

参赛队员姓名：吴美蓓 万翔 谢誉权

中学：南京外国语学校

省份：江苏

国家/地区：中国

指导教师姓名：许开全 王宇伟

指导教师单位：南京大学

论文题目：How does Lockdown Policy affect Domestic Trade, is Transportation Restriction the Original Sin? Empirical Evidence from the Epidemic in Shanghai

# How does Lockdown Policy affect Domestic Trade, is Transportation Restriction the Original Sin? Empirical Evidence from the Epidemic in Shanghai

Meiqian Wu, Xiang Wan, Yuquan Xie, Nanjing Foreign Language School, 2022/09/09

## Abstract

Since January 2020, the emerging Covid-19 epidemic has to very high impacts on the human's life and the economy. Especially, the lockdown policy adopted by some cities restricts the cargo transportation greatly, which is the main way to conduct domestic trade. Does the lockdown policy have any impact on domestic trade? If so, what is the mechanism? In order to answer these emerging and important questions, we utilize the nature event, the epidemic occurred in Shanghai and Yangtze River Delta (YRD) in March 2022, and collected the cargo transportation data from the largest platform for the water shipping business in China. The difference-in-difference (DID) analysis method is used to validate the impacts of the lockdown on domestic trade. We find that, compared with the water shipping amount outside YRD, even water shipping were not restricted, the water shipping amount in YRD still has a decline trend in spite of the railway and highway transportation restriction effect. The water shipping amount from the outside YRD to the YRD, and the one from YRD to the outside of YRD, both decrease greatly and significantly. These findings have the important academic and practical contributions in the post epidemic era. This study contributes to domestic trade field by validating the relation between the antiepidemic policy and trade. Transportation recovery still is not the cause while is the result of trade. Reigniting demand still is the key of the economy recovery.

**Keywords:** Lockdown, Domestic Trade, Covid-19, Economy

# 1. Introduction

As we know that domestic trade is playing the key roles in a national economy. It facilitates exchange of goods within the country, and helps the growth of an industry by ensuring the availability of raw materials [1]. Compared with the international trade, domestic trade has unique benefits, such as lower transaction costs and transportation costs. It also helps to eliminate the country's dependence on foreign lands[2].

Since January 2020, the novel coronavirus, Covid-19, spread globally, and the epidemic has very high impacts on the various aspects of our society including the economy. For preventing the epidemic, many polices and measures are adopted. Among them, the lockdown is the strictest policy adopted by government at city level, which usually restricts the movement of people and vehicles. Although this policy is very effective in stopping the spread of the epidemic, it also decreases the cargo transportation greatly, which is the main way to conduct domestic trade. Does the lockdown policy have any impact on domestic trade? If so, in what degree does it influence domestic trade and economy?

In order to answer this emerging and important question in the current post epidemic society, we utilized the nature event, the epidemic occurred in Shanghai and Yangtze River Delta (YRD) in March 2022, and collected the cargo transportation data from the largest platform for the water shipping business in China. The difference-in-difference (DID) analysis method is adopted to validate the impacts of the lockdown on domestic trade. We find that, compared with the water shipping amount outside of YRD, the water shipping amount in YRD has a decline trend. The water shipping amount from the outside of YRD to the YRD, and the one from YRD to the outside of YRD, both decrease greatly and significantly.

As we know under our limited knowledge, there are not many related studies on exploring the lockdown's impact on domestic trade. The findings in this study have the important academic and practical contributions in the post epidemic era. First it contributes to domestic trade field by validating the relation between antiepidemic policy and trade. Second, this study also has some practical implications for the government to balance economy and antiepidemic measures.

## 2. Research Setting

As we know that, a large scale epidemic occurred in Shanghai from March to May 2022, and quickly spread to most cities in YRD, such as Suzhou, Nanjing, Yangzhou, Hefei, Taizhou, Wuhu etc [3]. In order to slow down the spread of the coronavirus, the lockdown policy were adopted seriously from March to May in these cities. During the lockdown period, people, cars and trains cannot enter and leave these cities.

Lockdowns in Shanghai and other cities is piling severe pressure on logistics across the country. Everyone says it is exacerbating the economic fallout. However, is the transportation restriction the only reason driving economic fallout, or is there any other inner-reasons, for example, the demand falling.

Given YRD is the most important economy center and connects with many other cities in domestic trade, this epidemic event and the lockdown measure provide an ideal research setting to explore the lockdown's impacts on domestic trade.

### 2.1 Hypothesis

Highway transportation is the main transportation way in YRD. When highway and trains are blocked,

the water transportation should increase significantly.

H1: Compared with the water shipping amount outside YRD, the water shipping amount in YRD has an increase trend.

H2: The water shipping amount from the outside YRD to the YRD has an increase trend.,

H3: The water shipping amount and the one from YRD to the outside of YRD has an increase trend.

## 2.2 Dataset

The dataset was collected from the first and largest platform for mating ships and cargoes across China. Different with DiDi matching passengers and taxis, this platform mainly focuses on the water transport. The cargo owners publish their shipping requirements in the platform, for example, sending 10 tons of oil from Suzhou to Shanghai. The ship owners can bid to get the deal. Since this platform has a monopoly in this emerging business, the data from it is very representative and indicates domestic trade status, especially for the bulk cargoes and industrial products.

We choose this dataset firstly because the railway and highway transportation were restricted during the lockdown, however the shipping transportation were not restricted. Because shipping can achieve non-touching transportation, which means, the cargo can be downloaded and uploaded without people contacting, and the crew member can stay on board without contacting people on the port. Therefore, theoretically speaking, the shipping data should not be affected by the lockdown.

Secondly, in YRD area, even though highway transportation is the main way of logistics, however, the water transportation has its natural advantages because of the Chang Jiang River, and has been significantly developed during the recent years by government support [8].

We collected the all data in this platform from 2022-02-16 to 2022-05-31 at deal level across the whole China. For each deal, the information includes: departure city, destination city, cargo name, landing date, amount of cargo (in RMB) etc. The popular products include coal, steel, ironstone, cement, oil etc.

The lockdown started on March 17 in Shanghai, but other cities in YRD adopted this policy later than the date of Shanghai. And the cargo shipping was not restricted at first, after some infected staffs in shippes were discovered, the lockdown policy was extended to shippes. So here we adopted one month later after Shanghai's lockdown, April 17, as the starting date of the YRD's lockdown on shipping cargo.

## 2.3 Descriptive Statistics

We aggregated the data from deal level to week level, since the cargo shipping has week seasonality, and the following is the summary of the dataset.

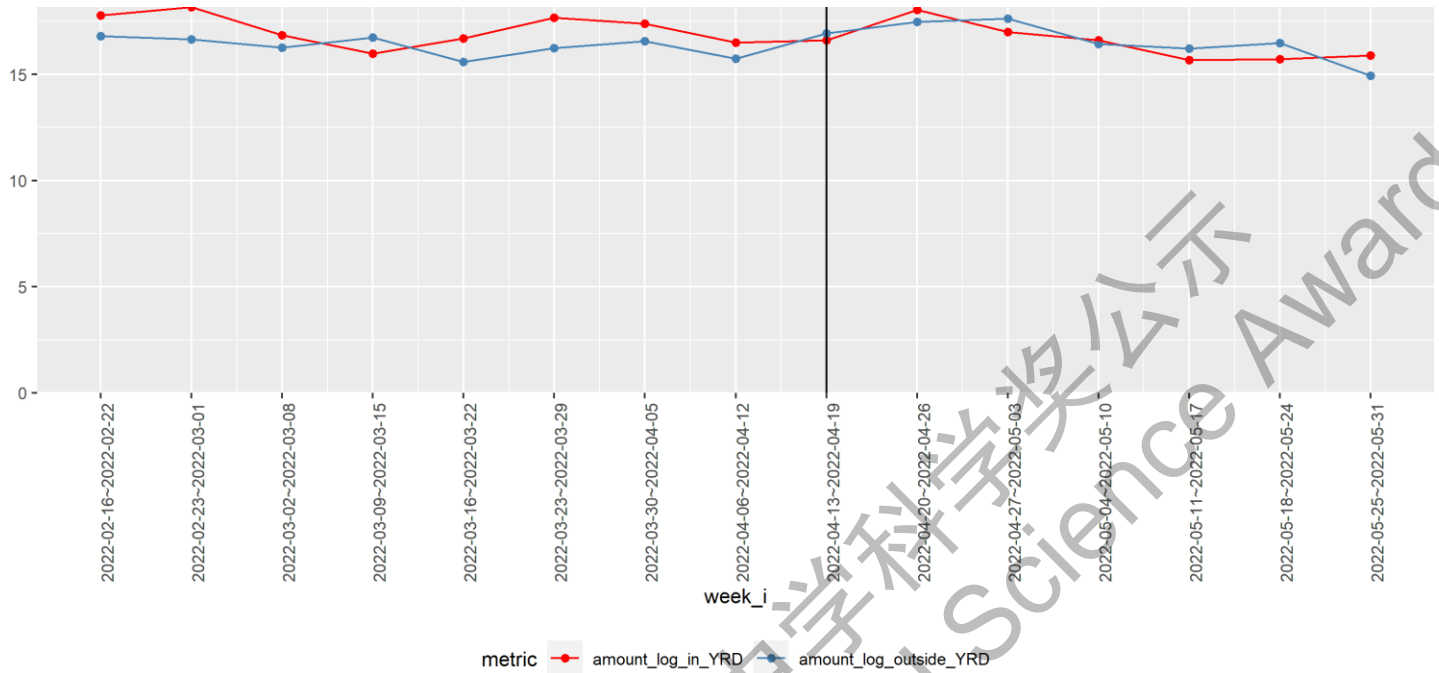
Table 1: Dataset Summary

Statistic	N	Mean	St. Dev.	Min	Max
row_id	1,230	615.500	355.215	1	1,230
week_i	1,230	7.790	4.150	1	15
amount	1,230	947,718.900	3,100,539.000	0.000	45,850,380.000

## 3. Research Findings

### 3.1 Water shipping amount in YRD

The following figure shows the water shipping amount (taking log) in YRD and outside of YRD at week level.



We can find that, compared to the water shipping amount outside of YRD, the water shipping amount in YRD is higher than that outside of YRD in most of weeks, before the lockdown starting date. But after the starting date, the water shipping amount in YRD become similar with, even slight lower than, that outside of YRD.

In order to seriously validate if the water shipping amount in YRD decreases after the lockdown starting date, with taking the water shipping amount outside of YRD as the control, we run the following difference-in-difference regression:

$$\log(\text{water shipping amount}) = a + \beta_1 \cdot is\_YRD + \beta_2 \cdot \text{after\_lockdown} + \beta_3 \cdot is\_YRD \times \text{after\_lockdown}$$

The regression result is reported in the following table.

The table shows that the coefficient for  $is\_YRD : \text{after\_lockdown}$  is minus. Although it is not significantly different with zero, p-value related with this coefficient is 0.1163, which is slightly higher than 0.1 (significance level), and we can think the effect is weakly significant in some degree. This means the lockdown policy decreases the water shipping amount in YRD. The possible reasons are the restriction of shipping movement in this area, or the factories in this area stopped operating, which leads to the decrease of cargo generation and requirements.

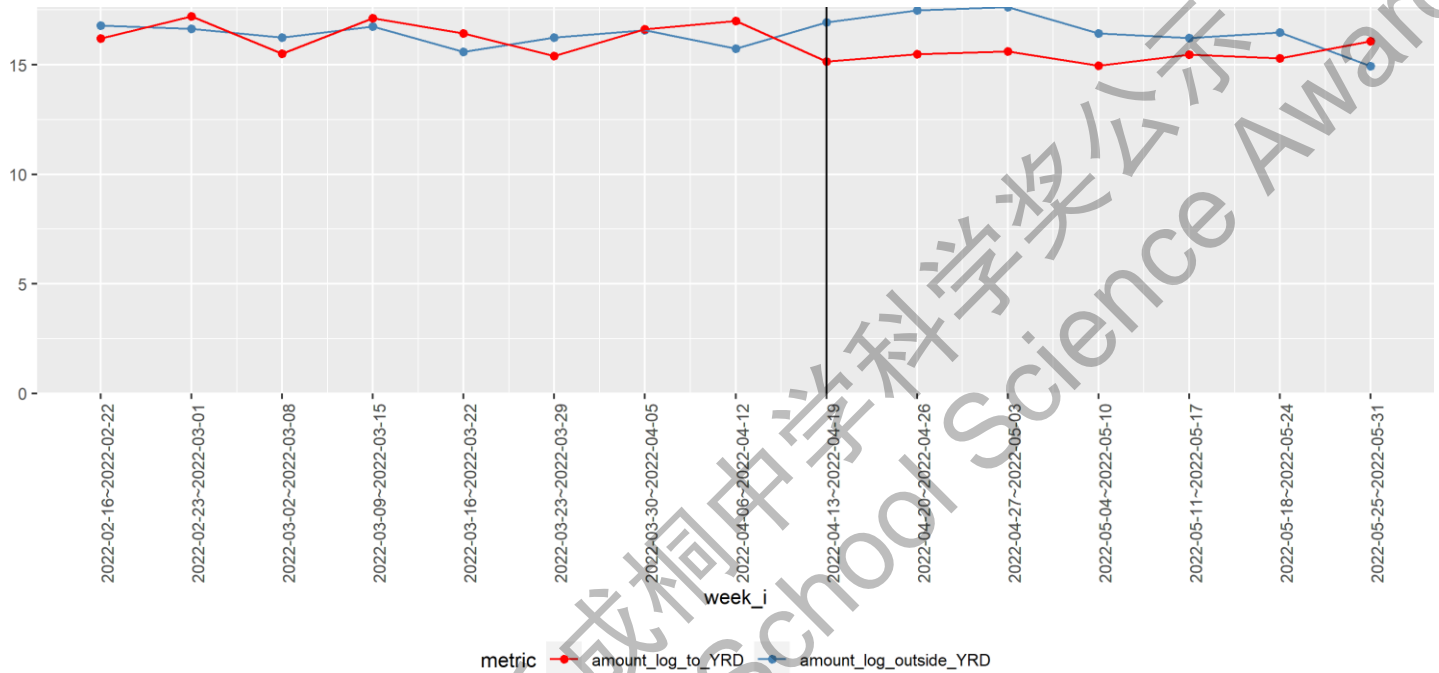
Table 2: Table 1: Water shipping amount in YRD

<i>Dependent variable:</i>	
trade amount log	
is_YRD	0.806 ** (0.373)
after_lockdown	0.266 (0.387)
is_YRD:after_lockdown	-0.888 (0.547)
Constant	16.322 *** (0.264)
Observations	30
R <sup>2</sup>	0.165
Adjusted R <sup>2</sup>	0.068
Residual Std. Error	0.747 (df = 26)
F Statistic	1.710 (df = 3; 26)

Note: \* p<0.1; \*\* p<0.05; \*\*\* p<0.01

### 3.2 Water shipping amount to YRD

The following figure shows the water shipping amount to YRD from outside of YRD at week level, by taking the water shipping amount outside of YRD as the reference.



We can find that, compared to the water shipping amount outside of YRD, the water shipping amount to YRD is similar in most of weeks before the lockdown starting date. But after the starting date, the water shipping amount to YRD decreases quickly and is much lower than that outside of YRD.

In order to validate if the water shipping amount to YRD from the outside of YRD, decreased after the lockdown starting date, we run the following difference-in-difference regression, with using the water shipping amount outside of YRD as the control:

$$\log(\text{water shipping amount}) = a + \beta_1 \cdot \text{is\_to\_YRD} + \beta_2 \cdot \text{after\_lockdown} + \beta_3 \cdot \text{is\_to\_YRD} \times \text{after\_lockdown}$$

The regression result is reported in the following table.

The table shows that the coefficient for  $\text{is\_to\_YRD} : \text{after\_lockdown}$  is minus (-1.273) and is significantly different from zero, which means the lockdown policy decreases the water shipping amount to YRD from the other area, with the water shipping amount outside of YRD as the reference. The possible reasons are the restriction of the traffic of ships to YRD, or the factories in this area stopped operating, which leads to the decrease of cargo requirements.

Table 3: Water shipping amount to YRD

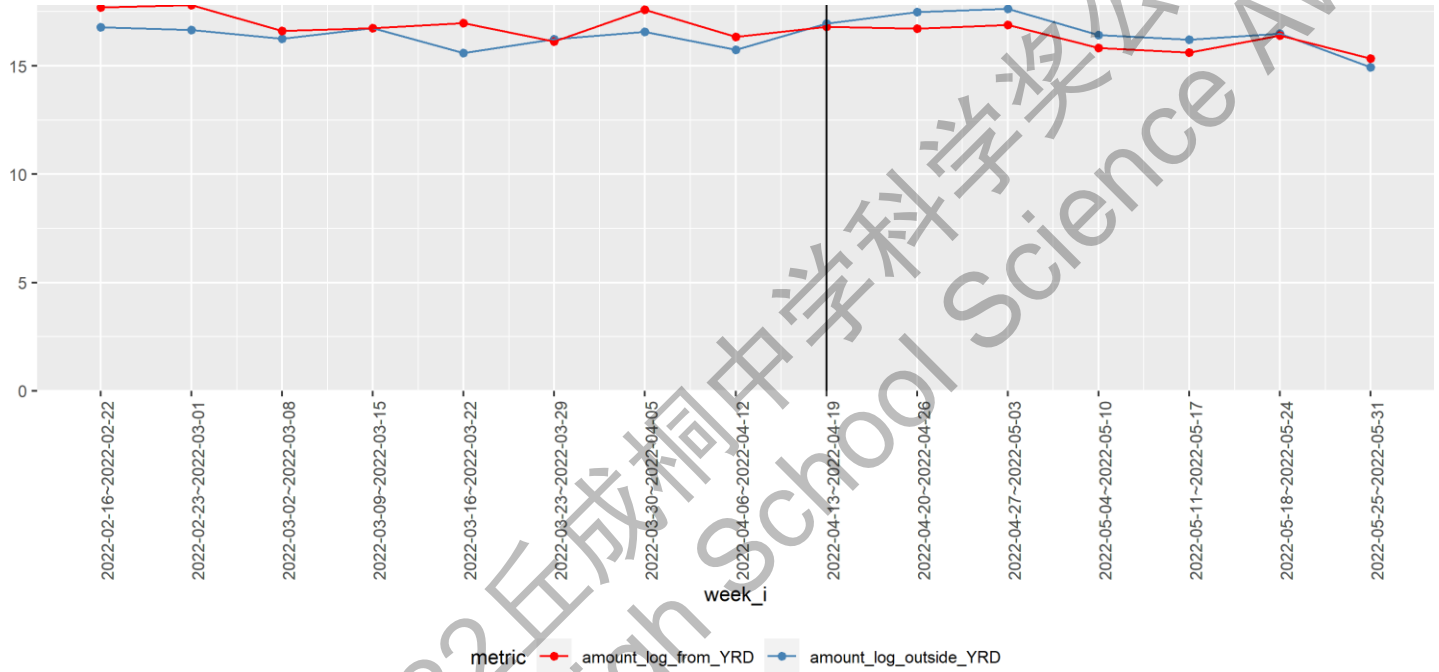
Dependent variable:	
trade_amount_log	
is_to_YRD	0.114 (0.319)
after_lockdown	0.266 (0.330)
is_to_YRD:after_lockdown	-1.273** (0.467)
Constant	16.322*** (0.225)

Observations	30
R <sup>2</sup>	0.353
Adjusted R <sup>2</sup>	0.279
Residual Std. Error	0.637 (df = 26)
F-Statistic	4.734 *** (df = 3; 26)

Note: \*p<0.1; \*\*p<0.05; \*\*\*p<0.01

### 3.3 Water shipping amount from YRD

The following figure shows the water shipping amount from YRD to the outside of YRD at week level, by taking the water shipping amount outside of YRD as the reference.



We can find that, compared to the water shipping amount outside of YRD, the water shipping amount from YRD is higher in most of weeks before the lockdown starting date. But after the starting date, the water shipping amount from YRD decreases obviously and becomes lower than that outside of YRD, which is as the reference.

In order to validate if the water shipping amount from YRD decreases after the lockdown starting date, we run the following difference-in-difference regression, with the water shipping amount outside of YRD as the control:

$$\log(\text{water shipping amount}) = a + \beta_1 \cdot \text{is\_from\_YRD} + \beta_2 \cdot \text{after\_lockdown} + \beta_3 \cdot \text{is\_from\_YRD} \times \text{after\_lockdown}$$

The regression result is reported in the following table.

The table shows that the coefficient for *is\_from\_YRD : after\_lockdown* is minus (-1.022) and is significantly different from zero, which means the lockdown policy decreases the water shipping amount from YRD to the other area. The possible reasons are the factories in YRD stopped operating, so that there were not cargo to ship to other areas.

**Table 4: Water shipping amount from YRD**

		<i>Dependent variable:</i>	
<u>trade_amount_log</u>		is_from_YRD	0.666*
		(0.334)	
after_lockdown		0.266	
		(0.346)	
is_from_YRD:after_lockdown	-	1.022**	
		(0.489)	
Constant		16.322***	
<u>(0.236)</u>			
Observations		30	
R <sup>2</sup>		0.187	
Adjusted R <sup>2</sup>		0.093	
Residual Std. Error		0.668 (df = 26)	
F Statistic		1.989 (df = 3; 26)	
<i>Note:</i>		*p<0.1; **p<0.05; ***p<0.01	

#### 4. Conclusions and Suggestions

Domestic trade has been playing key roles in economy. But the emerging Covid-19 epidemic and the lockdown policy bring the unpredicted impacts on domestic trade. In this study, we use the nature event, Shanghai and YRD's large scale epidemic, to explore the lockdown policy's effects on domestic trade. We collected the unique cargo transportation data from the largest platform for the water shipping, and the difference-in-difference method is adopted. We find that, compared with the water shipping amount outside YRD, the water shipping amount in YRD has a decline trend. The water shipping amount from the outside YRD to the YRD, and the one from YRD to the outside of YRD, both decrease greatly and significantly. Hypothesis1, 2 and 3 are not supported.

These findings rebut the opinions that lockdown affect transportation, therefore affect economy. These findings suggest that there are other drivers of economy fall down, transportation data are still the expression of economy rather than the driver of economy, even in the covid quarantines time. Transportation recovery still is not the cause while is the result of trade recovery. Reigniting demand still is the key of the economy recovery. Allowance or fee-reduction for transportation are of few use.

These findings have the important academic and practical contributions in the post epidemic era. , and can give suggestions for the government to balance the economy and antiepidemic measures. Reigniting demand still is the key of the economy recovery. Allowance or fee-reduction for transportation industry are of few use.

#### 5. Limitations and Future Research

##### Limitations:

1. Since Shanghai Port is one of the biggest international port in China, a lot of



international cargoes are sub-packaged and shipped to other places in China from Shanghai Port. Shanghai's lockdown restricted international shipping, which may influence shipping data from Shanghai to other places. However, because of the limitation of the data, we cannot eliminate this possible factor.

2. Data outside the shipping platform is not collected.

**Future Researches:**

1. Commodities can be divided into different categories like consumption material, construction material, production material, etc.
2. City to city pair shipping data can reflect the YRD economy ladder and reveal which loop of the economy is more vulnerable in front of the background of lockdown.
3. Shipping data all through China may reveal more economical operation mechanisms. Future researches may explore on that.

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Lockdowns in Shanghai and other cities are piling severe pressure on logistics across the country. Everyone says it is exacerbating the economic fallout. However, is the transportation restriction the only reason driving economic fallout? Or, there are other inner-reasons, for example, the demand falling.

We are interested in finding out the truth. Through the process, we found out that the railway and highway transportation is restricted while the shipping transportation is not restricted. That took advantage of shipping's ability of achieving non-touching transportation. In this way, the cargo can be downloaded and uploaded without people's interaction as the crew members can stay on board without contacting people on the port. Therefore, theoretically speaking, the shipping data should be increased rather than decreased.

Luckily, we found the database of the first and largest platform for mating ships and cargoes across China. We collected all data in this platform from 2022-02-16 to 2022-05-31 at deal level across the whole China, which covered Shanghai's lockdown. Meiqian Wu took responsibility of collecting the data, Xiang Wan and Yuquan Xie were in charge of data analysis. All of us did the literature and writing, polishing together.

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