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Game Theory Analysis on the Generation Process of Transfer of Rural Construction Land Transfer

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Abstract

At present, as to the rights of using rural collective construction land, our country in most cases adopts policy of limiting its transfer, however, the phenomenon of the transfer of collective construction land still occur in life. From the perspective of game theory, this paper established static game models to conduct analysis on the behavior choices of the village collective, construction land transferee and the government and elaborated the rise of transfer behavior in rural construction land. The final finding concluded that the optimal strategy in the game between the village collective and the government is to choose transference; the transferee's rational behavioral strategy is to transfer construction land to rural collective; and allowing the transfer of collective construction land is the conclusion of the government's rational choice. It theoretically explains the phenomenon that although the laws in our country prohibit the market transference of the rural collective construction land, in practice there is a large amount of such transference.

Keywords: Rural collective construction land, Land transference, Static game;

1. Foreword

The rural collective construction land is an important resource of construction land in our country. With the prosperity of urban development and driven by economic benefits, the phenomenon of spontaneous transferring the right to use of the collective construction land grows more and more common in the vast rural areas. Current law calls for that, land use right of rural profitable constructive land is not allowed to be trade in the land secondary market, and the village collectives and farmers are prohibited to devote land to construction or get legal benefits from the development and construction. At present, studies of the rural construction land are largely focused on providing references for the system innovations in the transfer of collective construction land in rural area of China, while the analysis about the generation of such transferring behaviors is rather limited. From the perspective of game theory, this paper establishes static game models and conduct analysis on the behaviors and choices of the village collective, construction land transferee and the government. The final finding is that the optimal strategy in the game between the village collective and the government is to choose transference; the transferee's rational behavioral strategy is to transfer construction land to rural collective; and allowing the transfer of collective construction land is the conclusion of the government's rational choice. It theoretically explains why there are a large

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amount of collective construction land transference in practice, although there are stated laws prohibiting rural collective construction land to enter the market.

2. Game hypothesis of the generation process of collective construction land

2.1. The prerequisites of game model hypothesis

(1) The hypothesis of full information. In this model, hypothetically, every participant has accurate understanding of the other participants' behavioral choices.

(2) Rationality hypothesis and risk-neutral hypothesis. The participants are rational men. The participants have neutral attitudes towards risks.

(3) The government is both "economic man" and "administrative man."

2.2. Elements of the game

(1) The participants. There are three main bodies: the first is the village collective; the second is the transferee; and the third is the government.

(2) Strategy space of game bodies. In the process, all three main bodies have various strategy choices. The village collective can choose either transferring or not. If it decides not to transfer, the village collective can choose to use or idle the land. The government may allow or prohibit transference. If it decides to prohibit, the government also needs to decide whether to supervise transferring behaviors. The transferee also has two strategies. It can choose to transfer the construction land to the government, or it can transfer to the village collective.

(3) Parameters setting and the payment of each participating bodies.

First, the payment of the village collective under different strategies: under the condition that government prohibits transformation and conducts the supervision and village collective chooses to transfer, its profit is R_{11}; the cost is illegal cost C_{11}, transaction cost C_{12} and psychological cost C_{13}. Under the condition that government conducts the supervision which is verified successfully, the pay of village collective is $f_1=R_{11}-C_{11}-C_{12}-C_{13}$; When the government conducts the supervision, but did not verified, the pay of village collective is $f_2=R_{11}-C_{12}-C_{13}$. When the government prohibits the transformation and doesn't conduct the supervision, the payment of village collective is $f_3=R_{11}-C_{12}$.

When the government permits transformation and the village collective also chooses transference, the revenue of village collective is R_{11}, and the cost includes transaction cost C_{12} and tax r_{11}. At this time, the payment of village collective is: $f_4=R_{11}-C_{12}-r_{11}$.

When village collective chooses to use by itself, it can acquire the management revenue R_{21}, and pay the cost of management cost E_{21}. When the collective's construction land is idle, both management revenue and paying cost are 0. When the village collective chooses to use the land, its payment is: $f_5=R_{21}-E_{21}$; when it idles the land, its payment is: $f_6=0$.

Second, the transferee's payment under different strategies: under the condition that the government prohibits transference, when the transferee transfers the construction land to the village collective, its benefits is R_{31}, while its costs include illegal cost C_{31}, transaction cost C_{32}, psychological cost C_{33} and land use fee C_{34}. Therefore, when the government conducts a supervision which is successfully verified, the pay of transfer-in is $g_1=R_{31}-C_{31}-C_{32}-C_{33}-C_{34}$. When the supervision is not verified, the pay of transfer-in is: $g_2=R_{31}-C_{32}-C_{33}-C_{34}$; When the government doesn't conduct the supervision, the payment of transfer-in is $g_3=R_{31}-C_{33}-C_{34}$. Under the condition that the government prohibits transference, when the transferee obtains the construction land from government, the benefits of operational land is R_{41}, costs include transaction costs R_{42}, land use fees R_{44}, and land use taxes r_{22}. During this time, the transferee payment is: $g_4=R_{41}-C_{42}-C_{44}-r_{22}$.

Under the condition that the government allows transference, the payment for the transferee to transfer construction land to the village collective is: $g_5=R_{41}-C_{32}-C_{34}-r_{22}$; the payment for the transferee to transfer construction land to the government is: $g_6=R_{41}-C_{42}-C_{43}-r_{22}$.

Third, the government's payment under different strategies: we assume the social benefits for the government prohibiting free transference of the rural collective construction land is V_1, while the economic benefit of allowing such transference is V_2.

Benefits of land circulation behavior happening when the government prohibits and supervises successfully, come from transferee and village collective investigation. Assuming the illegal cost for transferee and village collective is $C_{11}=L_1$, $C_{31}=L_2$ respectively; the government revenue is L_1+L_2 and V_1. But it needs to pay for the supervising cost C_{51} and V_2. At this time, the government payment is: $F_1=L_1+L_2+V_1-V_2-C_{51}$; if with failed supervising, the government payment is $F_2=V_2-V_1-C_{51}$; if the government chooses to prohibit transference but do not supervise, the government payment is $F_3=V_2-V_1$.

When transferring action happens and is allowed by the government, the benefits come from taxes of the two transferring parties $r_{11}+r_{21}$, and benefits from transferring V_2, and costs are office costs C_{52} and social benefits loss V_1, which comes along with transferring. At this point, payment of government is: $F_4=r_{11}+r_{21}+V_2-V_1-C_{52}$.

If the government chooses to prohibit transferring and conducts the supervision when transferring does not happen, then it should pay for the supervising cost C_{51}. But the government can also get the increased benefits R_{51} for state construction land when transferring does not happen, and benefits transferring from transferee to government r_{22}, meanwhile, it should pay for the transaction costs C_{62}. In that case, payment of government is: $F_5= (R_{51}-R-C_{62}+r_{22})-C_{51}$. If the government chooses to forbid the transfer of collective construction land, and does not implement supervision, then the payment of government is: $F_6=R_{51}-C_{62}+r_{22}$. When the transfer doesn't occur, if government chooses to allow the transfer of collective construction land, the payment of government is still: $F_6=R_{51}-C_{62}+r_{22}$.

Imaging the government conducts the supervision with a probability p, the government conducts a successfully verified supervision with a probability p_1, transferring happens with probability q_1, transferring is not allowed with probability q_2.

3. The establishment of game model

3.1. The game between the government and villagers

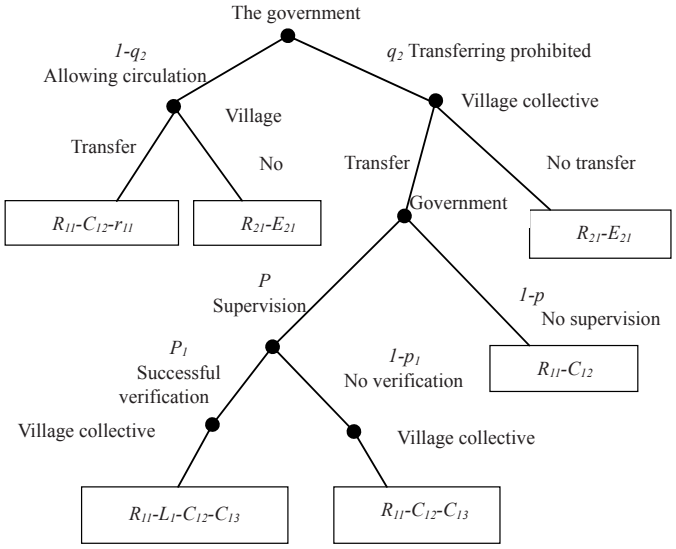

Fig.1 The Game between the Government and Villagers

3.2. The game between the government and transferee

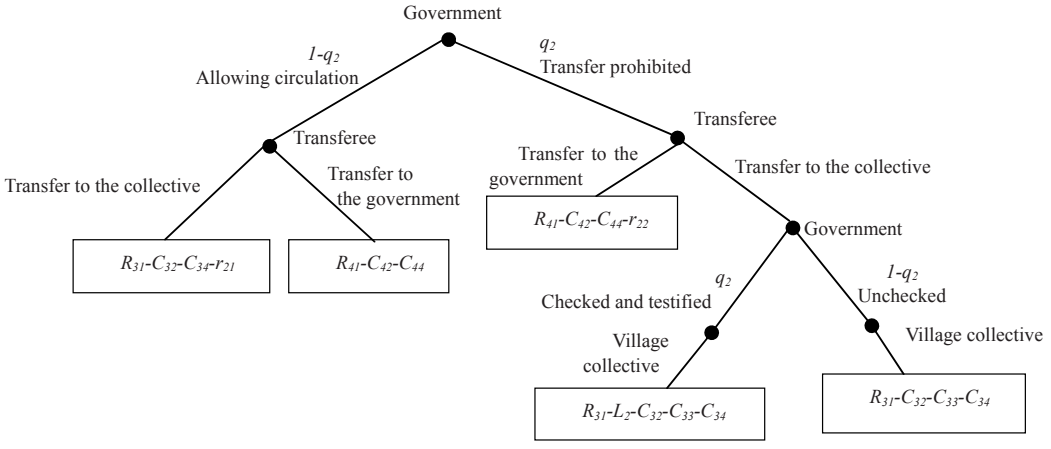

Fig. 2 The Game between the Government and Transferee

3.3. The game between the government and transfer entity

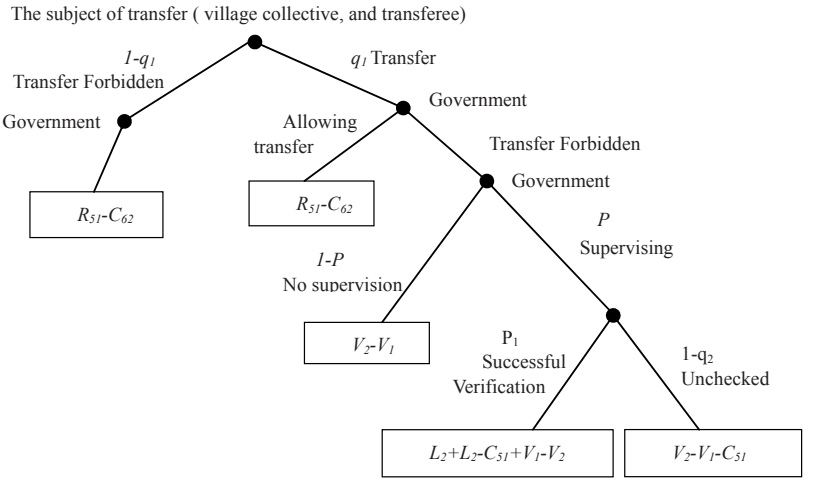

Fig. 3 The Game between Government and Transfer Entity

4. Game Model Solution

4.1. Solution of behavior strategies of village collective

The prospective revenue of village collective choosing transfer:

$S_1=q_2(R_{11}-C_{11}-C_{12}-C_{13})+(1-q_2)(R_{11}-C_{12}-r_{11})$

$=q_2\{p[p_1(R_{11}-L_1-C_{12}-C_{13})+(1-P_1)(R_{11}-C_{12}-C_{13}]+[(1-p)(R_{11}-C_{12})]\}+(1-q_2)(R_{11}-C_{12}-r_{11})$

$=q_2(R_{11}-pp_1L_1-PC_{13}-C_{12})+(1-q_2)(R_{11}-CS_{12}-r_{11})$

$=R_{11}-q_2pp_1L_1-q_2PC_{13}-C_{12}-(1-q_2)r_{11}$

The prospective earnings of village collectives not choosing transfer:

$S_2=R_{21}-E_{21}$ *or* $S_2=0$

When $S_1<S_2$, transfer will not benefit for the increase of the prospective revenue of village collective; when $S_1>S_2$, transfer will favor the increase of village collective prospective revenue.

If the village collective chooses to transfer, the available revenue will be leasing R_{11}. As land demand increases, conflicts of urban land supplies are prominent, while the village collective will have more revenue share as the owner and transferor of land-use right.

The village collective needs to pay for transfer cost including illegal cost, psychological cost, transaction cost and tax. According to the legal regulation, the punishment to illegal transfer of collective construction land is relatively moderate. In practice, the illegal cost of the transfer of collective construction land in rural area of China is usually very small. In the condition of low illegal cost, the villagers' psychological cost for illegal transfer is very small as well. In terms of negotiation cost, it could be relatively higher in the first exchange of the village collective. After several the transfer experiences, fixed operational process is established, and the cost will significantly reduce, thus the cost shows a gradually reducing trend. In addition, compared to the transference income, negotiation cost is not high. Besides, the village collective needs to pay tax to the government at the rate of $(1-q_2)$. When the government allows transference, the policy objective is to reflect the economic benefits brought by transference. Thus, the proportion of tax is rather small. Within the present system, the government prohibits transference at the probability of q_2. Transferring construction land brings substantial income S_1 to the village collective.

Assuming the village collective idles its collective construction land, S_2 equals 0 at this time, and the equation of "$S_1=S_2$" is true. In reality, there are many examples of collective operating loss. As a result, in general, the benefits of the self-use

lands S_2 chose by village collective body are much less than that those gained by transferring lands S_1, namely, now $S_1>S_2$ is also true.

In conclusion, no matter how big the probability is for the government to prohibit transference, the benefits of the village collective choosing transference is significantly larger than that of not choosing transference. Hence, whether the government allows or prohibits transference, the rational choice of the village collective is to actively transfer the collective construction land. Choosing transference is the optimal strategy for the village collective in its game with the government.

4.2. Behavioral Strategy Solutions of the Transferee

Expected income of construction land transferred to the village collecting body from transferee:

$S_3=q_2(R_{31}-C_{31}-C_{32}-C_{33}-C_{34})+(1-q_2)(R_{31}-C_{32}-C_{34}-r_{21})$

$=q_2\{p[p_1(R_{31}-L_2-C_{32}-C_{33}-C_{34})+(1-p_1)(r_{31}-C_{32}-C_{33}-C_{34})]+[(1-p)(R_{31}-C_{32}-C_{34})]\}+(1-q_2)(R_{31}-C_{32}-C_{34}-r_{21})$

$=q_2(R_{31}-pp_1L_2-PC_{31}-C_{32}-C_{34})+(1-q_2)(R_{31}-C_{32}-C_{34}-r_{21})$

$=R_{31}-q_2pp_1L_2-q_2pC_{33}-C_{32}-C_{34}-(1-q_2)r_{21}$

Expected income of construction land transferred to government from transferee:

$S_4=R_{41}-C_{42}-C_{44}-r_{22}$

When $S_3>S_4$, transferee choose to transfer construction land to village collecting body, which contributes to increase expected income of transferee; when $S_3<S_4$, transferee chooses to transfer construction land from the government which help raise expected benefits; while, when $S_3=S_4$, transferee transfers construction land from village collective and the government which can't affect the expected benefits.

If there is substitutability to transferee in managing between collective construction land and state construction land, then $R_{31}=R_{41}$. In this case, the findings compared S_3 with S_4 depends on the cost to be invested by transferee.

When transferee chooses to transfer construction land to village collective, the costs they should pay for costs including illegal costs, transaction costs, psychic costs, land use fees and taxes paid to the state. In practice, usually the cost of illegal the transfer of collective construction land in rural area of China is 0, and psychologically the cost of illegal conduct is extremely low, or equals to 0. So the factors that truly affect the value of S_3 are the trading cost, the land-occupying fee and the land-occupying tax. When transferees transfer the build-up land to the government, they have to pay the costs including transaction cost, land use fee and land use tax. Therefore, when $R_{31}=R_{41}$, what truly affect the values of $S_3$and S_4 are the trading cost, the land use fee and the tax paid to the government.

The collective construction land Transfer prices, mostly determined by negotiations between the village collective and the transferee, which lies in additional bargaining power, while market for State-owned construction land is generally in intense competition, which results in relatively high land prices. Therefore, it is much more worthwhile for the transferee to transfer construction land to the collective. The transferee who transfers built-up land from the government, should pay some land use tax r_{22} and forward it to the government, the transferee who transfers built-up land from the village collectives, should pay taxes r_{21} as a probability of $(1-q_2)$, but take speed up economic development into consideration, $(1-q_2)$ r_{21} will be lower than r_{22}. Comparison analysis of all the items of cost mentioned above indicates that, as a general rule, $S_3>S_4$.

So, on equal terms, the government has implemented policy of forbidden circulation of construction field with a probability of q_2. The transferee chooses to transfer built-up land from the village collective, which is in favor of expected benefit and is a rational action strategy.

4.3. Strategy Solutions of Action Choices of Government towards the transfer Banning or Permitting.

Expected benefit of government if choosing the transfer banning:

$S_5=q_1\{p[p_1(L_1+L_2-C_{51}+V_1-V_2)+(1-p_1)(V_2-V_1-C_{51})]+(1-p)\times(V_2-V_1)\}+(1-q_1)\{[p(-C_{51})+(1-p)\times0]+(R_{51}-C_{62}+r_{22})\}$

$=q_1[pp_1(L_1+L_2)-pC_{51}+(1-2pp_1)(V_2-V_1)]-p(1-q_1)(C_{51})+(1-q_1)(R_{51}-C_{62}+r_{22})$

$=q_1pp_1(L_1+L_2)-pC_{51}+q_1(1-2pp_1)(V_2-V_1)+(1-q_1)(R_{51}-C_{62}+r_{22})$

Expected benefit of government if choosing the transfer permitting:

$S_6=q_1(r_{11}+r_{21}+V_2-V_1-C_{52})+(1-q_1)(R_{51}-C_{62}+r_{22})$

When $S_6>S_5$, permitting the transfer will favor the increase of the expected benefit; when $S_6<S_5$, allowing transference will not be conducive to increase the expected benefits of the government; when $S_6=S_5$, the two strategies of whether allowing transference or not will make no difference to the expected benefits of the government.

It requires an extremely high cost for the government to inspect over the transference. The high costs determine that the probability of government, in reality, to supervise, successfully investigate and penalize the circulation p_1 is very small, so is the vested punishment strength L_1+L_2. Therefore, generally the costs of which, the government bans circulation and

implements supervision are higher than profits, namely $q_1pp_1(L_1+L_2)<pC_{51}$. That the government selects the implementation of the policy which bans circulation indicates as for the government, protecting land resource and stabilizing market are more important, namely $V_1>V_2$. Thus, $q_1(1-2pp_1)(V_2-V_1)<0$. And therefore, $q_1pp_1(L_1+L_2) <pC_{51}$, $q_1(1-2pp_1)(V_2-V_1)<0$, which leads that $q_1pp_1(L_1+L_2) <pC_{51}+q_1(1-2pp_1)(V_2-V_1)$. Finally we conclude that $S_5<(1-q_1)(R_{51}-C_{62}+r_{22})$.

Under the circumstances that the government permits the transfer of collective construction land, $S_6=q_1(r_{11}+r_{21}+V_2-V_1-C_{52})+(1-q_1)(R_{51}-C_{62}+r_{22})$. The government gains the taxes from both sides of the transfer which increases the fiscal revenue. That the government permits the transfer indicates that the government at this time thinks more of the economic benefit from the transfer of collective construction land, Namely, $V_2>V_1$. Cost is the government's normal office cost. In contrast to cost and benefit, permitting the circulation not only lets the government pay no supervision and cost, but also gets are earnings , namely, $q_1(r_{11}+r_{21}+V_2-V_1-C_{52})>0$; now, $S_6>(1-q_1$ 〉$(R_{51}-C_{62}|+_{22})$.

According to the analysis of findings, generally $S_5<(1-q_1)(R_{51}-C_{62}+r_{22})$, $S_6>(1-q_1)(R_{51}-C_{62}+r_{22})$, thus $S_6>S_5$ holds, which indicates the expected profit from the permission of the transfer of collective construction land is larger. Therefore, permitting of the transfer of collective construction land is a rational choice.

5. Conclusion

From the above analysis, we can see that there is economic justification for the common phenomenon that the rural collective construction land is transferred privately in a large number. No matter how big the probability is for the government to prohibit transference, for the village collective, benefits of choosing to transfer is significantly higher than choosing not to; under the same condition, it is more worthwhile for the transferee to transfer construction land from the village collective than from the government. The village collective, transferee and local government have common benefit in terms of building land's entering market to do free the transfer, achieve the equalization of markets of city-and-country side factors, "equal land, equal price, equal right", between collective construction land and city nationalized construction land, which is feasible. And realizing the integration of institution is the developing direction of the transfer of collective construction land in rural areas of China in the future.

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