

The Impact of Water Price Reform on Planting Structure from the Perspective of Farmer Differentiation

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Objectives

- The analysis framework of agricultural water price policy reform, planting structure adjustment and water use efficiency is constructed. The influence results and mechanism of water price policy on farmers' irrigation water use efficiency are analyzed.
- An empirical test of the path of water price policy reform to improve the efficiency of irrigation water through the adjustment of planting structure. Based on the perspective of farmers' heterogeneity, the differences in irrigation adaptation behaviors of heterogeneous farmers with different individual resource endowment constraints are tested.
- From the perspective of improving the design of water price pricing mechanism and adjusting planting structure, policy recommendations are put forward. It provides reference and reference for the implementation of future water price policy reform.
- 'Overuse-charge' is summarized as the water fee charging mode of 'three grades and two lines'. The core is that there is no price increase within the water right, and it can be traded, exceeding the fixed price increase. The water consumption is divided into three grades, each of which adopts different water prices, and the water-saving rewards within the quota are different.

Methods

- To study the impact of water price policy on planting structure, the econometric model is set as follows :

$$PS_j = \alpha_i + \beta_i Reform_j + \sum \sigma_i X_i + f_t + \xi_r + \varepsilon_j \quad (1)$$

In formula(1), PS_j as the core dependent variable, the proportion of low water consumption crop planting area to the total planting area of the family is used as the measurement index. The core independent variable Reform is a dummy variable reflecting whether to carry out water price policy reform. β_i reflects the impact of water price policy reform on planting structure. f_t and ε_r are fixed effects of time and region, respectively. X_j is a series of control variables that will affect the planting structure, including farmers' personal characteristics, family status, subjective cognition, and production characteristics. ε_j is a random error term.

- Farmers with different levels of concurrent business and scale of operation tend to choose different planting structures in the face of water price policy reform. One option is to reduce the planting area of wheat to increase the planting area of corn. Another option is to reduce the planting area of wheat to increase the planting area of cotton. In order to test the heterogeneity of farmers' differentiation, the econometric model is set as follows :

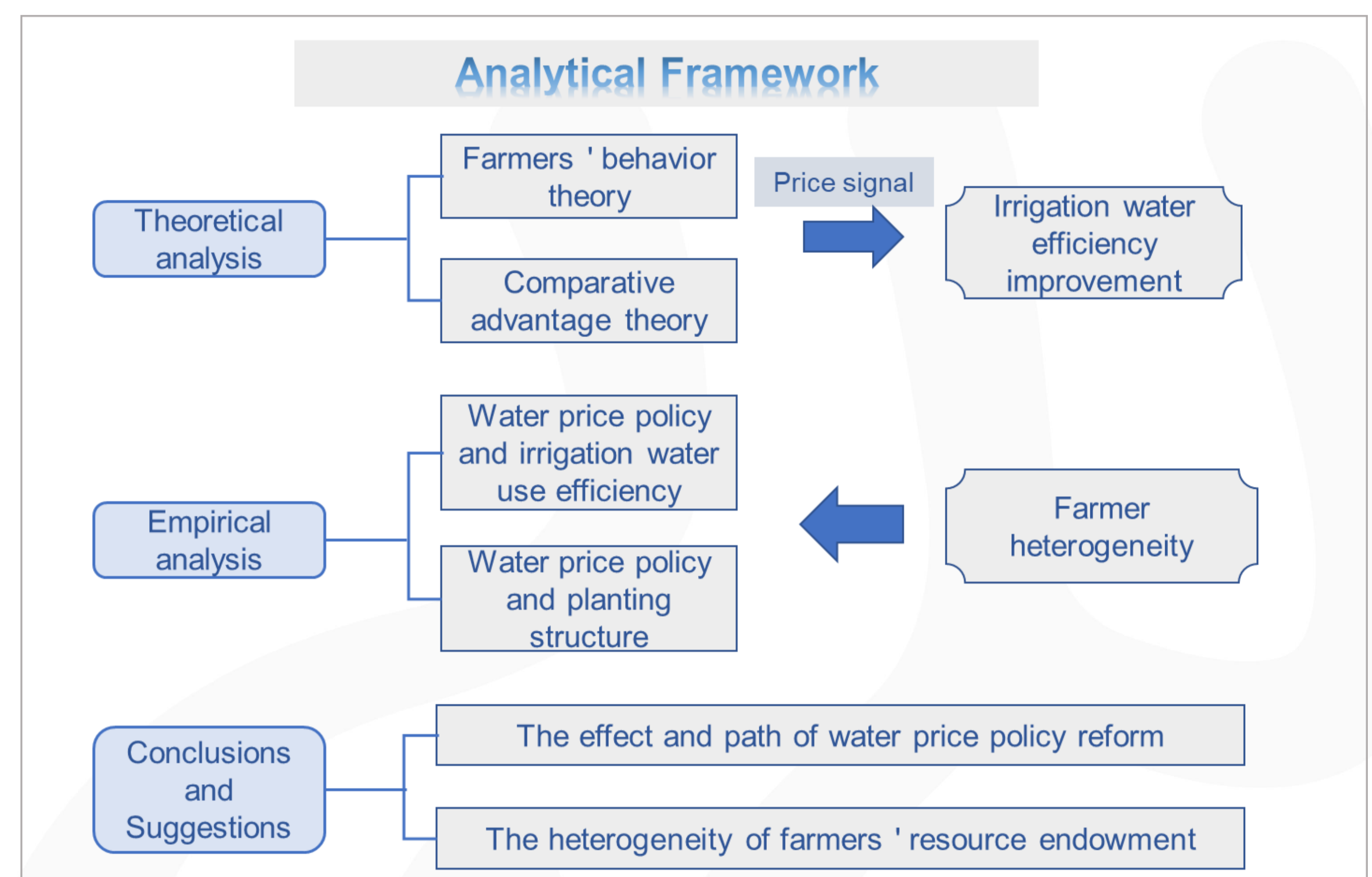
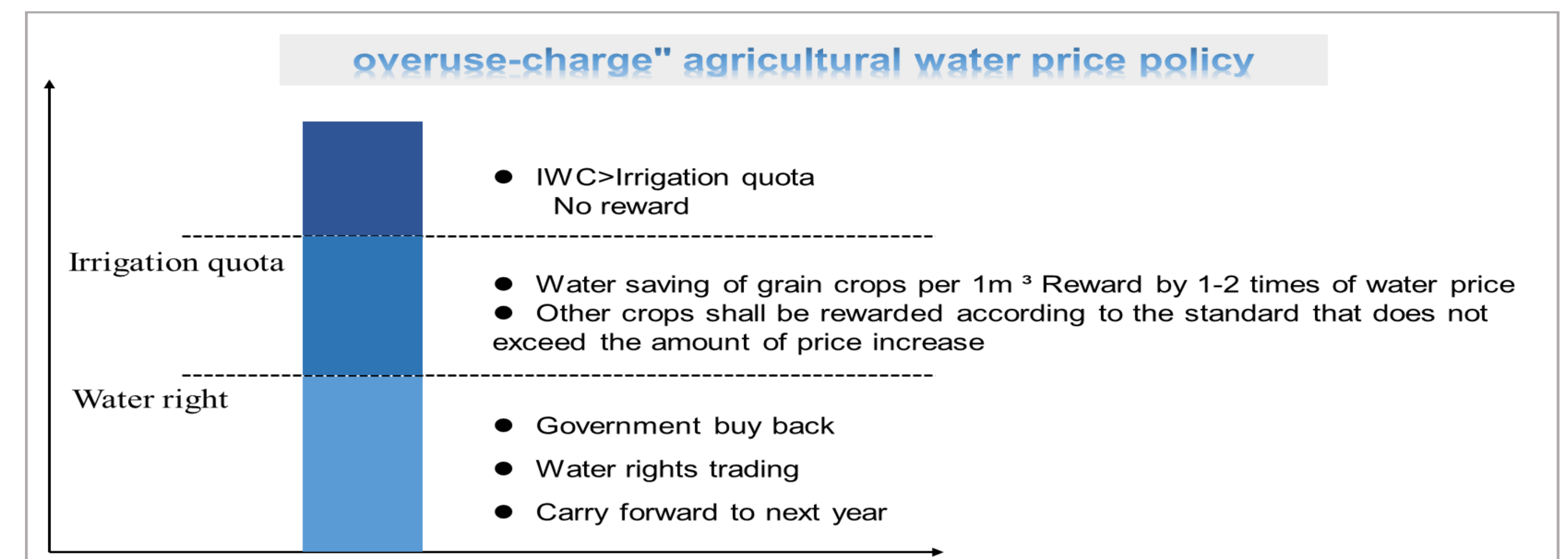
$$PS_{j1} = \beta_0 + \beta_1 Reform_j + \delta X_j + \varepsilon_j \quad (2)$$

$$PS_{j2} = \beta_0 + \beta_1 Reform_j + \delta X_j + \varepsilon_j \quad (3)$$

In the formula(2)、(3), PS_{j1} 、 PS_{j2} the proportion of corn planting area to the total planting area of the family and the proportion of cotton planting area to the total planting area of the family are respectively.

Table1 The regression results of water price reform on planting structure

Variables	(1)	(2)
Water price reform	0.231*** (0.05)	0.205*** (0.018)
Control variables	Yes	Yes
_cons	2.277*** (0.327)	1.569*** (0.225)
Area dummy variables	No	Yes
Time dummy variables	Yes	Yes
R-squared	0.172	0.456



Conclusions

- The reform of agricultural water price policy significantly affects the planting structure. In the regression with the proportion of sown area of low water consumption crops as the dependent variable, the estimated coefficient of water price policy reform is significantly positive. This means that compared with the unified water price policy, the water price policy reform has increased the proportion of low water consumption crops sown area of farmers.
- In the adjustment of different planting structures, the heterogeneity of farmers' differentiation and the heterogeneity of business scale also show significant differences. High and low part-time farmers tend to reduce the planting area of high water-consuming crops in the face of water price policy reform. However, farmers in the low part-time group tend to shift to expanding the sown area of corn and cotton. The high part-time group of farmers only expanded the planting area of corn. The heterogeneity of operating scale shows the same characteristics. Small-scale farmers are more likely to increase the planting area of corn and cotton, while large-scale farmers are more inclined to increase the planting area of corn.

Table2 The results of farmers' heterogeneity in different planting structures

Variables	Low part-time group		High part-time group		Small-scale group		Large-scale group	
	A	B	A	B	A	B	A	B
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Water price reform	0.033** (0.017)	0.029*** (0.008)	0.075*** (0.025)	0.016 (0.022)	0.049*** (0.012)	0.059** (0.025)	0.101*** (0.033)	0.056 (0.048)
Control variables	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Area dummy variables	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Time dummy variables	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
R-squared	0.107	0.165	0.051	0.232	0.199	0.136	0.151	0.136

Note : *** and ** indicate that the estimated results are significant at the 1 % and 5 % levels, respectively. A represents food crops with low water consumption. B represents high benefit economic crops.