Frontiers in Economics and Management Volume 5 Issue 4, 2024
ISSN: 2692-7608 DOI: 10.6981/FEM.202404_5(4).0024

The Impact of Industrial Structure Upgrading on the Renewal of Stock Industrial Land: Evidence from 274 Cities in China

Yin He[1, *], and Chenzhe Liu[2, a]

[1] MPhil, College of Public Administration, Huazhong University of Science and Technology, Wuhan, China

[2] MPhil, Engineer, Wuxi Xinfar Group Co., Ltd, Wuxi, China

[*]Correspondence: 13072805386@163.com, [a]lcz4ever@163.com

Abstract

The current problem of inefficient and idle industrial land in China has become increasingly prominent, prompting many local governments to propose a series of measures aimed at encouraging industrial enterprises to actively participate in the revitalization of stock industrial land. However, whether these incentive measures can truly be effective depends crucially on whether the urban industrial structure has undergone transformation and upgrading. Based on panel data from 274 prefecture-level and above cities in China from 2007 to 2020, this study uses a random Tobit model to estimate the impact and heterogeneity of industrial structure upgrading on the renewal of stock industrial land, and explores the mechanism of industrial agglomeration within it. The research findings indicate that (1) industrial structure upgrading has a promoting effect on the renewal of stock industrial land, and this effect exhibits regional and urban-level heterogeneity, and (2) industrial structure upgrading affects the renewal of stock industrial land by promoting the agglomeration of manufacturing and service industries. These findings hold significant practical implications for countries like China, which face challenges associated with idle industrial land.

Keywords

Industrial Structure Upgrading; Stock industrial land; The Renewal of Stock Industrial Land; Industrial Agglomeration.

1. Introduction

The dual land system in China grants local governments unique authority to utilize land for development purposes[1]. During the rapid urbanization phase in China, spurred by incentives such as the "GDP competition," local governments attracted investment by offering industrial land at low or even zero prices, resulting in a mix of industrial enterprises, some of which were of questionable quality. Many of the early entrants found it difficult to survive through industrial iterations and updates, leading to the current situation of low utilization or even idle industrial land in many cities. As urbanization progresses into the middle and later stages, land resources become increasingly scarce in various regions, while many inefficient and idle construction sites remain unused. In this contradictory scenario, activating inefficient and idle industrial land and creating space for high-quality development have become urgent tasks for current national spatial planning and urban governance.

To address this contradiction, cities like Guangzhou, Shenzhen, and Shanghai have explored the reuse of stock industrial land through initiatives such as the "revitalization of old areas" project, which involves coordinating multiple stakeholders, reclassifying industrial land categories, and implementing government-led strategies for reduction and classification disposal[2,3]. This

ISSN: 2692-7608 DOI: 10.6981/FEM.202404_5(4).0024

government-led "promotion model" for stock land use renewal embodies institutional innovation and flexibility, yet it cannot ignore the important role of objective economic laws in the policy implementation process. Therefore, exploring the impact and mechanism of urban industrial structure upgrading on the renewal of stock industrial land is of great significance for effectively promoting the benign interaction between policy and economic development and achieving intensive, economical, and efficient land use.

Furthermore, the spatial heterogeneity of industrial structure levels and industrial agglomeration also poses important issues to consider in the research on the renewal of stock industrial land. China's economic development is characterized by imbalances, with significant spatial non-uniformity in industrial structure upgrading[4]. The Eastern region generally exhibits higher levels of industrial structure sophistication and rationalization compared to the Central and Western regions. Additionally, industrial structure upgrading leads to industrial agglomeration, with spatial agglomeration occurring primarily along urban clusters and economic belts[5]. Moreover, regional disparities in industrial structure can lead to spatial heterogeneity in manufacturing and service industry agglomeration, necessitating consideration of the regional differences brought about by spatial heterogeneity in the renewal of stock industrial land.

Current research on the renewal of stock land mainly focuses on case studies, with macro-level studies concentrating on government land transfer behavior, official promotion assessments, and constraints on economic development. At the micro-level, theoretical analyses have primarily explored property rights theory, institutional change theory, and industrial cluster theory. However, there is still a lack of literature that quantitatively examines the impact of a city's own industrial structure on the renewal of stock industrial land. This study quantitatively analyzes the effects and heterogeneity of industrial structure upgrading on the renewal of stock industrial land, making marginal contributions to the understanding of the interaction between industrial structure upgrading and industrial land renewal.

Given this gap, this paper utilizes panel data from 274 cities in China from 2007 to 2020 to characterize the effects and heterogeneity of industrial structure upgrading on the renewal of stock industrial land using a random Tobit model. It also explores the mechanism of industrial agglomeration in this process, aiming to provide support for promoting the renewal of stock land and achieving high-quality development. The marginal contributions of this paper lie in two aspects: firstly, by focusing on the interaction between industrial structure and urban renewal, it empirically discusses the effects and heterogeneity of industrial structure upgrading on the renewal of stock industrial land, enriching the research on the renewal of stock land due to industrial structure upgrading; secondly, by introducing industrial agglomeration to explore the mechanism of industrial structure upgrading on the renewal of stock industrial land, it provides reference for the government to promote industrial structure upgrading and industrial agglomeration.

2. Theory and Hypotheses

Industrial structure upgrading is closely linked to the allocation of industrial land. In the context of decentralization between the central and local governments in China, local governments wield significant power in resource allocation[6,7]. In their pursuit of economic development, higher tax revenue, and employment opportunities, local governments often engage in the practice of "land-based investment attraction," which involves selling industrial land at low prices to attract investment[8]. This institutional practice of selling industrial land at low prices to large enterprises and key industries impedes the role of market mechanisms in deepening regional industrial division of labor. Consequently, the land transfer behavior of local governments significantly influences the evolution of industrial structure[9,10]. Conversely,

ISSN: 2692-7608 DOI: 10.6981/FEM.202404_5(4).0024

industrial structure upgrading can also drive the renewal of inefficient industrial land, thereby improving the efficiency of industrial land use. The "price discrimination" in government land supply is closely related to industrial structure. The rise in industrial land prices, under the effect of selection, promotes the improvement of urban industrial efficiency and accelerates the transformation and upgrading of urban industrial structure towards higher value-added industries[11,12].

Moreover, significant differences exist in the industrial structure among regions and city levels, which have heterogeneous effects on urban land use[13]. Variations in economic development and industrial structure lead to differences in the efficiency of industrial land use, the area and price of land transfers. Stock literature suggests that there are regional differences in the efficiency of industrial land use, with the efficiency being higher in the eastern regions compared to the western regions[14,15], although these regional differences are gradually diminishing. Regarding land transfer prices, high-value areas generally exhibit a decreasing trend from the center outward or from economically developed and well-connected areas to the surrounding regions[16], with the price of industrial land in agglomeration area is higher than that in non-agglomeration area[17]. As for the area of land transfers, differences mainly manifest between different industries[18].

Industrial structure upgrading leads to the aggregation of regions with relative industrial advantages, accompanied by the entry of new industries and the exit of old ones. Industrial agglomeration enables numerous enterprises to share infrastructure and knowledge spillovers, making them more inclined to locate in the same area, which increases the demand for land[19,20]. However, urban construction land is limited in China, and years of extensive land supply patterns have made urban land scarcer. In the era of stock land, the renewal of stock industrial land and inefficient industrial land has gained momentum[21]. The role of industrial agglomeration in the renewal of stock industrial land mainly manifests in urban innovation and factor allocation effects.

During the process of industrial structure upgrading and agglomeration, new demands, new formats, new models, and new industries emerge, attracting new enterprises to settle in. However, China's "fiscal decentralization" and "land-based investment attraction" have led to extensive land supply practices, resulting in a large number of idle industrial lands or lands with low utilization efficiency. Many enterprises with outdated equipment and low levels of technological innovation have concentrated in these areas, severely constraining industrial structure upgrading[22]. Regions with a strong innovative atmosphere can attract more high-quality talents, which is conducive to enterprises engaging in technological innovation and developing high-tech and high-value-added industries. The development and integration of enterprises bring opportunities to revitalize idle industrial land, facilitating the renewal of stock industrial land[23].

Industrial structure upgrading and agglomeration can influence urban land use demand and structure by adjusting factors such as land, capital, and technology allocation. Industrial structure upgrading optimizes industrial structure by eliminating backward production capacity and introducing emerging industries. The development of emerging industries generates demand for industrial land, while the withdrawal of backward industries brings about the renewal of stock industrial land[24]. The process of marketization promotes the rational allocation of resource factors, such as capital, technology, and labor, establishes a reasonable pricing mechanism, and promotes the renewal of urban stock industrial land[25]. Based on the above analysis, the following hypotheses are proposed:

H1: Industrial structure upgrading promotes the renewal of stock industrial land.

H2: The promotion effect of industrial structure upgrading on the renewal of stock industrial land varies across different regions and city levels.

ISSN: 2692-7608 DOI: 10.6981/FEM.202404_5(4).0024

H3: Industrial structure upgrading affects the renewal of stock industrial land through industrial agglomeration.

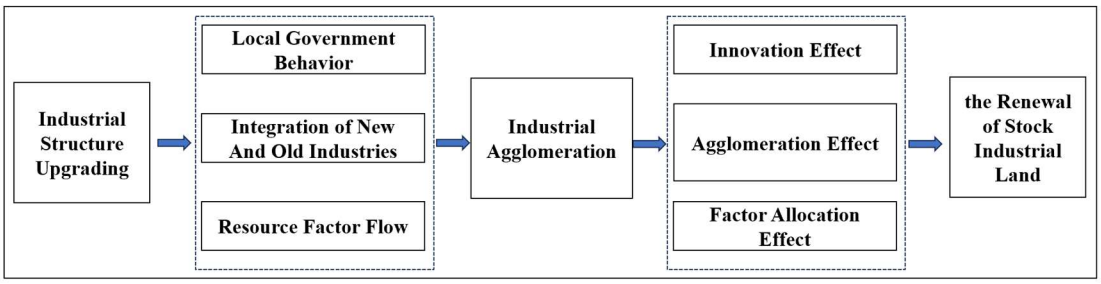

Figure 1. Theoretical analysis framework for the impact of industrial structure upgrading on the renewal of stock industrial land

3. Research Methodology and Data Sources

This study adopts a quantitative approach to investigate the impact of industrial structure upgrading on the renewal of stock industrial land. Firstly, measurements are conducted on industrial structure upgrading and the renewal of stock industrial land. Then, research methods are selected based on the characteristics of the data related to industrial structure upgrading and the renewal of stock industrial land, and the heterogeneity of industries across regions and city levels is analyzed.

3.1. Variable Measurement

Renewal of Stock Industrial Land.

The renewal of stock industrial land stems from urban renewal. It refers to the process of urban renewal construction on declining or idle industrial land, designed to involve multiple market entities through market-oriented mechanisms and promote the efficiency of industrial land utilization27]. Currently, measurements of the intensity of the renewal of stock industrial land mainly focus on the total area of renewal and the average price of renewal. Based on data availability, this study measures industrial land renewal using the area of renewal of stock industrial land and the price of renewal of stock industrial land[26]. The specific calculation formula is as follows:

$$Area_i = \sum_{1}^{j} plot_{ij} \tag{1}$$

In formula (1), $Area_i$ represents the total area of renewal of stock industrial land in city i; and $plot_{ij}$ denotes plot j of industrial land allocated in city i.

$$Price_i = \frac{\sum_{1}^{j} price_{ij} \cdot plot_{ij}}{\sum_{1}^{j} plot_{ij}} \tag{2}$$

In formula (2), $Price_i$ represents the average renewal price of stock industrial land in city i; and represents plot j of stock industrial land allocated in city i; and $price_{ij}$ represents the total price of plot j of stock industrial land allocated in city i.

Industrial Structure Upgrading.

ISSN: 2692-7608 DOI: 10.6981/FEM.202404_5(4).0024

The transition from an industrial economy to a service economy is one of the important characteristics of industrial structure upgrading. This paper refers to the methods of related studies and uses the industrial structure hierarchy method to measure the level of industrial structure upgrading (STR) in various cities[27]. In addition, the ratio of the added value of the tertiary industry to the regional gross product is used to depict the industrial structure upgrading (STR1) as an alternative variable for the robustness test[28]. The specific calculation formula is as follows:

$$STR = \sum_{i=1}^{3} x_i \times i, 1 \leq STR \leq 3 \tag{3}$$

In formula (3), STR represents the overall level of industrial structure upgrading, with its value ranging from 1 to 3; and x_i respectively denotes the proportion of the primary, secondary, and tertiary industries in GDP.

3.2. Research Methods

This study uses the renewal area of stock industrial land and the price of the renewal of stock industrial land as dependent variables, which are censored variables, with 18.74% of the values being zero. Conventional OLS cannot address the issues of limited dependent variables and zeros. Therefore, following the approach of Okamoto and other scholars[29-33], the Tobit model is used for estimation. Based on this, this paper selects the random Tobit model to study the impact of industrial structure upgrading on the renewal of stock industrial land. Model construction is as follows:

$$Y_{it} = \begin{cases} \beta_0 + \beta_1 X_{it} + \beta_2 Controls_{it} + \varepsilon_{it}, y_{it} > 0 \\ 0 \qquad\qquad\qquad\qquad\qquad\quad , y_{it} \leq 0 \end{cases} \tag{4}$$

Table 1. Variables selection and explanation

Expressions	Variables	Explanation
Area	the total area of renewal of stock industrial land	Calculated from formula $Area_i = \sum_{1}^{j} plot_{ij}$
Price	the average renewal price of stock industrial land	Calculated from formula $Price_i = \frac{\sum_1^j price_{ij} \cdot plot_{ij}}{\sum_1^j plot_{ij}}$
STR	Industrial Structure Upgrading	Calculated from formula $STR = \sum_{i=1}^{3} x_i \times i, 1 \leq STR \leq 3$
STR1	Industrial Structure	The ratio of the value added of the tertiary sector to GDP
EDU	the level of human capital	Proportion of students enrolled in ordinary secondary schools
AGDP	the level of economic development	Per capita GDP
OPEN	the degree of openness	Share of import and export trade in GDP
GOV	government support intensity	Fiscal expenditure as a percentage of GDP
TECH	regional technological level	Science and technology expenditure as a proportion of GDP
IN	the number of industrial enterprises	Number of industrial enterprises

ISSN: 2692-7608 DOI: 10.6981/FEM.202404_5(4).0024

In formula (4), Y_{it} is the dependent variable, which represents the renewal area and the renewal price of the stock industrial land; X_{it} is the core explanatory variable, representing the upgrading of the industrial structure; β_1 and β_2 respectively represent the regression coefficients of the control variables; β_0 is the constant term; ε_{it} is the random error term that follows a $N(0, \sigma^2)$ distribution.

The renewal of stock industrial land is influenced not only by the industrial structure but also closely related to the socio-economic development status, industrial development condition, and human capital, among other factors. To mitigate the estimation errors caused by omitted variables, this study references stock research findings and selects control variables at the prefecture-level city dimension, including the level of human capital (EDU), the level of economic development (AGDP), the degree of openness (OPEN), government support intensity (GOV), regional technological level (TECH), and the number of industrial enterprises (IN). The key variables and their meanings are as shown in Table 1.

3.3. Data Source

Taking into account the availability of data, the research sample in this study consists of 274 prefecture-level cities, covering the period from 2007 to 2020. Regions with severe data shortages are excluded from the study scope. Data on the area and price of the renewal of stock industrial land are sourced from the "Newly Added Construction Land - From Inventory" section of the China Land Market Website (www.landchina.com). After excluding land parcels with missing information on the area or price of transfer, the data are categorized and analyzed. Data on industrial structure upgrading and control variables are obtained from the "China Urban Statistical Yearbook" for the years 2007 to 2020. In cases of missing data, interpolation methods are used for imputation. Map data is sourced from the Map Technology Review Center of the Ministry of Natural Resources (https://www.zrzyst.cn), with map registration number GS(2019)1822, and the base map data remain unaltered. Descriptive statistics of the variables are presented in Table 2.

Table 2. Descriptive statistics of variables

VARIABLES	N	Mean	SD	Min	Max
Area	3836	48.055	90.104	0.000	1659.892
Price	3836	1219.986	996.939	1.000	3044.000
STR	3836	0.404	0.101	0.000	0.839
STR1	3836	2.275	0.151	0.003	2.836
EDU	3836	1.679	1.978	0.004	12.764
AGDP	3836	46716.254	33693.842	3398.000	467749.000
OPEN	3836	0.202	0.393	0.000	8.134
GOV	3836	0.213	0.235	0.012	6.041
TECH	3836	0.016	0.016	0.000	0.207
IN	3836	1298.626	1711.619	19.000	18792.000

4. Results and Discussions

4.1. Baseline Results

Table 3 reports the results of the baseline regression analysis in columns (1) through (4). The effects of industrial structure upgrading on the update of stock industrial land are presented. It can be observed that industrial structure upgrading has a promoting effect on the update of stock industrial land. In column (1), where no control variables are included, the coefficient of

ISSN: 2692-7608 DOI: 10.6981/FEM.202404_5(4).0024

the update area of stock industrial land is significantly positive. In column (2), after controlling for variables, the coefficient of the update area of stock industrial land remains insignificantly changed. In column (3), without control variables, the coefficient of the update price of stock industrial land is significantly positive. However, in column (4), with control variables included, the coefficient of the update price of stock industrial land remains insignificantly changed. In summary, Table 3 demonstrates that industrial structure upgrading has a promoting effect on both the update area and update price of stock industrial land, providing evidence for our first hypothesis.

Table 3. Baseline regression results

	(1)	(2)	(3)	(4)
VARIABLES	Area	Area	Price	Price
STR	0.182***	0.068**	0.424***	0.186***
	(0.022)	(0.027)	(0.045)	(0.055)
EDU		0.039		0.124**
		(0.033)		(0.061)
AGDP		0.040*		0.245***
		(0.022)		(0.045)
OPEN		-0.065**		0.001
		(0.031)		(0.064)
GOV		-0.045**		-0.188***
		(0.022)		(0.048)
TECH		0.145***		0.070
		(0.027)		(0.058)
IN		0.300***		0.277***
		(0.036)		(0.071)
Constant	0.000	-0.024**	0.173***	0.167***
	(0.012)	(0.012)	(0.024)	(0.023)
N	3836	3836	3836	3836
City	274	274	274	274
Controls	No	Yes	No	Yes

Note: numbers in parentheses denote robust standard errors. *, **, and *** correspond to significance levels of 10%, 5%, and 1%, respectively.

4.2. Robustness

4.2.1. One-phase Lag

To further address potential endogeneity issues in the model, this study employs the lagged one period of industrial structure upgrading as an instrumental variable for regression. The test results are presented in Table 4. Regardless of whether control variables are included, the significance and signs of the coefficients of the core explanatory variables remain unchanged. This indicates that the baseline regression results exhibit strong robustness.

ISSN: 2692-7608 DOI: 10.6981/FEM.202404_5(4).0024

Table 4. Regression results with one-phase lag

	(1)	(2)	(3)	(4)
VARIABLES	Area	Area	Price	Price
L.STR	0.177***	0.059**	0.427***	0.197***
	(0.023)	(0.027)	(0.047)	(0.056)
EDU		0.029		0.101*
		(0.033)		(0.061)
AGDP		0.036		0.216***
		(0.023)		(0.046)
OPEN		-0.064**		0.029
		(0.032)		(0.066)
GOV		-0.049**		-0.194***
		(0.021)		(0.047)
TECH		0.151***		0.087
		(0.027)		(0.058)
IN		0.303***		0.241***
		(0.036)		(0.071)
Constant	0.008	-0.016	0.187***	0.184***
	(0.013)	(0.012)	(0.024)	(0.024)
N	3562	3562	3562	3562
City	274	274	274	274
Controls	No	Yes	No	Yes

Note: numbers in parentheses denote robust standard errors. *, **, and *** correspond to significance levels of 10%, 5%, and 1%, respectively.

4.2.2. Alternative Measures of Key Independent Variable

Table 5. Replaces core explanatory variables

	(1)	(2)	(3)	(4)
VARIABLES	Area	Area	Price	Price
STR1	0.123***	0.049**	0.337***	0.165***
	(0.019)	(0.022)	(0.042)	(0.048)
EDU		0.049		0.138**
		(0.033)		(0.059)
AGDP		0.045**		0.251***
		(0.022)		(0.044)
OPEN		-0.062**		0.009
		(0.031)		(0.064)
GOV		-0.046**		-0.198***
		(0.022)		(0.049)
TECH		0.149***		0.079
		(0.027)		(0.058)
IN		0.310***		0.301***
		(0.036)		(0.070)
Constant	0.028**	-0.021*	0.216***	0.169***
	(0.012)	(0.012)	(0.023)	(0.022)
N	3836	3836	3836	3836
City	274	274	274	274
Controls	No	Yes	No	Yes

Note: numbers in parentheses denote robust standard errors. *, **, and *** correspond to significance levels of 10%, 5%, and 1%, respectively.

ISSN: 2692-7608 DOI: 10.6981/FEM.202404_5(4).0024

Using the ratio of the value added of the tertiary industry to the regional gross domestic product (GDP) as a proxy variable for industrial structure (STR1), the robustness of the model is tested. The test results, as shown in Table 5, indicate that regardless of whether control variables are included, there are no significant changes in the significance and signs of the coefficients of the core explanatory variables. This suggests that the baseline regression results exhibit strong robustness.

4.3. Heterogeneity Analyses

4.3.1. By District

To further examine the differences in the impact of industrial structure on the updating of stock industrial land across different regions, this study divides the 274 cities into three categories: Eastern, Central, and Western regions, and conducts regressions on cities in different regions. Table 6 presents the regression results for different regions. For the updating area of stock industrial land, industrial structure upgrading has a promoting effect across all regions, but this effect is more significant in the Central and Western regions than in the Eastern region. The Eastern region, with its earlier industrial development and solid industrial foundation, shows less pronounced effects of industrial structure upgrading on the updating area of stock industrial land. In contrast, the Central and Western regions, with later development stages, benefit more from industrial structure upgrading due to the absorption of more capital, technology, and human resources, resulting in a more significant promoting effect. Regarding the updating prices of stock industrial land, the impact of industrial structure upgrading is more significant in the Eastern and Western regions, with the coefficient in the Western region higher than that in the Eastern region, while the impact on the Central region is not significant.

Table 6. Regression results of group models based on different districts

	(1)	(2)	(3)	(4)	(5)	(6)
VARIABLES	Area	Price	Area	Price	Area	Price
	East city		Central city		West city	
STR	0.001	0.202**	0.079**	0.078	0.082*	0.315**
	(0.050)	(0.085)	(0.039)	(0.082)	(0.045)	(0.128)
Constant	0.003	0.187***	-0.053***	0.153***	-0.037**	0.144***
	(0.025)	(0.045)	(0.018)	(0.035)	(0.017)	(0.048)
N	1358	1358	1372	1372	1106	1106
City	97	97	98	98	79	79
Controls	Yes	Yes	Yes	Yes	Yes	Yes

Note: numbers in parentheses denote robust standard errors. *, **, and *** correspond to significance levels of 10%, 5%, and 1%, respectively.

4.3.2. By City-Levels

To examine whether there are differences in the impact of industrial structure upgrading on the updating of stock industrial land among cities of different levels, this study categorizes urban levels into two groups: ① High-level cities, including provincial capitals, municipalities directly under the central government, and sub-provincial cities; ② General prefecture-level cities, consisting of cities other than those in ①. Regression analyses are conducted for cities of different levels, and Table 7 presents the regression results for cities of different levels.

For higher-level cities, the impact of industrial structure upgrading on the updating of stock industrial land is not significant. This is because higher-level cities have developed earlier, possess a solid industrial foundation, and face land scarcity. Some industries may relocate to

ISSN: 2692-7608 DOI: 10.6981/FEM.202404_5(4).0024

nearby cities, leading to an insignificant impact of industrial structure upgrading on industrial land updating.

In contrast, for general prefecture-level cities, the positive impact of industrial structure upgrading on the updating of stock industrial land is more pronounced. The mean value of industrial structure upgrading for general prefecture-level cities is 0.94, indicating that most of these cities are dominated by the secondary industry. Industrial structure upgrading is accompanied by an increase in demand for industrial land. Moreover, as industries migrate from higher-level cities, surrounding cities receive the transferred industries, increasing the demand for industrial land. Therefore, industrial structure upgrading has a driving effect on both the updating area and prices of stock industrial land in general prefecture-level cities.

Table 7. Regression results of group model based on city-levels

	(1)	(2)	(3)	(4)
VARIABLES	Area	Price	Area	Price
	High level city		General level city	
STR	-0.087	-0.217	0.087***	0.224***
	(0.134)	(0.171)	(0.026)	(0.059)
Constant	0.019	0.468***	-0.023**	0.145***
	(0.120)	(0.143)	(0.011)	(0.024)
N	434	434	3402	3402
City	31	31	243	243
Controls	Yes	Yes	Yes	Yes

Note: numbers in parentheses denote robust standard errors. *, **, and *** correspond to significance levels of 10%, 5%, and 1%, respectively.

4.4. Mechanism Test

As discussed in the theoretical analysis, industrial structure upgrading affects industrial agglomeration, thereby influencing the updating of stock industrial land. Building upon this premise, this study continues to investigate the impact of industrial structure upgrading on the updating of stock industrial land using the Tobit model. The core explanatory variable remains industrial structure upgrading, measured in the same manner as discussed earlier. The dependent variables include industrial agglomeration[36], measured using both manufacturing industry location entropy (AGG1) and service industry location entropy (AGG2).

The regression results are presented in Table 8. Columns (1) and (2) of Table 8 indicate a significant positive effect of industrial structure upgrading on manufacturing industry agglomeration. Currently, most Chinese cities are still dominated by the secondary industry. Enterprises, in search of optimal locations to maximize profits, increase their investments in capital, technology, and manpower, thereby driving the updating of stock industrial land. Industrial agglomeration, through channels such as economies of scale and infrastructure sharing, reduces costs, attracts enterprises to establish their presence, and intensifies the demand for land, thus promoting the updating of stock industrial land. Columns (3) and (4) of Table 8 demonstrate a significant positive effect of industrial structure upgrading on service industry agglomeration. With the dominance of the tertiary industry, characterized by the upgrading of industrial structure, there is a surge in employment opportunities and innovative vitality. The rapid development of the economy and society fosters a trend of deep integration between the manufacturing and service industries, leading to spatial agglomeration. This increases the demand for industrial land in agglomerated areas, thereby driving the updating of stock industrial land.

ISSN: 2692-7608 DOI: 10.6981/FEM.202404_5(4).0024

Table 8. Action mechanism of industrial structure upgrading on the renewal of stock industrial land

	(1)	(2)	(3)	(4)
VARIABLES	AGG1	AGG1	AGG2	AGG2
STR	0.045***	0.059***	0.058***	0.063***
	(0.012)	(0.015)	(0.014)	(0.018)
Constant	0.410***	0.352***	0.324***	0.308***
	(0.014)	(0.012)	(0.012)	(0.013)
N	3822	3822	3821	3821
City	274	274	274	274
Controls	No	Yes	No	Yes

Note: numbers in parentheses denote robust standard errors. *, **, and *** correspond to significance levels of 10%, 5%, and 1%, respectively.

5. Conclusion

This study utilized panel data from 274 cities in China from 2007 to 2020 and employed a random Tobit model to analyze the impact and heterogeneity of industrial structure upgrading on the updating of stock industrial land. The mechanism of industrial agglomeration was also explored. The conclusions of the study are as follows:

1) Industrial structure upgrading has a positive driving effect on the updating of stock industrial land, increasing both the updating area and prices. This result holds true even after instrumental variable testing and replacing the core explanatory variable.

2) Heterogeneity analysis indicates that the impact of industrial structure upgrading on the updating of stock industrial land varies across different regions and city levels. The promotion effect is more significant in western regions and general prefecture-level cities.

3) Industrial structure upgrading promotes the updating of stock industrial land by influencing industrial agglomeration. Both manufacturing industry agglomeration and service industry agglomeration affect the updating of stock industrial land, leading to dynamic changes in both updating area and prices.

Updating stock industrial land is a long-term and complex project that can effectively improve the efficiency of industrial land use. Industrial structure upgrading facilitates the rational and efficient use of industrial land, promoting high-quality urban development. Based on the above research conclusions, the following policy recommendations are proposed:

Tailor the updating of stock industrial land to local conditions. Industrial land updating is a comprehensive, systematic, and complex project that often requires tailored strategies due to regional differences in urban development levels. Differentiated strategies should be adopted to promote the updating of stock industrial land in cities across China.

Integrate industrial structure upgrading with the updating of stock industrial land. Industries are a vital driving force for urban development. By developing and expanding modern service industries, digital economy, and high-end equipment manufacturing, the upgrading of industrial structure can be realized. This will optimize industrial structure, revitalize land elements, promote the flow of other factors, and unleash the potential for updating stock land. Outdated industries should be phased out, and high-end industries should be introduced to ascend to both ends of the value chain.

Develop urban clusters vigorously and promote industrial agglomeration. By promoting the transfer of industries and factors between central cities and nearby cities, a mutually beneficial relationship can be formed, driving the updating of stock land. Infrastructure construction

ISSN: 2692-7608 DOI: 10.6981/FEM.202404_5(4).0024

should be strengthened to facilitate the sharing of labor, technology, infrastructure, and knowledge among industrial enterprises, generating economies of scale and agglomeration effects, and maximizing the potential of updating stock inefficient industrial land.

References

[1] Zhou, Y.; Li, X.; Liu, Y. Rural land system reforms in China: History, issues, measures and prospects. Land Use Policy 2020, 91, doi:10.1016/j.landusepol.2019.104330.

[2] Gu, Y.; Lyu, P. Research on the Renewal Mechanism of Inefficient Industrial Land in the Perspective of Property Rights Game. Urban Stud 2021, 28, 71-77.

[3] Lu, X.; Zhou, J. The Allocation of Development Rights and Incomplete Renewal of Urban Stock Industrial Land: Take Shanghai Practice as an Example. Urban Stud 2022, 29, 68-72.

[4] Zhou, Y.; Lin, Z.; Zhang, Y.; Sun, W.; Lei, F.; Gao, W. Impact of changes in energy structure and industrial structure on green total factor productivity in the context of environmental protection-evidence from China. Environ Sci Pollut R 2024, doi:10.1007/s11356-024-32329-7.

[5] Ran, M.; Zhao, C. Spatial spillover effects of capital factor agglomeration on the urban industrial structure upgrading in China: Based on panel data of 284 prefecture-level cities. Plos One 2021, 16, doi:10.1371/journal.pone.0258758.

[6] Lu, S.; Wang, H. Limited Decentralization: Understand China's Land System from the Perspective of Central-Local Relation. Land-Basel 2022, 11, doi:10.3390/land11040517.

[7] Zhang, M.; Tan, S.; Pan, Z.; Hao, D.; Zhang, X.; Chen, Z. The spatial spillover effect and nonlinear relationship analysis between land resource misallocation and environmental pollution: Evidence from China. J Environ Manage 2022, 321, doi:10.1016/j.jenvman.2022.115873.

[8] Gao, B.; Huang, Z.; Zhang, T.; Sun, X.; Song, M. Exploring the Impact of Industrial Land Price Distortion on Carbon Emission Intensity: Evidence from China. Land-Basel 2023, 12, doi:10.3390/land12010092.

[9] Dai, P.; Sheng, R.; Miao, Z.; Chen, Z.; Zhou, Y. Analysis of Spatial-Temporal Characteristics of Industrial Land Supply Scale in Relation to Industrial Structure in China. Land-Basel 2021, 10, doi:10.3390/land10111272.

[10] Wang, D.; Ren, C.; Zhou, T. Understanding the impact of land finance on industrial structure change in China: Insights from a spatial econometric analysis. Land Use Policy 2021, 103, doi:10.1016/j.landusepol.2021.105323.

[11] Liu, Y.; Yang, H.; Song, J.; Gu, X. Urban development land price distortion and industrial structure evolution in China. Environ Dev Sustain 2023, doi:10.1007/s10668-023-03156-6.

[12] Huang, J.; Chen, L.; Zhang, Y.; Zhao, A. The relationship between industrial land price and industrial structure change. Resources Science 2017, 39, 585-596.

[13] Li, J.; Li, K.; Qiu, R. The Suburbanization and Revitalization of Industrial Land in Shanghai, China. Sustainability-Basel 2022, 14, doi:10.3390/su14127062.

[14] Wang, Y.; Zhang, A.; Min, M.; Zhao, K.; Hu, W.; Qin, F. Research on the Effect of Manufacturing Agglomeration on Green Use Efficiency of Industrial Land. Int J Env Res Pub He 2023, 20, doi:10.3390/ijerph20021575.

[15] Huang, H.; Li, Y.; Wang, Z. Spatio-temporal changes of eco-efficiency and influencing factors of industrial land use at the provincial level of China. Acta Ecologica Sinica 2020, 40, 100-111.

[16] Zhou, Y.; Li, A.; Huang, X.; Niu, L. Analysis on the Characteristics and Influencing Factors of Land Transfer in Shanghai City. Areal Research and Development 2022, 41, 162-168.

[17] Lin, S.; Ben, T. Impact of government and industrial agglomeration on industrial land prices: A Taiwanese case study. Habitat Int 2009, 33, 412-418, doi:10.1016/j.habitatint.2009.01.001.

[18] Rao, Y.; Yang, J. Analysis on Spatial and Temporal Evolution of Industrial Land Under Industry Classification in Wuhan City. Resources and Environment in the Yangtze Basin 2020, 29, 1525-1534.

ISSN: 2692-7608 DOI: 10.6981/FEM.202404_5(4).0024

[19] Yang, Y.; Jiang, G.; Zheng, Q.; Zhou, D.; Li, Y. Does the land use structure change conform to the evolution law of industrial structure? An empirical study of Anhui Province, China. Land Use Policy 2019, 81, 657-667, doi:10.1016/j.landusepol.2018.11.016.

[20] Li, C.; Gao, X.; Wu, J.; Wu, K. Demand prediction and regulation zoning of urban-industrial land: Evidence from Beijing-Tianjin-Hebei Urban Agglomeration, China. Environ Monit Assess 2019, 191, doi:10.1007/s10661-019-7547-4.

[21] Zhang, W.; Wang, B.; Wang, J.; Wu, Q.; Wei, Y.D. How does industrial agglomeration affect urban land use efficiency? A spatial analysis of Chinese cities. Land Use Policy 2022, 119, doi:10.1016/j.landusepol.2022.106178.

[22] Gao, B.; Luo, H.; Huang, Z.; Xu, F.; Liu, B. Research on the Spatial Layout of and Factors Affecting the Price of Industrial Land in China. Journal of Geo-Information Science 2020, 22, 1189-1201.

[23] Gao, J.; Qiao, W.; Ji, Q.; Yu, C.; Sun, J.; Ma, Z. Intensive-use-oriented identification and optimization of industrial land readjustment during transformation and development: A case study of Huai'an, China. Habitat Int 2021, 118, doi:10.1016/j.habitatint.2021.102451.

[24] Yang, Z.; Li, S.; Sun, D.; Li, C.; Wu, J. Intensive Evaluation and High-Quality Redevelopment of Enterprise Land Use: A Case Study in China. Land-Basel 2022, 11, doi:10.3390/land11030432.

[25] Tu, F.; Zou, S.; Ding, R. HOW DO LAND USE REGULATIONS INFLUENCE INDUSTRIAL LAND PRICES? EVIDENCE FROM CHINA. Int J Strateg Prop M 2021, 25, 76-89, doi:10.3846/ijspm.2020.14051.

[26] Huang, Z.; Dai, X.; He, C. The Impact of "Three Old Regeneration" on the Transfer of Urban Industrial Land in Guangdong Province,China. Urban Stud 2021, 28, 37-48.

[27] Zhao, B.; Wang, K.; Xu, R. Fiscal decentralization, industrial structure upgrading, and carbon emissions: evidence from China. Environ Sci Pollut R 2023, doi:10.1007/s11356-022-24971-w.

[28] Chen, L.; Ye, W.; Huo, C.; James, K. Environmental Regulations, the Industrial Structure, and High-Quality Regional Economic Development: Evidence from China. Land-Basel 2020, 9, doi:10.3390/land9120517.

[29] Okamoto, E. Effects of Health Guidance on Outpatient and Pharmacy Expenditures: A Disease- and Drug-Specific 3-Year Observational Study Using Propensity-Score Matching. J Epidemiol 2013, 23, 262-269, doi:10.2188/jea.JE20120136.

[30] Li, B.; Shen, Y. Effects of land transfer quality on the application of organic fertilizer by large-scale farmers in China. Land Use Policy 2021, 100, doi:10.1016/j.landusepol.2020.105124.

[31] Aldieri, L.; Brahmi, M.; Chen, X.; Vinci, C.P. Knowledge spillovers and technical efficiency for cleaner production: An economic analysis from agriculture innovation. J Clean Prod 2021, 320, doi:10.1016/j.jclepro.2021.128830.

[32] Yang, H.; Huang, K.; Deng, X.; Xu, D. Livelihood Capital and Land Transfer of Different Types of Farmers: Evidence from Panel Data in Sichuan Province, China. Land-Basel 2021, 10, doi:10.3390/land10050532.

[33] Xue, D.; Yue, L.; Ahmad, F.; Draz, M.U.; Chandio, A.A.; Ahmad, M.; Amin, W. Empirical investigation of urban land use efficiency and influencing factors of the Yellow River basin Chinese cities. Land Use Policy 2022, 117, doi:10.1016/j.landusepol.2022.106117.