Incentive Effect of Special Transfer Payment on Local Government Agricultural Expenditure — An Incentive-response Model

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Abstract: In 1994, China implemented a major tax reform aimed at ensuring a stable budget for both central and local governments, laying a solid foundation for the country's sustainable development. In order to stimulate local governments' investment enthusiasm in key economic areas, especially in agriculture, the central government has carefully planned a series of special transfer payment policies. These policies not only provide the necessary financial support for local governments, but also set clear conditions for local governments to ensure the corresponding expenditure of local budgets before obtaining specific transfer payments. This special transfer payment system has played an important role in promoting China's rapid economic growth. In order to deeply understand the effect of this system, this paper constructs an incentive response theoretical model to deeply analyze the response mechanism of local governments to special transfer payments. The results of the model show that only when the amount of special transfer payments exceeds a certain threshold can local governments effectively stimulate their spending behavior. In addition, this incentive effect is particularly evident in areas with relatively backward economies.

Keywords: Incentive effect, transfer payment, agricultural expenditure, incentive-response.

1. Introduction

Food security is an important foundation for national security. Against the backdrop of the interwoven and superimposed changes of the century and the pandemic, as well as an increasingly complex and uncertain external environment, ensuring national food security is even more a "matter of great importance to the nation" for achieving economic development and ensuring social stability, and it is also a long-term and arduous task faced by governments at all levels in China.

Due to the foundational, weak, and external characteristics of agriculture, financial support is an important means for governments of all countries to support agricultural development. After the reform and opening up, China has placed great emphasis on grain production, and central and local governments have continued to increase financial support for agriculture [1,2]. However, looking at the main bodies responsible for financial support for agriculture, due to the lag in establishing the central and local financial management system for supporting agriculture in China, there has been a situation of "unclear division of responsibilities and unclear expenditure responsibilities" between the

central and local governments in financial support for agriculture, leading to frequent overlap and misalignment in implementation [3,4,5].

After the "tax-sharing system" reform in 1994, the central financial resources grew faster than local financial resources, but the reform of responsibilities and expenditure responsibilities between the central and local governments lagged relatively, making it difficult for local governments to match their expenditure capabilities with their corresponding responsibilities [5,6]. To motivate local governments, the central government supports local financial resources through transfer payments, and a large number of special transfer payment projects were established under this institutional background [7]. Statistical data show that from 1995 to 2018, the scale of China's transfer payments grew from 253.3 billion yuan to 6168.6 billion yuan, with an average annual growth rate of about 15.6%, while the scale of special transfer payments grew from 37.3 billion yuan to 2292.7 billion yuan, with an average annual growth rate of about 20.6% [8,9]. Among them, due to the foundational nature and wide-ranging involvement of "agriculture, rural areas, and farmers" work, the scale of special transfer payments from the central finance to local agricultural, forestry, and water affairs also achieved a relatively fast growth rate [10]. In 2015, the scale of special transfer payments from the central government to local agricultural, forestry, and water affairs reached 595.7 billion yuan, accounting for 27% of the total special transfer payments that year, far exceeding the 10.9% in 2002. Although China has continued to promote the cleanup, integration, and standardization of special transfer payments in recent years, the proportion of the number of agricultural special transfer payment projects still ranks at the forefront [11,12].

By the practice of the central government's special grants to local governments in China, when the central government establishes special transfer payment projects, for matters of shared responsibilities, the prerequisite for local governments to receive special transfer payments is to arrange necessary funds to match, otherwise it is difficult to secure special transfer payments from the central finance [13,14]. For instance, the "Opinions on Reforming and Improving the System of Central Government Transfer Payments to Local Governments," issued by the State Council in 2014, clearly states that the central government may require local governments to provide matching funds for shared responsibilities between the central and local governments when arranging special transfer payments. Based on the basic theory of intergovernmental fiscal transfer payments, the central finance's requirement for local governments to provide matching funds in special transfer payments helps to overcome the local governments' dependency on central finance, guides and motivates local governments to actively provide public products or services emphasized by the central government, and forms a better synergy between the central and local governments [15,16]. However, given the significant differences in agricultural resource endowments and financial capacities across various regions, how does the central finance's special transfer payment affect the fiscal behavior of local governments in supporting agriculture? Against the backdrop of China's continuous deepening of the reform of the fiscal transfer payment system and the optimization of the financial mechanism for supporting agriculture, studying this issue clearly is especially important [17].

2.   Model Set-up

2.1.   Utility Function

Due to the direct relationship between the local governments' agricultural subsidies and the incentive effect of the central government's special transfer payments to agriculture, focus on the objective function of local governments[17]. To simplify the analysis, adopt a linear objective utility function of a provincial government, as seen in Equation (1). Here, I_A and I_{NA} represent the agricultural and non-agricultural incomes of a province, respectively. $\lambda \in (0,1)$ is the weight of agricultural income in the provincial government's utility function, and $(1 - \lambda)$ is the weight of non-agricultural income.

The weights can be understood as the degree of importance a provincial government places on these parts of their income. $\overline{G}$ represents the total fiscal budget of the provincial government, while G_1 and G_2 are the fiscal expenditures on agriculture and non-agriculture, respectively, with G_0 being the minimum level of agriculture expenditure that a provincial government has to fulfill. It is assumed that $\overline{G}$ and G_0 are given exogenous variables. The endogenous variables of the model are G_1 and G_2, and a provincial government maximizes the utility function by deciding on expenditures for agriculture and non-agriculture.

$$\max_{G_1, G_2} U(I_A, I_{NA}) = \lambda I_A + (1 - \lambda) I_{NA}$$

$$s.t. \, G_1 + G_2 \leq \overline{G} \, and \, G_1 \geq G_0 \tag{1}$$

2.2. Agricultural Production Function

The agricultural production function of a provincial governments is given by Equation (2):

$$I_A = d * \beta(G_1, G_0, r) * I_A^N + (1 - d) * I_A^N \tag{2}$$

where d is the probability of natural disasters that are detrimental to agricultural production, I_A^N is the agricultural income in the absence of natural disasters, which is an exogenous variable determined outside the model. The function $\beta(G_1, G_0, r)$ is the risk protection coefficient for agricultural income, which is a function of the total agrarian expenditure G_1, the minimum requirement of local expenditure on agriculture G_0, and the agrarian subsidy coefficient r that includes the central government's special transfer payment for agricultural. Here, $r \geq 1$, and thus the central government's special transfer payment subsidy coefficient for agriculture is $(r - 1)$, meaning that for every 1 yuan of subsidy from provincial governments, the central government will provide an additional subsidy of $(r - 1)$ yuan. Therefore, the total expenditure that can be used for agriculture is $G_0 + r(G_1 - G_0)$. The function of the agricultural income protection function coefficient is as follows:

$$\beta(G_1, G_0, r) = \beta_0 - \beta_1 * e^{-(G_0 + r(G_1 - G_0))} \tag{3}$$

in which β_1 can reflect the efficiency of agricultural expenditure utilization. It is assumed that $\in (0,1]$, meaning that the parameters β_0 and β_1 need to satisfy $\beta_0 > \beta_1 * e^{-G_0}$, and $\beta_0 - \beta_1 * e^{-(G_0 + r(\overline{G} - G_0))} \leq 1$. The protection coefficient β increases monotonically with the increase of the expenditure of provincial governments on agriculture $(G_1 - G_0)$, and at the same time, due to the second derivative $\frac{\partial^2 \beta}{\partial G_1^2} < 0$, the local expenditure exhibits the property of diminishing marginal returns.

2.3. Non-agricultural Production Function

The non-agricultural production function of local governments is given by:

$$I_{NA} = \alpha(G_2) * I_{NA}^N \tag{4}$$

where I_{NA}^N represents the theoretical maximum capacity of the non-agricultural sector. The extent to which this maximum capacity can be converted into non-agricultural income depends on the conversion function $\alpha(G_2)$, which is given by the following formula:

$$\alpha(G_2) = \alpha_0 - \alpha_1 * e^{-G_2} \tag{5}$$

Here, α_1 can reflect the efficiency of capital utilization in non-agricultural expenditures. Assuming $\alpha \in (0,1]$, the parameters α_0 and α_1 must satisfy $\alpha_0 - \alpha_1 > 0$, and $\alpha_0 - \alpha_1 * e^{-(\overline{G} - G_0)} \leq 1$. The conversion coefficient α increases monotonically with the increase in non-

agricultural expenditureG_2, and since the second derivative $\frac{\partial^2 \alpha}{\partial G_2^2} < 0$, non-agricultural expenditures also exhibit the property of diminishing marginal returns.

Based on the model setup described above, can solve the model. There are two types of solutions: one is a corner solution, and the other is an interior solution. I will analyze them in turn.

2.4. Corner Solution

Given that both agricultural and non-agricultural expenditures in the model exhibit diminishing marginal returns, under the premise that the central government's special transfer payment coefficient is $(r - 1)$, if the marginal return of agricultural expenditure is still lower than that of non-agricultural expenditure when the local government's agricultural insurance subsidy is zero, then the provincial government will not provide any subsidy for agricultural above its minimum level G_0. In this case, the solution of the model is$G_1 = G_0$, and$G_2 = \bar{G} - G_0$.

Next, I analyze the conditions required for a corner solution. When the provincial government's agricultural expenditure is G_0, i.e., with no additional agricultural subsidy, the marginal return of the agricultural insurance subsidy is $\lambda d\beta_1 re^{-G_0} * I_A^N$, while the marginal return of non-agricultural expenditure is $(1 - \lambda)\alpha_1 e^{-(\bar{G}-G_0)} * I_{NA}^N$. The provincial government will only provide additional agricultural subsidies if the marginal return of the agricultural expenditure is greater than that of non-agricultural expenditure. From the perspective of the subsidy coefficient, the provincial government will only respond to the central government's special transfer payment when the subsidy coefficient r satisfies the following condition, i.e., when the transfer payment reaches a certain scale:

$$r > \frac{1-\lambda}{\lambda} * \frac{1}{d} * \frac{\alpha_1}{\beta_1} * \frac{I_{NA}^N}{I_A^N} * e^{(2G_0 - \bar{G})} \tag{6}$$

Given the special transfer payment coefficient from central finance, the smaller the right-hand side of the inequality, the more likely the central special transfer payment is to incentivize the provincial government to provide subsidies. The provincial government is more likely to respond to the central special transfer payment when the importance of agriculture in the local government's objective function is higher, the probability of natural disasters affecting the region is greater, the efficiency of agricultural funds relative to non-agricultural funds is higher, and the proportion of agriculture in the local economy is larger. Additionally, the local government's fiscal budget situation and agricultural expenditure also have a significant impact. Specifically, the more relaxed the local fiscal budget, and the less the local government's overall agricultural expenditure, the more likely it is to respond by offering additional agricultural subsidies. Since the proportion of the agricultural economy in the central and western provinces is significantly higher than in the eastern provinces, and the overall economic development is not as advanced as in the eastern regions, under the same policy conditions, the central and western regions are more likely to respond to central transfer payments.

2.5. Interior Solution

Given that inequality (6) is satisfied, the local government's optimal subsidy for agricultural $G_1 > G_0$. The provincial government achieves the optimal subsidy level for agriculture when the marginal return of the agricultural expenditure equals the marginal return of non-agricultural expenditure. From the equality of marginal returns, can derive the following equation:

$$\lambda d\beta_1 re^{-G_0} * I_A^N = (1 - \lambda)\alpha_1 e^{-(\bar{G}-G_0)} * I_{NA}^N \tag{7}$$

From this equation, it can determine the optimal subsidy level for agricultural by the provincial government as:

$$G_1 = \frac{ln\left(\frac{\lambda}{1-\lambda}*\frac{\beta_1}{\alpha_1}*\frac{I_A^N}{I_{NA}^N}*d*r\right)+\bar{G}+(r-1)*G_0}{1+r} \tag{8}$$

Therefore, the subsidy level for agriculture by the provincial government is positively correlated with the importance of agricultural income relative to non-agricultural income in the objective function $(\lambda/(1-\lambda))$, the efficiency of agricultural funds relative to non-agricultural funds (β_1/α_1), the scale of local agricultural income relative to non-agricultural income (I_A^N/I_{NA}^N), the probability of natural disasters occurring in the region d, and the overall scale of local agricultural expenditure G_0. This indicates that the provincial government's subsidy behavior for agriculture is effective, meaning that the greater the demand for agricultural subsidy in the local economy, the larger the subsidy scale provided by the provincial government. Additionally, the provincial government's behavior has a positive income effect, with a larger subsidy scale when the local fiscal budget is $\bar{G}$.

2.6. Comparative Statistics of the Incentive Effect

According to equation (8), by taking the derivative of the right-hand side with respect to the central government's subsidy coefficient r, it obtained:

$$\frac{dG_1}{dr} = \frac{\frac{1+r}{r}+2G_0-\bar{G}-\ln{\left(\frac{\lambda}{1-\lambda}*\frac{\beta_1}{\alpha_1}*\frac{I_A^N}{I_{NA}^N}*d*r\right)}}{(1+r)^2} \tag{9}$$

Equation (9) represents the incentive effect of the central special transfer payment coefficient r on provincial government subsidies. First, the incentive effect is not a monotonically increasing function of r. After r reaches a certain threshold, as r continues to increase, the subsidy amount provided by the local government will decrease, reflecting the "crowding out effect" of central special transfer payments on local government subsidies. Second, the incentive effect is positively correlated with the minimum requirement of local expenditure on agriculture G_0, indicating that the higher the agricultural expenditure in the region, the more significant the incentive effect. Third, the incentive effect is negatively correlated with the local fiscal revenue level $\bar{G}$, suggesting that the more relaxed the local fiscal budget, the weaker the dependence on central funds, and thus the less significant the incentive effect. The eastern regions, compared to the central and western regions, have a higher level of economic development and more relaxed fiscal conditions, and their agricultural expenditures are generally lower than those in the central and western regions. Therefore, the incentive effect of central special transfer payments on the central and western regions will be more significant than in the eastern regions.

3. Conclusion

The key conclusions of the conceptual framework can be summarized as follows. There is a minimum requirement for the amount of the special transfer payment from the central government if the central government wants to incentivize local governments to make any positive expenditure on agriculture. The minimum requirement depends on the importance of agricultural income in the objective function, the risk of agricultural natural disasters, the efficiency of agricultural and non-agricultural production, as well as the financial budget of local governments.

The impact of the special transfer payment on the subsidy of local governments is not monotonically increasing. If the special transfer payment reaches the minimum requirement, the local subsidy begins to increase as the special transfer payments grow. However, the local subsidy is likely to decrease if special transfer payment reaches a large amount, which can be understood as a "crowding-out" effect. The incentive effect is more significant in rich areas than in poor areas, since

the local governments in rich areas do not have to rely on the special transfer payment of the central government.

However, the conclusions in this paper are based on theoretical derivation, and further empirical research is required to verify the above conclusions.

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