

## Foreign Direct Investment Inequality (FDI) and Convergence of Growth: Evidence from Yangtze River Delta

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### 1 Introduction

The Yangtze River Delta (YRD) Economic Circle has experienced a long period of development. From the original Shanghai Economic Zone in 1983, altogether 10 cities encompassing Suzhou, Wuxi, Changzhou, Nantong and Hangzhou, Jiaxing, Huzhou, Ningbo and Shaoxing surrounding the Shanghai Core, to the final stage in 2003 when the latest leaguer, Taizhou of Zhejiang Province joined the family, the YRD has been experiencing a long time of expansion. Focusing on the aggregation, see Table 1, the YRD attracted almost half the FDI in the nationwide scale, over 1/3 export and import, around 6 percent of the fixed investment and produced nearly 1/5 of the GDP. We should say this was, and is a miracle in the river of regional economic growth.

**Table 1** *Main Economic Indices of 2006*

	China	YRD	Weight (%)
GDP (\$ bn)	26.82	5.06	18.88
Fixed Investment (\$ bn)	14.07	0.80	5.70
Export and Import (\$ bn)	17.61	6.26	35.54
FDI (\$ bn)	0.69	0.32	45.43

*Source:* Author's calculation.

*Note:* Calculation and the transformation exchange rate applied is 1:7.8087 in 2006 in accordance with the Statistical Communiqué of the People's Republic of China on the 2006 National and Social Development.

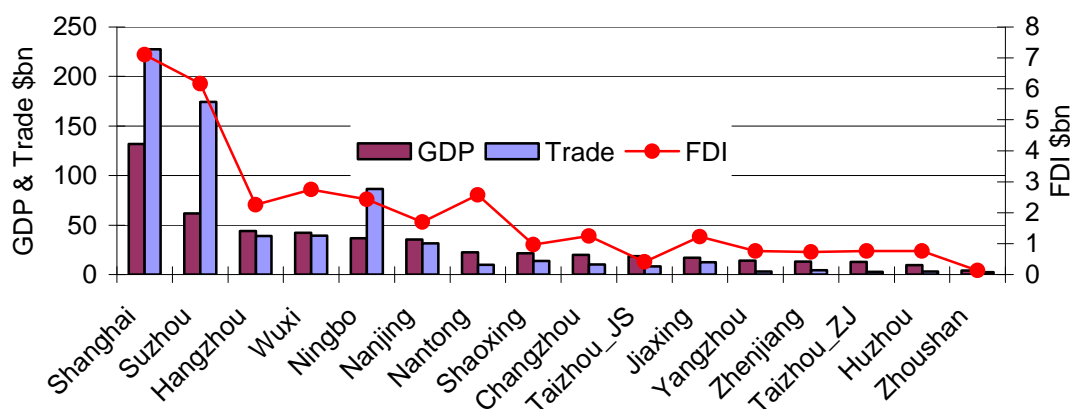
In this long course of evolution and extension of integrity for two decades, and going with the boom of the integrative strength, some inequality of development is emerging, confronting other integrity regions as well, such as EU. The YRD regional economy is suffering from drastic inequality of development. The GDP of Shanghai in 2006 reached more than \$130 billion

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compared with \$4.3 billion in Zhoushan, only being 3% of the former. The trade volume differentiation of YRD is as huge as shown in Fig 1, from which we find the top three are Shanghai, Suzhou and Ningbo. Drastic fluctuation of FDI level amidst the 16 cities is, to a small degree, positively related to the GDP and Trade growth. However, there are some exceptions such as Hangzhou, Wuxi, Ningbo, Nantong, Shaoxing, Taizhou and Jiaying, which show one suspicious indication, whether the huge FDI differentiation would not induce a necessary divergence of GDP. Facing such an FDI and trade divergence, how would the steady state be in the long run in the YRD economic circle?

Fig 1 The Intra Differentiation of GDP Trade and FDI in YRD in 2006



Note: Calculation and the transformation exchange rate applied is 1:7.8087 in 2006 in accordance with the Statistical Communiqué of the People’s Republic of China on the 2006 National and Social Development.

There are two main concepts of convergence in classical literatures related to the transitional dynamics,  $\beta$ -convergence and  $\delta$ -convergence, which was for the first time introduced by Sala-i-Martin in his Ph. D. dissertation as a widely used economic terminology in development economics (to be more mathematically precisely defined in a later section).

In the neoclassical growth models for closed economies<sup>1</sup>, the per capita growth rate tends to be inversely relative to the starting level of output or income per capita. In particular, if economies are similar in respect to preferences and technology, then poor economies grow faster than rich ones<sup>2</sup>. Thus, a force promotes convergence in levels of per capita product and income no matter how huge the initial difference gap is.  $\beta$ -convergence and  $\delta$ -convergence indicate two different approaches of economies becoming similar over time. The former embodies the mobility of the different individual economy within the given distribution of regional income group, while the latter relates to the income level in terms of cross-section trend of change,

<sup>1</sup> Ramsey, Frank P., “A Mathematical Theory of Saving”, *Economic Journal*, Vol. 38, 1928, pp.543-59; Solow, Robert M. “A Contribution to the Theory of Economic Growth”, *Quarterly Journal of Economics*, Vol. 70, 1956, pp. 65-94; Cass, David. “Optimum Growth in an Aggregative Model of Capital Accumulation”, *Review of Economic Studies*, Vol. 32, No. 91, 1965, pp. 233-40

<sup>2</sup> Barro, R. J. and Sala-i-Martin. “Convergence”, *The Journal of Political Economy*, Vol., 100, No. 2. Apr. 1992, pp. 233-51.

narrower or not over time. In other words, a necessary condition for the existence of  $\delta$ -convergence is the existence of  $\beta$ -convergence. We say a group of economies is converging in the sense of  $\beta$ , which is tenable when the poor economies tend to grow faster than the rich do<sup>3</sup>. Another is called  $\delta$ -convergence, and we say a group of economies is converging in the sense of  $\delta$  if the dispersion of the real per capita GDP<sup>4</sup> levels tends to decrease over time<sup>5</sup>.

However, one of the key hypothesis of neoclassical growth theory that the deduction of  $\beta$ -convergence depends on is the single difference amidst economies is the initial capital stock and the diminishing marginal return of capital, namely, the smaller the stock, the higher the marginal return of capital and vice versa.<sup>6</sup> This strict assumption differs far from the real world on the ground that the technology level, marginal propensity to save and the growth rate of population amongst economies differentiated. Sala-i-Martin<sup>7</sup> tested the economic growth evidence of 110 countries around 3 decades and concluded that it was not absolute  $\beta$ -convergence, thus he presented another kind of convergence after control of some conditions making the steady state of the economy: conditional  $\beta$ -convergence<sup>8</sup>. Thereafter, he took advantage of the data from OECD, 48 states of American, 47 prefectures of Japan and 90 regions in Europe, all the conclusions proved the conditional convergence. Some other researches from China on the inequality and disparity of regional economy development, as presented by Barro<sup>9</sup>, Lin Yifu, Cai Fang and Li Zhou<sup>10</sup>, Liu Xiaming, Wei Yingqi and Li Guoping<sup>11</sup>, Xu Xianxiang, Shu Yuan<sup>12</sup>, most of them verified the assumption of conditional  $\beta$ -convergence.

Most of the existing researches processed the data of provincial levels or geographical groups, and few of them took use of the data from city level or other special groups as the criteria of study. This paper, in a micro perspective, deploys the research from the city level of the YRD, groups the cities in accordance with the FDI scale as the criteria, and makes analysis on

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<sup>3</sup> To be precise, here it means absolute beta convergence, or unconditional beta convergence, the conditional beta convergence will be introduced in a later section.

<sup>4</sup> In accordance with Sala-i-Martin (1996), real per capita GDP is the normal per capita GDP deducing the inflation factor.

<sup>5</sup> Sala-i-Martin, A., "The Classical Approach to Convergence Analysis", *The Economic Journal*, Vol. 106, No. 437. July 1996, pp.1019-36.

<sup>6</sup> This hypothesis means with the increase of the capital stock of an economy the growth rate would be decrease until nil in the steady state.

<sup>7</sup> The same as footnote 4.

<sup>8</sup> The conditional beta convergence means economies develop with a converging trend under the condition that some other factors hold constant in steady state.

<sup>9</sup> Barro, R.J. "Economic Growth in a Cross Section of Countries", *Quarterly Journal of Economics*, vol. 106, No. 2, May 1991, pp. 407-43; Barro, R., "Determinants of Economic Growth: A Cross-Country Empirical Study", Cambridge, Massachusetts, London, England: The MIT Press, 1998.

<sup>10</sup> Lin Yifu, Cai Fang and Li Zhou, "Analysis on the Regional Inequality in Transition Stage in Chin", *Economic Research Journal*, 1998, Vol. 6.

<sup>11</sup> Liu Xiaming, Wei Yingqi and Li Guoping, "Convergence or Divergence?: Literature Review on the Debate on the Regional Development in China", *Economic Research Journal*, 2004, Vol. 7.

<sup>12</sup> Xu Xianxiang and Shu Yuan, "Evolution of Economic Growth Distribution in China's Provinces", *China Economic Quarterly*, 2004, Vol. 3, No. 3.

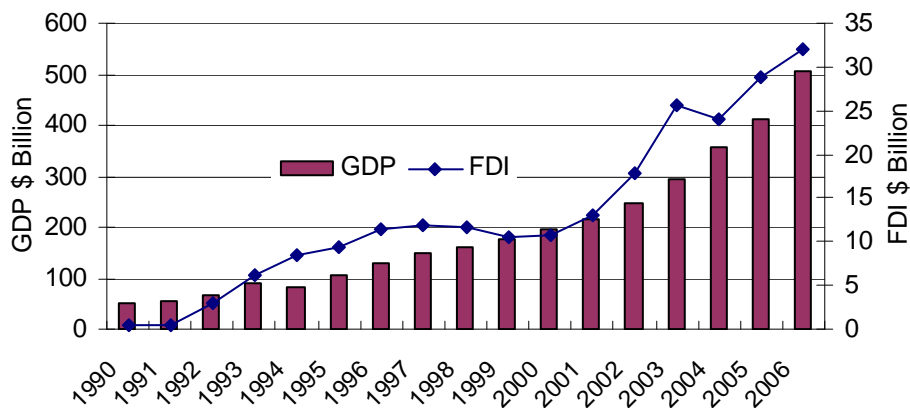
convergence in accordance with the specialty of objectives and purposes. We put our eyes on the confusion whether the disparity of FDI level induces the same result of economic development, namely, if the divergence of FDI causes the divergence of economic development necessarily or not.

The rest of this paper is organized as follows: section II will deal with the primary statistic description, analyzing the fluctuation of per capita FDI and convergence of per capita GDP; section III, we figure out the convergence of economic growth, focusing on the convergence of economic growth amongst different groups by FDI scale; in section IV we offer some conclusions.

## 2 Basic Statistical Descriptions

Compelled by the global transfer of manufacturing capital, the enormous positive externalities from the industry agglomeration effect as well as the policy of attracting the FDI and the steady lower labor cost in that area made the YRD the first option for ambitious profit seeking international capital. The gross amount of real FDI of the 16 cities in YRD reached \$32 billion in 2006, which was only \$560 million in 1990, nearly the average volume per week of the former! The GDP increased from \$51 billion in 1990 to \$506 billion in 2006, basically a steady increasing trend with tiny fluctuation. Compared with the evident growth path, we can perceive vaguely one sort of clue that maybe the GDP changes are not that sensitive as the FDI is, whether this means that as to the holistic economy, the FDI is not the significant one factor that affects the path of growth as much as we expected so<sup>13</sup>.

*Fig 2 Regionally Aggregative GDP and FDI of YRD*

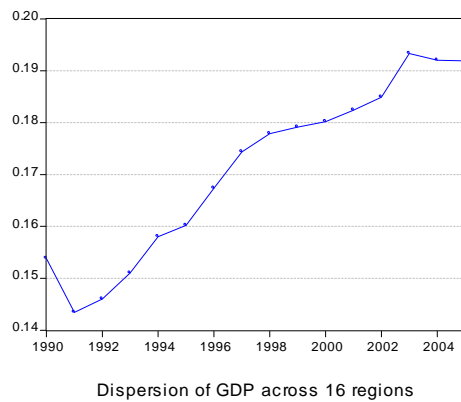


*Source:* it is plotted in accordance with the related version of Jiangsu, Zhejiang and Shanghai Statistic Yearbook from 1991 through 2006 and the related Statistical Communiqué of the People’s Republic of China on the 2006 National and Social Development. The transformation from RMB to US Dollar is processed by the ER data from International Financial Statistics.

<sup>13</sup> In China, especially in the YRD, the holistic economy is considered so dependent on the FDI and foreign market that many papers documented and argued so critically.

Fig 3 represents the disparity of per capita GDP amongst the 16 regions, namely the index of  $\delta$ -convergence, from 1990. Judging from the graph, we can figure out unambiguously that the value of  $\delta$  increases from 0.15 in 1990 to 0.19 in 2005, despite the small scale and some fluctuation, the holistic trend of  $\delta$ -divergence is palpable, which means apparently the gap amongst different parts in the YRD widened in the past 16 years.

**Fig 3** Economic Growth Disparity  
Inter Regions:  $\delta$ -divergence



**Fig 4** Economic Growth Convergence  
Inter Regions:  $\beta$ -convergence

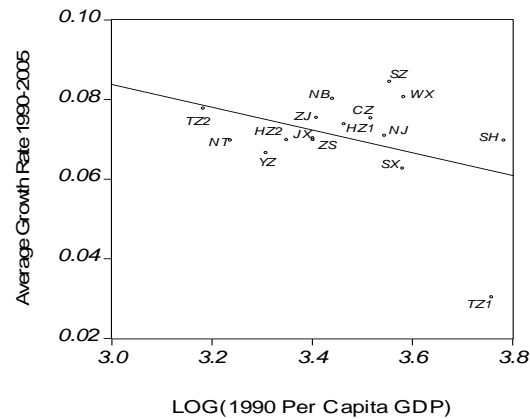


Fig 4 represents the relationship between the starting levels of regional economy (1990) and the reciprocal growth rate, namely the index of  $\delta$ -divergence. The horizontal axis denotes the logarithmic value of the per capita GDP in 1990, the vertical axis the average growth rate from 1990 through 2005. The graph shows the reverse relationship of the growth rate and the starting level of per capita GDP, which implies that  $\beta$ -convergence exists overall in the YRD regions and the accurate empirical test would be processed in Section III.

In light of the inequality of both FDI and economic growth amongst the 16 cities, we will make further investigation on the disparity amidst the regions. We carve up the 16 regions into 5 plates in accordance with the FDI stock scale and some comparative analysis would be conducted in the following parts. Shanghai and Suzhou are the first plate, more than \$20 billion, and Wuxi, Ningbo and Nanjing the second, more than \$10 billion but less than \$20 billion, and Hangzhou, Changzhou, Nantong and Zhenjiang the third, from \$5 billion to \$10 billion, and Jiaxing, Yangzhou, Shaoxing, Huzhou and Taizhou (in Jiangsu Province) the fourth, from \$1 billion to \$5 billion; Taizhou (in Zhejiang Province) and Zhoushan the fifth, less than \$1 billion. See Table 2.<sup>14</sup>

<sup>14</sup> Regional dummy variables would be put into the regression function in Section 3.

**Table 2** Five Plates of YRD according to FDI Scale (Unit: \$ 100 million)

First Plate	Shanghai	584.418	Fourth Plate	Jiaxing	46.143
	Sushou	456.317		Yangzhou	36.750
Second Plate	Wuxi	182.803		Shaoxing	36.645
	Ningbo	122.287		Huzhou	26.101
	Nanjing	121.130		Taizhou(JS)	19.340
Third Plate	Hangzhou	81.573	Fifth Plate	Taizhou(ZJ)	3.030
	Changzhou	71.311		Zhoushan	2.201
	Nantong	68.578			
	Zhenjiang	59.708			

Source: calculated in accordance with the relative version of Jiangsu, Zhejiang and Shanghai Statistic Yearbook from 1991 through 2006.

**Fig 5** Dispersion of FDI to the regional mean

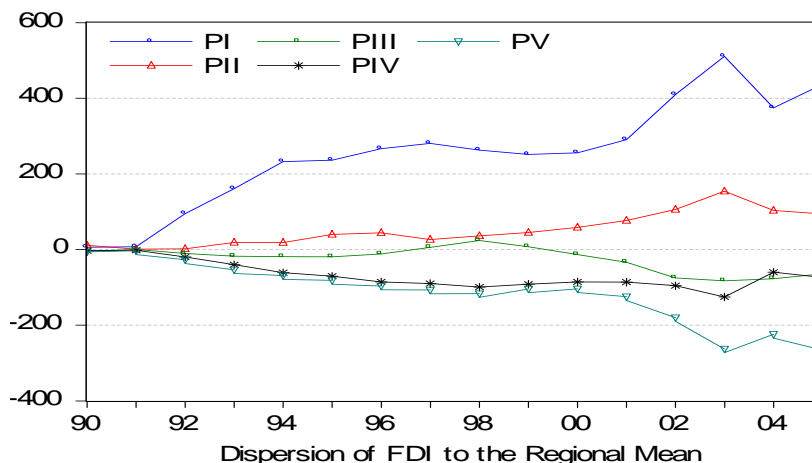


Fig 5 displays the gap amongst different plates FDI and the mean, we can draw the conclusions that the fourth and the fifth is beneath the mean line and more gap with time extension, the first and the second is above the mean and the first further beyond, the third fluctuates around the mean line. This sort of dispersion might be one demonstration of the investment environment, encompassing the local policy, the industry linkage and even the cultural and conventional effects besides the geographic characteristics differences and infrastructural completeness.

### 3 Analysis of Economic Growth Convergence

#### 3.1 Model Introduction

Concerning the approaches to the parity and convergence of economic growth, there might be two prevailing sorts. One, by quantified analysis, assesses the convergence speed  $\beta$  for the standard deviation  $\delta_{t,T+t}$  of per capita GDP in stage  $(t, T+t)$ , another, by Theil Entropy<sup>15</sup>, Gini Coefficient<sup>16</sup>, Coefficient of Variance<sup>17</sup> or Atkinson Index<sup>18</sup>, decomposes the gap amidst the economic regions and measures the level of different parts of research. Owing to the lack of theoretical support for the latter and even some fatal defects of some indexes, we employ the former to make analysis on the convergence of the five plates during 1990 through 2005.

Referring to Sala-i-Martin<sup>19</sup>, if we hold

$$\gamma_{i,t,t+T} = \alpha - b \log(y_{i,t}) + \varepsilon_{i,t,t+T} \quad (1)$$

$$\gamma_{i,t,t+T} = a - b \log(y_{i,t}) + \psi X_{i,t} + \varepsilon_{i,t,t+T} \quad (2)$$

where,  $\gamma_{i,t,t+T} \equiv \log(y_{i,T+t}/y_{i,t})/T$  is the annual growth rate of the economy  $i$  in period  $(t, T+t)$ ,  $\log(y_{i,t})$  is the logarithmic per capita in stage  $i$ ,  $b = (1 - e^{-\beta T})/T$ ,  $\beta$  is the speed of convergence,  $X_{i,t}$  is one set of variable vectors that remain constant of economy  $i$  in the steady state. If we make regression on expression (1), and got  $\beta > 0$ , then we can say this set of samples is absolute  $\beta$ -convergence; if we control  $X_{i,t}$ , and make regression on expression (2) and got  $\beta > 0$ , then we can say that this set of sample is conditional  $\beta$ -convergence.

If we have  $\delta_{T+t} < \delta_t$ , where  $\delta_{T+t}$  and  $\delta_t$  are the cross sectional standard deviation of  $\log(y_i)$  of this economy between stage  $T+t$  through  $t$ , then we can say this sample is  $\delta$ -convergence<sup>20</sup>.

### 3.2 Absolute $\beta$ -convergence Test

Based on neoclassical model, we add regional dummy variables to test the specific difference between different plates, using augmented expression (3),

$$\gamma_{i,t,t+T} = \alpha - b \log(y_{i,t}) + \chi_i \sum_{i=1}^4 D_i + \varepsilon_{i,t,t+T} \quad (3)$$

To test the convergence of economic growth with data from 1990 through 2005, by Ordinary

<sup>15</sup> Theil Entropy, as one of the measure to weigh the inequality between individual or areas in income, was first introduced by Theil, 1967, by borrowing the concept of entropy from information theory, for detail, see Economics and Information Theory, Amsterdam: North by Theil 1967.

<sup>16</sup> Gini Coefficient is a measure of statistical dispersion most prominently used as a measure of inequality of income distribution or in equality of wealth distribution, and was developed by the Italian statistician Corrado Gini and published in his 1912 paper "Variability and Mutability". More simply, it tells us how evenly the variable spread;

<sup>17</sup> Coefficient of Variation represents the ratio of the standard deviation to the mean, and it is a useful statistic for comparing the degree of variation from one data series to another, even if the means are drastically different from each other;

<sup>18</sup> Atkinson index, also known as the Atkinson measure, is a measure of economic income inequality developed by Anthony Barnes Atkinson. The distinguishing feature of the Atkinson index is its ability to gauge movements in different segments of the income distribution.

<sup>19</sup> The same as footnote 4.

<sup>20</sup> The same as footnote 4.

Least Square (*OLS*), see table 3. Judging from the results, the goodness of fit in the function, displayed by *R*-squared, is not as high as expected, which has something to do with the pooled data we applied despite all the parameter are significant above the statistic level of 5%, and D.W. test<sup>21</sup> is significant. The regression results are even better than the original model, which denotes the difference of FDI in the disparity of YRD, meanwhile the values calculated by the regression of model 1 and model 2 are 0.88% and 2.55% respectively, implying that taking the difference of FDI into consideration, the speed of convergence is evidently faster than the pooled data. This speed of convergence is slightly lower than the theoretical assessment of OECD and Japan, 2.9% and 2.7% respectively, higher than that of US, 2.1% and Europe, 2%, also obviously higher than that of the three regions of China, Eastern, Middle and Western parts, 1.4%<sup>22</sup>. The convergence speed inside the plate is far beyond that of inter-plate especially the second, reaching as high as 14% and the other two, both of which are around 7.6%. The fourth and fifth plates are pretty slower. The result of absolute  $\beta$ -convergence testifies to the reasonability of application of FDI difference to the regression, more importantly, implies the typical club convergence in YRD, which shows that the regions with similar FDI stock converge to each other in the whole process of economic growth.

The results are consistent with the statistical conclusions above mentioned given the consideration of FDI difference, implying that the economies converge to each other evidently despite the huge FDI divergence, which gives rise to the following research: for the reasons beneath the surface.

### 3.3 Conditional $\beta$ -convergence Test

For the purpose to further test the influence of some other variables that hold constant in condition of steady state on convergence, we add *Open*, *Information Degree*, *Investment Degree* and *Technology Innovation* referring to the existing literatures and the need of research to see about the conditional  $\beta$ -convergence possibility.

*Open* is the rate of foreign to GDP regionally; *Information Degree* uses the post and electronic communication value as the substitute, which is seldom employed in the previous literature but plays such an important role in the open economy. *Investment Environment* applies the ratio of local fiscal expenditure to GDP. Generally, the investment decisions are significantly influenced by public goods that are mainly supplied by fiscal expenditure; *Technology Innovation* takes advantage of the amount of patent application in a statistical year, and theoretically, the coefficient of technology and innovation should be positive embodying the compelling influence on economic growth.

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<sup>21</sup> D.W. test, Dubin-Watson test, is one test that the residuals from a linear regression or multiple regression are independent. For details, see "Introductory Econometrics: A Modern Approach", 2<sup>nd</sup> edition, Thompson South-Western, 2003, by J.M. Woodridge.

<sup>22</sup> Zhang Ru, "Empirical Research on the Regional Economic Growth Inequality in China", presented to the Sixth Economics Annual.



**Table 3** Regression of Intra-Plate and Inter-Plate  $\beta$ -Convergence

Independent Variable	Dependent variable :Growth Rate of GDP						
	Model 1	Model 2	Plate I	Plate II	Plate III	Plate IV	Plate V
Intercept	0.0755*** (4.9289)	0.1180*** (5.7567)	0.3428*** (4.3672)	0.3516*** (5.036)	0.3205*** (5.3540)	-0.1348** (-2.1082)	0.4360** (4.2480)
$\log(y)$	0.0174*** (4.2349)	0.0390*** (4.7227)	0.0621*** (-3.3971)	0.0662*** (-3.9444)	0.0621*** (-4.1642)	-0.0445*** (2.8685)	0.0929*** (-3.5406)
Derived $\beta$	<b>0.0088</b>	<b>0.0255</b>	<b>0.0776</b>	<b>0.1437</b>	<b>0.0776</b>	<b>-0.0163</b>	<b>NA</b>
$D_1$		0.0522*** (2.9512)					
$D_2$		0.0462** (2.7741)					
$D_3$		0.0423** (2.6522)					
$D_4$		0.0429** (2.6872)					
R-squared	0.1972	0.2900	0.2919	0.2657	0.2302	0.1606	0.3093
Adj R-squared	0.1862	0.2386	0.2666	0.2486	0.2169	0.1411	0.2846
D.W. Stata	1.9655	2.1440	1.1363	1.2521	1.1488	1.4904	1.5039
Prob (F-statistic)	0.0001	0.0002	0.0021	0.0003	0.0001	0.0064	0.0014
S.E.	0.0269	0.0260	0.0309	0.0375	0.0393	0.0181	0.0425

Note: \*\*\*, \*\* denotes the correspondent estimators are significant under statistical level of 5% and 10% respectively. Numbers in the brackets are the corresponding  $t$  value of the regressors.  $\beta$  is conducted by the expression of  $b=(1-e^{-\beta T})/T$ ,  $T=16$ , and the outcome in the eighth column is not worked out and the seventh negative and the rest positive.

For the demonstration of inter-plates difference, we employed regional dummies in the regression model,  $D_1$ ,  $D_2$ ,  $D_3$  and  $D_4$ , and regress expression (4) to testify the  $\beta$ -convergence see table (4) for the conclusions.

See table (4), the regression after addition of control variables is as significant as the former, in accordance with expression  $b=(1-e^{-\beta T})/T$ , we can solve that the value of  $\beta$  is between 1.7%~3.1% including the regression of model (2), which implies that there exists conditional  $\beta$ -convergence to some degree. The reason for “to some degree” is on the ground that except for *Technology Innovation* and *Open*, the other two are seldom significant simultaneously in the sense of statistic and economy. Meanwhile, the coefficient of *Technology Innovation* is not obviously different from zero. Therefore, the empirical results cannot convincingly prove the existence of conditional  $\beta$ -convergence, which implies that the “steady state conditions” amidst the different plates vary significantly. Probably, we can raise the explanation to the reasons for “condition” variation. Maybe just because of this sort of variation, different plates are compelled to iron and control the economic growth by means of the market, legislation and even administration despite the enormous distinction of FDI stock so as to eliminate the adverse impacts of FDI fluctuation and insufficiency, and further the stable growth and development of the local economy.

$$\gamma_{i,t,t+T} = \alpha - b \log(y_{i,t}) + f(Open, ID, IE, TI) + \chi_i \sum_{i=1}^4 D_i + \varepsilon_{i,t,t+T} \quad (4)$$

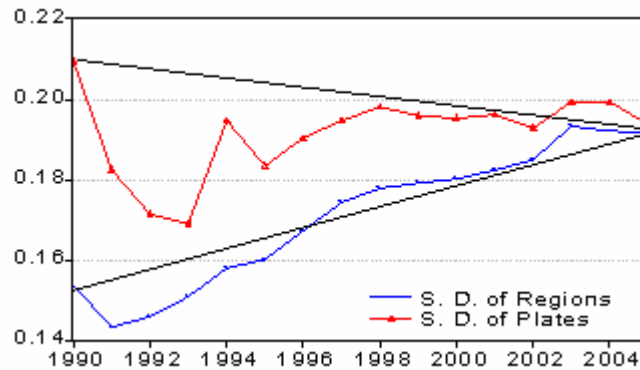
**Table 4** Regression of Inter-Plate Conditional  $\beta$ -Convergence Test

Independent Variable	Dependent Variable: Growth Rate of GDP									
	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7	Model 8	Model 9	Model 10
Interception	0.118*** (5.756)	0.090*** (5.604)	0.090*** (5.511)	0.121*** (5.692)	0.111*** (5.277)	0.122*** (5.963)	0.098*** (4.158)	0.088*** (3.557)	0.117*** (5.295)	0.092*** (3.727)
log(y)	-0.044** *	-0.036** *	-0.038** *	-0.042** *	-0.029** *	-0.034** *	-0.036** *	-0.030** *	-0.031** *	-0.033** *
Open	(-4.308) 0.098* (0.827)	(-3.292)	(-3.593)	(-4.264)	(-2.632)	(-3.411)	(-3.664) 2.057** (2.023)	(-2.720) 0.493* (1.661)	(-2.752)	(-2.983) 0.616** (2.008)
ID		-1.9E-05 (-0.368)			-3.2E-04 *			-4.0E-04 *	-1.6E-04 (-0.709)	-1.6E-04 (-0.705)
IE			-3.5E-06 (-0.244)			-1.0E-04 *	-1.4E-04 *		-6.3E-05 (-0.896)	-1.0E-04 (-1.439)
TI				3.8E-07* *	3.9E-06* (2.552)	4.6E-06* (2.632)	3.3E-06* (1.792)	2.4E-06 (1.382)	4.7E-06* *	3.4E-06* (1.815)
D <sub>1</sub>	0.067** (2.665)	0.045** (1.698)	0.048** (1.904)	0.061** (2.684)	0.021 (0.772)	0.029* (1.171)	0.043* (1.679)	0.031* (1.132)	0.022 (0.812)	0.036 (1.294)
D <sub>2</sub>	0.061** (2.502)	0.039* (1.548)	0.042* (1.730)	0.055** (2.538)	0.015 (0.562)	0.020 (0.823)	0.035 (1.396)	0.027 (1.004)	0.014 (0.538)	0.029 (1.090)
D <sub>3</sub>	0.059** (2.309)	0.035* (1.358)	0.038* (1.551)	0.051** (2.369)	0.011 (0.417)	0.018 (0.753)	0.039 (1.503)	0.027 (0.984)	0.012 (0.435)	0.032 (1.160)
D <sub>4</sub>	0.060** (2.299)	0.035* (1.370)	0.038* (1.536)	0.052** (2.386)	0.012 (0.439)	0.016 (0.617)	0.039 (1.415)	0.031* (1.078)	0.010 (0.377)	0.033* (1.161)
Derived $\beta$	<b>0.031</b>	<b>0.022</b>	<b>0.024</b>	<b>0.029</b>	<b>0.017</b>	<b>0.021</b>	<b>0.022</b>	<b>0.017</b>	<b>0.018</b>	<b>0.020</b>
R-squared	0.297	0.291	0.291	0.294	0.354	0.357	0.395	0.380	0.362	0.399
Adj R-squared	0.235	0.229	0.228	0.232	0.287	0.290	0.321	0.305	0.285	0.316
D.W.	2.122	2.170	2.159	2.112	2.323	2.314	2.426	2.420	2.346	2.460
F-statistic	4.791	4.662	4.644	4.721	5.250	5.317	5.379	5.060	4.681	4.800

Note: \*\*\*, \*\*, \*denotes the correspondent estimators are significant under statistical level of 1%, 5% and 10%, and t-value in the brackets beneath the estimators.

Fig 6 displays the disparity amidst plates, accompanied by Fig 2 for comparison. Telling from the graph, differentiated from the signalized divergence trend in Fig 2, we can figure that all the five plates assume convergence first and then erratic divergence. Generally, the standard deviation converged in a small scale from 0.209 in 1990 to 0.192 despite not evident trend of convergence.<sup>23</sup>

<sup>23</sup> Relative to Fig2, the altitude of inter-plate fluctuation is far more exquisite than that of inter-regional by virtue of taking no account of the influence of FDI stock on the economic growth in the latter. However, what we are focusing on is the standard deviation changing trend, not the changing scale. And what we should deem is the inter-plate disparity narrowed compared with the starting stage in spite of small scale.

**Fig 6** *Inter-Plate Economic Growth Disparity*

In conclusion, if we calculate the regional difference by FDI plates instead, we can state that evident  $\beta$ -convergence is a reality, namely, the speed of growth assumes reversal relationship with the starting per capita GDP level and the gap between different economies would be narrowed gradually. Simultaneously, there is no evident trend of  $\delta$ -convergence though  $\delta_{T+t} < \delta_t$  in plates scenario. From another angle, we should say there is no divergence at least despite the gargantuan differentiation of regional FDI. It shows that some negotiating and competing regime between the plates, such as the macro controlling leverage and the industrial adjustment measures, function in the course of ironing the gigantic fluctuation of FDI so that the local government is able to ensure the smooth and swift growth of the economy. Thus, we are convinced from the aspect of empirical research that neither the central government nor the local would be a disregarding looker-on during the course of economic development. Any precautions and decisive application of non-market instruments to stabilize the holistic economic situation would be potent on a number of occasions.

#### 4 Conclusions

On the convergence and disparity of the regional economy of the Yangtze River Delta, as is called the World Factory, we made statistical analysis, test of  $\beta$ -convergence and  $\delta$ -convergence and conditional  $\beta$ -convergence and draw conclusions as follows: firstly, typical convergence is proved among regions and plates despite the enormous difference of FDI between them; overall  $\beta$ -convergence would be a herald to the inspiring future when the laggards with low stock of capital, including FDI, would keep up with the pioneers soon or later; secondly, inter-plate  $\beta$ -convergence displays the club convergence of YRD; thirdly,  $\delta$ -convergence implies the dispersion of the real per capita GDP levels between different regions and plates is narrowing step by step, though not so remarkable; fourthly, conditional  $\beta$ -convergence, not as significant as theoretically expected, demonstrates the huge difference of steady state condition amidst different regions; fifthly, through the calculation of  $\beta$ , we turn out that reckoning in the regional FDI difference, the speed of convergence reaches around 2.5%, almost to the approximation of

OECD.

The gargantuan FDI inequality in the city level in the YRD is one signal of less regional corporation and adjustment in industry structure and investment strategy, which is a sign that YRD should have set up one union administration to coordinate and cooperate the business. However, from the reality analysis, the sort of union inefficiency did not affect the economy to a degree as large as we believed. The economy itself bears one kind of mechanism that allows the system to conduct properly with some other non-economic administration.

World Factory, a fantastic title, would not be good news to the long run. Labor-intensive industries, environment problems, lower wages and even the international dispute about the employment outsourcing instead of the products outsourcing, all the above problems require a further step to optimize the economic development policy, particularly the low end FDI. The consideration on the domestic employment, from the perspective of central and local government, is one political strategy for the social stability, but one economic impolicy from the long run of the national economy. In the stage of global outsourcing, anything would be possible to be outsourced to some lower wage countries or regions, especially the outsource of service or some service part in the manufacturing industry. Further upgrading of the industry and employee computerization would be the key factor in the future competition.

In a word, the independence and endogenous trend are enhanced gradually inside YRD, as to the outer environment, esp. the dependence on capital and FDI is descending, an auspice that the local government or related agents are consolidating their abilities to cope with fluctuation and uncertainty in the outside markets. From our research, this result should be encouraging for the future economy in China, not only the YRD.