



Study on the Impact of the Establishment of Made-in-China National Demonstration Zones on the Green Transformation of the Manufacturing Industry

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Abstract. High-quality development requires a profound change in the mode of industrial production and development, and the green transformation of the manufacturing industry is precisely an important shift in high-quality development in line with the requirements of the construction of ecological civilization. The policy document "Made in China 2025" determines the development direction of China's manufacturing industry in the next ten years, and the establishment of national demonstration zones of Made in China 2025 is one of the explorations to realize the goal of "Made in China 2025", encourage and support local explorations of the development of the real economy. This paper takes the establishment of national demonstration zones of Made in China 2025 as a quasi-natural experiment, and constructs a multi-period double-difference model to explore the impact of the establishment of demonstration zones on the green transformation of the manufacturing industry based on the panel data of 189 prefectural-level cities in China from 2012 to 2021. This paper finds that the establishment of national demonstration zones of Made in China 2025 can significantly enhance the green transformation of manufacturing industry, and the effect of the establishment of demonstration zones in regions with different city sizes and market potentials is different.

Keywords: national demonstration zone of Made in China 2025; green transformation of manufacturing industry; multi-period DID

1 Introduction

The report of the 19th National Congress points out that "China's economy has shifted from a mode of high-speed growth to a stage of high-quality development". Since the reform and opening up, the development of China's industrialization of the era of accelerated development. Starting from environmental technical standards, Jing Xu(2021)et al. took the industry standard policy of cleaner production as the impact to construct a DID model, which verified that environmental technical standards can reduce pollutant emission intensity and improve total factor productivity of enterprises, and have a more significant effect on enterprises with higher pollutant discharge and

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lower productivity before policy [7]. Summer (2022) and Liu Yue (2020) using the industrial policy "Made in China 2025" as an external shock analyzing policy effects [6][8]. Qiansheng Gong (2023) et al. took the big data comprehensive experimental area as a quasi-natural experiment to analyze that the digital economy significantly promotes the green transformation of the manufacturing industry [3][9]. Ming Chen (2023) et al. used the implementation of green finance policies as a quasi-natural experiment to analyze the effects of capital-oriented, credit catalytic, integration and decentralization mechanisms on the mechanism of green finance to promote the green transformation of manufacturing industry [2].

Based on Schumpeter's endogenous growth theory, the establishment of demonstration zones makes enterprises within the demonstration zones increase R&D and innovation to further refine the division of labor, and economic growth is achieved through the expansion of product categories. The innovation compensation effect is manifested in the fact that, the establishment of Made in China National Demonstration Zones improves the green concepts of enterprises in the zones in the process of production activities and R&D inputs, satisfying the requirements and demands of green development. For the demonstration area, the policy guidance is clearer, the transformation goal is clearer, under the guidance of the manufacturing industry, the degree of green transformation will be higher, so that the economies of scale caused by the convergence of resources in the surrounding areas, and the intensity of aggregation continues to strengthen when the aggregation reaches the scale of diseconomies, will be formed in the demonstration area. Therefore, this paper concludes that the establishment of Made in China national demonstration zones significantly promotes the green transformation of the manufacturing industry.

2 Research design

In this paper, the establishment of national demonstration zones for manufacturing in China is regarded as a quasi-natural experiment, and a multi-period DID model is used to estimate the impacts of the establishment of the national demonstration zones for manufacturing in China on the local manufacturing industry's green transformation^[1]:

$$GreenTrans_{it} = \beta_0 + \beta_1 \times Treat \times Post_{it} + \beta_2 \times con_{it} + \delta_i + \theta_t + \varepsilon_{it} \quad (1)$$

The explanatory variables are energy consumption and industrial sulfur dioxide emissions. The core explanatory variable is the interaction term of whether or not it is a test area. A total of 31 urban areas were established in the Made in China National Demonstration Zones, selecting the other non-test zones in the province where the demonstration zones are located as a sample of the control group.

The control variables are: government size, real GDP, the level of financial development, the degree of openness to the outside world, the per capita investment in fixed assets, the level of human capital, capital stock.

The data used in this paper come from the 2012-2021 China Urban Statistical Yearbook; some years of data are missing for this sub-prefecture-level city, and this paper uses interpolation to fill them in.

3 Empirical results and analysis

3.1 Benchmarking empirical analysis

Construct a multi-period double-difference model to test the impact of the establishment of national demonstration zones of manufacturing in China on the green transformation of the manufacturing industry^{[4][5]}, in which, as shown in Table 1(1)-(4)(The models all controlling for time and area fixed effects), the establishment of national demonstration zones of manufacturing in China has a significant role in reducing energy consumption and pollutant emissions, regardless of whether or not to add the control variables.

In this paper, radius matching and kernel matching are used to match the cities of Made-in-China national demonstration zones. The regression results are shown in Table 1(5)-(8)(The models all controlling for time and area fixed effects). The regression results show that the establishment of national demonstration zones for manufacturing in China can significantly reduce energy consumption and unit energy consumption. The role of core explanatory variables for "energy saving and emission reduction" obtained from PSM-DID is consistent with the direction of the benchmark regression results, and the estimation results and significance of the core explanatory variables do not differ much, therefore, the benchmark regression results are robust.

Table 1. Benchmark regression results and PSM-DID

	Benchmark regression results				PSM-DID			
	(1)	(2)	(3)	(4)	radius matching		kernel matching	
					(5)	(6)	(7)	(8)
	lnEnerCon	lnEnerCon	lnSO2	lnSO2	lnEnerCon	lnSO2	lnEnerCon	lnSO2
Treat×Post	-0.1124*** (0.0225)	-0.1036*** (0.0214)	-0.1075** (0.0545)	-0.1106** (0.0542)	-0.1070*** (0.0214)	-0.1128** (0.0544)	-0.1036*** (0.0214)	-0.1106** (0.0542)
Controls	No	Yes	No	Yes	Yes	Yes	Yes	Yes
_cons	6.7537*** (0.0124)	-5.8654*** (1.0568)	10.6018*** (0.0302)	12.8872*** (2.6854)	-5.8571*** (1.0890)	13.5391*** (2.7738)	-5.8654*** (1.0568)	12.8872*** (2.6854)
R ²	0.9667	0.9708	0.8947	0.8992	0.9709	0.8985	0.9708	0.8992
N	1647	1638	1645	1636	1624	1622	1638	1636

3.2 Parallel trend test

This paper use the event study methodology to test for ex ante parallel trends and to observe whether there are time-lagged effects of policies, to study the dynamic effects of policies to establish a national demonstration zone for manufacturing in China.

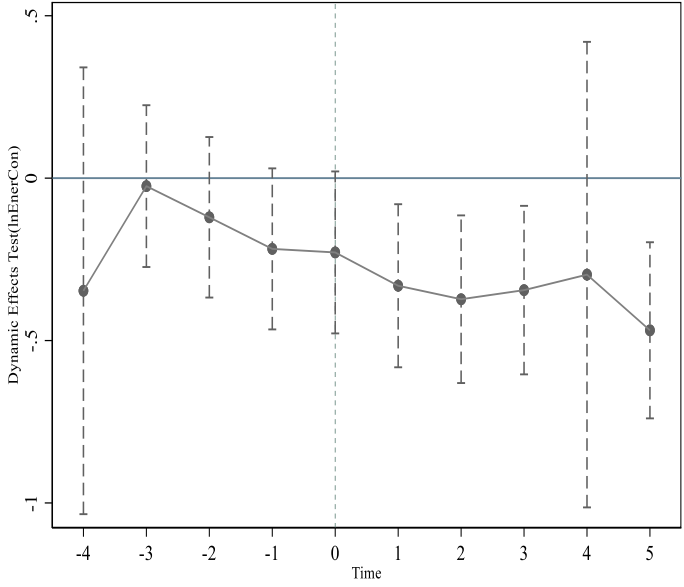


Fig. 1. Policy dynamics test (lnEnerCon)

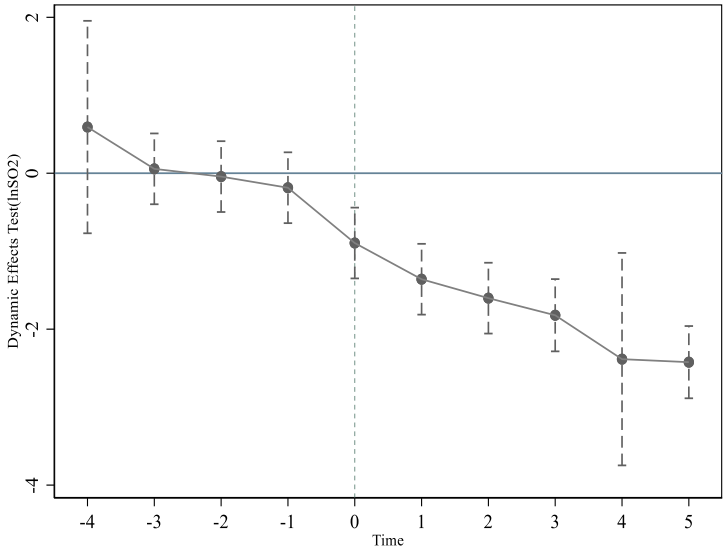


Fig. 2. Policy dynamics test (lnSO2)

From Fig. 1 and Fig. 2, it can be seen that the coefficient estimates are around zero value before the establishment of the demonstration zone, indicating that there is no significant difference between the demonstration zone cities and the non-demonstration zone cities prior to the policy, which suggests that the control group of urban areas can be used as a valid counterfactual to satisfy the ex-ante parallel trend assumption.

3.3 Heterogeneity analysis

According to the size of market potential, In this paper, the total sample is divided into large and medium-sized cities and small cities, and high-potential and low-potential cities, respectively, and the results are shown in Tables 2 (The models all incorporate control variables, controlling for time and area fixed effects). The results show that the establishment of Made in China 2025 national demonstration zones in large and medium-sized cities or with high market potential has a more obvious impact on the green transformation of the manufacturing industry.

Table 2. Heterogeneity analysis

	Urban scale				Heterogeneity of market potential			
	large or medium-sized city		small city		Low market potential		High market potential	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	lnEnerCon	lnSO2	lnEnerCon	lnSO2	lnEnerCon	lnSO2	lnEnerCon	lnSO2
Treat×Post	-0.1031*** (0.0269)	-0.2880*** (0.0801)	-0.0640** (0.0305)	-0.1106** (0.0542)	-0.0616*** (0.0191)	-0.1093* (0.0653)	-0.1054*** (0.0316)	-0.1758** (0.0748)
_cons	-0.6320 (2.1338)	19.4649*** (6.3656)	-6.3265*** (1.2009)	12.8872*** (2.6854)	-0.6320 (2.1338)	19.4649*** (6.3656)	-6.3265*** (1.2009)	12.8872*** (2.6854)
R^2	0.9810	0.9200	0.9545	0.8992	0.9810	0.9200	0.9545	0.8992
N	396	396	1242	1636	396	396	1242	1636

4 Conclusions and policy implications

This paper draws the following conclusions: Firstly, the establishment of Made in China 2025 national demonstration zones plays a significant role in the green transformation of the manufacturing industry in the cities. Secondly, the establishment of demonstration zones in large cities and the regions with high market potential will have a more significant "energy reduction" and "emission reduction" effect.

For the conclusions drawn in this paper, there are the following suggestions: we should continue to adapt to local conditions and steadily promote the policy of industrial transformation and development. For the pilot cities in the demonstration zones, policy protection should be strengthened and the implementation mechanism should be improved to give play to their positive demonstration role. For other non-demonstration zone cities, corresponding policies in line with their development should be formulated according to the specific characteristics of the cities.

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