

비디오 게임 산업의 진화: 미국 비디오 게임 시장에 대한 산업조직론적 접근

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The Evolution of Video Game Industry: Applying the Industrial Organization Model to the U.S. Video Game Market

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요 약

지난 40년간 비디오 게임 산업은 비약적인 발전을 이루었다. 이에 본 연구는 산업조직론을 이론적 분석틀로 이용하여 미국 비디오 게임 산업의 진화를 살펴보았다. 분석 결과 미국 비디오 게임 산업의 시장 구조 및 시장 행위의 역사적 변화를 확인할 수 있었으며, 특히 미국 비디오 게임 산업의 시장구조의 변화와 시장행위의 변화간에 밀접한 연관이 있는 것으로 나타났다. 이와 같은 결과는 비디오 게임 산업에 대한 경제학적 분석을 실시하는 후속 연구에 기초가 될 것으로 여겨진다.

주제어 : 비디오 게임 산업, 산업조직론, 시장 구조, 시장 행위

ABSTRACT

Video game industry has undergone the drastic changes for forty-year history. The purpose of this study was to gain an understanding of the historical evolution of the U.S. video game industry. To achieve this goal, this study has chosen the industrial organization model as the theoretical framework. This study found that the market structure as well as the market conduct in the U.S. video game industry changed drastically. This study concludes that the change of the market structure of the U.S. video game industry relates to the change of market conduct. This study could serve as the basis for future research on the economic analysis of video game industry.

Keywords : video game industry, industrial organization, market structure, market conduct

Received: Nov. 22, 2011 Revised: Oct. 19, 2012
Accepted: Nov. 13, 2012
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ISSN: 1598-4540

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1. Introduction

The origin of video games can be traced back to the early 1970s. First video game was introduced in 1972 as Pong. In the same year, Magnavox introduced Activision, a video game system that could be played on home television sets[1]. Several subsequent driving forces enhanced consumer interests in video games. Those include the major technological developments in coin-operated video games¹⁾ in 1979 and the advancement of video games into home computers during 1982 and 1983[2].

Today, video games appear as a cultural icon and commodity. In addition to the ubiquity of arcade, console and its on-line versions, video games influence popular culture across fields. Video games offer experiences that traditional media cannot compete with. For young and old players, video games offer a rich interactive entertainment experience which is more compelling than passive media forms like movies and television.

While video games are archetypal popular culture and entertainment, they are also big business. Presently, numerous small and big size companies engage in the manufacture and distribution of all types of video game products. A study on the video game industry in the U.S. entitled "Economic Impacts of the Demand for Computer and Video Games" maintains that the industry created 220,000 jobs and nine billion dollars in salaries[3].

Development for the industry is astonishing as it was once viewed as a niche business for teenage boys. Recently, big three video game makers such as Sony, Nintendo and Microsoft target formerly non-royal customers like

females and adults and offer non-gaming features such as DVD and Internet. Video game consoles²⁾ are developed as a digital gateway that has a capability of audio, video and network connection. The technological convergence will make video game consoles become an essential electronic digital device which has an ability of storing and transmitting information. Thus, it can be expected that video games will become an entertainment core and the hub of digital life in a future as they make a way into a mass market.

A study on video game industry would be important because it is a major source of entertainment and leisure. Although television is still the most popular source of entertainment and leisure, video game has become a richer medium, and they keep attracting more players. Video games are being played by all ages and tastes of people in these days. For these reasons, a study on video game industry has great importance in the field of entertainment and mass media research.

2. Literature Review and Research Question

2.1 Theoretical framework

The industrial organization model provides a

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- 1) Coin-operated video games are also called arcade video games. Coin-operated video game machines are usually in the form of arcade-style uprights. For example, Atari's Pong was one of most popular arcade video games in 1970s[2].
 - 2) Video consoles are also called home video games which usually consist of a game console and game controllers. The console is the central unit to which the game controllers are attached[2].

useful framework for economic analysis. The industrial organization model helps researchers to analyze abstract concepts in market analysis [4,5].

Media industry researchers used the industrial organization model to examine a variety of issues [6]. One reason is "the better explanations of the strategic behavior of firms in the industry[7: p.45]".

In particular, the industrial organization model focuses on three key elements: market structure, market conduct and market performance. This model maintains that the structure of markets affects the conduct of firms in those markets[4].

Market structure refers to how a given market is organized. The structure of a market include variables such as the number of firms and the degree of market concentration. Market conduct refers to the behavior of firms in a market with respect to advertising strategies and innovation. Advertising strategies refer to the promotional activities in which firms may engage, and innovation refers to the efforts made to change products[4].

2.2 Previous media industry research using industrial organization model

The following are examples of previous studies on media industries using the industrial organization model. A number of previous studies have dealt with the relationship between market structure and conduct in newspaper or television industry—especially the impact of market competition on the conduct and performance of newspaper companies or television stations.

Specifically, Albarran et al. found that

competition has a positive relationship with program diversity[8]. The authors pointed out that the emergence of a new broadcast station led to the increase of program diversity. According to Bae, cable news networks differentiate news programs further as the competition among cable networks increases [9]. Chan-Olmsted also examined the impact of competition in commercial television market for children. The author found that the enhancement of competition in commercial television market for children led to a greater number of channels available to the audiences [10]. Moreover, Lacy et al. investigated the impact of competition on broadcast stations' news budgets. They found that the financial resources for news increase as competition increase[11]. Litman found that competition among television networks led to more option for the viewers[12]. Litman and Bridges also found that competition has a positive impact on newspaper companies' financial commitment [13]. Powers found that the degree of competition was related to the broadcast hours of local news. The author found that, in more competitive circumstances, the hours of news programs are likely to increase to compete with competitors effectively[14]. In a later, Powers also found that programs are more likely to be differentiated when additional television competitors appear[15].

Hellman and Soramaki found that a more concentrated market presents a better quality of videos[16]. Moreover, Lin found that there was a negative relationship between market competition and product diversity[17].

2.3 Research question

The overall aim of this study is to trace the evolution of the U.S. video game industry. Thus, following research questions were established based on the theoretical framework and reviews of previous studies.

RQ1: How has the market structure of the U.S. video game industry changed over time?

RQ2: How has the market conduct of the U.S. video game industry changed over time?

3. Method

Historical method can give us an opportunity to trace the evolution of the U.S. video game industry as it emerges in real time. Historical method is a form of inquiry that asks questions about what things happened in the past and elicits answers based on evidences.

With the combination of the industrial organization model which is the theoretical framework of this study, the historical method can give us a picture of how the video game market looked at a given time and a guideline of how we could expect the video game market for the future.

Historical method contains at least three elements: “evidence”, “interpretation” and “narrative[18:p.2]”. Specifically, historical method has the following advantages. “First, people can study events from the past. Second, survey has the weaknesses of researchers’ memory problems or self-biases. Third, the historical approach enables us to study the effect of time[19:p.5]”.

The historical method relies on both original source data and secondary materials for its analysis. All data employed in the historical method is publicly available and found in published sources of information. These include government census, industry data, industry articles, newspaper articles and scholarly books.

3.1 Variables and data

To examine the historical changes of the market structure of the U.S. video game industry, this study has chosen three indicators ---the number of companies, sales and the degree of market concentration.

The number of companies was measured by the total number of companies in the U.S. video game industry and the number of home video game companies with shipments of \$100,000 and more. Several previous studies used the number of sellers in a market to examine the market structure of media[15,20,21, 22,23,24,25]. To measure the total number of companies in the U.S. video game industry, the data of 1972, 1977, 1982, 1987, 1992 and 1997 Census of Manufacturers of the U.S. Department of Commerce were used. In addition, to measure the number of home video game companies with shipments of \$100,000 and more in the U.S. video game industry, the data of 1982, 1987 and 1992 Census of Manufacturers of the U.S. Department of Commerce were also used.

Second, to measure the sales in the U.S. video game industry, the data of 1981, 1982, 1985, 1992, 1997 and 2000 Electronic Market Data Book were used.

Finally, to measure the degree of market

concentration of the U.S. video game industry, the CR index and Herfindahl-Hirschman index were calculated. The Herfindahl-Hirschman Index(HHI) was used for measuring the degree of market concentration in many previous media industry studies. Some studies used HHI Index for measuring competition in a media market[12,26,27]. Higher ratios point out that only a small number of firms dominate the industry. In addition, some studies used CR index to measure the degree of media market concentration[10,15,26]. This measurement uses the proportion of market shares of the top ranked firms. A higher concentration ratio indicates a larger market power of the firms. In this study, to calculate the CR and HHI, 1993, 1995, 1996, 1997, 1998, 1999, 2000, 2001 and 2002 U.S. Market Share Reporter were used.

Moreover, to examine the historical changes of the market conduct of the U.S. video game industry, this study has chosen two indicators ---the practice of innovation and advertising.

The practice of innovation in the U.S. video game industry was operationalized as the total expenditures for research and development (R&D) in the U.S. video game industry.

In addition, the practice of advertising in the U.S. video game industry was operationalized as the total expenditures for advertising in the U.S. video game industry. To measure the expenditures for research and development(R&D), data from 1984 U.S. International Trade Commission Report was used. In addition, to measure the expenditures for advertising in the industry, data from American Toy Manufacturers Association (TMA) was used.

3.2 Data analysis

This study used quantification which is known as quanto-history from traditional historical method as an approach to the data. Using quantification, a researcher can obtain historical knowledge about industry. Quantification would provide useful insights in analyzing market growth[28].

In this study, the changes of percentage in each variable were used to explain the real-time difference of the market structure and conduct of the U.S. video game industry.

4. Findings

4.1 Number of companies

[Table 1] Changes of number of companies in the U.S. video game industry

Year	1972	1977	1982	1987	1992	1997
# of firms	619	754	732	698	895	756
% change	-	22	-3	-4.6	28	16
# of home video game firms	-	-	11	5	1	-
% change	-	-	-	-55	-80	-

According to the U.S. Census of Manufacturers, the number of companies in the U.S. video game industry was 619 in 1972, 754 in 1977, 732 in 1982, 698 in 1987, 895 in 1992 and 756 in 1997. There was a 22 percent increase in the number of companies in the U.S. video game industry during the period from 1972 to 1997.

The number of home video game companies in the U.S. video game industry was 11 in 1982, 5 in 1987 and 1 in 1992. In sum, there was a 90 percent decrease in the number of home video game companies in the U.S. video game industry during the period from 1982 to 1992.

4.2 Sales

The sales of video games in 1978 were \$89,000 (in thousands of dollars), \$175,000 (in thousands of dollars) in 1979, \$525,000 (in thousands of dollars) in 1980, \$1,000,000 (in thousands of dollars) in 1980, \$1,300,000 (in thousands of dollars) in 1982 and \$700,000 (in thousands of dollars) in 1983.

[Table 2] Changes of sales in the U.S. video game industry

Year	1978	1979	1980	1981	1982	1983
Sales (thousands \$)	89,000	175,000	525,000	1,000,000	1,300,000	700,000
% change	-	96	200	90	30	-46
Year	1991	1992	1996	1997	1998	1999
Sales (thousands \$)	3,600,000	3,975,000	4,600,000	5,550,000	6,460,000	7,350,000
% change	414	10	16	21	16	13

Moreover, the sales of video games in 1991 were \$3,600,000 (in thousands of dollars), \$3,975,000 (in thousands of dollars) in 1992, \$4,600,000 (in thousands of dollars) in 1996, \$5,500,000 (in thousands of dollars) in 1997, \$6,460,000 (in thousands of dollars) in 1998 and \$7,350,000 (in thousands of dollars) in

1999. In sum, there was a 6,100 percent increase in the sale of video games during the period from 1978 to 1999 in the U.S. video game industry.

4.3 Market concentration

[Table 3] Changes of CR3 in the U.S. video game industry

Year	1982	1983	1984
CR3	67%	56%	50%
	Bally-Midway: 33%	Bally-Midway: 25%	Bally-Midway: 21%
	Atari: 23%	Atari: 19%	Atari: 19%
	Williams: 11%	Williams: 12%	Nintendo: 10%
% change	-	-11	-6
Year	1996	1999	2001
CR3	92%	100%	96.4%
	Sega: 38%	Nintendo: 47%	Sony: 58.1%
	Nintendo: 30%	Sony: 44%	Nintendo: 23.6%
	Sony: 24%	Sega: 9%	Sega: 14.7%
% change	42	8	-3.6

The market concentration ratio in the U.S. video game industry was 67 percent in 1982, 56 percent in 1983, 50 percent in 1984, 92 percent in 1996, 100 percent in 1999 and 96.4 percent in 2001. There was a decrease from 1982 to 1984 as seen in the [table 3]. Despite the decrease in the early 1980s, the market concentration increased again in the mid-1990s.

The table shows that the U.S. video game industry has been severely concentrated in the 2000s. In total, there was a 29.4% increase in

the market concentration ratio in the U.S. video game industry during the period from 1982 to 2001.

[Table 4] Changes of HHI in the U.S. video game industry

Year	1982	1983	1984
H-H Index	0.17	0.11	0.09
% change	-	-35	-18
Year	1996	1999	2001
H-H Index	0.29	0.42	0.41
% change	222	45	-2

In addition to the CR3 ratio, the Herfindahl-Hirschman index also tells us the degree of market concentration of the U.S. video game industry. If the calculated number is greater than .18, it is considered a rigorously concentrated market, while numbers between .10 and .18 is considered as a fairly concentrated market and less than .10 is not concentrated market[29].

The HHI of the U.S. video game industry in 1982 was 0.17, 0.11 in 1983, 0.09 in 1984, 0.29 in 1996, 0.42 in 1999 and 0.41 in 2001. There was a 141 percent increase in the HHI in the U.S. video game industry between 1982 and 2001. Those changes of the Herfindahl-Hirschman index in the U.S. video game industry imply that the U.S. video game industry was moderately concentrated in earlier periods, but the degree of market concentration continuously intensified, and the industry has severely been concentrated in the 2000s.

4.4 Research and development (R&D)

[Table 5] Changes of R&D expenditures in the U.S. video game industry

Year	1978	1979	1980	1981	1982	1983
R&D expenditures (thousands \$)	12,230	17,375	29,001	43,547	97,709	161,072
% change	-	0.42	66	50	124	65

The expenditures for research and development (R&D) in the U.S. video game industry were \$12,230 (in thousands of dollars) in 1978, \$17,375 (in thousands of dollars) in 1979, \$29,001 (in thousands of dollars) in 1980, \$43,537 (in thousands of dollars) in 1981, \$97,709 (in thousands of dollars) in 1982 and \$161,072 (in thousands of dollars) in 1983. In total, there was a 1,220 percent increase in the expenditures for research and development (R&D) in the U.S. video game industry during the period from 1978 to 1983.

4.5 Advertising

[Table 6] Changes of expenditures for advertising in the U.S. video game industry

Year	1996	1997	1998	1999	2000
Advertising expenditure (thousands\$)	950,178	874,172	976,720	842,173	837,103
% change	-	-8	12	-14	-0.6

The expenditures for advertising in the U.S. video game industry were \$950,178 (in thousands of dollars) in 1996, \$874,172 (in thousands of dollars) in 1997, \$976,720 (in thousands of dollars) in 1998, \$842,173 (in thousands of dollars) in 1999 and \$837,103 (in thousands of dollars) in 2000. In sum, there

was a 12 percent decrease in the expenditures for advertising in the U.S. video game industry during the period between 1996 and 2000.

4.6 Recent movement during 2000s

The video game industry has matured and diversified since the 2000s. In consumer side, game players could play video games on mobile video players as well as on consoles, and they also could experience a virtual-world [30]. Developments in technologies have increased online gaming, especially in massively multi-player online role-playing games (MMORPGs).

In this period, video game makers spent a huge investment on the research and development (R&D) in order to have next generation platforms such as PS3, Nintendo's Will and Microsoft's Xbox 360[31]. Specifically, for example, Nintendo spent ¥42,211 million in R&D in 2010[32].

The increase of demand for video games expanded software market as well as hardware market. Many companies such as Electronic Arts, Activision Blizzard, THQ, Capcom, Square Enix, Konami, Namco-Banda and Ubisoft etc. compete severely for software market shares[33]. In addition, they needed to compete with the dominant incumbents such as Sony, Nintendo and Microsoft which provide software as well as platforms to play games.

[Table 7] Changes of sales in the U.S. video game industry in 2000s[34,35]

Year	2000	2001	2002	2003	2004	2005
Sales (in billion \$)	5.5	6.0	6.9	7.0	7.3	7.0
% change	-	9.09	15	1.45	4.29	-4.11
Year	2006	2007	2008	2009	2010	2011
Sales (in billion \$)	7.4	9.5	11.7	16.0	16.9	16.6
% change	5.71	28.38	23.2	45.35	9.49	-3.16

The sales of video games in U.S. have increased from \$5.5 billion in 2000 to \$16.6 billion in 2011. In this period, the growth of sales in the video game industry was 201.82%.

[Table 8] Changes of unit sales in the U.S. video game industry in 2000s[34,36]

Year	2000	2001	2002	2003	2004	2005
Units (in millions)	194.8	208.6	224.3	239.5	248.4	227.4
% change	-	7.08	7.53	6.78	3.72	-8.45
Year	2006	2007	2008	2009	2010	2011
Units (in millions)	240.1	268.2	298.6	278.7	257.3	245.6
% change	6.4	11.3	11.4	-8.3	-7.68	-4.66

The unit sales of video games in U.S. have grown from 194.8 million units in 2000 to more than 245 million units in 2011. Between this period, the growth of unit sale in the video game industry was 26.08%.

5. Conclusion and Discussion

Overall, this study found that the market structure as well as the market conduct in the U.S. video game industry changed drastically.

There was approximately 1,700 percent increase in sales of video games during the period from 1978 to 2011 in the U.S. video game industry. This means that video games are not just toys for children anymore, but have become increasingly popularized and are in growing demand of customers.

There were some decreases of concentration ratios in early periods in the U.S. video game industry. However, the concentration ratio increased sharply from the mid-1990s, and the concentration ratio reached almost the highest point in 2000s. In total, there was a 29.4 percent increase of the concentration ratio in the U.S. video game industry from 1982 to 2001.

In addition to concentration ratio, the Herfindahl-Hirschman index also tells us the degree of market concentration of the U.S. video game industry. There was a 141 percent increase of the H-H index in the U.S. video game industry during the period from 1982 to 2001. The changes of Herfindahl-Hirschman index in the industry tell us that the U.S. video game industry was moderately concentrated in earlier periods. However, the degree of market concentration continuously intensified and reached the almost highest point of concentration in the early 2000s. This means that very few companies dominated the U.S. video game industry for a long time. This phenomenon was due to the domination of a limited number of large size transnational corporations such as Nintendo, Sega, Sony and later Microsoft in the video game industry. However, this study has also found that the industry was diversified after 2000s. Many companies except the dominant incumbents

such as Sony, Nintendo and Microsoft emerged into the market during the time.

As the changes of market conduct, this study found that the expenditures for R&D increased more and more. It was interesting that the expenditures for R&D increased as the sales of video games and the degree of market concentration increased. Thus, this study would argue that as the degree of market concentration increased, video game companies' financial commitment for product innovation increased. This finding coincides with the findings of previous studies which maintain that market competition has a negative relationship with innovation[16,17]. Thus, this study concludes that the change of the market structure of the U.S. video game industry relates to the change of market conduct. This fact coincides with the theory of the industrial organization which maintains that the structure of markets affects the conduct of participants in those markets[4].

This study could serve as the basis for future research on the economic analysis of video game industry. However, this study did not use statistical analyses because the historical data on the video game industry was not enough. This would be a limitation of the study. It will be possible when additional data become available.

In addition, future research could also examine the aspect of market performance of the video game industry. For example, it would be interesting to examine the historical changes of video game content and how video game makers, for example, Sony, Nintendo and Microsoft, diversified the content of their products over time. Finally, it would be

necessary to examine the impact of technological convergence in video games on the other information, technology and entertainment (ITE) sectors.

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