Block Chain Policy's Impact on Firms' Performance Based on PSM-DID

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Abstract. Early in 2020, China's National Development and Reform Commission initially outlined the parameters of new infrastructure, with blockchain technology serving as a crucial tenet. A technologically advanced infrastructure system based on information networks, targeted at the requirements of high-quality development, and offering services like digital transformation, intelligent upgrades, and integrated innovation is what is hoped to be built. This study builds a DID model for analysis and aims to investigate how the adoption of the blockchain policy has affected the performance of various carbon emission enterprises. The paper discovered that blockchain regulation has a negative impact on the performance of high-carbon emission businesses using the DID model. A robustness assessment using PSM-DID reveals the same results. Furthermore, we found that the current ratio and ttm had a positive impact on corporate performance. This paper still has some limitations. To explore the impact of blockchain policy on the performance of various types of organizations, the article does not take into account the state-owned and non-state-owned qualities of enterprises. Future research on this topic will focus on the characteristics of businesses.

1. Introduction.

The National Development and Reform Commission of China made it plain at the start of 2020 that the blockchain is a part of the new infrastructure's new technology. This policy demonstrates that the continued promotion and support of the national team's blockchain services also present significant obstacles and opportunities for the growth of businesses [1-2].

Currently, the new infrastructure primarily consists of three components: infrastructure for information first. It primarily refers to the infrastructure created as a result of the development of the new generation of information technology, such as the new infrastructure represented by artificial intelligence, cloud computing, and blockchain, as well as the communication network infrastructure represented by 5G, the Internet of Things, the Industrial Internet [3-5], and the Satellite Internet. Infrastructures related to technology, computing power, data centers and intelligent computing centers, etc. Infrastructure integration is the second. The extensive use of the Internet, big data, artificial intelligence, and other technology is mostly referred to. Infrastructure innovation is the third strategy. It mostly refers to infrastructure that supports scientific research, technical advancement, and product development and has elements related to public welfare [6-7].

The implementation of blockchain technology by enterprises will also have an impact on carbon emissions and performance. Blockchain technology can be beneficial to the carbon offset market. In the upcoming years, the carbon offset market has the potential to grow into a multi-trillion dollar one, but there are a number of challenges it must currently overcome, such as fraud and credit theft. By providing accurate and accountable tracking of all carbon credit sales, the immutability and security of blockchain technology can assist in overcoming these difficulties. Thus, this study builds a DID model for analysis and aims to investigate how the adoption of the blockchain policy has affected the performance of various carbon emission enterprises.

The study found that high-carbon emission enterprises perform poorly as a result of blockchain regulation. The same conclusions are reached when robustness is evaluated using PSM-DID. In addition, we discovered that the current ratio and ttm were beneficial to company performance.

2. Data

In this article, the author collected the stock information of all companies listed on China's Shanghai Stock Exchange, Shenzhen Stock Exchange, and Beijing Stock Exchange from 2018 to 2021 from the wind database. Moreover, this article also excluded financial institutions such as banks, brokerages, and companies with missing data when conducting research, and finally obtained 18208 samples. In order to eventually expand the difference in difference model, we set the high-carbon emission firms as the experimental group, numbering 1, and the low-carbon emission enterprises as the control group, marked as 0, for grouping. In this study, the current ratio and total asset turnover(ttm) are employed as control

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variables, and ROA is used as an index to measure how well the company is performing. Table 1 presents the descriptive statistics of each variable.

We found that the mean value of the roa in each province and city in 2018-2021 is 6.794, the standard deviation is 10.945, the minimum value is -183.981, and the maximum value is 158.9373. The average number of current ratio is 2.635531, the average number of ttm is 0.699052. The standard deviation of ttm is 0.547353. The numerical characteristics of other variables can also be consulted from Table 1.

Table 1. Descriptive statistic

Variable	Obs	Mean	Std. Dev.	Min	Max
roa	18,208	6.973928	10.94509	-183.9813	158.9373
current ratio	18,208	2.635531	3.03481	0.0278	80.66373
ttm	18,208	0.699052	0.547353	-0.04794	11.97554
treat	18,208	0.478251	0.499541	0	1
post	18,208	0.5	0.500014	0	1

Each variable was subjected to a correlation analysis as well, and the pertinent outcomes are displayed in Table 2. We can deduce that the current ratio has a favorable impact on roa since a number of indices for the current ratio have a significant positive connection with it. The ttm is also positively correlated with roa with a correlation of 0.2565.

Table 2. Correlation between each variable.

	roa	current ratio	ttm
roa	1		
current ratio	0.1365***	1	
ttm	0.2565***	-0.1173***	1

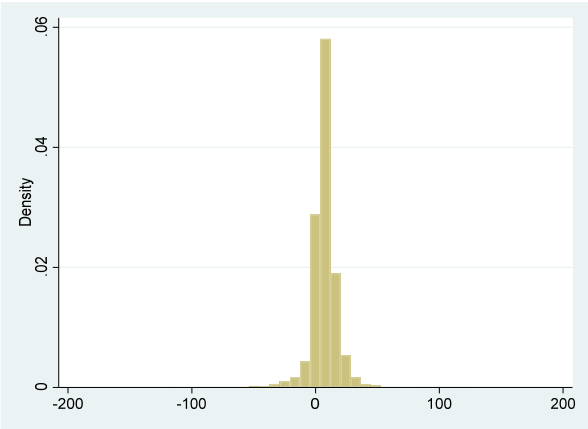

Fig 1. Statistical histogram of ROA
(By authors)

Figure 1 shows the statistical histograms of firms' performance index ROA, in order to better describe the probability distribution of each variable. The variables essentially follow the assumption of normal distribution, as shown by the histogram. Figure 2 presents the statistical histograms of the current ratio and total asset turnover (ttm) of the company. Their distribution also basically follows a normal distribution.

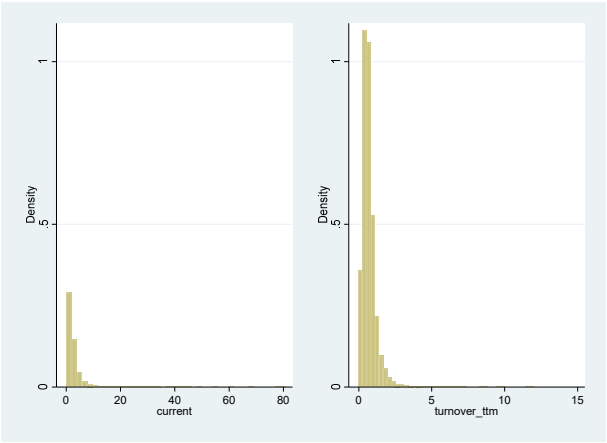

Fig 2. Statistical histogram of current ratio and ttm
(By authors)

3. Method

The difference-in-difference method is becoming more and more popular since it is a potent instrument in the policy effect evaluation method [8-9]. In summary, there are various reasons: (1) It can substantially reduce the hassle of endogenous issues: general policy. In general, there is no issue with reverse causation because it is exogenous to microeconomic subjects. Additionally, the use of fixed effect estimates somewhat reduces the issue of omitted variable bias. (2) The typical approach to evaluating policy effects mostly involves creating a dummy variable that indicates whether the policy is implemented or not, followed by regression analysis. In contrast, the model configuration of the twofold difference technique is more scientific and is capable of more precise estimation of the policy effect. (3) The double difference method's premise and model setting are much less complex, straightforward, and intimidating than approaches like spatial measurement. (4) Although the estimation of panel data fixed effects is the core of the double difference estimation method, DID sounds somewhat more "fashionable and high-end" than OLS, FE.

This article evaluates the policy that "blockchain belongs to new technology infrastructure in new infrastructure" clearly stipulated by China's National Development and Reform Commission in early 2020. After 2020 is divided into the policy implementation year, set to 1; before 2020, set to 0 and generating the post variable. The high carbon emission firms are 1 and low carbon emission is the control group named 0, generating the treat variable.

In this article, we consider the integration of post and treat as the dependent variable, and roa as the independent variable. We also set the firm's current ratio and total asset turnover(ttm) as the control variable. Thus, we obtain the following DID model to investigate the impact of block policy on the firm's performance based on the Chinese stock market.

$$ROA = \beta_0 + \beta_1 \times post + \beta_2 \times treat + \beta_3 \times post \times treat + \beta_4 \times current + \beta_5 \times ttm \quad (1)$$

4. Result analysis

We discovered that the blockchain policy has a detrimental impact on the performance of high-carbon emission enterprises based on the findings in Table 3. The production of high-carbon-emitting enterprises will result in additional carbon emissions, which will be monitored and will be subject to a higher risk of fines, decreasing the motivation of high-carbon-emitting enterprises to over-produce and reduce gains. This demonstrates how the blockchain can make information transparent. In addition, we also found that the current ratio and ttm have a positive impact on corporate performance.

Table 3. Regression result of DID.

	(1) roa	(2) roa	(3) roa	(4) roa
treat	2.98***	2.81***	2.941***	2.726***
	(0.003)	(.014)	(0)	(.006)
post	-1.32***	-1.368***	-.997***	-1.033***
	(0.001)	(.004)	(.003)	(.012)
posttreat	-0.217***	-0.067	-0.28***	-0.096*
	(0.001)	(.013)	(.001)	(.008)
current ratio		.46*		.574**
		(.039)		(.019)
ttm			5.074***	5.44**
			(.043)	(.166)
_cons	6.157***	5.085**	2.452***	.848*
	(0)	(.091)	(.031)	(.078)
year	Y	Y	Y	Y
Observations	18208	18208	18208	18208

Standard errors are in parentheses
*** p<.01, ** p<.05, * p<.1*

Economists typically establish "treatment groups" and "control groups" to compare the effects of various policies when examining the consequences of a public policy. Non-randomized observational studies frequently have baseline differences between the treatment group and the control group, which raises the possibility of selection bias. Using a propensity score function, data from a multidimensional vector is condensed into one dimension in Propensity Score Matching (PSM), which then uses the propensity score to match data [10]. Making the individuals in the treatment group and the persons in the control group as similar as possible under the provided observable characteristic variables will address the issue of selection bias of the treatment effect. Then, the paper considers PSM-DID to check the robustness of the result. Table 4 prove that the results of policy's impact on firms' performance are robust.

Table 4. Regression result of PSM-DID.

	(1) roa	(2) roa	(3) roa	(4) roa
treat	3.326***	2.915**	3.297***	2.767**
	(.002)	(.098)	(.002)	(.118)
post	-.59***	-.804**	-.078	-.3**
	(.001)	(.051)	(.037)	(.012)
posttreat	-2.446***	-1.793*	-2.56***	-1.735*
	(.002)	(.155)	(.008)	(.172)
current ratio		.591		.758
		(.141)		(.165)
ttm			5.894**	6.505*
			(.42)	(.55)
_cons	6.848***	5.315**	2.542*	.129
	(0)	(.366)	(.307)	(.831)
year	Y	Y	Y	Y
Observations	7161	7161	7161	7161

Standard errors are in parentheses
*** p<.01, ** p<.05, * p<.1*

5. Conclusion

This article attempts to evaluate the effects of blockchain regulations on the efficiency of businesses with high and low carbon emissions. The author of this post obtained stock data from the wind database for all businesses listed between 2018 and 2021 on China's Shanghai Stock Exchange, Shenzhen Stock Exchange, and Beijing Stock Exchange. When doing research, this paper additionally removed financial institutions including banks, brokerages, and businesses with incomplete data, and ultimately obtained 18208 samples.

We found that the DID model-based high-carbon emission firms perform poorly as a result of the blockchain policy. The same outcomes are also shown by a PSM-DID robustness check. Additionally, we discovered that ttm and the current ratio had a favorable effect on corporate performance.

There are still shortcomings in this paper. For example, the paper does not consider the state-owned and non-state-owned attributes of enterprises to explore the impact of blockchain policy on the firms' performance of different types of enterprises. In the future, this paper will consider the attributes of enterprises for further exploration.

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