Impact of Technological Innovation and Covid-19 on the Yangtze River Delta Region's FDI

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Abstract. The Yangtze River Delta is an area in China's lower portions of the Yangtze River that borders both the Yellow Sea and the East China Sea and contains a large number of coastal ports. Foreign direct investment (FDI) has driven the rapid development of the local economy. However, there are few studies on the impact of local technological innovation on the attractiveness of FDI. This paper examines how technical innovation affects FDI and considers if FDI might be encouraged by technological advancements made during Covid-19. This paper uses the principal component analysis method to establish the technological innovation index. The regression model is established to evaluate the impact of technological innovation and Covid-19 on Foreign direct investment (FDI). We found that technological innovation has a positive effect on FDI. At the same time, under the background of Covid-19, technological innovation is not conducive to attracting FDI. We also provide some recommendations to assist the government in fostering technological innovation. (1) The local government ought to support both homegrown and international innovation. (2) The government should also promote the development of creative talent teams and inspire scientists and technicians to work for regional businesses or launch their own ventures.

1. Introduction

All nations across the world have seen the miracle of China's economic growth, which has increased by leaps and bounds since the reform and opening up. Many academics have investigated and argued on the actual catalyst for China's economic growth miracle in this area [1-4]. In truth, it is impossible to deny the role that the Chinese government's advocacy of large-scale investment has played in the miracle of economic growth. Both domestic and international investment are vital sources of funding for local governments, as well as a key tool for my nation's local economic development to overcome some fiscal challenges [5-8]. The Yangtze River Delta region benefits greatly from FDI. FDI not only boosts local technical advancement but also increases the production efficiency. Local economic level and investment climate will improve along with increased investment value [9-11], which will have a positive feedback impact on FDI as local scientific and technological innovation advances. However, the impact of technological innovation on FDI has not been extensively studied. A foreign direct investment (FDI) is an investment made by a company based in another nation that takes a controlling interest in a company in another country. The higher FDI represents a very strong interest in the country, and it will also bring greater room for growth and innovation to the country, making the market more active. It has positive feedback.

The happen of covid-19 also impact the FDI entering. The COVID-19 epidemic has had significant effects and challenges for global sustainable development over a number of years, especially when cities are put under greater strain [12-15]. The Yangtze River Delta area has been continuously plagued by epidemics since the start of this year. A number of economic indices have fallen, and the social and economic order has been impacted. It has a bigger effect on the stability of the global industrial chain, supply chain, and capital chain because it is a significant component of the world economy.

The Yangtze River Delta urban agglomeration, which is centered in Shanghai, has adopted a number of green recovery and revitalization measures in order to restore and revive the economy and has gained successful experience in avoiding explosive recovery at the expense of depleting environmental resources. However, there is a few pieces of literature conducted research about covid-19's impact on FDI from the perspective of technological innovation. FDI duties refer to the obligation of foreign investment institutions to invest in the country to promote the development of science and technology in the country

This paper uses the principal component analysis method to reduce the dimension according to the number of patents, the number of inventions, the number of scientific and technological innovation personnel, and R&D expense. Reducing dimension refers to represent the multiple data with one or a few data. Patents are the invention and creation protected by law. The R&D planning is about the company's plan for the number of future R&D patents and funding. It then constructs a technological innovation index to measure the scientific and tech-

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nological innovation level of Shanghai City, Jiangsu Province, Zhejiang Province, and Anhui Province in the Yangtze River Delta region. Then, in order to examine the influence of technological innovation and the impact of COVID-19 on FDI, we established an OLS model taking temporal and regional fixed effects into consideration. According to our research, technological innovation helps FDI. In addition, technological innovation does not aid the attraction of FDI in the situation of Covid-19. Through robustness testing techniques like PSM regression and group regression, we further demonstrate the dependability of our model's predictions.

The remainder of the article is organized as follows. Section 2 shows the data. Section 3 is the method. Section 4 presents the analysis of the results. Section 5 presents the robustness test. Section 6 conducts a discussion. Section 7 summarizes the conclusion.

2. Data

The Yangtze River Delta, commonly referred to as the Yangtze River Delta, is an area in China's lower portions of the Yangtze River that borders both the Yellow Sea and the East China Sea and contains a large number of coastal ports. Shanghai, Jiangsu, Zhejiang, and Anhui provinces are all included. This alluvial plain was built before the Yangtze River reached the ocean. This article would take the Yangtze River Delta region as the analysis object to explore the impact of technological innovation and the epidemic on FDI.

The relevance of technological advancement and the impact of COVID-19 on the FID of the Yangtze River Delta region will be discussed in this paper. In addition to gathering FDI statistics, we also compile information on the number of patent authorizations, invention authorizations, scientific research personnel, and funding in Shanghai, Jiangsu, Zhejiang, and Anhui provinces. As additional control variables, we additionally gathered data on the number of households registered locally, the population growth rate, the yearly wage level in the area, the fiscal year's government revenue, and the expenditure on education. The years 2008 through 2021 are covered by the data. The official websites of the statistical offices of Shanghai, Jiangsu, Zhejiang, and Anhui, as well as the China City Statistical Yearbook, the China Statistical Yearbook, the wind database, and others, serve as sources of data [16-19].

The variables are then described: patent represents the number of patent authorizations in each province, the invention represents the number of invention authorizations; Rdfee indicates the R&D spending of firms above the designated size, Rdpeople represents scientific researchers of enterprises above the designated size in each province. people indicates the total number of people who are officially registered in the region, peoplegrowth is the population growth rate, wages represent the average yearly wage in the area, arearev is the total fiscal revenue for the year, and edufee is the cost of education by the government. The aforementioned variables have all undergone logarithmic processing. We set covid equal to 1 representing the happening of Covid-19 after 2020, otherwise, with 0. We also utilize the interaction of covid and technological innovation to identify the impact of technological innovation during the covid-19 period.

Table 1. descriptive statistic

Variable	Mean	Std.Dev.	Min	Max
FDI	8.040174	1.093687	5.539872	9.568616
zhuanli	11.53545	0.994593	8.377011	13.37066
invention	9.428795	1.063872	6.192362	11.13915
Rdfee	15.57152	0.807519	13.44652	17.11749
Rdpeople	11.99815	0.795641	10.40135	13.32559
people	8.543863	0.470309	7.543517	9.04841
peoplegrowth	3.661071	2.270673	-1.12	8.17
wages	8.517702	0.715776	6.777077	9.61197
arearev	17.50758	0.615551	15.79599	18.4222
edufee	16.41949	0.526579	15.29341	17.40847
covid	0.142857	0.353093	0	1

The descriptive statistic for each variable is displayed in Table 1. We discovered that between 2008 and 2021, the mean logarithmic FDI in each province and city was 8.04, with a standard deviation of 1.093687, a minimum of 5.539872, and a maximum of 9.568616. In each province, the average number of patents is 11.53545, the average number of inventions is 9.428795, the average amount spent by businesses on R&D is 15.57152, and the average amount spent on scientific research is 11.99815. Table 1 contains the numerical characteristics of other variables that can be used as well.

Additionally, a correlation analysis was performed on each variable, and the relevant results are shown in Table 2. Since a lot of indices for measuring technological innovation have a strong positive correlation with it, we can conclude that technical innovation has a beneficial impact on FDI. FDI and population growth rate are inversely connected.

Table 2. Correlation analysis

	FDI	zhuanli	invention	Rdfee	Rdpeople	people	peoplegrowth	wages	arearev	edufee
FDI	1									
zhuanli	0.7097*	1								
invention	0.7969*	0.8778*	1							
Rdfee	0.7993*	0.9526*	0.9055*	1						
Rdpeople	0.5974*	0.9179*	0.7259*	0.9223*	1					
people	-0.1144	0.4075*	0.1024	0.4124*	0.6370*	1				
peoplegrowth	-0.8130*	-0.4737*	-0.5205*	-0.5273*	-0.3264*	0.1912	1			
wages	0.8396*	0.8453*	0.9447*	0.8853*	0.7026*	0.0451	-0.5740*	1		
arearev	0.9167*	0.8534*	0.9346*	0.9140*	0.7279*	0.0506	-0.6345*	0.9589*	1	
edufee	0.6039*	0.9233*	0.8636*	0.9413*	0.8901*	0.5477*	-0.3504*	0.8337*	0.8111*	1

The statistical histograms between the level of FID and Covid are shown in Figures 1 and 2, respectively, to more clearly illustrate the probability distribution of each variable. The histogram demonstrates that FID basically conforms to the premise of normal distribution.

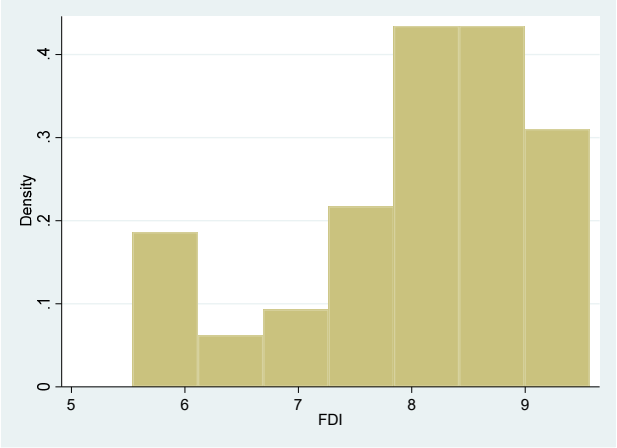

Fig 1. Statistical histogram of FDI

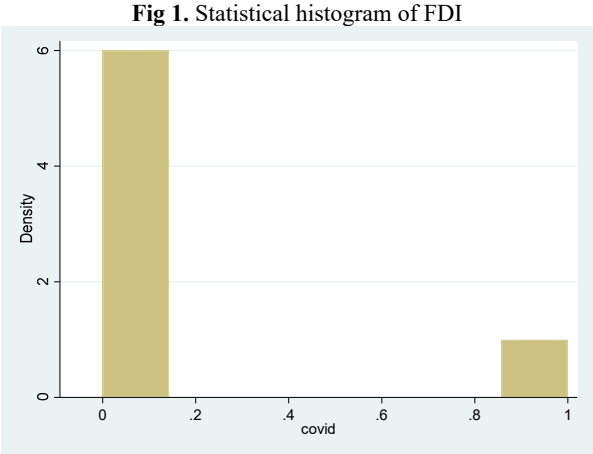

Fig 2. Statistical histogram of covid

3. Method

In this work, we first would establish the technological innovation variables based on principal component analysis (PCA). Then, we would investigate the impact of technological innovation and covid-19 on the FDI of the Yangtze River Delta taking the data from Shanghai, Jiangsu, Zhejiang, and Anhui provinces.

3.1.PCA

Principal component analysis (PCA) is used in this research to pinpoint technological innovation. Principal component analysis can be used to address issues with population statistics, quantitative geography, molecular dynamics simulation, mathematical modeling, etc. It is a popular method for examining many factors. Principal component analysis (PCA), the basic method for mathematical analysis, is widely used. The PCA can be used to reduce the dimension of the data without altering its characteristics [20].

Principal component analysis may be used to control the risk of interest rate derivative portfolios directly in quantitative finance. Trading multiple swap instruments aim to simplify them to 3 or 4 main components, which define the direction of interest rates on a macro level and are often a function of 30-500 other market quotable swap products. Risks can be assessed and understood in ways that go beyond what is possible by just considering risks as a whole in terms of individual 30-500 buckets [21]. This is done by converting risks to be represented as those to factor loadings (or multipliers).

Similar to this, PCA has been used to examine portfolio risk and risk-return for equity portfolios. To reduce portfolio risk, allocation methods are used to "principal portfolios" rather than the underlying equities. The strong impacts between each assessment indication can be removed using the principal component analysis, which is utilized for multi-indicator comprehensive evaluations. The quantity of information and the number of system impacts were produced by mathematical changes during the analysis process. But the PCA appears that way as follows.

$X = \left(X_1, X_2, X_3, ..., X_n\right)'$ is an N-dimensional random vector, and its linear changes are as follows.

$$\begin{aligned} PC_1 &= a_1'X = a_{11}X_1 + a_{21}X_2 + a_{31}X_3 + ... + a_{n1}X_n \\ PC_2 &= a_2'X = a_{12}X_1 + a_{22}X_2 + a_{32}X_3 + ... + a_{n2}X_n \\ PC_3 &= a_3'X = a_{13}X_1 + a_{23}X_2 + a_{33}X_3 + ... + a_{n3}X_n \\ &\cdots\cdots \\ PC_n &= a_n'X = a_{1n}X_1 + a_{2n}X_2 + a_{3n}X_3 + ... + a_{nn}X_n \end{aligned} \quad (1)$$

The PCA problem is addressed in this article using the STATA program. It would create a new variable (first main component) by applying mathematical corrections to the initial N variable, which might, in part, reflect the information of the original variable. After presenting the first main ingredients, which cannot replace the majority of the original variables, we can introduce the second main components, and so on. The number of main components is derived based on the cumulative contribution rate of each main component. The rate of accumulated contribution for the primary component is as follows.

$$AC = \sum_{k=1}^{m} \lambda k \Big/ \sum_{i=1}^{n} \lambda_i \quad (2)$$

In this formula: λ is the characteristic value of each main component; k is the selected number in component; i is all the main components.

The process of analyzing various classes of tangible or intangible goods based on how closely their quality features match is known as PCA analysis. The cluster analysis method is finished when it aggregates in accordance with the numerous specific properties of the category. Then, the aspect of technological innovation (f1) would be available. According to the features of these data, the f1 primarily represents the possibility for technological innovation. To rephrase it another way, there is a great deal of room for technological innovation if the f1 is high for the area.

3.2. regression model

Regression analysis is mainly used to test the relationship between variables, and it is used in finance, economics, and other fields. Researchers used regression analysis to

study the anti-corruption campaign on bank loan loss provisions in China [22]. Some people also use regression analysis to predict stock price fluctuations. The OLS analysis is a mathematical optimization technique [23-24]. It identifies the function that best matches the data by lowering the sum of squared errors. By using the least square strategy to quickly get the unknown data, the sum of squared errors between the acquired data and the actual data can be decreased. The OLS model is used in many fields, including finance, economics, and marketing. It is common practice to assess how the pandemic affects the economy using the OLS model. The impacts of time and area fixed effects are also taken into account when OLS is used for regression using panel data. OLS regression is now referred to as a fixed effect model [25].

In this article, we consider technological innovation, covid-19, and the integration of technological innovation and covid-19(f1*covid) as the dependent variable, and FDI as the independent variable. We use the coefficient of f1*covid to reflect the impact of technological innovation on FDI during the period of covid-19. The control variables include the total number of people who are officially registered in the region, the population growth rate, the average yearly wage in the area, the total fiscal revenue for the year, and the expenditure on education by the government.

$$FDI = \beta_0 + \beta_1 \times f_1 + \beta_2 \times \mathrm{cov}id + \beta_3 \times \mathrm{cov}id \times f_1 + \sum \beta_j \times Control_j + Area + Year \quad (3)$$

4. Result analysis

4.1. results of PCA

The technical innovation is calculated in the paper using PCA. Based on the table of the characteristic value, contribution rate, and accumulation contribution rate, the article discovers that for the major component (Table 3), the first factor's eigenvalue to the fourth factor's eigenvalue is more than 1, and the other is lower than 1. Besides, the first factor's proportion is 0.9137, which contains lots of information on different technological innovation indexes. As a consequence, we gather 1 component of technical innovation. The gravel produces the same result (Fig 3). The article makes predictions about the variables using Stata software.

Table 3. the characteristic value, contribution rate, and accumulation contribution rate of the main component

Factor	Eigenvalue	Difference	Proportion	Cumulative
Factor1	3.65468	3.37851	0.9137	0.9137
Factor2	0.27617	0.2254	0.069	0.9827
Factor3	0.05077	0.0324	0.0127	0.9954
Factor4	0.01838	.	0.0046	1

LR test: independent vs. saturated: chi2(6) = 375.10 Prob>chi2 = 0.0000

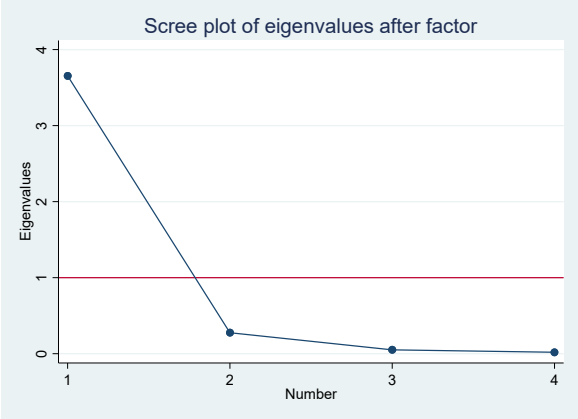

Fig 3. Gravel of different main components

We can further evaluate the effectiveness of the primary component using the Bartlett and KMO test. When either the KMO value or the P-Value is less than 0.05, the result is regarded as credible. The table shows that f1's KMO is 0.6756. The Bartlett test shows that Chi-square is 368.132 and the p-value is 0. Thus, the accuracy of the PCA result is displayed in this analysis's result. Table 4 shows the main ingredient load matrix of technological innovation.

Table 4. Main ingredient load matrix of technological innovation

Variable	Factor1	Uniqueness
patent	0.9812	0.0373
invention	0.9172	0.1587
Rdfee	0.9894	0.0212
Rdpeople	0.9338	0.1281

Figure 4 shows the distribution of the technological innovation index, and its probability density basically presents a normal distribution pattern. In addition, its highest probability density is 4.5 and the lowest is 0.2.

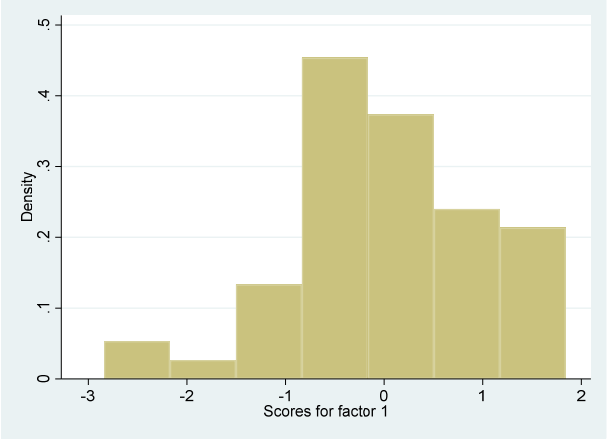

Fig 4. Statistical histogram of technological innovation

4.2. regression analysis

In Table 5, we divide different regression results according to different control variables and construct the following five regression results. The first column of regression results does not consider other control variables, and only controls the year effect and regional effect. The

second column of regression results considers The impact of population growth rate and population size, and consider the annual effect and regional effect at the same time. The regression result of the third column is to consider the impact of wages and the impact of local government fiscal revenue and also control the annual effect and regional effect. The fourth column The regression result is to control the population growth rate, population size, wages, and local government fiscal revenue at the same time, and consider the annual effect and regional effect. The last column's regression result takes into account both the yearly and regional effects while simultaneously controlling the population growth rate, size, and wages as well as local government fiscal revenue and spending for local education.

Table 5. Regression results on FDI by different control variables

	(1) FDI	(2) FDI	(3) FDI	(4) FDI	(5) FDI
f1	.588***	.592***	.627***	.58***	.478**
	(.125)	(.156)	(.157)	(.193)	(.199)
covid	.593*	-.047	.872	.556	-.234
	(.336)	(.494)	(.753)	(.93)	(1.033)
covid*f1	-.351***	-.267**	-.355***	-.263**	-.312***
	(.094)	(.099)	(.098)	(.102)	(.104)
peoplegrowth		-.107**		-.115**	-.125***
		(.042)		(.045)	(.044)
people		.598		.342	.287
		(.835)		(.938)	(.917)
wages			-.051	-.19	-.183
			(.262)	(.28)	(.274)
arearev			-.201	-.167	-.575
			(.424)	(.397)	(.464)
edufee					1.229
					(.767)
Area	Y	Y	Y	Y	Y
Year	Y	Y	Y	Y	Y
_cons	8.987***	4.685	12.832	10.92	-.835
	(.251)	(6.227)	(7.757)	(10.756)	(12.817)
R-squared	.984	.987	.984	.987	.988

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

According to Table 5, we know that technological innovation has a positive effect on local FDI. From the regression results in the first column, it can be found that, without considering the influence of other control variables, only considering the annual fixed effect and regional fixed effect, each increase of one-unit technological innovation can increase FDI by 0.588 and be statistically significant at the 1% level. The regression findings in the last column reveal that after controlling for the effects of other factors, each additional unit of technical innovation can boost FDI by 0.478 also statistically significant at the 1% level. These five different regression results all show that technological innovation has an enhanced effect on FDI, and can also be used as a way of stability testing to illustrate the reliability of the results of this paper.

Then, the author also investigates how the level of technical innovation affects foreign direct investment (FDI) in the context of covid-19 (based on the coefficient in front of the variable covid*f1). According to the regression results in the first column, on the basis of the condition of Covid-19, each increase in one unit of technological innovation can decrease FDI by 0.351 and is statistically significant at the 1% level when taking into account only the annual fixed effect and regional fixed effect. According to the regression results in the last column, each additional unit of technological innovation can lower FDI by 0.312 with statistical significance at the 1% level when compared to the condition without Covid-19. These five different regression results demonstrate that technological innovation has less of an impact on foreign direct investment (FDI) and can also be used to demonstrate the stability of the findings of this paper. The findings indicate that strongly advancing technical innovation during Covid-19 will drown out FDI, which is not advantageous for encouraging the expansion of FDI.

Additionally, the author discovered that the population growth rate significantly reduces FDI through the analysis of several control variables. The population does not, however, directly influence FDI. Additionally, we discovered that local wages, education costs, and local government financial income level have no discernible influence on FDI. These five regression models' respective R2 values of 0.984, 0.987, 0.984, 0.987, and 0.988 further demonstrate the model's extremely reliable output. The model does a great job of explaining FDI.

In order to ensure that the results are more accurate, we further conducted stability tests, including PSM regression and group regression.

5. Robustness test

Propensity Score Matching (PSM) is very common as the robustness test to check the robustness of the model. Economists typically establish "treatment groups" and "control groups" to compare the effects of various policies when examining the consequences of a public poli-

cy. 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. 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.

The PSM method operates under two presumptions. (1) The foundation of universal support. The two subsamples of the treatment group and the control group must overlap in order for matching to occur. It ensures that there is an equal distribution of propensity score values between the treatment group and the control group. 2) The balancing presumption. Because it is randomized, there is no difference between the treatment group and the control group before the treatment, and the effect shown in the treatment group is completely due to the treatment.

The steps below are typically followed when using PSM. Choose covariates to reduce the effects of the different dependent variables. The propensity score can be estimated using probit or logit models; Ascertain whether the parallel hypothesis is correct: after matching, maintain data balance by bringing the means of the treatment and control groups for the independent variable closer; Assign members of the treatment group and members of the control group to pairs based on the propensity score; matching strategies include nearest neighbor, radius, kernel, etc.; Using the matched data, determine the ATT.

Therefore, we use PSM to further test the impact of technological innovation, Covid-19, and other control variables on FDI.

Table 6 shows the regression results based on PSM. We found that the impact of technical innovation on FDI is still consistent with the earlier findings after going through the PSM. Innovation in technology is still helping FDI grow. We discovered that FDI is positively impacted by technological innovation. The PSM regression results also demonstrate that technical innovation is less alluring to FDI following the covid-19 outbreak and can drive FDI away. It has a detrimental effect on FDI. This is consistent with prior findings as well. We also investigate the effects of population, population growth rate, education investment, and local government revenue on FDI in order to better understand the effects of other variables.

Table 6. Regression results on FDI by different control variables based on PSM

	(1)	(2)	(3)	(4)	(5)
	FDI	FDI	FDI	FDI	FDI
f1	1.063***	.858***	.993***	.692**	.554*
	(.266)	(.237)	(.322)	(.264)	(.315)
covid	-.728	-.715	-.773	-.205	-.705
	(.652)	(.6)	(.751)	(.695)	(.655)
covid*f1	-.279***	-.205***	-.275***	-.19***	-.229**
	(.08)	(.069)	(.086)	(.067)	(.09)
peoplegrowth		-.081**		-.096***	-.096***
		(.032)		(.031)	(.03)
people		.418		-.709	-1.119
		(.7)		(1.062)	(1.154)
wages			-.01	-.26*	-.239*
			(.115)	(.13)	(.129)
arearev			.165	.336	.14
			(.202)	(.261)	(.314)
edufee					.906
					(.905)
Area	Y	Y	Y	Y	Y
Year	Y	Y	Y	Y	Y
_cons	10.041***	6.64	7.203*	11.32*	3.452
	(.532)	(5.458)	(3.817)	(6.425)	(9.88)
R-squared	.984	.987	.984	.988	.988

Standard errors are in parentheses

**** p<.01, ** p<.05, * p<.1*

While PSM makes an effort to reduce as much as possible the deviation of the observation data from the random experimental data, it also has the following flaws: For PSM to achieve the high-quality matching, a sizable sample size is frequently required. The propensity scores of the treatment group and the control group must have a larger common support range in PSM; otherwise, more observations will be lost, rendering the remaining samples invalid. PSM can only lessen the influence of

observable factors; if there are any unobservables, there will still be "hidden bias" in the results.

Then, we conduct a group regression using the data after 2008. The results are shown in Table 7. The result is consistent with our former analysis. The dependability and stability of our model's findings are further demonstrated by the two stability tests of PSM and group regression.

Table 7. Regression results on FDI by different control variables based on group regression

	(1) FDI	(2) FDI	(3) FDI	(4) FDI	(5) FDI
f1	.673***	.59***	.687***	.551**	.443**
	(.15)	(.163)	(.172)	(.203)	(.209)
covid	.584*	.221	.678	.766	-.035
	(.337)	(.44)	(.794)	(.858)	(.979)
covidf1	-.343***	-.251**	-.344***	-.243**	-.294**
	(.097)	(.104)	(.1)	(.108)	(.11)
peoplegrowth		-.101**		-.11**	-.121**
		(.044)		(.047)	(.046)
people		.038		-.315	-.524
		(1.154)		(1.33)	(1.305)
wages			-.006	-.231	-.242
			(.281)	(.304)	(.297)
arearev			-.088	-.08	-.475
			(.449)	(.436)	(.494)
edufee					1.286
					(.815)
_cons	8.957***	8.807	10.521	14.646	3.127
	(.244)	(8.806)	(8.286)	(12.299)	(14.047)
Observations	52	52	52	52	52
R-squared	.983	.985	.983	.986	.987

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

6. Discussion

Based on the above analysis, we know that technological innovation plays a crucial part in promoting FDI, however, it is still unclear how it influences FDI in the Yangtze River Delta and whether it can support local economic development. The subsequent essay will cover the history of Covid-19, assess certain technological advancements, investigate their effects on The Influence of FDI, and conduct pertinent debates and recommendations.

One of China's regions with the most active economic development, the greatest degree of openness, and the greatest capacity for innovation are the Yangtze River Delta. In the general scenario of national modernization and the pattern of all-around opening up, it occupies a crucial strategic position. The Yangtze River Delta's integrated development strategy has been in place for more than three years and has produced outstanding results. One of the regions in my country with great economic power, a developed market, and a high industrial correlation is the Yangtze River Delta. The Yangtze River Delta's three provinces and one city play a significant role in China's economic structure. The Yangtze River Delta region accounts for 4% of the nation's total land area and produces around 25% of the nation's overall economic output. The Yangtze River Delta area currently functions essentially as a strong and active national growth pole.

A foreign direct investment (FDI) is an investment owned by a business based in another nation that takes a controlling interest in a company in another country. Because of the idea of direct control, it can be separated from a foreign portfolio investment. FDI has been growing in China for a while and has been present in the Yangtze River Delta for a very long time. Local economic conditions and technical innovation capacity serve as the foundation for evaluating FDI entry and quantify the investment opportunities facilitated by FDI. Since it entered Shanghai, FDI has focused more on research and development, marketing, and financial services than on more broad product production, processing, and manufacturing. Presently, FDI continues to play a significant function in advancing the scope of industrial production and its share of the overall economy. The fact that FDI maintains the industrial manufacturing industry in the Yangtze River Delta region at a high growth rate is another example of how FDI aids in the development of the manufacturing sector in the region. Additionally, the performance of FDI's contribution to the growth of the manufacturing sector in the Yangtze River Delta region is also reflected in the proportion of foreign direct investment businesses' total industrial output value in total industrial output value, which is also rising. Shanghai's share of the total industrial output value in the Yangtze River Delta region has shown a unilaterally high tendency, showing that a sizeable percentage of Shanghai's industry has been run by FDI enterprises.

The large FDI inflow will also give the Chinese economy greater prospects for growth. However, the issue of China's FDI's uneven site distribution is a severe one that not only exacerbates the unbalanced industrial structure that exists in the eastern, central, and western regions but also is detrimental to social stability and long-term sustainable economic growth. Attracting foreign direct investment has steadily grown in importance as a strategy for local economic growth during the crucial period of China's economic reform. Local governments frequently provide a lot of convenience to foreign busi-

nesses in terms of fiscal policies and other areas to direct the influx of foreign capital. Additionally, the level of domestic technological innovation serves as a major impetus for attracting FDI and fostering R&D. As can be shown, FDI location selection will be influenced by both local technology innovation and government action.

The following chart outlines the precise connection between technological innovation and FDI. On the one hand, local businesses have gradually internalized their own technological capabilities, particularly scientific research skills, through partnerships with global businesses. This has allowed them to make the transition from imitation to source innovation and leading innovation. creation of a network and institutional system for scientific research. The development of branches by global innovation juggernauts in the Yangtze River Delta and the investment of foreign scientists in China, on the other hand, has sparked the transformation of scientific research findings and further supported the emergence of more inventive findings.

The investigation above led us to the following recommendations. (1) To create an atmosphere that would encourage investment, the local government should uphold a combination of indigenous creativity and foreign innovation. It is important to focus on raising the level of independent innovation within the province and strengthening interprovincial exchanges and collaboration in science and technology. and encourage the growth of innovation introduction. To hasten the transformation of technological advancements, it is essential to concentrate on enhancing the independent innovation capacities of businesses, support businesses in becoming the hub of technological innovation and boost scientific research personnel's faith in research and development. (2) The government also needs to actively promote the development of innovative talent teams, encourage scientific and technological professionals to work for local businesses or launch their own ventures, and encourage local businesses to investigate incentives like equity and stock options to attract scientists and engineers to companies for innovation and entrepreneurship, as well as to continuously expand the technological innovation team, lay a good talent for the future. (3) In addition, the government should act as a "bridge" to promote collaboration between businesses, academic institutions, and other groups, and gradually build an innovation system based on the integration of businesses, markets, and industry-university-research institutions. It should also encourage the application of scientific and technological advancements, as well as offer technical assistance for industrial upgrading and optimization.

7. Conclusion

Technology innovation has benefited greatly from foreign direct investment. Since the reform and opening up, my country has actively drawn foreign direct investment while simultaneously introducing a significant number of cutting-edge and useful technologies, fostering technical advancement, and aiding in industrial restructuring. Additionally, FDI encourages the growth of the Yangtze River Delta region. However, there isn't much research on how innovation in science and technology affects FDI. It is crucial to conduct research on how technical advancement responds to FDI.

In order to explore the impact of scientific and technological innovation on FID and identify its impact during Covid-19, this paper first uses the principal component analysis method to reduce the dimension according to the number of patents, the number of inventions, the number of scientific and technological innovation personnel and R&D expense, and constructs a technological innovation index to measure the scientific and technological innovation level of Shanghai City, Jiangsu Province, Zhejiang Province, and Anhui Province's in the Yangtze River Delta region. Then we established an OLS model considering time and regional fixed effects to test the impact of technological innovation and the impact of covid-19 on FDI. We found that technological innovation has a positive effect on FDI. At the same time, under the background of Covid-19, technological innovation is not conducive to attracting FDI. We further prove the reliability of our model results through stability testing methods such as PSM regression and group regression.

We also propose some suggestions to help the government to increase technological innovation in our discussion part. The local government should uphold a combination of indigenous creativity and foreign innovation. The government should also actively support the creation of innovative talent teams, encourage scientists and technologists to work for local companies or start their own businesses, and encourage those companies to look into offering incentives like equity and stock options to scientists in order to attract them.

This paper still has several shortcomings. It doesn't take into account the effects of some excluded variables and doesn't provide a theoretical model to pinpoint the theoretical underpinnings of how technological innovation affects the expansion of FDI. Additionally, the effect of COVID-19 on FDI is neglected in favor of a theoretical model. To further examine the effect of technical innovation on FDI, further control variables will be taken into account in the future.

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