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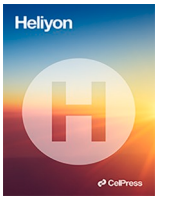

Research article

Differences in competitors' market influence due to market structure: Evidence from Japanese gambling market

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ABSTRACT

This study investigates how differences in the market structure between the Japanese horse racing and Keirin[1] racing markets affects the influence exercised by high-turnover operators (major operators) in both markets on low-turnover operators (minor operators) in those markets.[2] In the horse racing market structure, there are few competitors, and the difference in turnover[3] between major and minor operators is large. In contrast, in the Keirin racing market structure, there are many competitors, and the difference in turnover between major and minor operators is small. Panel analysis results show that in horse racing, operators with low turnover are significantly affected by those with high turnover, while in Keirin racing, operators with low turnover are less affected by competitors with high turnover. The results not only indicate that firms are affected differently by competitors due to the market structure but also suggest that this has an impact on market segmentation policies and firms' marketing efforts.

1. Introduction

Gambling on races is regulated by national, prefectural, and municipal governments in Japan.[1,2,3] Gambling is prohibited by law [2]; however, other laws such as horse racing laws, motorboat racing law and bicycle racing law allow national, prefectural, and municipal governments to sponsor gambling as a social enterprise [3–5]. Although few types of gambling[4] are conducted 24 h a day, 365 days a year, such as online casinos, there are always gambling events being held in horse racing. For example, according to a set schedule, various operators alternately host horse races daytime and nighttime on weekdays and weekends. This operating model is similar to that of other types of race gambling, such as boat racing and Keirin.

Gamblers place their bets using the same odds and methods by gambling category. Kind of betting ticket which includes virtual one on the Internet is same in each of gambling. Odds are conducted using only the pari-mutuel method, and only one type of odds is available domestically, regardless of the different betting websites used.

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[1] Keirin, the gambling racing used in this paper, is different from the Keirin held at the Olympics. In Japan, bicycle races that are the subject of gambling are called Keirin, and is used in this context in this paper.

[2] In this paper, "major operators" means high-turnover operators, and "minor operators" means low-turnover operators. Operator means the race organizer as recognized by gamblers.

[3] Turnover means amount of monies in gambling product sales [1]. Sales means revenue including non-gambling in this paper.

[4] Quick One, an instant-win format raffle that is always sold over the Internet, was launched on April 1, 2022 [6].

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The situation which the gambling operators are public institution, gamblers betting schemes and odds are unified is same in horse racing and Keirin. However, the structure of the market is different in these racing gambling. This difference can be seen in the differences in daily turnover between the operators in each industry (refer to Figs. 1 and 2). Briefly, horse racing has fewer operators but large differences in turnover between operators. Keirin has more operators but the differences in turnover between operators are small. Fig. 1 shows the average daily turnover of horse racing operators from FY2016 to FY2021.[5] The Japan Racing Association (JRA) has the highest average daily turnover which is approximately 9.97 billion in the horse racing industry by a significant margin. Whereas horse race operators under the National Association of Racing (NAR),[6] such as Oi, Kawasaki, Funabashi, and Urawa horse racecourses, have daily turnover of approximately 900 million yen to 1.5 billion yen. Urawa, in 4th, has 1.83 times the turnover of Kochi, in 5th, indicating a gap between the 4th and the 5th horse racing operator. The daily turnover of the 2nd-ranked Oi racetrack were approximately 6.98 times the daily turnover of the 17th-ranked Obihiro racetrack, which had the lowest turnover.

Fig. 2 shows the average daily turnover of Keirin operators for the fiscal years 2016 through 2021. No Keirin operator earned turnover significantly higher than that of its competitors. Instead, the decline in turnover from the highest earning operator to the lowest was gradual; for instance, the daily turnover of the 1st-ranked Hiratsuka Keirin race course was only 1.78 times the daily turnover of the 41st-ranked Toyama Keirin race course.

This difference in the performance of small gambling operators relative to market leaders in the horse racing and Keirin gambling markets could be explained by the differences in their market structures. Prior studies have shown that a firm's economic performance is variously affected by differences in market structures [7–9]. The strength of the competitor's threat depends on its market position [10–12]. While these studies have shown that differences in market conditions can affect firm performance, it is even more useful for firms with smaller sales to be able to estimate the strength of influence from competitors. Only a few studies examine market structures and market positions simultaneously. In other words, it is not clear how the magnitude of competitive threats differs depending on market position and differences in industry structure. This study statistically examines the differences in the impact of different market structures on businesses with small sales. Specifically, this study examines how operators with smaller average daily turnover in the horse racing and Keirin gambling markets are affected by operators with larger daily turnover. Prior studies that statistically examined the influence of competitors with a large market share with showing differences in two or more market structures, such as that between horse racing and Keirin, which are the subjects of this study, are limited. This study contributes to market segmentation policies and marketing research by identifying these differences in the impact from firms with larger sales stemming from different industry structures from the perspective of firms with smaller sales, such as followers.

This paper is divided into the following sections: Literature review, Hypothesis, Method, Results, Hypothesis Testing, Discussion, and Conclusions. The Literature review shows the competitive advantages that resources bring, the impact of competitors on their own companies, impact of market structures, and the different reactions shown by companies affected by their competitors. The Hypothesis section presents hypotheses on how the market structures of the horse racing and Keirin racing gambling markets will affect market leaders' influence on follower firms in each market. The methodology section presents the methods used to test the hypotheses, collect data, and define the model for the data analysis. The Results section presents the results of the panel data analysis, and the Hypothesis Testing section examines the hypotheses based on the results of the analysis. Finally, suggestions for marketing measures and conclusions are presented in the Discussion and Conclusion sections.

2. Literature review

For this study to be meaningful, it needs to be justified by the fact that businesses with small sales are influenced by larger businesses, the influence of competitors is not constant, and market structure influences businesses. Without these justifications, it would not be possible to ascertain the differences in the impact of large turnover operators on small turnover operators in the horse and bicycle racing industries, which is the focus of this study. Prior studies are investigated to verify that they could be justified. In addition, this review also clarifies that there are few studies on the different influences of competitors in multiple markets from the point of view of firms with small sales, as this study does. This suggests that this study could bring value to academia and industry through its contribution to market definition measures and market research studies.

2.1. Resource advantage

The impact of firms with competitive advantage in the market is examined from a resource-based view (RBV) perspective. RBV focuses on the resources possessed by firms that are valuable, rare, inimitable, and non-substitutable and enable them to achieve sustainable competitive advantages [13–18]. This theory explains the differences in turnover among gambling operators within the horse racing and Keirin gambling markets. The positive relationship between competitive advantage and performance indicates that firms with higher turnover in each gambling market have assets that provide them with a competitive advantage [19–23].

Firms with resources that provide competitive advantages influence their competitors. For example, in the study extending RBV to small firms, it was found that small firms felt significant pressure when they were in direct competition with Wal-Mart and other large firms [24]. Newbert showed that environmental hostility and the threat of competition had negative effects on business performance

[5] The method of data acquisition and detailed numerical data for this figure are presented in the Major Operators Definition section of the Methodology chapter.

[6] NAR is an association of 15 horse racing operators other than JRA in Fig. 1.

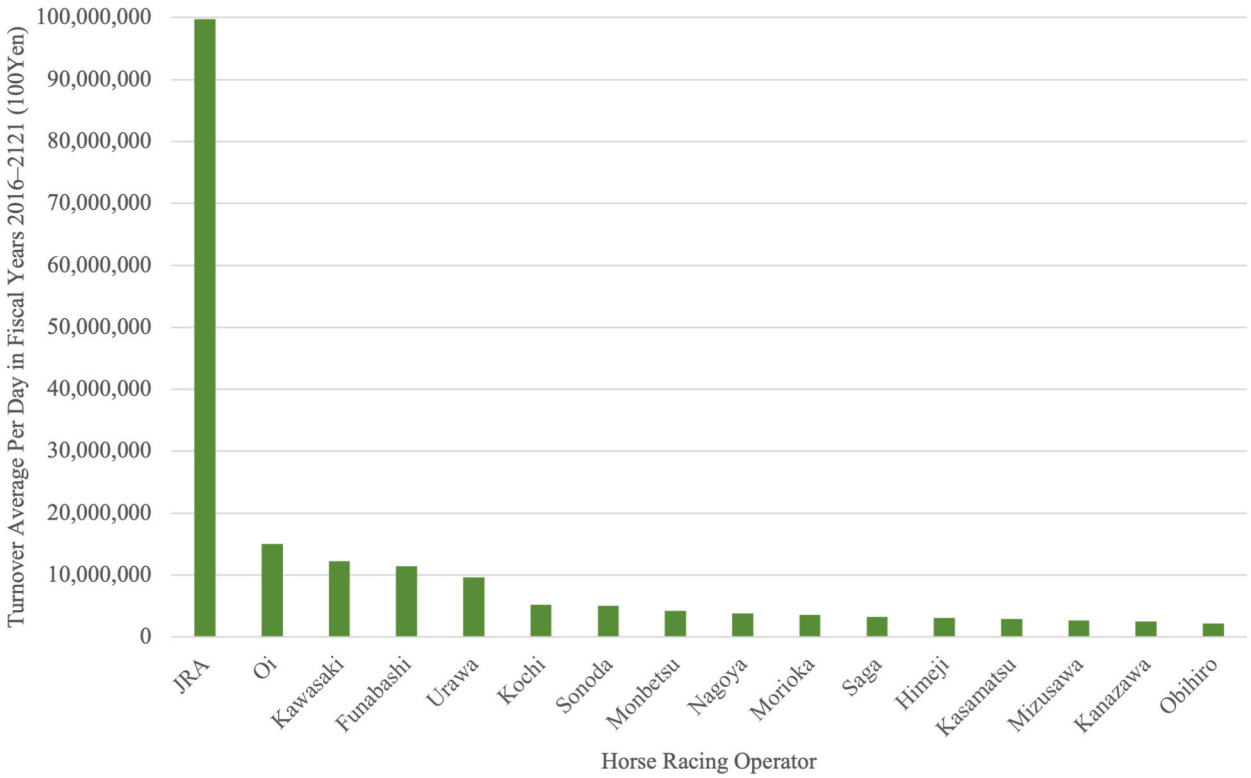

Fig. 1. Daily turnover average of horse racing operators in fiscal years 2016–2021.

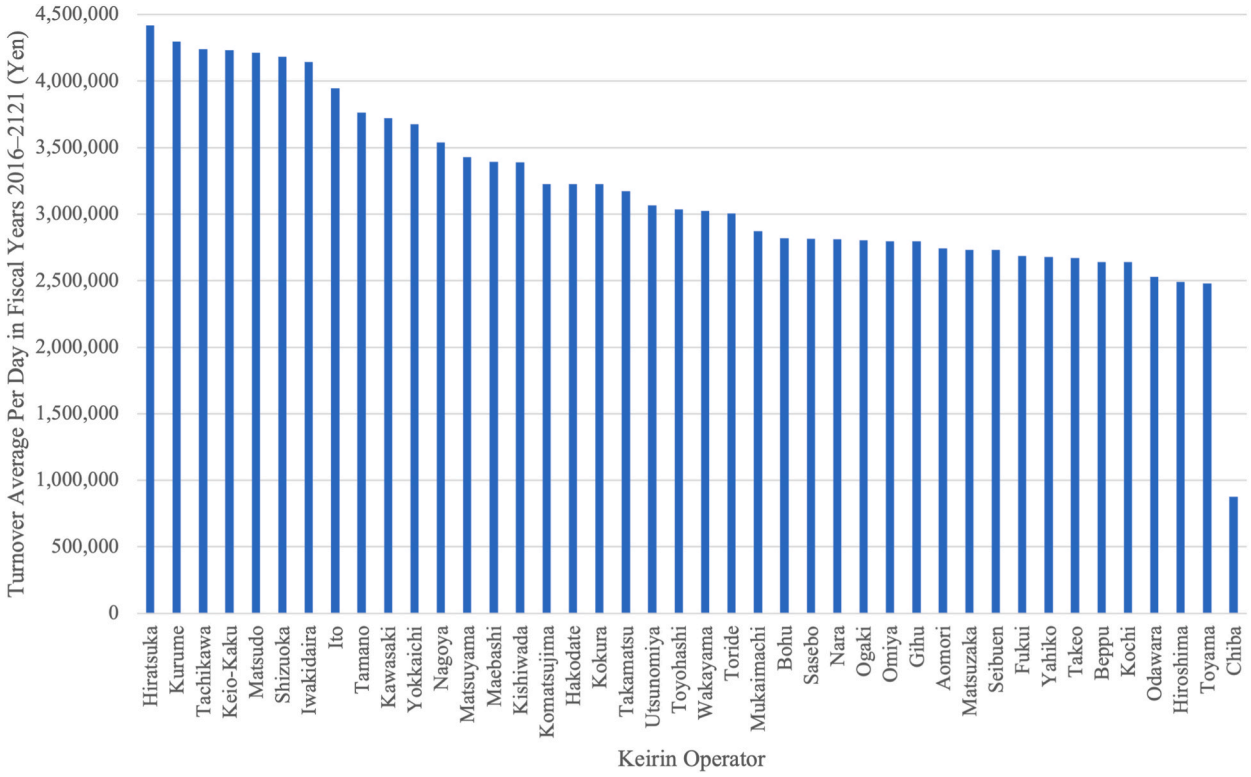

Fig. 2. Daily turnover average of Keirin operators in fiscal years 2016–2021.

[19]. Bridoux also showed how a resource advantage could be used to damage competitors, by raising rival's costs and lowering consumer's willingness to buy [25].

Regarding the influence between leader and follower firms in markets, leaders have a large impact on their followers, while followers have little impact on leaders. In a study of the printing industry, Shankar analyzed the competitive strategies of market leader HP and market followers Canon, Epson, and Lexmark [26]. The study showed that the changes in HP's product line (the leader) triggered a complex response from follower firms, while the changes in followers' product lines did not trigger a response from HP.

2.2. Impact of rivals on a company

From the perspective of the companies affected in the market, the impact of firms with large competitive sales are shown to vary from situation to situation. Li et al. studied the relationship between product portfolio diversity and popularity for all businesses in the mobile app industry, which has many small businesses [27]. In this study, the popularity of existing applications in the same category was shown to have a positive impact on new applications. Lee and Raghu also studied portfolio diversity and ranking for the top 300 mobile apps [28]. In this study, they found that apps in popular categories had a 1.22 times higher rate of exit from the top charts than those in niche categories due to high competition. These two studies on the same industry showed different insights: the first showed that popular existing applications enhanced the presence of one's app, while the second showed that top tanked applications in popular category were what made one's app lose its presence in the market as a competitor. A study of the impact of changes in P&G's marketing mix strategy showed that competitors that had multiple market contacts with P&G would follow P&G's moves if they benefited from P&G's market moves [29]. This study also found that smaller brands were less likely to follow P&G's moves when they benefited from P&G's market moves. Moreover, this suggested that the impact of competitors varies depending on market share, structural factors, and firm-specific effects.

2.3. Impact of market structure

Market structure affects firms'strategies and economic performance. A study of corporate strategy showed that firms' incentives to diversify are correlated with the market structure [30]. In a study on bank profitability, market structure was also shown to be related to profitability, with a higher market share being less related to profitability in emerging markets [8]. Similarly, in the gambling market, the strategies employed and the revenues generated differ depending on the market structure. One casino company in the U.S. A., Station Casios, developed its business by targeting locals, unlike Las Vegas Sands and MGM/Mirage, which developed large-scale resorts in Nevada [31]. This shows that even the casino industry in the same region can soften competition and grow by defining different markets. In addition, a casino economics study showed that profitability was higher in areas with only a few dozen casinos and strict regulations than in areas with more competition, such as Nevada [32]. This suggests that a small number of competitors affect economic performance.

3. Hypothesis

Prior studies have shown that firms with competitive advantages influence their competitors. They also show that market leaders exert their influence on their followers. The response of follower firms to this influence has been found to be complex.

In this study, we analyze horse racing and Keirin in Japan to identify differences in the impact of competitors on companies that are due to differences in market structure. As indicated in the Introduction, the two market structures differ. This difference in market structure can be expected to result in a difference in the impact of major operators on minor operators. Hypotheses are formulated for each market.

Hypothesis 1. Minor operators' turnover is significantly decreased when they hold races simultaneously with major operators in the horse racing gambling market.

This hypothesis is based on the small number of operators and the large difference between major and minor operators in daily average turnover.

Hypothesis 2. Minor operators' turnover is decreased a little when they hold races simultaneously with major operators in the Keirin gambling market.

This hypothesis is based on the large number of operators and the small difference between major and minor operators in daily average turnover.

4. Materials and methods

4.1. Research design

4.1.1. Research method

This study was designed to test these hypotheses by conducting a quantitative analysis. The reason for conducting quantitative analysis was that it was possible to obtain numerical information on the amount of sales and the impact on sales for a period of time during which the hypothesis could be tested from publicly available data and to enable hypothesis testing by numerically showing the magnitude of the impact from competitors.

4.1.2. Variables for analysis

The variables analyzed were Internet turnover and the number of days held for each minor operator in horse racing and Keirin. In horse racing and Keirin in Japan, the odds are the same throughout the country, and betting methods are standardized. Therefore, Internet turnover is a direct indicator of consumer choice because it is not affected by differences in website usability, odds or gamblers' living addresses. The factor affecting turnover is the number of days that an event is held. Obviously, more days of events result in more turnover, and fewer days of events result in less turnover.

The number of days minor operators held races at the same time as major operators was also included in the variables for analysis. This is the number of days gamblers are willing to bet on races held by major operators rather than those held by minor operators. In other words, it is a factor that indicates the impact on turnover from major to minor operators.

Scheduling also affects turnover. This is because it is expected to be higher if gambling operators hold races during hours when many people are free, on holidays, or on weekday nights. Therefore, the policy was that the number of days held by each gambling minor operator and the number of days held at the same time as the major operators were counted by classifying them into types that multiply the day of the week (weekday or holiday) and the time of day (morning, afternoon, night, or midnight).

4.1.3. Data format and size

The data format is a panel data format in which the three variables are obtained for each minor operator and in time series. This is because the amount of data increases and unbiasedness is expected to increase by using the panel data format.

When analyzing panel data, although there is no guideline for the amount of data required for statistical accuracy, more data are better. In a multiple regression analysis with an effect size of 0.15, power of 0.8, and significance level of 5 % for 30 parameters, the number of records required was approximately 186. Therefore, this study aimed to obtain more than 200 records.

4.1.4. Statistical method for analysis

Panel data analysis was used to quantitatively analyze the collected data. This analytical method can be used for two reasons. First, panel data analysis allows a large sample size. Second, it resolves the separation of heterogeneity inherent in the subject of analysis from the coefficients, potentially solving the problems of omitted variables and measurement errors in the data [33].

4.1.5. Data collection policy

The analysis period covered the past five years, starting in 2021, when the JRA, the operator with the largest turnover, published data on its turnover and financial status in 2022 when the research was conducted. The number of panel data records for minor operators per month during this period was 629 for horse racing and 1597 for Keirin. The number of records of data analyzed together for horse racing and Keirin was over 200.

For the analysis, it is possible to obtain sales and number of days held via the Internet for each gambling operator from publicly available information. In the case of horse racing, it is possible to obtain monthly data from 15 operators belonging to the JRA and NAR. In the case of bicycle racing, it is possible to obtain monthly data from 43 gambling operators. The turnover and scheduling data used were obtained from websites where operators officially announced their information. In the case of horse racing, the websites were JRA and NAR [34–38]. In the case of Keirin, the websites were public relations magazines published on the web by JKA [39], the organization to which the Keirin operators belong, and the official website of the Keirin [40].

4.1.6. Software for analysis

The STATA 17 MP's reghdfe command was used as the panel data analysis tool. The reghdfe command allows for the setting of variables for fixed effects. In this study, these are the year, month, and number that identify the gambling operator.

4.2. Analysis policy

This study statistically examines the influence on turnover of horse racing and Keirin when minor operators conduct races simultaneously with major operators. The formula is shown below using a simple concept.

Concept Formula:

$$ln(MonthlyMinorOperatorTurnover) = \gamma_1 * MonthlyMinorOperatorHoldingDate - \gamma_2 * MonthlyMajorOperatorsSimultaneousHoldingDate$$

This formula represents the relationship between the monthly turnover of minor operators, the number of days per month that they hold races, and the number of days that major operators hold races simultaneously. The relationship is that for every one increase in the number of days a minor operator holds a race relative to the number of days a minor operator holds a race, there is a positive impact on the monthly turnover of the minor operator and a negative impact for every one increase in the number of days a major operator holds a race simultaneously. The monthly turnover of minor operators is related to the number of days they hold race. In addition, the monthly sales of minor operators are negatively affected by sales because they cannot monopolize gamblers if major operators simultaneously race. The coefficient γ is the coefficient of the number of race days for minor operators and the coefficient of the number of race days for major operators that run races simultaneously. The size of these coefficients determines the impact of major operators on the turnover of minor ones. Data on monthly turnover and the number of days held per month for each of the minor operators and the number of days held by the major operators at the same time will be collected, and a panel analysis will be conducted

to show the magnitude of the impact.

Fixed effects were employed in the panel analysis. The reason for employing fixed effects was to account for the influence of unobserved variables. For standard errors, cluster robust standard errors were used. The clusters in the model equation for this study were numbers identifying the gambling operator and the year and month. The coefficient of determination for the panel analysis, which is the measure used to evaluate the model equation, is Within R-square, where all variables are R-squared averaged over all fixed effects. In this study, an explanatory variable was considered to explain the explained variable well if the Within R-square was greater than or equal to 0.5. The standard for statistical significance was a p-value smaller than 0.1. When testing hypotheses, coefficients with a p-value smaller than 0.05 were included in the analysis.

4.2.1. Definition of major operators

For this statistical examination, it is necessary to determine the definition of an operator with large turnover and the verification method for races held simultaneously. Table 1 shows the rankings of horse racing operators by average daily turnover, and Table 2 shows the same ranking of operators by average daily turnover but for Keirin operators. The five top ranked horse racing operators are defined as major operators, while the top 13 Keirin operators receive this definition. There are 17 horse racing operators, with five being equivalent to approximately 30 % of the total number. There are 43 Keirin operators, with 13 being equivalent to approximately 30 % of the total number.

The five horse racing operators defined as major operators are JRA, Oi, Kawasaki, Funabashi, and Urawa. The four operators who are located in South Kanto area under the NAR belong to a group called the Kanto Regional Public Horse Racing Council and coordinate their schedules. The JRA only holds daytime races on weekends, whereas the four horse race operators in the southern Kanto region mainly hold afternoon races on weekdays, evening races on weekdays and holidays. JRA has the highest daily turnover average overall, while Oi, Kawasaki, Funabashi, and Urawa horse racing track have the higher turnover averages among NAR horse racing operators. As indicated in the Introduction, there is a significant difference in daily turnover between 5th place Urawa horse racing track and 6th place Kochi horse racing track.

4.2.2. Method of determining the impact of racing simultaneously with major operators

It is necessary to define a method of determining the impact on minor operators of holding a race simultaneously with major operators. To achieve this, previous studies in the entertainment industry were consulted. Optimization models in the entertainment industry use the day of the week and time of day to perform this analysis. Horen presented a model for predicting viewership ratings [41]. The model included a factor representing intensity. This factor uses the previous year's ratings to represent the influence of other companies' TV programs, increasing if the company's own broadcast network is more popular and decreasing if a competitor's broadcast network is more popular. Eliashberg et al. conducted a study to generate an optimal movie screening schedule, determining the optimal time and day of the week [42]. They developed a demand model that included factors indicating the effect of time factors, which contain the time, day of the week and holiday, on attendees such as 10 a.m.–10 p.m. and 11 a.m.–1 a.m. on Saturdays for estimation of the demand model.

In these previous studies of previous paragraph, time factors such as time and day of the week, which indicate changes in people's lives, and factors of intensity of influence that competitors have on their own services were included. Therefore, the monthly racing days held per day and night on weekdays and holidays are used in this study as time factors. Monthly days on which minor operators hold races with major operators in each of their schedules are summed are also adopted to represent influential intensity for minor operators' turnover by type of horse race and Keirin race. These racing days with major operators should show different negative influences.

4.3. Data collection

Time-series panel data are a set of observations for each individual multiple times. In this study, the individuals were race operators such as horse racing and Keirin, and the times were one-month intervals. Information on the turnover of horse race operators shown in Table 1 and Keirin operators shown in Table 2 is published monthly, and the schedule of races is published daily. Turnover data did not need to be processed since they are for one month. The number of days the race was held had to be totaled in units of one month by multiplying the time schedule pattern of race, weekdays, and holidays. This monthly data the race was held were obtained by summing the number of days per month for each pattern that multiplied weekdays and holidays by the time of day the race was held, as well as the monthly total number of days per month that minor operators in that pattern held races at the same time as the major operators.

4.3.1. Horse racing

The monthly turnover of minor operators were obtained via the Internet from January 2016 to December 2021 from business reports published on the NAR website [34]. The minor operator turnover was monthly; therefore, no processing was required. The schedules of both minor and major operators were obtained from the schedule information published on the JRA website [35] and the NAR website [36]. Horse races of NAR are scheduled during the daytime and night on weekdays and on holidays including weekends and holidays, and JRA races are held only during daytime on holidays. Horse race schedule was divided into four patterns (weekdays daytime, weekdays night, holidays daytime, and holidays night). The number of days on which the minor operators held horse races and the number of days on which those races were held simultaneously with races by the major operators were counted into the four patterns.

Table 1
Daily turnover ranking of horse racing operators.[7]

Rank	Horse Racing Operator	Turnover Average Per Day in Fiscal Years 2016–2121 (Yen)	Major/Minor
1	JRA	9,970,894,400	Major
2	Oi	1,504,065,075	Major
3	Kawasaki	1,222,906,747	Major
4	Funabashi	1,147,137,008	Major
5	Urawa	960,416,537	Major
6	Kochi	524,613,883	Minor
7	Sonoda	507,419,050	Minor
8	Monbetsu	426,714,008	Minor
9	Nagoya	384,725,617	Minor
10	Morioka	356,195,647	Minor
11	Saga	323,391,417	Minor
12	Himeji	309,056,267	Minor
13	Kasamatsu	293,474,517	Minor
14	Mizusawa	269,782,867	Minor
15	Kanazawa	255,638,950	Minor
16	Obihiro	215,482,783	Minor

[7] The total turnover and holding dates are obtained for each financial year from FY 2016 to FY 2021 financial reports [37] and from the NAR website [34]. These daily turnover figures are calculated.

4.3.2. Keirin

The turnover data of minor operators were retrieved via the Internet from the Keirin publicity magazine on their website for each month from January 2016 to December 2021 [39]. The minor operator turnover were monthly; therefore, no processing was required. The schedules of all operators were obtained from the website [40]. Keirin races of all operators are scheduled during the morning, daytime, night, and midnight on weekdays and on holidays including weekends and holidays. The Keirin schedule was divided into eight patterns (weekdays morning, weekdays daytime, weekdays night, weekdays midnight, holidays morning, holidays daytime, holidays night, and holidays midnight). The method for totaling the number of days per month for each of the eight schedule patterns for bicycle racing was the same as that for horse racing.

4.4. Data summary

4.4.1. Horse racing

The monthly turnover summary which is influenced due to time factors and intensity's factors of influence is shown in Table 3. Horse racing is held on weekdays (day and night) and weekends (day and night); hence, the number of monthly racing days in each of schedules by multiplying the time of the race and the kind of weekdays and weekends. The summary of the data of them is presented in Table 3. The data retrieved via the Internet were excluded from the analysis if the minor operator's turnover was 0 yen such as is the case in the winter season and was the case during the Covid-19 pandemic. Holidays are counted as weekends.

4.4.2. Keirin

The monthly turnover summary which is influenced due to time factors and intensity's factors of influence is indicated in Table 4. Keirin is held on weekdays and weekends in the morning, daytime, at night, and midnight. The number of monthly racing days in each of schedules is counted by multiplying the time of race and the kind of weekdays and weekends in the same way as for horse racing. Table 4 summarizes the data of them acquired for Keirin. The Keirin major operators do not hold races on weekday and weekend mornings, so 0 is set in variables that indicate simultaneous races with the major operators. Turnover retrieved via the Internet and holidays are treated in the same way as for horse racing.

4.5. Model definition

Panel data analysis is conducted to examine the impact of major operators on minor operators in horse racing and Keirin, respectively. The panel data analysis employs a two-way fixed effects model that includes the individual characteristics of gambling operators and the time-specific characteristics of the year and month. The explained variable to examine the effect of time factors and intensity's factors of influence is the internet turnover of minor operators. Standard errors are cluster-robust standard errors.

4.5.1. Model definition for horse racing

The explanatory variables are four for the timing at which the minor operators hold races and four for the timing at which they hold races with major operators simultaneously.

Model (1)

Table 2
Daily turnover ranking of Keirin operators.[8]

Rank	Keirin Operator	Turnover Average Per Day in Fiscal Years 2016–2121 (Yen)	Major/Minor
1	Hiratsuka	441,745,618	Major
2	Kurume	429,798,432	Major
3	Tachikawa	423,989,034	Major
4	Keio-Kaku	423,272,328	Major
5	Matsudo	421,446,226	Major
6	Shizuoka	418,158,600	Major
7	Iwakidaira	414,376,436	Major
8	Ito	394,699,037	Major
9	Tamano	376,264,035	Major
10	Kawasaki	372,281,568	Major
11	Yokkaichi	367,658,828	Major
12	Nagoya	353,808,283	Major
13	Matsuyama	342,979,248	Major
14	Maebashi	339,453,072	Minor
15	Kishiwada	339,025,979	Minor
16	Komatsujima	322,648,853	Minor
17	Hakodate	322,643,758	Minor
18	Kokura	322,495,876	Minor
19	Takamatsu	317,437,554	Minor
20	Utsunomiya	306,812,549	Minor
21	Toyohashi	303,812,090	Minor
22	Wakayama	302,600,670	Minor
23	Toride	300,541,693	Minor
24	Mukaimachi	287,373,208	Minor
25	Bohu	282,107,945	Minor
26	Sasebo	281,648,819	Minor
27	Nara	281,061,234	Minor
28	Ogaki	280,513,546	Minor
29	Omiya	279,792,398	Minor
30	Gihu	279,700,879	Minor
31	Aomori	274,167,454	Minor
32	Matsuzaka	273,115,323	Minor
33	Seibuen	273,072,811	Minor
34	Fukui	268,658,943	Minor
35	Yahiko	267,913,298	Minor
36	Takeo	267,259,701	Minor
37	Beppu	263,925,237	Minor
38	Kochi	263,915,408	Minor
39	Odawara	253,108,343	Minor
40	Hiroshima	248,993,121	Minor
41	Toyama	248,176,472	Minor
42	Chiba	87,808,933	Minor
43	Kumamoto	–	Minor

[8] The turnover and holding date of each fiscal year from 2016 to 2021 were obtained from the public relations magazine for Keirin to calculate the turnover per day [39]. Kumamoto was defined as minor because no races have been held there since February 2016. The small daily turnover in Chiba is because the city has not held a Keirin race since March 2018.

$$\begin{aligned} ln(InternetGamblingTurnover_{it}) = {} & \alpha_0 + \alpha_1(WeekendsDaytime_{it}) + \alpha_2(WeekendsNight_{it}) + \alpha_3(WeekdaysDaytime_{it}) \\ & + \alpha_4(WeekdaysNight_{it}) + \alpha_5(MHWeekendsDaytime_{it}) + \alpha_6(MHWeekendsNight_{it}) \\ & + \alpha_7(MHWeekdaysDaytime_{it}) + \alpha_8(MHWeekdaysNight_{it}) + u_i + e_{it} \end{aligned}$$

i represents the year and month and t represents a unique number assigned to each operator. β_0 is a constant term, u_i represents within entry error term and e_{it} is the overall error term. This is a log-level model that analyzes the time series by horse racing operators. MH in the above equation is an abbreviation for "Major Horse Racing Operators". In the defined model, the marginal effect of the explanatory variables on the internet gambling turnover are tested by checking α_1–α_8.

4.5.2. Model definition for Keirin

The explanatory variables are eight for the timing at which the minor operators hold races and eight for the timing at which they hold races with major operators simultaneously.

Model (2)

Table 3
Data summary of internet gambling turnover and timing of racing for horse racing.

No.	Data	Obs.	Mean	Std. dev.	Min	Max
1	Internet Gambling Turnover	629	2.80e+09	2.16e+09	1.33e+08	1.43e+10
2	Weekends Daytime	629	0.252	0.792	0	12
3	Weekends Night	629	0.964	1.225	0	11
4	Weekdays Daytime	629	0.21	0.676	0	18
5	Weekdays Night	629	0.487	1.063	0	15
6	Major Horse Race on Simultaneous Weekends Daytime	629	0.325	0.931	0	11.5
7	Major Horse Race on Simultaneous Weekends Night	629	2.18	1.983	0	4
8	Major Horse Race on Simultaneous Weekdays Daytime	629	0.506	1.287	0	14
9	Major Horse Race on Simultaneous Weekdays Night	629	0.988	1.83	0	13

Table 4
Data summary of internet gambling turnover and timing of race for Keirin.

No.	Data	Obs.	Mean	Std. dev.	Min	Max
1	Internet Gambling Turnover	1597	9.32e+08	9.47e+08	1.96e+07	9.91e+09
2	Weekends Morning	1597	0.252	0.792	0	6
3	Weekends Daytime	1597	0.964	1.225	0	7
4	Weekends Night	1597	0.210	0.676	0	6
5	Weekends Midnight	1597	0.487	1.063	0	7
6	Weekdays Morning	1597	0.325	0.931	0	8
7	Weekdays Daytime	1597	2.180	1.983	0	9
8	Weekdays Night	1597	0.506	1.287	0	9
9	Weekdays Midnight	1597	0.988	1.830	0	12
10	Major Keirin on Simultaneous Weekends Morning	1597	0.000	0.000	0	0
11	Major Keirin on Simultaneous Weekends Daytime	1597	0.528	0.936	0	6
12	Major Keirin on Simultaneous Weekends	1597	0.093	0.395	0	4
13	Major Keirin on Weekends Midnight	1597	0.065	0.346	0	4
14	Major Keirin on Simultaneous Weekdays Morning	1597	0.000	0.000	0	0
15	Major Keirin on Simultaneous Weekdays Daytime	1597	0.992	1.367	0	7
16	Major Keirin on Simultaneous Weekdays Night	1597	0.197	0.675	0	7
17	Major Keirin on Simultaneous Weekdays Midnight	1597	0.065	0.346	0	4

$$\begin{aligned} ln(InternetGamblingTurnover_{it}) = {} & \beta_0 + \beta_1(WeekendsMorning_{it}) + \beta_2(WeekendsDaytime_{it}) + \beta_3(WeekendsNight_{it}) \\ & + \beta_4(WeekendsMidnight_{it}) + \beta_5(WeekdaysMorning_{it}) + \beta_6(WeekdaysDaytime_{it}) \\ & + \beta_7(WeekdaysNight_{it}) + \beta_8(WeekdaysMidnight_{it}) + \beta_9(MKWeekendsMorning_{it}) \\ & + \beta_{10}(MKWeekendsDaytime_{it}) + \beta_{11}(MKWeekendsNight_{it}) + \beta_{12}(MKWeekendsMidnight_{it}) \\ & + \beta_{13}(MKWeekdaysMorning_{it}) + \beta_{14}(MKWeekdaysDaytime_{it}) + \beta_{15}(MKWeekdaysNight_{it}) \\ & + \beta_{16}(MKWeekdaysMidnight_{it}) + u_i + e_{it} \end{aligned}$$

MK in the above equation is an abbreviation for "Major Keirin Operators." The coefficients test the method for checking β_1–β_{16} and use the same method as in model (1).

5. Results

5.1. Horse racing

The model equation as a whole was evaluated as an effective model equation because Within-R-sq. exceeded 0.5 (Table 5). In result of model (1), the monthly number of weekend daytime hours ($MHWeekendsDaytime_{it}$) and night time hours ($MHWeekendsNight_{it}$) of the minor operators simultaneously holding races with the major operators did not show statistically significant results at a significance level of less than 10 %. All other variables were statistically significant at a significance level of less than 5 %. JRA only holds races on weekends during the day; hence, the results indicate that the impact of JRA's high turnover among the horse racing operators has no statistically significant effect on the minor operators.

The coefficient for the number of days of weeknight races ($WeekdaysNight_{it}$) was the highest at 0.165. The coefficient for the number of days of weekend daytime races ($WeekendsDaytime_{it}$) was the lowest at 0.146. The coefficient of 0.165, the highest number, is approximately 1.11 times higher than that of 0.146, the lowest number. This is not a significant difference. The coefficient for the number of race days held on weekdays during the day ($MHWeekdaysDaytime_{it}$) simultaneous to major operators has a lower negative effect at −0.037, and the coefficient for the number of race days on weeknights ($MHWeekdaysNight_{it}$) has a higher negative effect at −0.047. Both absolute values of the coefficient for the number of race days simultaneous with major operators have large negative effects because both effects are larger than 0.019 (=0.165–0.146) for minor operators.

Table 5
Result of model (1).

	Panel analysis (Fixed) Model (1)
Variables	Coefficient (Robust std. err.)
WeekendsDaytime	0.146*** (0.017)
WeekendsNight	0.155*** (0.022)
WeekdaysDaytime	0.153*** (0.013)
WeekdaysNight	0.165*** (0.014)
MHWeekendsDaytime	−0.007 (0.012)
MHWeekendsNight	−0.043 (0.031)
MHWeekdaysDaytime	−0.037** (0.013)
MHWeekdaysNight	−0.047** (0.017)
Constant	20.125*** (0.092)
Observations	629
R-sq.	0.937
Within R-sq.	0.753
Fixed Effect	Horse Racing Operator ID, Year and Month

***p < 0.01, **p < 0.05, *p < 0.1.

5.2. Keirin

The model equation as a whole was evaluated as an effective model equation because the Within-R-sq. was almost 0.5 (Table 6). In result of model (2), the three coefficients, the number of weekend morning ($MKWeekendMorning_{it}$), weekday morning ($MKWeekdaysMorning_{it}$), and weekday midnight ($MKeekdaysMidnight_{it}$) races held simultaneously with the major Keirin operators do not show statistically significant results at a significance level of less than 10 %. The other variables were statistically significant at significance levels of 10 % or less.

The coefficient for the number of weekend daytime races ($WeekendsDaytime_{it}$) was the highest at 0.338. The coefficient for the number of weekend morning races ($WeekendsMorning_{it}$) was the lowest at 0.115. The highest coefficient, 0.338, was approximately 2.94 times the lowest coefficient, 0.115, indicating a large difference compared with horse racing. As for days on which races were held simultaneously with major operators, the coefficient for the number of weekday daytime races ($MKWeekdaysDaytime_{it}$) has the lowest negative effect at −0.023, and the coefficient for the number of weekend daytime races ($MKWeekendsdaytime_{it}$) has the highest negative effect at −0.145. The largest negative coefficient at −0.145 has a small negative effect because its absolute value is smaller than 0.223 (=0.338–0.115) for minor operators.

Table 6
Result of model (2).

	Panel analysis (Fixed) Model (2)
Variables	Coefficient (Robust std. err.)
WeekendsMorning	0.115*** (0.016)
WeekendsDaytime	0.338*** (0.021)
WeekendsNight	0.261*** (0.038)
WeekendsMidnight	0.246*** (0.022)
WeekdaysMorning	0.131*** (0.012)
WeekdaysDaytime	0.208*** (0.017)
WeekdaysNight	0.201*** (0.014)
WeekdaysMidnight	0.232*** (0.013)
MKWeekendsMorning	0.000 (0.000)
MKWeekendsDaytime	−0.145*** (0.027)
MKWeekendsNight	−0.106*** (0.031)
MKWeekendsMidnight	−0.075*** (0.023)
MKWeekdaysMorning	0.000 (0.000)
MKWeekdaysDaytime	−0.023* (0.012)
MKWeekdaysNight	−0.050*** (0.018)
MKWeekdaysMidnight	−0.004 (0.014)
Constant	18.951*** (0.062)
Observations	1597
R-sq.	0.734
Within R-sq.	0.495
Fixed Effect	Keirin Operator ID, Year and Month

***p < 0.01, **p < 0.05, *p < 0.1.

6. Hypotheses testing

6.1. Horse racing

The effects of simultaneous races and the coefficient of the timing of larger internet gambling turnover were simultaneously examined. As indicated in Table 5, the timing that generates the highest internet gambling turnover is weeknights at 0.165. When major horse race operators held races simultaneously with minor operators, the marginal effect for weeknights on internet gambling turnover was 0.118 (=0.165–0.047), smaller than the coefficient of 0.146 for the lowest weekend daytime. This means that if minor horse racing operators hold races on weeknights while major horse racing operators hold races simultaneously, internet gambling turnover will be at its lowest. This result supports hypothesis 1.

JRA turnover do not influence their competitors' turnover. The reason for this may be that operators, except the operator of Saga horse racing track, seldom held weekend daytime races in the period 2016–2021.

6.2. Keirin

The result for the Keirin market was examined using the same method as that for horse racing. As shown in Table 6, the timing that generates the highest internet gambling turnover is weekends daytime at 0.338. The marginal effect on internet gambling turnover is 0.193 (=0.338–0.145) if minor Keirin operators hold races on weekends during the daytime when major operators hold races. On weekend nights, the marginal effect was 0.155 (=0.261–0.106). These values are higher than the 0.115 weekend morning coefficient, the lowest, and the 0.131 weekday morning coefficient, the second-lowest. Therefore, weekends daytime and at night races do not yield the worst turnover if the minor Keirin operators hold races at these times when the major operators hold races. These findings support hypothesis 2.

7. Discussion

The results of the two hypothesis tests reveal differences in the impact of different market structures on the positions of firms with small sales that are affected by competitors. In hypothesis 1, if a company is in a market with few competitors, and its direct competitors have turnover much larger than its own, the influence of the larger competitors on the smaller company's turnover will be large. In hypothesis 2, if a company is in a market with many competitors, but none of them have turnover much larger than its own, the influence of the slightly larger competitors on the smaller company will be small. The results reveal that in the affected market positions, the impact varies depending on the market structure, which has not been previously revealed. Differences in competitive influence due to market structure could be one means of avoiding competition by market definition. Several studies have been conducted in which strategies such as differentiation and cost leadership have been used to lower the threat from competitors [43–47]. However, these studies did not focus on the magnitude of competitive threats in markets to new entrants or competing firms. In this study, the numerical values of the impact on sales from competitors in two different markets are presented to show the difference in magnitude. It contributes to the market segmentation and marketing strategies in that it makes it possible to lower the threat from competitors, depending on how the market is defined. In addition, the results are also consistent with a previous study showing that leader firms influence followers [26]. Newbert showed that competitive advantage was positively correlated with business performance [19], and ICB-InterConsult Bulgaria Ltd found that economies of scale could constitute a competitive advantage [48]. These previous studies also support the results of this study in that firms with larger sales also have an impact.

The results of this study suggest that the presence of influential competitors in a market may affect marketing efforts. Consumers spend time in contact with a brand and considering it through mediums such as SNS, TV, conversations with others [49–52]. The more favorable they are to the target brand during the consideration phase, the stronger the brand's fascination [53–57]. High-performing companies have assets that provide them with competitive advantages [19–23]. Assets that are valuable, rare, inimitable, and non-substitutable and provide competitive advantages are those such as brand equity accumulated by the firm [58–62]. Therefore, when a company has highly influential competitors in its market, such as in the horse racing gambling market, it is necessary to take the competitors' marketing measures such as pricing, product and communication with consumers into account in its marketing initiatives to reduce influence by competitors which are market leaders. Whereas, when there are competitors with little influence in the market, such as in the Keirin gambling market, it is less important to take competitors' marketing measures into account in marketing initiatives.

One of the marketing efforts that this study's suggestion influences is segmentation. This is because it can be selected for which a company might be particularly well advantaged due to its competitive advantage in that segment [63–67].

8. Conclusion

This study was conducted to analyze the Japanese horse racing and Keirin gambling markets and identify differences in the competitors' market influence due to differences in the market structure. Prior studies showed that the influence of competitors on a company are complex. The horse racing gambling market has a structure in which there are large differences between high- and low-turnover operators, and the number of competitors is small. The Keirin gambling market has a structure in which the difference between high- and low-turnover operators is small and the number of competitors is large. In these two gambling industries with different market structures, panel analysis was conducted to determine the differences in the magnitude of the impact on operators with low-

turnover from those with high-turnover. It was found that there was a large negative impact on low-turnover operators in the horse racing market, while there was a small negative impact on low-turnover operators in the Keirin gambling market. The results indicated that the impact of small sales on firms with large sales depends on market structure. This implies that firms with a small number of competitors, but large sales differentials have a large impact, whereas firms with a large number of competitors but small sales have a small impact. The results of this study showed that the impact from competitors differs depending on the market structure as conclusion. Furthermore, the results also suggested that the presence of enterprises with a competitive advantage affected market segmentation policies and marketing efforts. Marketing professionals should examine the number of competitors and the difference in sales between competitors and their own company and analyze the structure of the market for their products. If their company is in a position to influence competitors, they could maintain a dominant position in the market by developing and marketing products in response to the products of other companies. Conversely, if the company is in a position to be influenced by its competitors and the influence of its competitors can be assumed to be small, it could gain an advantageous position in the market by offering products in response to customer demand. If the influence from competitors is significant, it is better to avoid competing with them and gain a dominant position in another market by defining different market segments.

This study had several limitations. First, this study focused on the Japanese gambling industry of horse racing and bicycle racing as a comparison of businesses with different market structures. Although operators in these two markets published their sales per month since 2016, we were unable to find a market that publishes data for each operator for the entire market, including competitors and foreign and non-gambling operators. Therefore, the results and conclusions of this study cannot be generalized to other industries. Second, all gambling operators operating in the Japanese horse racing and Keirin markets were either local governments or organizations under the jurisdiction of a ministry such as the JRA. This means that the primary objective of each operator is not to increase profits and that the operators are not in full competition with each other. These operators are more important for their financial contribution to national and local governments, as well as for social development, such as livestock farming and sports, and are not growing their presence in Japanese entertainment, such as the video streaming service industry to which Netflix belongs. In addition, to optimize turnover in the market as a whole, race schedules and content may be prompted by industry associations to make adjustments and businesses may adjust among themselves. Therefore, the atmosphere of competition among operators was lower than that in a typical business environment, but it was impossible to consider this in the analysis. Despite these limitations, it is also a fact that the analysis yielded the conclusions and suggestions presented in this study because the data are presented in detail and the gambling operators are not diversified and the market structure is simple.

Future research would require market analysis in a general business environment. While many markets are complex and difficult to analyze, it may be possible to do so in areas where it is difficult for new entrants to enter the market. Although it is often impossible to obtain sales on a monthly basis, as in this analysis, it would be necessary to conduct a similar analysis by obtaining information from publicly available materials to general shareholders for a longer period to see whether similar results could be obtained as in the present study.

Ethics declarations

Informed consent was not required for this study because it is not intended for humans or animals.

Data availability statement

Data will be made available on request.

CRediT authorship contribution statement

Masafumi Nagata: Writing – review & editing, Writing – original draft, Methodology, Investigation, Formal analysis, Data curation. **Tokuro Matsuo:** Writing – review & editing, Supervision, Funding acquisition, Conceptualization.

Declaration of competing interest

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