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Comparative Analysis of Locational Factors and Their External Influence on Free-Trade Port Zones in China

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Abstract: In the context of regional economic integration, free-trade port zones (FTPZs) have become a powerful platform for attracting high-quality international investment and promoting national economic development. It is worthwhile, then, to explore the hidden value of the locational factors of FTPZs in the process of their construction. Specifically, analyzing the key locational factors of FTPZs and their influences on the locational value can help to improve the ability of FTPZs to add value through factor congregation and further promote the development of regional economies. This study, therefore, analyzes the locational factors of the Shanghai and Ningbo-Zhoushan free-trade ports using an econometric model. The corresponding external influences of locational factors are examined as well. The results show that regional economic development level, industrial structure, port and shipping system, capital accumulation, talent quality, institutional policies, market scale, market consumption potential, and market openness are the essential factors affecting the locational value of FTPZs. Based on our analysis and comparison of the location characteristics and locational value of the Shanghai and Ningbo-Zhoushan free-trade ports, three constructive suggestions are made to enhance the locational value of free-trade ports based on the actual situation of the Ningbo-Zhoushan free-trade port. These suggestions can also maximize the value of free-trade ports' locations and promote high-quality regional economic growth.

Keywords: free-trade port; locational factor; external influence; econometric model; improvement strategy

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1. Introduction

Although the global economy is currently in recession, global value chains and industrial chains have been further developed. The economic growth gap between Asia and Western countries is gradually narrowing, and the status of developing countries is continually improving. Moreover, the global economy is becoming increasingly multipolar. In this context, economic globalization has focused on the service economy, aiming to transform into a global free-trade port (FTP) as its primary direction. In response to this development trend, China introduced an innovative tax regime to attract investment, setting out policies to support the construction of the Hainan FTP.

The Shanghai free-trade zone (FTZ) was established in 2013, so Shanghai could become a pioneer in market reform and test innovative systems in certain fields. FTZs also aim to improve the business environment, such as providing one-stop services for enterprises in the zone. FTZs are also expected to support the Belt and Road Initiative (BRI) through bilateral free-trade agreements between China and other countries. That said, FTPs are usually regarded as an economic stimulus strategy for the development of individual countries.

As a regional economic center, the locational value of an FTP will continue to increase with the advancement of economic integration. The development and utilization of an FTP's locational value can help to drive the economic growth of the FTP and its adjacent areas

while also helping to establish the strategic fulcrum of the BRI. The construction of FTZs not only accelerates economic integration but also creates favorable conditions supporting the locational value of FTPs. For example, Ningbo-Zhoushan Port in Zhejiang Province is the largest cargo throughput port in China. It has special geographical conditions supporting FTP construction. These unique locational advantages help to promote the value of the FTP. Meanwhile, the locational value of FTPs also helps to drive the economic growth of adjacent areas, thus establishing regional financial centers. As a hub area for trade between various countries, Ningbo-Zhoushan Port's locational advantage is also key to increasing the value of the FTP. As a hub area for trade between multiple countries, Ningbo-Zhoushan Port's locational advantage is the key to increasing the value of the FTP. However, it is unclear to China how best to enhance the geographical advantages of FTPs and the cooperation mechanism of ports in the Yangtze River Delta region.

In light of the above, this study uses an econometric model to investigate the regional situation and locational value factors of the Shanghai and Ningbo-Zhoushan FTPs. We also examine the formation and evolution mechanisms of the FTPs' locational value factors. Finally, we propose targeted measures based on the locational characteristics of the FTPs.

The rest of this paper is organized as follows. The relevant literature is summarized in Section 2. Section 3 analyzes the influence of the locational value of FTPs. Section 4 compares the Shanghai and Ningbo-Zhoushan FTPs. Section 5 suggests some strategies for promoting the locational value of the Ningbo-Zhoushan FTP. Finally, conclusions and prospects are given in Section 6.

2. Literature Review

FTZ is a specified area where trade is based upon the free international exchange of goods, with customs tariffs used only as a source of revenue and not as an impediment to trade development [1]. Moreover, FTPs are a formally defined area, often encompassing a whole city, enabling custom regulations and permitting foreign investment and ownership [2]. All or most goods entering and leaving the port area are exempted from customs duties. Business activities such as free storage, exhibition, disassembly, modification, repackaging, sorting, processing, and manufacturing of goods are allowed in the free port.

The construction of FTZs aims to exempt foreign firms from the tariffs on imported intermediate goods and raw materials that domestic firms must pay [3]. Because the FTZ plays a pivotal role in regional economic development, more and more port cities have started to launch the FTZ program [4], including Shanghai, Guangdong, and Tianjin, etc. Although the Chinese FTZ policy creates new opportunities for these seaports, the impacts of FTZ policies are different from region to region [5]. In this case, competition between ports evolves into the competition between supply chains [6]. With the tendency of internationalization and globalization, the free trade port zone (FTPZ) is thought to be one of the most well-known free economic zones. Hsu et al. [7] suggested an evaluation model based on the fuzzy analytic hierarchy process approach for evaluating the FTPZs' foreign direct investment performance. For gradually exploring and steadily boosting the development of FTPZs, Chinese characteristics must be considered when designing the important mission and development goal [8].

In the present study, FTP zones (FTPZs) are analyzed from the perspective of locational factors. The first study of free trade from a locational perspective was conducted in Canada. Subsequently, Britton [9] suggests an improved Harris–Todaro model to answer the question, "In which region of a country should an FTZ be established?". FTZs should be introduced in the countryside rather than in the cities. Locational factors positively affect the level of foreign direct investment inflow, especially in terms of market size, infrastructure, economic openness, and market attractiveness [10]. Yang [11] comparatively analyzes FTZ policies based on a port hinterland perspective and finds that the functions of FTZs should be consistent with local industrial development. Chiu et al. [12], meanwhile, identify five crucial factors for business operations in FTPZs—namely, government administration efficiency, cheap rates and charges, simplified customs procedures, transparent

regulations, and free tax incentives. Moreover, Chan et al. examine advanced producer service industries in Hong Kong and Shenzhen, and they examine the Shenzhen Qianhai free-trade service zone for promoting service cooperation between the two areas [13].

FTPZs bring various kinds of business opportunities. Accordingly, when analyzing the relevant factors, the increasing number of investors is viewed as a multicriteria decision-making problem. Deng et al. [14], for example, use a modified Delphi method to investigate the determinants of investment in FTP areas; they find that economic potential and operating environment are the most important factors for investment. Chen et al. [15], meanwhile, evaluate six typical Chinese FTPZs using an analytic hierarchy process and grey relational analysis; they find that FTPZs rely heavily on the city's economic foundation, infrastructure, and development. On that basis, they suggest measures for improving industry and policy. Hu et al. [16] comparatively examine the development of 18 pilot FTZs in China and identify five major comparative advantages and the important driving factors for supporting the construction of Chinese FTPs. Li et al. [17] find that FTZs have different promotion effects on the performance of listed companies located in FTPs at different port-city scales. Liu et al. [18], meanwhile, use Tobit regression to identify external and internal influencing factors, including pilot FTZ factors and economic and operational indicators. Although the above-mentioned studies of FTPs and FTZs provide useful findings, few studies have specifically considered locational factors. It is therefore worth investigating locational factors and their effects on FTPZs.

Studies have considered locational factors in various contexts, such as restaurants, real estate, logistics, and manufacturing. Using point-of-interest data for restaurants, Wu et al. [19], for example, analyze various locational factors using count regression models. Liang et al. [20], meanwhile, investigate the effects of locational factors on housing prices in residential communities. Pace and Zhu [21] consider the locational factors affecting the likelihood that a property will sell. Analyzing the location choices for logistics facilities, Sakai et al. [22] find that zoning and traditional clusters significantly influence the choice of location for new facilities. Finally, using confirmatory factor analysis and regression analysis, Johansson and Olhager [23] verify that locational factors are important for manufacturing offshoring and backshoring. Jiang et al. [24] adopted the zero-inflated negative binomial model to analyze the location characteristics of firms in the business service industry in airport economic zones based on the grid cells. They found that the factors that affect the locational decisions of domestic and foreign firms are significantly different, and the most critical factor is the travel time to the city center. Both quantitative and qualitative methods were used to explore the relevant locational factors for determining the strength of the factors in the specific industries: creative industries [25], the reindustrialization process [26], entrepreneurs [27], and warehouse facilities [28], etc. However, it is rare to explore the locational factors of FTPZs.

Our review of the literature reveals some issues that still need detailed investigation:

1. No research has specifically examined the locational factors of FTPs. It is currently not possible, therefore, to scientifically reveal the formation and evolution mechanisms of FTPs' locational value.
2. There is no systematic analysis and application of locational and external influencing factors related to the locational value of the FTP.
3. The lack of research on FTPs' locational value makes it difficult to explore their full potential for economic development and investment. Thus, the corresponding development strategies cannot currently be designed to promote local trade.

3. Influence Analysis of FTPs' Locational Factors

The locational value elements of FTPs involve various aspects, including natural endowment, capital elements, and labor elements. FTPs' locational factors include the regional port and shipping system, talent quality, industrialization structure, and capital, among others. Based on previous research on the factors affecting regional economies, we use a multiple linear regression model to analyze the locational value factor of FTPs.

Moreover, given the nonstationary nature of the general real economy, the augmented Dickey–Fuller (ADF) test, cointegration test, and Granger causality test are used as well. However, locational value has many influencing factors, and some data are missing. It is, therefore, impossible to analyze *all* variables.

3.1. Data Collection and Notation

This study investigates the locational value of the Shanghai FTP and the Ningbo-Zhoushan FTP. The development of ports is objectively affected by the six elements: development and operation environment, demand environment, production factor environment, support environment, opportunity, and government. For the Shanghai FTP, we gather data from the Shanghai Statistical Yearbook, covering 40 years (1978–2017); this is referred to as dataset 1 [29], as shown in Table 1. For the Ningbo-Zhoushan FTP, we use the Ningbo Statistical Yearbook, covering 1985–2017 [30]; this is dataset 2, as shown in Table 2.

To analyze the factors affecting FTPs' locational value as comprehensively as possible, we select the most representative data, including the following variables: port throughput (X_1), number of college students per 100,000 students (X_2), the balance of domestic- and foreign-currency loans by financial institutions (X_3), amount of foreign capital utilized (X_4), level of industrialization (X_5), regional GDP (X_6), and foreign trade import and export volume (Y). Considering past economic trends, we select foreign trade import and export volume as the standard to measure the locational value of FTPs and analyze the relationship between the above variables. Table 3 presents the variable descriptions.

In order to avoid pseudo-regression and eliminate heterogeneous variance, the natural logarithm of the time series is usually taken to obtain stable data. Because the empirical analysis results are easily affected by heteroscedasticity, the economic variables are processed using a regression equation, expressed as follows:

$$lnY = \beta_0 + \beta_1 lnX_1 + \beta_2 lnX_2 + \beta_3 lnX_3 + \beta_4 lnX_4 + \beta_5 lnX_5 + \beta_6 lnX_6 + \mu \quad (1)$$

where β_0 is the constant term, β_i is the variable correlation coefficient to be estimated for X_i, μ is the random disturbance term.

3.2. Unit Root Test

Generally, when quantitatively analyzing economic data, if the economic variable is a nonstationary sequence, the regression analysis result will face a false regression situation. After the regression analysis of variables with no causal relationships, there may be strong correlations, and a regression model is established only for a stationary series of economic variables. It is necessary, therefore, to test the stability of each variable before conducting various econometric analyses of financial data. If the variable has a unit root, which means it is a nonstationary sequence, it needs to be differentiated. After that, if the economic variables are stable, they can be analyzed by cointegration and regression.

For time series y_t, the unit root of the autoregressive model test can be selected:

$$\mathrm{D}y_t = (\beta - 1)y_{t-1} + \mu_t \quad (2)$$

Original hypothesis: $H_0: \ \beta = 1$ (when y_t is nonstationary).

Alternative hypothesis: $H_1: \ \beta < 1$ (when y_t is stationary).

On the premise that the null hypothesis can be accepted, the unit root test of the sequence can use the DF test method:

$$\mathrm{DF} = \frac{\hat{\beta} - 1}{s(\hat{\beta})} = \frac{\hat{\beta} - 1}{s(\hat{u}) / \sqrt{\sum_{t=2}^{T} {y_{t-1}}^2}}, \quad (3)$$

Table 1. Shanghai FTP's data.

Year	Port Throughput (10,000 Tons)	Number of College Students per 100,000 People	Balance of Domestic- and Foreign-Currency Loans of Chinese and Foreign Financial Institutions (RMB 100 million)	Amount of Foreign Capital Utilized (USD 100 Million)	The Proportion of Secondary Industry	GDP (RMB 100 Million)	Foreign Trade Import and Export Volume (USD 100 Millon)
1978	7955	46	153.37	-	0.774	272.81	30.26
1979	8350	60	165.16	-	0.772	286.43	38.78
1980	8483	67	200.98	-	0.757	311.89	45.06
1981	8333	78	221.98	0.18	0.752	324.76	41.5
1982	8976	71	227.77	0.14	0.740	337.07	38.93
1983	9190	66	239.5	0.16	0.726	351.81	41.4
1984	10,066	74	245.35	0.41	0.705	390.85	44
1985	11,291	88	306.27	1.15	0.698	466.75	51.74
1986	12,604	94	427.66	2.61	0.685	490.83	52.04
1987	12,833	97	523.35	7	0.668	545.46	59.96
1988	13,320	100	576.11	13.22	0.668	648.3	72.45
1989	14,604	96	698.71	11.9	0.669	696.54	78.48
1990	13,959	90	857.76	7.8	0.647	781.66	74.31
1991	11,679	87	1008.82	8.66	0.616	893.77	80.44
1992	16,297	88	1213.32	22.38	0.608	1114.32	97.57
1993	17,596	95	1605.57	31.75	0.594	1519.23	128.32
1994	16,581	100	1966.96	39.89	0.577	1990.86	158.67
1995	16,567	101	2387.33	52.98	0.568	2518.08	190.25
1996	16,402	102	2852.66	75.1	0.540	2980.75	222.63
1997	16,397	103	3722.3	63.45	0.516	3465.28	247.64
1998	16,388	108	4259.71	48.16	0.493	3831	260.46
1999	18,641	119	4862.03	60	0.475	4222.3	386.04
2000	20,440	141	5415.71	53.91	0.464	4812.15	547.1
2001	22,099	168	7187.9	43.92	0.462	5257.66	608.95
2002	26,384	194	10,550.94	50.3	0.458	5795.02	726.64
2003	31,621	214	13,168.05	58.5	0.481	6762.38	1123.97
2004	37,897	227	14,972.01	65.41	0.483	8165.38	1600.26
2005	44,317	234	16,798.12	68.5	0.475	9365.54	1863.65
2006	53,748	237	18,603.92	71.07	0.472	10,718.04	2274.89
2007	56,144	235	21,709.95	79.2	0.448	12,668.89	2829.73
2008	58,170	235	24,166.12	100.84	0.435	14,276.79	3221.38
2009	59,205	232	29,684.1	105.38	0.402	15,287.56	2777.31
2010	65,339	224	34,154.17	111.21	0.423	17,436.85	3688.69
2011	72,758	218	37,196.79	126.01	0.416	19,539.07	4374.36
2012	73,559	213	40,982.48	151.85	0.392	20,558.98	4367.58
2013	77,575	209	44,357.88	167.8	0.366	22,264.06	4413.98
2014	75,529	209	47,915.81	181.66	0.350	24,068.2	4666.22
2015	71,740	212	53,387.21	184.59	0.322	25,659.18	4517.33
2016	70,177	213	59,982.25	185.14	0.298	28,183.51	4338.05
2017	75,051	213	67,182.01	170.08	0.305	30,632.99	4761.23

Table 2. Ningbo-Zhoushan FTP's data.

Year	Port Throughput (10,000 Tons)	Number of College Students per 100,000 People	Balance of Domestic- and Foreign-Currency Loans of Chinese and Foreign Financial Institutions (RMB 100 Million)	Amount of Foreign Capital Utilized (USD 100 Million)	The Proportion of Secondary Industry	GDP (RMB 100 Million)	Foreign Trade Import and Export Volume (USD 100 Million)
1985	1040	0.27	30.48	0.0359	40.4	71.05	0.1
1986	1797	0.34	41.49	0.05	44.47	80.22	0.21
1987	1940	0.39	52.22	0.0429	53.99	95.99	0.21
1988	2002	0.45	64.32	0.0689	66.43	118.62	1.48
1989	2209	0.49	76.57	0.1758	77.69	137.25	2.2
1990	2554	0.49	97.39	0.2197	80.31	141.4	2.98
1991	3390	0.48	122.70	0.268	98.39	169.87	5.73
1992	4367	0.53	160.37	1.1497	128.7	213.05	9.91
1993	5321	0.66	211.61	3.4455	189.12	315.11	16.94
1994	5850	0.83	267.12	3.5812	260.97	459.66	25.15
1995	6853	0.98	389.23	3.9909	338.99	602.65	38.53
1996	7638	1.04	524.08	5.0162	442.64	784.07	41.86
1997	8220	1.15	574.75	5.5408	500.06	879.1	46.09
1998	8707	1.25	670.08	5.0329	528.73	952.79	42.12
1999	9660	1.68	773.48	5.2035	564.07	1017.08	50.09
2000	11,547	2.59	883.12	6.2186	635.83	1144.57	75.41
2001	12,852	4.34	1051.56	8.7446	690.81	1278.75	88.92
2002	15,398	6.21	1479.47	12.4696	793.01	1453.34	122.7
2003	18,543	7.99	2102.78	17.2727	954.04	1749.27	188.1
2004	22,586	9.6	2483.61	21.0322	1167.44	2109.45	261.12
2005	26,881	11.12	2959.78	23.1079	1341.87	2447.32	334.94
2006	30,969	12.13	3727.50	24.3018	1580.7	2874.42	422.12
2007	34,519	12.76	4735.91	25.0518	1894.14	3418.57	564.99
2008	36,185	13.04	5672.74	25.3789	2190.78	3946.52	678.4
2009	38,385	13.75	7424.87	22.0541	2356.68	4334.33	608.13
2010	41,217	14.08	9000.62	23.2336	2856.74	5181	829.04
2011	43,339	14.14	10,209.99	28.0929	3315.76	6074.94	981.87
2012	45,303	14.54	11,300.32	28.5252	3475.08	6601.21	965.73
2013	49,592	14.9	12,493.28	32.7483	3680.97	7164.51	1003.29
2014	52,646	15.09	13,610.61	40.2514	3980.41	7610.28	1047.04
2015	51,005	15.58	14,966.92	42.3375	4098.22	8003.61	1003.72
2016	49,619	15.51	15,806.76	45.1333	4455.33	8686.49	949.23
2017	55,151	15.61	17,125.29	40.2995	5119.45	9842.06	1121.97

Table 3. Locational factor selection.

Index	Representative Value
Port and shipping system	Port throughput (X_1)
Talent quality	Number of college students per 100,000 people (X_2)
Capital element	Balance of domestic- and foreign-currency loans of Chinese and foreign financial institutions (X_3)
	Amount of foreign capital utilized (X_4)
Industrial structure	Industrialization level (X_5)
Level of economic development	GDP (X_6)
Locational value	Foreign trade import and export volume (Y)

$$s(\hat{u}) = \sqrt{\frac{1}{T-1}\sum_{t=2}^{T}\hat{u_t^2}} \quad (4)$$

where $s(\hat{u})$ is the standard deviation of the residual $\hat{u_t}$; the percentage of the significance level is used as the critical value for comparison. When DF $\geq$ the critical value, y_t is accepted as nonstationary. When DF $<$ *the critical value*, y_t is rejected as nonstationary. The optimization and upgrading of the DF testing method resulted in the ADF testing method. If the time series has a high-order lag correlation, the DF test method cannot be performed, which will affect the inspection results. ADF testing can resolve this problem.

Based on the above, we use the ADF unit root test to test the stationarity of economic variables. The null hypothesis is that the series is nonstationary. If the test data show that the null hypothesis can be rejected, the time series is considered stationary. Otherwise, the ADF test is performed on the time series after the first-order difference until there is no unit root.

Using EViews version 9.0, the ADF stationarity test is performed on lnY, lnX_1, lnX_2, lnX_3, lnX_4, lnX_5, and lnX_6. Tables 4 and 5 show the results of the ADF test for datasets 1 and 2, respectively.

Table 4. Stationarity test of dataset 1.

Variables	ADF Statistics	Critical Value			*p* Value	Conclusion
		1%	5%	10%		
lnY	−0.201	−3.610	−2.939	−2.608	0.930	accept
$D(lnY)$	−4.156	−3.616	−2.941	−2.609	0.002	reject
lnX_1	−0.152	−3.610	−2.939	−2.608	0.936	accept
$D(lnX_1)$	−5.040	−3.616	−2.941	−2.609	0.0002	reject
lnX_2	−1.255	−3.621	−2.943	−2.610	0.640	accept
$D(lnX_2)$	−3.422	−3.621	−2.943	−2.610	0.016	reject
lnX_3	−0.617	−3.621	−2.943	−2.610	0.855	accept
$D(lnX_3)$	−3.731	−3.616	−2.941	−2.609	0.007	reject
lnX_4	−3.254	−3.627	−2.946	−2.612	0.025	reject
$D(lnX_4)$	−3.789	−3.639	−2.951	−2.614	0.007	reject
lnX_5	1.146	−3.610	−2.939	−2.608	0.997	accept
$D(lnX_5)$	−4.816	−3.616	−2.941	−2.609	0.0004	reject
lnX_6	−0.812	−3.616	−2.941	−2.609	0.804	accept
$D(lnX_6)$	−2.812	−3.616	−2.941	−2.609	0.066	accept

Note: significance level is set at 5%.

Table 5. Stationarity test of dataset 2.

Variables	ADF Statistics	Critical Value			*p* Value	Conclusion
		1%	5%	10%		
lnY	−4.213	−3.654	−2.957	−2.617	0.002	reject
$D(lnY)$	−5.108	−3.662	−2.960	−2.619	0.0002	reject
lnX_1	−1.681	−3.661	−2.960	−2.619	0.431	accept
$D(lnX_1)$	−6.300	−3.661	−2.960	−2.619	0.000	reject
lnX_2	−1.380	−3.670	−2.964	−2.621	0.578	accept
$D(lnX_2)$	−2.606	−3.670	−2.964	−2.610	0.103	accept
lnX_3	−1.792	−3.662	−2.960	−2.619	0.377	accept
$D(lnX_3)$	−2.742	−3.662	−2.960	−2.619	0.079	accept
lnX_4	−6.624	−3.738	−2.992	−2.636	0.000	reject
$D(lnX_4)$	−3.497	−3.662	−2.960	−2.619	0.015	reject
lnX_5	−4.678	−3.700	−2.976	−2.627	0.001	reject
$D(lnX_5)$	−2.831	−3.700	−2.976	−2.627	0.067	accept
lnX_6	−2.381	−3.738	−2.992	−2.636	0.157	accept
$D(lnX_6)$	−2.337	−3.662	−2.960	−2.619	0.168	accept

Note: significance level is set at 5%.

As shown in Table 4, the p values of lnY, lnX_1, lnX_2, lnX_3, lnX_5, and lnX_6 based on the ADF test are larger than the critical value at 5% significance. Therefore, the test results cannot reject the original hypothesis. We can conclude that port throughput (X_1), number of college students per 100,000 students (X_2), balance of domestic- and foreign-currency loans of financial institutions (X_3), amount of foreign capital utilized (X_4), level of industrialization (X_5), regional GDP (X_6), and foreign trade import and export volume (Y) are nonstationary. Then, the raw sequence corresponding to X_1, X_2, X_3, X_4, X_5, X_6, and Y is handled via first-order difference. After that, the ADF unit root test is used. The results show that X_1, X_2, X_3, X_4, X_5, and Y are below the critical value; thus, the null hypothesis can be rejected. It is considered that X_1, X_2, X_3, X_4, X_5, and Y are stationary series without unit roots. The raw variables of lnX_6 and the sequence after being handled by the first-order difference are nonstationary sequences. Therefore, the conditions for other analyses cannot be met. The variables lnX_1, lnX_2, lnX_3, lnX_4, lnX_5, and lnY are analyzed and tested next.

As shown in Table 5, the p values of lnX_1, lnX_2, lnX_3, and lnX_6 are larger than the critical value at 5% significance. The alternative hypothesis is accepted, and X_1, X_2, X_3, X_4, X_5, X_6, and Y are nonstationary. Then, the first-order difference is used to handle the raw sequence corresponding to X_1, X_2, X_3, X_4, X_5, X_6, and Y. After that, we use the ADF unit root test. The results show that the statistical values of X_1, X_4, X_5, and Y are below the critical value; thus, the null hypothesis can be rejected. We consider that X_1, X_4, X_5, and Y are stationary series without a unit root. The original variables of lnX_2, lnX_3, and lnX_6 and their first-order differences are all nonstationary series and do not meet the conditions of the cointegration test. The variables lnX_1, lnX_4, lnX_5, and lnY are analyzed and tested next.

3.3. Cointegration Test

The cointegration test is generally used to describe whether long-term equilibrium exists between nonstationary series. After the nonstationary series is differentiated, we obtain a stationary series variable. Because the long-term relationships between variables are affected, we use the Johansen method to test the cointegration relationships between the variables.

Tables 6 and 7 show the cointegration test results for dataset 1 obtained using the trace test and the criterion of the maximum characteristic root, respectively. In the trace test statistics, the null hypothesis is set as "there is no cointegration relationship" between variables, and the critical value corresponding to the significance level of 5% is used as the standard. The null hypothesis is rejected if the p value corresponding to the trace test statistic is less than the critical value. The test results show that four cointegration relationships can be found among X_1, X_2, X_3, X_4, X_5, and Y. The results of the trace test and

maximum eigenvalue test confirm the hypothesis that there are at most four cointegration relationships between these variables that should be accepted.

Table 6. Trace test results for dataset 1.

Variables	Characteristic Root	Trace Statistics	Critical Value (5%)	*p* Value
None *	0.795	166.766	95.754	0.0000
At most 1	0.738	111.239	69.819	0.0000
At most 2	0.569	64.338	47.856	0.0007
At most 3	0.458	34.868	29.797	0.0120
At most 4	0.241	13.457	15.495	0.0991
At most 5	0.103	3.820	3.841	0.0506

Note: When there is no unit root through inspection, the sequence is specially marked with *.

Table 7. Characteristic root test result for dataset 1.

Variables	Characteristic Root	Maximum Eigenvalue Statistics	Critical Value (5%)	*p* Value
None *	0.795	55.527	40.078	0.0004
At most 1	0.738	46.900	33.877	0.0008
At most 2	0.569	29.471	27.584	0.0283
At most 3	0.458	21.411	21.132	0.0457
At most 4	0.241	9.637	14.265	0.2369
At most 5	0.103	3.820	3.841	0.0506

Note: When there is no unit root through inspection, the sequence is specially marked with *.

Tables 8 and 9 show the cointegration test results for dataset 2 obtained using the trace test and the maximal characteristic root judgment standard, respectively. According to the results, the trace test statistics confirm cointegration equations among lnY, lnX_1, lnX_4, and lnX_5. The trace test and maximum eigenvalue test accept the null hypothesis that there are at most two cointegration relationships. Therefore, we believe there are two cointegration relations among lnY, lnX_1, lnX_4, and lnX_5.

Table 8. Trace test results for dataset 2.

Variables	Characteristic Root	Trace Statistics	Critical Value (5%)	*p* Value
None *	0.819	106.379	47.856	0.0000
At most 1	0.712	53.363	29.797	0.0000
At most 2	0.333	14.809	15.495	0.0632
At most 3	0.070	2.250	3.841	0.1336

Note: The trace test results show two cointegration relationships. And when there is no unit root through inspection, the sequence is specially marked with *.

Table 9. Characteristic root test results for dataset 2.

Variables	Characteristic Root	Maximum Eigenvalue Statistics	Critical Value (5%)	*p* Value
None *	0.819	53.015	27.584	0.0000
At most 1	0.712	38.555	21.132	0.0001
At most 2	0.333	12.559	14.265	0.0914
At most 3	0.070	2.250	3.841	0.1336

Note: The maximum eigenvalue test results show two cointegration relationships. And when there is no unit root through inspection, the sequence is specially marked with *.

3.4. Granger Causality Test

The Granger causality test is generally used to judge the causal relationship between sequences, which is different from the equilibrium relationship judgment of the cointegration test. In the Granger causality test, if x contains effective information for predicting y, and there is a significant influence relationship between them, then Granger causality exists between x and y [31].

The Granger causality test model is expressed as

$$y_t = c + \sum_{j=1}^{m} a_j \Delta y_{t-j} + \sum_{j=1}^{m} \beta_j \Delta x_{t-j} + \varepsilon_t \quad (5)$$

where m is the lag period, c is the constant.

If Y has a one-way influence on X: β as a whole is not zero, while α as a whole is zero.

If X has a one-way influence on Y: α as a whole is not zero, while β as a whole is zero.

If there is a two-way influence between X and Y: α and β as a whole are not zero.

If X and Y have no effect: α and β as a whole are zero. ε_t is the random disturbance value.

The test result can be obtained by comparing the original variable's value with the standard F-test statistic and the p value. If the p value is below the critical value, the null hypothesis (H0: a causal relationship exists between x and y) is rejected. If the p value is greater than the critical value, the alternative hypothesis is accepted, which means there is no causal relationship between x and y. The test result shows that the effective information x of predicting y meets the inclusion condition, which is still different from a causal relationship in its actual theoretical meaning.

Table 10 shows that the explanatory variables X_1, X_2, X_3, X_4, X_5, and Y have a causal relationship. As shown in Table 11, there are causal relationships between lnY, lnX_1, lnX_4, and lnX_5. For this, we perform multiple linear regression analysis on the variables to determine the specific inner relationships.

Table 10. Granger causality test results for dataset 1.

Original Hypothesis:	Obs.	*F*-Statistic	Prob.
lnY does not Granger cause lnX_1	38.000	3.880	0.031
lnX_1 does not Granger cause lnY		2.010	0.150
lnY does not Granger cause lnX_2	38.000	3.690	0.036
lnX_2 does not Granger cause lnY		1.306	0.284
lnY does not Granger cause lnX_3	38.000	0.968	0.390
lnX_3 does not Granger cause lnY		6.963	0.003
lnY does not Granger cause lnX_4	35.000	1.178	0.322
lnX_4 does not Granger cause lnY		0.536	0.591
lnY does not Granger cause lnX_5	38.000	1.052	0.360
lnX_5 does not Granger cause lnY		1.804	0.181

Table 11. Granger causality test results for dataset 2.

Null Hypothesis:	Obs.	*F*-Statistic	Prob.
lnY does not Granger cause lnX_1	31.000	1.841	0.179
lnX_1 does not Granger cause lnY		6.209	0.006
lnY does not Granger cause lnX_4	31.000	1.208	0.315
lnX_4 does not Granger cause lnY		5.792	0.008
lnY does not Granger cause lnX_5	31.000	5.600	0.010
lnX_5 does not Granger cause lnY		6.236	0.006

Here, we test whether there is Granger causality between the above economic variables. This is determined by comparing the p value and the confidence level of 0.05. The null hypothesis is that there is no causal relationship between x and y. Thus, if the null hypothesis is accepted, there is no causal relationship between x and y.

3.5. Multiple Linear Regression Analysis

3.5.1. Multiple Linear Regression Analysis of Dataset 1

The above cointegration and Granger causality tests show that there are long-term equilibrium cointegration and causal relationships among X_1, X_2, X_3, X_4, X_5, and Y. To further understand the specific impact relationships between variables, multiple linear regression analysis is performed on lnY, lnX_1, lnX_2, lnX_3, lnX_4, and lnX_5. Table 12 shows the regression analysis results.

Table 12. Multiple linear regression analysis results for dataset 1.

Variables	Coefficient	Standard Deviation	*t*-Statistics	*p* Value
C	−7.801	0.785	−9.940	0.000
lnX_1	0.578	0.116	4.967	0.000
lnX_2	0.417	0.188	2.217	0.034
lnX_3	0.799	0.105	7.583	0.000
lnX_4	−0.129	0.025	−5.150	0.000
lnX_5	0.448	0.378	1.183	0.246
R-squared	0.996	F-statistic		1531.532
Adjusted R-squared	0.995	Prob (F-statistic)		0.000

The specific regression equation is expressed as

$$\ln \hat{Y} = 0.578lnX_1 + 0.417lnX_2 + 0.799lnX_3 - 0.129lnX_4 + 0.448lnX_5 - 7.801 \quad (6)$$

Table 12 shows that the value of R^2 is 0.996 and the adjusted R^2 (goodness of fit of the regression equation) is 0.995, indicating that the goodness of fit of the regression line to the sample points is ideal. The F-test value is 1531.532, the corresponding p value is 0, and the regression coefficient is significantly nonzero. This indicates that the influence of X_1, X_2, X_3, X_4, and X_5 on Y is significant. We can see that the t-statistics of lnX_1, lnX_2, lnX_3, and lnX_4 are substantial because $p < 0.05$ in the significance test of the regression coefficient. This confirms that foreign trade imports and exports are significantly affected by port throughput, the number of college students per 100,000 people, the balance of domestic- and foreign-currency loans of Chinese and foreign financial institutions, and the total amount of foreign capital utilized.

Based on the regression equation, we can conclude the following: When considering port throughput, the number of college students per 100 thousand people, the balance of domestic- and foreign-currency loans of foreign-funded financial institutions, and the actual utilization of foreign capital, industrialization level increases by 1%, and the locational value of FTP will increase accordingly by 0.578%, 0.417%, 0.791%, −0.129%, and 0.448%. The rapid increase in foreign trade talents, such as cross-border e-commerce, can improve the level of foreign trade and effectively increase the total amount of imports and exports. Foreign trade and foreign investment, directly and indirectly, promote the employment of more than 200 million people, accounting for about one-quarter of the total employment, including the employment of a large number of people in rural and poor areas [32]. Liquidity loans still dominate the financing mode of small and medium-sized foreign trade enterprises, and the proportion of trade financing is low. Although the liquidity loan is convenient and long-term, the interest rate is generally higher than the trade financing interest rate.

Table 13 shows the multicollinearity test results. We can see that the explanatory variables are highly correlated and easily affect the analysis results. This means there are multiple collinearities among these variables.

Table 13. Multicollinearity test results.

Covariance Correlation	X_1	X_2	X_3	X_4	X_5
X_1	0.565057 1.000000				
X_2	0.311497 0.942848	0.193166 1.000000			
X_3	1.357673 0.964251	0.776929 0.943749	3.508470 1.000000		
X_4	1.232652 0.800548	0.708882 0.787411	3.393615 0.884498	4.195785 1.000000	
X_5	0.176549 0.919425	0.096762 0.861862	0.461329 0.964161	0.439390 0.839732	0.065254 1.000000

We use stepwise regression for multicollinearity to establish the regression formula for lnY and lnX_1, lnX_2, lnX_3, lnX_4, and lnX_5. The five regression formulas are sorted in descending order according to the size of the coefficient of determination (t-value is listed in parentheses):

1. $\ln\hat{Y} = 0.900lnX_3 - 1.420$, $R^2 = 0.975$, $\overline{R}^2 = 0.975$, DW = 0.241, $F = 1503.092$ (38.770) (-7.273);
2. $\ln\hat{Y} = 2.291lnX_1 - 17.134$, $R^2 = 0.970$, $\overline{R}^2 = 0.969$, DW = 0.319, $F = 1210.063$ (34.786) (-25.762);
3. $\ln\hat{Y} = 3.605lnX_2 - 11.577$, $R^2 = 0.919$, $\overline{R}^2 = 0.917$, DW = 0.246, $F = 433.608$ (20.823) (-13.701);
4. $\ln\hat{Y} = -6.436lnX_5 + 1.771$, $R^2 = 0.903$, $\overline{R}^2 = 0.901$, DW = 0.247, $F = 353.986$ (-18.815) (7.393);
5. $\ln\hat{Y} = 0.710lnX_4 + 3.832$, $R^2 = 0.680$, $\overline{R}^2 = 0.671$, DW = 0.070, $F = 74.537$ (8.633) (12.205).

Based on the first regression equation, the remaining explanatory variables are analyzed using EViews according to their degrees of influence. Then, we can obtain $\ln\hat{Y} = 0.585lnX_1 + 00.548lnX_2 + 0.699lnX_3 - 0.119lnX_4 - 8.009$; (5.000) (3.588) (0.063) (-0.153) (-10.404); and $R^2 = 0.996$, $\overline{R}^2 = 0.995$, DW = 1.203, $F = 1890.433$. Figure 1 shows the residual chart.

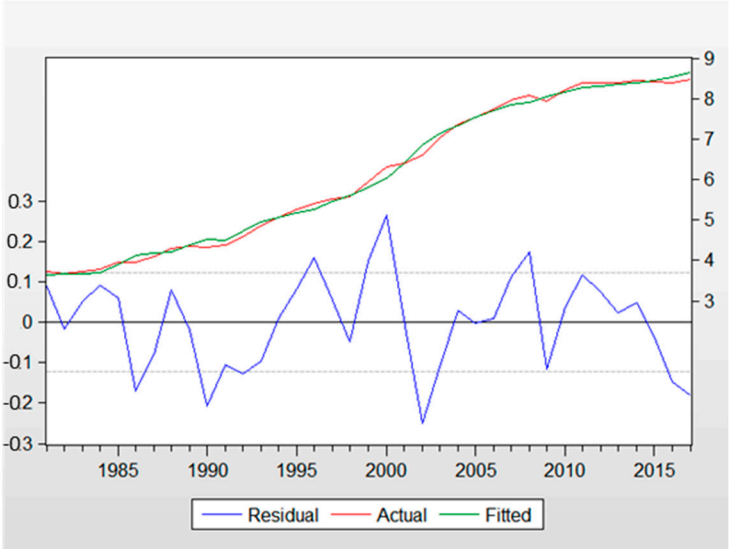

Figure 1. Residual chart.

According to the above analysis, the locational value factors of FTP consist of port throughput, the number of college students per 100,000 people, the balance of domestic- and foreign-currency loans of Chinese and foreign financial institutions, and the amount of foreign capital utilized. The locational value factors are related to the port and shipping system, talent quality, and capital. Different locational factors have different degrees of influence on the locational value of FTPs. The model results reveal that the capital factor has the highest degree of impact on locational value, followed by the regional port and shipping system and the quality of talent.

3.5.2. Multiple Linear Regression Analysis of Dataset 2

Multiple linear regression analysis is performed on lnY, lnX_1, lnX_4, and lnX_5. Table 14 shows the results.

Table 14. Multiple linear regression analysis results.

Variables	Coefficient	Standard Deviation	*t*-Statistics	*p* Value
C	−84.251	15.459	−5.450	0.000
lnX_1	0.019	0.003	6.312	0.000
lnX_4	−11.426	2.911	−3.925	0.000
lnX_5	0.144	0.027	5.335	0.000
R-squared	0.986	*F*-statistic		349.404
Adjusted *R*-squared	0.985	Prob (*F*-statistic)		0.000

The regression equation is expressed as follows:

$$ln\hat{Y} = 0.019lnX_1 - 11.426lnX_4 + 0.144lnX_5 - 84.251 \quad (7)$$

As shown in Table 14, R^2 = 0.986, and the adjusted R^2 (goodness of fit of the regression equation) is 0.985. This indicates that the goodness of fit of the regression line to the sample points is ideal. The *F*-test statistic value is 349.404, the corresponding *p* value is 0, and the regression coefficients are significantly nonzero. Taking the significance level of 5% as the criterion, the *p* value corresponding to the t-statistic of port throughput, amount of foreign capital utilized, and coefficient of industrialization level are all less than 0.05. Thus, the explanatory variables—including port throughput, amount of foreign capital utilized, and industrialization level—have a significant effect on the total amount of foreign trade import and export. Based on the regression equation, we can conclude the following:

1. When port throughput increases by 10,000 tons, foreign trade import and export volume will increase by USD 101.9 million.
2. When the actual utilization of foreign capital increases by USD 100 million, foreign trade import and export volume will increase by USD 122.9 million.
3. When the level of industrialization rises by one point, foreign trade import and export volume will increase by USD 104.4 million.

3.6. Analysis of the External Factors of Locational Value

The external factors of locational value mainly include institutional policies, markets, and other factors. Market elements are characterized by market size, consumption potential, and openness. Market scale constrains the division of labor in each region, and the effect of market restriction is positively related to the scale of the regional market. This will also positively affect the division of labor in the region and further promote regional economic development. There have been structural reforms in China's domestic supply. A new economy and new industries have sprung up. With growing network and data resources and information technology as the internal driving forces of development, the development trends of the digital economy and innovation clusters have gradually arisen. New economic development and its radiating effects are rapidly growing, and consumption is an essential factor driving economic growth. China's consumer market is being upgraded, consumption potential is continuously realized, market-economy vitality is constantly stimulated, and the traction effect on supply-side demand is enhanced. The balance of total demand and supply is achieved through market mechanisms. China has taken corresponding measures to continuously improve the market's consumption potential, promote the injection of new kinetic energy into the high-quality development of the regional economy, and promote the construction of FTPs. The inverse effect between the degree of market openness and trade costs means that if the transaction cost is high, the degree of market openness is low, and the market opens to a higher degree to attract foreign investment.

More open systems and policies are conducive to accelerating the accumulation of capital factors. FTPs provide greater convenience in terms of foreign exchange control, financial systems, and taxation, which are conducive to attracting foreign investment, increasing capital stock, and improving the ability of capital factors to gather. The development and utilization of FTPs positively affect the development of regional economies. Economic

strategies such as BRI also affect the locational value of FTPs. We can conclude, therefore, that enhancing the locational value of FTPs can facilitate the internal and external radiation of the interior economic market.

4. Comparison of Shanghai and Ningbo-Zhoushan FTPs

4.1. Economic Development

Figures 2 and 3 show the regional GDP and growth rate of Ningbo and Shanghai, respectively. The GDPs of Ningbo and Shanghai have both increased, while the economic development level of Shanghai is higher and more stable than that of Ningbo. The higher the level of economic development, the stronger the agglomeration capacity of regional factors. It is also more conducive to improving the locational value of FTPs. Based on the actual situation, partial factors in Shanghai are more concentrated than those in Ningbo. To effectively develop and utilize the locational value of the Ningbo-Zhoushan FTP, it is necessary to improve the level of regional economic development.

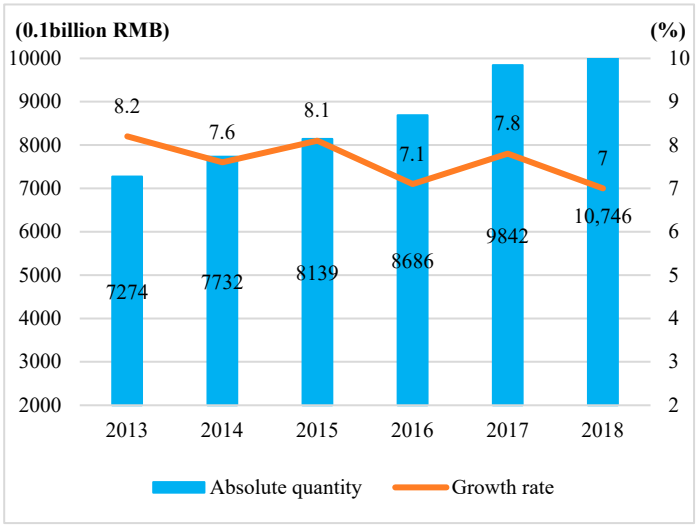

Figure 2. Economic development situation of Ningbo.

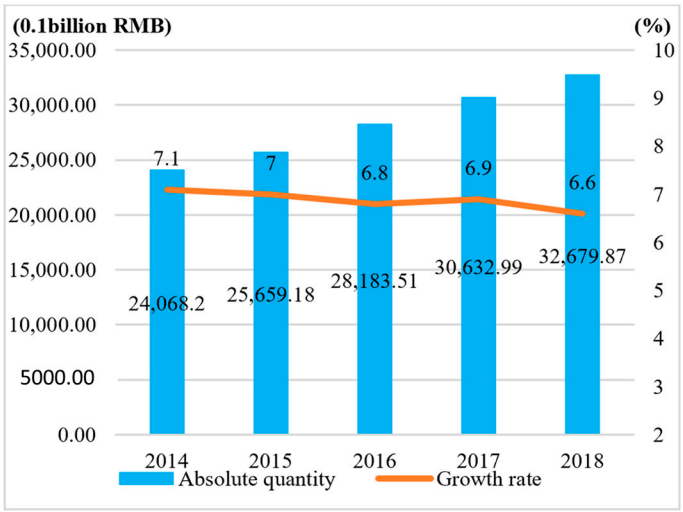

Figure 3. Economic development situation of Shanghai.

4.2. Industrial Structure

Shanghai and Ningbo, both located in the Yangtze River Delta region, have entered the postindustrial stage. The economic development models have transferred to the service

economy. Strategic emerging industries in Shanghai have increased by 8.2% year on year. The secondary industry reached CNY 973.3 billion, the tertiary industry reached CNY 2284.3 billion, and the service industry grew by 11.3% in 2017. The secondary industry in Ningbo reached CNY 550.8 billion, a year-on-year increase of 6.2%, and the tertiary industry reached CNY 493.2 billion, a year-on-year increase of 8.1%. The data indicate that the service industries in Shanghai and Ningbo have developed rapidly. Still, a large gap exists between secondary and tertiary industries in Shanghai, and the development of the service industry is the focus. Although the secondary industry is the mainstay in Ningbo, the service industry has developed rapidly, and the gap between the two is shrinking. The industrial influence and radiation effect of a region are related to the division of labor. Therefore, to enhance the locational value of FTPs, the industrial structure needs to be further optimized and upgraded.

4.3. Port System

Shanghai Port and Ningbo-Zhoushan Port, as the two crucial hub ports of the Yangtze River Delta, promote the steady development of the regional economy. Although they are both great economic ports, they are different in the following respects. Shanghai Port aims to be a comprehensive port for building an international logistics center and shipping center. Ningbo-Zhoushan Port, by contrast, is positioned as a comprehensive international port area, considering the bulk of materials and international container transit ports. Ningbo-Zhoushan Port is more suitable for deep-water wharf construction than Shanghai Port, while Shanghai Port is more advantageous than Ningbo-Zhoushan Port in terms of throughput and geographical location.

4.4. Capital Accumulation and Talent Quality

Because the economic development level of Shanghai is higher than that of Ningbo, it is more attractive in terms of capital, and the degree of capital accumulation is higher. The development of regional capital is important for enhancing the value-added ability of the agglomeration of capital factors. Comparing the economic development level, capital concentration, and other factors of the two regions, Shanghai has a higher degree of talent accumulation than Ningbo. Ningbo remains at a disadvantage concerning attracting high-quality talent.

4.5. Comparison and Analysis

Based on the results presented above and the comparison of the Shanghai and Ningbo FTPs, we can see that the construction of the Shanghai FTP has promoted economic, trade, and investment growth while having a radiation effect on the Yangtze River Delta.

Specifically, for the Shanghai FTP, the capital factor has the most substantial influence on its locational value. The port and shipping system and the quality of talent show little difference in their effect on the locational value, which is consistent with the actual situation in Shanghai. Compared with the Shanghai FTP, the Ningbo-Zhoushan FTP has certain locational advantages, and the economic environment in the interior is also superior. As with the Shanghai FTP, the capital factor has the most significant effect on the Ningbo-Zhoushan FTP's locational value. By contrast, the industrial structure has a more substantial effect on the locational value of the Ningbo-Zhoushan FTP than the Shanghai FTP. Ningbo-Zhoushan's level of economic development is slightly lower than that of Shanghai. Still, secondary and tertiary industries are developing rapidly. The gap between the two industries is narrowing, indicating that the tertiary industry in Ningbo is continuously rising, and the economic structure is being optimized.

Comparing the Shanghai and Ningbo-Zhoushan FTPs helps us to better understand the locational advantages and disadvantages of the Ningbo-Zhoushan FTP. Based on the actual situation, the Ningbo-Zhoushan FTP should aim to improve the value-added capacity of various elements, develop and utilize the locational value of the FTP, give full play to poles, and drive regional economic growth.

The advantage of Shanghai FTP lies in international container transit and international cruise transportation. Moreover, the Shanghai international shipping center also focuses on developing the high-end shipping service industry. Taking advantage of the unique benefits of Shanghai international financial center, Shanghai international shipping center leads the development of the shipping industry with finance. Ningbo Zhoushan port has built a river-sea intermodal service center, positioned as a transit, reserve, and trading platform for bulk cargo by the Chinese government. Bulk commodity carriers often need deep-water berths, which are not common in China. Zhoushan's advantages are significant in building bulk cargo transit and reserve facilities that complement Shanghai port. Combined with the previous analysis results, the development strategies promote the locational value of the Ningbo-Zhoushan port area are given to in the next section.

5. Strategies for Promoting the Locational Value of the Ningbo-Zhoushan FTP

This study analyzes locational factors and their external influence on the Ningbo-Zhoushan FTP and compares the characteristics of the Shanghai and Ningbo-Zhoushan FTPs. On that basis, we propose the following strategies for improving the locational value of the Ningbo-Zhoushan FTP based on its actual situation.

5.1. Develop Featured Industrial System and Boost New Growth Points of the Digital Economy

Ningbo mainly relies on the development of secondary and tertiary industries, and most manufacturing industries are at the low end of the global value chain. Still, the digital economy and strategic emerging industries do not account for a higher proportion. The development of new business forms and models has not yet formed a scale, and the sources of enterprises' technological innovation need to be enhanced. In this regard, the government should actively use digital technology to promote the transformation and upgrading of leading industries; develop "digital + industry", "digital + trade", and "digital + logistics", and promote the digitalization of manufacturing. It would also be beneficial to encourage and support industrial enterprises to accelerate the intelligent transformation and build groups of intelligent factories. Moreover, developing cloud manufacturing and transferring to service-oriented manufacturing should be promoted.

Today, blockchain technology is developing rapidly. Regarding the current situation of Ningbo's financial supply chain, the government should guide traditional finance trading companies to adopt relatively new models, such as e-commerce, the platform economy, and the sharing economy, to achieve upgrading and growth. It is also necessary to establish a cross-border trade service ecosystem, promote platforms for the digital economy (e.g., cross-border supply chain management and settlement technology operations), and provide "one-stop" services, such as intelligent supply chains and smart trade and logistics technologies. Accelerating the development of blockchain technology could be a good alternative for solving the financing difficulties of small and micro-enterprises [20]. It could also significantly improve the financing efficiency and capital flow efficiency of the entire industry chain, enhancing the security and authenticity of data.

5.2. Benchmark the Shanghai FTP and Promote Cooperation and Development between Shanghai and Ningbo

In terms of port and shipping systems, Shanghai Port and Ningbo-Zhoushan Port have both advantages and disadvantages. The two ports inevitably form a competition pattern as a result of their port positioning and location in the economic interior. However, with the continuous promotion of economic integration in the Yangtze River Delta, the two major ports will need to shift from a competitive relationship toward a cooperative one. Then, they will be able to give full play to their port advantages and coordinated development, thereby promoting the further development of the Yangtze River Delta and Yangtze River economic belt.

In the context of the BRI, Ningbo needs to build a large platform conducive to international capital operation to attract high value-added, high technology capital. The development of Ningbo and the construction of FTPs are mutually reinforcing.

5.3. Enhance the Attractiveness of Capital and Talent

The following measures should be taken to attract capital and talent: (1) Enterprises in the primary sector should pay more attention to developing the regional economy and providing innovation platforms. Furthermore, they should cooperate closely with well-known universities for training talent. (2) The government should devote itself to improving and enhancing scientific and technological innovation platforms. The government should also publish promotion measures to build a regional innovation space for the professional development of talent. (3) The environment for entrepreneurship and innovation should be optimized, and the financial system for science and technology should be improved. Lastly, (4) it would be beneficial to implement a quota system for talent, increase the talent welfare subsidy system, and enhance talent security measures.

6. Conclusions

Against the background of economic integration and supply-side structural reforms, FTPs have become key to promoting overall market reforms in China. The regional positioning of China's FTPs should be further improved to manifest the characteristics of regional development. The level of opening up needs to be improved as well, and the hidden locational value of FTPs should be further developed. Improving locational factors and external influencing factors can enhance the value-added ability of the accumulation of capital factors, thereby driving regional economic growth.

We found that FTPs' locational value factors include regional economic development level, industrial structure, port and shipping systems, capital accumulation, talent quality, institutional policies, market scale, market consumption potential, and market openness. In addition to improving FTPs' locational factors, it would be desirable to expand the market scale and consumption potential, increase the degree of openness, improve various infrastructures, and develop regional industrialization. Labor quality requires further optimization and innovation in terms of institutional policies to promote the flow and agglomeration of capital.

Ningbo should aim to develop emerging industries, improve traditional industries, promote innovation, elevate science and technology, and accelerate the optimization and upgrading of the industrial structure. Ningbo Port has advantages in terms of deploying high-end manufacturing industries, such as shipbuilding and high-end petrochemicals, and extending the port's industrial chain. The regional economy will give full play to internal and external linkages with the hinterland economy to radiate regional economic development. Ningbo also needs to deepen the development planning system for ports and shipping, promote the intensive use of shorelines and the integration of port resources, and accelerate the construction of port and shipping infrastructure. Ningbo could, for example, combine blockchain technology with its regional supply chain to maximize efficiency and overcome the shortcomings of traditional technologies [33]. Regarding talent accumulation, Ningbo could learn from Singapore and integrate universities with the local economy and culture and cultivate a large skilled technical labor force for use by enterprises and communities [34].

The evaluation of FTPs' trade effects, growth effects, and economic effects is based on the trade model of equilibrium theory. However, static models do not cover the radiation and driving effects generated by FTPs. This paper performs a preliminary simulation of the measurement model, and further research is still needed from the perspective of spatial measurement simulation in the future.

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