

Testing the Unconditional Convergence Hypothesis for Pakistan

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Abstract: This study looks into the long debated issue of regional imbalances in Pakistan through the convergence framework as is implied by the Solow [1] growth model. The annual output data from 1973 to 2000 is pooled for the four Pakistani provinces. The equation for the unconditional convergence is estimated through the pooled least squares (PLS) technique. The estimation result shows that there is no unconditional convergence among the Pakistani provinces. The output gap among the Pakistani provinces shows no sign of decline; instead it remains unchanged during the period under study. The non existence of unconditional convergence implies that determinants of the long run or steady state level of output are quite different in different provinces of Pakistan.

JEL Classification: 018 · 015 · 047

Key words: Unconditional Convergence · Steady State · Gross Provincial Product (GPP) · Provinces of Pakistan

INTRODUCTION

The concept of convergence is derived from the neoclassical model of economic growth put forward by Solow [1]. Two types of convergence are given in Economic literature, i.e. the unconditional and the conditional convergence. The unconditional convergence is defined as the tendency of the economies to converge to the same steady state or long run level of per capita income. This means that the poorer economies catch up to the richer economies by growing faster given that the determinants of the steady state level of income of all the economies are identical. However there is no consensus among the economists on the convergence issue, especially on the concept of unconditional convergence. The endogenous growth theorists do not believe in unconditional convergence as against the neoclassical economists. Siriopoulos and Dimitrios Asteriou [2] have found no or very little evidence of convergence across countries. However, Islam [3] is of the view that this controversy has given rise to the concept of conditional convergence. Baumol [4] has studied the phenomenon of unconditional convergence among different groups of countries. He has found evidence of unconditional convergence among the more

homogeneous industrialized market economies, but has found no evidence of unconditional convergence for a group of 72 countries containing a diverse group of industrialized market economies, centrally planned economies and less developed economies.

Barro [5], Barro [6], Barro and Sala-i-Martin [7], have arrived at the conclusion that the unconditional convergence hypothesis is suitable for homogeneous economies or regions of the same country and fails to be proved for heterogeneous economies. Studies by Coulombe and Lee [8], Barro and Sala-i-Martin [7], Coulombe and Tremblay [9] postulate that regions of the same country have the same determinants of the long run economic growth; therefore the prediction of the neoclassical models of economic growth about the unconditional convergence is more valid for regions of the same country. The Canadian provinces satisfy the hypothesis of unconditional convergence as is confirmed by the studies of Coulombe and Lee [8], Lee and Coulombe [10], Coulombe and Day [11], Coulombe [12]. Barro and Sala-i-Martin [7] arrive at the conclusion that the hypothesis of unconditional convergence is satisfied by US states, Japanese prefectures and European regions when the cross-section regression technique is applied to the regional data sets.

Pakistan may be an interesting case to be tested empirically for the existence or non existence of unconditional convergence across its provinces. Pakistan is a federation of four provinces (Punjab, Sindh, Khyber Pukhtoonkhwa and Baluchistan) and the capital city of Islamabad. The issue of regional imbalances has been a long debated issue in Pakistan. According to the Pakistan Economic Survey [13], Pakistan has performed very well as far as the economic growth is concerned. However the impressive growth performance of Pakistan has not been inclusive in character. The economic conditions in the poorer provinces have not improved. There is a huge income and development gap between the four provinces of Pakistan as confirmed by Ahmad [14]. He has constructed poverty index for the provinces of Pakistan. According to this study, 36.08%, 35.83%, 43.84% and 55.21% people are poor in Punjab, Sindh, Khyber Pukhtoonkhwa (KPK) and Baluchistan respectively. Easterly [15] has called the economic growth in Pakistan as “growth without development”.

So many researchers and social scientists like Azfar [16] and Zaidi [17], Hamid and Hussain [18], Khandker [19], Siddiqui [20], Pasha *et al.* [21], Pasha and Hasan [22] and Wasti and Siddiqui [23] have tried to highlight the issue of income and development gap between the provinces of Pakistan. However most of the researchers have presented the static or comparative static picture of the regional imbalances in Pakistan. No one has presented the evolution of income and development gap between the four provinces of Pakistan. This is mainly because of the lack of disaggregated data for a sufficiently long period of time in Pakistan. However Bengali and Sadaqat [24], by disaggregating the national accounts of Pakistan, generated the annual data on gross provincial product (GPP) from 1972 to 2000. We have used this data set in our study and have tried to present the dynamic analysis by testing empirically the unconditional convergence across the four provinces of Pakistan. Provinces of Pakistan are regions of the same country; therefore we assume homogenous social, political, cultural and economic structures across the Pakistani provinces. There are no barriers on the free movement of physical capital, labor and technological progress across the Pakistani provinces. Therefore, determinants of the steady state or long run level of per capita output in different provinces of Pakistan should be identical and the provinces should converge to the same level of per capita output in the long run.

The Remainder of the Paper Is Organized as Follows:

The remainder of the paper is divided into five sections: Estimation results; Discussion; and Conclusion and Policy Implications.

Estimation Results: We have used two variables in this study. Gross provincial product (GPP) per capita in the previous year is used as the independent variable and the growth rate of the GPP per capita in the current year is used as the dependent variable. The annual output data is available on national level. The official data on output is very hard to find for sub national levels in Pakistan on annual basis for a sufficiently long period of time. However Bengali [25] and Bengali and Sadaqat [24] have disaggregated the national level data on output and generated the annual data on output for the provinces of Pakistan from 1973 to 2000. This data has been used in this study.

The figure (1) shows the relative position of each province's per capita GPP from 1973 to 2000. The per capita GPP of each province is taken as relative to the cross-sectional/Pakistani average. The relative per capita GPP of Sindh is over and above the cross sectional mean for the whole period and remains almost the same. Sindh stands first among all the provinces for the whole period. Punjab starts from the lowest relative per capita GPP in 1973, but it crosses the cross-sectional average at the end of the period and reaches to the second position among the provinces. Khyber Pukhtoonkhwa (KPK) has maintained its third position among the provinces and remains below the provincial average for the whole period. The situation is most discouraging in Baluchistan; it starts from a position that is far above the cross-sectional average. Its relative per capita GPP is just below the relative per capita GPP of Sindh. But it starts to fall in 1977 from its higher position to the lowest position among all the provinces. Its per capita GPP has been far below the provincial average for the whole of the period.

The figure (2) shows the trend of the standard deviation of GPP per capita among the Pakistani provinces from 1973 to 2000. The standard deviation line clearly shows that the income gap between the Pakistani provinces remains almost the same over the whole of the period. These results are also in conformity with the popular view that there exist large economic and development gaps among the four provinces of Pakistan.

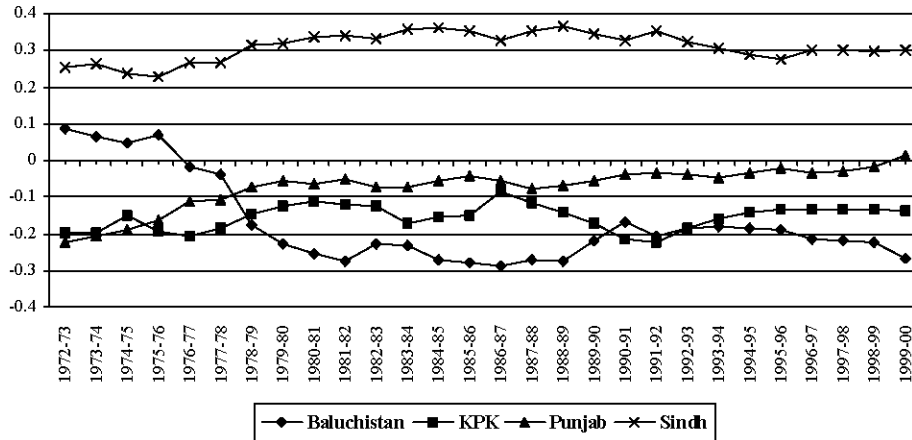


Fig. 1: GPP Per Capita (Logarithm of Deviation from the Cross-Sectional Mean)
 Source: Based on the data used in this paper.

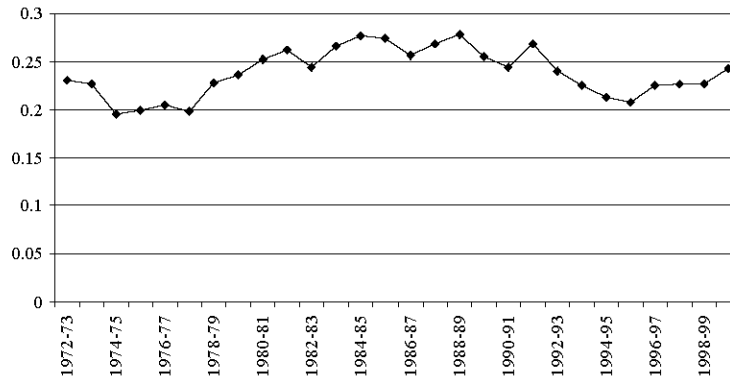


Fig. 2: Standard Deviation of GPP Per Capita
 Source: Based on the data used in this paper.

Barro and Sala-i-Martin [7] and Mankiw *et al.* [26] test the convergence property across different countries and across regions of the same country in a cross sectional regression framework. They use the following type of equations.

$$\ln\left(\frac{y_{t_2}}{y_{t_1}}\right) = (1 - e^{-\beta T})\ln y^* - (1 - e^{-\beta T})\ln y_{t_1} \quad (1)$$

$$\ln\left(\frac{y_{t_2}}{y_{t_1}}\right) = (1 - e^{-\beta T})(\ln y^* - \ln y_{t_1}) \quad (2)$$

Where y^* is the steady state level of output per capita; y_{t_1} is the output per capita at time t_1 and y_{t_2} is the output per capita at time t_2 . The term β is the speed or rate of convergence and T is the total length of the time period under study. The above equations mean that the current growth rate of output per capita is the function of the gap

between the initial level of output per capita and the steady state level of output per capita.

In this study, we follow the above definition for measuring the speed of convergence, i.e. β , across the province of Pakistan. However, we have only four cross-sectional units, as there are only four provinces in Pakistan. So we cannot conduct simple cross-sectional test for Pakistan. Therefore we adopt another strategy and pool the annual time series data from 1973 to 2000 for the four cross-sections. As a result our number of observations has sufficiently increased.

The unconditional convergence hypothesis has usually been tested by assuming that the determinants of the steady state level of per capita output in the different cross-sectional units are identical. As we are using a pooled time series and cross-section data, we estimate the unconditional convergence hypothesis among the four provinces of Pakistan by assuming identical determinants for the long run or steady state level of per capita output

of all the four provinces of Pakistan. We assume that there are no observable and unobservable cross-sectional specific effects and all the cross-sectional units have a common intercept or constant technological progress. We use the following equation for testing the unconditional convergence hypothesis among the four provinces of Pakistan.

$$Gy_{it} = \alpha_0 - \alpha_1 Y_{it-1} + \epsilon_{it} \quad (3)$$

$$i=1, \dots, 4; t=1973, 1974, 1975, 1976, \dots, 2000$$

The subscript ‘i’ represents the four provinces of Pakistan and ‘t’ stands for different years from 1973 to 2000. The error term ‘ ϵ_{it} ’ is a random variable having zero mean and constant variance and is independent of the initial level of per capita income, i.e. Y_{it-1} . ‘ GY_{it} ’ is the current growth rate of income per capita of the different provinces of Pakistan, where ‘ α_0 ’ is the common intercept term and α_1 is the coefficient on the initial level of per capita income that is equal to ‘ $-(1-e^{-\beta})$ ’. The term β is known as the convergence speed. All the variables are taken in natural log form. To eliminate the time trend or time specific effects, we take all the variables as logarithmic deviations from the cross sectional mean as follows:

$$\ln\left(\frac{X_{it}}{X_t}\right) \quad \text{and} \quad \bar{X}_t = \frac{\sum_{i=1}^4 X_{i,t}}{4}$$

Where ‘i’ represents the provinces of Pakistan and ‘t’ represents a specific year. Estimation of the equation (3) is also known as the common constant method of estimation in the panel data literature. The equation (3) is estimated through the Pooled Least Squares (PLS) technique. The value of the coefficient on the initial level of income is estimated. The implied speed of convergence can then be estimated from the value of the coefficient on the initial level of income. The values of the coefficient on the initial level of income and R-squared are given in table (1). The results show that the coefficient on the initial level of per capita GPP carries the right sign but statistically is not significant. The R-squared value is also very low. So the unconditional convergence does not hold across Pakistani provinces. These results are not in contradiction with the neoclassical theory of economic growth, as according to Barro and Sala-i-Martin [27], Mankiw *et al.* [26], Islam [3], Siriopoulos and Asterious [2], the neoclassical model of economic growth predicts the concept of conditional convergence and not the unconditional convergence.

Table 1: Estimation of Equation (3) Through Pooled Least Squares (PLS)

Independent Variable	Dependent Variable:			
	Coefficient	Std. Error	t-Statistic	Prob.
α_0	-0.000273	0.002803	-0.097262	0.9227
Y	-0.007629	0.013431	-0.567994	0.5712
R^2	0.003034			
Durbin-Watson stat	1.652396			
F-statistic	0.322617			0.571240

Source: Author’s calculations

DISCUSSION

This study has tried to look into the issue of regional imbalances in the convergence framework as is implied by the neo-classical growth model of Solow [1]. The hypothesis of unconditional convergence has specifically been tested across the four provinces of Pakistan. It is assumed in unconditional convergence that the determinants of long run economic growth, ranging from saving and investment to technological progress and other more fundamental determinants of economic growth and development, are identical across the countries or regions of the same country. This hypothesis is stated to be more relevant for regions of the same country, as regions of the same country have identical determinants of the long run economic growth {Barro [5], Barro [6], Barro and Sala-i-Martin [7], Coulombe and Lee [8], Coulombe and Tremblay [9]}. As the provinces of Pakistan are regions of the same country, so it is hypothesized in this study that there should be unconditional convergence across the provinces of Pakistan. However the results show that there is no unconditional or absolute convergence across the provinces of Pakistan, which implies that the provinces of Pakistan have heterogeneous determinants of the long run economic growth. Being regions of the same country, there is no restriction on the free movement of physical capital and human resources across the provinces. So according to the convergence hypothesis, the capital should move from the provinces where it is in abundance to the provinces where it is scarce. However this study shows that this has not been the case in Pakistan, which means that there are some other, more fundamental, determinants of the long run economic growth that are different across the different provinces of Pakistan. Different studies mention different determinants that have made the provinces of Pakistan to grow differently. Zaidi (28) mentions technology, infrastructure, physical and human capital and historical legacies of the British

Colonial era as the most important factors behind the development gap between the different regions of Pakistan. However, he also mentions that the state has been interventionist in Pakistan. Most of the industries have been established in the already developed regions. This has the effect of even using the savings of the less developed regions in the more developed regions. This kind of policy on the part of the state has worsened the relatively bad economic position of the poorer provinces, as private investment also gravitates towards already developed regions due to availability of other complementary factors. Similarly Chaudhary *et al.* [29] have emphasized the importance of human capital, as education and economic growth are closely related in Pakistan. Therefore people of the poorer regions should be provided with free or subsidized education and health facilities. People of the backward areas must be linked with the rest of the country through modern means of communication. Moreover in a study by Jan and Chaudhary [30], the importance of industrialization for the economic growth of the provinces has been emphasized. They further mention that tax free industrial zones should be established in different parts of the Khyber Pukhtoonkhwa (KPK) and Baluchistan. This will encourage the private investors to come and invest in these backward regions of the country.

CONCLUSION

The study shows that there is a dualistic type of economic structure in Pakistan; some regions are more developed while the others are backward. The more important finding of this paper is the persistence of this dualistic economic structure in Pakistan. The output and development gap among the provinces of Pakistan has not declined; instead it has remained unchanged over the whole period of study. This implies that instead of no restrictions on the free movement of physical capital across provinces, the capital does not move towards the provinces where it is scarce. It means that there is a serious shortage of other complementary factors necessary for investment and economic activity in these capital scarce provinces. As a future research work, it will be worthwhile to identify and analyze these complementary factors.

REFERENCES

1. Robert M. Solow, 1956. A Contribution to the Theory of Economic Growth, *The Quarterly J. Economics*, 70: 65-94.

2. Siriopoulos, C. and D. Asterious, 1997. Testing the Convergence Hypothesis for Greece, *Managerial and Decision Economics*, 18: 383-389.
3. Islam, N., 1995. Growth Empirics: A Panel Data Approach, *The Quarterly J. Economics*, 110: 1127-1170.
4. William J. Baumol, 1986. Productivity Growth, Convergence and Welfare: What do the Long Run Data Show, *American Economic Review*, 6: 1072-1085.
5. Robert J. Barro, 1991. Economic Growth in a Cross Section of Countries, *The Quarterly J. Economics*, 106: 407-443.
6. Robert J. Barro, 2003. Determinants of Economic Growth in a Panel of Countries, *Annals of Economics and Finance*, 4: 231-274.
7. Robert J. Barro and X. Sala-i-Martin, *Economic Growth*, MIT Press, ISBN: 0-262-02553-1.
8. Coulombe, S. and Frank C. Lee, 1995. Convergence across Canadian Provinces, 1961 to 1991, *The Canadian J. Economics*, 28: 886-898.
9. S. Coulombe and J. Tremblay, 2007. Skills, Education and Canadian Provincial Disparity, *J. Regional Sci.*, 47: 965-991.
10. Frank C. Lee and S. Coulombe, 1995. Regional Productivity Convergence in Canada, *Canadian J. Regional Sci.*, 18: 39-56.
11. Coulombe, S. and Kathleen M. Day, 1999. Economic Growth and Regional Income Disparities in Canada and the Northern United States, *Canadian Public Policy*, 25: 155-178.
12. Coulombe, S., 1995. Convergence Across Canadian Provinces, 1961 to 1991, *The Canadian J. Economics*, 28: 886-898.
13. Government of Pakistan, 2007. *Pakistan Economic Survey 2006-2007*, Islamabad, Pakistan: Finance Division, Government of Pakistan.
14. Ahmad, M., 2009. Measurement of Poverty in Pakistan: A New Method, *In M. Ahmad and S.A. Lodhi (eds.) Poverty Reduction Policies & Global Integration*, Islamic Countries Society of Statistical Sciences, Lahore, Pakistan.
15. Easterly, W., 2001. *The Political Economy of Growth without Development: A Case Study of Pakistan*, Paper for Analytical Narratives of Growth Project, Kennedy School of Government, Harvard.
16. Azfar, J., 1973. The Distribution of Income in Pakistan-1966/67, *Pakistan Economic and Social Review*, 11: 40-66.
17. Zaidi, S.A., 2005. *Regional Imbalances and the National Question in Pakistan*, Vanguard Books (PVT) LTD, Pakistan, ISBN: 969402062X.

18. Hamid, N. and A. Hussain, 1992. Regional Inequalities and Capitalist Development: Pakistan's Experience, In Zaidi, S. A. (ed.), Regional Imbalances and the National Question in Pakistan, Vanguard, Lahore, Pakistan.
19. Khandker, R.H., 1973. Distribution of Income and Wealth in Pakistan, Pakistan Economic and Social Review, 11: 1-39.
20. Siddiqis, A.H., 2006. Regional Inequality in the Development of Pakistan, Geo J., 5: 17-32.
21. Pasha, H.A., S. Malik and H. Jamal, 1990. The Changing Profile of Regional Development in Pakistan, Pakistan J. Appl. Economics, 9: 15.
22. Pasha, H.A. and T. Hassan, 1992. Development Ranking of Districts in Pakistan, In Zaidi S. A. (ed.), Regional Imbalances and the National Question in Pakistan. Vanguard, Lahore, Pakistan.
23. Wasti, S.A. and M. Siddiqui, 2002. Development Rank Ordering of Districts of Pakistan, Unpublished Paper.
24. Bengali, K. and M. Sadaqat, 2006. Regional Accounts of Pakistan: Methodology and Estimates 1973-2000, Social Policy and Development Centre, Karachi.
25. Bengali, K., 1995. Temporal and Regional Decomposition of National Accounts of Pakistan, Unpublished Ph.D. Dissertation. Department of Economics, Faculty of Arts, University of Karachi.
26. Mankiw, N.G., D. Romer and David N. Weil, 1992. A contribution to the Empirics of Economic Growth, Quarterly J. Economics, 107: 407-437.
27. Robert J. Barro and X. Sala-i-Martin, 1992. Convergence, The J. Political Economy, 100: 223-251.
28. Zaidi, S.A., 2005. Issues in Pakistan Economy, Oxford University Press, Karachi. Pakistan, ISBN: 0-19-579052-9.
29. Chaudhary, A.R., A. Iqbal and S.Y.M. Gillani, 2009. The Nexus between Higher Education and Economic Growth: An Empirical Investigation for Pakistan, Pakistan J. Commerce and Social Sci., 3: 1-9.
30. Jan, S.A. and A.R. Chaudhary, 2011. Testing the Conditional Convergence Hypothesis for Pakistan, Pakistan J. Commerce and Social Sci., 5: 01-12.