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# Product market competition and organization capital

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*Reference:* Shin, Ilhang/Lee, Hansol (2023). Product market competition and organization capital. In: Economics and Business Letters 12 (1), S. 10 - 19.

<https://reunido.uniovi.es/index.php/EBL/article/download/17509/15574/57018>.

doi:10.17811/ebl.12.1.2023.10-19.

This Version is available at:

<http://hdl.handle.net/11159/15825>

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## Product market competition and organization capital

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*Received: 29 November 2021*

*Revised: 14 October 2022*

*Accepted: 26 October 2021*

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### Abstract

This study examines the impact of product market competition on a firm's investment in organization capital using a sample of Korean, listed firms during 2001–2020. As the high product market competition provides firms with incentives to build competitive advantages and increase productivity, we hypothesize that increases in product market competition drive firms to invest in organization capital. We found a positive relationship between product market competition and a firm's investment in organization capital. We also found that such a relationship is more pronounced for firms in the high-tech industry and financially distressed firms.

*Keywords:* product market competition; organization capital; investment; intangible assets

*JEL Classification Codes:* D24, E22, L10, L20

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### 1. Introduction

According to the literature, organization capital is defined as firm-specific or plant-specific intangible assets rooted in business practices, processes, and systems that allow firms to utilize both human and physical resources efficiently (Ericson and Pakes, 1995; Lev and Radhakrishnan, 2005; Lev et al., 2009). Others consider that organization capital is embodied in a firm's employees (Eisfeldt and Papanikolaou, 2013). Extant research defines organization capital as intangible assets that help firms improve their productivity and performance.

Both anecdotal evidence and previous research have indicated that the importance of intangible assets has dramatically increased in recent decades. The *Intangible Asset Market Value Study* by Ocean Tomo, LLC, states that the share of the intangible asset market value has increased from 68% to 84% between 1995–2015. Additionally, it shows that the pandemic has accelerated the development of intangible assets in the market, as in 2020, the value of intangible assets accounted for over 90% of the S&P 500 market value. Previous research highlights the increasing importance of intangible assets at both the macroeconomic and firm levels. At the macroeconomic level, the contribution of intangible assets to economic growth

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Citation: Shin, I., and Lee, H. (2023) Product market competition and organization capital, *Economics and Business Letters*, 12(1), 10-19.

DOI: 10.17811/eb1.12.1.2023.10-19

has increased dramatically (Corrado et al., 2013, 2018; Haskel and Westlake, 2017). Many studies prove that intangible assets, including intellectual properties and organization capital, enhance a firm's value and productivity (Bontempi and Mairesse, 2015; Sandner and Block, 2011). Previous studies further show that organization capital captures the most significant portion of a firm's intangible assets, helping firms generate competitive advantage and achieve superior performance (Eisfeldt and Papanikolaou, 2013; Li et al., 2018).

These findings raise further interest in the effect of organization capital on a firm's value, performance, and operation. Recent studies document that organization capital increases a firm's productivity and performance (Atkenson and Kehoe, 2005; De and Dutta, 2007; Lev et al., 2009). Research in finance and accounting further proves that organization capital improves stock returns (Eisfeldt and Papanikolaou, 2013; Leung et al., 2018). Other researchers have investigated the effect of organization capital beyond firm performance and value by showing its significant effects on a firm's financial reporting quality and operations, such as analysts' forecasts, cost of capital, auditor choice, and cash holdings (Attig and Ghoul, 2018; Kim et al., 2021; Lim and Qin, 2019; Marwick et al., 2020).

Extant studies prove that organization capital contributes significantly to improving firm performance and value. Despite the widespread studies investigating the effects of organization capital, studies on the determinants that affect a firm's investment in organization capital are scarce. Understanding the factors affecting a firm's investment in organization capital is critical because not all firms invest their resources in it despite its increasing importance in improving firm performance and value. Several studies have shown that organization capital is essential for both the economy and firms to achieve superior performance and growth. Therefore, our study aims to fill this gap by investigating the relationship between product market competition and a firm's investment in organization capital.

Firms invest in organization capital to construct and sustain competitive advantage, allowing them to achieve superior performance (Lev and Radhakrishnan, 2005; Lev et al., 2009; Peteraf, 1993; Webster and Jensen, 2006). In other words, firms must identify the incentives and motivations of investments in organization capital before they allocate their resources to organization capital (Andrews and Serres, 2012; Thum-Thysen et al., 2019). Prior studies claim that a level of product market competition impacts managerial efforts to construct and sustain competitive advantage (Machlup, 1967; Schmidt, 1997). They contend that increased market competition drives firms to spend more effort and build a competitive advantage to survive and achieve superior performance in a competitive market. Other research also argues that only efficient firms will survive in a highly competitive market, while less efficient firms may survive and maintain a specific portion of market share in a less competitive market (Hay and Liu, 1997; Nickell, 1996). Therefore, firms in a more competitive market are more likely to invest in organization capital to construct and sustain competitive advantages, increasing the probability of survival.

Using the data of listed Korean companies between 2001–2020, we found a positive relationship between the product market competition level and the firm's investment in organization capital. Additionally, we performed a first-difference test for robustness test, showing qualitatively consistent results with our main findings. Furthermore, we found that the effect of market competition on a firm's investment in organization capital was more pronounced for firms in the high-tech industry and financially distressed firms, where the firm's incentives and motivations to invest in intangible assets are high. Moreover, we used an alternative proxy to measure market competition to enhance the robustness of our main results. Collectively, our results show that market competition plays an important role in promoting firms' investments in organization capital.

This study contributes to the literature in several ways. First, based on the literature survey, this study is the first to provide empirical evidence of the relationship between product market

competition and a firm's investment in organization capital. Additionally, most previous studies have focused on the effects of organization capital. This study further shows that market competition level affects a firm's investment decisions on organization capital. Second, it expands the literature on intangible assets by focusing on the effects of external factors. Archival literature mainly studies firm-specific factors that determine corporate investment in intangible assets, such as CEO characteristics (Galasso and Simcoe, 2011), cash holdings (Bloch, 2005; He and Wintoki, 2016), and corporate governance (AlHares, 2020). Our study investigates the market-level factors that determine the firm's investment in organization capital. Finally, this study provides practical implications for investors and regulators by showing that regulations promoting market competition can lead firms to invest in organizational capital, one of the most important components in achieving firm and economic growth.

The remainder of this paper is organized as follows. Section 2 discusses the study's research model and its design. Section 3 presents the empirical results. Finally, Section 4 concludes the paper.

## 2. Research model and design

### 2.1. Research design

Following Lev and Radhakrishnan (2005) and Lev et al. (2009), we use the following research model:

$$OC_{it} = \beta_0 + \beta_1 Comp\_Sale_{it-1} + \beta_2 PPE_{it-1} + \beta_3 SIZE_{it-1} + \beta_4 ROA_{it-1} + \beta_5 LEV_{it-1} + \beta_6 CAPEX_{it-1} + \beta_7 LNAGE_{it-1} + \sum IND + \sum YEAR + \varepsilon_t$$

Following Bena et al. (2017) and Eisfeldt and Papanikolaou (2013), the firm's organization capital  $OC$ , measured by the ratio of selling, general, and administrative expenses (SG&A) to sales.  $Comp\_Sale$  captures the product market competition. Specifically, we use the Herfindahl-Herschman Index (HHI) multiplied by -1 as a proxy for market competition (Giroud and Mueller, 2011; Boubaker et al., 2018).

We also control for various firm characteristics that could affect a firm's investment in organization capital, including its property, plant, and equipment ( $PPE$ ), size ( $SIZE$ ), performance ( $ROA$ ), leverage ( $LEV$ ), capital expenditures ( $CAPEX$ ), and age ( $LNAGE$ ). The details of the variables are presented in Appendix A. We also control for industry and year-fixed effects. Standard errors are adjusted to confirm robustness within-firm cluster correlations (Petersen, 2009).

### 2.2. Sample selection

This study uses data on listed Korean companies for the period 2001–2020. The use of Korean data allows controlling for other external corporate governance mechanisms on the relationship between market competition and investment in organization capital. For example, markets for managerial labor and corporate control are acknowledged as weak in Korea among external governance mechanisms (Lemmon and Lin, 2003). However, market competition is an effective operational factor in Korea that ensures market discipline (Black et al., 2006). Thus, using Korean data allows us to control for the effects of other corporate governance, minimizing endogeneity concerns and ensuring a valid inference.

This study excludes financial firms because they have distinct industrial characteristics. Additionally, firms with fiscal year-end other than December and missing data were excluded to ensure sample homogeneity.

### 3. Empirical results

#### 3.1. Descriptive statistics

Table 1 presents descriptive statistics for each variable. For example, the mean values of *OC* and *Comp\_Sale* were 0.6254 and -0.1276, respectively.

Table 1. Descriptive statistics.

Variable	N	Mean	Standard deviation	Median	25%	75%
<i>OC</i>	12,224	0.6254	2.0719	0.1529	0.0813	0.3349
<i>Comp_Sale</i>	12,224	-0.1276	0.1309	-0.0787	-0.1717	-0.0362
<i>PPE</i>	12,224	0.1935	0.1493	0.1648	0.0795	0.2745
<i>SIZE</i>	12,224	26.5489	1.4965	26.3073	25.4955	27.3523
<i>ROA</i>	12,224	0.0316	0.0889	0.0327	0.0055	0.0704
<i>LEV</i>	12,224	0.4410	0.2107	0.4432	0.2775	0.5890
<i>CAPEX</i>	12,224	0.2109	0.2806	0.1166	0.0542	0.2466
<i>LNAGE</i>	12,224	3.4436	0.6788	3.6376	3.2581	3.8918

Notes: (1) All variables are defined in Appendix A. (2) All continuous variables were winsorized at the top and bottom 1%.

#### 3.2. Main results

Table 2 reports the empirical results of our baseline regression model. The coefficient of *Comp\_Sale* (0.6199) is positive and significant at the 1% level, suggesting that an increase in the market competition drives firms to invest in organization capital. Among control variables, *PPE*, *SIZE*, *ROA*, *LEV*, and *CAPEX* are significantly associated with a firm's investment in organization capital.

Table 2. Product market competition and firm's investment in organization capital.

Variable	Dependent variable = $OC_t$	
	Coef.	p-value
Intercept	-1.8321	0.0671
<i>Comp_Sale<sub>it-1</sub></i>	<b>0.6199</b>	<b>&lt;0.01</b>
<i>PPE<sub>it-1</sub></i>	-2.3528	<0.01
<i>SIZE<sub>it-1</sub></i>	0.1675	<0.01
<i>ROA<sub>it-1</sub></i>	-1.7261	<0.01
<i>LEV<sub>it-1</sub></i>	-2.2931	<0.01
<i>CAPEX<sub>it-1</sub></i>	-0.2983	0.0120
<i>LNAGE<sub>it-1</sub></i>	-0.0547	0.4819
<i>Firm Clustering</i>		YES
<i>Industry fixed effect</i>		YES
<i>Year fixed effect</i>		YES
Adj. R <sup>2</sup>		0.1096
N		12,224

Notes: (1) All variables are defined in Appendix A. (2) All *p*-values were based on two-tailed tests. (3) All continuous variables were winsorized at the top and bottom 1%.

#### 3.3. Additional analysis

Previous research shows that firms in the high-tech industry with more investment in intangible assets, such as research and development and organization capital, are more likely to survive (Cefis and Marsili, 2006; Fontana and Nesta, 2009). This means that firms in the high-tech industry have more incentives and a stronger motivation to invest their resources in organization capital. Therefore, the market competition effect on a firm's investment in organization capital

is more pronounced for firms in the high-tech industry. We divide the sample into two subsamples to further verify whether the firm's 'incentives' and 'motivation' to invest in organization capital are the major factors facilitating the firm's investment in organization capital.

Following Kile and Phillips (2009), we classify firms into high-tech and low-tech industries. Kile and Phillips (2009) recommend industry categorization accuracy by generating samples of high-technology enterprises using Standard Industrial Classification, North American Industry Classification System, and Global Industry Classification Standard (SIC, NAICS, and GICS) codes. The SIC code combination developed by Kile and Phillips can generate large samples of technology enterprises, resulting in more powerful statistical sampling. Therefore, we analyzed by dividing the samples based on Kile and Phillips (2009).

The results in Table 3 show that the coefficient of *Comp\_Sale* (2.9402) is significantly positive for firms in the high-tech industry, while the coefficient of *Comp\_Sale* (0.2230) is not statistically significant for firms in the low-tech industry. This result shows that the effect of market competition on a firm's investment in organization capital is higher for firms with higher incentives and motivation.

Table 3. Product market competition and firm's investment in organization capital based on industry type.

Variable	Dependent variable = $OC_t$				Difference Test
	High-Tech Industry		Low-Tech Industry		
	Coef.	p-value	Coef.	p-value	
Intercept	-5.4266	0.0439	-0.1243	0.8822	
<b><i>Comp_Sale</i><sub>it-1</sub></b>	<b>2.9402</b>	<b>&lt;0.01</b>	<b>0.2230</b>	<b>0.1595</b>	<b>&lt;0.01</b>
<i>PPE</i> <sub>it-1</sub>	-5.0187	<0.01	-1.2023	<0.01	
<i>SIZE</i> <sub>it-1</sub>	0.4133	<0.01	0.0571	0.0806	
<i>ROA</i> <sub>it-1</sub>	-2.1318	0.0153	-1.1205	<0.01	
<i>LEV</i> <sub>it-1</sub>	-4.1720	<0.01	-1.1037	<0.01	
<i>CAPEX</i> <sub>it-1</sub>	-0.6529	0.0181	-0.1727	0.0588	
<i>LNAGE</i> <sub>it-1</sub>	-0.1263	0.6557	-0.0217	0.6168	
<i>Firm Clustering</i>		YES		YES	
<i>Industry fixed effect</i>		YES		YES	
<i>Year fixed effect</i>		YES		YES	
Adj. R <sup>2</sup>		0.2219		0.07269	
N		2,745		9,479	

Notes: (1) All variables are defined in Appendix A. (2) All *p*-values were based on two-tailed tests. (3) All continuous variables were winsorized at the top and bottom 1%.

In addition, this study also examines whether the relationship between product market competition and a firm's investment in organization capital differs based on the firm's financial health. Extant studies show that intangible assets are significantly associated with a firm's financial health (Garcia-Appendini, 2018; Jiang and Wang, 2009; Thum-Thysen et al., 2019; Zeb and Rashid, 2016). For example, Jiang and Wang (2009) show that a distressed firm's survival strategies, such as increasing fixed assets, productivity, and decreasing production costs, help a financially distressed firm's survival. Moreover, they contend that investment in intangible assets can significantly increase a distressed firm's profitability and its willingness to survive in the market. In a similar vein, Zeb and Rashid (2016) provide evidence that intangible assets are the significant moderator of the relationship between a firm's capital structure and firm value. Given that investment in organization capital has a positive effect on firm performance and operations (Bontempi and Mairesse, 2015; Eisfeldt and Papanikolaou, 2013; Li et al., 2018; Sandner and Block, 2011), financially distressed firms are more likely to have stronger motivation and incentives to invest in organization capital to improve their

financial condition and survive in the competitive market. Thus, the impact of market competition on a firm's investment in organization capital would be stronger for financially distressed firms.

To test the expectation, we divide samples based on Altman's (1968) Z-score, which captures a firm's financial health. Specifically, we divide samples into three subgroups: (1) financially safe firms with Z-score  $> 2.99$ , (2) gray firms with  $1.8 < \text{Z-score} \leq 2.99$ , and (3) financially distressed firms with Z-scores  $< 1.8$ . Table 4 reports how product market competition affects a firm's investment in organization capital, depending on the firm's financial health. The result shows that the positive effect of market competition on a firm's investment in organization capital is significant only for financially distressed firms. The coefficient of *Comp\_Sale* for all groups is positive, but it is statistically significant only for financially distressed firms (0.7855, p-value = 0.0106). This result verifies our expectation that financially distressed firms have stronger incentives and motivation to invest in organization capital for their survival in the market.

Table 4. Product market competition and firm's investment in organization capital based on a firm's financial health.

Variable	Dependent variable = $OC_t$					
	Safe firms with Z-score $> 2.99$		Grey firms with $1.8 < \text{Z-score} \leq 2.99$		Distressed firms with Z-score $< 1.8$	
	Coef.	p-value	Coef.	p-value	Coef.	p-value
Intercept	-3.1507	0.1018	-0.3535	0.5778	-1.7910	0.1883
<b><i>Comp_Sale</i><sub>it-1</sub></b>	<b>0.5930</b>	<b>0.1682</b>	<b>0.1751</b>	<b>0.4124</b>	<b>0.7855</b>	<b>0.0106</b>
<i>PPE</i> <sub>it-1</sub>	-3.7830	<0.01	-1.2836	<0.01	-2.6789	<0.01
<i>SIZE</i> <sub>it-1</sub>	0.2323	<0.01	0.0628	<0.01	0.1811	<0.01
<i>ROA</i> <sub>it-1</sub>	-1.7019	<0.01	-0.7259	0.0374	-0.9399	0.0199
<i>LEV</i> <sub>it-1</sub>	-2.5892	<0.01	-0.9624	<0.01	-2.8953	<0.01
<i>CAPEX</i> <sub>it-1</sub>	-0.3492	0.0800	-0.2240	0.0211	-0.2870	0.0894
<i>LNAGE</i> <sub>it-1</sub>	-0.1342	0.2868	-0.0104	0.8140	-0.0317	0.7618
<i>Firm Clustering</i>		YES		YES		YES
<i>Industry fixed effect</i>		YES		YES		YES
<i>Year fixed effect</i>		YES		YES		YES
Adj. R <sup>2</sup>		0.1237		0.06792		0.1513
N		3,608		3,765		4,851

Notes: (1) All variables are defined in Appendix A. (2) All p-values were based on two-tailed tests. (3) All continuous variables were winsorized at the top and bottom 1%.

### 3.4. Robustness test

To address the problem of omitted variables, we perform the first-difference test (Wooldridge, 2001). The results are presented in Table 5. This analysis shows whether an increase in market competition affects the change in a firm's investment in organization capital. As shown in Table 5, the coefficient of changes in market competition in year t-1 ( $\Delta \text{Comp\_Sale}_{it-1}$ ) is still positive and significant (0.5053), showing qualitatively consistent results with our main findings.

We use alternative methods to measure product market competition (HHI) to enhance the robustness of our main results. Rather than calculating the HHI based on the firm's sales, we use total assets to measure the HHI (Tóth, 2016). The results are presented in Table 6. The coefficient of *Comp\_Asset* (1.5335), capturing the HHI measured based on the firm's total assets, is positive and statistically significant, showing qualitatively consistent results with our main findings.

Table 5. First-difference test: Changes in product market competition and changes in organization capital.

Variable	Dependent variable = $\Delta OC_t$	
	Coef.	p-value
Intercept	0.0364	0.0368
$\Delta Comp\_Sale_{it-1}$	<b>0.5053</b>	<b>&lt;0.01</b>
$\Delta PPE_{it-1}$	-0.1865	0.0113
$\Delta SIZE_{it-1}$	-0.0196	0.0494
$\Delta ROA_{it-1}$	0.0771	0.1165
$\Delta LEV_{it-1}$	-0.1869	<0.01
$\Delta CAPEX_{it-1}$	0.0168	0.3334
$\Delta LNAGE_{it-1}$	-0.1048	0.2059
Firm Clustering		YES
Industry fixed effect		YES
Year fixed effect		YES
Adj. R <sup>2</sup>		0.0274
N		12,224

Notes: (1) All variables are defined in Appendix A. (2) All *p*-values were based on two-tailed tests. (3) All continuous variables were winsorized at the top and bottom 1%.

Table 6. Robustness Test: HHI based on a firm's total assets.

Variable	Dependent variable = $OC_t$	
	Coef.	p-value
Intercept	-2.2966	0.0226
$Comp\_Asset_{it-1}$	<b>1.5335</b>	<b>&lt;0.01</b>
$PPE_{it-1}$	-2.1964	<0.01
$SIZE_{it-1}$	0.1878	<0.01
$ROA_{it-1}$	-1.8141	<0.01
$LEV_{it-1}$	-2.2692	<0.01
$CAPEX_{it-1}$	-0.2754	0.0183
$LNAGE_{it-1}$	-0.0534	0.4892
Firm Clustering		YES
Industry fixed effect		YES
Year fixed effect		YES
Adj. R <sup>2</sup>		0.118
N		12,224

Notes: (1) All variables are defined in Appendix A. (2) All *p*-values were based on two-tailed tests. (3) All continuous variables are winsorized at the top and bottom 1%.

#### 4. Conclusion

This study examines the effect of product market competition on a firm's investment in organization capital. It is well established that an increase in product market competition encourages firms to apply more effort to build and sustain their competitive advantage, as increased competition reduces their survival chances. Therefore, it can be expected that an increase in product market competition will promote a firm's investment in organization capital because it is a firm's important intangible assets that allow firms to improve their performance and productivity and to construct their competitive advantage.

This study proves that product market competition is positively related to a firm's investment in organization capital. Furthermore, we find that the positive relationship between product market competition and a firm's investment in organization capital is more pronounced for firms in the high-tech industry and financially distressed firms. The firm's incentives and



motivations to invest in organization capital are strong. Our main results remain robust after addressing potential issues related to the omitted variables.

Overall, this study provides practical implications for investors and regulators that regulations or policies promoting market competition could drive firms to invest in organization capital, critical in improving both firm and economic growth.

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## Appendix A - Variable definitions

Variable	Description
<i>OC</i>	To proxy for investment in organization capital, we use the ratio of selling, general, and administrative expenses to sales (SG&A) (Eisfeldt and Papanikolaou, 2013).
<i>Comp_Sale</i>	Herfindhal-Hirschman Index measured as: $\sum_{i=1}^N x_i^2 \times (-1),$ where, $x_i$ is the market share of sales of firm $i$ among all firms within the same industry. A higher value of <i>Comp_Sale</i> indicates less concentrated industries or more competition among firms in the same industry.
<i>Comp_Asset</i>	Defined the same as <i>Comp_Sale</i> except that total asset is used instead of sales when calculating the market share.
<i>PPE</i>	Ratio of net property, plant, and equipment to the beginning, total assets
<i>SIZE</i>	The natural log of the total sales
<i>ROA</i>	Return-to-assets ratio, calculated as the income before extraordinary items divided by the beginning total assets
<i>LEV</i>	The leverage ratio, calculated as the sum of long-term and short-term debts divided by total assets
<i>LNAGE</i>	Natural logarithm of one plus firm's age
<i>CAPEX</i>	Capital expenditures scaled by the book value of total assets at the end of fiscal year $t$ .