A pre-evaluation of Hubei province's“Shadow Index” for the equalization of land development rights and interests

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ABSRTACT: to distinguish and analyze the realistic challenges of the implementation of the main functional area planning, which is directed to the coordinated development of the region and the realization of the strategic goal of common prosperity, s-CAD public policy evaluation method was used to evaluate the policy performance of“Shadow Index” for optimizing the implementation of main functional area planning and achieving the goal. Conclusion: the implementation strategy of“Dual fair value + three-stage fair realization” is helpful to realize the balance of rights and interests of regional land development “Shadow Index” intervention to achieve the equalization of land development rights and interests in different main functional areas has a high degree of local recognition, the“Shadow Index” and the central financial transfer payment together constitute the regional balanced development guarantee mechanism of“Horizontal transfer payment + vertical transfer payment”, it is conducive to the implementation of central strategic intention and the autonomy of local development. Based on the S-CAD method, the paper evaluates the two policy scenarios of Hubei province with or without“Shadow Index” intervention, the policy with“Shadow Index” is easier to reach the goal of optimizing the pattern of development and protection in terms of policy effect and efficiency.

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Key words: land development right; Shadow Index; policy pre-evaluation; Hubei Province

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Preliminary Evaluation of the“Shadow Quota” Policy in Hubei Province: A Perspective of Land Development Rights Equalization

Xia Jing, Tian Li, Wang Chenyue, Wei Wei, Wang Zhifeng

Abstract: This paper aims to identify and analyze the real challenges facing planning for development priority zones (PDPZ) . Rooted in the principle of equal land development rights, the shadow quota policy (SQP) is introduced to facilitate coordinated reginal development and common prosperity. Employing the S-CAD policy evaluation method, this paper evaluates the application of SQ to optimize the implementation of pdpz. Several key findings emerge. Firstly, the strategy combines“Double fair value” with“Three-stage fairness realization” helps balance regional land development rights. Secondly, the SQ approach has gained widespread local acceptance by ensuring justice in the allocation of land development rights among different types of development priority zones. Additionally, along with central transfer payment, SQP forms a critical component of China's horizontal and vertical transfer payment system. It supports balanced regional development, promotes national strategy implementation, and preserves local autonomy. Thirdly, the paper compares and evaluates two policy scenarios in Hubei Province by adopting the S-cad method. The results show that The scenario involving SQP is more likely to strike a balance between development and protection with high efficacy and efficiency.

Keywords: land development rights; shadow quota; public policy pre-evaluation; Hubei Province

Since the idea of promoting the construction of main functional areas was first put forward in the eleventh five-year plan, the planning of main functional areas has been implemented for nearly 20 years. While promoting the optimization of the pattern of land and space development and protection, the development differences between regions are further highlighted, it is difficult to achieve the goal of promoting regional coordinated development and common prosperity through improving the main functional zoning proposed in the 20th National Congress of the CPC. The reason is that the differentiated spatial control means of the main functional area means the differentiated allocation of land development rights and interests. Based on the idea of“Shadow Index”, which is the optimized policy conception of the implementation of the main functional area planning oriented by the equalization of land development rights and interests, and based on the S-CAD Public Policy Evaluation method, to carry out the pre-evaluation of the effect of implementing the“Shadow Index” policy to assist the main body function area planning in Hubei province, so as to build a new territorial space planning system and improve the ability of space planning governance for our country at the present time, at the same time, the goal of realizing the fair and balanced development of the main functional area should be achieved.

1 Equalization of land development rights and interests and a“Shadow index” framework

1.1 The planning of main functional areas has become a factor aggravating the imbalance of regional development

In essence, the planning of main functional area is the means of space control for regional development, and it is an important planning control tool for implementing the national use control system and realizing the national strategy of regional coordinated development and common prosperity. The planning of main functional area is an important tool to decide the allocation of land development rights and interests in different districts and counties at the level of land development rights management. The definition of main functional areas, such as urbanization area, main agricultural product producing area, key ecological functional area and so on, means that different spatial control and land development rights are given to different main functional areas. This is the main agricultural production areas and key ecological function areas (hereinafter referred to as“Restricted zone”) , its land development rights will be“Limited. If the compensation policy of land development right is not fully matched, the result of regional unbalanced development will only be formed under the unbalanced configuration of land development rights and interests, this would go against the original goal of the main functional area planning-to achieve coordinated regional development.

The biggest limitation of the classification and differential management of the main functional areas is that it is not convenient to carry out the regional fair competition and cooperation [8] . Tracing back to the planning and implementation background of the main functional areas, the strategic conception of the eleventh five-year plan and the planning of the main functional areas at the national and provincial levels during the twelfth five-year plan, it is in the national priority development from the coastal areas of the“First overall situation” to the coastal and inland coordinated development of the“Second overall situation” transition. In the process of the transformation of the regional development strategy, the more the regional planning adapts to the unbalanced development strategy and its regional economic policy, it is less suited to the requirements of coordinated regional development strategies and harmonious coexistence between man and nature [9-11] . The typical feature is that after the implementation of the main function area planning, the regional imbalance between the urbanized area and the restricted area becomes more serious, which makes it difficult to form the spatial development and protection pattern restricted by the main function. Relevant empirical studies confirm this conclusion. For example, Liu et al. 12 suggested that at the regional level, the rate of urban expansion in the Midwestern sectional figure skating championships was at a high level after the introduction of the Master Functional Area Plan, li Hui et al. [13] proposed that the implementation of Hunan province's main function area planning has no significant effect on shaping the main function pattern of restricted area, the development of the main functional zones in the national important economic zones and ethnic minority areas also shows a state of uncoordinated development [14-15] .

As far as the transfer payment mechanism is concerned, it has the characteristic of“More vertical and less horizontal”, it is difficult to solve the problem of internalization of horizontal externalities such as cost sharing and benefit sharing between regions due to the vertical central transfer payment mechanism, the design of such a system also obscures the positive externalities of the rights and responsibilities of implementing protection objectives in restricted areas due to the difficulty of segmenting funding sources [16-17] . As far as the design of transfer payment policy is concerned, the current policy still focuses on the key ecological function areas, while the transfer payment policy for the main agricultural product producing areas is generally

insufficient, in particular, there is a lack of general transfer payments to effectively compensate for land development rights in the main agricultural producing areas [18] . Even if the transfer payment policy is well implemented in the key ecological function areas, the existing transfer payment amount can not fully cover the opportunity cost of the loss of the key ecological function areas. For example, Li Guoping estimated that the proportion of transfer payments to opportunity cost losses in 2009-2014 for counties in key ecological function districts in Shaanxi province was mainly in the 5-10% range, liu Chen et al. (20) calculated that the amount of special transfer payment for ecological compensation from 2008 to 2015 was less than 5% of the opportunity cost of loss in the hilly and gully eco-functional zones of the Loess Plateau in Shanxi province. This shows that the existing transfer payment policy is difficult to fully compensate the main agricultural production areas and key ecological function areas because of restrictions on the development of damaged land development rights, this is also the actual starting point of this paper's policy conception of“Shadow Index”, which is to balance the rights and interests of land development to help the implementation of the main functional area planning.

1.2 equity of land development rights and“Shadow Index” design

The lack of coordination of supporting policies has become a major challenge to the implementation of the main functional area planning. In the absence of systematic incentive and constraint mechanisms, local governments generally choose the policy implementation that is beneficial to them [21] . Restricted zones require large amounts of funding for the construction of major functional zones, however, the restricted area is faced with the problem of lack of financial fund income due to the restriction of the main functional area in land, population, industry and so on. It is very important to explore the transferable land development right, to construct the policy and system of controlling the use of land and space with cross-regional compensation, balanced opportunities and fair results, and to enhance the synergy between the policies [23] . In the light of the implementation of the control system of land and space use and the externalities caused by it, it is an important internalization mechanism of external effects to perfect the policy of ecological compensation and explore the policy design of tradable development rights [24] . Therefore, it is very urgent and important to design the policy tools for the implementation of the planning and implementation of the main functional areas that focus on all-round and all-process fairness. In terms of the imbalance of regional development caused by the planning of main functional zones and the coordinated development of Regions, the key lies in two aspects: first, the fair realization of land development rights and interests of the whole district and county (group) and individual members; Second, all districts and counties from the allocation of indicators to the implementation of the results of the whole process of equitable realization of land development rights and interests [25-28] . That is to optimize the main function area planning implementation of land development rights and interests equity in an all-round, all-process way to help regional coordinated development and common prosperity strategic objectives. In view of this, Tian Li and other [5] put forward the concept of“Shadow Index”, which is the main function area planning policy tool guided by the equity of land development rights. “Shadow Index” is a policy conception based on the linkage design of“Land + Finance” to promote the balance of rights and interests in the development of different main functional zones, based on the principle of equal potential development opportunity, the equalization of initial land development rights distribution among different functional zones is realized, that is, the initial

distribution focuses on“How many indicators should be allocated”, based on the principle of equal opportunity and equal development result, the index of carrying capacity of construction land among different main functional zones is implemented, that is, the redistribution focuses on the index of carrying capacity, the value of value spillover such as ecological protection and cultivated land protection is internalized and compensated by shadow index trade.

In particular, the policy design of“Shadow Index” takes the dual fair value of Macro and micro as guidance to realize the equity of land development rights and interests of the whole district and the individual members in an all-round way, in order to achieve the fair allocation of land development rights and interests in the whole process, the initial fair, the process fair and the result fair are three stages (Figure 1) . “Dual fair value” aims to break the initial land development rights allocation of the predicament, so that restricted areas and urbanized areas have the same development opportunities. “Three-stage fair realization” aims to mobilize the administrative and market forces comprehensively to meet the two-way needs of public interest and efficiency of land resource allocation. The design of“Shadow Index” is based on the policy design which is carried out on the basis of the attribute of quantity and scale and the attribute of spatial positioning of the construction land index, and distinguishes the two attributes of the construction land index, in particular, emphasizing that restricted areas at the initial allocation stage can have the same land development rights and interests in terms of scale attributes as urbanized areas, at the stage of process and result, the space management and control condition of realizing main body function are fully considered. This is also the“Shadow Index” policy concept is different from the current implementation of the urban and rural construction land increase and decrease linked to the key policy (Table 1) . Among them, the individual equity of district and county refers to the optimal land resource allocation efficiency based on the individual development of district and county, and the overall equity of district and county with different principal functions refers to the overall development of all districts and counties, the optimal allocation efficiency of land resources, the dual fair value refers to the optimal allocation efficiency of land resources, which takes into account the needs of individual and overall development, the realization of dual fair value-oriented policy objectives requires the dual planning and design of“Quantity”+ “Spatial layout”, that is, through planning based on the balance of individual and overall development needs to achieve the dual equity of the individual and the whole.

Fig. 1 “Shadow Index” helps to realize the theoretical logic of the balance of land development rights and interests in the main functional areas

Fig. 1 Theoretically SQP helps to balance land development rights and achieve justice

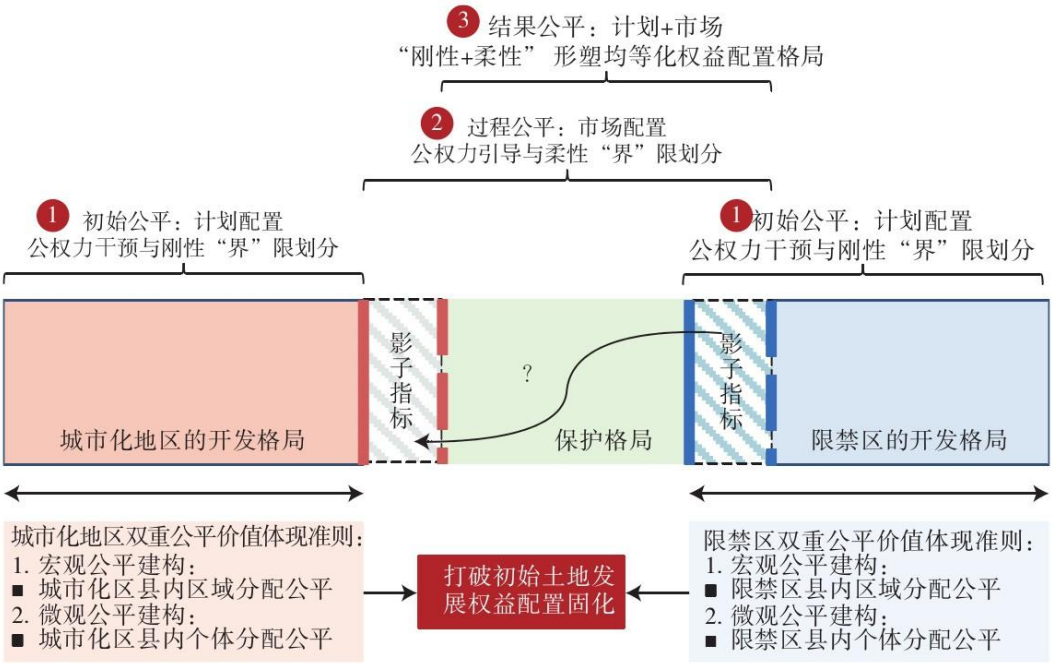


Table 1 comparison of “Shadow index” and “Increase-decrease linkage” policy [29-31]

Table. 1 Policy comparison between SQ and increasing and decreasing balance of construction land quota

名称	政策目标与价值导向	实施逻辑	主要内容
影子指标	双重公平价值与共同富裕： 宏观公平：不同主体功能区县整体公平 微观公平：不同主体功能区县个体公平	三阶段公平实现与区域协调发展：兼顾初始公平、过程公平和结果公平，区分公权力干预的刚性管控边界与公权力引导发挥市场力量配置资源的柔性边界	“量”+“空间布局”双重规划
增减挂钩	耕地保护与建设用地平衡： 耕地面积不减少与质量不降低 城乡建设用地总量平衡	强化耕地保护的优先落实，扩大增减挂钩的适用范围，逐步反哺农村、农民和农业	主要强调“量”的平衡

1.3s-cad public policy evaluation method and“Shadow Index” policy design concept fit

In order to analyze and judge whether the policy tool design of“Shadow Index” can effectively deal with the problem of regional development imbalance, this paper uses the S-CAD public policy evaluation method to carry out the pre-evaluation. The S-CAD method conceptually considers how to“Optimize-balance” under the conditions of different conflicts of interest and different players of interest [32-33] , this is consistent with the objective of optimizing the balance of regional development imbalance caused by the main functional area planning.

2 research areas, methods and data sources

2.1 study area

The subjects were the functional districts and counties in Hubei province from 2010 to 2020. At the end of 2020, there were 57.45 million people in Hubei province, 63 percent of whom were urbanized, with a total area of 185,900 km2. At the end of 2020, there was 79,400 km2 of arable land and 98,000 km2 of ecological space. There are a total of 103 district and county units in Hubei Province, of which: 29 major agricultural production areas, all at the national level; 44 key development areas, including 28 national-level and 16 provincial-level district and county units; and 30 key ecological function areas, including 28 national-level and 2 provincial-level district and county units.

2.2 study methodology

2.2.1s-cad public policy assessment method

The S-CAD Public Policy Assessment Method, proposed by Professor Helian Leung of Queen's University of Canada, is based on the dominant view (S-subjectivity) , conduct C-consistency, A-adequacy, and D-dependency analyses of public policies. The approach begins by defining“Good policy” as“The right goal” plus“Effective action” to further optimize the status quo while balancing the interests of the various actors involved [32] . To decide the balance of interests and optimize the status quo is to focus on the political perspective, while to take concrete measures to achieve the balance of interests and optimize the status quo is to focus on the technical perspective. The research results of S-CAD public policy evaluation in the field of spatial planning and land planning management are increasing gradually. Based on this, the following pre-evaluation of the policy conception of“Shadow Index” in Hubei Province is carried out based on the S-CAD method, the purpose of this study is to compare and analyze the difference of balanced development between the main functional districts and counties in Hubei province with or without“Shadow Index” intervention. See Figure 2.

Technically, the S-CAD approach assumes that all public policies have four typical elements: V-value, G-goal, S-strategy, R-result, policy-making should be directed towards the four directions of stable position, clear aim, effective means and effective results. Based on the identification of these four elements, the consistency, the necessity and the feasibility are analyzed respectively. The consistency analysis focuses on the effect evaluation, tests the internal logic of each policy element, and evaluates the consistency of“Purpose represents position”, “Means pursue purpose”, and“Results reflect means” The adequacy assessment is used to evaluate the efficiency of public policy, while the feasibility assessment is to evaluate the policy approval and implementation from the stakeholders of the system implementation.

2.2.2 questionnaire method

Before developing the S-CAD-based Public Policy Evaluation Method for Hubei Province, it is necessary to collect relevant information about the degree of local approval of the“Shadow Index” policy concept, from July to September in 2022,12 cities in 6 provinces of East, middle and West China, including Zhejiang, Jiangsu, Guangdong, Guangxi, Gansu and Hubei, were

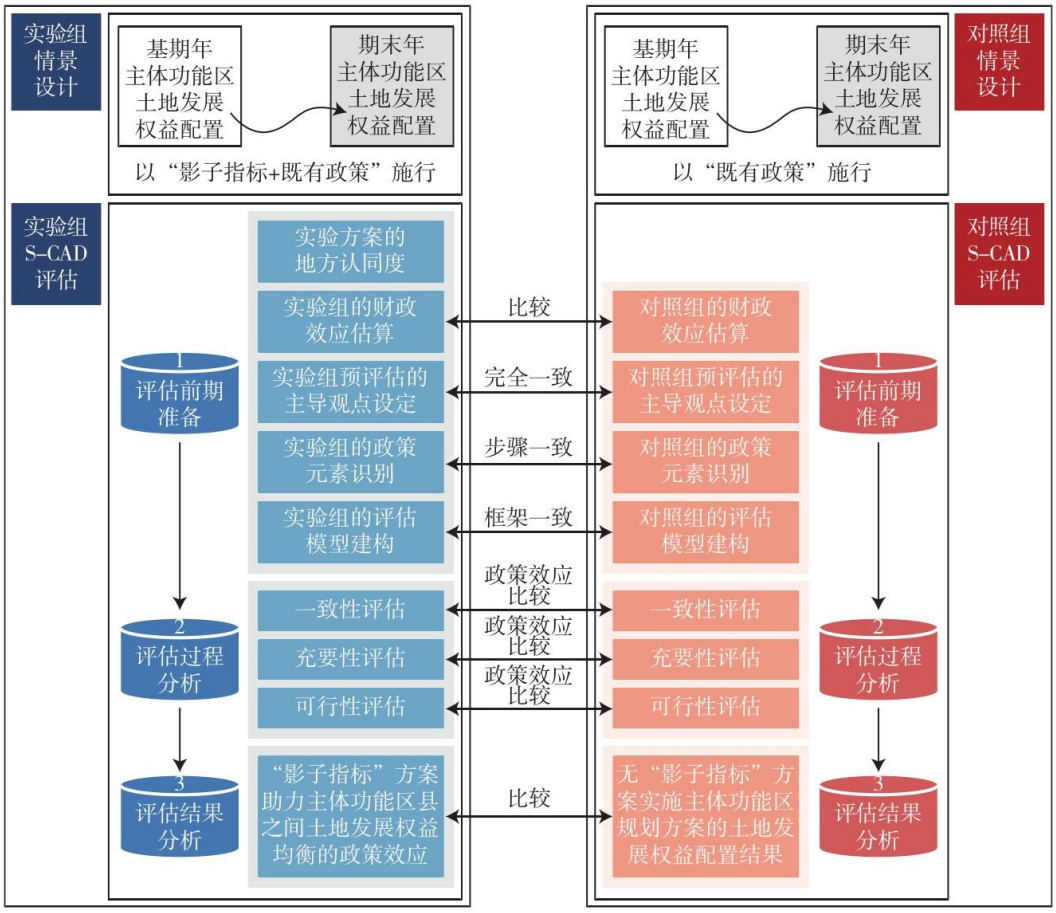
investigated with standardized questionnaires and in-depth interviews. Among them, 45 cities and counties were investigated, and 45 effective questionnaires were collected.

2.2.3 expert rating

Because the“Shadow Indicator” scheme is still in the policy conception stage, it is difficult to accurately select and judge the position importance score of the“Political decision” oriented policy maker in the pre-evaluation stage, below, the experts in Hubei province and those who know the contents of the“Shadow Index” program and participated in the design and research of the“Shadow Index” policy conception in six provinces are selected to participate in the scoring, to ensure the rationality and validity of experts' scores, and as a“Shadow indicator” of the implementation of this policy concept may bring about a measure of the policy effect of the basic data. A total of nine experts were given a score sheet in november-december 2022, and each expert was given a procedural explanation of the need to score from the dominant point of view of the Natural Resources Department of Hubei Province, each expert was asked to rate the importance, effectiveness, efficiency, and feasibility of each position on the basis of the same dominant point of view.

Figure 2 shows the flow of evaluating“Shadow Metrics” based on the S-CAD method

Fig. 2 The process of SQP evaluation based on S-CAD method



2.3 data sources

In the empirical research, the related data of policy link and policy chain analysis based on S-CAD method mainly come from experts' grading, in the estimation of financial effect of promoting“Shadow Index” policy in Hubei Province, the related data about the initial allocation, redistribution and“Shadow Index” of construction land index in different main functional districts and counties mainly come from the land change investigation from 2010 to 2020, the image remote sensing identification of land use, the Statistical Yearbook of Hubei Province, the Statistical Yearbook of China Finance and so on.

3 the S-CAD pre-evaluation framework of the implementation of the“Shadow Index” in the main functional areas of Hubei province

3.1 the analysis of the degree of local identity of the policy conception of“Shadow Index”

The results of a survey conducted by natural resources management authorities in 12 cities in six provinces in eastern, central and western China on the identity of the“Shadow Indicators” policy idea show that, local Governments' attitudes towards the policy concept of“Shadow Indicators” fall into two categories: “Necessary” and“Prudent”, according to the feedback from the local natural resources authorities who hold the“Necessary” attitude to the policy design, there is no obvious difference in the degree of recognition, such as very recognition and basic recognition,

they all gave specific suggestions on how to implement the policy. Among them, the“Necessary” to promote the“Shadow Index” as a policy tool accounted for as much as 91% , and gave the acceptance of the recommendations: the national and provincial governments should introduce this policy, “Shadow indicators” cross-regional transactions should first carry out policy pilot, pilot scope can be focused on the provincial and municipal level two levels. In view of maximizing the benefits of policy implementation, it is widely believed that cross-provincial trading should be allowed, as it is difficult to form a trading market in backward provinces. This means that it is more appropriate to carry out pre-evaluation of“Shadow Index” policy based on district and county spatial units within the province, in the whole country, both the policy concept itself and the scope of policy implementation space have a high degree of recognition. The degree of local approval of the policy conception of“Shadow Index” has nothing to do with the importance, effect, efficiency and feasibility of the experts' S-CAD position.

3.2 the estimation of the financial effect of the implementation of“Shadow Index” in the main functional areas of Hubei province

How much financial improvement will be achieved in the major agricultural production areas and key ecological function areas of Hubei province with the intervention of“Shadow Index” policy tools? That is, how much feedback does it get from local finance on the positive externalities of promoting space protection by limiting its own development? Assuming that in 2010 when the main functional area planning implementation, Hubei Province at the same time pilot“Shadow Indicators” policy, then the construction land scale structure of initial allocation and redistribution of urbanization area, main agricultural product producing area and key ecological function area in Hubei province from 2010 to 2020 was calculated. To further measure the revenue compensation from market-based transactions through the“Shadow Index” in order to judge when the time comes back in 2010, through the“Shadow Index” of the policy design, the extent to which this policy could be used to supplement restricted areas.

The result shows that with the intervention of“Shadow Index”, the allocation structure of construction land index in urbanized and restricted areas of Hubei Province in 2010 is 48% ：52% . According to the actual increment of urban construction land in Hubei Province from 2010 to 2020, as the total scale of construction land allocated by the central government to Hubei province (191 km2 per year) , the total amount of construction land available in the restricted area is 99.3 km2. This is 27.3 km2 more than the actual allocation of construction land scale, that is, Hubei province in 2010-2020 restricted zone tradable“Shadow index” size of 27.3 km2.

The“Measures for the management of inter-provincial transfers of the savings indicators linked to the increase or decrease of urban and rural construction land”(hereinafter referred to as“The measures”) , issued by the State Council General Office, specifies the prices for inter-provincial transfers of the savings indicators linked to the increase or decrease of urban and rural construction land in the“Three regions, three states” and other deeply poor counties. Taking into account the social and economic development stage and other factors, reference to the“Measures” in Hubei Province, Fujian, Shandong and other provinces, savings index adjustment of the base price as a“Shadow index” of the transaction price (1) . The results show

that the largest index trading income in Hubei Province from 2010 to 2020 is 3.28 billion yuan per year on average, this accounted for 7% of the province's total revenue from restricted areas in 2020. Compared with the transfer payment quota (2) obtained by Hubei Province in 2020, the maximum annual trading income obtained by“Shadow Index” is 1.9 times.

3.3 construct the S-CAD pre-evaluation model of“Shadow Index” in the main functional area of Hubei province

First, set up the evaluation viewpoint. In general, the opinion of policy makers is the assessment view. In this assessment, the leading view of the experimental group and the control group is the same, both are the Natural Resources Department of Hubei Province. Second, problem interpretation and identification of policy elements. Finally, the policy elements are arranged and mapped. See Figure 3.

As far as the policy stance is concerned, the essence of the equalization of land development rights and interests in the main functional areas focused on by the two scenarios is to make the best use of land within each main functional area and to get their own place among the different main functional areas, that is to say, both within and between the main functional areas achieve the goal of optimizing the pattern of land development and protection. For the purposes of policy implementation, in order to achieve the optimization of the development and protection patterns within and between the main functional districts, it needs to realize three kinds of equilibrium states: the balance of rights and interests in urbanized area (g 1) , the balance of rights and interests in restricted area (g 2) , and the balance of rights and interests among each other (g 3) . As far as the policy implementation means are concerned, the control group mainly relies on the construction land allocation (s 1) and the central financial transfer payment (s 2) to achieve the policy objectives, the experimental group mainly relies on the initial allocation of construction land index (s 1) , the cross-regional transaction of“Shadow Index”(s 2) , and the superposition of cross-regional transaction income of“Shadow Index” and the transfer payment of the central government (s 3) to achieve the policy objectives. In terms of policy outcomes, the control group and the experimental group were all reflected in four aspects: the improvement of land benefit in all main functional areas (R 1) , the improvement of construction land supply in urbanized areas (r 2) , the increase of public finance in restricted areas (R 3) , the enhancement of farmland protection in restricted areas and the enthusiasm of ecological protection (R 4) . The difference between the two scenarios lies in the same position, means and result, but the difference lies in the relative importance of the position and the elements of means in different scenarios. The reason is that existing policies without“Shadow indicators” are consistent in their positions, objectives and results, but the participation of“Shadow Indicators” will add new policy tools, it may also produce favorable results for the expected optimization of spatial development and protection pattern, which is the ideal prototype and basic assumption for the whole S-CAD policy evaluation.

The policy stance elements are the same in both scenarios, and the relative importance of the stance varies. The analysis of the importance of policy positions in the two scenarios shows that, the relative importance of the position of development pattern optimization (V 1) and protection pattern optimization (V 2) without“Shadow Index”(7.6∶7.1 = 1.07) was higher than that

of“Shadow Index”(8.2∶8.1 = 1.01) , this shows that the policy design with the“Shadow Index” scheme pays more attention to the coordination of the conflict of interest between space development and space protection, it puts more emphasis on the two-way optimization of the overall development and protection pattern.

4 S-CAD pre-evaluation results of implementing“Shadow Index” in main functional area of Hubei province

4.1 consistency analysis and evaluation results

Through consistency analysis, we can judge the degree of logical agreement between the standpoint, the aim, the means and the result. This includes the extent to which the end represents the position of the counterpart/conflict, the extent to which the means pursue the end, and the extent to which the expected outcome measures the counterpart/conflict of the means. The results of the consistency analysis are shown in Figure 4.

The results of the policy link comparison analysis (Figure 4) showed that the logical consistency of the experimental group in the V-G, G-S, S-R three policy links was stronger than that of the control group. The distribution of“Very relevant” links was sufficient to indicate this conclusion. In the experimental group, the proportion of“Very relevant” links in the V-G, G-S and S-R policy was 100% , 89% and 92% respectively, while that in the control group was 67% , 50% and 50% respectively. This shows that if Hubei province adopts the policy of increasing the“Shadow Index” to promote the optimization of the pattern of local development and protection, and then to achieve regional coordinated development, the logical relationship of policy design will be more clear.

The results of a comparative analysis of the policy chain (Table 2) show that, overall, higher importance positions were assigned higher effect consistency in both policy scenarios (the more important positions in the control group V 1 had higher chain values in V 1-g, V 1-g-s, and V 1-g-s-r than in V 2-g, V 2-g-s, and V 2-g-s-r) , the policy objectives in both scenarios had better position importance and outcome presentation. Among them: in the control group without“Shadow Index” intervention, the importance of the more important position v 1 decreased from 7.6 to 7.12 by means, aim and result, a decrease of 6% ; In the experimental group with“Shadow Index” intervention, the importance of position v 1 decreased from 8.2 to 7.84 by means of aim and result, a decrease of 4% . This suggests that, although the more important positions in the two scenarios were collocated with higher effect concordance, the expected results of the experimental group contributed more to the realization of the policy design position, and the policy chain effect loss was less than that of the control group.

Fig. 3 diagram of policy elements for the control and experimental groups

Fig. 3 Policy elements of control group and experimental group

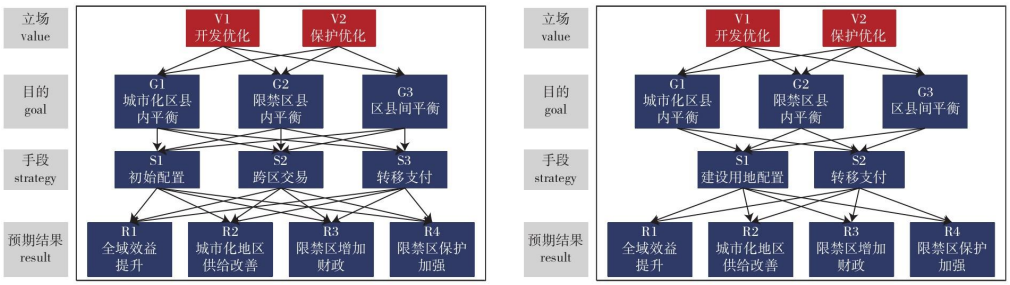
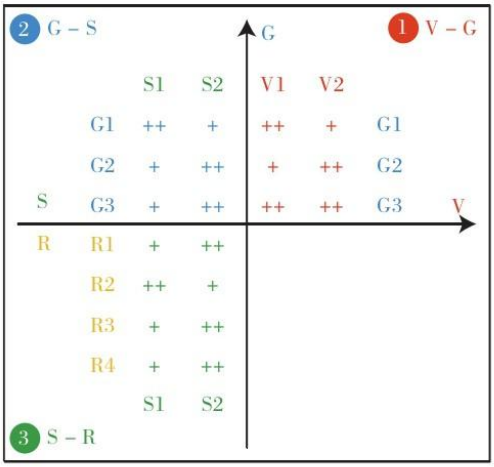


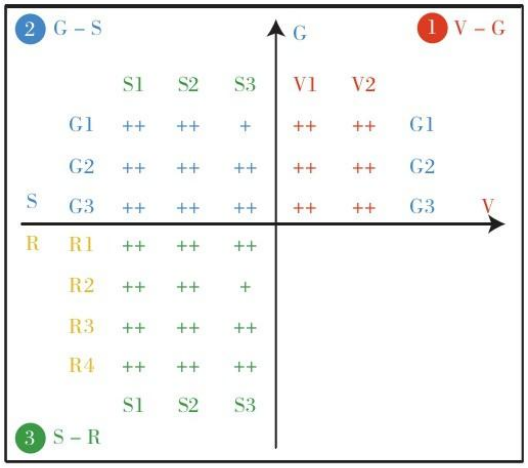
Fig. 4 the results of the consistency assessment of the two scenarios for the policy chain

Fig. 4 The consistency evaluation results of The two scenarios in The policy link

情景1：对照组——无“影子指标方案”



情景2：实验组——有“影子指标方案”



Note: + + indicates highly correlated (7-10) and + indicates correlated (3-6) . The “+” symbol here is derived from a rounding translation of the results above, and the same is shown in figure 5 below

4.2 results of adequacy analysis and assessment

Through the analysis of adequacy and necessity, we can judge the cause-and-effect strength among the policy elements (policy links) such as standpoint, aim, means, and result, to assess the effectiveness of the policy (not falling short because of inadequacies/not wasting because of inadequacies) . It specifically includes the extent to which the end represents a position of adequacy/need, the extent to which the means pursue the end, and the extent to which the expected outcome measures the adequacy/need of the means. The results of the adequacy analysis are shown in figure 5.

The results of the comparative analysis of the policy links (figure 5) showed that the experimental group had a higher degree of adequacy and necessity in the three policy links of V-G, G-S and S-R than the control group, this shows that it is easier to achieve the strategic objectives of development and protection pattern optimization and regional coordinated

development with lower cost and higher efficiency when“Shadow Index” is involved. Specifically, there are“Shadow indicators” in the V-G, G-S, S-R three policy links in the“Very adequate” share of 83% , 89% , 83% , 67% , 50% and 38% of those without“Shadow indicators”. There are“Shadow indicators” in the V-G, G-S, S-R three policy links in the“Very need” of the proportion of 83% , 100% , 100% , respectively, 67% , 83% , and 63% of policies do not have“Shadow indicators”. Among them, the experimental group in the means and expected results (S-R) of the policy link policy efficiency is significantly higher than the control group. This shows that the increase of“Shadow Indicators” as a policy tool, the expected policy objectives to achieve more efficient.

Overall, the more important position in both scenarios was not allocated more efficiently, that is, the position that the initial design of both policy options was development pattern optimization (V 1) was more important (table 3) . Specifically, the experimental group represented the two chains of development pattern optimization (V 1) and protection pattern optimization (V 2) in adequacy assessment, with a relative efficiency loss of 2% for V-G-S-R; The relative efficiency loss of the two chains V-G-S-R, representing development pattern optimization (V 1) and protection pattern optimization (V 2) in the necessity assessment, was 4% . The relative efficiency loss of the two chains, V-G-S-R, representing development pattern optimization (V 1) and protection pattern optimization (V 2) in the control group adequacy assessment was 7% ; The relative efficiency loss of the two chains V-G-S-R, representing development pattern optimization (V 1) and protection pattern optimization (V 2) in the necessity assessment, was 7% . This means that a scheme with a“Shadow index” will lose less efficiency to achieve the policy objective of optimizing the development and protection pattern, and its efficiency loss will be reduced by 5% in adequacy compared with a scheme without a“Shadow index”, 3% on necessity.

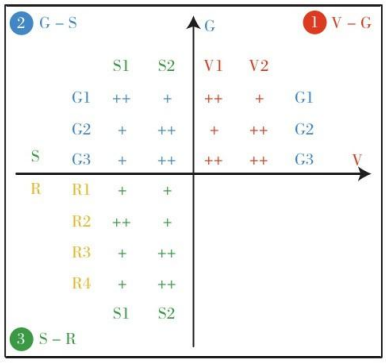
In a word, the shadow index helps the equalization of land development rights and interests in the main function areas of Hubei province to realize the policy element system of regional coordination and common prosperity. Among them, some links may aggravate the local development gap, not conducive to the optimization of the pattern of development and protection, such as from the standpoint to the goal of the link. In the future, we should focus on these links to improve the efficiency of land development and resource allocation in different main functional zones and reverse the situation of passive protection in restricted zones by further perfecting the relevant system contents, encourage the formation of an active conservation pattern.

Fig. 5 the adequacy and necessity of two scenarios for the policy chain

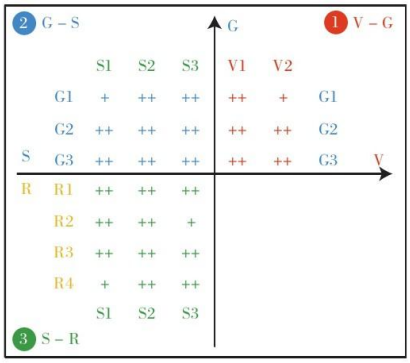
Fig. 5 The sufficiency and necessity of The two scenarios in The policy link

（1）充分性评估

情景1：对照组——无“影子指标方案”

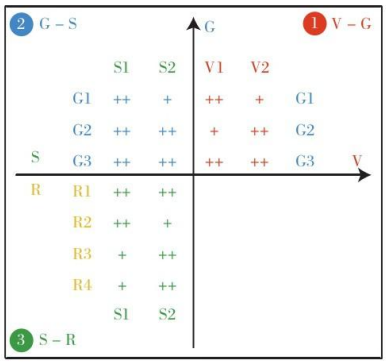


情景2：实验组——有“影子指标方案”



（2）必要性评估

情景1：对照组——无“影子指标方案”



情景2：实验组——有“影子指标方案”

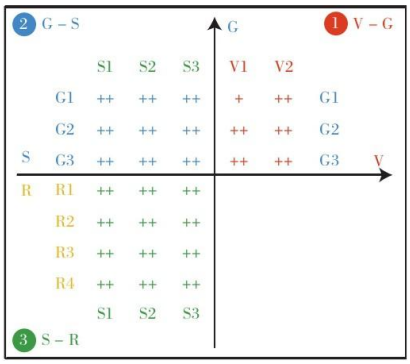


Table 2 results of consistency assessment of two scenarios for the policy chain (3)

TAB. 2 The consistency evaluation results of The two scenarios in The policy chain

	对照组	实验组
V1:V2	7.6:7.1=1.07	8.2:8.1=1.01
V1−G : V2−G	7.43:7.35=1.01	7.98:7.76=1.03
V1−G−S : V2−G−S	7.18:7.14=1.01	7.91:7.82=1.01
V1−G−S−R : V2−G−S−R	7.12:7.09=1	7.84:7.78=1.01

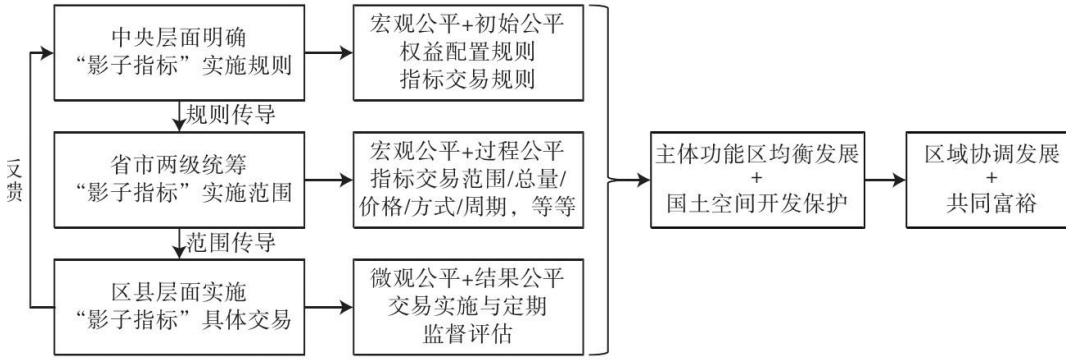
Table 3 results of the adequacy/necessity assessments of the two scenarios for the policy chain

Table. 3 The sufficiency and necessity of The two scenarios in The policy chain

	对照组	实验组
V1:V2	7.6:7.1=1.07	8.2:8.1=1.01
V1-G : V2-G	7.26:7.33=0.99 7.48:7.59=0.99	7.59:7.74=0.98 7.44:8.11=0.92
V1-G-S : V2-G-S	7.12:7.15=1 7.43:7.50=0.99	7.65:7.74=0.99 7.70:8.02=0.96
V1-G-S-R : V2-G-S-R	7.01:7.03=1 7.37:7.42=0.99	7.57:7.64=0.99 7.72:7.94=0.97

Figure 6“Shadow Indicators” policy formulation and implementation process framework design

Fig. 6 Process design of SQI policy formulation and implementation



4.3 results of feasibility analysis and assessment

Generally, the feasibility assessment needs to identify the key chain and elements, identify the key related viewpoints, and carry out the identification analysis and executive analysis of the key elements. Starting from the leading view of the Natural Resources Department of Hubei Province, key points identified based on expert scoring included the Ministry of Natural Resources, the Natural Resources Management Department of Hubei Province, municipal governments and natural resources management departments, district and county governments and natural resources management departments in urbanized areas, district and county governments and natural resources management departments in major agricultural production areas, district and county governments in key ecological function areas, and natural resources management departments.

The results of the key elements identification and executive analysis were compared between the experimental group and the control group, the most significant differences in the recognition and implementation of the key elements were found among the natural resource management departments in Hubei Province, the regional and county governments and natural resource management departments in the urbanized areas, the regional and county governments and natural resource management departments in the main agricultural product producing areas, the regional and county governments in the key ecological function areas, and the natural resource management departments. This means that if we want to promote the“Shadow indicators” policy needs to further improve the relevant performance considerations, incentive policies and regulatory mechanisms. For example, how to coordinate the path dependence and mindset of these vested interests in urbanized areas, how to better improve the corresponding regulatory system to avoid the natural resources ministry on the liberalization of horizontal transfer payments brought about uncontrollable risks, and so on.

5 conclusion and enlightenment

The planning of main functional area is a kind of planning control tool under the background of the use control in our country, the process of intervention is accompanied by a differentiated distribution pattern of land development rights and interests. If we rely solely on administrative means to enforce planning control, and do not take external effects and internalization of supporting policies and rights and interests protection system design, in the end, it can only lead to the deviation of spatial planning practice [29] . Repeated failure to implement the blueprint will directly affect the authority and credibility of spatial planning. At this time, spatial planning not only can not give full play to the strategic guidance of effective allocation of resources, but will restrict the vitality of the market, affect economic development, and even lead to acute social contradictions, this should be especially vigilant in times of economic downturn [35-36] .

The“Shadow Index” proposed in this paper is to achieve the tension balance between the right of land planning and the right of land development in different main functional areas by means of“Land + finance” linkage, to facilitate the effective and orderly implementation of the blueprint of Spatial Planning. The difference between the policy design principle of“Shadow Index” and the current land policy design of“Increase and decrease linkage” lies in the development-oriented or control-oriented policy design as the starting point. The policy design of“Shadow Index” follows the theoretical logic of“Dual fair value + three-stage fair realization” oriented by the balance of land development rights and interests, it is a development-oriented policy design that considers the whole as well as the individual, and focuses on the equity of the starting point as well as the process and outcome equity, the purpose is to break the path dependence of“The stronger the strong, the weaker the weak” in the pattern of distribution of interests, and take“Win-win” and common prosperity as the criterion of“Good policy”, rather than control urban expansion, to achieve the protection of arable land and other constraints-oriented policy design and bring about“Part of the interests to gain and part of the interests to lose” results. The evaluation results of the two policy scenarios with or without“Shadow indicators” show that the policy options with“Shadow indicators” are more likely to achieve the goal of optimizing the development and protection pattern in terms of policy effect and efficiency. The policy conception of“Shadow Index” can be combined with the central financial transfer payment to

form the regional balanced development guarantee mechanism of“Horizontal transfer payment + vertical transfer payment”, this will help to balance the central strategic intention with the autonomy of local development.

As far as the implementation of“Shadow Indicators” is concerned, pilot and in-depth studies are needed on the rule-making, scope framing and specific transactions of the implementation (Figure 6) . The biggest challenges to the implementation of shadow indicators, it is also based on the S-CAD method of feasibility assessment from the Central Department of the upper part of the particularly worried about the risk of liberalizing horizontal transfer payments will lead to hidden uncontrollable risk throughout the country. The author believes that the risk should not be avoided at the expense of land development rights and interests in restricted areas, and that the same land development rights should be the natural rights of restricted areas, in the future, the optimization of planning control system should actively analyze the possible risks and explore the corresponding policies to reduce the risks. This paper proposes that the implementation of“Shadow indicators” can avoid potential uncontrollable risks in three directions: the top-level design of trading rules, inter-provincial trading range and price range is dominated by the central government, specific implementation rules such as tradable scope and space placement are coordinated at the provincial and municipal levels, unimpeded bottom-up feedback channels and the whole process of monitoring and evaluation.

Specifically, the implementation of“Shadow Indicators” in the top-level design requires the central government to be responsible for setting policy implementation rules, it is up to the provincial and municipal levels to coordinate the implementation scope of the“Shadow Index” at the intermediate level between the central government and the districts and counties, and to coordinate with the“Three districts, three lines” and other control lines defined in the current territorial and spatial planning, to control the overall spatial scope of the“Shadow indicators” that can be placed after purchase. On the one hand, the index transaction can be carried out flexibly according to the actual needs of the development of the district and county, and give full play to the positive role of the market in the allocation of resources; On the other hand, it is a transaction with constraints on the basis of central-level rules and provincial-municipal co-ordination, which can avoid the uncontrollable risk of completely liberalizing horizontal transfer payment. In addition, government departments at the national and provincial levels can regularly carry out supervision and evaluation of“Shadow Index” transactions at the district and county levels, to fully grasp whether the transaction at the district and county level deviates from the balanced development objectives of different functional districts and counties. In terms of specific implementation, it could be implemented on a pilot basis in some localities within the province and then gradually expanded, with a view to reducing the uncontrollable risk of full liberalization in the short term.

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Notes

(1) the transaction price is estimated at 800,000 yuan per mu. Among them, although there are differences in the total amount of“Shadow indicators” that can be used for trade and the actual price of trade between major agricultural production areas and key ecological function areas, but because this paper estimates the financial effect of the“Shadow Index”, it emphasizes the realization of the dominant functions of land development and protection between the urbanized area and the restricted area, therefore do not consider the restricted zone of the two main functional areas of the actual per mu of construction land transaction price differences.

(2) in 2020, the 27 key eco-functional districts and counties receiving transfer payments will receive a budget of 1.55 billion yuan from the central government. In 2020, transfer payments were budgeted at 200 million yuan for the 28 major agricultural production regions.

(3) in the consistency analysis of policy chain, the score of policy chain is calculated based on the score of policy link. (1) the V1-G-S chain score in scenario 1 control group was used as an example; The calculation method is as follows: The V1-G-S chain score is calculated from the average value of the V1-GS1 chain score (including the following three chains: V1-G1-S1, V1-G2-S1, V1-G3-S1) and V1-G-S2 chain score (including the following three chains: V1-G1-S2, V1-G2-S2, V1-G3-S2) . Among them: the value of V1-G-S1 is obtained by averaging the sum of the three chain values of V1-G1-S1, V1-G2-S1, V1-G3-S1, and the value of V1-G1-S1, is obtained by multiplying the values of V1-G1 and G1-S1. Similarly, the chain value of V2-G-S is obtained. (2) take the V1-G-S-R chain score in scenario 1 control group as an example, the calculation method is as follows: the chain score of V1-G-S-R is calculated from the average of the four chain scores of V1-G-S-R1, V1-G-S-R2, V1-GS-R3 and V1-G-S-R4. Where the value of V1-G-S-R1 is the sum of the chain values of V1-Gi-Si multiplied by r 1, taking into account that there are three G's and

two s's, then divide the sum of the chain values by three and divide by two, then open to the third power, the result. The following chain scores for adequacy and necessity are calculated in the same way to obtain chain values.