

Increasing Inter-regional Heterogeneity Leads to Sustainable Economic Growth

— A Case of China's Unique Institutional System

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Abstract

China has been demonstrating a conspicuous economic growth, which can be attributed to its unique transitional institution structure comparing with other countries. Taking China's economic development in each respective 31 regions over the last two decades, this research focuses on the result of empirical analysis which indicates that China's nationwide economic development has shifted from an inter-regional homogeneity to an inter-regional heterogeneity to welcome the global shift from industry society to information society since 1990s. On the other hand, the co-evolutionary dynamism between heterogeneous economic development and institutional structure will be demonstrated.

1. Introduction

China has been demonstrating an economic miracle as one of the rapidest economic growth countries in the world since its economic reform from 1978. Figure 1 indicates the economic growth trend of China by using index of GDP per capita. The average economic increase rate was more than 9% in the last two decades in China.

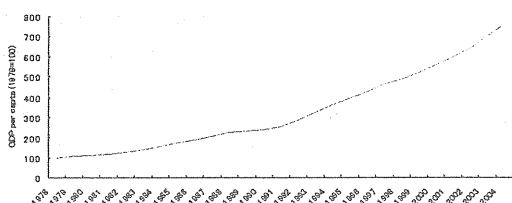


Fig. 1. Increase trend of GDP per capita in China.

Companioning with the conspicuous economic growth, per capita annual income increased more than 5 times both in urban households and in rural households since 1978 (shown as Figure 2). Meanwhile the Engle coefficient of rural households decreased from 67.7% in 1978 to 47.2% in 2004, and that of urban households decreased from 57.5% in 1978 to 37.7% in 2004 (shown as Figure 3). This demonstrates that the living level of Chinese people has been improved greatly.

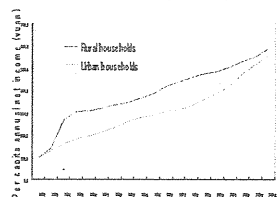


Fig. 2. Increase trend of per capita annual income (1978-2004).

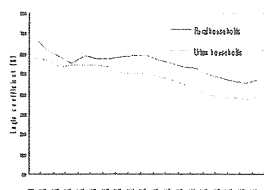


Fig. 3. Decrease trend of Engle coefficient (1978-2004).

Beginning from the economic reform, many aspects of Chinese institution has been changed and still in changing such as culture and value dimension, social and political condition, economic policy, education and enterprises, which has come into been the institutional factor and reason to further stimulate economic growth. So there is a co-evolutional mechanism between institutional innovation and economic growth in China. The main aspects of transitional characteristic of institution in China are illustrated in Figure 4.

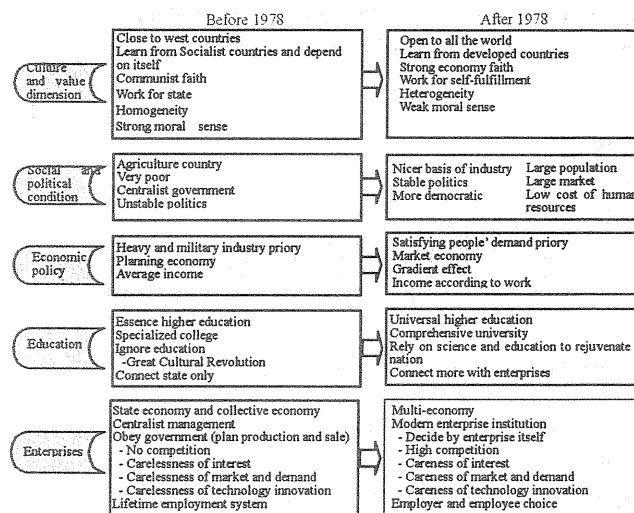


Fig. 4. Transitional Characteristic of Institution in China.

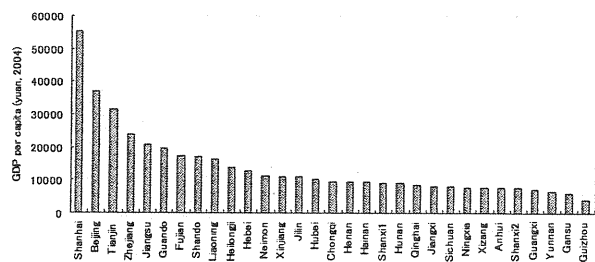
2. Increasing Productivity by Inter-regional Heterogeneity

As same as the dramatic economic growth of the whole nation, there has been a rapid economic development in each respective 31 regions of the whole country. But the economic increasing situations are very heterogeneous with deferent regions. Generally, the economy of east area increased quickly, on the other hand, the west area has been following behind, and the middle area is between them. Figure 5 indicates the increasing productivity by inter-regional heterogeneity since 1978. It demonstrates that China's nationwide economic development had gone in a homogeneity way towards minimizing the gap between backward and leading regions after economic reform in 1980s, and this trend changed to heterogeneity way towards widening the gap between backward and leading regions

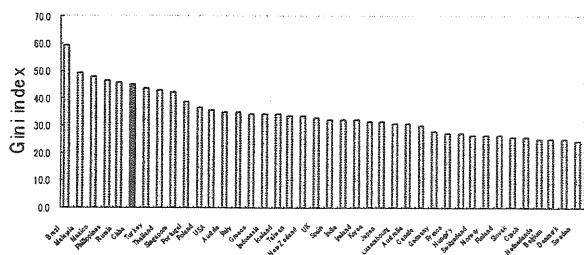
The graph illustrates the economic disparity between leading and backward regions in China. Leading regions show a significant increase in GDP per capita over time, while backward regions remain relatively low and stagnant. The gap between the two groups has widened over the years.

Region	1978	1984	1989	1994	1999	2004
Shanghai	58,000	32,000	15,000	10,000	8,000	5,000
Beijing	58,000	32,000	15,000	10,000	8,000	5,000
Tianjin	58,000	32,000	15,000	10,000	8,000	5,000
Zhejiang	58,000	32,000	15,000	10,000	8,000	5,000
Jiangsu	58,000	32,000	15,000	10,000	8,000	5,000
Guangdong	58,000	32,000	15,000	10,000	8,000	5,000
Fujian	58,000	32,000	15,000	10,000	8,000	5,000
Shandong	58,000	32,000	15,000	10,000	8,000	5,000
Liaoning	58,000	32,000	15,000	10,000	8,000	5,000
Henan	58,000	32,000	15,000	10,000	8,000	5,000
Heilongjiang	58,000	32,000	15,000	10,000	8,000	5,000
Hebei	58,000	32,000	15,000	10,000	8,000	5,000
Neimonggu	58,000	32,000	15,000	10,000	8,000	5,000
Xinjiang	58,000	32,000	15,000	10,000	8,000	5,000
Jilin	58,000	32,000	15,000	10,000	8,000	5,000
Hubei	58,000	32,000	15,000	10,000	8,000	5,000
Hainan	58,000	32,000	15,000	10,000	8,000	5,000
Henan	58,000	32,000	15,000	10,000	8,000	5,000
Shanxi	58,000	32,000	15,000	10,000	8,000	5,000
Hunan	58,000	32,000	15,000	10,000	8,000	5,000
Guangxi	58,000	32,000	15,000	10,000	8,000	5,000
Jiangxi	58,000	32,000	15,000	10,000	8,000	5,000
Sichuan	58,000	32,000	15,000	10,000	8,000	5,000
Ningxia	58,000	32,000	15,000	10,000	8,000	5,000
Xizang	58,000	32,000	15,000	10,000	8,000	5,000
Anhui	58,000	32,000	15,000	10,000	8,000	5,000
Shanxi	58,000	32,000	15,000	10,000	8,000	5,000
Yunnan	58,000	32,000	15,000	10,000	8,000	5,000
Guizhou	58,000	32,000	15,000	10,000	8,000	5,000
Gansu	58,000	32,000	15,000	10,000	8,000	5,000

The dramatic imbalance of economic development between 31 regions is indicated by Figure 6, it can be seen that the leading regions are far developed more than the backward regions. Taking an extreme example, the GDP per capita of the top region, Shanghai, is more than 13 times of that of the most backward region – Guizhou in 2004.



On the other hand, with the great nationwide increase of annual income and people's living level, the regional disparity of income and living level also increased in the last two decades in China. The Gini index of China increased from 23.4% in 1978 to 44.7% in 2004, which makes China changed from one of the most balance income countries to one of the most imbalance income countries. The Gini index of 40 countries is demonstrated in Figure 7, which indicates that China ranked number 6 in the 40 countries, following Brazil, Malaysia, Mexico, Philippines and Russia, this also indicates a heterogeneity trend of economic development in China from a view of income besides GDP per capita.



3. Shift from Inter-regional Homogeneity to Heterogeneity in an information society

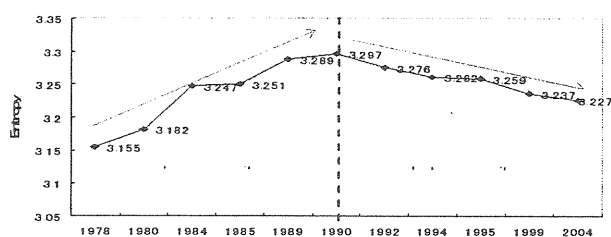
Using entropy to measure homogeneity and heterogeneity, the significance of entropy is as Table 1. The computing method of entropy is as following.

$$\varepsilon = \sum_{j=1}^n P_j \ln \frac{1}{P_j}$$

where $P_j = \frac{X_j}{\sum_{i=1}^n X_i}$, and $\sum P_j = 1$, $0 < \varepsilon < \ln n$.

P_j	1 (maximum)	$1/n$ (minimum)
ε	0 (minimum)	$\ln n$ (maximum)
Social and economic significance	Monopoly Convergence Heterogeneity	Competitive Divergence Homogeneity

Based on computing method of entropy, using regional data of GDP per capita from 1978 to 2004, the entropy trend in China is shown in **figure 8**. It demonstrates that entropy in China increased from 3.155 in 1978 to the highest 3.297 in 1990 and then decreased to 3.227 in 2004 since 1990s. So it is clear that China's nationwide economic development has shifted from an inter-regional homogeneity to an inter-regional heterogeneity to welcome the global shift from industry society to information society since the beginning of 1990s.



Following the observation in Figure 1 with respect to correlation between inter-regional homogeneity/heterogeneity, and by measuring entropy nationwide productivity trend, **Figure 9** demonstrates the correlation between them over the period 1978-2004. Figure 9 clearly demonstrates this correlation indicating that homogeneity trend continued to 1990 with continuous production increase which was a typical structure during the course of an industrial society. Such a trend shifted to heterogeneity from the beginning of the 1990 which contributed to a more

dramatic productivity increase. This shift corresponds to the requirement in a global information society.

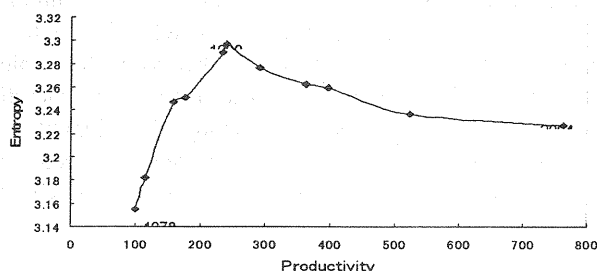


Fig. 9. Correlation between Entropy and productivity.

3.3 Homogeneity and Heterogeneity in a Paradigm Change

The paradigm change from homogeneity to heterogeneity is demonstrated in Figure 10. It indicates that China had been in an inter-regional homogeneity in 1980s characterized by divergence and competition which contributed to productivity increase responding to industrial society. China shifted to inter-regional heterogeneity in 1990s characterized by monopoly and convergence which contributed to functionality increase responding to information society. Comparing with lower economic growth in 1980s, China demonstrated sustainable rapid economic growth since 1990s with respect of inter-regional heterogeneity trend. Surely, shift from an inter-regional homogeneity to an inter-regional heterogeneity is essential in an information society. On the other hand, the discrepancy and social stability has become a crucial problem needed careful resolve in the near future.

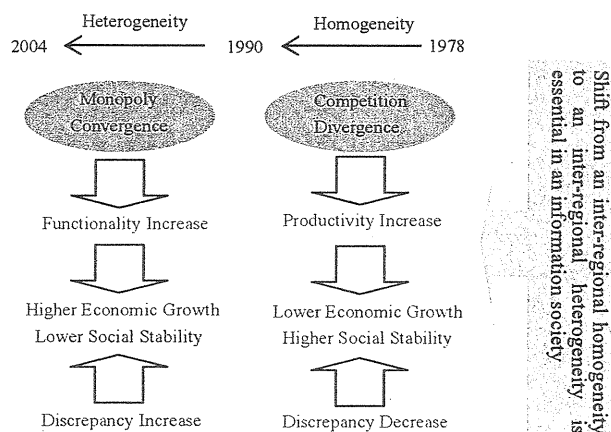


Fig. 10. Paradigm Change from Homogeneity to Heterogeneity in China.

4. Institutional Analysis by Structure of VEU

Observing the whole Chinese transitional institution, the main economic and social development in China is characterized by conspicuous economic growth, rapid urbanization and development of education.

Given that a shift from an industrial society to an information society emerged in the beginning of 1990s, the shift from an inter-regional homogeneity to an inter-regional heterogeneity in China responded the requirement of information society very well, which contributed the sustainable economic growth in China. This can be attributed to its unique institutional structure characterized by V.E.U structure. The empirical analysis of the dynamism structure between GDP per capita, education and urbanization will be demonstrated as following.

4.1 Structure of Cyclical Dynamism

Figure 11 demonstrates the cyclical dynamism structure between GDP per capita, education and urbanization. α , β , γ represent the elasticity between triangle institutional factors respectively.

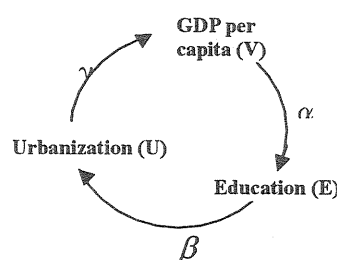


Fig. 11. Cyclical Dynamism Structure between GDP per capita, Education and Urbanization.

Elasticities of α , β , γ are subjected to following models:

$$\ln E = \ln A + \alpha \ln V_{-1}$$

$$\ln U = \ln B + \beta \ln E_{-1}$$

$$\ln V = \ln C + \gamma \ln U_{-1}$$

$$\alpha = \frac{\partial \ln E}{\partial \ln V_{-1}}, \quad \beta = \frac{\partial \ln U}{\partial \ln E_{-1}}, \quad \gamma = \frac{\partial \ln V}{\partial \ln U_{-1}}$$

4.2 Empirical Analysis

Using national level time series data 1978-2003, assuming α , β , γ as function of time t , given 1978 = 0, The elasticities can be obtained by making regression analysis as following.

(1) Elasticity of GDP per capita to education (V to E)

$$\ln E = \ln A + \alpha \ln V_{-1} \quad \alpha = \sum_{i=0}^n a_i t^i$$

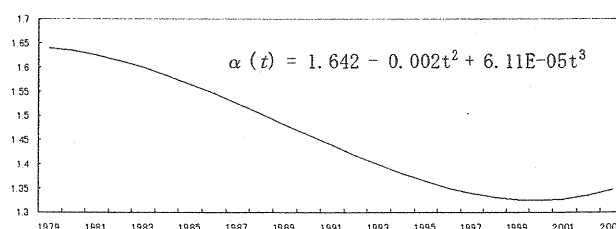


Fig. 12. Trend in Elasticity of V to E in China (1979-2003).

(2) Elasticity of education to urbanization (E to U)

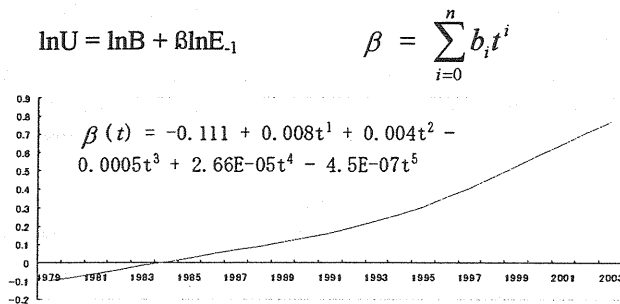


Fig. 13. Trend in Elasticity of E to U in China (1979-2003).

(3) Elasticity of urbanization to GDP per capita (U to V)

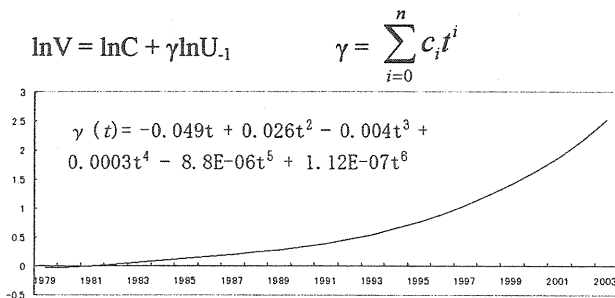


Fig. 14. Trend in Elasticity of U to V in China (1979-2003).

4.3 Implications of Empirical Analysis

- (i) Elasticities of α , β , γ are all positive and significant.
- (ii) Except elasticity of α had a decrease trend before the end of 1990s, the trends of β and γ continuously increased, which demonstrates a growing stronger contributing effect between VEU structure.
- (iii) These demonstrate a co-evolutionary dynamism between GDP per capita, education and urbanization.

5. The Co-evolutionary Dynamism between Heterogeneous Economic Development and Institutional Structure

Based on the above analysis, we know that there is a virtuous dynamism between Chinese institutional factors characterized by VEU structure which contributes to inter-regional heterogeneous economic development. Figure 15 demonstrates the dynamism between institutional structure and inter-regional heterogeneous economic development in China. During the period of the planning economy, move from rural to urban area was strictly prohibited, rural people were restrained in rural area with poor education and low income. While this impediment has removed and move from rural to urban area has been principally encouraged as market economy emerged. People go to big cities getting good education, job opportunities and earning high income. This process of urbanization contributes to economic growth, again contributes to improvement of education and a virtuous cycle of institutional structure between economic growth, education

and urbanization is formed. Meanwhile, China shifted from an homogeneous economic development to an heterogeneous economic development from the beginning of 1990s responding to information society. It could be assumed that virtuous relationship between this unique institutional structure plays a significant role in accelerating heterogeneity trend and enhancing functionality of information society. Again, the heterogeneity economic development contributes to enhancing institutional virtuous cycle.

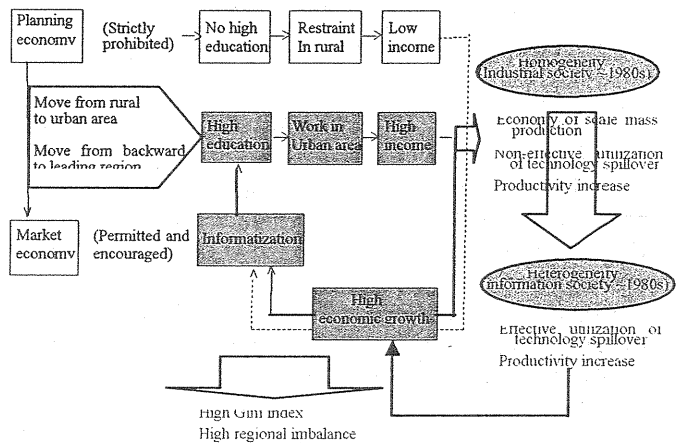


Fig. 15. Co-evolutionary Dynamism between Heterogeneous Economic Development and Institutional Structure.

6. Conclusion

- (i) China has been demonstrating a conspicuous economic growth.
- (ii) China's nationwide economic development has shifted from an inter-regional homogeneity to an inter-regional heterogeneity responding to information society since 1990s.
- (iii) The unique institutional structure characterized by VEU structure formed a virtuous cycle.
- (iv) There is a co-evolutionary dynamism between heterogeneous economic development and institutional structure.

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