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A Two-Stage Evaluation of China's New Energy Industrial Policy Package

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Abstract: Energy structural transformation plays a strategically important role in achieving the dual-carbon reduction goals. Among the various approaches to carbon reduction, the Chinese government regards the growth of the new energy industry as an essential means. Considering that the government policy support determines the long-term growth of the new energy industry, how to improve and optimize the policy support system has always been the core issue. Based on the fact that policy evaluation is a prerequisite, and the new energy industrial development requires the government to promote solutions in the form of a policy package rather than just individual policies, we investigate whether the implementation of the new energy industry policy package (NEIPP) is effective through an empirical case study of Shanghai. A two-stage evaluation method, which integrates the content analysis method (CAM) and synthetic control method (SCM), was used to empirically evaluate the actual effect of the NEIPP. At Stage One, four policy goals were summarized. SCM was used to identify the pure multi-effect of the NEIPP. The results showed that the NEIPP had a significant positive effect on green economic growth and industrial structure, while having a negative effect on carbon emissions. The NEIPP had no impact on the promotion of technological innovation. Several policy implications were drawn from this study.

Keywords: policy package; new energy industry; two-stage evaluation; content analysis method; synthetic control method; Shanghai

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1. Introduction

Under the current grievous situation of the energy crisis, resource shortage, and the increasing enhancement of global warming, how to guarantee sustainable supplies of energy and reduce carbon emissions have become the two core policy issues worldwide [1–3]. Many countries have shifted their environmental policies to focus on promoting energy structural transformation and actively promoting changes in the way energy is produced and used to improve energy efficiency. Among all these government initiatives, developing new energy industries plays a strategically important role in addressing the global energy crisis and climate change, as it not only affects a country's energy structure transformation and energy conservation, but also further influences carbon emission reduction [4]. Accordingly, stimulating the development of the new energy industry to promote energy structural transformation has become a major policy issue.

As one of the largest and most economically significant developing countries in the world, China is currently entering a crucial phase of energy structural transformation since the year of 2020 when the government set the goal of achieving carbon peak by 2030 and carbon neutrality by 2060 (Dual-Carbon Target). Pursuing the Dual-Carbon Target creates an urgent demand for the green-oriented energy transition, the Chinese government regards the growth of the new energy industry, including the solar energy industry, the hydrogen energy industry, and so on [5], as an essential means of energy structure transformation and carbon emission reduction. Through making use of various policy instruments to promote the utilization and development of new energy, the Chinese new energy industry has achieved booming growth in the past few decades [6]. Admittedly, the Chinese government's vigorous development in the new energy industry can solve the national energy puzzle and achieve sustainable economic growth. While limited by factors including enormous capital investment, advanced technology barriers, and pervasive financing risk in the early stages of new energy industrial development, its long-term growth depends heavily on financial, technological, and commercial support from the government. Consequently, how to improve and optimize the policy support system for the new energy industry has always been the focus of academic and policy discussions. It is recognized that policy evaluation is a prerequisite for the optimization of the existing policy system and for the improvement of the effective policy supply. Therefore, there is a pressing need to conduct a comprehensive assessment of the existing new energy policies under the background of carbon peaking and carbon neutrality.

In practice, the new energy industry is characterized by its complexity and high degree of systemic interdependence, which objectively require the government to promote new energy industrial development in the form of a policy package rather than isolated individual policies. Although the term policy package has not been explicitly used in the area of the new energy industry, scholars have employed similar concepts, such as policy mixes, policy group, and policy combination [7,8], to convey the same meaning. Building on previous research, we introduce the concept of a policy package in our analysis of the new energy industry, defining it as a combination of policies implemented in the way that is synergetic and complementary to each other in a given region, which shares a common conceptual output, has a similar orientation, and serves the same strategic objective. Compared to a specific or single policy, a policy package involves various policy texts issued by different levels of government and relevant functional departments; a complete policy package is usually composed of the main policy and a series of sub-policies. Each sub-policy focuses on different directions and contents under the value orientation of the main policy, thus forming a vertical pyramid structure. Additionally, the policy package has specific characteristics, which include the multidimensional and hierarchical objective structure [9]. For instance, when the local government aims to pursue the development of the new energy industry, it always considers regional green economy growth as a long-term goal. This complexity makes it more challenging to analyze, especially to evaluate the new energy industrial policy package (NEIPP).

Although some scholars have drawn attention to the study of new energy industry policies' effectiveness in China [10], in the extant policy evaluation research, most of these emerging studies have mainly focused on using some policy evaluation method to evaluate the influence of new energy policy on singular objectives. There are very few studies that discuss the evaluation of new energy industrial policy packages; especially, empirical studies that exactly assess the actual multi-effectiveness of the NEIPP are extremely insufficient. Given that the use of policy packages has been theoretically proven to be significant during the new energy industry development and that policy packages have the specific characteristics of a multidimensional and hierarchical objective structure, a key question arises: how can scientific methods be used to evaluate their diverse and multidimensional impacts? Therefore, in this exploratory study, we attempt to introduce a two-stage evaluation method that integrates the content analysis method and synthetic control method to empirically evaluate the actual effect of the new energy industrial policy package. In the first stage, we attempt to summarize the diversified policy goals through deconstructing the various new energy industrial policy texts based on the method of content analysis, then decompose the abstract and general strategic objective into observable and measurable specific goals. In the second stage, we take the counterfactual policy evaluation method, namely the synthetic control method, to synthesize virtual control groups on each dimension of specific goals separately and then compare the differences in policy effectiveness between the treatment group and the virtual control group.

2. Literature Review

The existing literature has broadly established a consensus that the development of the new energy industry is highly dependent on government policy support. Accordingly, they have extensively and deeply studied the new energy industry policy, which provides a solid theoretical foundation for our analysis of the NEIPP. Considering that we mainly focus on evaluating the actual effectiveness of the NEIPP, this paper chiefly relates to the literature on policy packages and new energy policy evaluation.

2.1. Literature Review on Policy Packages

Since Rizwanul Islam pioneered the concept of the policy package as early as 1980 in his study of public food distribution in Bangladesh [11], scholars have become increasingly aware that overemphasizing a single policy and ignoring linkages between policies can lead to biased and one-sided policy analysis [12–15]. Accordingly, more attention has been paid to the study of policy packages [16–18]. Among these related research studies, a full understanding of the conceptualization is crucial. Actually, the previous literature has basically reached a consensus on the connotation of the term policy package, and most have regarded it as a set of related policies that are designed and implemented together in order to create a comprehensive and coordinated approach to achieve certain governmental goals [19–21]. In general, the policy package is approximately akin to the comprehensive treatment philosophy of Chinese traditional medicine; even though there are differences in policy instruments and policy components, all have similar guiding principles and a common strategic goal. Through bundling these related policies together, local governments can ensure that they are addressing all aspects of the specific goal in a cohesive and effective manner [18,22]. Compared to a single policy, policy packages are often more effective in coping with realistic and complex issues. Recently, policy packages have been widely used in complicated areas, and studies have explored their application in areas, such as technological innovation [23–25], social security [26,27], targeted poverty alleviation, and rural social assistance [28].

2.2. Literature Review on New Energy Policy Evaluation

To better understand the current research trends, this paper further categorizes the existing evaluations of new energy industry policy evaluation research from the dimensions of policy subjects and objects. One type of policy evaluation can be conducted from the perspective of policy contents. Scholars have evaluated the effectiveness of new energy policy from the perspective of the policy itself, including the following: (i) Evaluations based on the inherent attributes of the policy texts, where most scholars describe and analyze policy texts from aspects such as annual trend changes, issuing institutions, text form, and completeness, using these standards to assess the intensity of new energy industry policies [29,30]; (ii) Deconstructing the content of new energy policies from the perspective of policy tools and evaluating the government's preferences and policy tool selection during the new energy industry development [31–34]. When evaluating new energy industry policy, scholars have always selected the various policy texts as the first material for analysis. Factually, deconstructing policy texts can better help scholars to gain insights into the content, structure, and objectives of policy packages from the inherent normativity of the policy texts since they offer objective evidence recording government intentions, policy objectives, and implementation processes. Therefore, the current academic analysis of new energy industry policy texts can provide certain references for us to explore the multidimensional effects of new energy industrial policies based on the policy text content.

The second type of policy evaluation can be conducted from the perspective of policy objects, mainly paying attention to investigating their actual influence on promoting the development of a new energy industry and regional economic growth. In these evaluations, many scholars used the new energy policy texts as independent variables and the policy results, such as carbon emission reduction [2,35,36], carbon capture technology utilization [37–39], and green economic growth [40–42], as dependent variables, further constructing corresponding econometric models and empirically exploring the relationship between the policy intervention variables and policy outcome variables. Among these studies, the policy objects' changes before and after policy implementation are the focus of scholars' research. Although scientifically rigorous methods of policy effect evaluation can help us to obtain an objective understanding of the new energy industry policy, evaluation of the single new energy industrial policy's effects on its single policy goal often overlook the multidimensional and diversified influence of new energy policy packages.

From the above analysis, current scholars have conducted in-depth and beneficial explorations of new energy policies, which provide a certain degree of literature support for our study. However, the existing literature mainly focused on one specific new energy policy and evaluated its effect on a single policy goal rather than putting all new energy-related policies into the same evaluation framework and investigating the multidimensional and diversified influence of a new energy policy package. Compared with the previous studies, we intend to overcome the limitations of the existing literature in the following aspects: (1) This paper introduces the policy package into the new energy industry area and focuses on empirically exploring the actual effect of the policy package. In the extant literature, the only few existing studies on the NEIPP discussed a similar concept—policy mixes—but only investigated the influence of the mix of feed-in tariffs, carbon emissions trading, and R&D subsidies. We expand the policy mix, and all policies related to developing the new energy industry are included in the policy package. (2) Prior studies have always used counterfactual policy evaluation methods to investigate the policy's actual effect, while these methods are only suitable for the evaluation of a single policy goal. Considering that the NEIPP has the characteristic of a multidimensional and hierarchical objective structure, we attempt to introduce a two-stage evaluation method that integrates the content analysis method and synthetic control method to evaluate the actual effect of the NEIPP empirically from the perspective of multidimensional goals.

3. Methodology for Evaluating the Effect of the NEIPP

As outlined in the introduction part, we adopt a two-stage evaluation method integrating the content analysis method (CAM) and synthetic control method (SCM) to empirically evaluate the actual effect of the NEIPP. We use this method mainly based on the two following considerations: Firstly, a policy package consists of a set of interrelated policies issued by different governmental departments and has the salient features of a multidimensional and hierarchical objective structure that is distinguished from a single policy. These unique features lead the evaluation of policy packages to face the challenge of how to identify multidimensional goals from the various new energy policy texts. Thus, in the first stage of our evaluation, we introduce CAM to clarify the overall and specific objectives of the policy package to be evaluated, and translate the target language into measurable indicators. Secondly, identifying the net policy effect has always been the core issue of policy evaluation. Although some estimation methods, such as DID, PSM, and RD, have advantages in identifying the policy impact, they require multiple untreated and treated units as a prerequisite. Considering that we chose Shanghai as our single evaluation example, which does not meet the requirement of having multiple treated units, SCM is selected as the empirical methodology, because it is a critical methodology widely used to assess policy outcomes with very few treated units. Therefore, in the second stage of our evaluation, we use SCM to identify the multi-effect of the NEIPP. The specific steps of our two-stage evaluation method are as follows.

3.1. Text Analysis Based on the NEIPP

Current policy evaluation mainly focuses on assessing the degree to which policy objectives have been achieved; thus, clarifying the policy objectives is the first step to empirically evaluating the NEIPP. As policy objectives represent the intentions and expectations of policymakers and implementers, they are explicitly articulated in various policy documents. We begin by applying CAM to clarify both the overall and specific policy objectives through interpreting the content, structure, language, etc., of the policy texts. Then, we need to translate the target language into measurable indicators, namely decompose the policy objectives into specific, observable, comparable, and calculable variables, which serve as an outcome variable for the next counterfactual evaluation of the NEIPP. Figure 1 illustrates our refinement process of the NEIPP.

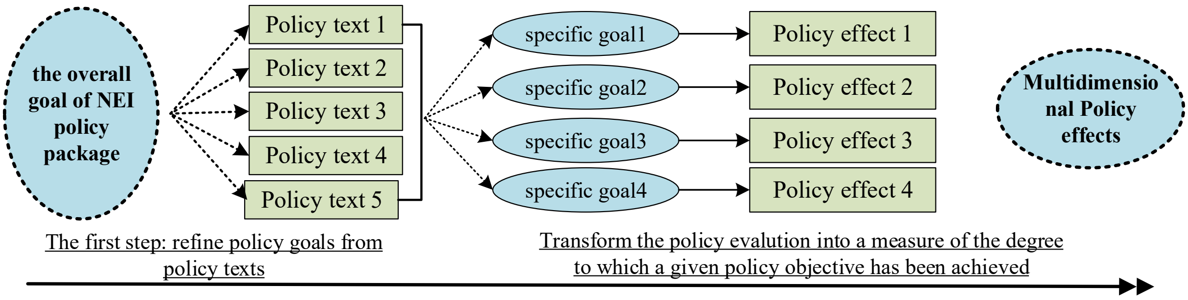


Figure 1. Refinement process of the NEIPP.

3.1.1. The First Step of Text Analysis: Policy Text Collection and Coding

Collecting related policy documents is the first step for our evaluation. In this study, the selection of new energy industry policy should adhere to the following three conditions: Firstly, the NEIPP should have a clearly defined overall objective, typically the strategic goal for new energy development set out by the Central Committee of the Party. Secondly, all policies should be formal and legitimate. Lastly, the title or content of the policy should explicitly correspond to the overall objective of the NEIPP. After collecting all the related new energy industry policies, we have filtered the policy texts through seeking advice from some related experts. Then, we use the method of policy text analysis to encode the relevant policy text, according to the Grounded Theory Approach [43] Generally, the steps for policy coding are as follows:

(1) Open coding: using concise phrases as labels to conceptualize each clause in the policy text, and using the representative key terms in the policy text as much as possible to abstract the policy text into a set of concepts.
(2) Axial coding: classifying and integrating the concepts generated by open coding to form main categories. If the policy text has a clear objective concept, we mark it directly as the main category. If the policy text has concepts related to policy tools and measures, we then extract and aggregate the policy objectives from them to form the main category.
(3) Selective coding: confirming the core category of the NEIPP, namely, the overall objective of the NEIPP. Further, we adjust and optimize the relationship between the different concepts, main categories, and core categories, so that the overall framework has the maximum coverage and explanatory power.

3.1.2. The Second Step of Text Analysis: Establishing Evaluation Index System

Policy text coding provides us with some specific policy objectives, which serve as the outcome variables for the next SCM evaluation. Given that the prerequisite for SCM evaluation is that the outcome variable is measurable and observable, the next crucial step is to further translate the specific policy objectives into observable quantitative indicators and build up a well-defined and hierarchical objective system. The objective system includes three levels of indicators: the overall objective as the first-level indicator, the specific goal as the second-level indicator, and the third-level indicator as the representative policy object directed by the specific policy objective.

3.2. SCM to Identify the Multi-Effect of the NEIPP

In the second stage of our evaluation, we use SCM to identify the multi-effect of the NEIPP. As we all know, SCM has gained popularity in recent years due to its ability to address the challenges of traditional methods, such as selection bias and unobserved confounding variables, and it is particularly useful when a randomized control trial is not feasible or ethical. In contrast with the traditional DID method, the key idea behind SCM is to create a synthetic control group that closely resembles the treated group before the intervention occurred. By combining information from multiple control units, we create a weighted average that closely matches the characteristics of the treated unit; further comparing the outcome of the treated unit with the synthetic control group, we can estimate the causal effect of the treatment. According to the above analysis and some related studies [44], the basic principle of SCM is as follows:

Suppose we have a treated unit (such as a region that implemented a specific policy) and multiple control units (regions that did not implement the policy). The goal is to evaluate the impact of this policy on the treated unit. The policy effect formula is $\alpha_{it} = Y_{it}(1) - Y_{it}(0)$, where 0 represents the region that did not implement the policy, and 1 represents the region that implemented the policy. Accordingly, $Y_{it}(1)$ represents the potential outcome variable of region i in period t implementing the new energy policy package, while $Y_{it}(0)$ represents the potential outcome variable of region i in period t not implementing the policy package. Therefore, the counterfactual outcome variable $Y_{it}(0)$ is constructed for calculation as follows:

$$Y_{i,t} = Y^{N}_{i,t} + D_{i,t} \quad (1)$$

$$Y^{N}_{i,t} = \theta_t Z_i + \lambda_t \mu_i + \varepsilon_{i,t} \quad (2)$$

In Equations (1) and (2), for the policy implementation unit, $i = 0$; for the control group (not affected by policy intervention), $i = 1, 2, \ldots, j$; the interval before policy implementation is $t = 1, 2, \ldots T_0$; and the interval after policy implementation is $t = T_0 + 1, T_0 + 2, \ldots, T$. $Y_{i,t}$ is the actual result. $Y^{N}_{i,t}$ is the expected result of the treatment group (i.e., the region affected by the policy intervention) in the absence of policy intervention. $\varepsilon_{i,t}$ is the disturbance term that varies with individuals and time. θ_t refers to the $(1 \times F)$ dimensional vector of observed common factors. Z_i is the $(F \times 1)$ dimensional vector of observed factor loadings. λ_t is the $(R \times 1)$ dimensional vector of unobserved common factors. μ_i is the $(R \times 1)$ dimensional vector of unobserved factor loadings. $\varepsilon_{i,t}$ is the short-term shock that cannot be observed in each region, with a mean of 0.

The SCM aims to find a set of weights w^{*}_{i} such that for any $i \in \{1, 2, \ldots, J\}$, the following approximate relationship holds:

$$Y_{0,t} \approx \sum\nolimits_{j=1}^{J} w^{*}_{j} Y_{j,t} (t \leq T_0) \quad (3)$$

This means that before implementing the policy ($t \leq T0$), a counterfactual synthetic group similar to the treatment group can be constructed by weighting the predictive variables of each sample in the control group. The observed result $Y_{0,t}$ of this synthetic group can be approximated by the weighted result of other groups.

$$Z_{0,t} \approx \sum\nolimits_{j=1}^{J} w^{*}_{j} Z_j \quad (4)$$

This means that the selected weight w^{*}_{j} also needs the covariate Z_0 of the treatment group to be approximated by the weighted sum of the covariate Z_j of the control group.

An important step is to find a better set of weights w_j through the constrained optimization problem:

$$\{\hat{w}_1, \hat{w}_2, \ldots, \hat{w}_j\} = \text{argmin}\left\|X_0 - \sum_{j=1}^{J} w_j X_j\right\| \quad (5)$$

There exists a region of $w_j \geq 0$ satisfyingj $\in \partial\{1, 2, \ldots, J\}$ and $\sum_{j=1}^{J} w_j = 1$.

3.3. Robustness Test on the Multi-Effect of the NEIPP

To ensure the robustness and reliability of our SCM evaluation results, we apply the permutation test method, which is widely used in SCM research to conduct a robustness test. The permutation test is a quasi-rank test method similar to the rank test in statistics, with the aim of calculating the probability of other provincial units in the control group exhibiting the same policy effects as the treatment group provincial units. The judgment basis of the ranking test is the distribution difference of the prediction error curves of the treatment group provinces and other provinces. The further the curve is from the gathering place of most treatment group curves, the better the robustness test result is represented.

4. Empirical Evaluation on the NEIPP of Shanghai

4.1. Research Area

We selected Shanghai as our empirical case for evaluating the NEIPP for several reasons: Firstly, as the largest and most developed city in China, Shanghai has faced significant challenges brought by excessively traditional energy use and has been under considerable pressure to transform its energy structure. Thus, there is an extremely urgent need for Shanghai to promote new energy industrial development. Furthermore, Shanghai is a prominent city in China in the field of new energy development with a large market demand, a complete industrial chain, strong innovation capabilities, and a supportive policy environment for new energy industrial development. As a result, Shanghai boasts a wide range of new energy policies that encompass new energy vehicles, new energy industrial parks, and new energy technology innovation, etc. These policies form a comprehensive and cohesive package with the strategic goal of developing new energy as a burgeoning industry. More importantly, Shanghai has undertaken a number of pilot projects related to the development of new energy issued and organized by the central government, such as the private purchase subsidy pilot policy for new energy vehicles and the new energy demonstration city project, among others. To implement central government strategies in the new energy industry, local governments are more active in providing policy support.

4.2. Policy Collection and Text Coding Based on Shanghai's NEIPP

4.2.1. Policy Text Collection

In the history of China's new energy industrial development, 2010 is a landmark year. That year, the Emerging Energy Industry Development Plan from 2011 to 2020 was formulated by the China National Energy Administration, which was the first national strategic plan for large-scale development of the new energy industry over the past decade. Meanwhile, the Notice on Carrying out Subsidy Pilots for the Private Purchase of New Energy Vehicles was jointly issued by various ministries of the government in 2010, which launched a subsidy pilot for the private purchase of new energy vehicles in cities such as Shanghai, Hangzhou, Hefei, Shenzhen, and other cities. These policies not only marked the formal establishment of Shanghai's new energy industrialization policy objectives, but a large number of related supporting policies were also introduced and rapidly developed in the following year. From the perspective of policy changes, this stage shows obvious policy breakpoint characteristics, providing a clear time division node for counterfactual inference. Therefore, we take 2010 as the observation starting point, use keywords such as new energy, emerging strategic industry, photovoltaic, solar energy, etc., and collect relevant policies, regulations, and normative documents from databases, such as the Peking

University Law Database, Laws and Regulations Database of the People's Republic of China, Law Star, and the official website of the local government of Shanghai. After initially collecting 143 policy texts, through careful review and screening, duplicate and non-related texts were excluded, and finally, 57 policy texts closely related to the new energy industry policy were determined, providing a basis for further research. Figure 2 shows the process of NEIPP text collection.

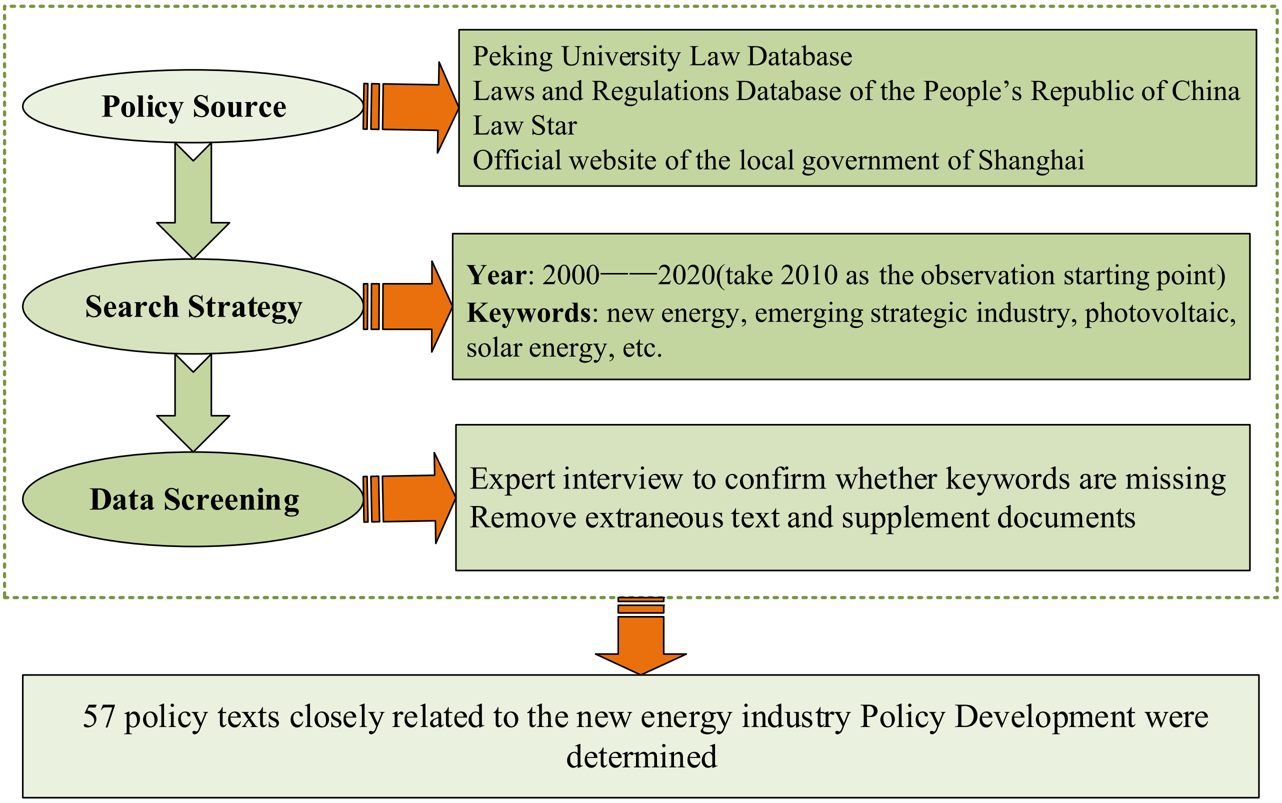


Figure 2. Process of NEI policy text collection.

4.2.2. Policy Text Encoding

This paper utilizes Nvivo 11Pro and Python 3.9 software to assist in the encoding of policy texts. During the open coding stage, we extracted key words from the 57 policy texts, initially refining and summarizing 27 concepts, mainly about the instruments and measures adopted by the government to promote the new energy industrial development. Then, coming to the stage of axial coding, we abstracted these 27 concepts into government objectives in new energy industry development based on the logical relationship between government action and objectives. Four main categories were obtained at this stage, namely, realizing energy saving and emission reduction, promoting industrial restructuring and upgrading, improving regional technological innovation, and achieving sustainable urban economic development. In the last stage of selective coding, we mainly merge and adjust the relationships between concepts, main categories, and core categories according to the principle of genus relationship and maximum difference. The final result is shown in Table 1.

Table 1. Results of policy text encoding.

Core Category	Main Category	Concept
New Energy Industry development	Industrial Structure Optimization	❖ Promote the cross-border integration of energy with transportation, finance, and other industries. ❖ Focus on building a strategic emerging industry and leading industry development system, centered around three major industries, following the '9 + X' model. Promote the transformation, demonstration, and application of scientific and technological achievements from innovative enterprises. ❖ Promote the low-carbon transformation of the industrial structure, aiming to achieve the 'five transformations' in industrial development.
	Sustainable Economic Development	❖ Develop clean and low-carbon new energy industries such as new energy vehicles, wind power, photovoltaics, etc. ❖ Improve energy utilization efficiency and safety. ❖ Reduce energy consumption intensity and carbon emission intensity. ❖ Promote energy structure optimization and transformation and upgrading. ❖ Build a green transportation energy system. ❖ Create an international energy innovation center. ❖ Support the integrated development of the Yangtze River Delta and promote international cooperation. Fully implement energy efficiency benchmarking in major energy-consuming sectors, key industries, and for main energy-consuming products.
	Energy Saving and Emission Reduction	❖ Accelerate the green upgrading of the energy industry and actively promote the development of new energy such as photovoltaics, wind power, hydrogen energy, etc. ❖ Promote the low-carbon transformation of industry. ❖ Encourage green development in urban and rural construction, scaling up the promotion of ultra-low energy consumption buildings and energy-saving renovations of existing buildings. ❖ Build a comprehensive green transportation system, vigorously promoting the new energy transformation of terminal transportation tools. ❖ Improve the energy efficiency of the circular economy industry and carry out the construction of waste material recycling system demonstration cities. ❖ Increase the intensity of scientific and technological innovation and accelerate the basic research and frontier technology layout of carbon neutrality. ❖ Consolidate and enhance the carbon sink capacity and steadily promote the plan of the "Thousand Parks". ❖ Hold the Shanghai International Carbon Neutrality Technology, Product, and Achievement Expo and guide the whole population to participate in low-carbon actions.

Table 1. *Cont.*

Core Category	Main Category	Concept
New Energy Industry development	Green Technological Innovation	❖ Support the research and development of new energy independently innovative products and the construction of industrial bases. ❖ Accelerate the breakthrough of power battery technology and lay out the research and development and industrialization of solid-state batteries and other next-generation products. ❖ Support enterprises to continuously carry out low-carbon/zero-carbon/negative-carbon basic research. ❖ Promote the application of energy-saving new processes, new technologies, new equipment, and new products. ❖ Strengthen support for projects and product technologies in energy-saving environmental protection, new energy, low-carbon transportation, green low-carbon building, and carbon capture and utilization. ❖ Focus on the actual situation of the city's industrial green low-carbon development and regularly publish the green technology catalogue.

4.3. Measurement of Objective Variables

In the above steps, we conclude and extract four specific policy objectives from 57 policy texts. In the following steps, we need to translate the specific policy objectives into observable quantitative indicators. Following the practice adopted in existing studies, we operationalize these variables, such as urban economic sustainable development, industry transformation and upgrade, carbon emission, and technological innovation. Specifically, the variables are as follows:

- Sustainable Economic Development. We constructed a comprehensive index system, naming this indicator Green Total Factor Productivity (GTFP), to measure Shanghai's economic sustainable development. This index system includes input variables and desirable output variables as well as undesirable output variables, and the specific indicators are as follows: the number of employees in the secondary and tertiary industries (labor input); the gross fixed capital stock of each city, which is measured by the perpetual inventory method (capital input) and the total amount of electricity usage of each city (energy input). The output variables contain not only desirable but also undesirable variables. As for the desirable output, we mainly select economic output measured by GDP with a constant price in 2000 and environmental output measured by industrial waste. We adopt the SBM-DDF method to calculate GTFP in China for each provincial unit. Generally, GTFP reflects the production efficiency of each provincial unit while considering environmental factors and is an important indicator for measuring the sustainable development dimension of new energy industry policies.
- Energy Saving and Emission Reduction. We calculate the carbon emissions of each provincial unit based on the IPCC method, using the total consumption of ten types of energy. Carbon emissions reflect the environmental burden of each provincial unit and are an important indicator to measure the energy-saving and emission-reduction dimension of new energy industrial policies.
- Industrial Structure Optimization. We use the ratio of the output value of tertiary industry to secondary industry to measure the industrial structure of each provincial unit. The industrial structure reflects the economic development level and structural transformation degree of each provincial unit. It is an important indicator to measure the industrial structure upgrade of new energy industry policies.
- Green Technological Innovation. We use the number of green invention patent authorizations of each provincial unit to measure its technological innovation ability. It can well reflect the innovative activities of each provincial unit in the field of new energy,

and thus it is an important indicator to measure the technological innovation of new energy industry policies.

To construct a synthetic control group, this article also selects some important factors that may affect local new energy industrialization as predictive control variables, including urbanization level, foreign direct investment, government intervention, transportation infrastructure, social consumption level, and labor level. These variables may have a direct impact on the result variables, representing the early endowments of different regions. Table 2 shows the descriptive statistics of each variable.

Table 2. Statistical description of the selected variables.

Variable Type	Variable Description	Variable Name	Statistical Indicator	Mean	Standard Deviation
Outcome Variables	Optimizing Industrial Structure	Industrial Structure	Tertiary Industry Output/Secondary Industry Output	0.967	0.376
	Sustainable Development	GTFP	GTFP	1.306	0.263
	Energy Saving and Emission Reduction	Per Capita Carbon Emissions	Carbon Emissions (100,000 tons)/Population	9.086	8.123
	Technological Innovation	Technological Innovation	Number of Green Patent Authorizations	2386.141	5300.620
Predictive Control Variables	Regional Social Development Endowment	Urbanization Level	Urban Population/Total Population	0.488	0.142
	Regional Industrial Resource Endowment	Industrialization Level	Industrial Added Value/Regional GDP	0.350	0.082
	Regional Ability to Attract Foreign Investment	Foreign Direct Investment	(Total Amount of Foreign Direct Investment ×Exchange Rate of US Dollar to RMB)/Regional GDP	0.022	0.019
	Degree of Government Intervention	Government Intervention	Fiscal Expenditure/Regional GDP	0.210	0.100
	Regional Transportation Infrastructure Level	Transportation Infrastructure	Natural Logarithm of Highway Mileage	11.491	0.829
	Regional Social Resource Endowment	Social Consumption Level	Total Retail Sales of Social Consumer Goods/GDP	0.358	0.060
	Regional Logistics Transportation Capacity	Logistics Transportation Capacity	Natural Logarithm of Total Freight Volume	11.266	0.929
	Labor Resource Endowment	Labor Level	Natural Logarithm of Employment	7.614	0.807

4.4. Sample Selection and Data Collection

The subject of this study is the new energy industrial policy in Shanghai, mainly empirically examining the effects of this policy in promoting technological innovation, sustainable development, energy saving, and emission reduction and optimizing industrial structure. To evaluate the causal effect of the policy package, this study uses the SCM for cross-time zone analysis, constructs a synthetic Shanghai as a control group, and compares it with the real Shanghai where the policy is implemented. The sample period of this article is [1, T] = [2000, 2020], where the pre-policy intervention period is [1, $T_0 - 1$] = [2000, 2009], and the post-policy intervention period is [T_0, T] = [2010, 2020].

In the process of constructing the synthetic control group, the following principles should be met: firstly, selecting provincial units with similar economic, social, and technological characteristics to Shanghai before the implementation of the policy as the candidate control group to ensure the comparability of the synthetic control group; secondly, excluding provincial units that implemented similar new energy industry policies in the post-policy implementation period to avoid the interference effect of the policy. Finally, provincial units with missing or incomplete data were excluded to ensure the effectiveness of the synthetic control group. This article excludes Hong Kong, Macao, Taiwan, Tibet, and other regions because the statistical data for these regions are seriously missing. After these steps, the control group pool used by this article to synthetically control Shanghai includes the remaining 26 provincial units nationwide. Based on the principle of objectivity and authority, data for these provincial units were primarily collected from the Provincial Statistical Yearbooks, China Science and Technology Statistical Yearbook, China Labor Statistical Yearbook, city government website, NEA official website, and so on. For those missing data, we use the mean interpolation method to estimate and supplement the gaps.

The results of the fitted means of the predicted control variables compared with the real Shanghai are shown in Table 3. From the table, it can be seen that the difference between the real Shanghai and the synthetic Shanghai is small at the overall level. This indicates that the latter better fits the characteristics of the former before 2015. This further suggests that the synthetic Shanghai, weighted by the corresponding provinces, can be used to assess the policy effects of the real Shanghai on the dimensions for each of the outcome variables included in this study.

Table 3. Comparison of the fitted mean values of the control variables predicted by the synthetic Shanghai and the real Shanghai.

Predictive Control Variables	**Treated Shanghai**	**Synthetic Shanghai**			
		Economic Sustainable Development	**Energy Saving and Emission Reduction**	**Industrial Structure Optimization**	**Green Technological Innovation**
Urbanization Level	0.5335	0.468	0.479	0.454	0.444
Industrialization Level	0.428	0.392	0.405	0.398	0.309
Foreign Direct Investment	0.061	0.032	0.039	0.038	0.053
Government Intervention	0.209	0.233	0.0225	0.231	0.227
Transportation Infrastructure	9.287	10.862	11.015	10.866	10.808
Social Consumption Level	0.417	0.379	0.373	0.38	0.382
Transportation Capacity	11.439	11.182	11.353	11.058	10.811
Labor Level	7.091	7.039	7.12	6.893	7.021

5. Empirical Test and Analysis

5.1. Empirical Test Results

This paper selects Shanghai as the research sample and 26 other provinces as the control group. The SCM method is used to evaluate the pure policy effect of the NEIPP. We respectively compare the constructed counterfactual control group synthetic Shanghai with the treatment group real Shanghai in four aspects: the effect of the NEIPP on green technological innovation, economic sustainable development, industrial structure optimization, energy saving, and emission reduction.

5.1.1. The Impact of the NEIPP on Green Technological Innovation

The effect of Shanghai's NEIPP in promoting technological innovation can be observed by comparing the constructed counterfactual control group synthetic Shanghai with the treatment group real Shanghai. When the number of green patent authorizations is used as the outcome variable, Zhejiang (0.359), Jiangsu (0.062), Hainan (0.563), and Ningxia (0.017) constitute the synthetic Shanghai. The result shows that before the implementation of

Shanghai's new energy policy, the performance of the real Shanghai and synthetic Shanghai in terms of technological innovation was basically consistent, indicating that the synthetic Shanghai can effectively replicate the development trajectory of the real Shanghai before the policy implementation. However, after the implementation of the new energy policy, the two results still maintained a basically consistent trend, as shown in Figure 3. As of 2020, the number of green patent authorizations in the real Shanghai is only slightly higher than in the synthetic Shanghai, indicating that the effect of Shanghai's new energy industry policy in promoting technological innovation has not met expectations. This may be due to the fact that the strength and scope of Shanghai's policy in supporting technological innovation are not comprehensive enough. According to the Shanghai Energy Development Twelfth Five-Year Plan, the policy mainly focuses on new energy vehicles, wind energy, solar energy, and other fields, with less support for other new energy fields such as biomass energy, geothermal energy, and marine energy, which may cause Shanghai's new energy industry's technological innovation ability and level to be relatively limited, making it challenging to establish a diversified technological innovation system, which could affect overall development and competitiveness. In addition, Shanghai faces higher innovation costs as one of China's economic and technological innovation centers. The costs of labor, land, equipment, etc., are higher than in other provinces, putting pressure on innovation activities. At the same time, Shanghai pays more attention to the quality of innovation rather than quantity. New energy industry policies may be more inclined to support high-level innovation projects rather than many innovation projects, which may make it difficult to reflect policy effects in terms of quantity. In conclusion, although the policy's effect is not as significant as expected, it is worth noting that the actual Shanghai outperforms the synthetic Shanghai slightly. This suggests that while the policy's impact may not be substantial in terms of quantity, it may have contributed to a slight edge in the quality of technological innovation in Shanghai's new energy industry. This improvement highlights the policy's potential in promoting a sustainable and innovative new energy sector in Shanghai.

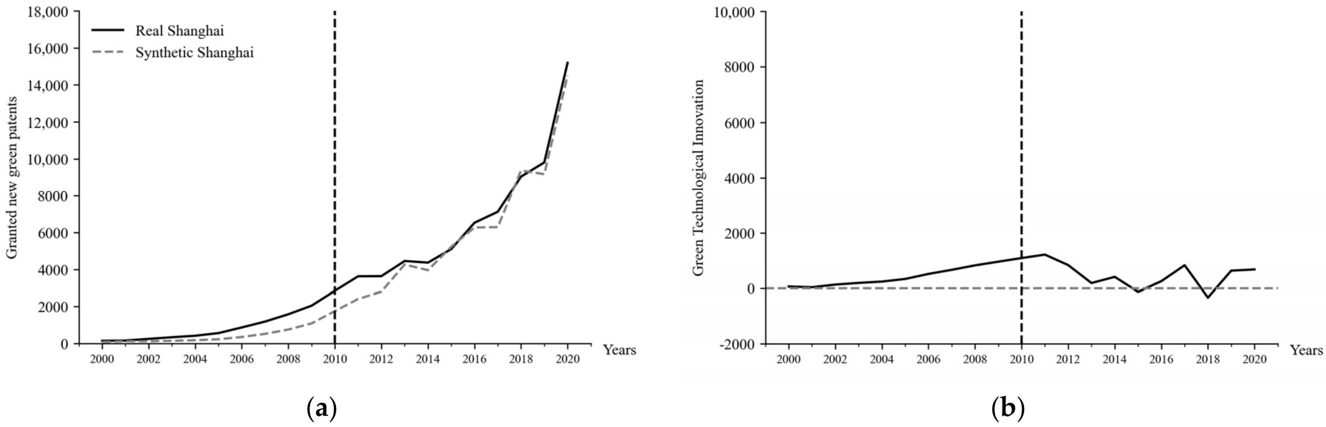
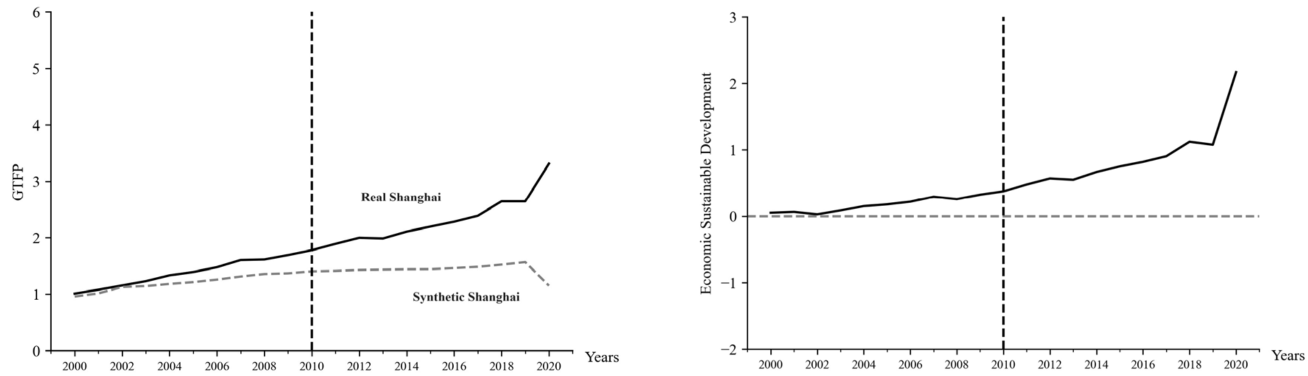


Figure 3. Impact of the NEIPP on the real Shanghai's technological innovation in contrast with the synthetic Shanghai: (**a**) Comparison of green technology innovation between real Shanghai and synthetic Shanghai: (**b**) Mean value gap between real Shanghai and synthetic Shanghai in green technology innovation.

5.1.2. The Impact of the NEIPP on Economic Sustainable Development

To study the impact of Shanghai's NEIPP on economic sustainable development, the real Shanghai can be used as the treatment group, and the counterfactual synthetic Shanghai composed of Zhejiang (0.508), Hainan (0.128), and Ningxia (0.364) can be used as the control group for comparison. When the green total factor productivity (GTFP) was used as the outcome variable, as shown in Figure 4, before the implementation of Shanghai's NEIPP, there was a certain gap between the real Shanghai and the synthetic

Shanghai in terms of economic sustainable development, indicating that the synthetic Shanghai did not fully simulate the development trend of the real Shanghai before the policy implementation, but the trends of the two were basically consistent, and there was a certain reliability of trend prediction. However, after the policy implementation, the GTFP of the real Shanghai was significantly higher than that of the synthetic Shanghai, indicating that the policy had a significant positive effect, which persisted throughout the observation period. As shown in Figure 4 and Table 4, the difference between the real Shanghai and the synthetic Shanghai in GTFP in 2020 was 2.169, indicating that the policy effect was significant. From the whole observation period, the difference showed an upward trend year by year, indicating that the real Shanghai's NEIPP policy had a significant policy effect on improving GTFP. This result may be caused by two reasons: Firstly, Shanghai's NEIPP covers multiple fields such as new energy vehicles, wind energy, solar energy, etc., providing comprehensive support and guarantees for the development of the new energy industry, promoting the scale expansion and technological progress of the new energy industry, as well as improving the resource utilization efficiency and environmental friendliness of the new energy industry. Secondly, Shanghai's NEIPP has strong innovation and foresight, introducing market mechanisms and incentives, stimulating the innovation vitality and competitiveness of new energy enterprises, and enhancing the core competitiveness and economic sustainable development ability of the new energy industry. For example, Shanghai's NEIPP encourages new energy enterprises to cooperate with scientific research institutions and universities, through strengthening technology research and development and thus improving the quality and performance of new energy products.



(**a**) (**b**)

Figure 4. Impact of the NEIPP on the real Shanghai's eEconomic sSustainable dDevelopment in contrast with the synthetic Shanghai: (**a**) Comparison of economic sustainable development between real Shanghai and synthetic Shanghai; (**b**) Mean value gap between real Shanghai and synthetic Shanghai in economic sustainable development.

Table 4. Policy effect.

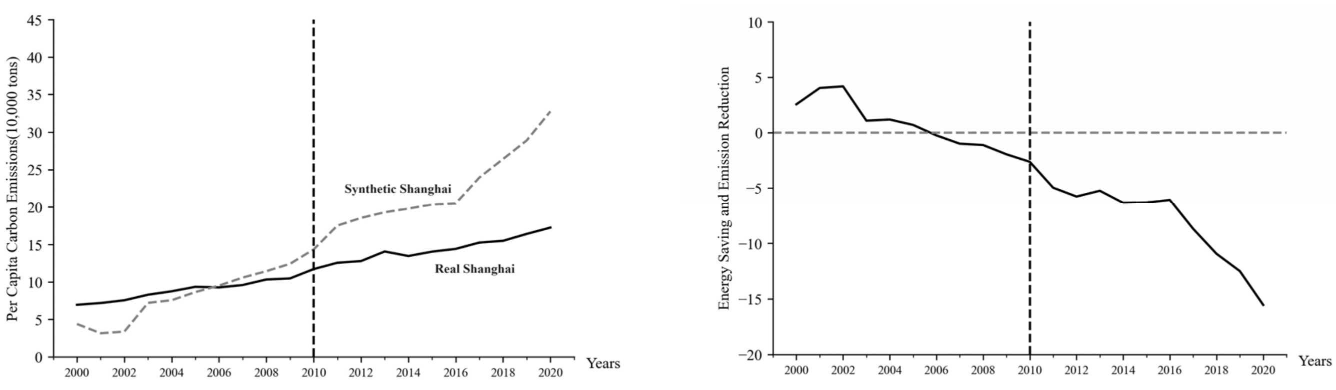
Year	The Difference between "Treated Shanghai" and "Synthetic Shanghai"			
	Economic Sustainable Development	Energy Saving and Emission Reduction	Industrial Structure Optimization	Green Technological Innovation
2000	0.051	2.562	0.237	62.470
2001	0.064	4.034	0.222	36.635
2002	0.027	4.180	0.245	132.634
2003	0.087	1.083	0.209	192.478
2004	0.153	1.188	0.230	240.769
2005	0.180	0.702	0.205	335.053

Table 4. *Cont.*

Year	The Difference between "Treated Shanghai" and "Synthetic Shanghai"			
	Economic Sustainable Development	**Energy Saving and Emission Reduction**	**Industrial Structure Optimization**	**Green Technological Innovation**
2006	0.220	−0.247	0.255	517.143
2007	0.293	−0.993	0.357	666.131
2008	0.258	−1.112	0.446	827.276
2009	0.324	−1.950	0.644	960.814
2010	0.375	−2.628	0.538	1091.963
2011	0.480	−4.966	0.600	1216.673
2012	0.570	−5.765	0.722	837.017
2013	0.550	−5.242	0.837	188.590
2014	0.666	−6.339	0.998	411.986
2015	0.753	−6.308	1.198	−124.599
2016	0.821	−6.079	1.366	256.535
2017	0.905	−8.702	1.227	832.846
2018	1.122	−10.946	1.267	−331.226
2019	1.077	−12.505	1.572	635.927
2020	2.169	−15.539	1.561	680.087

5.1.3. The Impact of the NEIPP on Energy Saving and Emission Reduction

To investigate Shanghai's performance in energy conservation and emission reduction under the impact of the NEIPP, we use Shanghai as the intervention group and a synthetic Shanghai composed of Zhejiang (0.244), Liaoning (0.283), Ningxia (0.358), and Fujian (0.114) as the baseline group to conduct difference analysis. When carbon emissions were used as the outcome variable, as shown in Figure 5, before the implementation of Shanghai's NEIPP, there was a certain gap between the real Shanghai and the synthetic Shanghai in terms of carbon emissions, indicating that the synthetic Shanghai did not fully simulate the development trend of the real Shanghai before the policy implementation. Still, the trends of the two were basically the same, and there was a certain reliability of trend prediction. However, after the policy implementation, the carbon emissions of the real Shanghai were significantly lower than those of the synthetic Shanghai, indicating that the policy had a significant negative effect, which persisted throughout the observation period. As shown in Table 4, the difference between the real Shanghai and the synthetic Shanghai in per capita carbon emissions in 2020 was −15.539 (100,000 tons), indicating that the policy effect was significant. From the whole observation period, the difference showed an upward trend year by year, indicating that the real Shanghai's NEIPP had a significant policy effect on reducing carbon emissions. Two key factors may explain this outcome: Firstly, Shanghai's NEIPP has strong innovation and foresight. During the 11th Five-Year Plan period, Shanghai proposed a strategy to prioritize research and development and the industrialization of new energy vehicles. The formulation and implementation of these policies push Shanghai to surpass other provinces in the synthetic control group in terms of the development level and speed of the new energy industry, thus effectively reducing carbon emissions; the effect was already evident in 2010, and the advantages brought by the policy gradually expanded after 2010. Secondly, Shanghai's regional and first-mover advantages in the new energy industry are also important factors for reducing carbon emissions. Shanghai has a number of leading new energy enterprises and research institutions in China, forming a relatively complete new energy industrial chain and innovation system, providing solid support for the development of the new energy industry. At the same time, as China's largest economic center and international metropolis, Shanghai's energy demand and consumption levels are high, providing great potential and space for the application and promotion of new energy. These regional and first-mover advantages make the development effect and the energy saving and emission reduction effect of the new energy industry in Shanghai significantly better than in other provinces in the synthetic control group. Shanghai's new energy vehicle ownership has reached the first in the country, and it also has comprehensive measures in terms of new energy vehicle charging facilities, subsidy policies, and license issuance.

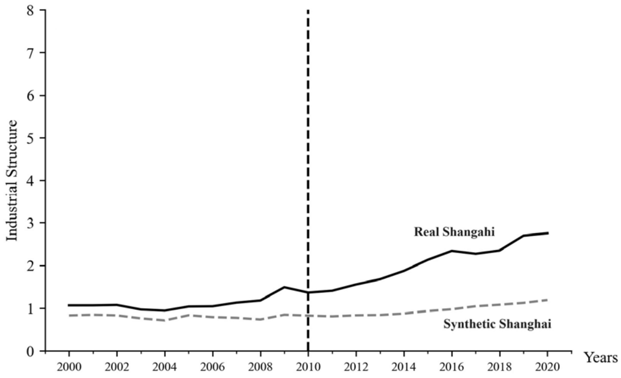


(**a**) (**b**)

Figure 5. Impact of the NEIPP on the real Shanghai's eEnergy sSaving and eEmission rReduction in contrast with the synthetic Shanghai: (**a**) Comparison of energy saving and emission reduction between real Shanghai and synthetic Shanghai; (**b**) Mean value gap between real Shanghai and synthetic Shanghai in energy saving and emission reduction.

5.1.4. The Impact of the NEIPP on Industrial Structure

To evaluate the impact of Shanghai's NEIPP on the optimization of industrial structure, we compare the real Shanghai with the synthetic Shanghai composed of weighted averages of Zhejiang (0.209), Fujian (0.324), and Ningxia (0.467). We use the ratio of value added in the tertiary industry to that in the secondary industry as an indicator. As shown in Figure 6, before the implementation of the policy, the real Shanghai and the synthetic Shanghai closely mirrored each other on this indicator. Although the synthetic Shanghai did not fully reproduce the historical trajectory of the real Shanghai, their trends were highly similar, so it can be considered that the synthetic Shanghai has a high predictive power. After the implementation of the policy, the difference between the real Shanghai and the synthetic Shanghai gradually increased. As shown in Figure 6 and Table 4, in 2020, the real Shanghai was 1.19 points higher than the synthetic Shanghai on this indicator, indicating that the policy had a significant effect. From the entire observation period, the difference showed an upward trend, indicating that Shanghai's NEPP was important in optimizing the industrial structure. This result can be explained from the following two aspects: Firstly, Shanghai's NEIPP effectively promoted the development of the tertiary industry, especially the innovation and industrialization of new energy vehicles, wind energy, solar energy, and other fields, enhancing the value-added and competitiveness of the tertiary industry, thereby increasing the proportion of the tertiary industry in the total value-added. Second, Shanghai's NEIPP was conducive to the transformation and upgrading of the secondary industry, encouraging the traditional energy industry to shift to the new energy industry, reducing the energy consumption and environmental pollution of the secondary industry, enhancing the sustainability and efficiency of the secondary industry, and thereby reducing the proportion of the secondary industry in the total value-added.



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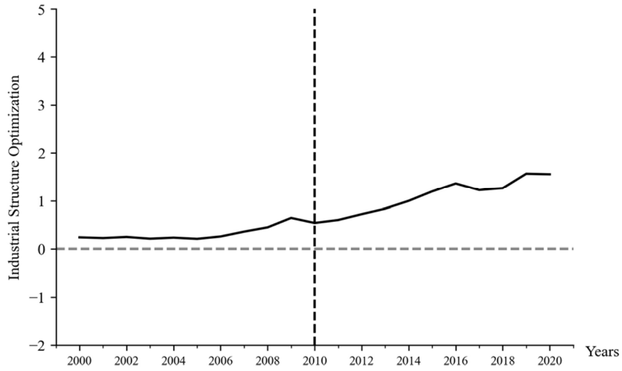

(**b**)

Figure 6. Impact of the NEIPP on the real Shanghai's Industrial Structure Optimization in contrast with the synthetic Shanghai: (**a**) Comparison of industrial structure optimization between real Shanghai and synthetic Shanghai; (**b**) Mean value gap between real Shanghai and synthetic Shanghai in industrial structure organization.

5.2. Robustness Test

Although after considering the estimated bias probably caused by sample self-section and endogenous problems, we have chosen the SCM method to obtain an accurate estimated result. This paper further introduces the method of Abadie et al. (2010) to further verify the robustness of the policy evaluation results [45]. The basic idea of this method is to assume that all control group provinces implement the new energy industrial policy with Shanghai in the same year and then use the SCM to construct a synthetic control unit for each control group province, calculating the difference between the synthetic control unit and the actual province as the effect of the hypothetical policy. Then, from the goal dimensions of optimizing the industrial structure, promoting sustainable development, promoting technological innovation, and energy saving and emission reduction, we compare the actual policy effects of Shanghai and the hypothetical policy effects of the control group provinces. If, on a certain goal dimension, the actual effect of Shanghai is significantly higher than the hypothetical effect of the control group, it indicates that the implementation of the new energy industry policy in Shanghai is effective on this goal dimension, and the conclusion is robust. Conversely, if on a certain goal dimension, the difference in effects between the two is not significant, or the actual effect of Shanghai is lower than the hypothetical effect of the control group, there are two possibilities: first, the implementation of the new energy industry policy is ineffective in this goal dimension, and the conclusion is robust; second, Shanghai's new energy industry policy is effective in this goal dimension, but the conclusion is not robust.

In addition, attention should also be paid to the square root of the average prediction standard deviation (RMSPE, which measures the degree of fit between a province and its synthetic control province). The calculation formula is as follows:

$$\mathrm{RMSPE_{POST}} = \sqrt{\frac{1}{\mathrm{T}-\mathrm{T_0}}\sum_{\mathrm{t}=\mathrm{T_0}+1}^{\mathrm{T}}\left(\mathrm{y_{it}}-\mathrm{y^*_{it}}\right)^2} \tag{6}$$

$$\mathrm{RMSPE_{PRE}} = \sqrt{\frac{1}{\mathrm{T_0}}\sum_{\mathrm{t}=1}^{\mathrm{T_0}}\left(\mathrm{y_{it}}-\mathrm{y^*_{it}}\right)^2} \tag{7}$$

If the square root of the average prediction standard deviation of a province before 2010 is relatively large, it indicates that the fitting effect of the province before 2010 is not ideal, which leads to insufficient validity of using the gap of the province after 2010 as a comparison sample. Therefore, when a province's synthetic control unit shows a poor fit before the policy implementation, further analysis of its ranking test is no longer conducted.

This study excludes provinces in the control group where the square root of the average prediction standard deviation is more than twice that of the corresponding treatment group.

From Figure 7, it can be seen that after adjusting the prediction error value, the new energy industry policy in Shanghai has effects in promoting sustainable development, optimizing the industrial structure, and energy saving and emission reduction. The robustness of these findings is strong. Combined with the previous policy evaluation results, a robust conclusion can be reached that the new energy industry policy in Shanghai is relatively ineffective in promoting technological innovation. In the ranking test where the industrial structure is used as the result variable, Qinghai is excluded according to the RMSPE before the policy. In the ranking test where per capita carbon emissions are used as the result variable, Inner Mongolia, Guangdong, Guangxi, and Ningxia are excluded according to the RMSPE before the policy.

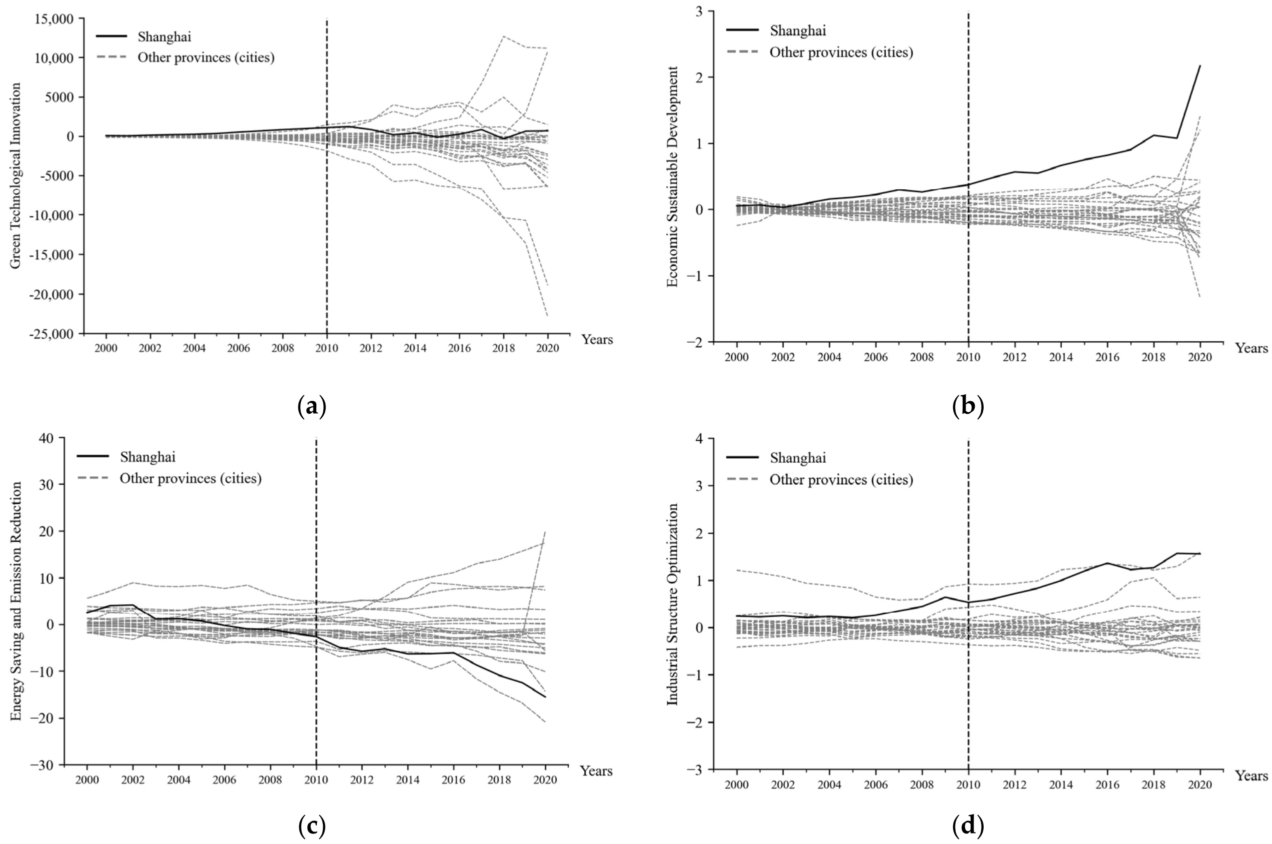

Figure 7. Distribution of differences by province and city: (**a**) Distribution of differences in green technological innovation by province (city); (**b**) Distribution of differences in economic sustainable development by province (city); (**c**) Distribution of differences in energy saving and emission reduction by province (city); (**d**) Distribution of differences in industrial structure optimization by province (city).

6. Conclusions, Policy Implications, and Future Research

Recently, achieving the dual-carbon goal has increasingly become the government policy direction and strategic goal, and it is well-recognized that the new energy industry plays a crucial role during the process of carbon emission reduction. Considering the government policy supports determines the long-term growth of the Chinese new energy industry, how to improve and optimize the policy support system for the new energy industry has always been the one of the core issues for related scholars and policy practitioners. In practice, the new energy industry development requires the government to promote solutions in the form of policy packages rather than just individual policies. We thus introduced the notion of a policy package into our new energy industry policy analysis and defined it as a set of related policies that are designed and implemented together to create a comprehensive and coordinated approach to achieve the new energy industry's long-term growth. Based on the fact that policy evaluation is a prerequisite for the improvement of government policy supports, we turned to investigating whether the implementation of the new energy industry policy package is effective or not and tried to provide new evidence to demonstrate the effectiveness of China's new energy industrial policy package through the empirical case study of Shanghai.

Some conclusions can be drawn as follows. This paper developed a two-stage analytical framework which integrates CAM and SCM to empirically evaluate the actual effect of the new energy industrial policy package. In the first stage, we summarized the diversified policy goals through deconstructing the various new energy industrial policy texts, then we decomposed the abstract and general strategic objectives into observable and measurable specifics. Four specific policy objectives from 57 policy texts were concluded and extracted, namely, urban economic sustainable development, industry transformation and upgrade, technological innovation, energy saving, and emission reduction. In the second stage of our evaluation, we used SCM to identify the multi-effect of the NEIPP, and we selected Shanghai as the research sample to empirically investigate the pure policy effect of the NEIPP. The results showed that the NEIPP had a significant positive effect on Shanghai's GTFP and industrial structure, while it had a significant negative effect on carbon emissions. It is worth noting that the effect of Shanghai's new energy industry policy in promoting technological innovation did not meet expectations. We conducted robustness checks after the SCM analysis, and the results remained robust.

As the evaluation of the NEIPP mainly assessed the degree to which governmental policy goals had been achieved, the objective and reasonable evaluation results can provide an empirical basis for future government policy adjustment, reinforcement, or abolition. Several policy implications can be drawn from this study. Firstly, since the NEIPP plays an important role in improving urban GTFP, optimizing regional industrial structure, and reducing carbon emissions, both central and local governments should strengthen policy support for the development of the new energy industry. Central government should mainly improve the guidance and supervision for urban new energy development, while the local government should spare no effort in promoting the new energy industry development through tax reduction, talent encouragement, and building related infrastructure, especially providing policy support for high-level innovation projects.

Although this paper proposed a two-stage analytical framework to empirically evaluate the actual effect of the NEIPP, which can also be used in other similar policy package evaluations, and presented initial evidence on the average effect of the NEIPP from the perspective of multidimensional objectives, some limitations need to be acknowledged. Due to limited data availability, we only chose Shanghai as a single empirical case study, and whether the NEIPP has the similar impact in other jurisdictions still needs further empirical research. What is more, whether the two-stage evaluation method can be further applied to the evaluation practice of other similar policy packages still needs future research to explore.

Author Contributions: For this research article, different authors performed different work; H.Y. and Q.W. conceived and designed the experiment, Q.W. wrote the paper, and S.C. is responsible for the data. All authors have read and agreed to the published version of the manuscript.

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Institutional Review Board Statement: Ethical review and approval were waived for this study, due to some relevant legal provisions (such as *Personal Information Protection Law of the People's Republic of China and Measures for the Ethical Review of Biomedical Research Involving Humans*), this study only involves expert interviews and does not collect, handle, or disclose personal identification information (such as names or contact details). Furthermore, the information we collected does not pose a risk of identifying individuals. Therefore, an ethical review is not required.

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Data Availability Statement: The original contributions presented in the study are included in the article, further inquiries can be directed to the corresponding author.

Conflicts of Interest: The authors declare no conflicts of interest.

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