

Biostatistical Analysis on the Enterprise Dynamic Management in the COVID-19 Pandemic

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Research Article

ABSTRACT

Background: With the worldwide spread of the novel coronavirus(COVID-19), the global economy has entered a cold winter, and the International Monetary Fund predicts that the global economy will shrink by about 3% in 2020. The outbreak of the epidemic has also caused heavy losses to the Chinese economy. In the first quarter of 2020, actual GDP fell sharply for the first time by 6.8% year-on-year for the first time. This is the first decline since record. Then, according to the data from the business survey in March, China's economy has improved compared with February, which shows that the economy has rebounded under the influence of policies. Judging from the current situation, although China has passed the peak period of the epidemic, affected by the high cases abroad, it can only be carried out slowly for the resumption of production. Enterprises, as micro-individuals under the macro economy, need to pass through analyzing the dynamic management of the enterprise to deepen the reform of the commercial system and stimulate the vitality of the enterprise. This will also provide data support for the government formulating relevant policies, which is conducive to the synergy of various policies and enhance the momentum of economic recovery.

On the other hand, we choose tourism as our specific research object. Thus, we need to set different scenarios according to the development situation of the epidemic, evaluate the impact of the novel coronavirus epidemic on China's tourism industry, and discuss tourism development and opportunities in the post-epidemic era from the aspects of tourism's response to the epidemic and the development trend of the tourism after the epidemic⁴.

Methods: This dissertation first discusses the issue of enterprise dynamic management in the post covid-19 epidemic era, establishes the Difference-in-Difference model (DID model), and improves the model reasonably. It puts forward the dynamic management plan of different regions, and judges the effect of the policy on the implementation of the epidemic. At the same time, it also aims at the impact of the epidemic on the tourism industry at the important time points. The elasticity method and linear regression are used to evaluate and forecast. Using transportation data as a leading indicator, the elasticity of the total number of Tourists E_{t1} and the elasticity of total tourism revenue E_{i1} during the Spring Festival and Spring Festival are calculated to be 1.39 and 1.60 respectively. The impact of COVID-19 on the Spring Festival tourism market is evaluated through the Spring Festival elasticity; During the period, the elasticity of the International Workers' Day tourism market relative to the Spring Festival tourism market E_{t2} , E_{i2} is calculated to be 1.14 and 0.9024 respectively through data over the years. Combining the forecast results of the Spring Festival tourism market and the data

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calibration of different forecast scenarios, the International Workers' Day is predicted. The total number of tourist trips and total tourism revenue during the period; for the National Holiday, the above ideas are used to calculate the elasticity of the National Holiday tourism market relative to the Spring Festival and International Workers' Day tourism markets $\epsilon_{t3} \square \epsilon_{i3}$, which are 0.69 and 0.94, respectively, predicting the total number of tourists and total tourism revenue during the National Holiday period.

Findings: The results based on DID model analysis show that the significance level of the policy to the GDP of Jiangsu Province is 32%. The saliency level in Hubei province is 37%. In the first quarter of the year 2020, the total travel time and total tourism revenue of the first quarter of the year 2020 are predicted, and the logarithmic linear regression equation is established based on the total tourist arrivals and the total tourism revenue in the year 2020 as the explanatory variables of total tourism trips and total tourism revenue in the first quarter. The total number of tourist trips in the first quarter of the year 2020 is 394 million, a decrease of 74.42% over the same period last year, and the total value of tourism revenue is 319 billion 565 million yuan, a decrease of 77.01% over the same period last year. The counter-factual prediction value of the total number of tourists in the first quarter of the year 2020 is 1 billion 676 million, and the counter-factual prediction value of the total tourism revenue is 1 trillion and 580 billion yuan. During the first half of the year 2020, the total number of tourists and the total tourism revenue in the first half of the year are predicted. The total number of tourists in the first quarter and the International Workers' Day is used as the explanatory variables of the total travel time in the first half of the year. Logarithmic linear regression equations are established respectively and replaced by the estimated values. The predicted value of the total tourist arrivals in the first half of the year 2020 is 1 billion 440 million, which is 53.25% lower than that in the same period last year. The forecast value of total tourism revenue is 1 trillion and 165 billion 98 million yuan, with a decrease of 58.09%. Compared with the same period last year, the potential decline of the total number of tourists in the first half of the year 2020 is 1 billion 911 million, with a decrease of 57.03%, resulting in a potential loss of 1 trillion and 994 billion 902 million yuan and a loss ratio of 63.13% for tourism total revenue. Under the optimistic forecast, the total number of tourist trips in the year 2020 is 4 billion 659 million. A decrease of 23.12% compared with the same period last year, and the total value of tourism revenue is 4 trillion and 807 billion 295 million yuan, 26.27% lower than that of the same period last year. Under the prudent forecast, the total number of tourist trips in the year 2020 is 3 billion 941 million, a decrease of 34.97% over the same period last year, and the total value of tourism revenue is 3 trillion and 922 billion 883 million yuan, a decrease of 39.83%, over the same period of the last year.

Interpretation: China's economy has been affected by the epidemic to varying degrees in all sectors, especially in the tertiary sector. And because the outbreak situation in China did not look good in the first quarter of 2020, almost all companies made a loss in the first quarter of 2020. To address the economic downturn, the Chinese government has taken various measures, such as issuing coupons to stimulate consumption, discounting promotions, etc. And as the domestic epidemic situation in China continues to improve, more and more companies have resumed normal operations in the last two months. It is believed that in the near future, China's economic situation will be significantly better than in the first quarter.

INTRODUCTION

The COVID-19 has affected all walks of life in the national economy. After over 4 months fighting against the virus, it is basically under the control, therefore, the domestic economy is facing a restart in the post-epidemic era[1,2]. How to accurately promote the recovery of

post-epidemic industries and eventually turn crisis into an opportunity has become an important topic that all circles continue to pay attention to. If we want to take the pace of economic recovery further, we need to make enterprise management computable, and then implement dynamic management rationally[3]. Only by analyzing the influencing factors of enterprise strategic adjustment and establishing a dynamic management model, thus can obtain a sustainable competitive advantage based on enterprise dynamic strategic management. On the other hand, the tourism industry, which is highly market-oriented and mainly relies on people to gather and consume, is one of the industries with the greatest impact[4]. Thereby, studying the tourism industry can be a good analysis of the economic impact of the outbreak, and make recommendations[5].

This article will solve the following questions: 1. Analyze the impact of COVID-19 on enterprise dynamic management in the post-epidemic era, and give an overall plan design. 2. Combined with the government's dynamic management policy for the epidemic situation, the impact of micro-dynamic management on the implementation of dynamic management by the enterprise is evaluated and recommendations are made. 3. In terms of important points of time, what impact the novel coronary pneumonia has had and could have on our tourism industry during holidays such as Spring Festival, International Workers' Day and National Holiday. 4.

According to the impact of tourism in different situations, how should the government formulate or improve policies to intervene.

Methods

Data

Based on model 1, we chose to combine Hubei Energy Group Co., Ltd. (hereinafter referred to as Hubei Energy)[7] and Jiangsu New Energy Development Co., Ltd. (hereinafter referred to as Jiangsu Xinneng)[8], Jiuzhou Tong Pharmaceutical Group Co., Ltd. (hereinafter referred to as Jiuzhou Tong Pharmaceutical)[9] and Jiangsu Hengrui Medicine Co., Ltd. (hereinafter referred to as Hengrui Medicine)[10] as two groups, both from the secondary industry. In order to ensure the comprehensiveness of the enterprise, we have also selected Hubei Radio and Television Information Network Co., Ltd. (hereinafter referred to as Hubei Radio & TV)[11] and Jiangsu Radio & Television Cable Information Network Co., Ltd. (hereinafter referred to as Jiangsu Cable)[12] as another group. For the analysis of various industries, we mainly collect tertiary industries, such as Alibaba Network Technology Co., Ltd. (hereinafter referred to as Alibaba)[13], SF Express Co., Ltd. (hereinafter referred to as SF)[14], and Shenzhen Tencent Computer System Co., Ltd. (hereinafter referred to as Tencent)[15], Suning Tesco Group Co., Ltd. (hereinafter referred to as Suning)[16] quarterly data of these large enterprises, in order to ensure the comprehensiveness of the industry, we also collected quarterly data of Muyuan Food Co., Ltd. (hereinafter referred to as Muyuan shares).

The model

The method of analyzing the impact of COVID-19 on enterprise dynamic management and evaluating the effect of micro dynamic management implementation dynamic management is generally to establish a DID model[17].

When analyzing the impact of the epidemic on tourism, we mainly use the elasticity method.

DID-based method

Math symbols	Explanation
Y_{it}	The explained variable, the economic situation of a company or region
$t \times e \times ti$	Group dummy variable, treatment group is 1, control group is 0
P_t	Time dummy variable, 1 after policy implementation, 0 before policy implementation
β_i	Variable Coefficient
s_t	Residual
$t \times e \times ti \times Pt$	The intersection of the dummy variable of time and the dummy variable of the group represents the comprehensive dummy variable and represents the estimate of the double difference. The coefficient of this dummy variable β_3 is the DID effect concerned by this article, which shows the effect of policy on the economy

Table 1. Explanation of mathematical symbols in DID model

Drawing a line chart according to the known data, we can obtain that the actual GDP comparison between Province A and Jiangsu Province has the same change trend, and the actual GDP comparison between Province B and Hubei Province has the same change trend. The results are shown in Figure 1.

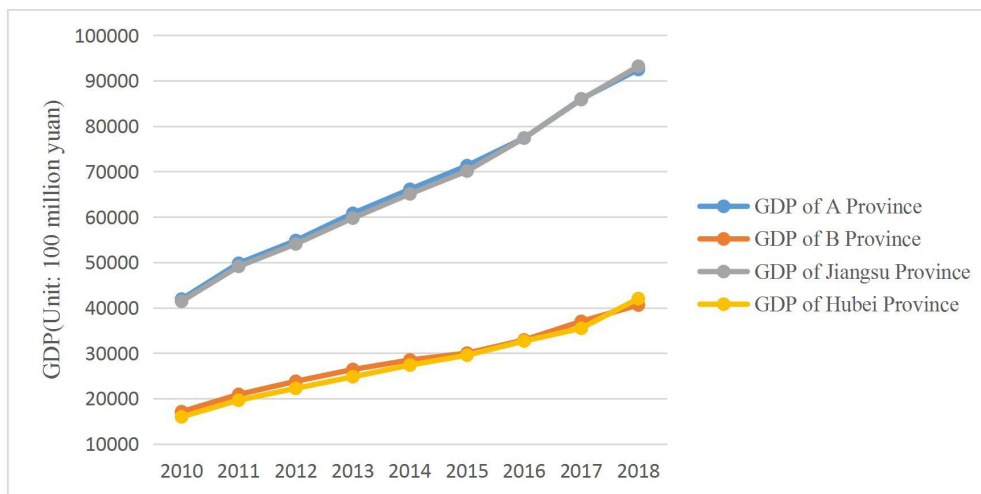


Figure 1. Comparison of GDP of A and B provinces with Jiangsu Province and Hubei Province respectively

Therefore, when analyzing the economic impact of policies on Hubei and Jiangsu provinces, the known data of A and B provinces and their predicted GDP by SPSS for 2019 and 2020 are set as the control group. The actual GDP of Hubei Province and Jiangsu Province and the GDP predicted by SPSS are used as the control group to establish a DID model for this, the basic regression equation is set as shown in formula .

$$Y_{it} = \beta_0 + \beta_1 t_{it} + \beta_2 P_t + \beta_3 t_{it} \times P_t + s_t \tag{1}$$

The elasticity method for estimation

Regarding the impact of the epidemic on tourism at an important time, the elasticity method is mainly used for assessment and prediction. The meaning of E_t is the ratio between the percentage change in total number of the tourists and the percentage change in independent variables. The meaning of E_i is the ratio between the percentage change in total tourism revenue and the percentage change in independent variables. Through double logarithmic regression, the elasticity values of E_t and E_i can be estimated based on historical data, and then the predicted value of total tourism visits can be estimated by E_t , and the predicted value of total tourism revenue can be estimated by E_i .

As far as the Spring Festival is concerned, because the time of the outbreak coincides with the Spring Festival Holiday, in this article, the transportation data is used as the leading indicator to evaluate the impact of COVID-19 on the Spring Festival tourism market through the flexibility of the Spring Festival transportation.

As far as the International Workers' Day period is concerned, the elasticity of the International Workers' Day tourism market relative to the Spring Festival tourism market can be calculated from historical data, combined with the forecast results of the Spring Festival tourism market and the data calibration of different forecast scenarios, the total number of tourists and the total tourism revenue during the International Workers' Day can be predicted.

As far as the National Holiday is concerned, the above ideas are used to predict the total number of tourists and total tourism revenue during the National Holiday period by calculating the elasticity of the National Holiday tourism market relative to the Spring Festival and the International Workers' Day tourism market.

When predicting total number of tourists and total tourism revenue in the first quarter of 2020, we establish a regression equation through the Spring Festival tourism market data; when predicting total number of tourists and total tourism revenue in the first half of 2020, we establish a regression equation through the first quarter and the International Workers' Day tourism market data; when predicting the total number of tourists and total tourism revenue for the whole year of 2020, we establish another regression equation through the first half of the year and the National Holiday tourism market data.

Based on the following three principles to assess and predict the impact of COVID-19 on China's tourism dynamic management:

(1) The principle of "counterfactual": calculate the expected value of tourism development under the assumption that there is no epidemic, and then predict the actual situation that the tourism industry may present under different trends of the epidemic situation, the impact of the epidemic situation on the tourism industry is calculated according to the difference between the two;

(2) The principle of "limited extrapolation": when the epidemic situation has not ended and the prevention and control

situation is complicated, focus on grasping for short-term forecast and key point forecast, carry out limited extrapolation;

Math symbols	Explanation
E_i	The ratio between the percentage change in total tourism revenue and the percentage change in independent variables
E_t	The ratio between the percentage change in total tourist arrivals and the percentage change in independent variables
E_{t_1}	Number of tourists during the Spring Festival Holiday and the elasticity value of passengers sent during the Spring Festival
E_{i_1}	Total tourism revenue during Spring Festival Holiday and elasticity value of passengers sent during Spring Festival
E_{t_2}	Number of Tourists on International Workers' Day and Elasticity of Number of Tourists on Chinese New Year Holiday
E_{i_2}	International Workers' Day total tourism revenue and Spring Festival Holiday total tourism revenue elasticity value
E_{t_3}	The average value of the elasticity of the number of tourists on the National Holiday and the number of tourists on the Spring Festival and International Workers' Day
E_{i_3}	The average value of the total tourism revenue during the National Holiday and the elasticity of the total revenue during the Spring Festival and International Workers' Day

Table 2. Explanation of mathematical symbols in the elasticity method

(3) The principle of "camera correction": make reasonable corrections to the prediction results according to the latest changes in the epidemic situation.

Based on the above epidemic judgment, this article sets three different scenarios for evaluation and prediction. Scenario 1 is optimistic, assuming that the domestic epidemic will basically end at the end of March, and it will be completely ended at the latest in early April;

scenario 2 is cautious, assuming that the domestic epidemic will basically end at the end of May, and at the latest, it will completely end in early June.

End of the domestic outbreak		Scenario 1: optimism	Scenario 2: Cautious
		At the end of March, at the latest in early April	At the end of May, at the latest in early June
Time	Spring Festival	Loss	Loss
	International Workers' Day	Rebound	loss
	National Holiday	No effect	Rebound
Period	the first season	Loss	Loss
	the second season	Limited rebound	Loss
	In the second half of the year	No effect	Limited rebound

Table 3. Two scenarios assumed in this paper

Results

DID Model-based estimates Dynamic management Model 1

According to the known data, in the Stata software[17], the results obtained are shown in Table 4 and 5.

DIFFERENCE-IN-DIFFERENCES ESTIMATION RESULTS
 Number of observations in the DIFF-IN-DIFF: 12

	Before	After		
Control:	5	1	6	
Treated:	5	1	6	
	10	2		

Outcome var.	GDP	S. Err.	t	P> t
Before				
Control	8.5e+04			
Treated	8.5e+04			
Diff (T-C)	37.709	7262.882	0.01	0.996
After				
Control	1.1e+05			
Treated	1.0e+05			
Diff (T-C)	-1.3e+03	1.6e+04	0.08	0.937
Diff-in-Diff	-1.4e+03	1.8e+04	0.08	0.941

R-square: 0.37
 * Means and Standard Errors are estimated by linear regression

Table 4. The impact of policies on the GDP of Jiangsu Province

No control variables are added to the order. The difference between the treatment group and the control group before policy implementation is 37.709, and the difference between the treatment group and control group after policy implementation is -1.3e + 03. -1.4e + 03 is the coefficient of double difference estimation. The p-value of this coefficient is 0.941, indicating that it passes the test at a very high significance level[18].

DIFFERENCE-IN-DIFFERENCES ESTIMATION RESULTS
 Number of observations in the DIFF-IN-DIFF: 12

	Before	After		
Control:	5	1	6	
Treated:	5	1	6	
	10	2		

Outcome var.	GDP	S. Err.	t	P> t
Before				
Control	3.7e+04			
Treated	3.7e+04			
Diff (T-C)	168.784	3938.887	0.04	0.967
After				
Control	4.8e+04			
Treated	4.5e+04			
Diff (T-C)	-3.3e+03	8807.620	0.37	0.718
Diff-in-Diff	-3.5e+03	9648.264	0.36	0.729

R-square: 0.32
 * Means and Standard Errors are estimated by linear regression
 Inference: * p<0.01; ** p<0.05; * p<0.1

Table 5. The impact of policies on the GDP of Hubei Province

No control variables are added to the order. The difference between the treatment group and the control group before policy implementation is 16.784, and the difference between the treatment group and the control group after policy implementation is -3.3e + 03. -3.5e + 03 is the coefficient of double difference estimation. The p-value of this coefficient is 0.729, which means that

it passes the test at a high significance level.

As can be seen from Table 4 and 5 above, it is precisely because of the effective policies adopted by Jiangsu Province in the fight against the epidemic, its economy is less affected by the epidemic, thus it can be seen that Jiangsu Province has its own strength.

Dynamic management Model 2

According to the known relevant data, the observed variables are tested to meet the assumption of parallel trends, and the test process is the same as model one, so it will not be repeated here. After conforming the parallel trend test, the DID model is established, and then the formula \square is used for regression analysis.

For the enterprises in Hubei Province and Jiangsu Province, we have selected three types of industries, namely Hubei Energy and Jiangsu Xinneng, Hubei Radio and TV and Jiangsu Cable, Jiuzhou Tong Pharmaceutical and Hengrui Pharmaceutical, of which the first and third

groups are secondary industries the second group is the tertiary industry. In the Stata software, the results obtain through the commands are shown in Table 6, 7, and 8.

DIFFERENCE-IN-DIFFERENCES ESTIMATION RESULTS

Number of observations in the DIFF-IN-DIFF: 26

	Before	After		
Control:	12	1		13
Treated:	12	1		13
	24	2		

Outcome var.	GDP	S. Err.	t	P> t
Before				
Control	2.256			
Treated	14.229			
Diff (T-C)	11.973	1.746	6.86	0.000***
After				
Control	2.179			
Treated	5.685			
Diff (T-C)	3.506	6.047	0.58	0.568
Diff-in-Diff	-8.467	6.294	1.35	0.192

R-square: 0.69
 * Means and Standard Errors are estimated by linear regression
 Inference: * p<0.01; ** p<0.05; * p<0.1

Table 6. The economic impact of policies on Hubei Energy, Jiangsu Xinneng as the control group

No control variables are added to the order. The difference between the treatment group and the control group before policy implementation is 11.973, and the difference between the treatment group and the control group after policy implementation is 3.506. -8.467 is the coefficient of double difference estimation. The p-value of this coefficient is 0.192, which means that it passes the test at a very high significance level. The DID model shows the comprehensive effect of the policy, and the empirical results show that the epidemic will affect the economy of the enterprise.

DIFFERENCE-IN-DIFFERENCES ESTIMATION RESULTS

Number of observations in the DIFF-IN-DIFF: 26

	Before	After		
Control:	12	1		13
Treated:	12	1		13
	24	2		

Outcome var.	GDP	S. Err.	t	P> t
Before				
Control	4.525			
Treated	1.681			
Diff (T-C)	-2.845	0.755	-3.77	0.001***
After				
Control	0.119			
Treated	-0.575			
Diff (T-C)	-0.694	2.616	0.27	0.793
Diff-in-Diff	2.151	2.723	0.79	0.438

R-square: 0.48
 * Means and Standard Errors are estimated by linear regression
 Inference: * p<0.01; ** p<0.05; * p<0.1

Table 7. The impact of policies on Hubei Radio and Television, Jiangsu Cable as the control

No control variables are added to the order. The difference between the treatment group and the control group before policy implementation is -17.016, and the difference between the treatment group and the control group after policy implementation is -2.845. -0.694 is the coefficient of double difference estimation. The p-value of this coefficient is 2.151, indicating that it passes the test at a very high significance level. The DID model shows the comprehensive effect of the policy, and the empirical results show that the epidemic will affect the economy of the enterprise.

DIFFERENCE-IN-DIFFERENCES ESTIMATION RESULTS

Number of observations in the DIFF-IN-DIFF: 26

	Before	After		
Control:	12	1		13
Treated:	12	1		13
	24	2		

Outcome var.	GDP	S. Err.	t	P> t
Before				
Control	25.563			
Treated	8.548			
Diff (T-C)	-17.016	4.228	-4.02	0.001***
After				
Control	13.060			
Treated	6.136			
Diff (T-C)	-6.924	14.645	0.47	0.641
Diff-in-Diff	10.092	15.243	0.66	0.515

R-square: 0.44
 * Means and Standard Errors are estimated by linear regression
 Inference: * p<0.01; ** p<0.05; * p<0.1

Table 8. The impact of policies on Jiuzhou Tong Pharmaceutical, Hengrui Medicine as the control group

No control variables are added to the command. The difference between the treatment group and the control group before the policy implementation is -17.016, and the difference between the treatment group and the control group after the policy implementation is -6.924. 10.092 is the coefficient of double difference estimation. The p-value of this coefficient is 0.515, which means that it passes the test at a high significance level. The DID model shows the comprehensive effect of the policy, and the empirical results show that the epidemic will affect the economy of the enterprise.

The data from Model 1 and Model 2 shows that policies and epidemics will affect the economy of the enterprise. So for the first question, the overall design plan we produced is to determine whether the establishment of the corporate image has an impact on the development of the enterprise.

Dynamic management Model 3

Similar to model one and two. First of all, according to the collected net profit of the enterprise before the first quarter of 2020, time series analysis is performed by SPSS to obtain

the fitted value and its predicted value. We will use the fitting value obtained and predicted value by time series analysis as the control group, and the actual net profit of the company as the treatment group, establish a DID model, and perform regression analysis through formula

For domestic enterprises affected by the government policy, we selected well-known large enterprises as the research objects, respectively SF, Suning, Alibaba and Tencent. In the Stata software, the results obtain through the commands are shown in Table 9, 10, 11, 12, and 13.

DIFFERENCE-IN-DIFFERENCES ESTIMATION RESULTS

Number of observations in the DIFF-IN-DIFF: 26

	Before	After		
Control:	12	1		13
Treated:	12	1		13
	24	2		

Outcome var.	GDP	S. Err.	t	P> t
Before				
Control	29.595			
Treated	29.708			
Diff (T-C)	0.113	6.518	0.02	0.986
After				
Control	20.520			
Treated	8.336			
Diff (T-C)	-12.184	22.578	0.54	0.595
Diff-in-Diff	-12.297	23.500	0.52	0.606

R-square: 0.08
 * Means and Standard Errors are estimated by linear regression
 Inference: * p<0.01; ** p<0.05; * p<0.1

Table 9. The impact of policies on SF Express's net profit

No control variables are added to the command. The difference between the treatment group and the control group before policy implementation is 0.113, and the difference between the treatment group and the control group after policy implementation is -12.184. -12.297 is the coefficient of double difference estimation. The p-value of this coefficient is 0.606, indicating that it passed the test at a very high significance level. The DID model shows the comprehensive effect of the policy. The empirical results show that the policies adopted by SF Express, such as the rapid layout of routes, fully guarantee the smooth flow of import and export cargo transportation, assisting enterprises in resuming production, providing different types of products and services, providing international express delivery services for import and export companies and individuals, providing international parcels and overseas warehouse services for cross-border e-commerce sellers, and providing international air transport and international shipping services for international traders, manufacturing, and multinational companies[19]. These series of measures do ease the impact of the epidemic and effectively promoted the growth of the enterprise economy.

DIFFERENCE-IN-DIFFERENCES ESTIMATION RESULTS

Number of observations in the DIFF-IN-DIFF: 26

	Before	After		
Control:	12	1	13	
Treated:	12	1	13	
	24	2		

Outcome var.	GDP	S. Err.	t	P> t
Before				
Control	45.668			
Treated	43.422			
Diff (T-C)	-2.247	17.545	-0.13	0.899
After				
Control	47.440			
Treated	-7.394			
Diff (T-C)	-54.834	60.777	0.90	0.377
Diff-in-Diff	-52.587	63.258	0.83	0.415

R-square: 0.06
 * Means and Standard Errors are estimated by linear regression
 Inference: * p<0.01; ** p<0.05; * p<0.1

Table 10. The impact of policies on Suning's net profit

No control variables are added to the order. The difference between the treatment group and the control group before the policy implementation is -2.247, and the difference between the treatment group and the control group after the policy implementation is -54.834. -52.587 is the coefficient of double difference estimation. The p-value of this coefficient is 0.415, which means that it passes the test at a high significance level. The DID model shows the comprehensive effect of the policy. The empirical results show that the policies adopted by Suning, such as Suning Tesco, Carrefour, Suning stores, and retail cloud stores, on the basis of meeting the needs of frontline support, fully ensure the protection of materials, healthy products, the supply and prices of people's livelihood products are stable; Suning Logistics is responsible for the industry of first-line anti-epidemic materials transportation; sports, health, red children and other systems, give full play to the advantages of commodities and content, and provide users with online fitness, health, and childcare related experiences content; Finance provides greater credit support to a wide range of suppliers and SMEs. These series of measures do ease the impact of the epidemic and effectively promoted the growth of the enterprise economy.

DIFFERENCE-IN-DIFFERENCES ESTIMATION RESULTS

Number of observations in the DIFF-IN-DIFF: 26

	Before	After		
Control:	12	1	13	
Treated:	12	1	13	
	24	2		

Outcome var.	GDP	S. Err.	t	P> t
Before				
Control	492.612			
Treated	518.753			
Diff (T-C)	26.141	152.763	0.17	0.866
After				
Control	1646.530			
Treated	1403.500			
Diff (T-C)	-243.030	529.187	0.46	0.651
Diff-in-Diff	-269.171	550.795	0.49	0.630

R-square: 0.39
 * Means and Standard Errors are estimated by linear regression
 Inference: * p<0.01; ** p<0.05; * p<0.1

Table 11. The impact of policies on Alibaba's net profit

No control variables are added to the order. The difference between the treatment group and the control group before policy implementation is 26.141, and the difference between the treatment group and the control group after policy implementation is -243.030. -269.171 is the coefficient of double difference estimation. The p value of this coefficient is 0.630, which means that it passes the test at a very high significance level. The DID model shows the comprehensive effect of the policy. The empirical results show that the policies adopted by Ali, such as opening free medical services when medical personnel are in short supply, and joint transportation companies to open global green channels when the material transportation channel is blocked; Are hungry merchants reducing commissions in batches, re-employ facing unemployed restaurant workers waiting for their jobs; the urgent need for research and development efficiency, it frees all the research and development of virus vaccines and new medicines for public scientific research by AI computing power[20]. These series of measures do ease the impact of the epidemic and effectively promoted the economic growth of the enterprise, greatly improved the positive image of the enterprise, and also showed Ali's corporate culture to the people of the country. This is the core competition in the dynamic management of the enterprise.

DIFFERENCE-IN-DIFFERENCES ESTIMATION RESULTS

Number of observations in the DIFF-IN-DIFF: 26

	Before	After		
Control:	12	1	13	
Treated:	12	1	13	
	24	2		

Outcome var.	GDP	S. Err.	t	P> t
Before				
Control	529.330			
Treated	527.448			
Diff (T-C)	-1.882	102.298	-0.02	0.985
After				
Control	423.260			
Treated	294.030			
Diff (T-C)	-129.230	354.370	0.36	0.719
Diff-in-Diff	-127.348	368.840	0.35	0.733

R-square: 0.04
 * Means and Standard Errors are estimated by linear regression
 Inference: * p<0.01; ** p<0.05; * p<0.1

Table 12. The impact of policies on Tencent's net profit

No control variables are added to the order. The difference between the treatment group and the control group before policy implementation is -1.882, and the difference between the treatment group and the control group after policy implementation is -129.230. -127.348 is the coefficient of double difference estimation. The p-value of this coefficient is 0.733, indicating that it passes the test at a very high significance level. The DID model expresses the comprehensive effect of the policy. The empirical results show that the policies adopted by Tencent, such as giving play to the corporate sense of responsibility, donated 1.5 billion to the state, freely open a variety of remote conference office software such as Tencent conferences, corporate WeChat, and actively expanded in the game industry[21]. These series of measures do ease the impact of the epidemic and effectively promoted the growth of the enterprise's economy, while also increasing the market's trust in the enterprise, which is also related to the corporate culture in the dynamic management of the enterprise.

DIFFERENCE-IN-DIFFERENCES ESTIMATION RESULTS

Number of observations in the DIFF-IN-DIFF: 26

	Before	After		
Control:	12	1	13	
Treated:	12	1	13	
	24	2		

Outcome var.	GDP	S. Err.	t	P> t
Before				
Control	8.648			
Treated	11.731			
Diff (T-C)	3.083	6.884	0.45	0.659
After				
Control	74.960			
Treated	45.450			
Diff (T-C)	-29.510	23.847	1.24	0.229
Diff-in-Diff	-32.593	24.821	1.31	0.203

R-square: 0.45
 * Means and Standard Errors are estimated by linear regression
 Inference: * p<0.01; ** p<0.05; * p<0.1

Table 13. The impact of policies on Muyuan's net profit

No control variables are added to the command. The difference between the treatment group and the control group before the policy implementation is 3.083, the difference between the treatment group and the control group after the policy implementation is -29.510, and -32.593 is the coefficient of double difference estimation. This coefficient The p-value is 0.203, indicating that it passed the test at a very high level of significance. The DID model expresses the comprehensive effect of the policy. The empirical results show that the policies adopted by Muyuan Co., Ltd. such as intelligent pig farming, expanding job demand, contracting

high-speed rail and aircraft to ensure return to work rate, help poor counties and poor households[22]. These series of measures really eased the impact of the epidemic and effectively promoted the growth of the enterprise economy.

Comprehensive analysis of the second question to analyze the corporate image and corporate culture is a very important aspect of corporate management, because technology may lag behind, management may fail, only corporate culture is the key to supporting the company's long-term development.

The impact of the Spring Festival Holiday on the dynamic management of tourism

To carry out the evaluation work, first establish a counterfactual reference system for the 2020 Spring Festival tourism market. On January 9, 2020, the State Council Information Office held a press conference to predict that the number of passengers sent by the country during the Spring Festival 2020 will reach about 3 billion. Since COVID-19 had not yet fully erupted

at that time, the data could reflect the expected value of counterfactuals and could be used as an evaluation reference. On February 20, 2020, the Spring Festival data released by the Ministry of Transport showed that the 40-day Spring Festival ended in 2020. National railways, highways, waterways, and civil aviation sent 1.48 billion passengers, down 50.3% from the same period in 2019. Assuming that the elasticity of total tourists and total tourism revenue will remain roughly the same in 2020, the estimated impact of COVID-19 on tourism during the Spring Festival is shown in Table 14.

	Passengers sent during the Spring Festival (unit: 100 million people)	Total number of tourists during the Spring Festival Holiday (unit: 100 million people)	Total tourism revenue during the Spring Festival Holiday (Unit: 100 million yuan)
Absolute index			
2019 actual value	29.8	4.15	5139
2020 estimate value	14.76	1.45	516.65
2020 counterfactual estimate value	30	4.23	5254.38
The difference between 2020 estimate and counterfactual estimate	-15.24	-2.78	-4737.73
Relative index (unit:%)			
Year-on-year growth rate based on 2020 estimates value	-50.47	-65.06	-89.95
Year-on-year growth rate based on 2020 counterfactual estimate value	0.67	1.93	2.25
The difference between the 2020 estimate and the counterfactual estimate is equivalent to the ratio of the counterfactual estimate	-50.8	-65.72	-90.17

Table 14. The impact of the COVID-19 on tourism in the Spring Festival Holiday in 2020

The estimated results are shown in Table 14. The estimated total number of tourists during the Spring Festival in 2020 is 145 million, a decrease of 65.06% from the same period in 2019.

The counterfactual estimate is 423 million; the estimated value of total tourism revenue during the Spring Festival in 2020 is 51.665 billion yuan, a decrease of 89.95% from the same period in 2019. The counterfactual estimate is 525.438 billion yuan. From the perspective of absolute value, the difference between the estimated total tourists and total tourism revenue and counterfactual estimates during the Spring Festival of 2020 (can be understood as losses) are 278 million and 473.773 billion yuan, respectively. From the perspective of relative value, the difference between the estimated total number of tourists and total tourism revenue and the counterfactual estimate during the Spring Festival in 2020 is equivalent to the ratio of counterfactual estimates (which can be understood as losses) of 65.72% and 90.17%, respectively.

The impact of International Workers' Day on the dynamic management of tourism

The International Workers' Day in 2020 lasts for 5 days, which is 1 day longer than the previous year and 2 days longer than 2018. Therefore, the prediction results based on counterfactuals show significant growth fundamentals. This article assumes that there is a stably elastic relationship between the Spring Festival tourism market and the International Workers' Day tourism market. In scenario 1, the counterfactual estimates of the aforementioned Spring Festival tourism market for 2020 are used for calculation. The prediction results are shown in Table 15.

	Total number of tourists (100 million)		Total tourism revenue (100 million yuan)	
	Scenario 1	Scenario 2	Scenario 1	Scenario 2
	Absolute index			
Actual value in 2019	1.95		1176.7	
Projections for 2020	2.32	0.31	1443.69	165.78
Counterfactual projections for 2020	2.28		1413.51	
The difference between the actual value in 2020 and the counterfactual predicted value	0.04	-1.97	30.18	-1247.73
	Relative index (%)			
Year-on-year growth rate based on 2020 projections	18.97	-84.1	22.69	-85.91
Year-on-year growth based on counterfactual projections for 2020	16.92		20.12	
The difference between the 2020 forecast and the counterfactual forecast is the proportion of the counterfactual forecast	1.75	-86.4	2.14	-88.27

Table 15. The impact of the COVID-19 on tourism in International Workers' Day in 2020

Under Scenario 1, the tourism market after the epidemic experienced a rebound in demand, which is positively superimposed on the growth trend of counterfactual fundamentals. It is predicted that the total number of tourist arrivals during the International Workers' Day in 2020 will reach 232 million, and the predicted value of total tourism revenue is 144.369 billion yuan, an increase of 18.97% and 22.69% respectively over the same period of the previous year.

In Scenario 3, the International Workers' Day is still in the epidemic period, and the upward trend of counterfactual fundamentals is far from enough to offset the downward trend of actual demand. The predicted value of total tourist arrivals during the International Workers' Day in 2020 is 31 million, and the predicted value of total tourism revenue is 16.578 billion yuan, which is a decrease of 84.10% and 85.91% respectively over the same period of the previous year. According to counterfactual standards, the potential decline in the total number of tourists caused by COVID-19 is 197 million, with a potential decline rate of 86.40%, a potential loss of total tourism revenue is 124.773 billion yuan, and a potential loss rate of 88.27%.

The impact of The National Holiday on the dynamic management of tourism

The National Holiday in 2020 lasts for 8 days, which is one day longer than in previous years. Therefore, the forecast based on counterfactuals shows a fundamental increase. Considering the relationship between the end time of the epidemic and the National Holiday, the distinction between Scenario 2 and Scenario 3 has no significant impact on the National Holiday tourism market. We assume that the National Holiday and the Spring Festival and International Workers' Day tourism markets are subject to a relatively stable elastic relationship. In scenario 1, the estimated value of the Spring Festival tourism market and the estimated value in the scenario 1 of the International Workers' Day tourism market are used for calculation, and the geometric average of the results is taken. The detailed results are shown in Table 16.

In scenario 1, the epidemic subsided during the "National Day" period, but compensatory travel demand had been released earlier, so the predicted result is the same as the counterfactual situation. The predicted value of the total tourist visits in the "National Day" period in 2020 is 852 million, and the estimated value of the total tourism revenue is 712.602 billion yuan, an increase of 8.95% and 9.68% respectively over the same period last year.

In scenario 2, the epidemic subsided during the "National Day" period, and the release of compensatory demand is positively superimposed with the growth trend of counterfactual fundamentals. The forecast value of the total tourist visits in the "National

Day" period in 2020 is 865 million, and the forecast value of the total tourism revenue is 746.981 billion yuan, an increase of 10.61% and 14.97% respectively over the same period last year.

	Total number of tourists (100 million)		Total tourism revenue (100 million yuan)	
	Scenario 1	Scenario 2	Scenario 1	Scenario 2
	Absolute index			
Actual value in 2019	7.82		6497.1	
Projections for 2020	8.52	8.65	7126.02	7469.81
Counterfactual projections for 2020	8.52		7126.02	
The difference between the actual value in 2020 and the counterfactual predicted value	0	0.13	0	343.79
	Relative index (%)			
Year-on-year growth rate based on 2020 projections	8.95	10.61	9.68	14.97
Year-on-year growth based on counterfactual projections for 2020	8.95		9.68	
The difference between the 2020 forecast and the counterfactual forecast is the proportion of the counterfactual forecast	0	1.53	0	2.02

Table 16. The impact of COVID-19 on tourism during the National Holiday in 2020

By comparing the evaluation results of COVID-19 affecting the tourism industry at important time points such as the Spring Festival, the International Workers' Day and the National Holiday, it can be seen that the tourism losses caused by the epidemic are mainly concentrated in the Spring Festival and the International Workers' Day tourism market. The epidemic caused a potential decline in total tourism arrivals during the Spring Festival of 278 million, with a decrease rate of 65.72%, and a potential loss of total tourism revenue of 473.773 billion yuan, with a loss rate of 90.17%. Under a cautiously optimistic forecasting scenario, the epidemic caused a potential decline in total tourism arrivals period of 609 million during the International Workers' Day, a decrease rate of 30.26%, and a potential loss of total tourism revenue of 45.874 billion yuan, with a loss rate of 32.45%.

It is worth noting that, in addition to affecting the scale of losses at different time points in the tourism industry, different forecast scenarios will also cause different rebounds in the tourism market. In general, under different forecasting scenarios, the market rebound in total number of tourists and total tourism revenue is expected to be between 1% and 3%.

The impact of the novel coronary pneumonia on tourism in Q1 2020

In any forecasted scenario, the first quarter is the main period of the tourism industry affected by the epidemic. When predicting the total number of tourist trips and total tourism revenue in the first quarter of 2020, this article uses the total number of tourist trips and total tourist revenue during the Spring Festival Holiday as the explanatory variables of the total tourist trips and total tourist revenue in the first quarter to establish a logarithmic linear regression

equation, and substitute the aforementioned estimated value into the 2020 Spring Festival tourism market for calculation. The specific prediction results are shown in Table 17.

	Total number of tourists (100 million)	Total tourism revenue (100 million yuan)
	Absolute index	
Actual value in 2019	15.4	13900
Projections for 2020	3.94	3195.65
Counterfactual projections for 2020	16.76	15800
The difference between the actual value in 2020 and the counterfactual predicted value	-12.82	-12604.35
	Relative index (%)	
Year-on-year growth rate based on 2020 projections	-74.42	-77.01
Year-on-year growth based on counterfactual projections for 2020	8.83	13.67
The difference between the 2020 forecast and the counterfactual forecast is the proportion of the counterfactual forecast	76.49	79.77

Table 17. The impact of COVID-19 on tourism in the first quarter of 2020

As shown in Table 17, the predicted value of total tourism in the first quarter of 2020 is 394 million, a decrease of 74.42% over the same period of last year; the predicted value of total tourism revenue is 319.565 billion yuan, a decrease of 77.01% over the same period of the previous year. In the first quarter of 2020, the counterfactual predicted value of total tourism visits is 1.676 billion, and the counterfactual predicted value of total tourism revenue is 1.580 trillion yuan. According to counterfactual standards, COVID-19 caused a potential decline in total tourist arrivals of 1.282 billion in the first quarter, with a potential decrease rate of 76.49%, and a potential loss of total tourism revenue of 1,240.435 billion yuan, with a potential loss rate of 79.77%.

The impact of the novel coronary pneumonia on tourism in the first half of 2020

Under different forecasting scenarios, the duration of COVID-19 has caused its impact on tourism in the first half of 2020 to be different. When predicting the total number of tourist trips and total tourism revenue in the first half of 2020, this article uses the total tourist trips in the first quarter and the International Workers’ Day as the explanatory variables for the total tourist trips in the first half of the year, and the first quarter and the International Workers’ Day as the explanatory variable of the total tourism revenue in the first half of the year, then

establishes logarithmic linear regression equations respectively and substituted into the aforementioned estimates for calculation. Among them, Scenario 1 and Scenario 2 are substituted into the Spring Festival tourism market estimate and the International Workers’ Day tourism market estimate in the corresponding scenario for calculation. The prediction results are shown in Table 18.

	Total number of tourists (100 million)		Total tourism revenue (100 million yuan)	
	Scenario 1	Scenario 2	Scenario 1	Scenario 2
	Absolute index			
Actual value in 2019	30.8		27800	
Projections for 2020	14.4	9.85	11650.98	7992.5
Counterfactual projections for 2020	33.51		31600	
The difference between the actual value in 2020 and the counterfactual predicted value	-19.11	-23.66	-19949.02	-23607.5
	Relative index (%)			
Year-on-year growth rate based on 2020 projections	-53.25	-68.02	-58.09	-71.25
Year-on-year growth based on counterfactual projections for 2020	8.8		13.5	
The difference between the 2020 forecast and the counterfactual forecast is the proportion of the counterfactual forecast	-57.03	-70.61	-63.13	-74.71

Table 18. The impact of COVID-19 on tourism in the first half of 2020

As shown in Table 18, the counterfactual predicted value of total tourism in the first half of 2020 is 3.351 billion, and the counterfactual predicted value of total tourism revenue is 3160 billion yuan.

Under the optimistic prediction of Scenario 1, the predicted value of total tourist arrivals in the first half of 2020 is 1.44 billion, a decrease of 53.25% over the same period last year; the predicted value of total tourism revenue is 1.165098 trillion yuan, a decrease of 58.09% over the same period last year. The epidemic caused a potential decline in total tourism arrivals of 1.911 billion in the first half of 2020, with a decrease rate of 57.03%, and a potential loss of total tourism revenue of 1994.902 billion yuan, with a loss rate of 63.13%.

Under the cautious forecast of Scenario 2, the predicted value of total tourism in the first half of 2020 is 985 million, a decrease of 68.02% over the same period of last year; the predicted value of total tourism revenue is 799.250 billion, a decrease of 71.25% from the same period of last year. The epidemic caused a potential decline in total tourism arrivals of 2.366 billion in the first half of 2020, with a decrease rate of 70.61%, and a potential loss of total tourism revenue of 2,360.750 billion yuan, with a loss rate of 74.71%.

The impact of the novel coronary pneumonia on tourism in the entire year 2020

In order to avoid the multi-collinearity problem caused by the correlation of independent variables, when predicting the total number of tourism and total tourism revenue for the whole year of 2020, the total number of tourism for the first half of this year and the national Holiday will be used as the explanatory variable of the total number of tourism for the whole year, the total tourism revenue for the first half of the year and the National Holiday are used as explanatory variables of the total tourism revenue for the whole year, then we establish logarithmic linear regression equations, and substitute the leading indicators under

different forecasting scenarios for data calculation. The prediction results are shown in Table 19.

	Total number of tourists (100 million)		Total tourism revenue (100 million yuan)	
	Scenario 1	Scenario 2	Scenario 1	Scenario 2
	Absolute index			
Actual value in 2019	60.6		62500	
Projections for 2020	46.59	39.41	48072.95	39228.83
Counterfactual projections for 2020	66.37		71954.72	
The difference between the actual value in 2020 and the counterfactual predicted value	-19.78	.26.96	-23881.77	-32725.89
	Relative index (%)			
Year-on-year growth rate based on 2020 projections	-23.12	.34.97	-26.27	-39.83
Year-on-year growth based on counterfactual projections for 2020	9.52		10.36	
The difference between the 2020 forecast and the counterfactual forecast is the proportion of the counterfactual forecast	-29.8	-40.62	.33.19	-45.48

Table 19. The impact of COVID-19 on tourism in the whole year of 2020

As shown in Table 19, the anti-factual forecast value of total tourism in 2020 is 6.637 billion, and the anti-factual forecast value of total tourism revenue is 7.195472 trillion yuan.

Under the optimistic forecast of Scenario 1, the predicted value of total tourism in 2020 is 4.659 billion, a decrease of 23.12% over the same period of last year; the predicted value of total tourism revenue is 480.7295 billion yuan, a decrease of 26.27% over the same period of

last year. The epidemic caused a potential decline in total tourism arrivals of 1.978 billion people in 2020, a decrease rate of 29.80%, and a potential loss of total tourism revenue of 2.388177 trillion yuan, with a loss rate of 33.19%.

Under the cautious prediction of Scenario 2, the predicted value of total tourist arrivals in 2020 is 3.941 billion, a decrease of 34.97% over the same period of the previous year; the predicted value of total tourist revenue is 392.2883 billion yuan, a decrease of 39.83% over the same period of the previous year. The epidemic caused a potential decrease in total tourism arrivals of 2.696 billion in 2020, a decrease rate of 40.62%, and a potential loss of total tourism revenue of 32725.89 billion yuan, with a loss rate of 45.48%.

When predicting the impact of COVID-19 on the first quarter, semi-annual and annual tourism in 2020 based on different scenarios, different explanatory variables and leading indicator data are selected, so the prediction results are mainly used to observe the overall impact of tourism on the epidemic trends, not accurate numerical comparisons or time summation.

Discussion

It can be seen from the empirical results that the policy has a significant effect on the development of the enterprise, and different enterprises have adopted different coping strategies according to their actual conditions.

Taking SF Express in the tertiary industry as an example, the policies adopted by enterprises such as rapid layout of routes, fully guarantee the smooth flow of import and export cargo transportation, and assisting enterprises to resume production; providing different ways to meet the diverse needs of the market and different type of product service; providing international express delivery services for import and export companies and individuals, providing international parcels and overseas warehouse services for cross-border e-commerce sellers, and providing international air transport and international shipping services for international traders, manufacturing, and multinational companies. This series of measures has greatly increased SF's business volume and revenue, and its market share has further increased. However, the three express delivery companies such as Yunda, Yuantong and Shentong have declined in varying degrees in terms of receivables and business volume.

Taking Alibaba in the tertiary industry as an example, after experiencing the outbreak of SARS, it has further expanded after COVID-19 to increase people's trust in Ali, because they have taken appropriate policies to achieve crisis and turnaround.

According to data from the Ministry of Culture and Tourism: From 1 to 5 May 2020, the country received a total of 115 million domestic tourists and realized domestic tourism revenue of 47.56 billion yuan. In the optimistic and cautious forecast of this model, the total number of domestic tourists received during the International Workers' Day is 197 million and 39 million, respectively, and the domestic tourism revenue is 118.8 billion and 67.78 billion respectively. In the optimistic forecast, it is

assumed that the domestic epidemic will end in early April at the latest, the May 1st tourism situation will rebound compared to previous years, and the cautious forecast assumes that the domestic epidemic situation will end as early as late May. COVID-19 situation will cause losses to the May 1st tourism

industry. The predicted values in this model and the relationship between the ministry of culture and tourism data are consistent with the assumptions, and the model prediction is relatively consistent. However, due to the price increase, the value of RMB is not the same as in previous years, so it will cause International Workers' Day tourism revenue to be higher than the true value when prudently forecasting.

In recent years, DID model is widely used in economics for the measurement of the project or public policy implementation effect evaluation, such as talking about the coal of China railway special line opened to regional economic growth[23], the influence of "One Belt and One Road" affect China's export growth and along the country binary marginal and a series of policy effect[24], with the dynamic management model DID. In addition, intervention evaluation and event impact can be included in medical and health-related fields, and DID dynamic management model can also be used for analysis[25].

Limitations

Because the budget process of the dynamic management model based on the elastic value model is complex, there are many data, and the calculation process is huge, it cannot be considered comprehensively, resulting in some inconsistencies with the actual situation. so the prediction of the tourism situation is referred to The compensatory demand after the SARS epidemic has set an additional growth interval, and the applicability of this novel coronary pneumonia needs to be further improved to be verified.

When predicting the impact of COVID-19 on the first quarter, semi-annual and annual tourism in 2020 based on different scenarios, different explanatory variables and leading indicator data are selected, so the prediction results are mainly used to observe the overall impact of tourism on the epidemic the general trend needs further improvement to make it suitable for accurate numerical comparison or time summation.

The double differential model reflects the immediate effect of policy shocks, but sometimes the policy shocks have a lagging effect. We usually lag one period to estimate the average effect of policy shocks, but since the data we have collected is only in the first quarter, this idea is limited by the data and cannot be realized. We need to further collect data for the following quarters.

Since it is necessary to ensure that the time trends of the treatment group and the control group are consistent before the policy is implemented, this hypothesis can only be tested with sufficiently long time series data. It must be ensured that the control group and the treatment group have at least two periods before the policy occurs at the same time, when the enterprises in Hubei Province are set as the processing group and the enterprises in Jiangsu Province are set as the control group, because it is impossible to guarantee that the two have the same parallel trend, a triple difference model can be used to eliminate the impact of the time trend.

Conflict of interest

We have no conflict of interests to disclose and the manuscript has been read and approved by all named authors.

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