Defining Cities by Water: Addressing Capital Misallocation in a Race to Conserve Resources

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Abstract: *As part of its efforts to promote a sustainable and high-quality development, China has pledged to reduce water consumption and create a water-efficient society. On the basis of identifying the institutional root causes of excessive capital allocation and excessive water consumption in China's water-intensive industrial sectors, this study elaborates how the national water-efficient cities assessment contributes to optimized capital allocation. Our research shows that national water-efficient cities assessment has motivated local governments to compete for water efficiency. To conserve water, local governments regulated the entry and exit of water-intensive enterprises, discouraged excessive investments in water-intensive sectors, and phased out obsolete water-intensive capacities within their jurisdictions. This approach has resulted in mutually beneficial outcomes, including improved allocation of capital, enhanced water efficiency, and reduced emissions. This paper offers policy recommendations for establishing a water-efficient society throughout the 14th Five-Year Plan (2021-2025) period by presenting empirical evidence on the policy effects of resource efficiency evaluation.*

Keywords: *Competitive evaluation for resource efficiency, national water-efficient cities assessment, capital misallocation, water efficiency, emissions abatement*

JEL Classification Code: D24, R50, Q58

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1. Introduction

Water resources are a fundamental factor in the process of socioeconomic development. Space for socioeconomic progress depends on the availability of sufficient water resources. China's rapid industrialization and economic growth have put a significant strain on its water resources. Water pollution, water scarcity, and degradation have presented obstacles to China's sustainable high-quality development. China's industrial development adhered to a conventional approach characterized by intensive use of natural resources, consumption, and pollution consistent with strategic priority given to heavy industries. However, an excessive capital allocation to water-intensive industrial sectors, such as steel and coal chemicals, under this crude development model has led to the long-term coexistence of excessive capital allocation and water consumption. One aspect to consider is that China's industrial expansion is propelled by mass capital, which is evident in the allocation of capital to water-intensive sectors like steelmaking and coal chemicals. Industrial sectors that generate greater value addition

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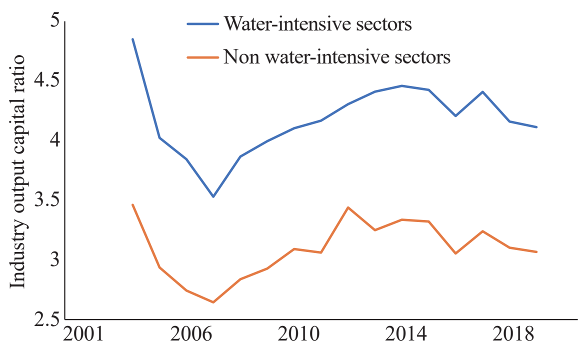
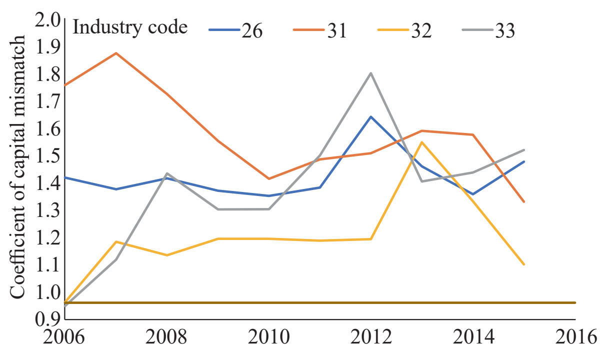
despite being more resource- and pollutant-intensive comprise a substantial portion of China's industrial structure. These sectors have experienced growth stagnation, overcapacity, and inefficient capital allocation as a result of excessive investments[1]. Moreover, water capacities in cities have been overburdened over the years due to the excessive allocation of capital to industries such as coal chemicals and steelmaking, which has exacerbated water scarcity and pollution. Therefore, China should abandon its conventional approach to development characterized by high levels of pollution, labor, and capital expenditure, and instead prioritize water conservation. This paradigm transformation is essential for coordinating high-quality economic development with water conservation.

By analyzing the dual structure of water-intensive and non-water-intensive sectors[2], this study identifies the relevant facts of excessive water consumption and capital allocation in a systematic manner. To begin, the capital output ratio (industrial capital divided by industrial value-added) is calculated with reference to Niu and Yan (2021) in order to identify capital misallocation among different sectors in China. The annual average capital output ratio for water-intensive and non-water-intensive sectors is 4.179 and 3.096 respectively, as shown in Figure 1(a). This indicates that access to excessive capital allocation for water-intensive sectors has resulted in inefficient capital utilization. Furthermore, with reference to Zhang et al. (2019), the sectoral capital misallocation coefficients for specific water-intensive sectors are estimated. The capital misallocation coefficients of the industrial sectors are all greater than one, as shown in Figure 1 (b). This indicates that water-intensive industries, including the processing of ferrous and non-ferrous metals, have received an excessive amount of capital, thereby exacerbating capital misallocation. In a nutshell, as a result of the strategic prioritization of heavy industries, water-intensive industrial sectors have received an excessive amount of capital, which has distorted capital allocation and exacerbated water scarcity and pollution.



a. Capital output ratios of water-intensive and non-water-intensive sectors



b. Capital misallocation coefficients of water-intensive sectors

Figure 1: Excessive Capital Allocation and Excessive Water Consumption

Note: Data are from the *China Statistical Yearbook* and *China Statistical Yearbook of Industrial Economy*. Water-intensive sectors include chemical raw materials and chemical products (26), ferrous metal smelting and rolling (31), nonferrous metal smelting and rolling (32), and metal products (33).

Source: Drafted by the authors.

[1] According to Lin and Chen (2013), a disproportionate part of China's industrial structure is devoted to capital-intensive and heavy industries, including coal chemicals and steel. Heavy industries received 89% of China's mid- and long-term loans between 2010 and 2014, according to Chang et al. (2015). Furthermore, overcapacity and capital misallocation have been aggravated by excessive capital investment.

[2] According to the definition of the ten most water-intensive sectors by the National Bureau of Statistics (NBS), we identified ten sectors, including coalmining and washing, ferrous metal smelting and rolling, non-metal ore dressing, and electric power and heat production and supply, as water-intensive sectors. See "Water consumption by large industrial enterprises continues to increase in the first half of the year", http://www.stats.gov.cn/tjsj/zxfb/201609/t20160909_1398444.html.

From our perspective, both excessive capital investment and excessive water consumption can be attributed to decentralized water resource management and incentive-driven political competition; these two factors mutually reinforce one another. Massive capital has been directed to water-intensive and polluting sectors, including steel and coal chemicals, due to government intervention, distorting the capital allocation structure and market equilibrium (Wang et al., 2014). Local governments were able to provide inexpensive water to water-intensive industrial sectors within their jurisdictions and relax environmental regulations, in some instances even permitting the illegal discharge of pollutants, under the decentralized water resource management (Li et al., 2015). Given the negative externalities of water pollution and the public availability of water resources, numerous zombie enterprises and obsolete factories have survived on inexpensive water, thereby impeding the flow of capital that could have been invested in more efficient enterprises[3].

In response to widespread water pollution and excessive water consumption, the central government integrated water environment management and water efficiency indicators into the performance evaluation system for local officials. However, the implementation of this measure has two limitations that restrict its effectiveness. To begin with, it is worth noting that the GDP-centric performance evaluation system for government officials places environmental performance at a relatively unimportant position, and this oversight incentivizes officials to prioritize economic development to the detriment of resource and environmental protection (Zhao et al., 2021). Furthermore, as an instrument of bottom-line control, the political knockout race incentivizes local governments to "race to the bottom" with regard to regulations concerning excessive water consumption and contamination (Zhou, 2017). In the context of this political knockout race, the question is how to resolve the excessive capital allocation to water-intensive sectors and reduce water consumption. This problem can be solved through a dual-pronged approach: First, the central government must abandon its GDP-centric strategy and the growth model based on factor input and resource consumption; second, water efficiency and pollution abatement obligations must be delegated to local governments. Since 2002, China has initiated a national evaluation of water-efficient cities for the development of a water-efficient society. This national evaluation program has increased water conservation and public awareness of water efficiency. Furthermore, it is imperative to examine whether this assessment mechanism has effectively optimized capital allocation and shifted China's development paradigm away from water-intensive and polluting industries.

This paper aims to provide a comprehensive analysis of how the national water-efficient cities assessment in China has contributed to the optimization of capital allocation, the conservation of water resources, and the reduction of pollution. The marginal contributions of this paper include: (i) Identifying inter-sectoral capital misallocation between water-intensive and non-water-intensive sectors, which exacerbate water shortage and pollution, and demonstrating that the capital misallocation has led to efficiency losses, increased resource waste and environmental pollution; (ii) defining how resource efficiency competitions may help optimize capital allocation through the case study of the national evaluation of water-efficient cities and proposing policy reference for limiting water consumption and building a water-efficient economy; (iii) providing a new perspective for understanding local government performance evaluation competition in China. The competitive evaluation should exert a political influence on local governments, prompting them to rectify resource misallocation and safeguard the environment.

[3] Research indicates a strong overlap among zombie firms, obsolete factories and water-intensive enterprises. There is a greater proportion of zombie firms in heavy industries such as coking, electric power, coal, steel making, and ferrous metals (Li and Zhou, 2014). Water-intensive industries primarily include metal smelting and rolling, petroleum processing, coking, nuclear fuel processing, chemical industry, and metal ore dressing.

2. Institutional Background and Theoretical Hypothesis

2.1 Institutional Background

The objective of the national water-efficient cities assessment is to encourage water conservation by establishing a competition system for cities to save water resources. Local governments have implemented natural resource and environmental regulations in response to public demand for such measures, as it is impractical to optimize water resource allocation solely through market-based mechanisms (Huang, 2019). Nevertheless, the decentralization of water resources management and the pursuit of political championship have incentivized local governments to exploit natural resources for financial benefits at the expense of their ecological importance. In this regard, China's central government has initiated a nationwide initiative for the competitive assessment of water-efficient cities with the intention of enhancing the awareness of local officials regarding water conservation and compelling them to act accordingly. The national water-efficient cities assessment can be seen as a contest for the preservation of resources.

The national water-efficient cities assessment is a competition among local governments to demonstrate administrative prowess in a non-economic domain. In order to foster inter-city horizontal benchmark competition for water conservation and water environment management, the central government has implemented competitive performance evaluation and distinction (Fredriksson and Millomet, 2002). By means of such assessment and differentiation, local governments are effectively motivated to improve their administrative performance in domains other than economics in order to meet pre-established goals (Wu and Huang, 2022). Therefore, in an effort to "race to the top" and obtain honorary titles, local governments actively participate in the competitive evaluation.

In a nutshell, the national evaluation of water-efficient cities motivates local governments to shift away from GDP-centric behaviors and prioritize water conservation and pollution abatement.

2.2 Theoretical Hypotheses

Local governments will be compelled by the national water-efficient cities assessment to curtail excessive investment in water-intensive sectors within their jurisdictions and to adjust the entry and exit of water-intensive enterprises in order to optimize capital allocation and water conservation via mandatory and market-based resource and environmental regulation (Figure 2).

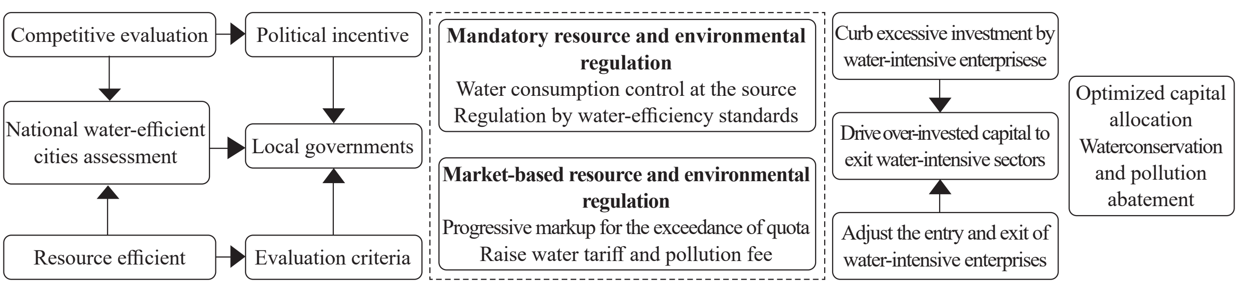


Figure 2: Mechanism of the National Water-Efficient Cities Assessment in Optimizing Capital Allocation and Promoting Water Conservation and Pollution Abatement

Source: Drafted by the authors.

2.1.1 The Administrative effects of mandatory environmental and resource regulation

In accordance with mandatory resource and environmental regulation, local governments enforce water consumption quotas and water efficiency standards to restrain water-intensive and polluting industries, discourage excessive investment in water-intensive businesses, and optimize capital allocation. Local governments have implemented regional water consumption quotas via scheduled water consumption and quota management in order to regulate water consumption. This entails limiting annual total water consumption for water-intensive enterprises. The implementation of quantitative control measures significantly influences the investment and production patterns of water-intensive enterprises. The national assessment of water-efficient cities motivates local government officials to reorient the paradigm of economic development by imposing limitations on water-intensive, energy-intensive, and polluting projects within their jurisdictions, which entails restraining the growth of water-intensive enterprises and preventing excessive investment, thereby improving investment efficiency (Han, 2017). With regard to water efficiency requirements, "industrial enterprises shall not exceed the GB/T18916 national standard for unit consumption of water or local quota designated by provincial authorities", "water-intensive processes, equipment and products explicitly prohibited by the State must be withdrawn from production, marketing or use within the prescribed time frame". To ensure adherence to these regulations, local governments may employ administrative measures including production restrictions, rectification orders, and business closures, suspensions, mergers or transfers. These measures are designed to force enterprises with inadequate production and water conservation technologies and water-intensive high-polluting manufacturing processes, equipment, and industrial products to cease operations.

Mandatory resource and environmental regulations by municipal governments are asymmetrical. The water consumption limitation will impose restrictions on the production capacity and output of water-intensive enterprises, leading to a subsequent decline in their business revenue. In the interim, the initial capital outlay for water efficiency equipment will elevate the fixed costs of businesses, thereby increasing the barrier to entry into the market. Due to the variations in water efficiency among water-intensive industries, the implementation of water-efficiency standards mandated by local governments will disproportionately affect businesses operating in water-intensive sectors. Particularly for businesses that exceed the maximum water consumption per unit of output, failure to improve water efficiency and upgrade technology within a reasonable time frame will force them to exit the market. Technology barrier and water consumption cap will increase the bar for water-intensive businesses to enter and remain in the market, while limiting their investment and expansion. As a result, technologically obsolete businesses will be compelled to exit the market. Capital will be transferred from water-inefficient to water-efficient enterprises as a result of this dynamic adjustment process, contributing to the optimization of capital allocation, water efficiency, and pollution abatement (Brandt et al., 2013).

2.2.2 The impact of market-based resource and environmental regulation on compliance costs

Water resource and pollution discharge fees, as well as progressive water tariffs imposed by local governments, have increased the financial burden associated with excessive water usage and pollution. The implementation of cost control measures has an asymmetric effect: It eliminates the long-standing cost advantage that water-intensive and uncompetitive zombie enterprises had built upon inexpensive water; as a consequence, their profitability and competitiveness are diminished due to the increased expenses associated with water pollution and consumption (Li and Sheng, 2018). The national water-efficient cities assessment has increased local government awareness of water conservation and pollution abatement responsibilities, prompting them to internalize external resource and environmental costs by raising the costs of water consumption and pollution for businesses. This contributes to the escalation of costs for enterprises that rely heavily on water, diminishes the production capacity of energy-intensive goods, and erodes their financial viability. Rising water consumption and pollution costs will force water-intensive zombie firms out of the market. Expectation for water pollution and consumption costs on the rise will discourage investment in new capacity, thereby mitigating overcapacity (Han, 2017).

In contrast, more efficient firms are not just tolerant of higher production cost in the short run, but capable of boosting water efficiency through technology upgrade and waste recycling and treatment. Water efficiency improvements can be carried out by investing in water-efficient industrial equipment. Through capital renewal, firms will phase out processes, equipment, and products with high water consumption, hence reducing water demand cost pressures (Wan et al., 2021). When it comes to wastewater recycling and treatment, local governments have offered water conservation incentives and credit support to encourage water-efficient firms to invest in waste recycling and treatment equipment to conserve water and minimize pollution[4] (Han et al., 2021). Asymmetrical regulatory effects between water-efficient and inefficient firms within water-intensive industries will impact the relative competitiveness of enterprises. Cost pressures will compel water-inefficient firms to lower the capacity and output of water-intensive products and in certain circumstances, halt operations. In contrast, water-efficient firms engage in technology upgrading to cope with the tighter regulatory environment for water resources and expand their market share.

Based on the analysis presented above, we predict that non-symmetrical regulation by local governments will reduce excessive investment in water-intensive firms and phase out water-intensive outmoded capacity through the administrative regulatory effect and compliance cost effect[5]. Inefficient firms are driven to leave water-intensive sectors, releasing capital resources to more efficient enterprises or non--water-intensive sectors (Wang et al., 2014). Excessively invested capital will quit water-intensive sectors during this dynamic process of adjustment, allowing for capital allocation optimization. As a result, we propose Hypothesis 1.

Hypothesis 1: *The national water-efficient cities assessment will encourage local governments to enact mandatory and market-based resource and environmental regulations in order to reduce excessive investment in water-intensive enterprises within their jurisdictions, to facilitate dynamic adjustment in the market entry and exit of water-intensive enterprises, and to encourage a capital exodus from water-intensive sectors, thereby optimizing capital allocation.*

2.2.3 Analysis of heterogeneity

The water-efficient cities assessment at the national level and the direction of capital misallocation. Prior research has categorized capital misallocation according to its direction as either excessive or inadequate capital allocation (Wang et al., 2022).

The policy effects of optimized capital allocation based on the national water-efficient cities assessment may, in our opinion, be heterogeneous. When there is an abundance of capital investment, local governments often intervene proactively in capital allocation and direct funds to politically important sectors, such as steel and coal chemicals, which contribute greatly to GDP growth (Liu and Wen, 2019). This creates a crude pattern of inefficient economic expansion fueled by high levels of investment and consumption. Those interventions by local governments have resulted in an overabundance of capital being directed towards water-intensive and polluting industries. Overcapacity and over-investment have intensified water environment pollution and excessive water consumption. The nationwide assessment of water-efficient cities has contributed to the resolution of the concurrent

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[4] According to the evaluation criteria, municipal fiscal spending on urban water conservation should account for no less than 0.5‰ of municipal fiscal spending, and municipal financial spending on urban water conservation should account for no less than 1‰. Local governments should maximize the role of fiscal spending to encourage major water consumers in their jurisdictions to invest in water efficiency technology.

[5] Local government resource and environmental regulation has had a considerable impact on the market entry and exit behaviors of water-intensive enterprises. As the first wave of national water-efficient cities, Qingdao has halted water-intensive development projects, terminated over 200 firms with outdated technology, inefficient use of natural resources, and severe water pollution, and directed over 20 enterprises to make improvements. These measures have helped transform China's industrial structure toward a water-efficient economy. As the tenth wave of national water-efficient cities of 2020, Xi'an downsized water-intensive sectors such as printing, dyeing, textiles, metallurgy, paper making, and mechanical processing, and closed 300 small paper mills, leaving fewer than 20 paper mills, while also upgrading technology for circular water use.

challenges of excessive capital allocation and water usage through the modification of market entry and exit strategies of water-intensive enterprises and the phase-out of water-intensive investments and obsolete capacities. This has resulted in favorable environmental outcomes and sustainable economic growth. When capital supply is insufficient, it is unlikely for water-intensive sectors such as steel and coal chemicals to receive excessive investments. In this scenario, smaller policy effects can be expected from the national water-efficient cities assessment. Therefore, we propose Hypothesis 2.

Hypothesis 2: *There is heterogeneity in the policy effects of the national water-efficient cities assessment in optimizing capital allocation between cities with excessive and insufficient capital allocations. The national water-efficient cities assessment will incentivize excessively invested capital to exit water-intensive sectors in order to optimize capital allocation under the condition of excessive capital allocation; when capital allocation being inadequate, the policy effect of the national evaluation of water-efficient cities is relatively marginal.*

3. Research Design

3.1 Model and Variable Specification

The baseline model is specified as follows:

$$MisallocationK_{ct}=\alpha_0+\beta_1 SWcity_{ct}+\gamma X_{ct}+\tau_c+\varphi_t+\varepsilon_{ct} \tag{1}$$

where, superscripts c and t denote city and year, respectively. The explained variable is the level of capital misallocation of the city ($MisallocationK_{ct}$), including the factor market capital distortion coefficient ($\ln mki_{ct}$), and the capital misallocation index of the city ($\ln uki_{ct}$); the core explanatory variable is the dummy variable of national water-efficient cities ($SWcity_{ct}$). When a city is rated as a national water-efficient city, the value of this variable is 1; otherwise, it is 0; X_{ct} is a series of city-level control variables; τ_c represents effects at the city level that do not change with time; φ_t is the fixed effect of the impact of the yearly external economic shocks to all cities; ε_{ct} is the stochastic error term. In this section, each of the above variables will be given concrete definitions.

(i) Explained variable. Degree of regional capital misallocation[6]

The factor market capital distortion coefficient ($\ln mki_{ct}$) is estimated referencing Restuccia and Rogerson (2013) and Cui et al. (2019), and the degree of regional capital misallocation is measured indirectly using equation (2):

$$\ln mki_{ct}=\ln\left|\beta_{ct}\frac{p_{ct}y_{ct}}{rK_{ct}}-1\right| \tag{2}$$

where, $p_{ct}y_{ct}$ is regional GDP; β_{ct} is the output elasticity of capital estimated with Solow residual; r is the regional level of interest rate and assigned the value of 10% according to Hsieh and Klenow (2009); K_{ct} is the capital input estimated with the perpetual inventory method. A higher value of market capital distortion coefficient implies a high degree of market capital distortion and regional capital misallocation.

The capital misallocation index of the city ($\ln uki_{ct}$) is measured using equation (3) referencing Chen and Hu (2011) and Bai and Liu (2018).

$$\ln uki_{ct}=\ln\left|cmi_{ct}\right|;\ \ cmi_{ct}=\left(\frac{s_{ct}\beta_{ct}}{\sum s_{ct}\beta_{ct}}\right)/\left(\frac{K_{ct}}{\sum K}\right)-1 \tag{3}$$

where, cmi_{ct} is the regional capital allocation efficiency, s_{ct} is the total output of city as a share of the

[6] We consider capital misallocation in the sense that excessive capital allocation in water-intensive sectors such as steel and coal chemicals has resulted in over-investment and overcapacity in water-intensive sectors, giving rise to the coexistence of inefficient capital allocation, water shortage and water environment pollution. We cannot explicitly characterize the extent of misallocation resulting from excessive investments in water-intensive sectors at the city level due to the lack of firm data. Hence, we chose the city's overall level of capital misallocation as an alternative.

total output of all city samples; $s_{ct}\beta_{ct}/\sum s_{ct}\beta_{ct}$ is the share of capital use for city c; $K_{ct}/\sum K_{ct}$ is the share of capital in actual use for the city. According to Hypothesis 2, capital allocation in a city is either excessive (cmi_{ct}<0) or insufficient (cmi_{ct}>0). Thus, we performed a regression analysis after dividing the samples into excessive capital allocation and insufficient capital allocation.

(ii) Core explanatory variable. Dummy variable of national water-efficient cities ($SWcity_{ct}$). As an exogenous policy shock, the national water-efficient cities assessment is analyzed in this paper in order to determine the influence of the resource conservation competition on the optimization of capital allocation. It is worth mentioning that the assessment process for the initial wave of water-efficient cities consisted of pilot programs, review, and distinction. In contrast, the subsequent waves of water-efficient cities underwent the application, review, and distinction phases. This variation in methodology could potentially affect the results of our analysis; therefore, the initial cohort of national water-efficient cities is omitted from our empirical analysis[7].

(iii) Control variables. We select the city's level of financial sophistication, industrial structure, ICT applications, economic development, savings deposits, local government economic growth target, local government fiscal decentralization, fixed asset investment, industrial agglomeration, and urban pollution discharge index as control variables that may affect the degree of capital misallocation.

3.2 Data Source

In this paper, we analyze the policy effect of China's national evaluation of water-efficient cities in optimizing capital allocation based on the panel data of prefecture-level cities across the country over the period from 2003 to 2019. Our city-level data were extracted from the *China Statistical Yearbook for Regional Economy*, *China City Statistical Yearbook*, and *China Urban Construction Statistical Yearbook*. To investigate the microscopic mechanism of China's national evaluation of water-efficient cities in optimizing capital allocation, we employed the databases of China's industrial enterprises and the corporate emissions from 2003 to 2013. Our study focused on the ways in which national evaluation of resource conservation helps curb excessive investment in water-intensive enterprises and promote the dynamic adjustment in the market entry and exit of water-intensive enterprises.

4. Results of Econometric Analysis

4.1 Baseline Regression: National Water-Efficient Cities Assessment and Optimization of Capital Allocation

In this paper we test the effect of the national water-efficient cities on optimization of capital allocation. According to Hypothesis 2, we divide our samples into two sub-samples with excessive capital allocation and insufficient capital allocation, respectively. According to the results shown in Table 1, the national water-efficient cities assessment led to heterogeneous policy effects: When there is an excessive capital allocation, the national water-efficient cities significantly reduce the capital distortion coefficient of the factor market ($\ln mki_{ct}$) and the degree of urban capital misallocation ($\ln uki_{ct}$), thus optimizing capital allocation; in cities with inadequate capital allocation, the national water-efficient cities assessment has an insignificant policy effect. This conclusion is consistent with theoretical expectations[8].

[7] Theoretically, the first wave of the national water efficient cities ranking, which followed the procedure of pilot programs, review and distinction, is incongruous with competitive assessment. The nature of competitive evaluation is horizontal competition among local governments, which are free to participate in a competition. However, the designation of pilot programs has deprived the right of non-pilot cities to participate. For such reasons, we have excluded the interference of such procedural difference in our empirical analysis.

[8] It should be acknowledged that the policy impact of the national evaluation of water-efficient cities is universally relevant. Excessive local government interventions and poor industrial policymaking have resulted in an excessive allocation of capital in water-intensive sectors, resulting in over-investment and overcapacity (Han et al., 2011). In terms of our samples, we found excessive capital allocation in 2,920 instances, while only 638 had insufficient capital allocation. This conclusion is similar with Wang et al. (2022), confirming the broad applicability of our policy effect findings. Unless otherwise specified, the following section will present a regression analysis of the sub-samples with excessive capital allocation.

Table 1: Baseline Regression Results: National Water-Efficient Cities Assessment and Capital Allocation Optimization

Variables	(1)	(2)	(3)	(4)
	Excessive capital allocation		Insufficient capital allocation	
	$\ln mki$	$\ln uki$	$\ln mki$	$\ln uki$
SWcity	-0.105***	-0.207***	0.007	-0.020
	(-3.14)	(-2.61)	(0.18)	(-0.10)
City-level control variables	Controlled	Controlled	Controlled	Controlled
Fixed effect of city	Controlled	Controlled	Controlled	Controlled
Fixed effect of year	Controlled	Controlled	Controlled	Controlled
Sample size	2,908	2,920	638	616
R^2	0.923	0.811	0.930	0.822

Note: *, ** and *** respectively denote significance at the 10%, 5% and 1% levels. The same below.

4.2 Test of Identification Assumptions: Parallel Trend Test and Placebo Test[9]

4.2.1 Analysis of the parallel trend test and dynamic effect test

Referencing Beck et al. (2010), we specified the model as follows by substituting the dummy variable for national water-efficient cities in the baseline model ($SWcity_{ct}$):

$$MisallocationK_{ct}=\alpha_0+\sum_{-2}^{-15}\beta_j B_{ct}^{-j}+\sum_{0}^{14}\beta_k A_{ct}^{k}+\gamma X_{ct}+\tau_c+\varphi_t+\varepsilon_{ct} \quad (4)$$

We define as year zero the year of policy introduction, and identify the policy implementation year for each national water-efficient city. In equation (4), B_{ct}^{-j} is j years before city c is recognized as a national water-efficient city, and A_{ct}^{k} is k years after city c is recognized as a national water-efficient city. The other variables are defined as in the baseline model. The parallel trend test result suggested that before the national water-efficient cities assessment, the dummy variable for the relative year of policy implementation was not significant and satisfied the parallel trend hypothesis; after the assessment, however, the regression coefficient became significantly negative and tended to continuously decrease, demonstrating that the review mechanism of the national water-efficient cities assessment continued to drive local governments to compete for water conservation, thereby optimizing capital allocation.

4.2.2 Placebo test

Referencing La Ferrara et al. (2012), we conducted a placebo test by creating a dummy treatment group using random cities and time points of evaluation. Specifically, the central government recognized 66 water-efficient cities in eight stages between 2003 and 2019 with each stage including 7, 7, 8, 10, 4, 11, 7, and 12 cities, respectively. In order to obtain the dummy treatment group with the same data structure of the baseline regression, we randomly created virtual policy time points T_1, T_2......T_8; each point corresponded to a dummy policy treatment group. This random sampling process was repeated 500 times. Results of the placebo test suggest that the mean estimated coefficient value of the dummy treatment group is 0 and approximately conforms to normal distribution. Moreover, the estimated value of the baseline regression coefficient is at the left tail of the distribution of the placebo regression coefficients. Hence, the interference of unobservable missing variables can be indirectly excluded to verify the real effectiveness of the policy effect of the national evaluation of water-efficient cities.

[9] The results of the parallel trend test and placebo test are withheld from the primary text for the sake of conciseness; however, they are accessible upon request.

4.3 Robustness Test[10]

4.3.1 Two-stage difference-in-differences (DID) method

Given the periodic evaluation mechanism of national water-efficient cities, the different treatment groups within the sample period received policy treatment at different time points in various cohorts. Each cohort contains individual cities with different durations of policy treatment. If the average treatment effect is dependent on different cohorts and the duration of treatment, the classical DID method could lead to biased results (Sun and Abraham, 2020). Following Gardner (2021), we performed a robustness test using two-stage DID method. The results showed that after considering inter-cohort differences and differences in the duration of treatment, the conclusions on the optimization of capital allocation driven by the national evaluation of water-efficient cities remained robust. In order to test the applicable conditions of the DID method, we carried out a parallel trend test and placebo test, and relevant conclusions remained robust.

4.3.2 Controlling for endogeneity using the instrumental variable method

With the priority on the development of heavy industries and the decentralized management of water resources, local governments competitively lower the prices of natural resources or lower the threshold of environmental standards, tolerating to the excessive use of water resources by enterprises. In this context, the degree of capital misallocation in cities may have an impact on whether the city can be recognized as a national water efficient city by influencing water consumption in its jurisdiction, i.e. reverse causality may exist. In this paper, we use the instrumental variable method to address the endogeneity problem. Following Criscuolo et al. (2019), we took various steps to create the instrumental variable. As a first step we estimated the weight for the national evaluation of water-efficient cities to influence the city's prospect of being recognized as a national water-efficient city. Using the logit model, we conducted a regression analysis of the evaluation variable of national water-efficient cities[11] (*Match*) with respect to whether a city is recognized as a water-efficient city ($treat_{c,gi}$), as expressed in equation (5):

$$treat_{c,gi}=\theta_{gi}Match_{c,gi} \quad i=2,3......8 \tag{5}$$

The second step was to create an instrumental variable.

The estimated result ($\hat{\theta}_{gi}$) of logit model in equation (5) can be approximately understood as whether each criterion has affected the weight of the national water-efficient cities assessment.

Therefore, equation (5) can be further transformed into the following:

$$treat_{c,gi}=\theta_{gi}(Match_{c,0}+\Delta Match_{c,gi-0})=\theta_{gi}Match_{c,0}+\theta_{gi}\Delta Match_{c,gi-0} \tag{6}$$

where, $Match_{c,0}$ is the status of city *c*'s relevant evaluation variables in the initial sample period, and $\Delta Match_{c,gi-0}$ denotes change in city *c*'s relevant evaluation variables from the initial sample period to the year of evaluation. We define $\hat{\theta}_{gi}Match_{c,0}$ as the instrumental variable for whether the city was recognized as a national water-efficient city in wave *i*, as expressed in equation (7):

$$IV=\hat{\theta}_{gi}Match_{c,0} \quad i=2,3......8 \tag{7}$$

The instrumental variable consists of the weight of each wave of evaluation variables and the initial state of the evaluation variables. Hence, the instrumental variable satisfies correlation; with respect to the instrumental variable's exogeneity, change in the level of urban capital misallocation is directly

[10] For the sake of conciseness, the results of the robustness test are withheld from the primary text but made available upon request.

[11] Referencing relevant documents of the *National Evaluation Standard for Water-Efficient Cities of 2018* and *Administrative Measures for the Application and Evaluation of National Water-Efficient Cities of 2022*, we define the following variables for the national water-efficient cities ranking (*Match*), including per capita water consumption, industrial water recycling rate, water consumption per 10,000 yuan of GDP, the ratio of new water intake for industrial use, water conservation per 10,000 yuan of GDP, and industrial water consumption per 10,000 yuan of GDP.

influenced by $\Delta Match_{c,gi-0}$, and is not correlated with the weight of evaluation variables and the status of evaluation variables in the initial sample period $\hat{\theta}_{gi} Match_{c,0}$. As such, the instrumental variable *IV* can be deemed as a good instrumental variable for the core explanatory variable. The estimated result of the instrumental variable method showed that the policy effect of the national evaluation of water-efficient cities remained robust.

4.3.3 Eliminating the impact of other competitive hypotheses

In addition to the competitive evaluation of resource conservation, the central government has also carried out a series of competitive evaluations in the non-economic sphere, such as the national evaluation of civilized cities (competitive evaluation with a social orientation) and pilot programs of low-carbon cities (competitive evaluation of environmental performance). In order to eliminate the above policy interference, we introduced the dummy variable for the evaluation of national civilized cities and the dummy variable of pilot low-carbon cities on the basis of the baseline model (1), and the estimated results indicate that the coefficient of the core explanatory variable (*SWcity*) is always significantly negative. This result shows that the national evaluation of water-efficient cities has a robust policy effect by optimizing capital allocation.

4.4 Micro Mechanism for the National Water-Efficient Cities Assessment to Optimize Capital Allocation[12]

4.4.1 Mandatory resource and environmental regulation and administrative regulatory effect

Mandatory resource and environmental regulation by local governments directly influences the business activities of water-intensive enterprises by limiting water consumption and imposing water efficiency standards. First, water consumption control: Scheduled water consumption and quota management are the primary criteria for evaluating national water-efficient cities. They provide the means for restricting water consumption and curbing the expansion of water-intensive and polluting projects. We define water consumption per unit of industrial output and new water intake per unit of industrial output as the proxy variables for the control of water consumption. Second, water-efficiency standards: Considering that water efficiency standards will restrict the production of water-intensive enterprises at the technical level by phasing out obsolete and water-intensive processes, equipment and products, we define the gross industrial output value and income from principal business as the proxy variables of water efficiency production standards.

As can be seen from the estimated results shown in Tables 2 and 3, water consumption control and water efficiency standards have significantly asymmetrical effects between water-intensive enterprises and non-water-intensive enterprises. Water consumption control by local governments has directly reduced water consumption and water intake per unit of industrial output by water-intensive enterprises while exerting no impact on non-water-intensive enterprises. Moreover, water efficiency standards set by local governments will phase out obsolete water-intensive products from water-intensive enterprises and reduce their gross industrial output and income from primary business. In contrast, those water efficiency standards have a limited impact on non-water-intensive enterprises that meet water efficiency standards.

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[12] According to the baseline regression, the national evaluation of water-efficient cities has a significant effect of optimizing capital allocation only under the condition of excessive capital allocation. To maintain consistency with the baseline regression, all the firm-level samples employed in this section are industrial enterprises in cities with excessive capital allocation. In addition, our empirical analysis has controlled for a series of firm-level control variables, including firm size, corporate assets, labor to capital ratio, operating profit margin, debt-to-equity capital ratio, and share of export in firm revenue.

Table 2: National Water-Efficient Cities Assessment and Imposition of Water Consumption Control

Variables	(1)	(2)	(3)	(4)
	Water-intensive enterprises	Non-water-intensive enterprises	Water-intensive enterprises	Non-water-intensive enterprises
	Water consumption per unit of industrial output		New water intake per unit of industrial output	
$SWcity_{ct}$	-1.273** (-2.16)	-0.741 (-0.48)	-1.266*** (-3.32)	0.381 (0.75)
Firm-level control variables	Controlled	Controlled	Controlled	Controlled
Fixed effect of firm	Controlled	Controlled	Controlled	Controlled
Fixed effect of industry	Controlled	Controlled	Controlled	Controlled
Fixed effect of year	Controlled	Controlled	Controlled	Controlled
Sample size	20,179	53,176	20,137	53,129
R^2	0.927	0.823	0.710	0.900

Notes: All regressions reported in Table 2 include firm fixed effects, dichotomous industry fixed effects, and year fixed effects. The same below.

Table 3: National Water-Efficient Cities Assessment and Water Efficiency Production Standards

Variables	(1)	(2)	(3)	(4)
	Water-intensive enterprises	Non-water-intensive enterprises	Water-intensive enterprises	Non-water-intensive enterprises
	Gross industrial output value		Corporate income from principal business	
$SWcity_{ct}$	-0.403** (-2.43)	-0.145 (-1.26)	-0.509** (-2.43)	-0.168 (-1.31)
Firm-level control variables	Controlled	Controlled	Controlled	Controlled
Fixed effect of firm	Controlled	Controlled	Controlled	Controlled
Fixed effect of industry	Controlled	Controlled	Controlled	Controlled
Fixed effect of year	Controlled	Controlled	Controlled	Controlled
Sample size	101,144	419,981	101,148	419,988
R^2	0.695	0.709	0.656	0.681

4.4.2 Cost of compliance with market-based resource and environmental regulation

Market-based resource and environmental protection will increase the costs of water consumption and pollution discharge by enterprises. Rising costs of water consumption and pollution discharge are both reflected in firm management expenses and will drive up these expenses. Furthermore, the national water-efficient cities assessment will also drive local governments to raise the costs of water consumption and pollution discharge, thereby internalizing the external resource and environmental costs. This will reduce gross profits for water-intensive enterprises and curb their excessive investment and expansion. We investigated how the national water-efficient cities assessment could affect the gross profit margin of enterprises. As illustrated in Table 4, the national water-efficient cities assessment has significantly raised corporate management expenses, and this compliance cost effect exists simultaneously for water-intensive and non-water-intensive enterprises but is more significant for water-intensive enterprise samples. Meanwhile, rising costs of water consumption and pollution discharge will significantly reduce gross profits for water-intensive enterprises without significantly affecting non-water-intensive enterprises. The implication is that market-based resource and environmental regulation will shrink gross profits for water-intensive sectors, thereby downsizing water-intensive sectors and optimizing their structure.

Table 4: National Water-Efficient Cities Assessment and in Compliance with Cost Effect

Variable	(1)	(2)	(3)	(4)
	Water-intensive enterprises	Non-water-intensive enterprises	Water-intensive enterprises	Non-water-intensive enterprises
	Corporate management expenses		Gross corporate profit	
$SWcity_{ct}$	0.003***	0.002**	-0.039***	-0.000
	(4.69)	(2.02)	(-3.37)	(-0.01)
Firm-level control variables	Controlled	Controlled	Controlled	Controlled
Fixed effect of firm	Controlled	Controlled	Controlled	Controlled
Fixed effect of industry	Controlled	Controlled	Controlled	Controlled
Fixed effect of year	Controlled	Controlled	Controlled	Controlled
Sample size	101,143	419,933	101,147	419,978
R^2	0.710	0.556	0.718	0.699

Furthermore, rising water consumption and waste discharge costs as a result of the national water-efficient cities assessment, combined with declining firm profits, will prompt water-intensive enterprises to upgrade intermediate production technology and terminal circulation and treatment methods as a means of dealing with changing external resource constraints. We did an empirical analysis at the two levels of fixed asset investment and end-of-pipe recycling and processing, referencing Wan et al. (2021), to investigate the actual effects of the national water-efficient cities evaluation in forcing enterprises to invest in water efficiency. According to Table 5, the national water-efficient cities assessment will prompt water-intensive enterprises to respond proactively by investing more in productive and operating fixed assets, implementing advanced water-efficient production equipment, and utilizing water conservation potentials to cope with rising water costs. According to Table 6, the national water-efficient cities assessment will encourage water-intensive enterprises to invest more in end-of-pipe recycling technology, boost daily wastewater processing and recycling capacity, and reduce end-of-pipe wastewater discharge.

Table 5: National Water-Efficient Cities Assessment and Firms' Water Efficiency Renovations

Variable	(1)	(2)	(3)	(4)
	Water-intensive enterprises	Non-water-intensive enterprises	Water-intensive enterprises	Non-water-intensive enterprises
	Net investment in fixed assets		Investment in productive and operating fixed assets	
$SWcity_{ct}$	0.011*	0.008	0.014***	0.010
	(1.85)	(1.15)	(3.58)	(0.80)
Firm-level control variables	Controlled	Controlled	Controlled	Controlled
Fixed effect of firm	Controlled	Controlled	Controlled	Controlled
Fixed effect of industry	Controlled	Controlled	Controlled	Controlled
Fixed effect of year	Controlled	Controlled	Controlled	Controlled
Sample size	75,621	320,830	77,875	322,113
R^2	0.401	0.278	0.730	0.716

Table 6: National Water-Efficient Cities Assessment and End-of-Pipe Recycling and Treatment

Variable	(1)	(2)	(3)	(4)	(5)	(6)
	Water-intensive enterprises	Non-water-intensive enterprises	Water-intensive enterprises	Non-water-intensive enterprises	Water-intensive enterprises	Non-water-intensive enterprises
	Growth in the daily terminal wastewater treatment capacity of firms		Circular use of terminal wastewater by firms		Terminal wastewater discharge by firms	
$SWcity_{ct}$	0.065*	-0.030	0.170*	0.016	-1.189***	0.082
	(1.95)	(-0.57)	(1.94)	(0.28)	(-3.07)	(0.36)
Firm-level control variables	Controlled	Controlled	Controlled	Controlled	Controlled	Controlled
Fixed effect of firm	Controlled	Controlled	Controlled	Controlled	Controlled	Controlled
Fixed effect of industry	Controlled	Controlled	Controlled	Controlled	Controlled	Controlled
Fixed effect of year	Controlled	Controlled	Controlled	Controlled	Controlled	Controlled
Sample size	4,801	12,020	9,643	29,874	18,339	50,772
R^2	0.073	0.265	0.855	0.911	0.760	0.721

4.4.3 National water-efficient cities assessment and its restrictive effect on the excessive investment by water-intensive enterprises

We introduced a variable for inefficient firm investment and excessive investment in our model in order to test how the national water-efficient cities assessment helps restrain excessive investment by water-intensive enterprises[13]. As shown in columns (1) and (3) of Table 7, the national water-efficient cities assessment will restrain inefficient investment and excessive investment by water-intensive enterprises. Further, we excluded cities other than national water-efficient cities and substituted the core explanatory variable ($SWcity_{ct}$) with the asymmetrical regulation variable ($ASR_{i,ct}$). In making such specification, we defined water-intensive enterprises as the policy treatment group and non-water-intensive enterprises as the control group[14]. As shown in columns (2) and (4), the national water-efficient cities assessment will significantly restrain inefficient and excessive investments by water-intensive enterprises compared with non-water-intensive enterprises in the jurisdiction. The implication is that local governments should reverse the resource and factor-driven growth model in order to conserve water, curb pollution, and optimize capital allocation.

4.4.4 National water-efficient cities assessment and dynamic adjustment in the market entry and exit of water-intensive enterprise

We created the variable of market entry and exit of water-intensive enterprises to test the policy effect of competitive resource conservation evaluation on the dynamic adjustment in the market entry and exit of water-intensive enterprises[15]. We also excluded non-water-efficient cities and the core explanatory variable ($SWcity_{ct}$) was substituted with asymmetrical regulatory variable($ASR_{i,ct}$); our estimated results

[13] Using the inefficient investment model developed by Richardson (2006), we calculate the inefficient investment by water-intensive enterprises using model regression residual. Residual value greater than 0 denotes excessive investment by water-intensive enterprises.

[14] Variable of asymmetrical regulation is defined as follows: If city *c* is a national water-efficient city recognized in year *t*, and firm *i* is a water-intensive enterprise in city *c*, $ASR_{i,ct}$ =1; otherwise, it is 0. Notably, the exclusion of non-water-efficient cities and designation of water-intensive enterprises as the control group help mitigate the systematic difference between the treatment group and the control group with respect to the designation of national water-efficient cities. Since both the treatment group (water-intensive enterprises) and the control group (non-water-intensive enterprises) are both located in national water-efficient cities, other policy interference can be further excluded.

[15] Referencing Disney et al. (2003), the firm entry variable is defined as follows: If water-intensive enterprise *i* does not exist in period $t-1$ but exists in period *t*, firm entry is defined as =1; the firm exit variable is defined as follows: If water-intensive enterprise *i* exists in period $t-1$ but does not exist in period *t* and afterwards, firm exit is defined as =1.

Table 7: National Water-Efficient Cities Assessment and Restriction of Excessive Investment by Water-Intensive Enterprises

Variable	(1)	(2)	(3)	(4)
	Inefficient investment by water-intensive enterprises		Excessive investment by water-intensive enterprises	
$SWcity_{ct}$	-0.007* (-1.75)		-0.019*** (-2.68)	
$ASR_{i,ct}$		-0.003* (-1.76)		-0.012*** (-3.11)
Firm-level control variables	Controlled	Controlled	Controlled	Controlled
Fixed effect of firm	Controlled	Controlled	Controlled	Controlled
Fixed effect of industry	Controlled	Controlled	Controlled	Controlled
Fixed effect of year	Controlled	Controlled	Controlled	Controlled
Sample size	46,833	75,978	19,207	26,745
R^2	0.705	0.725	0.753	0.787

are shown in Table 8. Columns (1) and (2) suggest that compared with non-water-efficient cities, the recognition of water-efficient cities will impede the entry of water-intensive enterprises and encourage existing water-intensive enterprises to leave. Columns (2) and (4) indicate that compared with non-water-intensive enterprises, the recognition of national water-efficient cities significantly discourage the entry of water-intensive enterprises and accelerate the exit of water-intensive enterprises, thereby increasing the cross-sectoral flow of capital between water-intensive and non-water-intensive sectors and optimizing capital allocation. In other words, Table 8 shows that, local governments are driven by the competitive evaluation of resources conservation to transform economic development paradigm, ditch the traditional water-intensive and polluting growth model, and encourage an exodus of excessive capital from water-intensive sectors.

Table 8: National Water-Efficient Cities Assessment and Adjustment in the Market Entry and Exit of Water-Intensive Enterprises

Variable	(1)	(2)	(3)	(4)
	Exit of water-intensive enterprises		Entry of water-intensive enterprises	
$SWcity_{ct}$	0.027*** (8.65)		-0.038*** (-6.38)	
$ASR_{i,ct}$		0.006** (2.22)		-0.012*** (-3.05)
Firm-level control variables	Controlled	Controlled	Controlled	Controlled
Fixed effect of firm	Controlled	Controlled	Controlled	Controlled
Fixed effect of industry	Controlled	Controlled	Controlled	Controlled
Fixed effect of year	Controlled	Controlled	Controlled	Controlled
Sample size	84,809	166,442	86,429	170,876
R^2	0.906	0.926	0.781	0.788

5. Concluding Remarks

This study aims to explain how the national water-efficient cities assessment could drive the optimization of capital allocation from the perspective of asymmetrical regulation by identifying the institutional root causes of excessive capital allocation and water consumption in China's water-intensive industrial sectors.

According to our findings, China's water-intensive industrial sectors face the dual challenges of excessive capital allocation and excessive water use. Local governments' misguiding interventions have resulted in excessive capital allocation in water-intensive industrial sectors such as steel and coal chemicals, aggravated capital allocation distortions, and created overcapacity. Moreover, local governments provided cheap water to firms in water-intensive industries in their jurisdictions, increasing water scarcity and pollution. The national water-efficient cities assessment as a policy initiative to address excessive capital investment and water consumption, should incentivize local governments to compete for water conservation and promote dynamic adjustments in the market entry and exit of water-intensive enterprises to optimize capital allocation, conserve water, and reduce pollution in their jurisdictions. CE

References:

Bai J. H., Liu Y. Y. Can Outward Foreign Direct Investment Improve the Resource Misallocation of China[J]. China Industrial Economics, 2018, 01: 60-78.

Beck T., Levine R., Levkov A. Big Bad Banks? The Winners and Losers from Bank Deregulation in the United States[J]. The Journal of Finance, 2010, 65(5): 1637-1667.

Brandt L., Tombe T., Zhu X. Factor Market Distortions across Time, Space and Sectors in China[J]. Review For Economic Dynamics, 2013, 16(1): 39-58.

Chang C., Chen K., Waggoner D., Zha T. Trends and Cycles in China's Macroeconomy[J]. NBER Macroeconomics Annual, 2015, 30(1): 1-84.

Chen Y. W., Hu W. M. Distortions, Misallocation and Losses: Theory and Application[J]. China Economic Quarterly, 2011, 10(04): 1401-1422.

Criscuolo C., Martin R., Overman H. Some Causal Effects of an Industrial Policy[J]. The American Economic Review, 2019, 109(1): 48-85.

Cui S. H., Li G. Q., Dou J. M. Research on Resource Misallocation Effect of Industrial Co-Agglomeration[J]. Statistical Research, 2019, 36(02): 76-87.

Disney R., Haskel J., Heden Y. Restructuring and Productivity Growth in UK Manufacturing[J]. The Economic Journal, 2003, 113(489): 666-694.

Fredriksson P., Millimet D. Strategic Interaction and the Determination of Environmental Policy across U.S. States[J]. Journal of Urban Economics, 2002, 51(1): 101-122.

Gardner J. Two-Stage Difference-in-Differences[J]. Mimeo, 2021.

Han C., Wang Z., Tian L. The Mechanism of Environmental Regulation Driving Emission Reduction: Pollution Treatment Behavior and Resource Reallocation Effect[J]. The Journal of World Economy, 2021, 44(08): 82-105.

Han G. G., Gao T. M., Wang L. G., Qi Y. F., Wang X. S. Research on Measurement, Volatility and Causes of Excess Production Capacity of Chinese Manufacturing Industries[J]. Economic Research Journal, 2011, 46(12): 18-31.

Han G. G. Can Environmental Regulation Enhance Production Capacity Utilization? Empirical Research Based on Panel Data of Manufacturing Industry in China[J]. Journal of Finance and Economics, 2017, 43(06): 66-79.

Huang R. B., Zhao Q., Wang L. Y. Accountability Audit of Natural Resource and Air Pollution Control: Harmony Tournament or

Environmental Protection Qualification Tournament[J]. China Industrial Economics, 2019, 10: 23-41.

La Ferrara E., Chong A., Duryea S. Soap Operas and Fertility: Evidence from Brazil[J]. American Economic Journal: Applied Economics, 2012, 4(4): 1-31.

Li J., Yang N., Tao L. Study on the Boundary Effect of Transboundary River Pollution and Emissions Mitigation Policy Impact —— An Empirical Research Based on the Key Monitoring Sections' Weekly Data[J]. China Industrial Economics, 2015, 03: 31-43.

Li L. L., Sheng D. Local Environmental Legislation and Optimization of Industrial Resources Allocation Efficiency in China's Manufacturing Industry[J]. China Industrial Economics, 2018, 07: 136-154.

Li Z. W., Zhou J. The Formation and Solution of Excess Capacity: From the Perspective of Fiscal and Taxation Policy[J]. Reform, 2014, 01: 60-78.

Lin Y. F., Chen B. K. Development Strategy, Industrial Structure and Income Distribution[J]. China Economic Quarterly, 2013, 12(04): 1109-1140.

Liu X. L., Wen S. Y. Should Financial Institutions Be Environmentally Responsible in China? Facts, Theory and Evidence[J]. Economic Research Journal, 2019, 54(03): 38-54.

Niu H., Yan C. L. Environmental Tax, Resource Allocation and High-Quality Economic Development[J]. The Journal of World Economy, 2021, 44(09): 28-50.

Restuccia D., Rogerson R. Misallocation and Productivity[J]. Review of Economic Dynamics, 2013, 16(1): 1-10.

Richardson S. Over-Investment of Free Cash Flow[J]. Review of Accounting Studies, 2006, 11(2-3): 159-189.

Sun L., Abraham S. Estimating Dynamic Treatment Effects in Event Studies with Heterogeneous Treatment Effects[J]. Journal of Econometrics, 2020, 225(2): 175-199.

Wan P. B., Yang M., Chen L. How Do Environmental Technology Standards Affect the Green Transition of China's Manufacturing Industry ——A Perspective from Technological Transformation[J]. China Industrial Economics, 2021, 09: 118-136.

Wang W. F., Ming J., Yue C. Y. Enterprise Scale, Local Government Intervention, Overcapacity[J]. Journal of Management World, 2014, 10: 17-36+46.

Wang W., Sun Z., Niu Z. D. Industrial Policy, Market Competition and Mismatch of Resources[J]. Economist, 2014, 09: 22-32.

Wang Y., Sun X. H., Liu T., Yu R. Q. Is the Problem of Factor Misallocation in Resource-Based Cities More Serious[J]. Statistical Research, 2022, 40(02): 58-72.

Wu M., Huang J. L. Is Campaign-Style Governance Effective: Civilized City Campaign and Urban Sanitation[J]. The Journal of World Economy, 2022, 45(03): 212-232.

Zhang B. C., Jin L. Q., Hu S. C. Resources Misallocation, Factor Input Efficiency and Total Factor Productivity among Manufacturing Industries in China[J]. Journal of Nanjing University of Finance and Economics, 2019, 01: 1-13.

Zhao Y., Shen H. T., Liu Q. Border Pollution Governance in China: Evidence from the Pilot Project of Environmental Protection Supervision Center and Establishment Emission Data[J]. Economic Research Journal, 2021, 56(07): 113-126.

Zhou L. Local Governments in Transition: Official Incentives and Governance[M]. Beijing: China CITIC Press, 2017.