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How Does New Energy Demonstration City Policy Promote Urban Land Use Efficiency in China? The Mediating Effect of Industrial Structure

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Abstract: As an effective measure to solve the dilemma of urban energy consumption and economic development, the new energy demonstration city (*NEDC*) policy in China could greatly promote the development of the new energy industry and urban economy. This study aims to explore how the *NEDC* policy effectively promotes the growth of urban land use efficiency (*ULUE*), an essential indicator of economic development, through the urban industrial structure. Based on the panel data of 285 Chinese cities during 2003–2019, this study took the *NEDC* policy as a quasi-natural experiment and employed the PSM-DID method and the mediating effect model to objectively evaluate its policy effects. We found that the *NEDC* policy could significantly promote the growth of the *ULUE*. Specifically, the *ULUE* has been significantly improved by 17.0%. The *NEDC* policy could also promote the *ULUE* indirectly through the mediating effect of industrial structure advancement (*ISA*), but the mediating effect of industrial structure rationalization (*ISR*) was not significant. Furthermore, the promotional effect of the *NEDC* policy on the *ULUE* has regional heterogeneity. Compared with eastern cities and high-innovation cities, central and western cities and medium-innovation and low-innovation cities can obtain much higher promotion effects. This study may provide some policy inspiration for policymakers to support low-corban and sustainable economic development and urban land use.

Keywords: new energy demonstration city (*NEDC*); urban land use efficiency (*ULUE*); industrial structure advancement; industrial structure rationalization; PSM-DID; mediating effect model

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1. Introduction

For a long time, the fast and furious development of the global economy has relied on traditional industries with high energy consumption [1], such as coal, oil, and natural gas, resulting in grave urban environmental pollution and inefficiency in urban land utilization [2]. To seek new progress in urban energy and economy, the concept of low carbon economy was initially introduced by the UK in White Paper: Our Energy Future—Creating a Low Carbon Economy in 2003, which garnered international attention toward new energy sources. Although these traditional energy sources are still commonplace in numerous regions, it has become an inevitable global trend to transform energy systems and industrial structures [3]. Given the constraints imposed by limited land resources and the non-renewable nature of traditional energy, enhancing urban land use efficiency (*ULUE*) has become a profoundly urgent endeavor in realizing sustainable long-term urban development.

As the second largest economy in the world, China actively contributes its wisdom in energy conservation and carbon emissions reduction while advocating for green, eco-friendly, and low-carbon lifestyles [4]. As early as 2012, the National Energy Bureau of China put forward the New Energy Demonstration City (*NEDC*) policy and resolved to establish 81 *NEDC*s in 2014, aligning with China's goals of reaching a carbon peak by 2030 and

achieving carbon neutrality by 2060. The *NEDC* policy aspires to further restrain global warming, reduce carbon emissions and enhance energy efficiency. Furthermore, it represents a pivotal measure in exploring new energy development technologies and refining the urban industrial structure, thereby altering the landscape of urban economic progression and fostering the advancement of the *ULUE*. The Energy Development Report of China (2020 Edition) highlights that the installed capacity of renewable energy power generation has surpassed 700 million kilowatts, with nuclear power projects under construction and in operation exceeding 58 million kilowatts by September 2020. These figures denote that China has become the world's largest new energy producer and consumer.

According to the previous literature [5], 70% of global carbon emissions come from urban living and production activities. As an effective countermeasure to solve the conflict between urban energy consumption and urban economic development, the *NEDC* policy has played an effective role in demonstrating and exemplifying the promotion of new energy production and consumption. This, in turn, could reshape the pathways and frequency of socioeconomic factors, such as urban land resources, ultimately influencing the material cycle and energy flow of the urban land use system and subsequently transforming the pattern and structure of urban land usage [6]. The *ULUE* serves not only as a direct reflection of urban economic development and the extent of urban land utilization but also as an essential indicator to assess the effective allocation and rational use of socioeconomic factors [7]. Based on the above analysis, it has become apparent that a qualitative assessment of the policy effects of *NEDC* on the *ULUE*, from the perspective of industrial structure, holds significant importance. Therefore, this study aimed to explore the influence of *NEDC* on the *ULUE* and the mediation effects of the industrial structure by constructing a PSM-DID model and mediating effect model.

This paper may provide the marginal contributions as follows. Firstly, while existing studies predominantly evaluate the economic performance of *NEDC* from a macroscopic standpoint, this paper centers its focus on the resource allocation impact of *NEDC* on socioeconomic factors such as urban land. Given China's rapid urbanization and industrialization, we emphasize that the research on the utilization efficiency of urban land is even more important. Secondly, this paper proposes an analytical framework to understand the mechanism that the *NEDC* policy may affect the *ULUE* through the investment-pulling effect, innovation-driving effect, and industrial structure effect. Third, to further explore the impact of *NEDC* on *ULUE*, this paper proposes the mediating effect of industrial structure rationalization and industrial structure advancement. Finally, this study revealed that the effect of *NEDC* on *ULUE* is heterogeneous, with central and western cities, as well as cities with medium and low levels of innovation, reaping notably higher promotional effects in comparison to their eastern counterparts and cities with high levels of innovation.

2. Literature Review and Analytical Framework

2.1. Literature Review

2.1.1. Literature Review on *ULUE*

There has been a considerable amount of associated academic research on *ULUE*, including four primary aspects: the connotation of *ULUE*, the measurement of *ULUE*, the factors influencing *ULUE*, and spatial differentiation, as well as optimization strategies on *ULUE*. Regarding the connotation of *ULUE*, scholars have yet to establish a unified criterion for the definition of *ULUE* based on different constraints. However, on the whole, they agree that the *ULUE* mainly denotes the sum of all the output values provided per land unit under certain socioeconomic conditions [8]. Some scholars additionally perceive urban land as a vital urban resource, wherein *ULUE* signifies the non-agricultural economic output per land unit [9]. Consequently, they generally employ a single indicator to measure *ULUE*. As research has deepened, some scholars start from the goal of urban land use and calculate the *ULUE* through the employment of index evaluation methodologies and the construction of a multi-objective evaluation system that reflects economic, social, and environmental aspects [10,11]. In addition to the aforementioned multi-index evaluation method, we

could divide the methodologies for measuring the *ULUE* into two categories, namely the SFA method [12] and DEA methods [13], both of which have been broadly acknowledged by scholars. Furthermore, the Super-efficient DEA [14] and Slack-based Measure (SBM) models [6] served as established theoretical foundations for measuring *ULUE* within this study. Concerning the factors influencing *ULUE*, certain scholars have explored various factors that may affect the *ULUE*, such as economic integration [7], government policy regulation [15], transportation infrastructure [16,17], land transfer marketization [18,19], and industrial structure [18,20]. However, they have usually ignored the huge impact of national policies on land use. The government regulations and pilot policies, functioning as institutions through which the central government regulates urban economic development, also exert significant effects on the *ULUE* in China [15,21]. Since the reform and opening up of China, the central government has issued several nationwide pilot policies that have proven significant in wielding impacts on *ULUE*, such as the smart city pilot policy [22], innovative city polit policy [23], and low carbon city polit policy [24,25]. However, few scholars have concentrated on the effects of the *NEDC* policy on *ULUE*. Therefore, this paper aims to explore how *NEDC* affects *ULUE* and quantitatively evaluate the impact of *NEDC* policy on *ULUE*.

2.1.2. Literature Review on *NEDC* Policy

Energy stands as an indispensable resource for a nation's pursuit of economic growth. Throughout history, the excessive utilization of energy by various nations across the globe has given rise to grave predicaments such as ecological degradation, the depletion of conventional energy sources, and global warming. Developed nations such as France, the United Kingdom, and the United States have initiated an ardent quest to explore energy alternatives, attaining commendable feats of accomplishment [26]. Likewise, some Asian developing countries, including Indonesia and China, have also made substantial strides in the realm of renewable energy development [27,28]. As a critical policy arrangement to achieve sustainable development in China, the *NEDC* policy has received extensive attention from scholars. The existing literature can be divided into two aspects. Firstly, some scholars have focused on the interpretation of the concept of the *NEDC* policy. Lou [29] pointed out the connotation and construction status of *NEDC* and took the lead in proposing the planning method of *NEDC* based on the "6A" concept. Wang [30] summarized the experience of constructing the *NEDC* pilot city in Turpan. Wu et al. [31] investigated the willingness and ability to cope with the construction challenges in the *NEDC* policy. However, this existing literature only conceptually explains the concept of *NEDC* and has not evaluated its policy effects. Further, some examples in the literature have focused on the evaluation of the *NEDC* policy effect. Xu [32] believed that the *NEDC* policy promoted the development of the regional economy and the adjustment of urban industrial structure, and technological innovation is an essential transmission channel. Wang and Yi [33] discussed the impact of *NEDC* on urban green economic development through the channels of industrial structure, technological innovation, and environmental constraints. Lu and Wang [34] and Yang et al. [2] found that the construction of *NEDC*s could help reduce the emissions of sewage and exhaust gases, which is conducive to curbing environmental pollution. Zhang et al. [35] empirically analyzed the relationship between the *NEDC* policy, technological innovation, and Energy-Carbon Performance (ECP) and found that the *NEDC* policy contributed to improving the ECP. However, few studies have explored the intrinsic interaction between the *NEDC* policy and *ULUE* while evaluating the effects of the *NEDC* policy on *ULUE* quantitatively from the perspective of industrial structure. Therefore, in this study, we subdivided the industrial structure into industrial structure advancement (*ISA*) and industrial structure rationalization (*ISR*) and explored the mediating effects of *ISA* and *ISR*, respectively.

2.1.3. Mechanism Analysis and Research Hypothesis

Although the existing research has yielded several inspiring insights regarding the establishment of *NEDC*s from diverse perspectives, they primarily focus on the conception and policy effect evaluation of the *NEDC*. The scholarly community has scarcely explored the influence of the *NEDC* policy on Urban Land Use Efficiency (*ULUE*), thereby underscoring a research gap when evaluating the effects of the *NEDC* policy on the *ULUE*.

The establishment of *NEDC*s possesses the potential to alter the urban industrial structure by influencing the material flow and energy circulation, consequently impacting changes in urban land utilization. By conducting a comprehensive review of the existing literature [6,32,33], we have determined that the *NEDC* policy may affect the *ULUE* through three primary mechanisms: the investment-pulling effect, the innovation-driving effect, and the industrial structure effect, as illustrated in Figure 1.

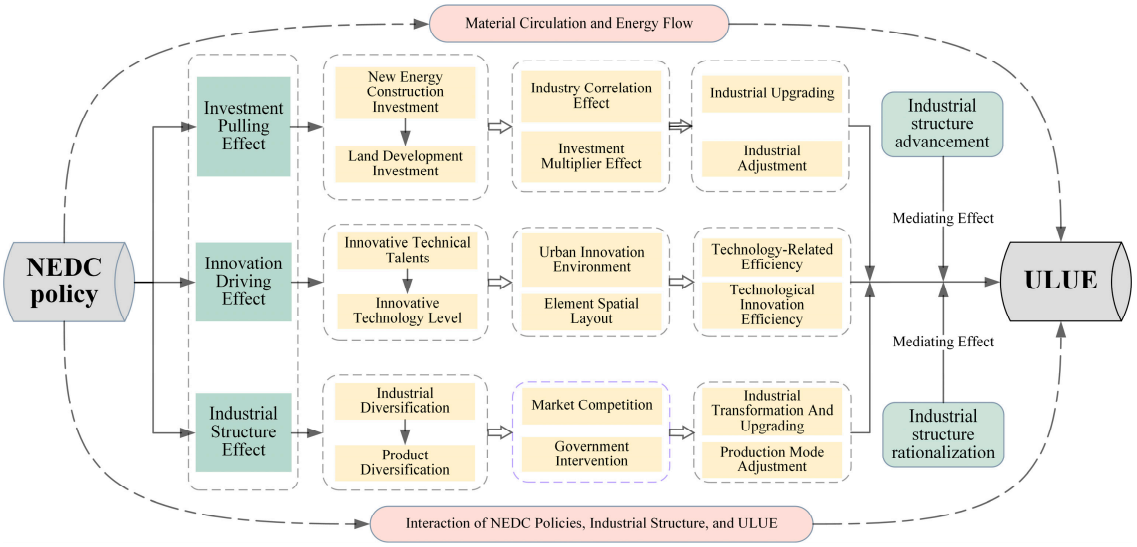

Figure 1. The theoretical framework of the *NEDC* policy affecting the *ULUE*.

Firstly, we considered the investment-pulling effect. Given that the establishment of *NEDC* can make a huge range of industrial correlation effects, the increased investment in *NEDC* pilot projects inevitably spurs the upgrading and adjustment of associated industries, increasing the urban industrial output and expanding the driving effect of unit urban land output value through the investment multiplier effect [36]. Second is the innovation-driven effect. The establishment of *NEDC* has fostered an enhanced innovation environment within urban settings [33], and the government's intervention and endorsement have propelled the diffusion of new energy technologies, mitigating the risks of innovation failure and bolstering the capital investment's capacity for risk-taking, which endeavors to facilitate the accelerated flow and integration of urban innovation elements [37]. Furthermore, technological innovation can optimize energy efficiency, curtail environmental pollution, and promote eco-friendly land utilization [35]. Third is the industrial structure effect. The *NEDC* policy can encourage diversified investments in urban industries, facilitating the development of new energy processes. Local governments may guide the transformation and upgrading of traditional industries through measures such as taxation and financial subsidies, which can help realize industrial structure advancement and rationalization [34]. During this period, local governments may implement differentiated policies and regulations concerning land resource management based on the different land resource conditions and competitive advantages in various locations, thereby fostering the growth of the *ULUE* [38]. Based on the above analysis, this paper puts forward the following hypothesis:

H1. *The NEDC policy can significantly promote the growth of ULUE.*

2.2. Mediating Effect Mechanism of Industrial Structure

If the above hypothesis is accepted, how does the *NEDC* policy affect the *ULUE*? It has been confirmed that there is positive feedback between the establishment of *NEDC* and the upgrading and adjustment of industrial structures [33]. The *NEDC* policy is conducive to the development of urban industries by reducing production costs and promoting the development of urban industrial structures in an environmentally sustainable and low-carbon direction. Meanwhile, the transformation of industrial structures could, in turn, help to improve the consumption and efficiency of new energy sources [39]. Liu et al. [40] also pointed out that the agglomeration of urban industries could significantly amplify energy efficiency in China. However, how to achieve the growth of the *ULUE* by promoting the interactive transformations of energy structure and industrial structure is still unclear and needs further investigation.

Firstly, the industrial agglomeration effect. The *NEDC* policy provides a good opportunity for industries associated with new energy to adjust and optimize their industrial structure. Specifically, the establishment of *NEDC*s has changed the urban industrial development environment. Emerging and traditional industries collide with each other, which can accelerate the mutual flow and integration of production factors and eventually form a coordinated development trend. In addition, there is the administrative intervention effect. To construct the *NEDC*s and realize the fundamental transformation of the industrial structure, the local government could inevitably intervene in the distribution of production factors among industries through administrative regulations, such as taxation and subsidies, and promote the closing, cessation, transfer, and integration of traditional energy-related industries with high-pollution [34], thereby advancing and rationalizing the urban industrial structure. Importantly, such measures can guarantee the sustainable and environmentally friendly development of the *NEDC*s. Based on this, this paper puts forward the following hypothesis:

H2. *The NEDC policy can promote the growth of the ULUE through the industrial structure.*

To further explore the internal mechanism of the industrial structure in the process of *NEDC*'s impact on *ULUE*, in this study, we subdivided the industrial structure into *ISA* and *ISR* [41] to explore the mediating effects of *ISA* and *ISR*, respectively.

2.2.1. The Mediating Effect of *ISA*

ISA denotes the dynamic development process in which the industrial structure is dominated by the primary industry to the secondary and tertiary industries [41]. The *NEDC* policy is conducive to industrial upgrading and adjustment [33]. Upon the establishment of *NEDC*s, local administrations can direct industrial enterprises toward technology development, carbon neutrality, environmental preservation, and energy-saving measures through pertinent supportive policies. Throughout the process of *NEDC* construction, the spatial distribution of the industrial structure, urban land utilization patterns, and other socioeconomic factors can be readjusted through territorial spatial planning, industrial planning, and preferential. These efforts can guide the regional industrial structure to shift from labor-intensive to technology-intensive domains. Existing studies have demonstrated that the development of high-tech industries contributes to the improvement of *ULUE* [6]. Furthermore, the local government can also pay attention to coping with high-pollution industries, achieve coordinated economic development and foster the growth of the *ULUE*. Based on this, this paper puts forward the following hypothesis:

H2a. *The NEDC policy promotes the growth of ULUE through ISA.*

2.2.2. The Mediating Effect of *ISR*

ISR refers to the enhancement of inter-industry coordination and the refinement of correlation capability [18]. At the core of *ISR* lies the effect of production resource allocation, whereby the efficacy of resource allocation directly influences the rationality of the industrial structure. The growth of the new energy industry can drive the development of related

industries, promote the integrity of the entire industrial chain, and enable coordinated development and synchronous upgrades across industries. A well-balanced industrial structure is conducive to the coordination of the urban land space layout and industrial development. However, the *NEDC* policy may also limit the development of high-pollution industrial enterprises, thus exerting a mitigating effect on the economic output and *ULUE* to a certain extent [42]. If the promoting effect of *NEDC* on the *ULUE* is greater than the restricting effect, the establishment of *NEDC*s could indeed stimulate the growth of the *ULUE* through *ISR*. Based on this, this paper puts forward the following positive hypothesis:

H2b. *The NEDC policy promotes the growth of the ULUE through ISR.*

3. Methodology and Data

3.1. Research Methods

3.1.1. PSM-DID Model

In this study, we took the construction of *NEDC*s as a quasi-natural experiment and used the PSM-DID model to evaluate the policy effects of *NEDC* on the *ULUE*. PSM selected the samples that were closest to the treatment group from the total samples, which effectively avoided selection bias [43]. At the same time, the samples that matched satisfied the common trend assumption required by the DID model [33]. In this paper, the cities approved as *NEDC* are defined as the treatment group, and the non-pilot cities are defined as the control group. To enhance the validity of the research conclusions, we excluded the samples of county-level cities and industrial parks and then generated the treatment group of 56 cities and the control group of 229 cities. The study area and spatial distribution of *NEDC*s are shown in Figure 2.

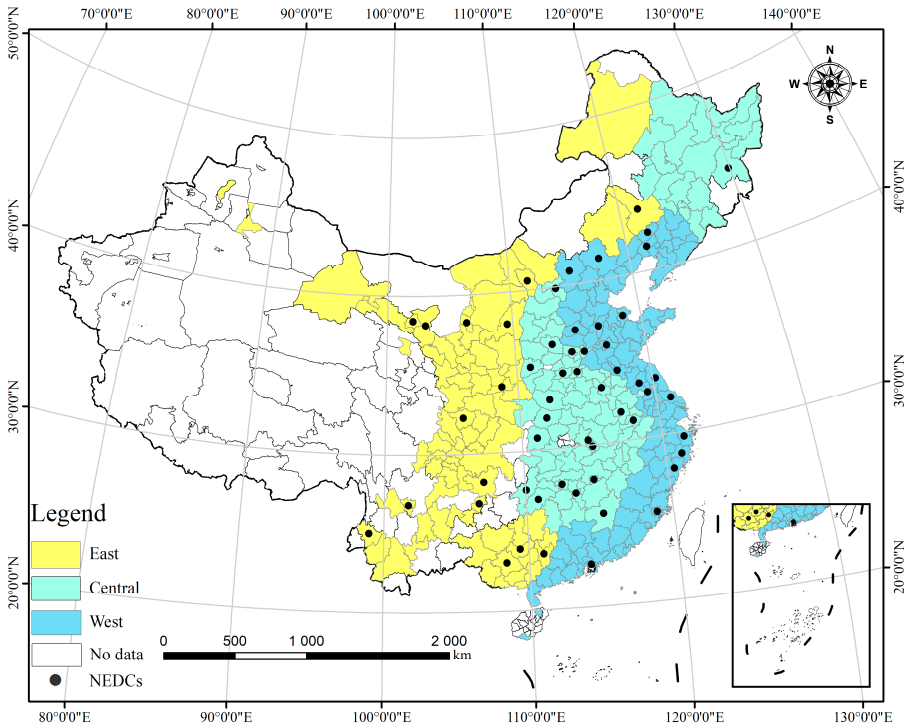

Figure 2. The spatial distribution of *NEDC*s and the study area.

According to the existing research [2], this study conducted the PSM-DID model as follows:

$$\ln ULUE_{i.t} = \alpha_0 + \alpha_1 NEDC_{i.t} + \alpha_2 X_{i.t} + A_i + T_t + \varepsilon_{it} \quad (1)$$

where i is the city, and t is the year; $ULUE_{i.t}$ represents urban land use efficiency. $NEDC_{i.t}$ represents the new energy demonstration city policy, and α_1 is the coefficient of *NEDC*,

which represents the net effect of the *NEDC* policy on the *ULUE*. $X_{i.t}$ represents the control variables, and α_2 is their coefficient. At the same time, the city effect A_i and the year effect T_t are both fixed in this model. $\varepsilon_{i.t}$ represents a random disturbance term.

3.1.2. Mediating Effect Model

The mediating effect model was adopted to explore whether one factor could mediate the effect of the explanatory variable on the explained variable [44,45]. In this study, the construction of *NEDC*s provided an opportunity to upgrade and adjust the urban industrial structure by driving the development of high-tech industries. To further explore whether *NEDC* could promote *ULUE* through the industrial structure, we quantitatively decomposed the mediating effect as follows. Firstly, we took the *ULUE* as the explained variable and *ISA* and *ISR* as the explanatory variables to test the effect of *ISA* and *ISR* on the *ULUE*. Secondly, we took *ISA* and *ISR* as the explained variables and *NEDC* as an explanatory variable to test the effect of *NEDC* on *ISA* and *ISR*. Moreover, to test whether the mediating effects of *ISA* and *ISR* were complete or not, we examined the effect of the *NEDC* policy on the *ULUE* after controlling the two mediating variables of *ISA* and *ISR*, respectively. The mediating models were conducted as follows [45]:

$$\ln ULUE_{i.t} = \beta_0 + \beta_1 M + \beta_2 X_{i.t} + A_i + T_i + \varepsilon_{i.t} \quad (2)$$

$$M = \gamma_0 + \gamma_1 NEDC_{i.t} + \gamma_2 X_{i.t} + A_i + T_t + \varepsilon_{i.t} \quad (3)$$

$$\ln ULUE_{i.t} = \sigma_0 + \sigma_1 NEDC_{i.t} + \sigma_2 M + \sigma_3 X_{i.t} + A_i + T_i + \varepsilon_{i.t} \quad (4)$$

where M represents the Industrial Structure Advancement (*ISA*) and Industrial Structure Rationalization (*ISR*), respectively. If the *NEDC* policy affected the *ULUE* by the mediating variables of *ISA* and *ISR*, both β_1 and γ_1 were significant. Additionally, if the signs of β_1 and γ_1 were in line with α_1 in Formula (1), it meant that *NEDC* affected the *ULUE* by the mediating variables of *ISA* and *ISR*, and the coefficient of the mediating variables was $\beta_1\gamma_1$. If the sign of $\beta_1\gamma_1$ and α_1 were opposite, the mediating effect of *ISA* and *ISR* could mask the actual impact of *NEDC* on the *ULUE* to a certain extent [41].

3.2. Variable Selection

3.2.1. Explained Variable

Urban Land Use Efficiency (*ULUE*) is an essential indicator that estimates the development level of urban economic and urban land use, which refers to the total social production per land unit [46]. Referring to the existing research [7,47], we selected the ratio of the added value of the secondary and tertiary industries to the urban construction land area to measure the *ULUE* and took *ULUE* as the explained variable. First, the *ULUE* of 285 cities during 2003–2019 was calculated in this paper, and the temporal and spatial evolution of the *ULUE* is shown in Figure 3.

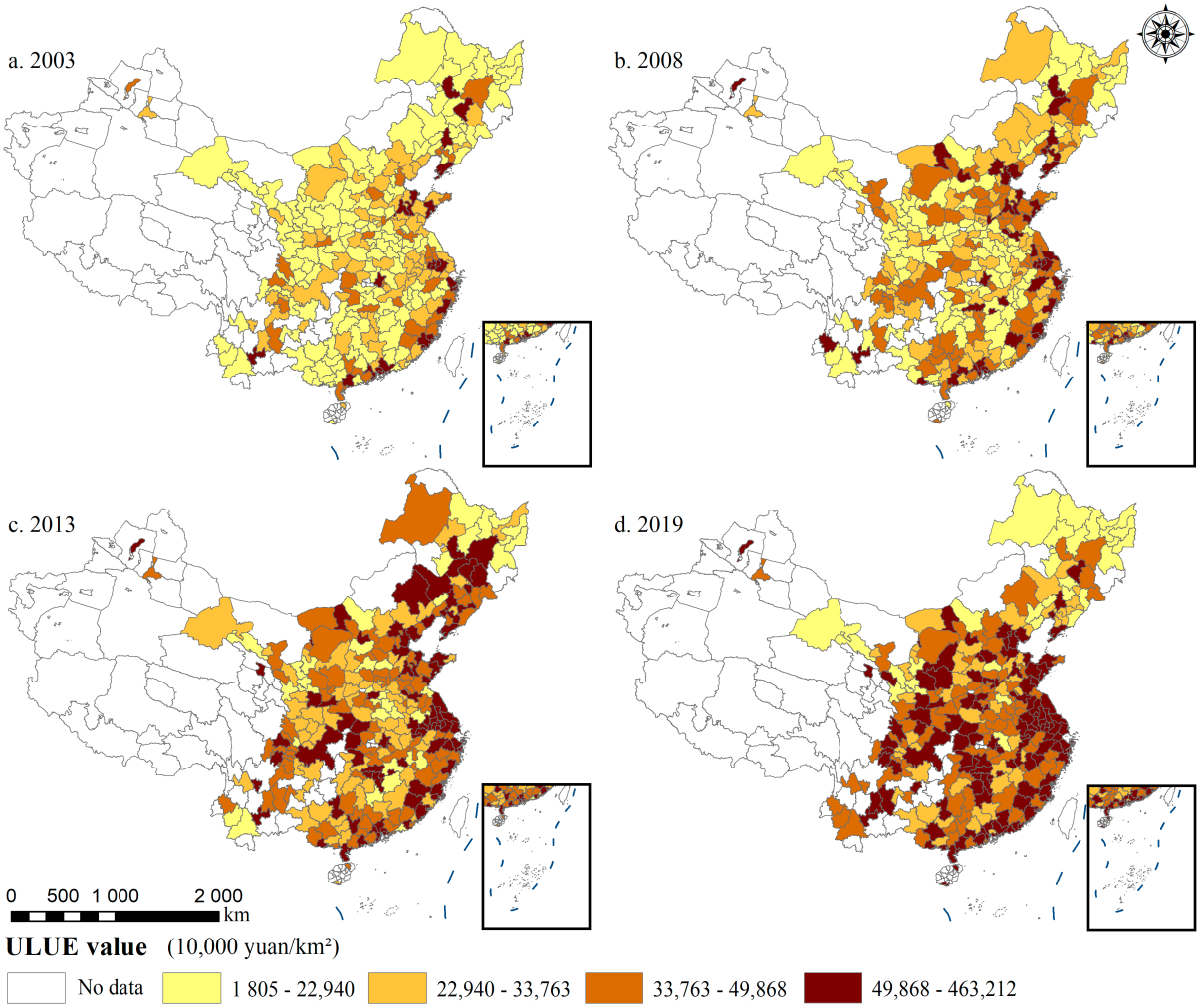

Figure 3. Urban land use efficiency (*ULUE*) in 2003, 2008, 2013, and 2019.

3.2.2. Explanatory Variable

The concept of *NEDC* was first introduced in China in 2012. The National Energy Bureau of China formally proposed the pilot policy of establishing *NEDC* in 2014, and 81 cities were selected as the pilot cities among the 285 city samples. In this paper, we focused on 67 prefecture-level cities (see Figure 2) and formed an interaction term between the policy variable, the treated, and the time variable period (*NEDC* = Treated × Period). Treated was defined as 1 if the city was approved as *NEDC*; otherwise, the value was 0. At the same time, considering that the *NEDC* policy was proposed in the first half of the year 2014, the period was coded as 1 if the period was in or after 2014; otherwise, the value was 0.

3.2.3. Mediating Variables

(1) Industrial Structure Advancement (*ISA*)

ISA can reflect the evolution from the dominance of the primary industry to the dominance of the second and tertiary industries [18]. Referring to the research of Tang et al. [41], this paper took the industrial structure hierarchy coefficient to describe *ISA*. The calculation formula was as follows:

$$ISA_{i.t} = \sum_{m=1}^{3} Y_{i.m.t} \times m, m = 1, 2, 3 \quad (5)$$

where *ISA* represents the industrial structure advancement. m is the weight of three industries, and the first, second, and third industries are assigned as 1, 2, and 3, respectively. $Y_{i.m.t}$ is the ratio of the three industries in the total output value of the city i in t year.

(2) Industrial Structure Rationalization (*ISR*)

ISR is an effective indicator that describes whether the socioeconomic factors are in a state of effective allocation between different industries [48]. Economic disequilibrium is very common, especially in many developing countries. The existing research usually uses the degree of industrial structural deviation to measure *ISA*, but the degree of structural deviation does not take the important roles of different industries in social economic development into consideration. Therefore, we selected the Theil index to describe *ISA*. The calculation formula was as follows:

$$ISR_{i.t} = \sum_{m=1}^{3} \frac{Y_{i.m.t}}{L_{i.t}} \times ln\left(\frac{Y_{i.m.t}}{L_{i.m.t}} \Big/ \frac{Y_{i.t}}{L_{i.t}}\right) = \sum_{m=1}^{3} \frac{Y_{i.m.t}}{L_{i.t}} \times ln\left(\frac{Y_{i.m.t}}{Y_{i.t}} \Big/ \frac{L_{i.m.t}}{L_{i.t}}\right), m = 1, 2, 3 \quad (6)$$

where *ISR* represents the industrial structure rationalization, m represents the first, second, and third industries, respectively, $Y_{i.m.t}/Y_{i.t}$ and $L_{i.m.t}/L_{i.t}$ represent the proportion of the output value of the industry m in the city i to the local total output value in year t, respectively, and the labor force of the industry m in the city i.

3.2.4. Control Variables

Drawing on existing research [2,6,33,49], this study selected the following indicators as control variables: (1) Economic openness (OPEN), which is measured by the ratio of the actual use of foreign investment in the regional GDP; (2) the level of human capital (HC), which is measured by the ratio of the number of students in ordinary institutions of higher learning to the total regional population; (3) the level of research and development investment (R&D), which is measured by the proportion of scientific expenditure in the general budget of the local government.

3.2.5. Matching Variables

Based on the principle of selecting the matching variables [43], we introduced these variables into the PSM model to improve the estimation accuracy if they had significant impacts on the outcome variable. Following the previous relevant studies [35,50,51], this study selected the five variables: *ISA*, *ISR*, OPEN, HC, and R&D.

3.3. Data Sources

Due to data completeness and availability, this paper selected the panel data covering 285 Chinese cities during 2003–2019. All the data were collected from the China Statistical Yearbook (2004–2020), the Statistical Yearbook of Chinese Cities (2004–2020), and the website of the National Energy Bureau of China (http://www.nea.gov.cn/ (accessed on 20 May 2022)). Table 1 shows the descriptive statistics of each variable.

Table 1. Descriptive statistics of each variable.

Variable	Definition	Obs	Mean	Std. Dev.	Min	Max
ln *ULUE*	Urban land use efficiency	4845	10.412	0.621	7.498	13.046
NEDC	New energy demonstration city	4845	0.196	0.397	0	1
ISA	Industrial structure advancement	4845	2.369	0.145	1.710	2.832
ISR	Industrial structure rationalization	4845	2.609	1.274	−0.316	10.657
OPEN	Economic openness	4845	2.081	2.465	0	29.358
HC	Human capital	4845	4.423	4.103	0	28.730
R&D	Research and development investment	4845	1.440	1.626	0.003	20.907

4. Result and Discussion

4.1. The Results of PSM

According to the previous theoretical analysis and model setting, the PSM method was employed to match the samples of the control group with similar conditions for each *NEDC*. Table 2 shows the applicability test results of PSM. The results show that the value of the standard bias of most covariates was smaller than 10%, and the *t*-test results showed that there was little systematic difference between the two groups. In addition, Figure 4 gives the propensity score distributions of PSM, and we found that most of the observations (99.3%) were supported, and only a few samples (0.7%) were lost in this study. Figure 5 shows the distribution of the propensity score kernel density and the difference between the two groups as being significantly reduced after PSM. The curves even partially coincided with each other, which means the two groups were more similar after matching, indicating the validity of the PSM method.

Table 2. Applicability test of PSM method.

Variable	Unmatched	Mean		Bias (%)	Reduct |Bias| (%)	*t*-Test	
	Matched	Treatment	Control			*t*	$p > \|t\|$
ISA	U	2.385	2.365	13.9	60.4	3.91	0.000
	M	2.384	2.376	5.5		1.22	0.223
ISR	U	2.712	2.584	10.1	80.8	2.79	0.005
	M	2.700	2.675	1.9		0.42	0.672
OPEN	U	1.982	2.106	−5.4	41.7	−1.39	0.165
	M	1.963	1.891	3.1		0.76	0.449
HC	U	5.097	4.258	20.1	49.1	5.67	0.000
	M	5.012	4.585	10.2		2.20	0.028
R&D	U	1.667	1.384	14.9	75.2	4.82	0.000
	M	1.555	1.485	3.7		0.91	0.365

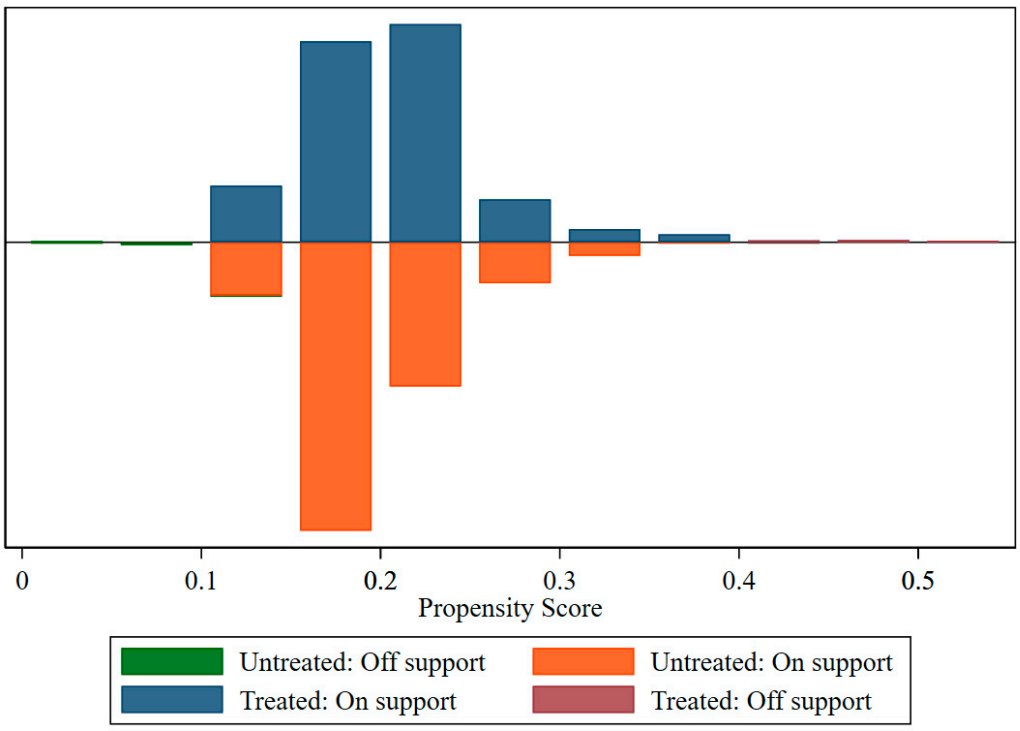

Figure 4. Propensity score distributions of PSM.

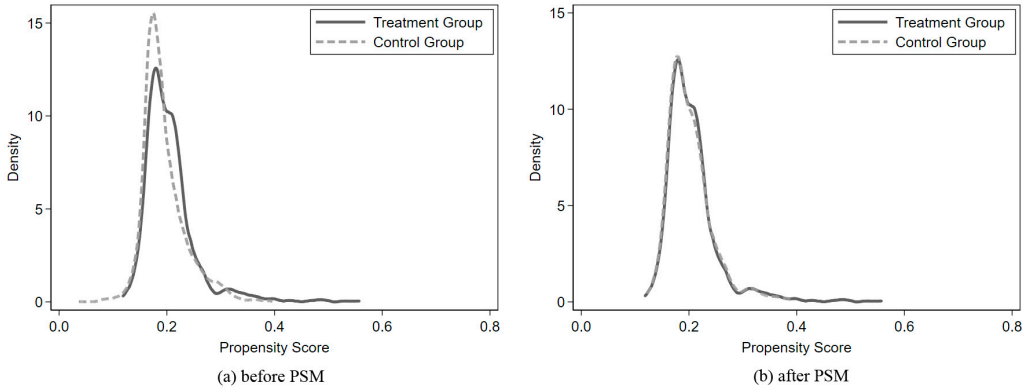

Figure 5. Propensity score kernel density distribution.

4.2. The Results of PSM-DID

4.2.1. The Benchmark Regression Analysis

This study takes the *NEDC* policy as a quasi-natural experiment [2] to identify how *ULUE* changed when the *NEDC* policy was applied, and Stata 15.2 software was used to estimate the policy effects. The results are shown in Table 3; columns (1) and (2) represent the regression results without and with the control variables, respectively. The benchmark regression results show that the *NEDC* policy had a significant positive effect on the *ULUE*. This is consistent with hypothesis H1. In addition, we also found that the coefficient of *NEDC*, α_1, was significantly positive at the 1% level when the control variables were added to the model. Compared with the non-pilot cities, the *NEDC* policy promoted the growth of the *ULUE* by 17.0%. The construction of *NEDC* further rationalized the spatial allocation of socioeconomic factors, such as urban land and investment, and promoted the flow of urban land and other factors to those industries with comparative advantages, which could lead to industrial structure rationalization and more obvious advancement, ultimately affecting the pattern and structure of urban land. These results also show that opening up, human capital, research, and development investment were important factors affecting the *ULUE*.

Table 3. Results of the benchmark regression.

Variable	(1)	(2)	(3)	(4)
NEDC	0.308 ***	0.170 ***		
	(7.03)	(4.12)		
pre_5			0.196	0.077
			(3.87)	(1.65)
pre_4			0.245	0.116 *
			(4.84)	(2.48)
pre_3			0.305	0.175
			(6.03)	(3.73)
pre_2			0.310 *	0.172
			(6.12)	(3.66)
pre_1			0.353	0.195 *
			(6.97)	(4.16)
current			0.403 ***	0.232 ***
			(7.96)	(4.94)
aft_1			0.406 ***	0.222 ***
			(8.03)	(4.72)
aft_2			0.456 ***	0.226 ***
			(9.01)	(4.77)
aft_3			0.439 ***	0.253 ***
			(8.69)	(5.38)
aft_4			0.438 ***	0.210 ***
			(8.65)	(4.44)
aft_5			0.499 ***	0.276 ***
			(9.86)	(5.83)
OPEN		−0.008		−0.012 ***
		(−1.37)		(−4.25)

Table 3. *Cont.*

Variable	(1)	(2)	(3)	(4)
HC		0.043 ***		0.043 ***
		(5.69)		(14.13)
R&D		0.101 ***		0.085 ***
		(11.63)		(20.02)
Constant	10.393 ***	10.083 ***	10.37 ***	10.10 ***
	(3448.13)	(291.99)	(1765.59)	(654.53)
City effect	YES	YES	YES	YES
Year effect	YES	YES	YES	YES
R-squared	0.036	0.203	−0.003	0.148

Note: *t* statistics in parentheses. * $p < 0.10$, *** $p < 0.01$.

4.2.2. The Dynamic Effect Analysis

We have found from the above analysis that the *NEDC* policy had significant promoting effects on the *ULUE*. As is shown in Table 3, the estimates of columns (1)–(2) were only the average treatment effect, which did not distinguish whether the effects of the *NEDC* policy on the *ULUE* experienced time lag and persistence. To analyze the dynamic effects of the *NEDC* policy, we further added the dummy variables of the policy implementation. In this study, we generated a series of dummy variables to indicate the five years before becoming an *NEDC* (*pre*_5, *pre*_4, *pre*_3, *pre*_2, and *pre*_1), the year of being an *NEDC* (current), and the years after the appointment (*aft*_1, *aft*_2, *aft*_3, *aft*_4, and *aft*_5). The dynamic effect estimation equation is as follows:

$$\begin{aligned} \ln ULUE_{i.t} &= \theta_0 + \theta_1 pre\_5 + \theta_2 pre\_4 + \theta_3 pre\_3 + \theta_4 pre\_2 + \theta_5 pre\_1 + \theta_6 current \\ &+\theta_7 aft\_1 + \theta_8 aft\_2 + \theta_9 aft\_3 + \theta_{10} aft\_4 + \theta_{11} aft\_5 + \theta_{12} X_{i.t} + A_i + T_t + \varepsilon_{i.t} \end{aligned} \quad (7)$$

By constructing the dynamic regression model, we could quantitatively measure the dynamic effects and time lags of the *NEDC* policy. The results are shown in column (3)–(4) of Table 3. We can find that the coefficients of the dummy years before becoming *NEDC*s, θ_i, were not significant, indicating there was no difference between the *NEDC*s and the non-pilot cities. We also found that the *NEDC* policy played an essential role in the years of current, *aft*_1, *aft*_2, *aft*_3, *aft*_4, and *aft*_5, which means the effect of the *NEDC* policy was sustainable for the growth of the *ULUE*. This is in line with the findings of Xu [32]. In conclusion, the *NEDC* policy had a continuous promotion effect on the *ULUE*, and there was no lag effect.

4.3. Mediating Effect Analysis

The construction of *NEDC*s has an impact on the development of local industries by promoting the adjustment and improvement of the industrial structure in terms of advancement and rationalization and finally affecting the growth of the *ULUE*. To explore the mediating effects of industrial structure, we further decomposed Industrial Structure into *ISA* and *ISR* and empirically tested the mediating effect of *ISA* and *ISR* separately.

4.3.1. The Mediating Effect of *ISA*

We tested the mediating effect of *ISA* next. The mediating effect regression results of *ISA* are reported in columns (1)–(3) of Table 4. The result of column (4) shows that the effect of *ISA* on the *ULUE* was significantly positive at the 1% level, which meant that *ISA* could significantly promote the growth of the *ULUE*. Specifically, *ISA* was not only the driving force but also the specific embodiment of industrial structure upgrading and development. *ISA* provides new paths for the sustainable development of the social economy and the growth of the *ULUE*. To further explore the pilot policy effect of *NEDC* on *ISA*, the result of column (1) shows that *NEDC* could significantly affect the development of *ISA*, and the *ISA* of the *NEDC*s has improved by 6.5% compared with the non-pilot cities.

Table 4. Results of the mediating effect model regression.

Variable	(1)	(2)	(3)	(4)	(5)	(6)
	ln *ULUE*	*ISA*	ln *ULUE*	ln *ULUE*	*ISR*	ln *ULUE*
M	0.926 ***		0.865 ***	0.102 ***		0.101 ***
	(6.56)		(5.91)	(5.84)		(5.83)
NEDC		0.065 ***	0.113 *		0.087	0.160 ***
		(6.54)	(2.46)		(0.93)	(4.17)
OPEN	−0.006 *	−0.003 *	−0.006 *	−0.008 *	−0.010 *	−0.007 *
	(−1.05)	(−2.34)	(−0.94)	(−1.48)	(−0.76)	(−1.26)
HC	0.036 ***	0.009 ***	0.035 ***	0.040 ***	0.0480 ***	0.038 ***
	(4.86)	(6.94)	(4.84)	(5.51)	(3.68)	(5.38)
R&D	0.094 ***	0.012 ***	0.091 ***	0.096 ***	0.101 ***	0.091 ***
	(11.44)	(6.18)	(11.00)	(11.80)	(6.64)	(10.92)
Constant	7.943 ***	2.311 ***	8.085 ***	9.851 ***	2.263 ***	9.855 ***
	(24.18)	(353.28)	(23.69)	(176.27)	(34.02)	(178.81)
City effect	YES	YES	YES	YES	YES	YES
Year effect	YES	YES	YES	YES	YES	YES
R-squared	0.229	0.143	0.233	0.227	0.056	0.236

Note: *t* statistics in parentheses. * $p < 0.10$, *** $p < 0.01$.

The results of columns (1) and (2) comprehensively show that the *NEDC* policy could affect the growth of the *ULUE* by promoting *ISA* while the mediating effect of *ISA* was 0.060 (0.065 × 0.926); this means that *ISA* has mediating effects rather than masking effects on the *ULUE*. The results verified Hypothesis H2a. The total effect of *NEDC* on the *ULUE* was 0.170, and the direct effect of *NEDC* on the *ULUE* was 0.110 (0.170–0.060) when we controlled the mediating effects of *NEDC* on *ISA*.

To further test whether the mediating effect of *ISA* was complete or not, this study took the *ULUE* and *ISA* into the model simultaneously. The result in column (3) of Table 4 shows that when controlled for the mediating effect of *ISA*, the impact of *NEDC* on the *ULUE* was still significantly positive at the 1% level, and the coefficient of *NEDC* was slightly smaller than that of the benchmark regression result, which further verified Hypothesis H2b. The existence of the mediating effect of *ISA* was proved again and adjusted to 0.056 (0.065 × 0.865), while the direct effects of the *NEDC* policy on the *ULUE* were adjusted to 0.114. This can be explained as follows. The *NEDC* policy enables the continuous development of high-tech industries, which helps the upgrading of the industrial structure, slowing down economic fluctuations, enhancing investor confidence, and promoting the steady growth of the urban economy in the long run [33]. This is also consistent with real economic development.

4.3.2. The Mediation Effect of *ISR*

We first tested the mediating effect of *ISR*. The mediating effect regression results of *ISR* are shown in columns (4)–(6) of Table 4. The result in column (4) shows that the effect of *ISR* on the *ULUE* was significantly positive, indicating that *ISR* could also significantly promote the *ULUE*. This result is also in line with Hypothesis H2.

To further investigate the influence of *NEDC* on *ISR*, the result was reported in column (5) of Table 4. The mediating effect of *ISR* was 0.009 (0.087 × 0.102), and when the effect of *NEDC* on *ISR* was controlled, the direct effect of the *NEDC* policy on the *ULUE* was 0.161 (0.170–0.009). However, the coefficient of *NEDC* on *ISR* was positive but not significant and only reduced by 5.1% compared with the benchmark regression result. Therefore, we can conclude that the mediating effect of *ISR* was not obvious. When *NEDC* and *ISR* were taken into the mediating model simultaneously, the coefficient of *ISR* was significantly positive at the 1% level, which indicated that *ISR* has a direct effect rather than a mediating effect on the growth of the *ULUE*. This is in line with the study of Tang et al. [41] and partially verifies Hypothesis H2b. The explanation may be as follows: *ISR* represents the relationship and coordination degree between various industries and the spatial distribution pattern of socioeconomic factors, while the impact of *NEDC* on the industrial structure can be reflected in the development of traditional and backward industries. The transformation and development of Chinese emerging industries are mainly reflected in the concentration

of industrial development in the tertiary industry, which can be described as *ISA* rather than *ISR*; therefore, the effect of the *NEDC* policy on *ISR* maybe not be significant. In addition, there may be time lag effects of *NEDC* on *ISR*, meaning that the impact was not significant during the research period of this study.

4.4. Robustness Test

To ensure the robustness of the regression results, we conducted three robustness tests: (1) We considered that relevant policies might have impacts on *ULUE*. This study excluded the pilot cities of low-carbon city pilot cities [52] and national innovation city pilot policy [53] based on the existing research, and the results are reported in columns (1)–(2) of Table 5; (2) We excluded the core city samples. Cities with higher administrative levels are usually equipped with better infrastructure, more developed economics, and other supporting conditions, which may have imitation effects and demonstration effects on their neighboring regions, resulting in selection heterogeneity. To avoid the influence of extremely developed cities, 33 municipalities, provincial capitals, and sub-provincial cities [54] were eliminated from the total samples in this study. The results are reported in columns (3)–(4) of Table 5. (3) Finally, we eliminated extreme values. To minimize the effect of extreme values, all the continuous variables were winsorized at 1% and 99% [55], and the data below the 1% quantile and above the 99% quantile were replaced by the 1% and 99% quantiles, respectively. The results are reported in columns (5)–(6) in Table 5. It was found that the coefficients of *NEDC* in all the models were significantly positive, ranging from 0.163 to 0.431, which is in line with the benchmark regression results, indicating the robustness of the conclusions.

Table 5. Results of robustness tests.

Variable	Eliminate the Interference of Relevant Policies		Exclude Core Cities		Eliminate Extreme Values	
	(1)	(2)	(3)	(4)	(5)	(6)
NEDC	0.305 ***	0.431 ***	0.282 ***	0.169 ***	0.311 ***	0.163 ***
	(6.27)	(9.86)	(5.73)	(3.63)	(7.32)	(4.08)
OPEN		−0.042 ***		−0.009		−0.009
		(−6.35)		(−1.13)		(−1.49)
HC		−0.042 ***		0.048 ***		0.049 ***
		(−4.15)		(4.94)		(6.92)
R&D		−0.112 ***		0.098 ***		0.118 ***
		(−10.16)		(8.46)		(14.08)
Constant	−3.451 ***	−3.031 ***	10.340 ***	10.050 ***	10.390 ***	10.050 ***
	(−1040.54)	(−69.19)	(3141.56)	(269.16)	(3617.15)	(309.34)
City effect	YES	YES	YES	YES	YES	YES
Year effect	YES	YES	YES	YES	YES	YES
R-squared	0.021	0.147	0.028	0.178	0.040	0.233

Note: *t* statistics in parentheses. *** $p < 0.01$.

5. Discussion: Why Do Urban Characteristics Matter?

To avoid the analysis based on the overall sample and cover the potential impact differences of the *NEDC* policy for cities with different characteristics, such as regional location and urban innovation capabilities, this study further examined the heterogeneous effects of *NEDC* on *ULUE* in cities with different regional locations and different urban innovation capabilities.

5.1. Regional Heterogeneity: The Better the Regional Location, the Stronger the Policy Effect?

The construction of *NEDC*s must take into account various factors, such as the urban economic structure, resource endowment, and the industrial spatial layout in different regions. The *NEDC* policy is mainly aimed at the service industry and high-tech industries, and its implementation effects in different regions may be affected by the local policy envi-

ronment and restrictions. Meanwhile, factors such as the natural environment, topography, and climatic conditions in different locations also have an impact on the construction of new energy demonstration cities. To explore the role of regional location and its effect on the *NEDC* policy and *ULUE*, 285 cities are divided were three regions, that is, the eastern, central, and western regions (see Figure 2). We followed the previous research [33,56] and set the following model:

$$\ln ULUE_{it} = \omega_0 + \omega_1 NEDC_{it} \times Location + \omega_2 X_{it} + A_i + T_t + \varepsilon_{it} \quad (8)$$

where Location refers to the three regional variables, and the coefficient, ω_1, describes the effect of *NEDC* on the *ULUE* in different regions. The results are reported in columns (1)–(3) of Table 6.

Table 6. Results of heterogeneity analysis.

Variable	Regional Location			Urban Innovation Heterogeneity		
	(1)	(2)	(3)	(4)	(5)	(6)
NEDC × Eastern	0.081					
	(1.52)					
NEDC × Central		0.193 **				
		(3.08)				
NEDC × Western			0.224 *			
			(2.42)			
NEDC × High				0.054		
				(0.93)		
NEDC × Medium					0.205 ***	
					(4.19)	
NEDC × Low						0.250 ***
						(3.67)
OPEN	−0.009	−0.010 *	−0.009 *	−0.010	−0.008 *	−0.009 *
	(−1.50)	(−1.62)	(−1.51)	(−1.58)	(−1.36)	(−1.56)
HC	0.045 ***	0.044 ***	0.043 ***	0.045 ***	0.044 ***	0.042 ***
	(5.83)	(5.70)	(5.68)	(5.80)	(5.70)	(5.51)
R&D	0.106 ***	0.103 ***	0.106 ***	0.107 ***	0.100 ***	0.103 ***
	(12.21)	(11.88)	(12.52)	(12.48)	(11.35)	(12.04)
Constant	10.08 ***	10.09 ***	10.08 ***	10.08 ***	10.08 ***	10.09 ***
	(285.89)	(286.96)	(292.28)	(286.45)	(291.42)	(291.81)
City effect	YES	YES	YES	YES	YES	YES
Year effect	YES	YES	YES	YES	YES	YES
Obs	4813	4813	4813	4813	4813	4813
R-squared	0.193	0.198	0.197	0.192	0.203	0.203

Note: *t* statistics in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

From the perspective of regional location, the coefficients of *NEDC* were all significantly positive, which showed that even if the geographic locations of cities were different, the *NEDC* policy could still promote the growth of the *ULUE*, which proved the robustness of the benchmark regression. Notably, the coefficients of *NEDC* in columns (2) and (3) of Table 6 were significantly positive at the 5% and 10% levels, respectively, while it was not significant in column (1) of Table 6. These results show that the *NEDC* policy may have greater effects in less developed areas such as western and central China, while this kind of promoting effect in more developed cities in eastern China is not obvious, showing significant regional heterogeneity. This can be explained as follows. In economically developed areas of eastern China, a well-established energy system and market have been formed due to the early application of advanced technologies and rapid economic development. These mature industrial chains and market systems may impose constraints on the implementation and promotion of policies that aim to build new energy demonstration cities. Additionally, the energy consumption structure in the eastern region is relatively stable, and the demand and acceptance of new energy by residents and businesses may be

relatively low, with a correspondingly higher energy substitution cost. These factors could all affect the implementation and effectiveness of the policy. Furthermore, the experience and resources of the government and enterprises in economic development and energy construction are relatively abundant in the eastern region. They may be more inclined to implement mature policies and programs, while the policy of building new energy demonstration cities is relatively novel and may require a longer promotion period and technological adaptation period. In summary, these factors may be among the reasons why the policy's effectiveness in building new energy demonstration cities is relatively unclear in economically developed areas of eastern China. This finding also indicates that the *NEDC* policy can not only promote the growth of the *ULUE* but also help narrow the regional gaps and promote coordinated regional development if the spatial layout of *NEDC*s is reasonable.

5.2. Urban Innovation Heterogeneity: The Higher the Urban Innovation, the Stronger the Policy Effect?

The objective of the *NEDC* policy is to promote sustainable energy development, including land use planning and management. The capacity for urban innovation encompasses diverse dimensions such as economy, technology, talent, and policy, significantly influencing the potential for development and competitiveness of the city. Therefore, it is crucial to consider the impact of urban innovation capacity when examining the effects of *NEDC* policies on *ULUE*. Urban innovation capacity directly affects the research and development of technology and the application of sustainable energy, as well as its comprehension and responsiveness to new energy policies. This examination enabled a thorough exploration of the influence mechanism of urban innovation capacity on the implementation of pilot city policies and land use efficiency, ultimately facilitating the provision of scientific policy recommendations and references for the construction of *NEDC*s. Present studies tend to employ the number of patents applied or authorized to measure the urban innovation capacity [57,58]; however, these kinds of data are lacking in the openness, timeliness, and completeness of the information. Therefore, in this study, we learned from the research of Kou and Liu [59], selected the urban innovation index, and calculated it in the following years according to the computational model put forward by FIND to enlarge the sample. Further, took take the 75% quantile and 50% quantile of the urban innovation index as the division criterion to divide the sample city into high-innovation cities, medium-innovation cities, and low-innovation cities. The model was set as follows:

$$\ln ULUE_{it} = \eta_0 + \eta_1 NEDC_{it} \times Innovation + \eta_2 X_{i.t} + A_i + T_t + \varepsilon_{it} \quad (9)$$

where Innovation represents urban innovation capacity, the coefficient, η_1, describes the effect of *NEDC* on the *ULUE* of cities with different urban innovation capacities. The results are reported in columns (4)–(6) of Table 6.

From the perspective of urban innovation, the regression coefficients of medium-innovation cities and low-innovation cities were both significantly positive, while high-innovation cities were positive but not significant, which means that the *NEDC* policy in low-innovation cities and medium-innovation cities could greatly promote the growth of the *ULUE*. This conclusion is consistent with that of Liu and Zhao [60]. Cities with higher innovation capabilities enjoy superior advantages in technology, talent, and policy, enabling them to respond and adapt more swiftly to *NEDC* pilot policies, and are more likely to achieve policy objectives. However, such cities may also encounter specific challenges that could mitigate the effectiveness of these policies. For example, in these regions, the developmental pace of new energy technologies may be faster, but concurrently, it could be more complex and diverse, with heightened competition among various technologies, resulting in increased challenges when selecting the appropriate technologies and investment directions during policy implementation. Moreover, regions with higher innovation capabilities typically have higher levels of economic development, which could translate into the lower demand and willingness of residents to adopt new energy sources and comparatively higher energy substitution costs. These factors may also impede the

implementation effectiveness of *NEDC* pilot policies. Therefore, when implementing such policies in regions with higher innovation capabilities, it is crucial to consider the local context comprehensively and develop corresponding policies and measures that can maximize policy effectiveness. Additionally, it is imperative to conduct regular evaluations of policy effectiveness throughout the implementation process to identify and address these issues promptly, ensuring that policies achieve the intended effects.

5.3. Limitations and Future Perspectives

In this study, we explored the effects of the *NEDC* policy on the *ULUE* from the perspective of the mediating effect of *ISA* and *ISR*. However, there are still some limitations that need to be further explored in future research. Firstly, considering the availability of the sample data, we excluded the cities with new energy demonstration industrial parks, which could lead to missing data. Secondly, the selection of the *ULUE* indicator and control variables all came from previous studies, which might not reflect the orientation of green and low-carbon utilization of urban land. Therefore, future research should choose these indicators according to the research background and research questions to enhance the rationality of the research design and the validity of the policy recommendations. Thus, researchers need to use more methods (e.g., synthetic control method and instrumental variable method) to expand our understanding of the interaction between the *NEDC* policy and *ULUE*.

6. Conclusions and Policy Implications

6.1. Conclusions

Amidst the escalating gravity of global environmental pollution, climate change, and fossil energy dependence, nations worldwide are persistently engaging in recalibrating their energy infrastructure to align with the clarion call of the United Nations Climate Change Conference (UNCCC) and their Sustainable Development Goals (SDGs). Their collective endeavor seeks to contribute to China's pursuit of carbon peaking and carbon neutrality while concurrently fostering sustainable socioeconomic development on a global scale. Since the *NEDC* policy was first proposed in 2012, the past decade has witnessed the rapid development of the *NEDC* construction and urban industrial structure, which has further affected the growth of the *ULUE*. In this regard, the PSM-DID model was employed to empirically explore the mechanism and effect of the *NEDC* policy on the *ULUE* based on a dataset of 285 Chinese cities during 2003–2019. Moreover, a mediating model was conducted to verify the mediating effects of *ISA* and *ISR*. Furthermore, rigorous robustness tests and heterogeneity analyses were undertaken. The key findings of this study are summarized as follows:

(1) The establishment of *NEDC*s yielded a substantial enhancement in *ULUE*. By the investment-pulling effect, innovation-driven effect, and industrial structure effect, the construction of these demonstration cities exerted a transformative influence on the flow of urban economic production factors, thereby impacting the intricate fabric and configuration of urban land use. The results of the PSM-DID model show that the *NEDC* policy increased the *ULUE* by 17.0%, indicating that the *NEDC* policy was beneficial to the growth of the *ULUE*. This dynamic effect analysis also showed that the dynamic effect of *NEDC* on *ULUE* experienced a steady growth trend from the implementation of the *NEDC* policy.

(2) It is noteworthy to mention that the process of *NEDC* construction engendered a mediating effect on the *ULUE* through the prism of industrial structure. Among these effects, the mediating impact of industrial structure advancement was the most pronounced, while the mediating impact of industrial structure rationalization did not manifest a statistically significant effect.

(3) Remarkable disparities arise in the influence of the *NEDC* policy on the *ULUE*, which is contingent upon urban geographic location and innovative capacity. The heterogeneity analysis revealed the sequential augmentation of the promotion effect on

ULUE, moving from eastern to central to western cities, as well as from cities with high innovation capacities to those with medium and low innovation capacities. Furthermore, in comparison to eastern cities and cities with high innovation ability, the central and western regions, along with cities possessing a medium and high innovation capacity, experienced substantial improvements in *ULUE* through the implementation of demonstration city construction initiatives.

6.2. Policy Implications

Drawing upon the aforementioned conclusions, this paper presents the following policy implications with a global perspective and dimension that could serve as a reference for countries intending to explore the construction of new energy demonstration cities:

(1) The government in developing countries should steadfastly adhere to the New Energy Demonstration City (*NEDC*) policy and endeavor to expand its pilot program on a national scale. When recognized as a vital measure to bolster high-quality development, the governments should enhance the selection criteria for *NEDC* designation. Local governments, leveraging their regional characteristics, should actively vie for recognition as *NEDC* pilot cities, thereby enjoying associated policy incentives, including tax benefits, financial subsidies, and technological support. These incentives could attract high-tech enterprises and stimulate social investment, thereby elevating the productivity and efficiency of urban land. Simultaneously, customized selection criteria should be established to accommodate temporal and local conditions, guiding all regions to proactively apply for pilot city status, fostering a competitive environment, and propelling the harmonized development of regional land use and urban economy.

(2) Recognizing the considerable positive mediating effect of the Industrial Structure Adjustment (*ISA*) in the relationship between the *NEDC* policy and *ULUE*, local governments should prudently steer the development trajectory of local high-tech industries, contributing to the advancement of regional new energy and low-carbon economies. On one hand, local governments should enhance talent support and infrastructure development for new energy initiatives, facilitating the unhindered flow of socioeconomic factors and fostering the growth of high-tech industries. On the other hand, local governments should support an effective transition from primary and secondary industries to tertiary industries, as well as a shift from high-pollution industries to low-carbon industries through strategic industrial development planning. This approach could ultimately fuel the progress of *ULUE*.

(3) The establishment of *NEDC*s should duly account for heterogeneity among cities. The governments of various countries should formulate targeted support policies according to the location conditions of different types of cities in different countries, accurately locate the development direction, and systematically expand the scope of demonstration cities, with particular emphasis on less developed countries and cities, as well as cities with low innovation capabilities. Concurrently, local governments should diligently monitor and evaluate their policy's impact, implementing effective *NEDC* monitoring and a withdrawal mechanism to ensure the long-term efficacy of the *NEDC* policy, which is of great significance for the realization of SDGs and China's goals of carbon peaking and carbon neutrality.

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