A Study on the Impact of Emergency Industrial Policy on Total Factor Productivity of Enterprises

Xinyue Li
Beijing University of Posts and Telecommunications, Beijing 100876, China.

Abstract: In the context of China's risk society in recent years, the emergency industry has become increasingly important. This paper adopts the difference-in- difference model to investigate the assessment of the impact of emergency industry policies on total factor productivity of enterprises based on the policies related to emergency industry introduced in 2014. The empirical results show that the emergency industry policies have a significant contribution to the total factor productivity of enterprises. This study can provide insights for the next stage of emergency industry policy formulation.

Keywords: Emergency Management; Emergency Industry; Difference-In-Difference Model; Total Factor Productivity

1. Introduction

In recent years, natural disaster events, production safety accidents, public health events and other kinds of disasters have emerged in China, and the SARS epidemic in 2003 made the Chinese government start to pay attention to emergency management and develop emergency industry gradually. The emergency industry is an industry that provides emergency special equipment and services for disaster risk warning, prevention, treatment and rescue when it occurs, and recovery and reconstruction after the disaster event. The outbreak of the COVID-19 in 2019 has brought the importance of the emergency industry to the forefront. Most of the existing emergency industry enterprises in China are in transition, and it is urgent to improve the existing emergency industry policies and promote emergency industry reform.

2. The development history of China's emergency industry policy

China's emergency industry started relatively late, and only after the SARS outbreak in 2003 did the emergency industry formally begin to take off; the Wenchuan earthquake in 2008 and the H1N1 influenza in 2009 again reflected the lack of development of the emergency industry; in 2011, public safety and emergency products formally became an independent industrial category; in 2014, China's State Council formally adopted the Opinions on Accelerating the Development of Emergency.The Ministry of Emergency Management was formally established in 2018.In 2021, the Management Measures of National Safety and Emergency Industry Demonstration Bases were released, and efforts were stepped up to active construction of emergency industry demonstration bases.

3.Research design

3.1 Theoretical analysis and research hypothesis

Emergency industry is an important strategic emerging industry in China. Based on the infant industry protection theory proposed by Hamilton, the market competitiveness of emerging industry is weak at the early stage of development [1], so the emerging industry policy will be a key force to promote the development of emerging industry. And total factor productivity (TFP) includes both the impact of production factors on output and the utility of a series of non-production factors such as policy environment and technological innovation level [2]. Contingency industrial policy can bring loan concessions to enterprises, reduce their financing difficulties and operating costs, enhance their operating income, promote their expansion and increased innovation and R&D efforts. Accordingly, this paper proposes the following hypothesis:

H1: The emergency industrial policy promotes total factor productivity of enterprises.

3.2 Sample selection and data sources

In this paper, the emergency industry policy of 2014 is selected as a quasi-natural experiment because it is the first time that the definition of emergency industry is clarified in this industrial policy, which is a milestone in the development process of China's emergency industry, and the subsequent release of a series of emergency industry policies can be regarded as its supplementary extension [3].

In this paper, a total of 152 enterprises in China from 2011-2020 were selected as the study sample, 35 emergency industry enterprises as the treatment group, and 117 enterprises from emerging strategic industries other than emergency industry as the control group. Most of the data in this paper were obtained from the CSMAR database, and some of the data were obtained from Flush due to the late listing of most emergency industry enterprises. The continuous variables in the enterprise sample data were subjected to a 1% Winsor tailing process, and 1520 observations were finally obtained.

3.3 Variable definition and descriptive analysis

In this paper, we refer to some existing literature studies [4], and choose total factor productivity (TFP) of enterprises as the explanatory variable, defined as the amount of total output/all factor inputs, calculated by LP method; the interaction term Treat×Time of grouping dummy variable Treat and time dummy variable Time as the explanatory variable, with Treat=1 and vice versa 0 for emergency industry enterprises; After 2014 Time=1, and vice versa 0; control variables are selected as enterprise size (Size), age (Age), net profit (Profit), return on assets (Roa) and gearing (Lev), where enterprise size and net profit are expressed by taking the logarithm of total assets and net profit at the end of the enterprise year.

3.4 Model design

In order to investigate how the emergency industry policy affects the total factor productivity of enterprises,the paper takes the Opinions on Accelerating the Development of Emergency Industry issued in 2014 as a quasi-natural experiment,and applies a difference-in-difference(DID) model to estimate the basic regression model as follows:

$$TFP_{\mathrm{it}} = \beta_0 + \beta_1 T\mathrm{reat}_{\mathrm{i}} \times T\mathrm{ime}_{\mathrm{t}} + \beta_2 \mathrm{X}_{\mathrm{it}} + \lambda_{\mathrm{i}} + \nu_{\mathrm{t}} + \varepsilon_{\mathrm{it}} \qquad (1)$$

In Model (1), i denotes the enterprise, t denotes the year, and TFP_{it} is the total factor productivity of enterprise i in year t; $Treat_i$ is a grouping dummy variable, $Treat_i=1$ denotes enterprises belonging to the emergency industry and $Treat_i=0$ denotes enterprises not belonging to the emergency industry; $Time_t$ is the time grouping variable; X_{it} is the control variable; λ_i is the individual fixed effect of the enterprise; V_t is the time fixed effect; and ε_{it} is the random disturbance term. The core coefficient β_1 can reflect the net effect of emergency industrial policy on the total factor productivity of enterprises.

4.Empirical Results and Analysis

4.1 Analysis of benchmark regression results

To study how the emergency industrial policy affects the total factor productivity of enterprises, this paper adopts the DID model for regression. The basic regression results are shown in Table 1. Columns(2) and (4) include control variables, column (1) and (2) are general panel regression, and column (3) and (4) are fixed-effect regression. From column (4), it can be seen that after adding control variables and controlling for time and individual fixed effects, the Treat×Time regression coefficient is significantly positive at the 5% level, i.e., the emergency industrial policy has significantly promoted the total factor productivity of enterprises.

Table 1 difference-in-difference regression results

Variables	(1) TFP	(2) TFP	(3) TFP	(4) TFP
Treat×Time	0.345*** (0.0340)	0.0385* (0.0275)	0.140*** (0.0358)	0.0630** (0.0286)

Note:*, ** and *** indicate that the regression coefficient is significant at confidence level of 10%, 5% and 1% respectively.

4.2 Parallel trend test

Before the implementation of the emergency industrial policy, only if the treatment group and and the control group have the same development trend, the net effect of the emergency industrial policy can be obtained. The parallel trend test of Treat×Time from 2011 to 2020 is shown in model (2), in order to avoid collinearity, the year before the implementation of this policy is chosen as the base period, and the equilibrium trend results are shown in Figure 1, which shows that the treatment group and the control group enterprises' Total factor productivity has a parallel trend before the release of this policy.

$$TFP_{it} = \beta_0 + \sum_{t=2011}^{2020} \beta_1 Treat_i \times Time_t + \beta_2 X_{it} + \lambda_i + \nu_t + \varepsilon_{it} \qquad (2)$$

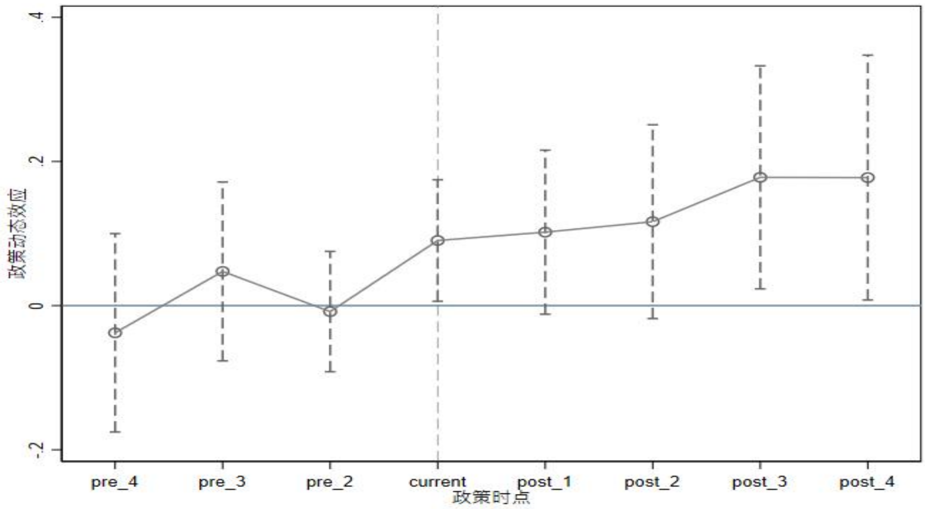

Figure 1 Parallel trend test

4.3 Robustness test

4.3.1 Substitution of explanatory variables

In order to avoid the influence of different total factor productivity calculation methods on the empirical results, the OP method is adopted to calculate the total factor productivity of the sample enterprises in the test, and the results are shown in column (1) of Table 2. The regression coefficient of Treat×Time is still significantly positive at the 5% level, which proves the robustness of the previous results.

4.3.2 Placebo test

Considering that other policies or stochastic elements affect the empirical results of this paper, the emergency industrial policy is advanced to 2011, 2012 and 2013 and regression analysis is conducted separately, the results are shown in column (2)-(4) of Table 2, the coefficients of interaction terms are not significant, which proves that it is the emergency industrial policy that causes the change of total factor productivity of enterprises.

4.3.3 Lagging the explanatory variables by one period

Since the effect of policy implementation may lag, this paper treats the explanatory variable TFP with a one-period lag and performs the basic regression, and the results are shown in column (5) of Table 2, which shows the robustness of the previous results.

Table 2 Robustness tests

Variables	(1)	(2)	(3)	(4)	(5)
Treat×Time	0.0625**	0.00265	0.0191	0.00358	0.111***
	(0.0286)	(0.0457)	(0.0346)	(0.0304)	(0.0375)

Note:*, ** and *** indicate that the regression coefficient is significant at confidence level of 10%, 5% and 1% respectively.

5. Research conclusions and policy implications

The results of this paper show that emergency industrial policy has a significant positive effect on the total factor productivity of enterprises. This paper can provide several insights for the reform of China's emergency industry policy: first, the Chinese government should continue to increase policy support for the whole emergency industry, continuously improve policies related to the emergency industry, improve the emergency industry system, and provide a good policy environment support. Second, the level of technological innovation is an effective path to improve the total factor productivity of enterprises, and the government should improve the incentive efficiency of policies, introduce policies to stimulate the innovation enthusiasm of enterprises in the emergency industry, and increase their innovative R&D efforts [5]. Finally, resource allocation efficiency also affects the total factor productivity of enterprises, and the government should provide subsidies and preferences to reduce the financing cost of emergency industry enterprises and actively promote the improvement of total factor productivity of enterprises.

References

[1] Myint D. Infant industry arguments for assistance to industries in the setting of dynamic trade theory. International trade theory in a developing world, 1963:173-I 193.

[2] Lu XD, Lian YJ. Total factor productivity estimation of Chinese industrial enterprises[J]. Economics (Quarterly), No. 11, 2012.

[3] Pu TL, Liang YY. Institutional construction of emergency industry development in China[J]. Gansu Social Science, No. 5, 2021.

[4] Xie K, Xu XL. Dual environmental regulation, green technological innovation and green total factor productivity of manufacturing enterprises [J]. Modern Management Science, 2023(03):103-113.

[5] Ting X, Wang W, Zhang C. Analysis of the demand of emergency industry led by science and technology innovation[J]. Science and Technology Management Research, 2020, No. 7.

About the Author: Xinyue Li ,1998.1, Female, Han Nationality, Hebei, Graduate Student, Beijing University of Posts and Telecommunications, Beijing, China 100876, Direction of Emergency Management