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# Ranking Value and Preference: A Model of Superstardom

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## Abstract

Superstars earn extremely high incomes as compared with those of ordinary people, but why? In this paper, I present a model of superstardom that explains the mechanism of extremely high incomes based on the concepts of ranking value and ranking preference. I propose that goods and services possess not only practical values but also ranking values because people derive utility through various types of rankings. This emotional response (i.e., ranking preference) gives monopolistic powers to the producers of some types of goods or services. For some goods and services (e.g., professional sports), the ranking preference is very strong and therefore so is the level of monopolistic power. This strong monopolistic power is the origin of the extremely high incomes of superstars.

JEL Classification code: D11, D31, D42, D63, J30

Keywords: Superstar; Income inequality; Ranking Value; Ranking preference; Monopoly

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# 1 INTRODUCTION

Superstars—for example, top athletes in professional sports, pop music stars, and best-selling authors—earn extremely high incomes as compared with those of ordinary people. In theory, wages are equal to marginal products of labor. The question that arises, then, is: Are superstars that earn extremely high incomes really extremely more productive? Indeed, the physical abilities of top athletes or other performers may very well be higher than those of ordinary people, but are they sufficiently high to explain the tremendous difference in incomes between superstars and ordinary people? Furthermore, even if, for example, an athlete (or any other performer) has physical ability that is very close to that of a superstar, he or she may generally not gain as high an income if he or she plays in a minor league or an unpopular sport.

Several models have been presented to explain why superstars are able to earn unusually high incomes. An early and important work on this topic was that of Rosen (1981), which was followed by those of Adler (1985), Frank and Cook (1995), and Borghans and Groot (1998). Rosen (1981) attributed the extremely high incomes of superstars to differences in talent (quality) and to a special market structure (i.e., “non-rivalry”). Adler (1985) discussed “consumption capital,” and Borghans and Groot (1998) “endogenous property rights” and monopolistic power. However, their models have problems (see Section 3). Frank and Cook (1995) and Borghans and Groot (1998) commonly emphasized people’s strong tendency to want to obtain the “best” or to observe the “winner,” but they have the common drawback that no mathematical model for the mechanism is presented. The aim of this study was to address this drawback and present an alternative model of income generation of superstars.

The essential element in people’s tendency to want to obtain the best or to view winners is related to the concept of ranking. With ranking, it is not the absolute performance that is important, but rather, it is the relative performance that is essential. People derive utility through various types of activities or products that involve ranking—for example, sport championships, Olympic competitions, or best-selling books. People are interested in many types of rankings in various aspects of their lives, and this intrinsic tendency has an influence on their behaviors with respect to economic activities. Hence, relative differences or rankings affect many aspects of economic activities. In this paper, this intrinsic nature of human beings is incorporated into the newly introduced concepts of “ranking value” and “ranking preference.” On the basis of these concepts, a model of superstardom is then constructed that explains the mechanism of why superstars can obtain extremely high incomes.

## 2 RANKING VALUE AND PREFERENCE

### 2.1 *Ranking*

Ranking indicates an ordered list of relative standing. Indeed, the concept of relativity is essential in ranking. Even if the absolute abilities and performances of competitors are almost identical, only one person or group can be the best or the champion. Even if there is little difference in an absolute sense, there are significant differences in a relative sense because people will derive utility through various types of rankings in different aspects of life. On some occasions, people practically neglect the absolute performances and are interested only in the rankings. Therefore, both absolute and relative differences surely have an important influence on people’s thoughts and activities.

In general, absolute terms are used in economic studies. Even though ordinal utility is conceptually important, cardinal utility is assumed in most studies. Therefore, the concept of ranking or relativity has not typically been seen as an important element in economics. However, because people are interested in rankings and relative differences, these factors will affect many aspects of economic activity.

## **2.2 *Ranking value and preference***

### **2.2.1 Practical value and ranking value**

Value is regarded as reflecting something useful. In this paper, it is assumed that there are two kinds of value: practical value and ranking value. Practical value is the value that people feel when consuming a good or service for practical purposes. Ranking value is the value that people feel from the rank of a good or service in a set of similar types of goods or services that people use, possess, or observe. Ranking value, therefore, is the value people place on goods or services on the basis of their rank (e.g., the ranking of a book in a best-seller list or that of a professional baseball team in a league). For example, people will buy a book not only because of its practical usefulness but also because of its popularity. That is, a book can have value not only on the basis of its practical usefulness (its practical value) but also on the basis of its popularity (its ranking value).

In many cases, practical value may be almost identical to the usual sense of value. If a good or service is more practically useful than another good or service, it has a higher practical value. People obtain utility from practical value through the consumption of goods and services. On the other hand, ranking value does not require practical usefulness. Even if a good or service is not practically useful, it can still have ranking value if it possesses a ranking: an example is the price of a curio that is not practically useful but is evaluated to be the best among a set of similar types of curios. If the rank of a good or service is higher than those of others in the set, its ranking value is higher. People obtain utility from ranking value through the consumption (use, possession, or observation) of goods and services.

For example, many people like to watch professional sports, even though watching them may be of little practical value. A sense of enthusiasm and fun is generated when viewing professional sports, but such emotions may not reflect any practical usefulness. Although the emotions generated may not be practically useful, the desire to watch, witness, and immediately know the winner (i.e., the best or the champion) provides ranking value. Although some people may want to see a game because they enjoy watching the performance (similar to watching a circus act), most people watch professional sports to watch, witness, and immediately know who wins: that is, they want to feel the sense of ranking and consume ranking value. People thereby obtain utility from the sense of ranking. I call people's preference for ranking value a "ranking preference." A mathematical expression of ranking preference is presented in Section 3.

### **2.2.2 The origin of ranking value and preference**

If ranking preference is a deep parameter of human behavior, it will be deeply rooted in the process of evolution of human beings; that is, it will be closely related to survival in the long history of humans. I propose the following two fundamental desires as the roots of ranking preference.

#### **(1) Desire to win a struggle, conflict, or war**

Struggles and conflicts are fundamental elements in life. In social species, they occur not only between individuals but also between rival groups. Struggles and conflicts generate intense emotions, including a strong desire to win. In an evolutionary sense, winning or losing a struggle or conflict was often a matter of life and death. Hence, people are very excited by struggles and conflicts. Interestingly, people may be excited by the occurrence of struggle or conflict itself, regardless of the eventual outcome. People therefore may "demand" the excitement of struggle, conflict, and even war (James, 1910; Cannon, 1915). If a particular group wins, the people in that group will be happy and comfortable (i.e., obtain utility). It is likely that humans have evolved to be excited by the occurrence of struggle or conflict because this response is important for their survival. Therefore, people have evolved to obtain utility from the occurrence of struggle or conflict regardless of whether they are actually involved in the conflict itself.

An important nature of struggle and conflict is that, regardless of the quality of performances in the struggle or conflict, a win is a win. Absolute performances in struggles or

conflicts are basically meaningless, whereas relative performances are vitally important. For example, in a horse race, the winning time is basically meaningless, but the order of finish is valuable. If they are relatively superior, people can win even if the difference in the performances is very slight. That is, people are happy not only because they are strong but also because they are stronger, and they are happy when they are the strongest. As a result, rankings generate strong emotions in people's minds. These emotions are among the origins of ranking value and preference.

## **(2) Desire to behave in accordance with dominance hierarchy**

Many species—particularly social species—have dominance hierarchies (see, e.g., Landau, 1951; Bayly et al., 2006). Most primates, including humans, have hierarchical societies. Dominance hierarchy has evolved to be deeply integrated into primate societal behaviors by necessity. Under dominance hierarchy, an individual's rank in its group is crucial. Knowing one's own rank and the rank of others is a significantly important part of living in a societal group.

Because life strategies in a societal group vary depending on an individual's rank, individuals must constantly reconfirm their rank. If individuals are unable to confirm their ranks, they may face adverse outcomes or even death. This confirmatory need may be accompanied by subordinate behaviors such as admiring, supporting, and following the leader and punishing members who neglect the ranking.

Therefore, it is likely that humans have evolved to possess the emotion or urge to regularly reconfirm rankings. In other words, people have evolved to obtain utility from regularly reconfirming ranking orders within groups. Conversely, people will be very uneasy and uncomfortable if they are unable to correctly assess the latest rankings. Only after they reconfirm rankings will they feel at ease and comfortable and be satisfied. It is likely that this intrinsic emotion is another origin of ranking value and preference.

### **2.2.3 Importance of ranking**

The emotions that underlie ranking value and preference will clearly surface on various occasions. Sports have been often seen as a substitute for war (Santayana, 1972; Fischer, 2002). Watching professional sports satisfies people's desires and makes them feel comfortable because the games substitute for struggle, conflict, and war. Fans of a specific team may view the team as a substitute for the mother country or tribe in a war. People often form attachments to a specific sports team and maintain allegiance to it as if it gives them a sense of tribal unity. Another example of this emotion is in people's responses to titles in the business world. A title indicates the rank of a person in a company, organization, or group. Whatever the true quality of performance of any given person, people evaluate and judge that person on the basis of the title to some extent. The quality of performance is of course important, but the title (rank) is also important.

Ranking is therefore an important element in people's lives and economic activities. For some goods or service, people may even place higher values on rank than on practical use. It is highly likely that humans are intrinsically equipped with emotions that respond to various types of ranking. Therefore, if people do not sufficiently consider rankings in their daily activities, they may not be successful in managing their lives.

## **2.3 *Difference between positional goods and ranking value***

The concept of ranking value and preference may be seen as the same as that of positional goods (Frank, 1985, 1991; Solnick and Hemenway, 1998). Indeed, both concepts are superficially similar in the sense that both emphasize the importance of relativity in people's behaviors. However, there is an important difference between the two concepts. The essential nature of positional goods is that people demand positional goods for the purpose of seeking status—that is, because they can feel and be seen as special, or in particular superior to other people. This means that, with the concept of positional goods, it is the rankings of consumers (users, buyers, or owners) and not of goods and services that are of importance because consumers of positional

goods are pursuing status.

On the other hand, it is the rankings of goods and services that are of importance with the concepts of ranking value and preference, and consumers are basically indifferent to their own relative status. For example, people do not watch professional sports to seek enhanced status. Rather, they obtain utility by consuming ranking value even if it does not change their status. In essence, the theory of positional goods reflects the rankings of consumers, whereas that of ranking value and preference reflects the rankings of goods or services. The emotions or desires of people in these systems are therefore completely different. The concept of positional goods is useful when studying luxury goods and services, but it is not when examining the incomes of superstars.

## 3 A MODEL OF SUPERSTARDOM

### 3.1 Background

As noted in the Introduction, Rosen (1981) performed early and important work on the model of superstardom. He attributed the extremely high incomes of superstars to a special market structure (i.e., “non-rivalry”). However, Adler (2006) criticized Rosen (1981) by arguing that non-rivalry results in very low prices, thus suggesting that superstars would actually be poor. Adler (1985) presented a different model and argued that the extremely high incomes of superstars can be attributed to what he called consumption capital. However, the assumption of increasing marginal utility in his model is not easily acceptable. Borghans and Groot (1998) presented a model based on the argument of Frank and Cook (1995). They argued that the extremely high incomes of superstars are attributable to “endogenous property rights” and the monopolistic power that these rights generate, because people have a strong tendency to want to watch the performance of someone known to be the best. Frank and Cook (1995) argued that, in modern economies, the winner takes all of the money in many industries. However, the argument of Frank and Cook (1995) is strictly narrative and lacks a theoretical model that clearly explains why the winner takes all. The model of Borghans and Groot (1998) suffers from the same drawback, because the mechanism used to explain people’s strong tendency to want to watch the winner, the best, or the champion is not sufficiently developed and is at best only suggested.

The concept of ranking value and preference discussed in Section 2 is, however, closely related to the arguments of Frank and Cook (1995) and Borghans and Groot (1998), because they commonly emphasize that household consumption is influenced by both absolute and relative performances or qualities.

### 3.2 The model of superstardom

#### 3.2.1 The model

Goods and services have three properties: quantity, quality, and ranking. Quality is related to practical value, and ranking is related to ranking value. Quantity is related to both values. Suppose that the quality and ranking of each good or service are given exogenously and fixed. Here, for simplicity, I assume that there is only one type of good or service in the economy, and that all goods or services belong to this type (these goods or services are hereafter called “goods”) and are substitutable for each other for households’ practical uses. Although the goods are substitutable from the point of view of practical uses, they are differentiated from the point of view of ranking.

Let  $R$  ( $= 1, 2, 3, \dots$ ) be the rank of the goods. Goods with rank  $R = 1$  are those most preferred by households.  $R = 2$  indicates the next most preferred, and so on. It is assumed for simplicity that there is no tied rank. A household’s utility derived from consuming the goods with rank  $R$  is

$$u(q_{n,R}, q_{l,R}, R)$$

where  $q_{n,R}$  and  $q_{l,R}$  are the quantity and quality of the goods with rank  $R$ , respectively. For simplicity, the utility of the household is modified to

$$u(\tilde{q}_R, R)$$

where  $\tilde{q}_R$  is the “quality-adjusted quantity” of the goods with rank  $R$ , and  $\tilde{q}_R = q_{n,R} q_{l,R}$ . The use of quality-adjusted quantity is based on the assumption that, given a standard (reference) quality of the goods, consuming  $\alpha\%$  worse/better quality goods than the standard quality goods for practical use is equivalent to consuming  $\alpha\%$  more/less of these goods than the standard quality goods for practical use. The quality-adjusted quantity  $\tilde{q}_R$  therefore indicates the “real” quantity of the goods standardized by a reference quality.

The utility function has the following conventional characteristics:

$$\frac{\partial u(\tilde{q}_R, R)}{\partial \tilde{q}_R} > 0$$

and

$$\frac{\partial^2 u(\tilde{q}_R, R)}{\partial \tilde{q}_R^2} < 0 \quad .$$

In addition, for ranking preference, the following characteristics are assumed. For any  $r \in R$ ,

$$u(\tilde{q}_r, r+1) < u(\tilde{q}_r, r) \quad (1)$$

and

$$u(\tilde{q}_r, r+2) - u(\tilde{q}_r, r+1) > u(\tilde{q}_r, r+1) - u(\tilde{q}_r, r) \quad . \quad (2)$$

Inequality (1) indicates that, as rank becomes lower ( $R$  increases), utility decreases, and inequality (2) indicates that, as rank becomes lower ( $R$  increases), the magnitude of decrease in utility with a lowering in rank decreases.

It is assumed, furthermore, for simplicity that utilities are separable. Therefore, a household’s total utility derived from its consumption of goods of various ranks is described as

$$U = u_{Quant}(\tilde{q}) + \sum_{R=1}^{\infty} u_{Rank}(\tilde{q}_R, R) \quad (3)$$

where  $u_{Quant}(\cdot)$  and  $u_{Rank}(\cdot)$  are the utility function for consumption of practical value and that of ranking value, respectively, and

$$\tilde{q} = \sum_{R=1}^{\infty} \tilde{q}_R \quad .$$

Similarly, the following conventional characteristics of the utility function are assumed:

$$\frac{\partial u_{Quant}(\tilde{q})}{\partial \tilde{q}} > 0$$

$$\frac{\partial^2 u_{Quant}(\tilde{q})}{\partial \tilde{q}^2} < 0$$

$$\frac{\partial u_{Rank}(\tilde{q}_R, R)}{\partial \tilde{q}_R} > 0$$

and

$$\frac{\partial^2 u_{Rank}(\tilde{q}_R, R)}{\partial \tilde{q}_R^2} < 0 .$$

In addition, with respect to ranking preference, the following characteristics are assumed. For any  $r \in R$ ,

$$u_{Rank}(\tilde{q}_r, r+1) < u_{Rank}(\tilde{q}_r, r) \quad (4)$$

and

$$u_{Rank}(\tilde{q}_r, r+2) - u_{Rank}(\tilde{q}_r, r+1) > u_{Rank}(\tilde{q}_r, r+1) - u_{Rank}(\tilde{q}_r, r) . \quad (5)$$

The budget constraint of households is

$$I = p_{Quant} \sum_{R=1}^{\infty} \tilde{q}_R + \sum_{R=1}^{\infty} p_{Rank, R} \tilde{q}_R = p_{Quant} \tilde{q} + \sum_{R=1}^{\infty} p_{Rank, R} \tilde{q}_R \quad (6)$$

where  $I$  is the budget (income) of the household and is exogenously given and constant,  $p_{Quant}$  is the price of a unit of  $\tilde{q}_R$  consumed for practical value, and  $p_{Rank, R}$  is the price of a unit of  $\tilde{q}_R$  consumed for ranking value. The price for practical value is identical for any  $R$ ,  $q_{n, R}$ , and  $q_{l, R}$ . Equation (6) indicates that there is not only a price for ranking value but also a price for practical value, and households pay for both practical values and ranking values when they buy the goods. A household maximizes its utility (equation [3]) subject to the budget constraint (equation [6]).

On the other hand, the producer of the goods with rank  $R$  behaves to maximize its profits. For simplicity, costs to produce the goods are assumed to be directly proportional to  $\tilde{q}_R$  and identical for any  $R$ ,  $q_{n, R}$ , and  $q_{l, R}$ . Let  $c$  be the cost per one unit of  $\tilde{q}_R$ . Therefore, the profit of the producer of the goods with rank  $R$  ( $\Pi_R$ ) is

$$\Pi_R = p_{Quant} \tilde{q}_R + p_{Rank, R} \tilde{q}_R - c \tilde{q}_R - \bar{c}_R \quad (7)$$

where  $\bar{c}_R$  is the fixed cost of the producer of goods with rank  $R$ .

### 3.2.2 The model with continuous ranking

Ranks are discrete by nature. However, for simplicity, it is assumed that rank is continuous. Let  $R$  be  $[0, 1)$ . The utility of a household is therefore changed to

$$U = u_{Quant}(\tilde{q}) + \int_0^1 u_{Rank}(\tilde{q}_R, R) dR \quad (8)$$



where  $\tilde{q} = \int_0^1 \tilde{q}_R dR$ . The budget constraint of a household is changed to

$$I = p_{Quant} \tilde{q} + \int_0^1 p_{Rank, R} \tilde{q}_R dR$$

Inequalities (1), (2), (4), and (5) are changed respectively to

$$\frac{\partial u(\tilde{q}_R, R)}{\partial R} < 0 \quad , \quad (9)$$

$$\frac{\partial^2 u(\tilde{q}_R, R)}{\partial R^2} > 0 \quad ,$$

$$\frac{\partial u_{Rank}(\tilde{q}_R, R)}{\partial R} < 0 \quad , \quad (10)$$

and

$$\frac{\partial^2 u_{Rank}(\tilde{q}_R, R)}{\partial R^2} > 0 \quad .$$

### 3.3 The mechanism of superstardom

#### 3.3.1 Extremely high incomes of superstars

##### 3.3.1.1 Monopolistic power

Ranking value and preference provide monopolistic powers to the producers of the goods because selling ranking value to consumers requires no additional cost, i.e., the marginal cost of producing a ranking value is zero, and thereby producers can set  $p_{Rank, R}$  above the marginal cost. Thanks to their monopolistic powers, producers are not price-takers. Rather, they can strategically set their prices for rank  $p_{Rank, R}$  in equation (7) so as to maximize their profits  $\Pi_r$ .  $\tilde{q}_R$  and  $p_{Rank, R}$  are therefore determined by producers' strategic behaviors.

##### 3.3.1.2 The shape of the utility function

The shape of the utility function with regard to ranking ( $u_{Rank}$ ) is important in determining the magnitude of the producers' monopolistic power. Depending on the values of  $\frac{\partial u_{Rank}(\tilde{q}_R, R)}{\partial R}$  in

inequality (10), utility functions can take various shapes, and the strength of monopolistic power depends on inequality (10) (or inequality [4]). As ranking preference becomes stronger—that is, as the values of  $\left| \frac{\partial u_{Rank}(\tilde{q}_R, R)}{\partial R} \right|$  become larger for any  $R$ —a household is willing to buy the goods

for a higher price  $p_{Rank, R}$  than it did before. This means that, if a household's ranking preference becomes stronger, the monopolistic powers of the producers become stronger, and the producers of the higher-ranked goods can set even higher prices.

Inequalities (9) and (10) (or inequalities [1] and [4]) indicate that  $p_{Rank, i} > p_{Rank, j}$  if  $i < j$  where  $i, j \in R$ . The producer of the goods with rank 1 therefore has the strongest monopolistic power, and it can set the highest price ( $p_{Rank, 1}$ ) relative to the other producers. If the ranking preference is extremely strong, the producer of the goods with rank 1 will monopolize almost all revenues in the industry.

### 3.3.1.3 The strategy for non-rival goods and services

Even if ranking preference is very strong, however, producers of the goods may not necessarily set high prices for ranking value ( $p_{Rank,R}$ ). Instead of setting  $p_{Rank,R}$  high, they may plan to sell larger quantities by keeping  $p_{Rank,R}$  relatively low if monopolistic profits are maximized by doing so. Whether this strategy is adopted will depend on the degree of rivalry of the goods with respect to practical value. In the case of rival goods or services with respect to practical use, this low price strategy will not be adopted. However, in the case of non-rival goods or services (i.e., if very little cost is needed to produce and distribute additional units for practical use), then the strategy of setting relatively low prices for ranking value may be preferred.

In the case of non-rival goods or services, the marginal cost to produce not only ranking value but also practical value is almost zero. In this case, even if the price for the practical value is set relatively low, it is still above the marginal cost. That is, the supply curve of such goods (the marginal cost for practical value plus that for ranking value) will be situated at a very low price level and will be almost flat. On the other hand, lower prices will attract more consumers. If the demand curve is also almost flat in a low price range, the profits of the producer of the non-rival goods may be far larger when the strategy of setting a relatively low price for ranking value and thereby attracting a larger number of consumers is taken. That is, the maximum monopolistic profits may be realized when the price is set relatively low. This low price strategy is closely related to the argument presented by Rosen (1981).

## 3.3.2 The two-producer model

### 3.3.2.1 The model

A two-producer version of the model is used in this section for simplicity to demonstrate the mechanism of superstardom. Suppose that there are only two producers: producers of goods with rank 1 and rank 2. Let them be producer 1 and producer 2, respectively. In addition, for simplicity,  $p_{Quant}$  and  $u_{Quant}$  are ignored. Hence, a household maximizes its utility

$$U = u_{Rank}(\tilde{q}_1, 1) + u_{Rank}(\tilde{q}_2, 2)$$

subject to its budget constraint

$$I = p_{Rank,1}\tilde{q}_1 + p_{Rank,2}\tilde{q}_2$$

where  $I$ ,  $p_{Rank,1}$ , and  $p_{Rank,2}$  are exogenously given. It is assumed that the ranking preference of the household is very strong—that is,  $u_{Rank}(\tilde{q}_1, 1) - u_{Rank}(\tilde{q}_1, 2)$  is very large. Hence, the indifference curve is almost horizontal (Figs. 1 and 2).

Producers 1 and 2 set their prices to maximize their profits, such that

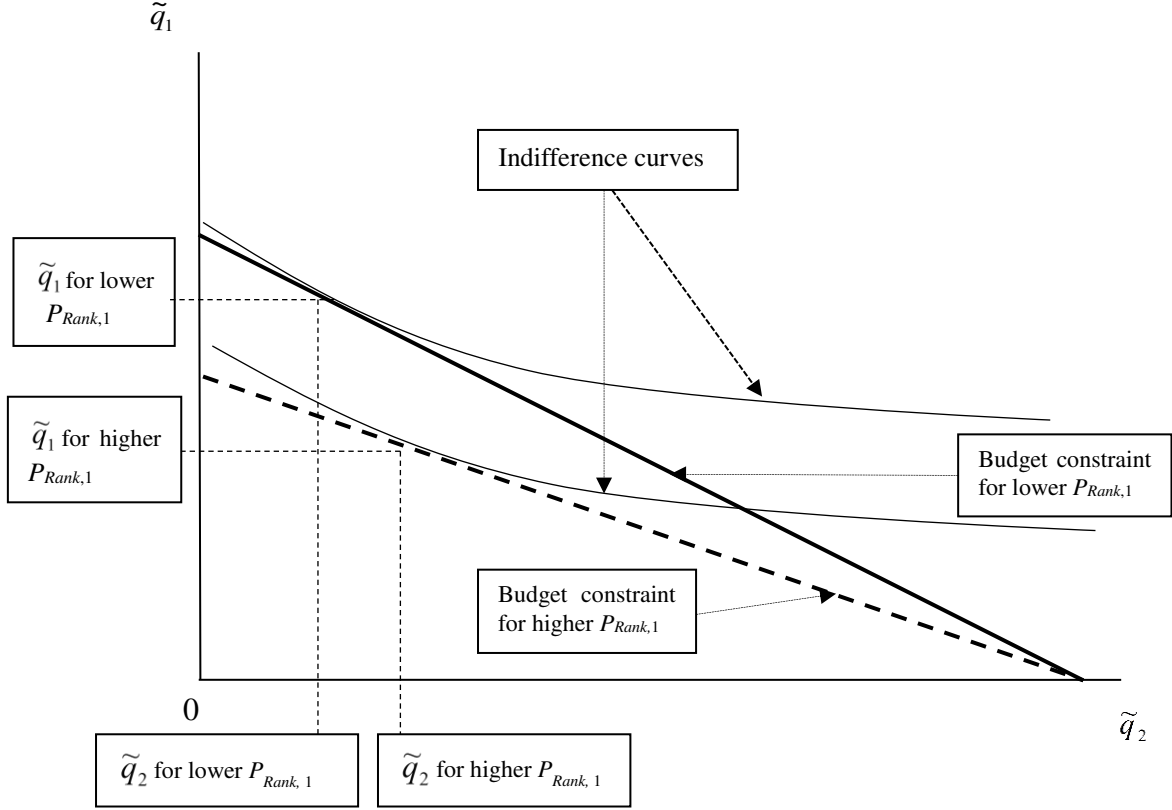
$$\Pi_r = p_{Rank,r}\tilde{q}_r - c\tilde{q}_r$$

for  $r = 1, 2$ .

### 3.3.2.2 Equilibrium prices and quantities

In the model with only two producers there is a duopoly. Suppose that producer 2 sets its price for ranking value  $p_{Rank,2}$ , and then, considering  $p_{Rank,2}$ , producer 1 sets its price for ranking value  $p_{Rank,1}$  to maximize its profits. The quantities  $\tilde{q}_1$  and  $\tilde{q}_2$  are determined at the point of contact between an indifference curve and the household budget constraint (Fig. 1).

**Figure 1: The case of a given  $P_{Rank,2}$**



As  $p_{Rank,1}$  is set higher,  $\tilde{q}_1$  decreases; that is,  $\frac{\partial p_{Rank,1}}{\partial \tilde{q}_1} < 0$ . Because producer 1 behaves to

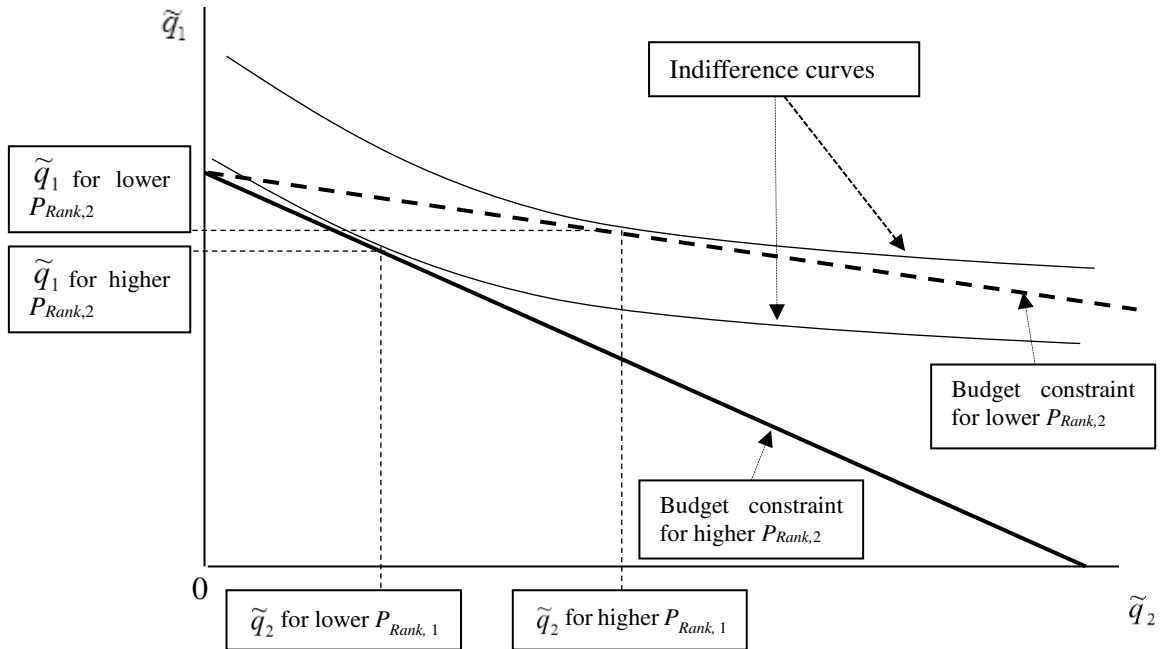
maximize its profits, it sets  $p_{Rank,1}$  so as to satisfy  $\frac{d\Pi_1}{d\tilde{q}_1} = \frac{\partial p_{Rank,1}}{\partial \tilde{q}_1} \tilde{q}_1 + p_{Rank,1} - c = 0$ ; that is,

$$p_{Rank,1} = c - \frac{\partial p_{Rank,1}}{\partial \tilde{q}_1} \tilde{q}_1 > c. \text{ An important point is that, because of very strong ranking}$$

preference and almost horizontal indifference curves, there is a range of  $p_{Rank,1}$  where  $\tilde{q}_1 > \tilde{q}_2$  even if  $p_{Rank,1} > p_{Rank,2}$  (Fig. 1). That is, producer 1 can obtain far larger profits than producer 2.

However, because of the duopoly, game theoretic considerations apply. Producer 2 will change its price  $p_{Rank,2}$  after recognizing producer 1's price  $p_{Rank,1}$  (Fig. 2). Each producer will adjust its prices for ranking value strategically by considering the other's behavior. Most simply,  $p_{Rank,1}$ ,  $p_{Rank,2}$ ,  $\tilde{q}_1$ , and  $\tilde{q}_2$  will be determined at a Cournot-Nash equilibrium. Each producer has its own response function, which indicates the producer's set of best strategies when a strategy of the other producer is given (i.e. its best prices for ranking value when the other's price for ranking value is given). Response functions are depicted as response curves on the  $p_{Rank,1}$  versus  $p_{Rank,2}$  plane in Figure 3. Equilibrium occurs at the point of intersection of the response curves. Note that neither producer sets its prices for ranking value below  $c$  because it would suffer losses by doing so (Fig. 3).

**Figure 2: The case of a given  $P_{Rank,1}$**

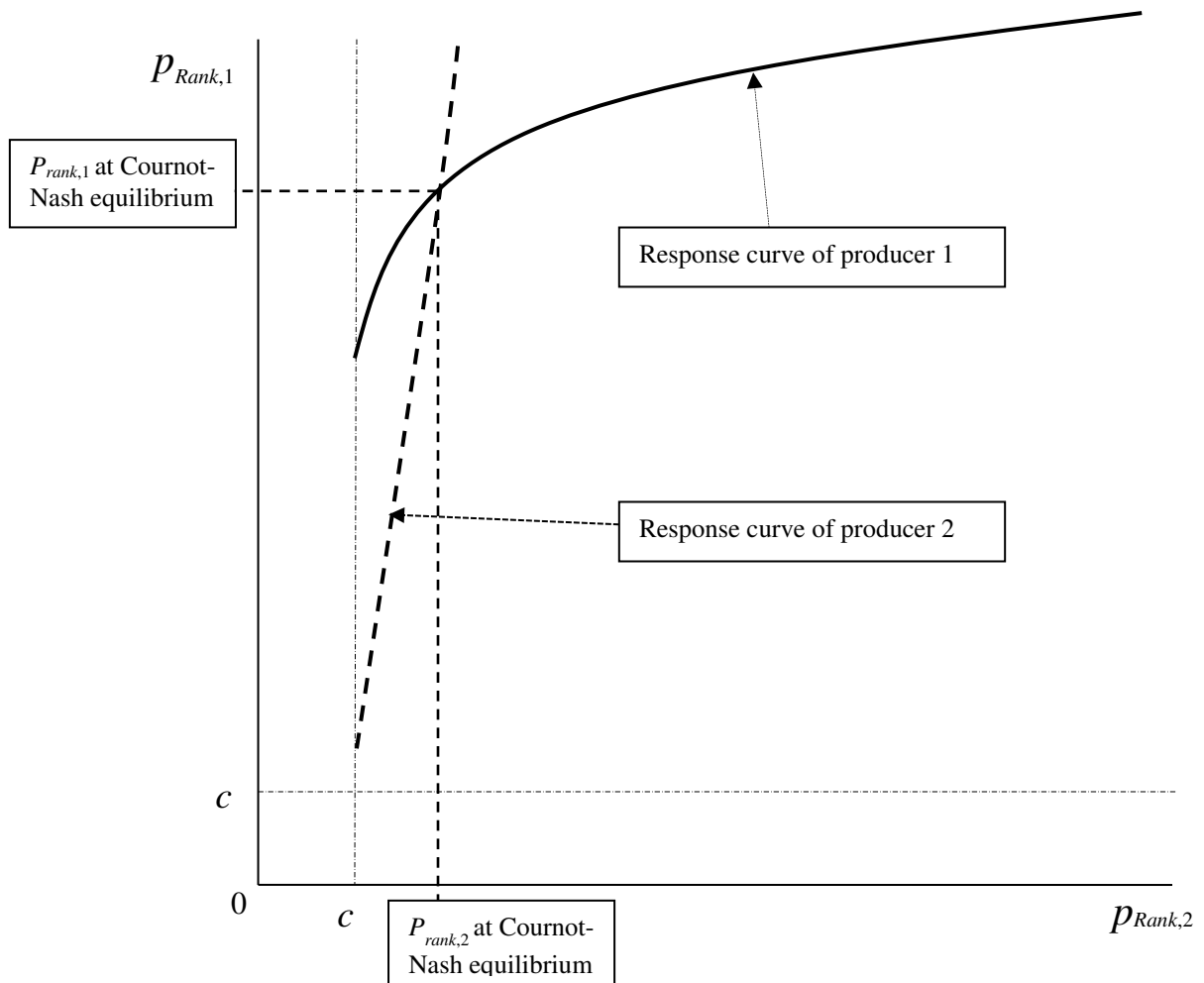


The shapes of the response curves of producers 1 and 2 are very different because of the households' very strong ranking preference—that is, because the indifference curve is almost horizontal. Because producer 1 can set significantly higher prices than producer 2, thanks to the very strong ranking preference, the response curve of producer 1 is situated at the upper side of the plane in Figure 3, whereas the response curve of producer 2 is situated at the left side of the plane. As a result,  $p_{Rank,1}$  is notably higher than  $p_{Rank,2}$  at the Cournot-Nash equilibrium. As the ranking preference increases, the response curve of producer 1 moves higher and that of producer 2 moves farther left, and the difference between  $p_{Rank,1}$  and  $p_{Rank,2}$  at the Cournot-Nash equilibrium also increases.

Figure 3 indicates that, if ranking preference is strong, the equilibrium quantity of goods with rank 1 will not decrease largely even if producer 2 sets its price at  $p_{Rank,2} = c$  (i.e.,  $\Pi_2 = 0$ ). This means that, if households' ranking preference is strong enough, producer 2 must accept far smaller profits than producer 1 no matter which strategy producer 2 chooses. In other words, producer 1 can be a superstar. This is the mechanism of superstardom.

Note that producer 1 may set its price for ranking value ( $p_{Rank,1}$ ) very low to expel producer 2 out of the market and completely monopolize the profits. However, if producer 2 is expelled and only producer 1 remains in the market, the ranking becomes meaningless for households and thereby the ranking value of the goods with rank 1 will be zero. Therefore, producer 1 will set its price for ranking value ( $p_{Rank,1}$ ) sufficiently high so that producer 2 will not leave the market.

**Figure 3: Cournot-Nash equilibrium under strong ranking preference**



### 3.4 Goods and services that can generate superstars

#### 3.4.1 Sports, art, and music industries

Superstars are not observed in every industry; on the contrary, they exist in a limited number of industries (Frank and Cook, 1995). For many goods and services, practical value is far more important than ranking value. However, there are some goods and services that households feel are of little practical value but that have a large ranking value. Furthermore, there are goods or services that households feel have no practical value but have a huge ranking value (e.g., collectible items). If some people perceive a ranking value in a curio, it begins to possess a ranking value even though the item has little or no practical value. Whether a material that has little practical value becomes a desirable collectable item depends entirely on whether some people feel a sense of ranking value towards it. If no people feel the desire to rank it, it is basically trash. In any case, if ranking values are far more important than practical values, household demand will be determined mainly by ranking values. The phenomenon of superstardom can be vividly observed in such industries.

An example is professional sports, in which ranking value greatly overwhelms practical value. The practical value of watching a professional sporting event may be to see or generally

appreciate the high-quality performances of athletes. However, the main purpose of spectators of professional sports will be to witness and immediately know who wins. In this way, professional sporting events are completely different from, for example, a circus show that features mainly acrobatic events. Of course, if the quality of athletes' performances in a game is low, spectators may be discontented with the game to some extent, but they will basically be satisfied with the game on the grounds that they can watch the game live. They obtain utility from feeling a sense of ranking or being immersed in the world of ranking. Hence, superstars can be generated in professional sport industries.

There are also gray-area goods and services—for example, art and music. In the industries of art and music, unlike in professional sports, there is no explicit game at which participants regularly compete. Of course, there are many competitions (particularly for young artists), but these represent only a small part of the art and music industries as a whole. Witnessing or knowing who “wins” a contest is not the main goal of consumers who buy art and music products. Practical value is undeniably important when a consumer buys such products: people purchase art and music products because they enjoy them. Nevertheless, ranking value is also important in these fields. There are few explicit and reliable rankings for many art and music products except, for example, hit charts in the music industry. Even so, people will still generally feel a sense of ranking, possibly even unconsciously, because they usually try to determine which products people are paying attention to, and they want to buy the products that are the most popular and well known. Fame is valuable because it provides information about implicit rankings and generates a sense of ranking. Even if a consumer makes the evaluation that the practical values and prices are the same between two paintings, he or she will generally buy the painting done by the more famous artist because the utility derived from the ranking value is greater. Therefore, although ranking value may be less important in the art and music industries than in professional sports, it is still relatively more important than it is in many other industries. Therefore, some artists may have great monopolistic powers: that is, superstars can be also generated in the art and music industries.

Note that, for ranking value to be important, the difference in abilities or qualities among contestants or competitors may have to be small. For example, if the differences in ability among teams within a professional sports league are very large, people may lose interest. Ranking is justified only when similar goods or services are compared. A large difference in abilities indicates that the good or service being contested belongs to a different category of goods or services. In this case, ranking value and ranking preference will not be generated in people's minds. Hence, large ranking values require relatively small differences in ability or quality. In this sense, the draft system widely adopted in professional sports in the United States can be justified because it was created to maintain competitive balance.

### **3.4.2 Culture and history**

It will be difficult to predict *a priori* whether any specific good or service will make some people feel a strong sense of ranking. Although any particular set of objects may be viewed as a valuable collectable item in a given society and time period, it may be perceived as worthless in other societies or time periods. It is therefore likely that culture and history have a significant influence on the generation of the sense of ranking. For example, soccer is very popular in Europe and South America but not in the United States. On the other hand, baseball and American football are very popular in the United States but not in Europe and South America. It makes sense, then, that soccer generates huge ranking values in Europe and South America and baseball and American football do not, whereas in the United States the reverse is true. Each of these sports, however, has a similar capacity to excite spectators. Within each region, there will be little difference between people's views of the rankings. Therefore, the completely different levels of popularity and views of ranking values across regions can be attributed mostly to cultural and historical differences.

### 3.4.3 Conditions for generation of superstars

In this section, I use the model of continuous ranking presented in Section 3.2.2 to specify the conditions necessary for the generation of superstars. Suppose that a household consumes only goods with rank 0 in period  $t$ . By equation (8), the household's utility is

$$U = u_{Quant}(\tilde{q}) + u_{Rank}(\tilde{q}, 0) . \quad (11)$$

By the total differential of equation (11),

$$dU = \frac{\partial u_{Quant}(\tilde{q})}{\partial \tilde{q}} d\tilde{q} + \left[ \frac{\partial u_{Rank}(\tilde{q}, R)}{\partial R} dR \right]_{R=0} .$$

By setting  $dU = 0$ ,

$$\left. \frac{d\tilde{q}}{dR} \right|_{R=0} = - \frac{\left. \frac{\partial u_{Rank}(\tilde{q}, R)}{\partial R} \right|_{R=0}}{\frac{\partial u_{Quant}(\tilde{q})}{\partial \tilde{q}}} (> 0) .$$

$\left. \frac{d\tilde{q}}{dR} \right|_{R=0}$  indicates the marginal rate of substitution between practical and ranking values. If the value of  $\left. \frac{d\tilde{q}}{dR} \right|_{R=0}$  is large, the influence of ranking preference is large and vice versa. Whether superstars can be generated therefore depends on the value of  $\left. \frac{d\tilde{q}}{dR} \right|_{R=0}$ .

If the ranking value of the goods is far larger than its practical value,  $\left. \frac{d\tilde{q}}{dR} \right|_{R=0}$  will be very large and vice versa. Nevertheless, it seems likely that, for many goods and services, the practical value largely exceeds the ranking value. Hence, in many economic analyses, ranking preference can be assumed to be negligible; that is,  $\left. \frac{d\tilde{q}}{dR} \right|_{R=0} \cong 0$  for any  $R$ .

Note, on the other hand, that  $\left. \frac{d\tilde{q}}{dR} \right|_{R=0}$  will not be completely zero for most goods and services. That is, goods and services will generally possess some ranking value even though the value of  $\left. \frac{d\tilde{q}}{dR} \right|_{R=0}$  may be very small.

### 3.5 Regular revisions of rankings

Most rankings will soon become obsolete and will need regular revision. In sports, for example, explicit contests are held regularly—in many cases, at fixed intervals. In the art and music industries, there are few explicit regularly-held contests except competitions for young artists, but popularity in the art and music industries certainly shifts temporally. People always collect information about the latest “implicit” rankings with respect to art and music through mass communications, websites, and word-of-mouth. In this sense, many implicit contests are held regularly in the fields of art and music.

In some cases, regular revisions of rankings will affect the strategies of producers of

those goods with higher ranks. Because rankings change and popularities shift regularly, monopolistic powers derived from ranking preferences are temporary. Producers of the goods with higher ranks should behave strategically with sufficient consideration of their shifting monopolistic powers. They should set prices for ranking value under the expectation of the length of period during which strong monopolistic powers can persist.

## **5 CONCLUDING REMARKS**

Superstars earn massively higher incomes than those of ordinary people, but superstars are not necessarily extremely more productive than ordinary people. A factor other than marginal productivity must play an important role to generate these extremely high relative incomes. Frank and Cook (1995) and Borghans and Groot (1998) commonly emphasized people's strong tendency to want to obtain the best product or view the champion in various competitions, but they did not present a mathematical model of the mechanism generating this phenomenon. In this paper, I have presented a model of superstardom based on the concept of ranking value and ranking preference. Goods and services possess not only practical values but also ranking values because people derive pleasure and utility through various types of rankings. This emotional response (i.e., ranking preference) gives monopolistic powers to the producers of certain types of goods or services. For some goods and services (e.g., professional sports), households' ranking preference is so strong that producers of high-rank goods or services can enjoy very strong monopolistic powers. I conclude that this ranking preference is the origin of the extremely high incomes of superstars. It is likely that each region's or society's culture and history have an important influence on the generation of ranking preference for certain goods and services.

As a future study, I plan to examine whether the extremely high superstar incomes that originate from monopolistic powers can be justified from the point of view of income inequality.



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