Factors Affecting Commercial Endorsement of Stars and the Game Behavior of Stars' Data Falsification

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Abstract. This scientific paper aims to analysis factors affecting commercial endorsement of stars, and the game between stars which is a cause of data falsification. This article will use the static game theory to construct a static game between stars, and find out the Nash equilibrium. Both choosing fraud is the result of Nash equilibrium. The results explain why celebrity data fraud has become so common among celebrities. In addition, this article will also use some star data regression to analysis the factors influencing star commercial endorsements by Stata. As can be seen from the results, male stars have gender advantages. And the more fans, especially the core fans that stars have, the more commercial endorsements they have. There was also a positive correlation between the number of works and endorsements. The game matrix constructed in this paper is a relatively simple static game model, without considering many practical factors. And because the data is difficult to collect, the cross-sectional regression is simple.

Keywords: data falsification · commercial endorsement · star effect

1 Introduction

With the continuous development of economy and the influence of Japanese and Korean culture, star-worship has become a trend among Chinese young people. Meanwhile, with the continuous development of the Internet in China, the concept of "Liuliang star" which means online celebrity with a huge fan base was born in China. This is the concentrated embodiment of star power in the age of Internet development. In the era of big data, celebrities are closer to the concept of commodities. Their number of fans and popularity on the Internet are all data sources that can be used to analysis the commercial value of celebrities. For example, in China, where the e-commerce industry is very developed, businesses will use these data to analysis who is the best spokesperson. For celebrities, good data means they can get a lot of endorsements. As a result, many celebrities have an incentive to fake their data, creating an atmosphere of their own popularity through fake data, so that businesses can choose themselves as spokespersons.

First of all, the data of a star refers to the number of mentions on the Internet and the number of interactions of fans on Social Networking Services platforms, such as

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forwarding comments and likes. It is regarded as a reflection of celebrity popularity in China. In a narrow sense, this concept mainly refers to the interactive data on Weibo, the most widely used SNS platform in China It has to be mentioned that the development of celebrity cult culture in China in recent years is inseparable from the continuous expansion and strength of Weibo as a platform. Quite a number of cultural and business studies have shown that Weibo is the driving force behind the development of celebrity cult culture. Broadly speaking, it may include the likes, reposts and video views of Tiktoks. For actors, the figures also include TV series airplay and movie box office.

Some stars will choose to buy water army to forward, like, forward their own posts. So this game of data manipulation between stars makes sense. Finally, out of their love for stars, some fans will try their best to make data for their favorite stars, such as re-posting the stars' micro-blogs hundreds of times.

In addition to the falsification of social platform interaction data, there are many other aspects of falsification. For example, in the early years, TV dramas' ratings were counted by households, and TV dramas would give gifts to sample households to improve their ratings. With the rise of streaming media, the number of online TV shows is now an important statistical indicator, so some people will increase the number of fake TV shows by replaying them. And the film industry also exists box office fraud.

In addition, there is also a kind of hidden fraud, that is, stars through their endorsement sales fraud, to create a kind of excellent ability to bring goods to the illusion, attract other merchants to invite their products.

In a word, data fraud related to stars is not a new thing, it is universal and diverse. This paper mainly studies whether such competition between stars will lead to data fraud, and analyzes the factors affecting the number of celebrity endorsements.

Although star isn't much a fresh career, star effect also has a long history, but in the modern sense star appeared more than one hundred years. The systemic research for celebrities has a even more shorter history, but there are still a lot of research results in recent years, and has a tendency to dispatch quantity more and more. Therefore, the attention of scholars in the study of celebrity endorsement is higher and higher. In addition, celebrity endorsement is a commercial activity, which involves knowledge related to communication and psychology, so it has the characteristics of interdisciplinary. In terms of region, countries with relatively developed entertainment industry, such as the United States and China, have more studies on it [1].

The research on celebrity endorsement effect has the following perspectives.

At present, the traditional celebrity spokespeople can be divided into the entertainment star singer, athletes, experts, entrepreneurs and politicians, et al. [2]. As the popular online social network, a new type of brand spokesperson KOL in different countries or regions is different to each kind of mouthpiece liking [3], such as Malaysia and China consumers more entertainment [4].

Celebrity endorsement has a positive influence on consumers' brand attitude through their brand trust, and then improves consumers' purchase intentions [5]. Celebrity spokespeople of professionalism and trustworthiness is helpful to enhance the brand image, and trustworthiness of celebrity spokesperson will pass brand trust and matching variables such as the brand assets value Celebrity spokespeople negative information than

positive information is more likely to transfer to the brand, found that when spokesperson scandal has attracted a lot of media attention, or celebrity status is prominent, stock returns will decline [6].

In addition to celebrities' fame, some other attributes of spokesmen also affect the effect of endorsement. The professional performance of spokesmen can improve the purchase intention of male consumers, while female consumers are more influenced by the attractiveness of spokesmen [7]. When there was a moderate mismatch between the celebrity and the product, the celebrity endorsement produced stronger purchase intention than when there was a perfect match or an extreme mismatch, and this effect was more obvious in the participants with high product involvement [8].

Another problem is unfair competition between stars. As the previous lines already suggest, the businessman will decide the spokesperson through the various qualities of the star. SNS interaction data is a common data to identify these qualities, which is the motivation that data fraud. In essence, data fraud is a form of unfair competition. Analysis of unfair competition [9], and how to reduce this kind of unfair competition [10], are carefully studied in this paper.

2 Method

As the title indicates, this paper will analyze two things next. First, it will use the knowledge of game theory to analyze the prisoner's dilemma caused by data fraud among stars. Second, it will analyze the constructors and empirically analyze the influence of fans on commercial endorsement.

2.1 Factors Affecting the Number of Endorsements a Star Receives

From the literature review, we can sum up some factors that influence celebrity merchants to choose celebrity endorsement. A simple function will be constructed to further discuss how these factors affect stars' endorsement.

First, we established a simple model, with the number of endorsements as the dependent variable, and the number of fans, gender, and number of works as the independent variable.

$$\text{edrsmt} = \beta_1 \text{sex} + \beta_2 \text{wb\_fns} + \beta_3 \text{wks} + \alpha \tag{1}$$

In Formula (1), we use the number of weibo fans to represent the number of fans, and then replace the number of fans with the number of core fans to establish Formula (2).

$$\text{edrsmt} = \beta_1 \text{sex} + \beta_2 \text{cr\_fns} + \beta_3 \text{wks} + \alpha \tag{2}$$

Where *edrsmt* means endorsements, *wb_fns* means Weibo fans, and *wks* means works.

2.2 Data Analysis

Here, we select the data of 44 Chinese stars, taking the number of endorsements from 2022 to April as the dependent variable, and the number of fans, gender and works of the stars as the independent variable. These 44 stars are selected according to the recent super topic interaction ranking of Weibo. Because there are so many stars, here are some of the most popular stars according to this interactive ranking. As mentioned above, data fraud is common among stars, so data dehydration for stars has become a hot business to facilitate the analysis of stars' commercial value, etc. Therefore, we get some data about the number of dehydrated fans of celebrities through the authoritative celebrity statistics website AIman, and call them core fans. In addition, the website also calculates the number of celebrity endorsements and works (Table 1).

First, we did a manipulation on gender, setting males to 0 and females to 1. It can be seen that there are more male celebrities than female celebrities in general. It can be seen that there are more men than women among these legitimate stars. Judging by the number of works, some of these popular stars have been well-known for a long time, while others are just beginning to be popular. The number of core fans is the result of AIman data based on algorithmic statistics. These fans have the following characteristics: they will mention their favorite stars online, and they will choose to buy things because these stars are spokespeople. The number of Weibo fans is the number of followers of Weibo.

Table 2 describes male stars' data, and Table 3 describes female stars' data. After dividing according to gender, we can feel the difference between male and female stars more intuitively. It mainly focuses on three aspects. First of all, there are more male stars than female stars. Second, female stars generally produce more works than male stars.

Table 1. Data descriptive statistics

Variable	Mean	Std. Dev.	Min	Max
Sex	0.273	0.451	0	1
Works	41.341	24.145	4	105
Endorsement	24.045	12.264	5	52
Core fans (Thousand)	41.143	35.075	2.705	142.11
Weibo fans (Million)	36.718	28.012	4.07	111

Table 2. Male stars' data descriptive statistic

Variable	mean	sd	min	max
Works	37.97	22.00	4	89
Endorsement	23.56	12.02	6	52
Core fans	40.30	37.03	2.71	142.1
Weibo fans	32.62	22.51	4.07	89.90

Table 3. Female stars' data descriptive statistic

Variable	mean	sd	min	max
Works	50.33	28.17	19	105
Endorsement	25.33	13.35	5	49
Core fans	43.39	30.60	8.48	107.7
Weibo fans	47.63	38.22	15.04	111

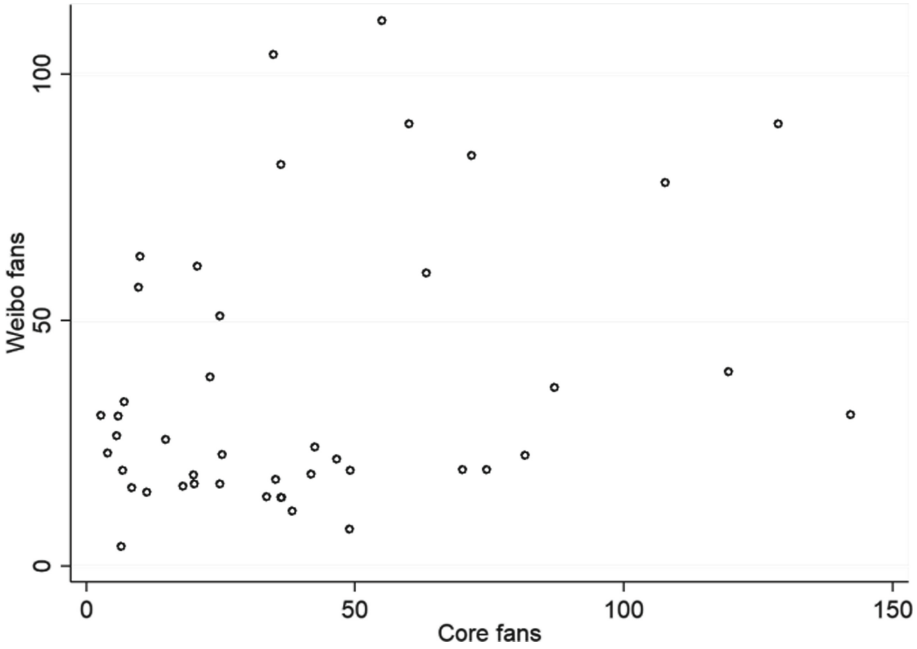

Fig. 1. Scatter chart of number of core fans and number of Weibo fans

Finally, female stars generally have more followers on Weibo than male stars, that is to say, female stars are more famous.

Is the number of core fans exactly the same as the number of Weibo followers?In order to solve this problem, we conducted correlation test for the two variables. As can be seen from the following table, the two variables are positively correlated, but not completely correlated.

As is shown in Fig. 1, the data of core fans and stars' fans on social platforms are not very consistent. Through correlation test, the correlation coefficient of the two is 0.31, which is not completely correlated. It does not mean that the more stars' fans, the more core fans. The number of fans on social platforms represents the popularity of a star, while the number of core fans represents the number of people who are willing to pay directly for the star's business endorsement.

Table 4. Game between 2 stars

		Star 2	
		Cheat	No Cheat
Star 1	Cheat	(a, a)	(c, d)
	No Cheat	(d, c)	(b, b)

3 Results and Discussion

3.1 Game Between Stars

Suppose there are two players in the game, star 1 and Star 2. Each participant is completely rational and aims at maximizing their own interests. Suppose the two stars have all the same personal conditions. The decision-making behaviors of both parties are independent, and both parties do not know the actions taken by the other party before making their own decisions; The game between the participants is a static game.

Stars have strategy that S1 = (cheating, no cheating).

Based on the above assumptions, this paper constructs the game payment matrix between stars, as shown in Table 4.

Result (a, a) is the payoff obtained by star 1 and Star 2 respectively when they both falsified data, and (b, b) is the payoff that star 1 and star 2 get when they both choose not to cheat in data. c is the payoff for a star who cheats when the other star chooses not to cheat, and d is the payoff for another star in this situation.

As long as the payoff brought by data fraud is greater than the sum of the cost of data fraud and the possible punishment, then the stars will choose to cheat. As long as the payoff of data fraud are less than the sum of the cost of data fraud and the possible penalties, is it a better strategy not to cheat, no matter what other stars choose.

The reality is usually $c \geq 0$, that is, if stars want to get more resources, especially new stars, there is a high probability that they will choose to fake their data, which explains why data fraud demand is so great and leading to the creation of part-time or full-time water armies and even companies which specializes in this things. To solve this problem, need to make $c \geq 0$ change into $c \leq 0$. In other words, it is possible to reduce the waste of social resources by controlling the benefits of data fraud for stars and increasing the cost of data fraud for stars. Unfortunately, celebrities don't usually get punished for this kind of data fraud.

3.2 Regression Results

Then, based on the above cross-sectional data, the regression analysis is carried out (Table 5).

It can be seen from the regression results that the number of fans has a significant positive effect on the stars' endorsement, no matter it is Weibo fans or core fans. The number of works also has a positive effect on celebrities' endorsement. The more works a star has, the more endorsements he or she is likely to get.

Table 5. Regression results

	(1)	(2)	(3)
	endorsement	endorsement	endorsement
Core fans	0.133**	-	0.0881*
	(3.15)	-	(2.03)
Works	0.274***	0.0855	0.133
	(4.36)	(1.05)	(1.62)
Sex	-2.022	-2.988	-2.910
	(-0.60)	(-0.90)	(-0.91)
Web fans	-	0.247**	0.184*
	-	(3.50)	(2.47)
constant	7.835*	12.27***	8.953**
	(2.32)	(4.27)	(2.78)

As recalled above, males were set as 0, while females were set as 1. According to the regression result, the coefficient of gender was negative, it can be seen that females occupy a disadvantage in obtaining commercial endorsement, while males occupy an advantage.

Then, is the number of core fans more important to the number of endorsements, or is the number of Weibo fans more important? According to the regression results of (1), (2) and (3), the number of Weibo fans has a greater impact on a star's ability to obtain endorsement. This also explains to a certain extent why stars cheat on their data. As we all know, followers of Weibo can be bought. If buying followers can make stars get more endorsements, why not?

4 Conclusion

This paper looks at two things: the first is the game between stars about data fraud. By constructing a game matrix and finding the Nash equilibrium, it can be found that stars always fall into this zero-sum game. As long as there is a star cheating, the payoff of other stars will be damaged, because the resources of film and television and commercial endorsement are always limited. When one star gets an opportunity to play a role or endorse a product through data fraud, another must lose the opportunity. In other words, whether a star wants to cheat or not, he or she has to cheat. Moreover, since laws and regulations in this area are not yet complete, there is almost no price to pay for data cheating, so stars have more incentives to cheat. This has led to widespread data fraud today. So this creates common data fraud situation today. This is a serious waste of social resources, but also misled many businesses and fans to make decisions. And this kind of situation also not only exists in this matter of chasing stars. On the shopping platform, merchants buy false favorable comments to mislead consumers. Amazon cracked down on this behavior not long ago. In the stock market, it may be that enterprises obtain

investment through false financial statements, such as Luckin coffee. In short, data fraud needs to be cracked down on.

In fact, stars are not exactly the same, and the gains and losses brought by data fraud are not exactly the same, which is the shortcoming of game matrix constructed. This is the problem that this paper needs to face.

By constructing the equation of factors affecting celebrity endorsement, we further discuss which factors affect celebrity endorsement and how they affect it. According to the regression results, the more fans a star has, the more endorsements a star will get. The more works a star has, the more endorsements a star will get. Male stars are more likely to get endorsements than female stars. Compared with the number of core fans, the number of Weibo fans is more important for commercial endorsement. On the one hand, the number of Weibo fans is intuitive, while the number of core fans is hard to find. However, the number of Weibo fans may be suspected of fraud. For businesses, how to avoid such information asymmetry and understand the real popularity of spokespersons is a topic worth studying. On the other hand, the number of Weibo followers is a better indicator of celebrity popularity than the number of core followers. Enterprises should choose according to their demand, if it is need to face with high visibility, so you should consider Weibo fans for this data, if it is need to face more hardcore fans The fans would because of star products to buy, you will need to business data more in-depth investigation of the stars.

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