Incentive Mechanisms of Altruistic Behavior With Social Preference Introduced and the Effects Comparison

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Abstract

Under the assumption of rational person, the provision of altruistic behavior will eventually be exhausted. However, in reality, some people still would rather sacrifice their own interests to help others. This paper introduces altruistic social preference into utility function, researches on how to push the upgrade of altruistic behavior in the society through designing the incentive mechanism while realizing the maximum of individual interest and social welfare. This paper divides the individuals into individuals with high, middle and low altruistic levels and analyzes the effects of different incentive mechanisms on these three kinds of individuals. Finally, this paper comes to the comparative analysis on the policy effects by combining the effects of the proportion of the individuals with different altruistic levels in the group on the aggregate provision of altruistic behavior.

Key words: Altruistic behavior; Social preference; Incentive mechanism

INTRODUCTION

With the development of experimental economics and behavior game theory, the economists have found in their researches that the traditional self-interested person assumption cannot explain quite a few behaviors of human beings; such behaviors have a large extent of altruistic tendency and such altruism cannot be explained by means of kin theory and reciprocity theory, for example, in the cooperation with others in the group, one would punish the person violating the cooperation rules at his own costs even such violation is not targeted towards himself and even he anticipates that such costs for punishing others cannot be compensated (Henrich et al., 2001). Such behavior is called as "altruistic punishment" (Fehr & Gächter, 2002).

Likewise, according to the assumption of rational person, the classical Nash equilibrium for the voluntary provision of public goods comes when all the participants choose to take a free ride. While the experimental results show that only a few subjects meet this deduction. In the experiment of public goods, in the early rounds of games, the subjects donate 40% to 60% assets averagely, while with the progress of games, the donation level decreases. This also proves the existence of altruistic behavior. This paper also tries to answer the question that how to inspire the altruistic behavior provision through the incentive mechanism (reward and punishment) design while considering not to crowd out the individual's intrinsic motivation of social altruism (social preference).

This paper is structured as follows: Section 1 describes the literature review on this issue; section 2 models and analyzes the incentive mechanisms with social preference introduced and with social preference unintroduced, divides the individuals into 3 categories as per their different altruistic levels based on the individual's utility function and surveys the equilibrium solution for the decision of individual's altruistic behavior by introducing the factor of the effect of the social group's altruistic level on the cost of individual's implementing altruistic behavior; section 3 describes the comparative analysis on the effects of different incentive mechanisms.

1. LITERATURE REVIEW

As to many altruistic behaviors in reality, the researchers study the occurrence mechanism of altruistic behavior through a series of behavioral economics experiments and theoretical models, mainly including intrinsic decision maker's behavior motivation—namely, social preference theory and extrinsic incentive mechanism design. The relationship between them on the effects of altruistic behavior is the disputes' focus.

In the early, Titmus (1971) and Hirschman (1985) thought that the extrinsic incentive had crowding out effect on social preference, thus reducing the impacts of explicit incentives correspondingly. Therefore, it was suggested that the smart social policymakers reduce the incentive means as the incentive effects reduce the crowding out effects would make the policymakers create large incentive for a certain goal.

Lin and Yang (2006) made deep research based on the Gneezy and Rustichini (2000) model. Before a penalty was introduced, the parents would take the teachers' behavior as a nonmarket behavior and avoid using it; while after a penalty was introduced, the parents would think that they get the convenience from their purchased service which made the lateness behavior increase; later, even the penalty was removed, the number of the parents coming late showed an increasing tendency as they thought such service was free. Therefore, they proposed that either severe penalty or no penalty be made.

Different from the discussion on the above substitution relationship, Gneezy and Rustichini (2000) pointed out that the effects of monetary incentive on human's behaviors was not one fold that cannot be simply discussed as complementary relationship or substitution relationship. The authors discussed the effects of monetary incentive on human's behaviors through experiments and the results showed that most people had positive response towards the monetary incentives, namely, increasing the output; however, it was not true that people would increase the outputs with the monetary incentives provided at any time, some would provide more outputs when without the monetary incentives provided than that with the monetary incentives provided.

Samuel Bowles and Sung-Ha Hwangadopted the indivisibility assumption different from the classical divisibility assumption, namely, the effects of morality and material interests on the human's behavior cannot be simply divided, they discussed the relationship between the social preference and extrinsic incentives, thinking that such indivisibility caused the alternative or complementary relationship between the incentives and social preferences that explicit incentives would crowd in or crowd out social preferences, i.e., incentives sometimes may cause human's behaviors towards the direction that the incentives expect to reach or sometimes may cause adverse effects (Bowles & Hwang, 2008). Therefore, the traditional intervention based on the incentive may not only be ineffective, but also the public policy may worsen the potential market failure and cause ineffective distribution equilibrium. The law designed for the rogue may cause rogue.

Further, Bowles made a systematic research on how the social preferences affected the public economy, showing that altruism, reciprocity, intrinsic incentive, support for moral rules and other social preferences were essential to a sound government, under which, more desirable social distribution can be promoted as proper social distribution cannot be reached only through calling on people not to be selfish and the extrinsic incentives were also necessary (Bowles & Hwang, 2014).

Hence, Siciliani (2009) considered introducing the providers' heterogeneous altruistic levels as to the provision of public goods (taking medical treatment as an example), studied the number of medical treatment provided by the medical service providers with different altruistic levels after the change on the medical services' prices. The research showed that the increase of price may have no effect on the aggregate output, when stigma effect was adequately highly correlated with higher prices, it may cause the decrease of aggregate output. The providers with high and low altruistic levels may have positive response towards such incentive system while the providers with middle altruistic level may make no response towards it.

Bowles further discussed the crowding out effect of extrinsic incentive on social preference, thinking that the incentive mechanisms like penalty and subsidy were not the root reasons for crowding out effect (Bowles & Reyes, 2012). Seemingly, the crowding out effect caused by the incentive mechanisms like penalty and subsidy was to seek more incentives, which was determined by the existing systems and the relationship between people. The experiment showed that the incentive effect may be larger when the incentive mechanism was chosen by the individual independently than that when it was regulated by the government. In case the government intended to guide the social preferences by means of penalty, the effects may be smaller and even adverse. Finally the experiment proved that as to the same incentive mechanism, the provision by the individual may develop prosocial behavior easier than the provision by the government and the incentive mechanism would cause crowding in effect instead of crowding out effect, thus it was concluded that incentive mechanism and social preference were complementary goods instead of the substitute goods.

The individual's behavior is not completely determined by measurable monetary value like money and material, but also commonly influenced by morality and preference; especially the altruistic behavior is more influenced by social preference. However, the individual heterogeneity causes that the same extrinsic incentive may have different effects on different people; therefore, it's not rigorous to make dual complementary or substitute discussion of the

effects of extrinsic incentive and social preference for the altruistic behavior.

2. ALTRUISTIC BEHAVIOR INCENTIVE MECHANISM WITH SOCIAL PREFERENCE

Social preferences are, under the premise of keeping rationality assumption, a type of human being's behavioral mode considering the social emotions such as fairness and reciprocity in sociology and psychology that's distinguished from altruistic assumption, including altruistic preference, reciprocal preference and equal preference. Altruistic preference refers to the individual sacrificing his interests to increase others' utility. This paper assumes that the individual will get benefits from providing altruistic behavior, but meanwhile he will undertake cost due to the implementation of altruistic behavior and will respond to the incentive mechanism. Based on the research of Siciliani (2009), individual utility function is set with representing total utility and the total utility is determined by the individual's benefits from his providing altruistic behavior and his costs, meanwhile, individual heterogeneity is introduced, taking θ as the factor of measuring individual's altruistic level, $\theta \in [0,1]$. When $\theta=0$, it means the individual is a perfect egoist and when $\theta=1$, the individual is a perfect altruist.

θ, on one hand, represents the individual's altruistic level and on the other hand, it can be used to illustrate to which extent the individual considers other's benefits for his own benefits. Whether the individual helps others out of sympathy or other reasons, we think that: the more willing to help others, the more consideration of other's benefits. Suppose a beneficiary of altruistic behavior gets benefit $d(q)$ from the altruistic behavior, and the marginal benefit that the beneficiary gets from altruistic behavior is positive and decreasing, then we can get $d'(q)>0$ and $d''(q)<0$. In the individual's utility function, $\theta*d(q)$ represents the benefits that the beneficiary gets.

The cost function of the individual's altruistic behavior is represented by $c(q)$, where q refers to the quantity of altruistic behavior provided, the unit cost c is related with the proportion of individuals with different altruistic levels in the group. Set the proportion of individuals with high altruistic level in the group being m and n for that of middle altruistic level, then the proportion of individuals with low altruistic level is $1-m-n$, and among which, the proportion of the individuals with middle altruistic level is relatively larger. Suppose that the individuals with middle altruistic level have no impact on the unit cost c of altruistic behavior, the unit cost c varies only with the change of the proportion of the individuals with high and low altruistic levels, and the unit cost decreases when the individuals with high altruistic level are more than those with low altruistic level, and otherwise the unit cost increases, then we can get

$$c(q) = \frac{1-m-n}{m} * c * q \quad (m \neq 0, n \neq 0)\,, \tag{1}$$

and

$$c'(q) = \frac{1-m-n}{m} * c > 0, \ \ c''(q) = 0\,.$$

It's further assumed that the individual not only cares about the beneficiary but also cares whether he has a good reputation or not. If the individual's provision of altruistic behavior $q \geq \tilde{q}$ (among which, $\tilde{q}$ is a normal number greater than 0), he would be regarded as a noble man and thus win good reputation, otherwise, the individual at $(q < \tilde{q})$ cannot get good reputation but also will not get bad reputation. We assume that all the individuals like good reputation, $r(q)$ represents the benefit from good reputation and the good reputation is correlated with the quantity of his altruistic behavior provision, i.e. $\partial r(q) / \partial \theta = 0$. In summary, we can give the individual's utility function an explicit form:

$$y = -\frac{1-m-n}{m} * c * q + r(q) + \theta * d(q)\,. \tag{2}$$

Setting y to a constant and supposing $y=y_0$, solve the first derivative of q over θ, we have:

$$\frac{\partial q}{\partial \theta} = \frac{d(q)}{\frac{1-m-n}{m} * c - \theta * d'(q)}.$$

As $d(q)>0$, the direction of $\partial q/\partial \theta$ depends on $\frac{1-m-n}{m} * c - \theta * d'(q)$.

When $\frac{1-m-n}{m} * c > \theta * d'(q)$, namely, $\theta < \frac{1-m-n}{m} * c/d'(q)$, we get $\partial q/\partial \theta > 0$, which means that the provision of the individual's altruistic behavior increases with the increase of his altruistic level.

When $\frac{1-m-n}{m} c < \theta * d'(q)$, namely, $\theta > \frac{1-m-n}{m} * c/d'(q)$, we get $\partial q/\partial \theta < 0$, which means that the provision of the individual's altruistic behavior decreases with the increase of his altruistic level.

This is different from our common sense, usually we think that the provision of the individual's altruistic behavior increases with the increase of his altruistic level, but here our research shows that:

When $c - \frac{1-m-n}{m} * \theta * d'(q)$ or when the individual's altruistic level $\theta = \frac{\frac{1-m-n}{m} * c}{d'(q)} < 1$, the quantity of provision of the altruistic behavior with the maximized utility reaches maxima rather than as we usually think that the provision of his altruistic behavior comes to the maximum when the individual is a perfect altruist($\theta=1$).

When $\frac{\frac{1-m-n}{m} * c}{d'(q)} \geq 1$, $\partial q/\partial \theta > 0$ and when $\theta=1$, q takes the maxima, i.e., under such circumstance, when the individual's utility is maximized, the quantity of the altruist behavior provided by the perfect altruist reaches the most.

The properties of the individual's benefit function are shown in Figure 1.
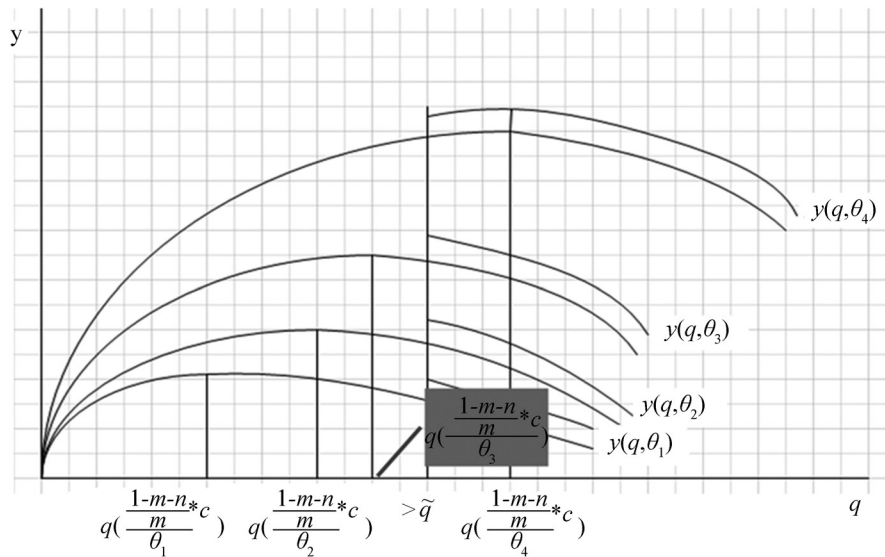
Figure 1
The Properties of the Individual's Benefit function

When a specific value is taken for $\frac{1-m-n}{m}$, we take 4 individuals with different altruistic levels, setting $0<\theta_1<\theta_2<\theta_3<\theta_4<1$.

As $c=\frac{1-m-n}{m}*\theta*d'(q)$, i.e.$d'(q)=\frac{1-m-n}{m}*c/\theta$, it's known that q is the function of c/θ. As $\theta_1<\theta_2<\theta_3<\theta_4$ we can get $\frac{1-m-n}{m}*c/\theta_1>\frac{1-m-n}{m}*c/\theta_2>\frac{1-m-n}{m}*c/\theta_3>\frac{1-m-n}{m}*c/\theta_4$. And it can be known from the $d'(q)$'s monotonically decreasing properties that

$$q\left(\frac{\frac{1-m-n}{m}*c}{\theta_1}\right) < q\left(\frac{\frac{1-m-n}{m}*c}{\theta_2}\right) < q\left(\frac{\frac{1-m-n}{m}*c}{\theta_3}\right) < q\left(\frac{\frac{1-m-n}{m}*c}{\theta_4}\right).$$

When $q>\tilde{q}$, the individual can get the benefit $r(q)$ from his good reputation and hence leap occurs at $q>\tilde{q}$ in individual's benefit function.

As seen from the figure, an individual with low altruistic level (such as θ_1) obtains the maximum utility when , which means that good reputation is not important for him as the benefits from good reputation cannot make up for the costs of increasing the provision of altruistic behavior and at that time, his provision of altruistic behavior doesn't change with the existence of good reputation.

An individual with high altruistic level (such as θ_4) obtains the maximum utility when $q>\tilde{q}$. Also we can observe that the maximum utility is still obtained at the same q even without the utility from good reputation, which means that good repuation simply increases the benefits of the individual with high altruistic level and will not change the provision of his altruistic behavior.

An individual with middle altruistic level (such θ_2 as θ_3 and) obtains the maximum utility when $q<\tilde{q}$ if without considering the benefits from good reputation, and

$$q\left(\frac{\frac{1-m-n}{m}*c}{\theta_2}\right) < q\left(\frac{\frac{1-m-n}{m}*c}{\theta_3}\right).$$

But after introducing the benefit $r(q)$ from good reputation, the costs due to increasing the provision of altruistic behavior are offset, at this moment, the individuals with altruistic levels θ_2 and θ_3 tend to provide q altruistic behavior to maximize their own utilities. The individuals with the altruistic levles within this range choose to provide altruistic behavior with the same quantity q for their own utilties' maximization.

Finally we conclude that the introduction of the benefit from good reputation has no impact on the individuals with low and high altruistic levels to make decision on providing the altruistic behavior, but the individuals with middle altruistic level may increase providing altruistic behavior.

3. INFLUENCE MECHANISM OF ECONOMIC INCENTIVES ON ALTRUISTIC BEHAVIOR WHEN WITH SOCIAL PREFERENCES UNINTRODUCED

The biggest difference of altruistic behavior from the goods traded in the market is that altruistic behavior has no price, which means that no equivalent exchange occurs with the occurrence of altruistic behavior and thus the altruistic behavior cannot be measured by the market method. The output of altruistic behavior caused by the pure cost of giving is influenced by the individual's moral level. Suppose we provide reward for the individual providing altruistic behavior, setting the reward as s. Without considering the positive effects of altruistic

behavior on the individuals, the individual's utility function is given by

$$y = \left(s - \frac{1-m-n}{m} * c\right) * q + r(q) + \theta * d(q),\quad (3)$$

but the $r(q)$ function's form may vary at this moment. When without the extrinsic incentives, suppose $r(q)$ is only correlated with the individual's good reputation and the good reputation is only correlated with the quantity of provision of the individual's altruistic behavior. But after the reward mechanism is introduced, the altruist's behavior motivation is questioned, thinking that his motivation of providing altruistic behavior is to get the reward and such questioning has negative impact on his reputation. We suppose the negative impact takes the following form:

$$r_s(q) = -\beta * s * q.\quad (4)$$

β is a positive parameter and $0 < \beta < 1$, indicating to which extent the reward influences the invidibual's repuation. The bigger β, the bigger negative impact of reward on the individual's reputation, and vice verse.

Then, the individual's utility function changes into

$$y = \left(s - \frac{1-m-n}{m} * c\right) q + r(q) - \beta * s * q + \theta * d(q).\quad (5)$$

Suppose the reputation and its extra utility $r(q) - \beta * s * q = 0$, then q satisfies the following condition:

$$\left(s - \frac{1-m-n}{m} * c\right) q + \theta * d(q) = y_0.\quad (6)$$

We differentiate q over θ and get $\left(s - \frac{1-m-n}{m} * c\right)\frac{\partial q}{\partial \theta} + d(q) + \theta * d'(q)\frac{\partial q}{\partial \theta} = 0$,

namely, $\frac{\partial q}{\partial \theta} = d(q)/[\frac{1-m-n}{m} * c - s - \theta * d'(q)]$.

As known from the above assumptions, $d(q) > 0$, hence we only need to judge the relationship between the denominator and $0, \theta * d'(q) > 0$, then:

(1) if $\frac{1-m-n}{m} * c < s$, i.e., the reward can make up for the cost of altruistic behavior, $\partial q/\partial\theta < 0$, then the provision of altruistic behavior decreases with the increase of the altruistic level.

(2) if $\frac{1-m-n}{m} * c > s$, two circumstances can be discussed:

① when $\frac{1-m-n}{m} * c > s + \theta * d'(q)$, i.e., $\theta < \frac{\frac{1-m-n}{m} * c - s}{d'(q)}$, then $\partial q/\partial\theta > 0$, the provision of altruistic behavior increases with the increase of the individual's altruistic level.

② when $\frac{1-m-n}{m} * c < s + \theta * d'(q)$, i.e., $\theta > \frac{\frac{1-m-n}{m} * c - s}{d'(q)}$, then $\partial q/\partial\theta < 0$, the provision of altruistic behavior decreases with the increase of the individual's altruistic level.

If without the incentive mechanism, the conclusion is similar that the provision of altruistic behavior doesn't monotonically increase with the increase of the individual's altruistic level, instead

When the individual's altruistic level takes $\theta = \frac{\frac{1-m-n}{m} * c - s}{d'(q)} \in [0,1]$, the individual provides the most quantity of altruistic behavior.

When $\frac{\frac{1-m-n}{m} * c - s}{d'(q)} > 1$, q gets the maximum at $\theta = 1$.

Without considering the individual being a perfect altruist and in the model with incentive mechanism unintroduced, when $\theta = \frac{\frac{1-m-n}{m} * c - s}{d'(q)}$, the individual provides the most quantity of altruistic behavior, and after the reward mechanism is introduced, q gets the maximum at $\theta = \frac{\frac{1-m-n}{m} * c - s}{d'(q)}$.

As $\frac{1-m-n}{m} * c > \frac{1-m-n}{m} * c - s$, and $d'(q)$ monotonically decreases, for the individual with the same altruistic level, then we can get

$$q\left(\frac{1-m-n}{m} * c\right) < q\left(\frac{1-m-n}{m} * c - s\right).$$

In summary, without considering the social preferences, the individual provides more altruistic behavior with the extrinsic reward mechanism introduced than that with the extrinsic reward mechanism unintroduced.

Further, we loosen the assumption of the reputation and its affiliated utility being 0, suppose that reputation is important to the individual, i.e., $r(q) - \beta * s * q > 0$, then q's condition is:

$$y_0 = \left(s - \frac{1-m-n}{m} * c\right) * q + r(q) - \beta * s * q + \theta * d(q).\quad (7)$$

Solve the first derivative of q over θ, getting $\frac{\partial q}{\partial \theta} = \frac{d(q)}{\frac{1-m-n}{m} * c - (1-\beta) * s - \theta * d'(q)}$.

If $\frac{1-m-n}{m} * c - s * (1-\beta) < 0$, namely, the reward and the integrated utility of negative effect of the reward on the altruist's reputation are larger than the costs of altruistic behavior, then $\partial q/\partial\theta < 0$, and the provision of altruistic behavior decreases with the increase of the individual's altruistic level.

When $\frac{1-m-n}{m} * c > (1-\beta) * s + \theta * d'(q)$, namely, $\theta < \frac{\frac{1-m-n}{m} * c - s * (1-\beta)}{d'(q)}$, then $\partial q/\partial\theta > 0$ and q monotonically increases over θ;

When $\frac{1-m-n}{m} * c < (1-\beta) * s + \theta * d'(q)$, namely, $\theta < \frac{\frac{1-m-n}{m} * c - s * (1-\beta)}{d'(q)}$, then $\partial q/\partial\theta < 0$, q monotonically decreases over θ;

At this time, q gets the maximum at $\theta = \frac{\frac{1-m-n}{m} * c - s * (1-\beta)}{d'(q)} = \theta_k \in [0,1]$.

If $\frac{\frac{1-m-n}{m} * c - s * (1-\beta)}{d'(q)} > 1$, then q gets the maximum at $\theta = 1$.

Likewise, without considering that q gets the maximum at $\theta = 1$, we get $\theta_i > \theta_k > \theta_j$. Suppose the negative effect of reputation and reward on the individual is not 0, the maximum of the provision of altruistic behavior is acquired at higher than that with the reputation and its affiliated utility being 0, and $\theta_k - \theta_j = s * \beta/d'(q)$, which

means that the increased altruistic level is used to make up for the decrease in the reputation caused by the reward corresponding to the marginal benefit of the benefiniary.

As $\frac{\frac{1-m-n}{m}*c-s*(1-\beta)}{d'(q)} > \frac{\frac{1-m-n}{m}*c-s}{d'(q)}$, we get $q(\frac{\frac{1-m-n}{m}*c-s*(1-\beta)}{d'(q)})$ $< q(\frac{\frac{1-m-n}{m}*c-s}{d'(q)})$.

Namely, when the individuals' altruistic levels are the same, consider the circumstance that the q's maxima at the reputation and its affiliated utility being is smaller than that at the reputation and its affiliated utility being 0 but larger than that without incentive mechanism.

4. COMPARISON OF POLICY EFFECTS

Under the condition of without incentive mechanism, the individual tends to provide more altruistic behavior with the increase of his altruistic level, however, due to the benefit from the reputation, within certain scope, the individuals with middle altruistic level choose to provide the altruistic behavior at the point of .

With the introduction of incentive mechanism, the individual's behavior's motivation changes. When a low reward is provided for the individual's altruistic behavior, the total social provision of altruistic behavior tends to increase, wherein, the individuals with low altruistic level increase the provision, part of the individuals with middle altruistic level may not respond to the reward mechanism, while the low reward causes an increase in the provision of altruistic behavior by the individuals with high altruistic level; however, when the reward exceeds a certain value, crowding out effect may be caused to the individuals with high altruistic level thus the altruistic behavior may be reduced, when the increase in the provision of the altruistic behavior by the individuals with low altruistic levels that's caused by the reward is not enough to make up for the decreased provision of altruistic behavior due to the crowding out effect, then the incentive mechanism is not desirable. Later, the proof of the provision of the altruistic behavior being correlated with the proportion of the individuals with different altruistic levels is also verified, when the proportion of the individuals with low altruistic level is comparatively more, the high-level reward is desirable; on the contrary, when more individuals with high altruistic level are in the group, low-level reward shall be provided correspondingly.

When the behavior of not giving help with others' peril is punished, even the cost that the government pays for the implementation of the punishment for not giving help with others' peril is not considered, there also exist an optimal supervision cost and a penalty for breaking law. When the punishment is too severe, it not only increases the government's expenditures but also causes reaction to the individual's provision of altruistic behavior. Under the proper punishment system, the individuals with low altruistic level will provide more altruistic behavior.

Compare the effects of reward mechanism and penalty mechanism on the individual and we can find that when the levels of reward and penalty are light, positive effects on the social aggregate provision of altruistic behavior are caused, when the reward and penalty are excessive, negative effects may be caused and the individuals with high altruistic level are affected most. When the expected law-breaking cost for the punitive measure is larger than the reward's aggregate utility , the crowding out effects of the punitive measure shall be smaller, and as the reward's aggregate utility is affected by the negative reputation caused by the reward on the individual, namely, the reward's utility against the penalty's effect may be discounted, thus, in summary, the punitive measure pushes the increased effective scope of the provision of altruistic behavior to become larger.

We summarize the changes of the individual's behavior after the introduction of incentive mechanism as shown in Table 1.

Table 1
Comparison on the Various Policy Effects

Contents		Individuals with low altruistic level	Individuals with middle altruistic level	Individuals with high altruistic level	Social aggregate
The individual's behavior with incentive mechanism unintroduced	Not consider the reputatin effect	The provision of the individual's altruistic behavior increases with the increase of the altruistic level.			When the proportion of the individuals with high altruistic level in the group is larger, not only the provision of the individual's altruistic behavior will increase but also the social aggregate provision of altruistic behavior will increase.
	Consider the reputatin effect	The provision of altruistic behavior increases	May provide altruistic behavior with quantity of	The provision of altruistic behavior decreases	
Contents		Individuals with low altruistic level	Individuals with middle altruistic level	Individuals with high altruistic level	Social aggregate

Continued

Contents		Individuals with low altruistic level	Individuals with middle altruistic level	Individuals with high altruistic level	Social aggregate
The individual's behavior with reward mechanism introduced	Not consider the reputatin effect	The provision of the individual's altruistic behavior increases with the existence of reward.			The social aggregate provision of altruistic behavior increases when low-level reward is provided, and the effect of the reward on the provision of altruistic behavior is crowding in effect at this moment. When the reward exceeds a certain level, the provision of altruistic behavior decreases and the reward will bring about crowding out effect, and the higher the proportion of individuals with high altruistic level, the earlier the crowding out effect occurs.
	Consider the reputation effect	The rovision of altruistic behavior increases	The quantity of altruistic behavior is unchanged and is still kept at	The rovision of altruistic behavior decreases	
The individual's behavior with penalty mechanism introduced		The introduction of punitive measure may increase the provision of the individual's altruistic behavior.			The provision of altruistic behavior increases when the punishment is lighter, and the provision of altruistic behavior decreases when the punishment is extremely severe; when >the punitive measure is superior to reward measure as the crowding out caused by the punitive measure is smaller than that caused by the reward measure.

CONCLUSION

We come to the following conclusions based on the paper's research and the analysis of individual's behavior under the conditions of without incentive mechanism and with reward or penalty mechanism adopted:

a) Compared with the provision of the individual's altruistic behavior when without incentive mechanism, the proper incentive mechanism will lead to the increase of the aggregate provision of altruistic behavior, among which, the individuals with high and low altruistic levels respond positively to the incentive mechanism and the individuals with middle altruistic level may not respond.

b) When there are too many rewards or the punishment is extremely severe, the aggregate provision of altruistic behavior may be decreased due to the crowding out effects and the crowding effects are affected by the group's aggregate altruistic level that the crowding out effect shall be larger when more individuals with high altruistic level are in the group.

c) When the reward is the same as the expected expenditure of the punishment, the reward's crowding out effect is larger and it is more desirable to adopt the punitive measure at this time.

It means that the policymakers shall first evaluate the social aggregate altruistic level when considering what policies are adopted to increase the social aggregate provision of the altruistic behavior. Lighter reward or penalty is more appropriate when the aggregate altruistic level is higher and the reward or penalty shall be increased when the aggregate altruistic level is lower.

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