

A Study on Regional Income Disparity of Rural and City after the “China's Western Development Program” in China

Hui-Lan Piao¹, Sang-Mok Kang²

Abstract

This study is aiming to analysis the performance of the Western Development Project in China. After the economic reform and openness policy in 1978, China has achieved about 10% annual growth rates. But the rapid growth has made several serious problems. One of them is serious inequality between eastern and western regions. To solve this problem, Chinese government established Western Development Project. The major objectives of this program is to develop the economy of western region, and to reduce the economic disparity between the west and east regions. The results of this paper are as followings. First, the economic level of western region has achieved remarkable increasing. Secondly, there are hardly can be found considerable decreasing of regional inequality between west and east. Finally, the income disparity in western region has been expanded during last 10 years.

Key Words: Western of China Development Project, Provinces/Cities and farm Economic Development, Regional Disparity, Income Convergence Hypothesis, β Convergence, σ Convergence.

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i. Introduction

According to the World Bank, Chinese GDP in 2009 is \$4,991,256.2(in millions) representing its annual GDP growth is 9.2%. Since China's economic reforms, it has become 'the world's second largest manufacturing country, recording its annual economic growth rate at approximately ten percent over three decades. In July of 2011, the World Bank Group reclassified China as an upper middle income economy and they expect that it will join the ranks of the world's high-income economies by in twenty years. China, however, has been confronted with difficulties such as clean drinking water supplies, air pollution, and regional inequalities despite its significant economic performance. Among them, the most serious problems are the economic gap between urban and rural regions, different social strata and different regions.

After the reform and opening up, Development policies implemented firstly in the eastern part of the results, the income gap between regions have been greater than before. Special economic zones and coastal open cities have been enjoyed very rapid economic growth and Improve income, but Income levels of the Central and the West are still remain in a standstill. The Chinese government brought in a policy that balanced regional development and rural economic development. Among them, "China's Western Region Development Program" has become the most important policy of Chinese government. In order to help the western of China catch up with the eastern, Western development was raised for the first time in 1999. After that a Leadership Group for Western China Development (西部地□□□□□小□) was created by the State Council in January 2000, led by then-Premier Zhu Rongji. The main components of the strategy include the development of infrastructure (transport, hydropower plants, energy, and telecommunications), enticement of foreign investment, increased efforts on ecological protection (such as reforestation), promotion of education, and retention of talent flowing to richer provinces. As of 2006, a total of 1 trillion Yuan has been spent building infrastructure in western China.³

According to "China's Western Region Development Program",there are two major objectives of the Chinese government.The first one is to increase the development of the economic.

³ http://en.wikipedia.org/wiki/China_Western_Development

And the second one is eliminating the dissatisfaction of the citizen who live in the western part of china. Because they are much poorer than the people who live in the eastern part. Second, Developing western resources and transport to the eastern where is experiencing shortage of resources

When Western development has just begun in 1999, Western area accounted for 56.2% of the country (Eastern 11.2%, Central 32.7%), and Western population accounts for 22.8% of the country (Eastern 36.9% and Central 39.0%). But accounted for the gross domestic product (GDP) is only 14.7% However, the eastern accounted for 58.2% of the GDP and Central accounted for 31.5% of the GDP. Nevertheless, the economic growth rate of China's East continues to exceed that of the West, causing the western share of domestic product to continue to fall. The West's contribution to the GDP decreased from 20.88% in 1990 to 17.13% in 2000. [18] Relative levels of GDP per capita in the West decreased from 73.30% in 1990 to 60.87% in 2000.[19] In 1990, Shanghai's per capita GDP was 7.3 times that of Guizhou, the poorest province in China; by 2000, the figure had grown to 12.9 times.[20] Evidence from the China Statistical Yearbook also confirms the increasing economic gap between China's West and East, indicating that the east-to-west GDP ratio increased from 2.98 in 1980 to 4.33 in 2000.

From 1999 to 2001, Xinjiang and Guangxi displayed an annual GDP percent increase of as high as 30%. China's western regions have reported an annual average economic growth rate of 10.6% for six years in a row. The combined GDP of the western regions reached 3.33 trillion Yuan in 2005, compared with 1.66 trillion Yuan in 2000, while net income grew on average 10% for urban residents in the west and 6.8% for rural residents⁴. Initiatives encouraging Chinese from wealthier and more crowded regions of China to move to the less crowded western regions has resulted in population growth in a few cities, most notably Qinghai with its increase of 12.6%.⁵[17]

“China's Western Region Development Program” has been developed economies of western significantly. However, we need to research Western Development eases the gap between east and west. In this study, we test rural and urban of the western and eastern by convergence hypothesis from 1985 to 2010.

4 http://news.xinhuanet.com/english/2006-09/06/content_5055217.htm

5 <http://news.bbc.co.uk/2/shared/spl/hi/guides/456900/456954/html/nn5page1.stm>

ii. The Solow-Swan Model

The conventional Solow-swan growth model suggests that the growth rate is positively correlated to the distance from steady state income per capita (Fiona 1998) . We want to Estimation of the Solow-swan cross-section model for the Caribbean shows Beta and sigma convergence.⁶

Concepts of convergence used in this paper are taken from Barro & Sala-i-Martin (1995).

$$Dy = f(y_t, y_t^*) \quad (1)$$

Dy , Mean growth rate of output per capita, and y means the per capita level of output at time t , y_t^* is steady state per capita output at time t . first-order Taylor Differential for y_t^* in equation(1) entails

$$\frac{d \ln \hat{y}}{dt} = \lambda \cdot [\ln(y_t^*) - \ln \hat{y}(t)] \quad (2)$$

Where $\lambda = (n + g + \delta)(1 - \alpha)$ is the speed of convergence, indicating the pace at which output per worker approaches its steady state value. This formula composed by capital resiliency (α), technology (g), depreciation rate (δ) and labor force growth (n). We Assume the $\bar{y}(t)$ is per capita of certain period of time for Areas, $\bar{y}(t-1)$ is per capita of the previous period year for Areas, the equation (2) may be rewritten as

$$\ln \hat{y}(t) - \ln \hat{y}(t-1) = (1 - e^{-\lambda \tau})(\ln y^* - \ln \hat{y}(t-1)) \quad (3-1)$$

$$\ln \hat{y}(t) = (1 - e^{-\lambda \tau}) \cdot \ln y^* + e^{-\lambda \tau} \cdot \ln \hat{y}(t-1) \quad (3-2)$$

Where $e^{-\lambda \tau} = \phi$, this equation may be rewritten as

⁶ The idea of convergence in economics (also sometimes known as the catch-up effect) is the hypothesis that poorer economies' per capita incomes will tend to grow at faster rates than richer economies. As a result, all economies should eventually converge in terms of per capita income. In the economic growth literature the term "convergence" can have two meanings however. The first kind (sometimes called "sigma-convergence") refers to a reduction in the dispersion of levels of income across economies. "Beta-convergence" on the other hand, occurs when poor economies grow faster than rich ones. Economists say that there is "conditional beta-convergence" when economies experience "beta-convergence" but conditional on other variables being held constant. They say that "conditional beta-convergence" exists when the growth rate of an economy declines as it approaches its steady state.

$$\ln y_t = (1 - \phi) \ln y^* + \phi \ln y_{t-1} \quad (4)$$

Where $y^* = A(t)(k^*)^\alpha = A_0 \cdot e^{gt} \cdot \left(\frac{s}{n + \delta + g}\right)^{\frac{1}{1-\alpha}}$, we assume technology (g), depreciation rate (δ) and labor force growth (n) and saving rates is the same for all areas. Where the same cannot be said about technology and endowment A_0 since this term reflects the initial technological endowments of an individual economy. This formula can be decomposed into constant value a, and areas-specific shock ϵ . Its mean $(1 - \phi) \cdot \ln y^*$ also can be decomposed into constant value a, and areas-specific shock ϵ . It can be written as⁷

$$\ln y_{i,t} = a' + \phi \cdot \ln y_{i,t-1} + \epsilon_{i,t} \quad (5)$$

Where I is various regions and t is each year. This equation may be rewritten as

$$\ln y_{i,t} = a' + \phi(a' + \phi \ln y_{i,t-2} + \epsilon_{i,t-1}) + \epsilon_{i,t} \quad (6-1)$$

$$\ln y_{i,t} = (a' + \phi a' + \phi^2 a' + \dots + \phi^{T-1} a') + \phi^T \ln y_{i,0} + (\epsilon_{i,t} + \phi \epsilon_{i,t-1} + \phi^2 \epsilon_{i,t-2} + \dots + \phi^{T-1} \epsilon_{i,t-T+1}) \quad (6-2)$$

$$\ln y_{i,t} = a + \beta \ln y_{i,0} + \epsilon_{i,t} \quad (6-3)$$

Beta convergence is concerned with the question of whether convergence when analyses form a common start date, poor countries grow faster than rich ones, hence generating mean reversion across economies. This is analyzed by estimating cross-section regressions. The form estimated below is that derived in (6-1, 6-2). The estimating notation is form (6-3). Where a is the weighted sum of the α' , and the error becomes a weighted average of different country errors, which should not be autocorrelated. We Assume the y_{it} is per capita of final year for Areas i, y_{i0} is per capita of initial year for Areas i. If the coefficient on y_{i0} is less than one there is unconditional β convergence. As the sample regions have been chosen because of their institutional similarities, additional conditioning determinants are not considered, so that the simple, rather than augmented, Solow model has been used. Beta convergence is necessary but not sufficient for sigma convergence (Barro and Sala-i-Martin, 1992). Sigma convergence additionally depends on whether countries are in fact converging to same steady states, and also on the strength of the convergence forces relative to the strength and persistence of shocks.

⁷ the following content refers to Atkins and Boyd (1998)

Formally, sigma convergence requires that the region variance of output decreases over time. Using Equation (6-3), the variance of Y_{iT} is,

$$E(y_{i,T} - \bar{y}_T)^2 = B^2 E(y_{i,0} - \bar{y}_0)^2 + E(\epsilon_{i,T} - \bar{\epsilon}_T)^2 \quad (7-1)$$

$$\sigma_T^2 = B^2 \sigma_0^2 + \sigma_\epsilon^2 \quad (7-2)$$

Assuming the covariance between initial output and random shocks to be zero(0). Dividing Equation (7-2) by σ_T^2 , the variance can be written

$$R^2 = 1 - \frac{\sigma_\epsilon^2}{\sigma_T^2} = B^2 \frac{\sigma_0^2}{\sigma_T^2} \quad (8-1)$$

$$\frac{\sigma_T^2}{\sigma_0^2} = \frac{B^2}{R^2} \quad (8-2)$$

Decreasing variance implies that the cross-section ratio between time T variation and initial variation should be less than unity, i.e. $\frac{\sigma_T^2}{\sigma_0^2} < 1$, and this condition for sigma convergence

may be written as $\frac{B^2}{R^2} < 1$.

iii. The empirical results

In China, the statistical data are available from the Chinese Statistical Yearbook and china compendium of statistics 1949-2008. We used the data of thirty one provinces within three local economies in China during 1985-2010.

The results for the equation (6-3) are presented in <table 1> ~ <table 3>. $\beta < 1$ Then this is the β convergence condition. It's mean that regions with low per capita real GDP has a faster growth rate than high per capita real GDP region.

<Table 1> present the east and west of the city results. For the overall period, 1985-2010, there is strength support for convergence. When divided into before and after Western development projects, 1985-1999, although smaller than one (1), but difficult for us to think that this time support for convergence. However, during the implement-ation of western development (1999-2010), we can see the very significant convergence. It's may be due to Invest heavily in infrastructure in the early stages of development of the west. For the entire period in eastern areas, there appears to be some degree of convergence, but we tested verify

the hypothesis $H_0: \beta = 1$ and $H_1: \beta < 1$, the results show there is no Convergence characteristics in the eastern.

<table 1> city areas

	western			eastern		
	1985-2010	1985-1998	1999-2010	1985-2010	1985-1998	1999-2010
α	4.76	1.35	5.88	2.59	2.44	1.88
Beta convergence	0.62***	0.93	0.43***	0.95	0.85	0.89
	(4.12) (2.48)	(5.13) (-0.38)	(2.52) (-3.31)	(7.42) (-0.37)	(5.25) (-0.95)	(5.81) (-0.73)
R^2	0.41	0.84	0.38	0.90	0.71	0.86
Sigma convergence	0.96	1.04	0.49	1.01	1.02	0.92

Note 1) The signal ***, **, * significance at 1%, 5%, 10% levels.

2) The first values in parentheses mean the value of t-statistics. Verify the hypothesis $\beta = 0$ and $\beta \neq 0$

3) The second values in parentheses mean the value of t-statistics. Verify the hypothesis $H_0: \beta = 1$ and $H_1: \beta < 1$

<table 2> rural areas

	western			eastern		
	1985-2010	1985-1998	1999-2010	1985-2010	1985-1998	1999-2010
α	-0.03	-0.67	-0.08	1.96	-0.41	0.95
Beta convergence	1.17***	1.18***	1.10***	0.91	1.17***	0.96
	(4.43)	(5.35)	(13.61)	(7.86) (-0.80)	(4.18)	(9.00) (-0.35)
R^2	0.65	0.80	0.94	0.78	0.59	0.83
Sigma convergence	0.96	1.75	1.29	1.05	2.32	1.11

Note 1) The signal ***, **, * significance at 1%, 5%, 10% levels.

2) The first values in parentheses mean the value of t-statistics. Verify the hypothesis $\beta = 0$ and $\beta \neq 0$

3) The second values in parentheses mean the value of t-statistics. Verify the hypothesis $H_0: \beta = 1$ and $H_1: \beta < 1$

<Table2> present the east and west of the rural results. We can be seen that there is Strength support for divergence in three periods. However, after performing the western development the degree of divergence has been mitigated. This phenomenon was similar in the East. The Chinese government focuses on policy issues about rural areas, but also has a substantial GDP gap in rural areas.

<table3> western + eastern

		city			rural		
		1985-2010	1985-1998	1999-2010	1985-2010	1985-1998	1999-2010
Beta convergence	α	2.06	0.89	2.11	-0.78	-0.69	0.33
	β	0.99 (7.15) (-0.03)	1.01*** (10.49)	0.87 (10.08) (1.50)	1.32*** (6.58)	1.20*** (9.07)	1.04*** (16.01)
	R^2	0.52	0.72	0.71	0.74	0.78	0.92
Sigma convergence		1.90	1.42	1.07	2.35	1.84	1.17

Note 1) The signal ***, **, * significance at 1%, 5%, 10% levels.

2) The first values in parentheses mean the value of t-statistics. Verify the hypothesis $\beta = 0$ and $\beta \neq 0$. 3) The second values in parentheses mean the value of t-statistics. Verify the hypothesis $H_0: \beta = 1$ and $H_1: \beta < 1$

In order to find out Implementation of the ten-year period of western development, we combine the data of the eastern and western and performed Empirical analysis. First look at urban areas, although the convergence properties are not obvious, but there is a trend of convergence. There is strength support for divergence in rural areas. However, after performing the western development the degree of divergence has been mitigated. This shows that the western development is contributing to reduce the central and western gap.

It was shown in equation (8) that the condition for sigma convergence, $\frac{\sigma_r^2}{\sigma_a^2} < 1$ can be

expressed as $\frac{B^2}{R^2} < 1$. The B^2 less than unity indicates β convergence, and relatively

large R^2 reflects a strong relationship between initial and final income. A relatively small R^2 would reflect a weak relationship between initial and final income due to the influence of shocks.

The analysis showed that before the Western Development Program, the western city present significant divergence but after the western development program, present significant convergence. However, the East was not. And there is Strength support for divergence in rural areas. In other words its means the distribution of income in the city was improved, but it has not in rural areas. Finally, combing the data of the eastern and western we found that there are divergent characteristics still and Eastern much more serious than western. From the beginning of reform and opening up to now Chinese government implemented policy to mitigate income gap in rural areas but this policy did not affect effectively. Therefore, we need to make up better study protocol about future income gap between urban and rural issues that can be copied with more effectively. Especially rural areas' problem is much more serious compared to urban.

iv. Conclusion

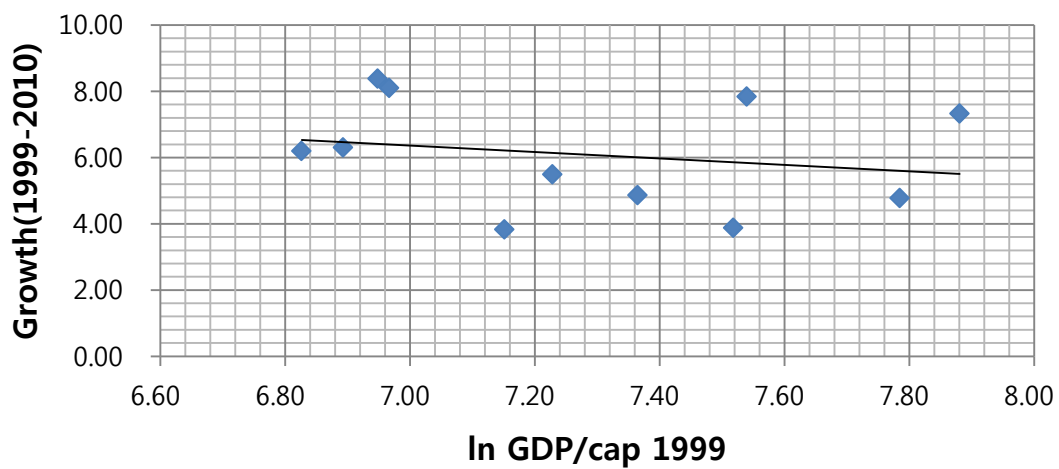
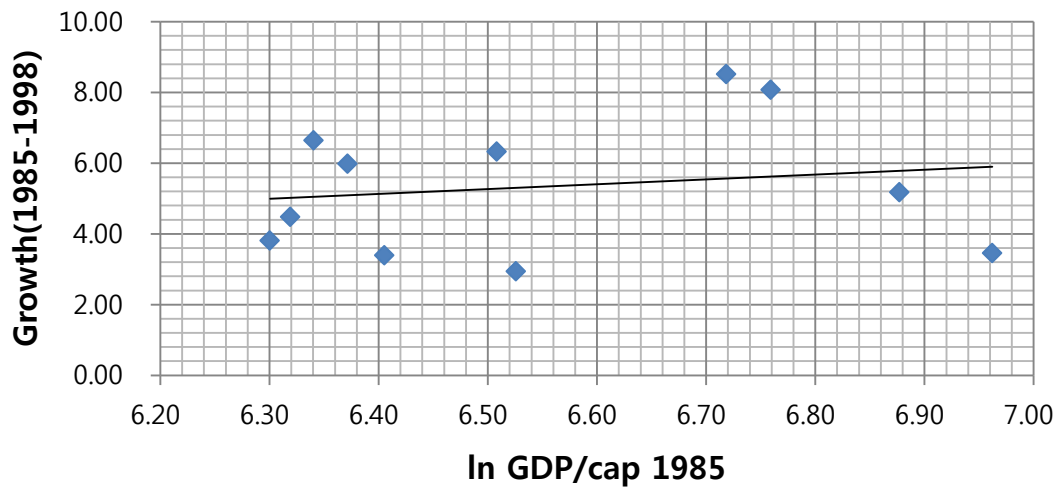
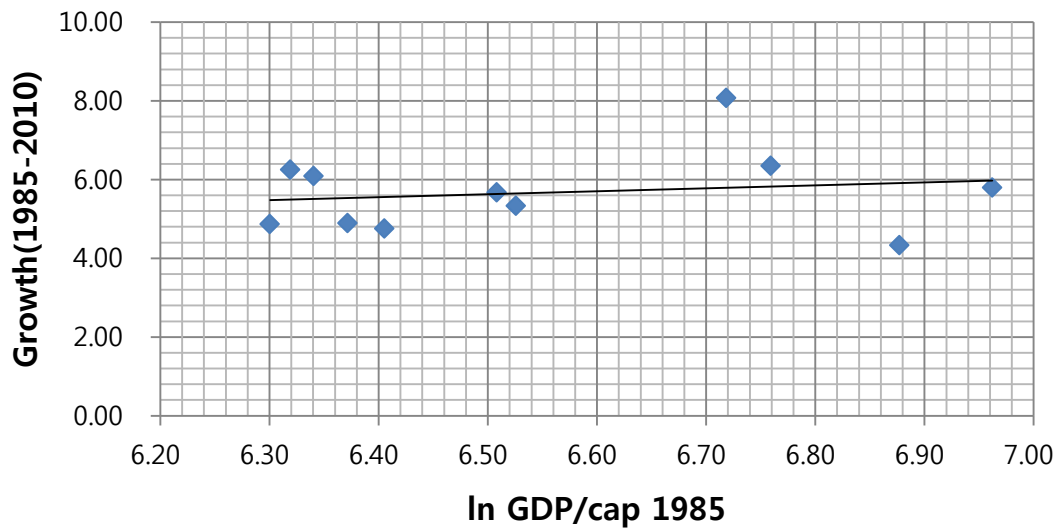
This study is aiming to analysis the performance of the Western Development Project in China. After the economic reform and openness policy in 1978, China has achieved about 10% annual growth rates. But the rapid growth has made several serious problems. One of them is serious inequality between eastern and western regions. To solve this problem, Chinese government established Western Development Project. The major objectives of this program is to develop the economy of western region, and to reduce the economic disparity between the west and east regions. The results of this paper are as followings. First, Although the economic level of western region has achieved remarkable increasing, but Only the city has the convergence properties. Second, there is hardly can be found considerable decreasing of regional inequality between west and east, especially in rural areas.

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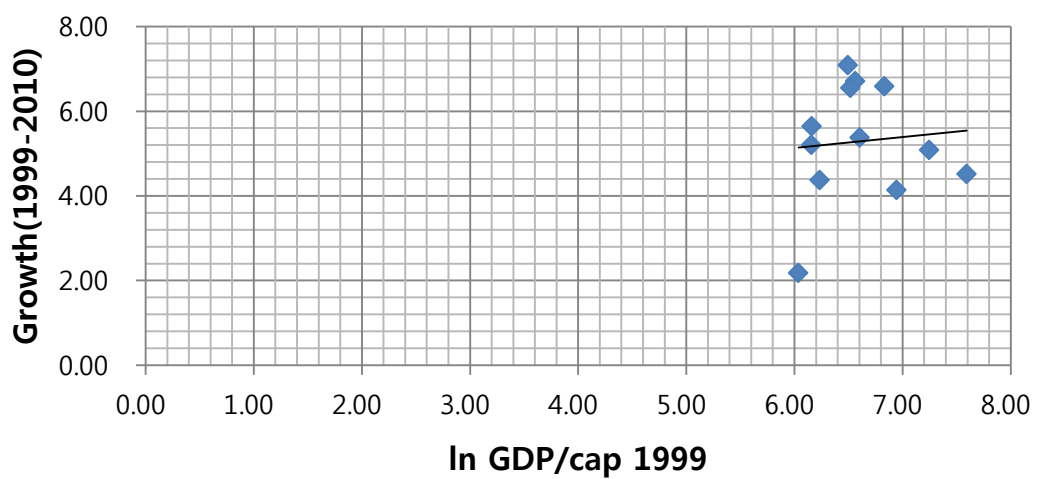
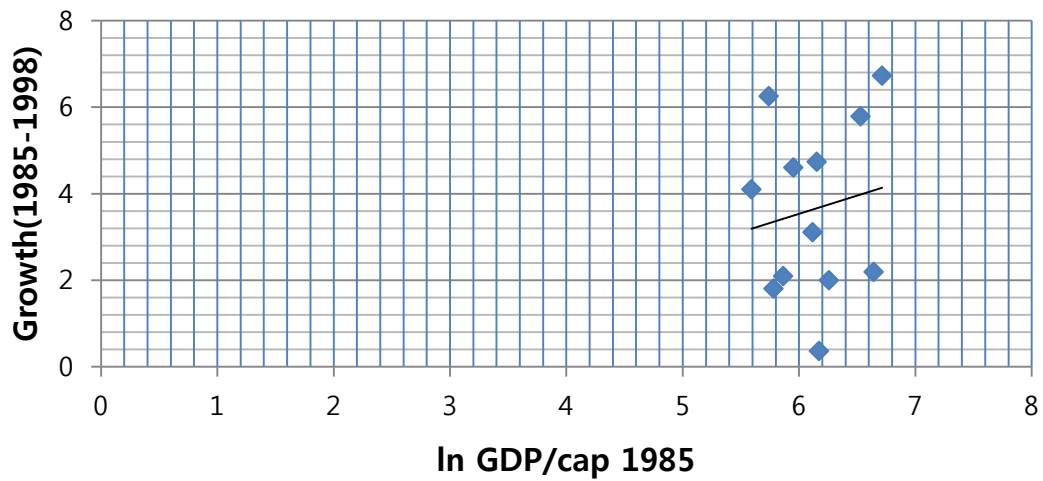
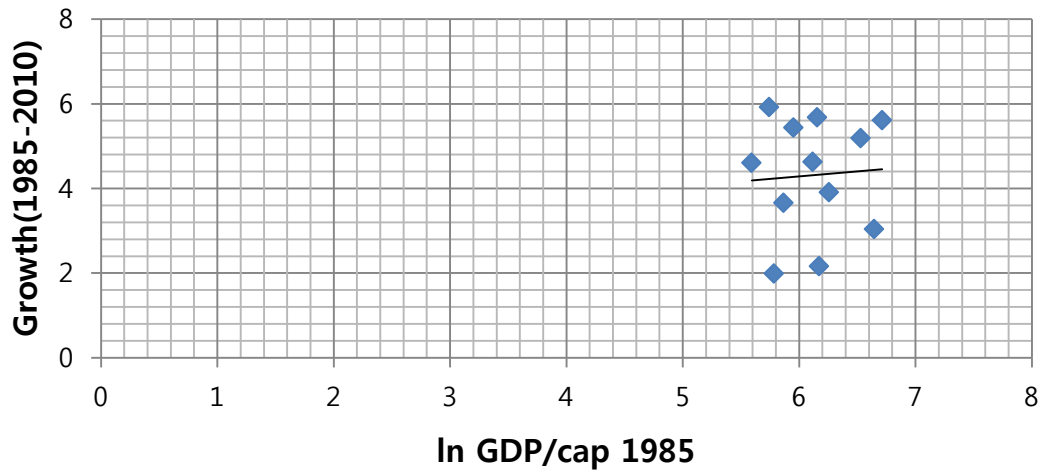
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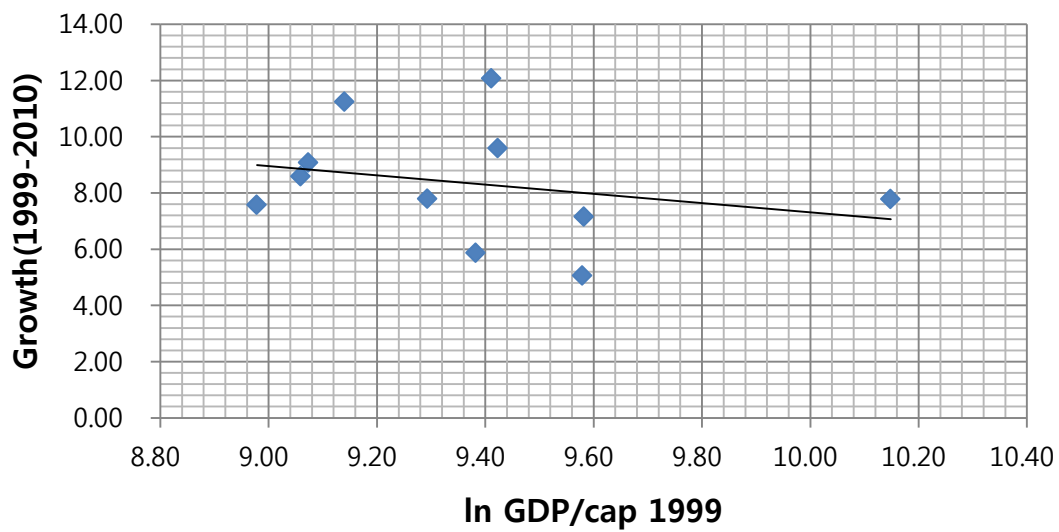
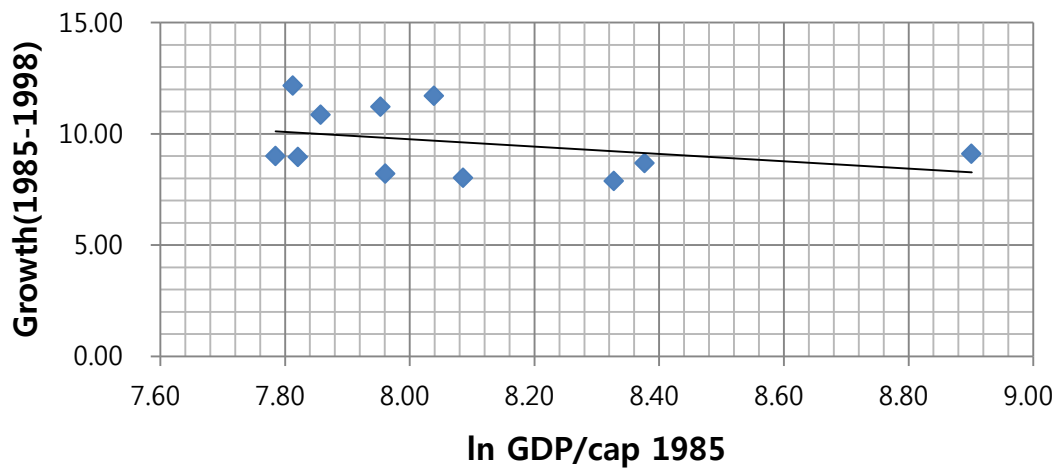
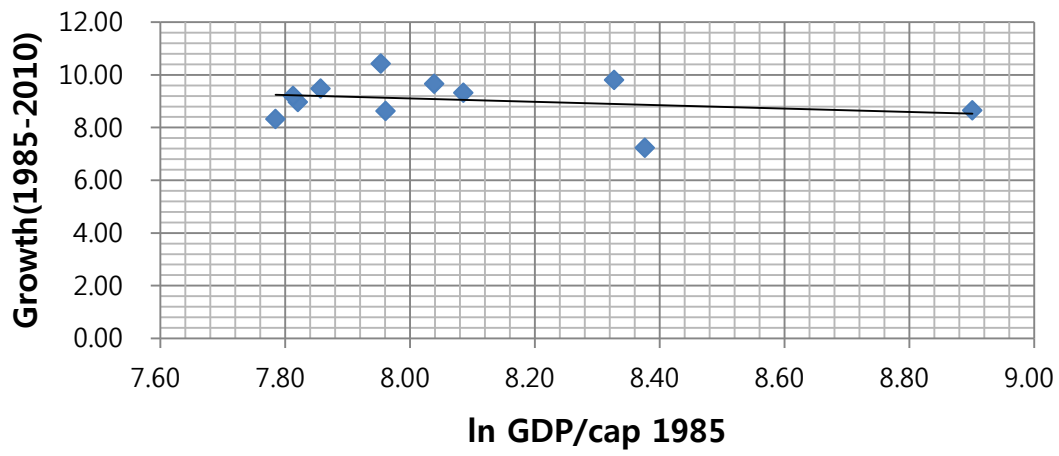
<Fig.1> Eastern Rural



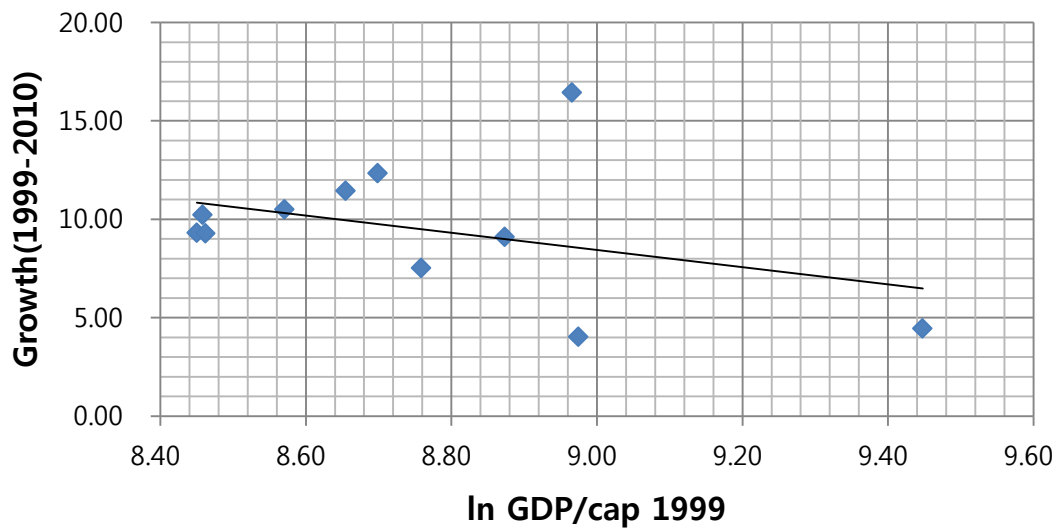
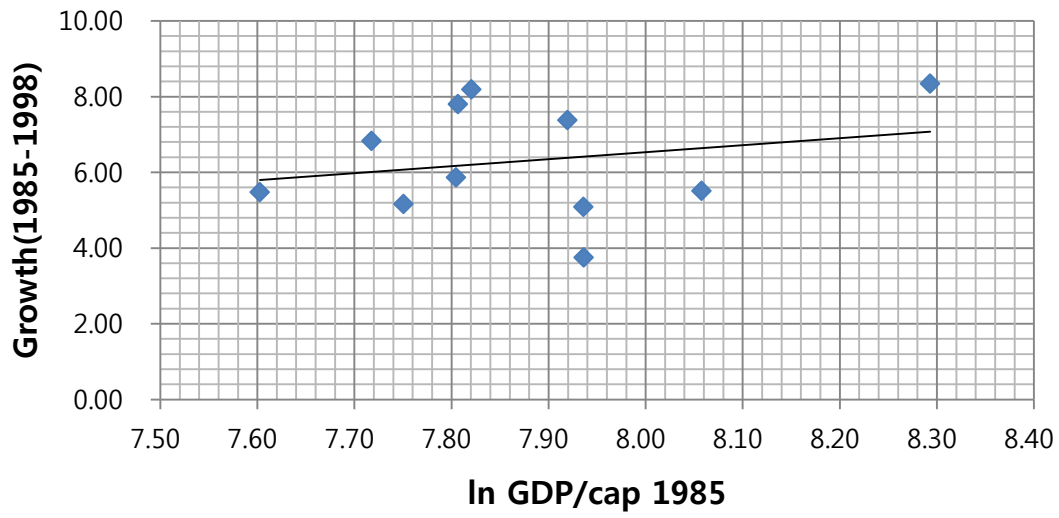
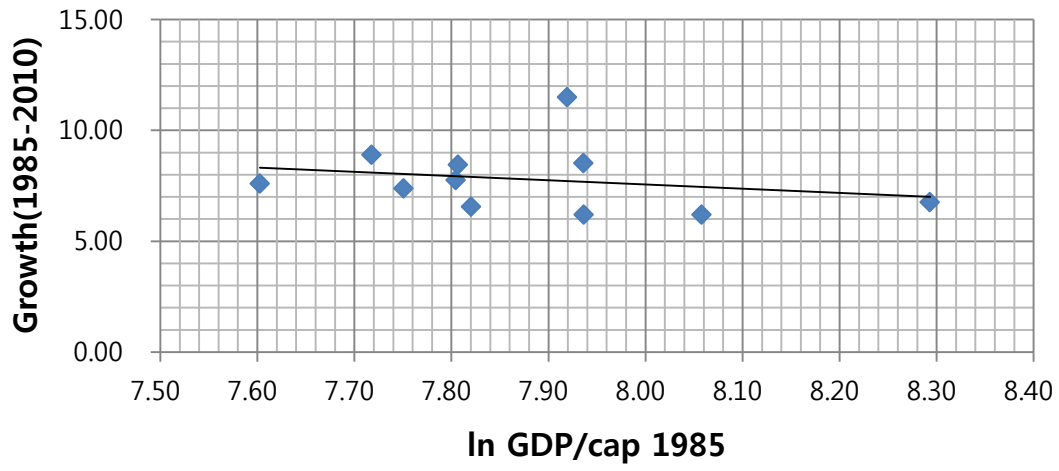
<Fig.2> Western Rural



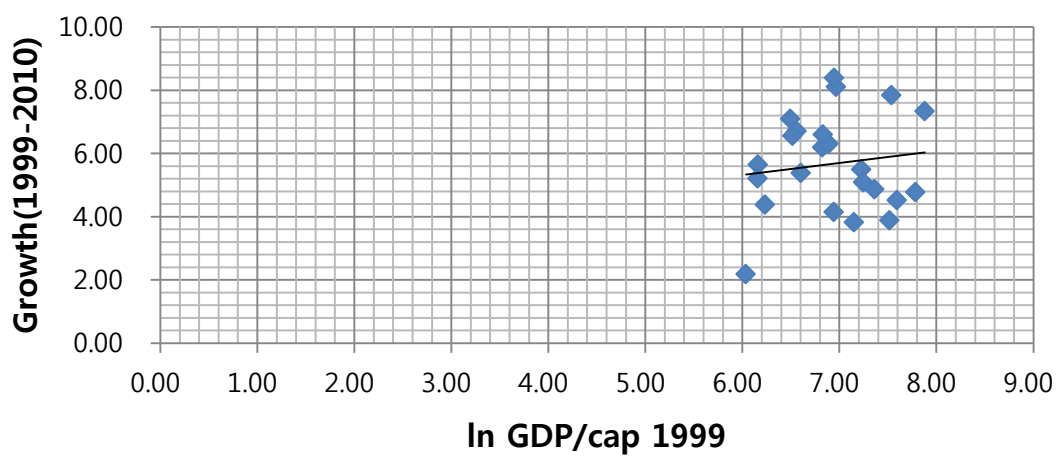
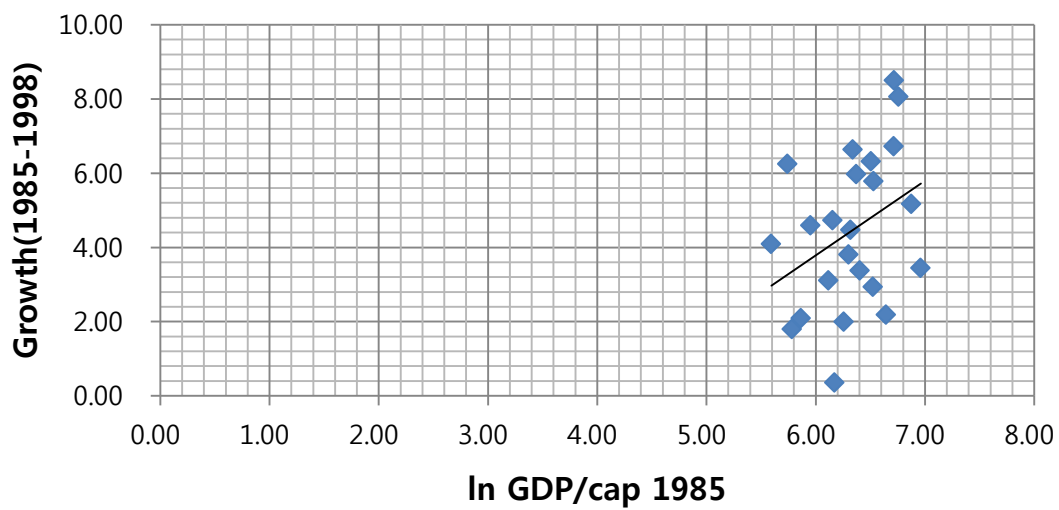
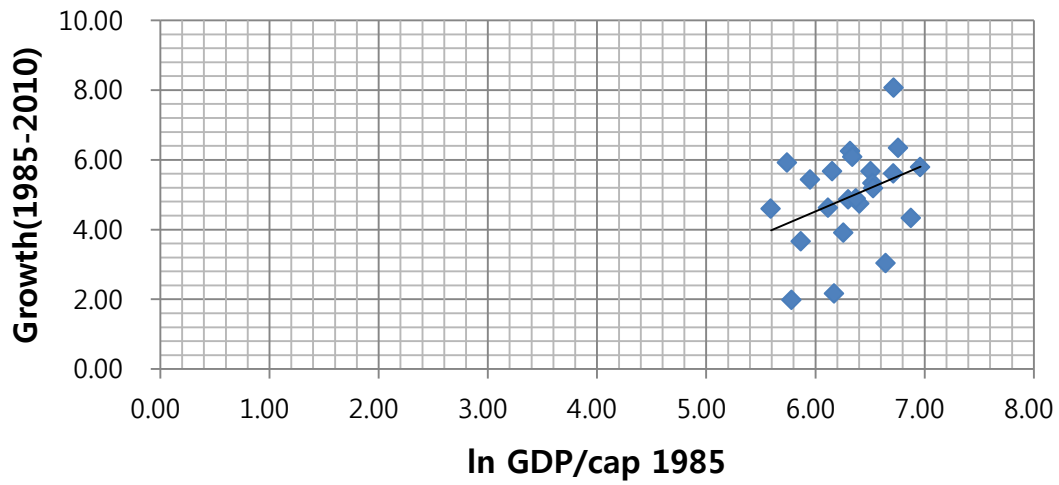
<Fig.3> Eastern City



<Fig.4> Western City



<Fig.5> Eastern and Western Rural



<Fig.6> Eastern and Western City

