated associations had a negative impact. The positive effect of total number of workers on competitiveness implies that an increase in organization size may increase the operational resources for superior performance whereas the temporary worker ratio had a negative effect on the probability of being competitively advantageous. This is consistent with other research on firm performance (e.g., Roca-Puig et al., 2012). The sales growth rate positively impacted competitiveness, while only the product diversity dummy showed a positive effect on competitiveness for the diversification. It is worth mentioning that a firm with only one product were less competitive, while a greater number of products did not linearly lead to competitiveness when holding other variables constant. This result aligns with previous findings, such as the work of Hitt et al. (1997), that has shown diversification strategy has a positive impact on competitive advantage.

### Industry Classification Categories

Based on the classification categories, 11 coefficients were statistically significant and positive (see Table 4). Sport organizations in these subindustries showed a relatively higher probability of having competitive advantage than other firms. Specifically, the subindustry *Mkt_s20202* had the highest marginal effect, implying that sporting goods manufacturing firms were most likely to be competitively advantageous within the Korean sport industry.

This tendency is similar in the stricter model using the dependent variable of *Sales_D_10*. The difference between the two models was that two additional industries, *Mkt_s10103* and *Mkt_s39902*, showed significance in the *Sales_D_10* model. This implies that a relatively smaller number of firms of the two subindustries are included in the competitive group. Checking the characteristics of these two subindustries data, the cross-tabulation analysis indicated only 7.6% and 9.3% of the firms were included in the competitively advantageous group of top 10% sales per capita and the distribution graph showed that tails were longer and skewed into the top 10% sales per capita in the histogram. Comparing the two, the subindustry *Mkt_s10103* had a higher probability than the subindustry *Mkt_s39902*.

### Profit Margin Ratio on Sales per Capita

*Profit_Marg_R* was statistically significant and positive. This result suggests that profitability increases the probability to enter the competitively advantageous group. However, the effect of the dummy variable *Profit_R_avg* was statistically significant and negative, implying that firms in a subindustry with a higher profit margin ratio than the average of the given market has a rather lower probability to enter the competitive advantage group in terms of sales criteria. In other words, the firms with lower-than-av-

erage profitability had a higher probability of belonging to the competitively advantageous group than the firms with higher-than-average profitability when holding other variables constant. Based on the data from Korean firms, even when considering the positive effect size of profit margin ratio, the economy of scale mattered more than maintaining higher profit margins. That is to say, considering the efficiency of a firm based on increasing market shares in larger markets may be a better strategy compared to focusing on margins in smaller markets. This result is further evidenced in the cross tables reported in Table 5.

Table 5 shows there were more firms with lower-than-average profitability in the competitive advantage group than those with higher-than-average profitability. Also, for the model with stricter criteria of predicting *Sales_D_10, Profit_Marg_R* did not show statistical significance. These results imply that substantial market share should be strategically prioritized to increase sales.

**Table 5**

*Cross tables between profitability measure and sales per capita measures*

| Profit Margin Ratio Above Average or Not | Sales_per_Capita Above Average or Not | | | Sales_per_Capita Above Top 10% or Not | | |
|---|---|---|---|---|---|---|
| | Below | Above | Total | Below | Above | Total |
| Below | 6,197 | 1,993 | 8,190 | 7,467 | 723 | 8,190 |
| Average | 3,819 | 1,484 | 5,303 | 4,819 | 484 | 5,303 |
| Total | 10,016 | 3,477 | 13,493 | 12,286 | 1,207 | 13,493 |

*Note.* Unit is number of firms.

## Conclusions and Limitations

The current paper adds evidence of organizational micro factors affecting economic performance, particularly in sport-related industries. Evidence from this analysis indicates that a firm with higher efficiency through better management of its inputs and outputs was able to achieve competitive advantage within the industry. Additionally, corporate organizations with greater human resources, higher sales growth, and more diverse products were likely to be competitive. Therefore, based on the aspiration level a firm sets (e.g., whether it is to perform higher than industry average or to be in top 10%), sport-related firms may carefully determine the level of efficiency, whether to change its organizational type, the size of its human resources, and the magnitude of investment in sales.

Moving forward, more international efforts to aggregate and publicly open big data are recommended. Such data can be invaluable to both academia and practitioners to scrutinize industry trends, consumer and firm behavior, and firm management. Even so, investigating competitive advantage of firms through public data may not be sufficient. For example, other determinants of competitive advantage such as innovation or human resource may not be captured by public data. Thus, a better comprehension of the complexity of competitive advantage could be achieved through strategically merging both public and private data. In addition, while the scope of the current study was limited to operationalizing sales data as the above-average performance (i.e., competitive advantage indicators), some micro-internal predictors such as efficiency indicators, sales growth, and profit margin ratio could be considered as competitive advantage indicators or mediators in future studies.

Sport practitioners can benefit from adopting the operationalizations of competitive advantage variables and the efficiency variables used in this study. Managers, regardless of whether they are in Korea or the United States, can use these modeling techniques to set their goals for competitiveness and

efficiency levels. Furthermore, when larger datasets are consistently accumulated, machine learning for setting those goals and automated analytical modeling could be implemented for strategic competitive advantage management.

The results of this study could be significantly different in other economies such as those found in Europe or North America where the media market and stadium business is much larger than the Korean industry. For instance, according to an annual report of sport industry in Korea, business in 2017 was related to Sport facility (37.8%), Sporting goods (35.4%), and Sport service (26.5%), respectively (Ministry of Culture, Sports and Tourism, 2017). Europe and North America may be different, which is why the nature of the industry should be considered first to better understand the determinants of competitive advantage in a specific context.

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