

About the RIS

The Research and Information System for the Non-Aligned and Other Developing Countries (RIS) is an autonomous research institution established with the financial support of the Government of India. RIS is India's contribution to the fulfilment of the long-felt need of the developing world for creating a 'Think Tank' on global issues in the field of international economic relations and development cooperation. RIS has also been envisioned as a forum for fostering effective intellectual dialogue among developing countries.

RIS is also mandated to function as an advisory body to the Government of India on matters pertaining to multilateral economic and social issues, including regional and sub-regional cooperation arrangements, as may be referred to it from time to time. RIS functions in close association with various governmental bodies, research institutions, academicians, policy-makers, business and industry circles in India and abroad. RIS has a consultative status with UNCTAD and NAM and has conducted policy research and other activities in collaboration with other agencies, including UN-ESCAP, UNCTAD, UNU, Group of 77, SAARC Secretariat, Asian Development Bank (ADB), The World Bank, and the South Centre.

RIS publication programme covers books, research monographs, discussion papers and policy briefs. It also publishes journals entitled *South Asia Economic Journal*, *Asian Biotechnology and Development Review*, and *RIS Diary*. ■



RIS

Research and Information System for the
Non-Aligned and Other Developing Countries

Core IV-B, Fourth Floor
India Habitat Centre
Lodhi Road
New Delhi-110 003, India.
Ph. 91-11-24682177-80
Fax: 91-11-24682173-74-75
Email: dgooffice@ris.org.in
Website: <http://www.ris.org.in>

RIS Discussion Papers

How Do Infrastructure Facilities Affect Regional Income? An Investigation with South Asian Countries

Prabir De
Buddhadeb Ghosh

RIS-DP # 66/2003



RIS

Research and Information System for the
Non-Aligned and Other Developing Countries

**How Do Infrastructure Facilities
Affect Regional Income?
An Investigation with
South Asian Countries**

Prabir De
Buddhadeb Ghosh

RIS-DP # 66/2003



RIS

**Research and Information System for the
Non-Aligned and Other Developing Countries**

Core IV-B, Fourth Floor, India Habitat Centre

Lodi Road, New Delhi – 110 003 (India)

Tel: +91-11-2468 2177 / 2180; Fax: +91-11-2468 2173 / 74

Email: prabirde@ris.org.in

RIS Discussion Papers intend to disseminate preliminary findings of the research carried out at the institute to attract comments. The feedback and comments may be directed to the authors(s).

How Do Infrastructure Facilities Affect Regional Income? An Investigation with South Asian Countries

Prabir De¹
Buddhadeb Ghosh²

Abstract

SAARC being a combination of seven nations in a diverse sub-continent of Asia is passing through various structural adjustment programmes. Without proper trading infrastructures, no country, or economic bloc can succeed in a world where regional cooperation has become an instrument for creating competitive edge over other regional blocs. This paper tries to find out the role played by infrastructure facilities in economic development across South Asian countries over the last quarter century. The findings are statistically very significant to warrant major changes in future regional policies in order to remove rising regional disparities in both infrastructure and income. This also has a strong bearing on the success of poverty removal policies as the poor are regionally concentrated in such diverse and heterogeneous region of the world.

December 12, 2003

[Authours would like to thank Prof. Sugata Marjit, Dr. Nagesh Kumar, Prof. Ashok Kotwal, Dr. Anjan Roy for their comments on an earlier draft of the paper. The usual disclaimer applies.]

¹ Research Associate, Research and Information System for the Non-aligned and Other Developing Countries, New Delhi, Email: prabirde@hotmail.com

² Associate Scientist, Economic Research Unit, Indian Statistical Institute, Kolkata, and Visiting Research Fellow, Institute of Developing Economies, Tokyo, Email: buddhadeb_ghosh@yahoo.com

1. Introduction

At a time when the world is all set to virtually become borderless in terms of flows of commodities and factors of production (due to the World Trade Organization), it may apparently be felt that regional economic cooperation is coming to an end. But if reality is any guide for all practical purposes, the need for economic integration and cooperation leading to regional economic bloc is much more pressing for the poor nations than for the developed nations at this juncture. Theoretically and practically, justifications for stronger economic cooperation among the South Asian countries has become substantial and indispensable with the beginning of the WTO beyond their inherent historical, cultural and socio-economic commonalities, geographical and ecological propinquity in time and space.

The fact is that just half a century ago, all the countries in South Asia were fully under one Government rule: India, Pakistan and Bangladesh were ruled by the same head, the same laws, and had a common currency; even Sri Lanka and Nepal permitted the Indian rupee to circulate freely. That is, a region - divided by a common heritage and bondage, quarrels and conflicts - has now to reorient its internal and external policies in order to usher in a new era of confidence and mutual exchange. The question is: for competition to be "free and fair", should the players not be provided with a "level-playing field"? The state of affairs in South Asia is so bare that it does not need any proof: South Asia today has the dubious honour of having two-fifths or more of the world's poor, and the highest poverty rate of any developing region. Also, it has a higher incidence of child and infant mortality than any other regions barring Sub-Saharan Africa. But it has resources. Hence, this region can improve. All that it needs is a new vision and leadership for the implementation of the doctrines of SAARC (South Asian Association for Regional Cooperation). At a global level, the belief of the convergence theorists (one of the most dominant empirical-theorist group of today) dealing with cross-country experience that poor countries are catching up with the rich countries (see, Barro, 1991; Barro and Sala-i-Martin, 1995) is not at all tenable to this sub-continent of Asia. On the one hand, the neo-classical assumptions of free mobility of capital and labour is just not true in this region, and on the other, diminishing returns to capital is very difficult to prove, given the unequal efficiency with which public infrastructure is being utilized across regions. Such was the conclusion of the recent papers of Marjit and Mitra (1996), Ghosh, Marjit and Neogi (1998), and Ghosh and De (1998, 2000a, 2000b and 2003b) dealing with Indian regions. And there is perhaps no chance for such hypothesis to be invalidated in

the remaining countries of SAARC, namely Bangladesh, Bhutan, Maldives, Nepal and Pakistan (except, perhaps, Sri Lanka).

One of the major obstacles to intra-SAARC integration is the poor transport infrastructure. Specifically, ships moving from Bangladesh to the ports of India's east coast levy higher freight charges than for movement to Singapore or Hong Kong. Much more intense is the case with Indo-Pak trade. Although this may partly be due to inadequate harbor facilities, a larger part is due to lack of cooperation. For example, Pakistan imports iron ore from Australia, Canada and Brazil, instead of from India. Had she imported through Goa, both landed cost and delivery time would have been lower. On the other hand, India imports natural rubber from Indonesia, Malaysia and Thailand instead of from Sri Lanka, which, again imports cements from Southeast Asia rather than from India. It would not be exaggerated to say that many manufactured goods of India would better suit the SAARC nations given the low purchasing power of these people. Finally, Bangladesh with her huge natural gas and sea resources could cooperate with India to produce value-added goods and thus gain competitive advantage in today's competitive environment but only with mutual cooperation.

Being one of the poorest regions of the world as it is, there is a high degree of simultaneity among all the seven members of SAARC insofar as the Government initiatives in undertaking the liberalization policies are concerned.¹ A few words are here needed to understand their ability and achievement in the context of the world wide onslaught of the classical concept (Mercantilist too) of free trade. The tragedy of the situation for such unprepared (before generating indigenous R&D background) poor nations cannot be bypassed with the exception of India in very limited fields of economy. The current global wave towards liberal economics policy has created such an impression among the policy-makers in this region that it is being understood as synonymous with the economics of efficiency (Banuri, 1991). The purpose of such economic reforms is to create a competitive environment through free entry and exit which are effected by de-regulation and de-licensing. Its economics essentially rests on the neo-classical concept of optimality of free market economy where there is no externality. This would lead, on theoretical virtues, to efficient resource allocation from which naturally follows a Pareto-optimal system of production and distribution in the long run (Vickers, 1995). During the initial phases, it would raise the productivity and efficiency of the factors. This is the most desired goal of this reform package. Questions very often raised against the feasibility of applying the liberal economic model into the LDCs mainly

center around the nullification of the assumptions underlying the neo-classical model as such. Moreover, under the same economic rationale for which increasing returns to scale have already been accepted as the determining force for trade and growth under given geographical traits (Krugman, 1991), the performance of the countries under SAARC is limited by their infrastructure bottlenecks.

Under such a perspective, the purpose of this paper is to investigate – (a) the role played by infrastructure facilities in determining per capita income across South Asian countries over different time spans during the last quarter century, and (b) an attempt is made to understand the linkage between infrastructure and income across the region. Section 2 deals with data and methodology. Sections 3 and 4 work on the regional disparity in per capita income and infrastructure endowment among South Asian countries. Section 5 is focused on the nature and strength of the relationship between different categories of infrastructure endowments and economic development. Finally, section 6 presents the summary, limitations of the study, and implications for policy.

2. Data and Methodology

The most serious hurdle in reviewing regional economic evolution in any LDC is the lack of a consistent set of data on income, labour, capital and other related variables across the specified regions over a reasonable period of time. For the countries in South Asia, the same problem is faced. The problem becomes multiplied when one has to work with infrastructure variables: for, in the absence of detailed information on infrastructure investment, one has to opt for infrastructural facilities or services.

For the present purpose, we have organized the following data for seven South Asian countries over the period from 1971 to 2001.

Infrastructure facilities can be understood largely as public infrastructural inputs from the supply side. However, depending on the nature of services delivered, infrastructure can be broadly divided into physical, social and financial categories - all economically desirable. The first of these consists of transport (railways, roadways, airways, and waterways), electricity, irrigation, telecommunication, water supply and the like. Notwithstanding their very direct impact on production through external economies, they are beneficial for “crowding in” of private investment (both domestic and foreign) in the concerned geographical region. In a “cumulative causation” fashion, physical infrastructure contributes to economic growth through lower transaction cost, and generates

“multipliers” of investment, employment, output, income and ancillary development. On the other hand, social infrastructure through enrichment of human resources in terms of education, health, housing, recreation facilities and the like improves the quality of life. This is primarily responsible for higher concentration of better human resources in a region, and helps improve productivity of labour. Finally, financial infrastructure incorporating banking, postal and tax capacity of the concerned population represents the financial performance of the state. These three taken together represent the relative income generating capability of a state within a country or a country within a region.

We have taken 11 important infrastructural variables across the seven South Asian countries for different time points over the period from 1971 to 2001. Unlike most other inputs into the production process, supply of infrastructural facilities is not continuously derivable. That is, it increased as fixed inputs almost like jumps over different time spans. We have tried to consider infrastructure variables from most of the sectors of the economy, starting from agriculture to transport to banking to communication. These include (i) transport facilities (TF), which are composed of railway route length in kms. per thousand sq km. of area, and road length in kms. per thousand sq. km. of area, and waterways in kms. per thousand sq. km. of area (ii) proportion of irrigated land area to total crop land area (IL), (iii) per capita consumption of electricity (PCE), (iv) telephone main line per 1000 persons (TL), (v) fertiliser consumption per 100 grams per hectare of arable land (FC), (vi) tractors per 100 hectares of arable land (AM), (vii) literacy rates (LR), (viii) infant mortality rates (IMR), (ix) domestic credit provided by banking sector as percentage of GDP (BC), (x) tax collected as percentage of GDP (TC), and (xi) port capacity utilisation (PC).²

The major sources of these data are various issues of (i) World Development Indicators of World Bank, (ii) Economic Survey of Government of India, (iii) Statistical Abstract of Government of India, (iv) (v) Direction of Trade Statistics Yearbook of International Monetary Fund, (vi) Asian Development Outlook of Asian Development Bank, (viii) Economic Survey of Government of Pakistan, (ix) Bangladesh Economic Review of Government of Bangladesh, (x) Statistical Yearbook of Government of Sri Lanka. This data set is supplemented with various publications of the Centre for Monitoring the Indian Economy (CMIE), and India Infrastructure Database (Ghosh and De, 2003a).

3.1 Measures of Infrastructure Development

An attempt is made here for developing some composite index of infrastructure development, namely infrastructure development index (IDI), having derived the weights for 11 representative indicators of infrastructure, namely TF, IL, PCE, TL, FC, AM, LR, IMR, BC, TC, and PC on the basis of principal component analysis (PCA). The basic limitation of the conventional method of construction of IDI is that while combining the infrastructure indicators they either give subjective ad hoc weights to different indicators or leave them unweighted. Since there is every possibility for the indicators to vary over time and space, assignment of equal ad hoc weights could lead to unwarranted results. To overcome these limitations, we have employed the well-known multivariate technique of 'factor analysis' from which follows the required weights (Fruchter, 1967).

In the PCA approach, the first principal component is that linear combination of the weighted variables which explains the maximum of variance. Hence, here the sole objective is to explain the variance across the countries for each of the variables.

We have at our disposal values of 11 infrastructure variables for four different years, 1971-72, 1981-82, 1991-92 and 2001-02, across seven South Asian countries, namely, Bangladesh, Bhutan, India, Maldives, Nepal, Pakistan and Sri Lanka. The last two breaks help us evaluate the impact of differential infrastructure endowments on the performance of the countries in the post-liberalization period.

The weights and corresponding ranks of 11 infrastructural variables are presented in Table 1(a). A few observations are as follows.

First, TF has become the most influential infrastructure variable for most of the years. Thus, transport facilities such as road, rail, and waterways have been emerging as an important facility in determining economic life across the South Asian countries.

Second, next to TF, FC and LR have appeared as the other two important factors. IMR has been unequivocally left as the least influential factor.

Third, in contrast to popular belief, TL and IL have emerged as factors of low importance in determining IDI.

Table 1(a). Weights of Infrastructure Variables: PCA

Variables	1971-72 Weights	1971-72 Rank	1981-82 Weights	1981-82 Rank	1991-92 Weights	1991-92 Rank	2001-02 Weights	2001-02 Rank
IL	0.475	11	0.393	10	0.380	10	0.421	10
PCE	0.740	9	0.777	8	0.814	5	0.888	4
PC	0.836	7	0.794	7	0.884	3	0.851	5
TL	0.601	10	0.104	11	-0.305	11	-0.058	11
TF	0.934	2	0.908	5	0.928	1	0.905	1
FC	0.888	4	0.943	2	0.895	2	0.894	2
LR	0.910	3	0.926	4	0.833	4	0.894	3
IMR	0.868	5	0.886	6	0.802	6	0.670	7
BC	0.788	8	0.438	9	0.755	8	0.638	8
AM	0.843	6	0.943	1	0.797	7	0.800	6
TC	0.967	1	0.935	3	0.633	9	0.482	9
Eigen Value	7.341		6.709		6.288		5.839	
Total variance (%)	67.00		61.00		57.00		53.00	

Notes: Weights count only 1st Principal factor (unrotated factor loadings)

Table 1(b). Rank Correlation of Weights of Infrastructure Variables

	1971-72	1981-82	1991-92	2001-02
1971-72	1	0.782	0.518	0.527
1981-82		1	0.482	0.545
1991-92			1	0.964
2001-02				1

Fourth, high rank correlations of the weights of concerned variables in four observation years (see Table 1b) indicate that the relative weights of the respective variables have not undergone any compositional changes over time in determining IDI.

It may be demanding to touch upon the inter-country variations of the raw infrastructure variables over time.³ Interestingly, the coefficients of variations (CV) for all the facilities have been either falling or have remained almost constant over time. This in other way, indicates equalization of infrastructure facilities across the countries in South Asia. Firstly, we have not found any single facility whose supplies across the countries have become equitable over time. Secondly, while the coefficient of variations for TM has rising continuously from 0.639 in 1971-72 to 0.820 in 2001-02 (incidentally, this is the highest value of disparity among all), that of PC, even marginal, has also increased from 0.878 in 1971-72 to 0.883 in 2001-02. Thus, supply of infrastructure facilities as appeared from the CVs of raw variables bears some sort of symptoms of long run normalization in neo-classical sense.

3.2 Spatial Variation of IDI over Time

An attempt is made here to investigate the spatial variation of infrastructure stock across the South Asian countries over time. The weights derived from PCA are used as the multiplying factor with the unit free values of the 11 infrastructure variables. However, after multiplying the unit free values with the weight of each of the 11 factors we have obtained the individual index. Then adding all the 11 indices for a particular country in a particular year we have derived the IDI for that country. The process is repeated for all seven countries in South Asia for four years. The final values of IDI with corresponding ranks across the countries over time are given in Table 2(a). Interestingly, the coefficient of rank correlation of IDI has been very high

Table 2(a). Infrastructure Development Index (IDI): PCA

Countries	1971-72 IDI	1971-72 Rank	1981-82 IDI	1981-82 Rank	1991-92 IDI	1991-92 Rank	2001-02 IDI	2001-02 Rank
Nepal	3.928	5	5.323	5	6.319	5	7.871	5
Bangladesh	7.374	4	8.187	4	9.277	4	10.527	4
Bhutan	2.183	7	2.392	7	2.502	7	3.960	7
Maldives	3.343	6	4.506	6	4.000	6	6.722	6
India	13.007	3	12.995	3	14.897	3	16.045	2
Pakistan	14.094	2	13.737	2	15.672	2	15.738	3
Sri Lanka	24.238	1	23.377	1	20.770	1	21.842	1
Mean	9.738		10.074		10.491		11.815	
Standard Deviation	7.341		6.709		6.288		5.839	
Coefficient of Variation (CV)	0.754		0.666		0.599		0.494	

Table 2(b). Year-wise Rank Correlation of IDIs

	1971-72	1981-82	1991-92	2001-02
1971-72	1.000	1.000	1.000	0.964
1981-82		1.000	1.000	0.964
1991-92			1.000	0.964
2001-02				1.000

all through the years (Table 2b). It tells us that the relative positions of the countries in South Asia have simply remained unaltered in terms of infrastructural endowment. The evolution of South Asian countries over the last quarter century has produced some interesting outcomes as revealed from both values and rankings of IDI and values of mean, SD and CV. That is, although disparity among the countries in terms of infrastructure endowments is less, there is nothing unusual in the estimated infrastructure development indices across the countries.

In so far as regional convergence or divergence in income is concerned, the easiest way to verify that hypothesis is to establish the relationship with the help of initial income and long run rate of growth (Ghosh, Marjit and Neogi, 1998). But since infrastructure by any definition is a flow of services out of a certain amount of capital stock at a point of time which essentially provides the service for income or output generation, the Barro-type testing cannot be done here. Naturally then, we have opted to show countries in final IDI ranking over time, which is given in Table 3. This regrouping appears to nullify to a large extent the major thrust of economic planning or what is known as “balanced” regional development with active support for industrialisation in backward region as well as through minimising inter-South Asia disparities in costs and prices.

A couple of general believes can further be verified from this table. A glance of Table 3 makes out the most miraculous consistency in Sri Lanka’s development during last quarter century: the ranks of the countries have been absolutely determined way back in 1971-72, and the same set of countries in the respective groups has been repeated in 1981-82, 1991-92 and 2001-02. In the post reform period, there is a noticeable change in this grouping. India is benefiting from the reform started in 1991, and as a

Table 3. Countries in IDIs in Ascending Order

1971-72	1981-82	1991-92	2001-02
Sri Lanka	Sri Lanka	Sri Lanka	Sri Lanka
Pakistan	Pakistan	Pakistan	India
India	India	India	Pakistan
Bangladesh	Bangladesh	Bangladesh	Bangladesh
Nepal	Nepal	Nepal	Nepal
Maldives	Maldives	Maldives	Maldives
Bhutan	Bhutan	Bhutan	Bhutan

matter of fact, India has replaced Pakistan and occupied second position, next to Sri Lanka, in 2001-02. On the other hand, the performance of Pakistan has been dissatisfactory. Pakistan has never been able to regain her old glory in 2001-02, albeit, she was second best performing country upto 1991.

Two notable trends have also been confirmed from this analysis. There has been no compositional change among the countries holding bottom three positions. Bhutan has recorded the lowest infrastructure endowment in all the four points. In essence thus, the relative positions of the countries have remained the same during the last quarter century.

3.3 Individual Infrastructure Facilities

The metamorphosis so far done on the basis of IDI makes one believe that inter-South Asia variations is so diverse that an aggregate concept has not much sense. The actual picture in terms of each of the 11 infrastructure variables is not so straightforward. As the construction of IDI implies, the losing countries consistently represent lower values for most of the individual infrastructure facilities. Table 4 presents the list of countries in terms of rank of individual infrastructures. South Asia’s land locked countries, namely Nepal and Bhutan, are the most suffered geographical area right at the moment.

On the better side, India (in IL and IMR), Sri Lanka (in IL), Pakistan (in IMR), and Bangladesh (in TC and TL) are countries having inadequacy in the

Table 4. Ranking of Countries in Individual Infrastructure Facilities

Year: 1971-72	IL	PCE	PC	TL	TF	FC	LR	IMR	BC	AM	TC
Nepal	6	5	5	7	5	5	5	5	5	4	4
Bangladesh	5	4	4	6	3	4	3	2	4	5	5
Bhutan	4	6	5	5	6	6	7	6	6	6	7
Maldives	7	6	5	2	7	6	6	6	6	6	6
India	3	1	1	4	2	3	2	3	3	3	3
Pakistan	1	2	3	3	4	2	4	4	1	2	2
Sri Lanka	2	3	2	1	1	1	1	1	2	1	1
Year: 1981-82	IL	PCE	PC	TL	TF	FC	LR	IMR	BC	AM	TC
Nepal	3	5	5	5	5	5	5	4	5	4	4
Bangladesh	6	4	3	6	3	3	3	2	6	5	6
Bhutan	4	7	5	7	7	6	7	6	7	6	7
Maldives	7	6	5	1	6	7	6	6	1	6	5
India	5	1	4	4	2	4	2	3	4	3	3
Pakistan	1	2	2	3	4	2	4	5	3	2	2
Sri Lanka	2	3	1	2	1	1	1	1	2	1	1

Table 4 continued

Table 4 continued

Year: 1991-92	IL	PCE	PC	TL	TF	FC	LR	IMR	BC	AM	TC
Nepal	2	5	5	6	5	5	5	3	5	4	5
Bangladesh	3	4	3	7	4	2	4	2	6	5	6
Bhutan	4	7	5	5	7	6	7	6	7	6	7
Maldives	7	6	5	1	6	7	6	6	4	6	2
India	5	2	2	4	2	4	2	4	1	3	4
Pakistan	1	1	4	3	3	3	3	5	2	1	3
Sri Lanka	6	3	1	2	1	1	1	1	3	2	1
Year: 2001-02	IL	PCE	PC	TL	TF	FC	LR	IMR	BC	AM	TC
Nepal	3	5	5	6	5	5	4	4	3	4	5
Bangladesh	2	4	3	7	4	2	5	2	6	5	7
Bhutan	6	7	5	4	7	6	7	6	7	6	6
Maldives	7	6	5	1	6	6	6	3	5	6	2
India	5	1	1	3	2	4	2	5	1	2	4
Pakistan	1	2	4	5	3	3	3	7	4	1	3
Sri Lanka	4	3	2	2	1	1	1	1	2	3	1

respective infrastructure facilities. Interestingly, Maldives has better penetration of telephone lines in South Asia, but except that, the country has tremendous inadequacy in rest of infrastructure endowments. Nepal and Bhutan have inadequacy in all 11 infrastructure facilities.

It is obvious that potential effectiveness of IDI will vary across three broad categories of regions: congested, intermediate and lagging. Congested regions are characterized by very high concentration of population, industrial and commercial activities, and public infrastructure. Lagging regions are characterized by a low standard of living due to small-scale agriculture or stagnant or declining industries and poor infrastructural facilities. However, performance in individual infrastructure does serve, for all practical purposes, both the policy makers as well as the potential investors who can choose the regions for higher return from investments. Hence, existing huge scopes for improvement in the lagging regions could be utilised through better incentives to private sector investment. Here comes the necessity for having coordinated regional development policy for South Asia. In this context, it is worth mentioning the work of Basu (2001): “If in an economy some people control all the water, some all the food and some all the energy, even if the total amount of water, food and energy is very large, if this society does not learn how to exchange and trade, it will be a very poor society; indeed so poor that all may die. In a modern nation, it is not enough for there to be a lot of medical knowledge and engineering knowledge and knowledge of information technology. If the nation does not have the organisation to share and exchange this knowledge and to harness it where it is needed, it will be a miserable and poor nation. Since we do not typically think of organisational skill and the ability for coordinated action as a resource or capital, it is easy to overlook their importance.”

The critiques of inter-regional comparisons cannot refute the fact that lower inter-South Asia variations in IDI (and which are not unachievable) could facilitate better utilisation of hitherto unutilised resources in the lagging regions. Hence, a major outcome of a spatial approach to economic growth analysis is to call for more coordination between government agencies at all levels and for the integration of all infrastructure decisions in an overall regional development strategy.

Before the wisdom of such a development strategy is assessed, a number of questions must be answered. For example, how do we identify the mechanisms by which infrastructure generates regional growth? What types of infrastructure

investments are crucial for promoting regional growth? Does the existing infrastructural stock put South Asia in any steady-state position? These are being dealt in next few sections.

4. Comparison of Income over Time

As discussed earlier, it is widely believed that infrastructure is not an end in itself. It is a composite means for generating income. Let us now see whether the rising disparity in infrastructure went *pari passu* with that of per capita income across the South Asian countries.

Except the failure to represent inter-class inequality within the region, there is hardly any disagreement among the economists to use per capita income as a measure of regional disparity. Table 5(a) presents the rankings of the countries in terms of per capita income (PCI) at constant 1995 US\$ from 1971-72 to 2001-02. A caution must be made at the outset. Although economists’ concept of regional imbalance is generally represented by the coefficient of variation over time and across countries, it is highly probable that there may be sub-regions (e.g. states or provinces) even within a richer country which are backward (and for South Asia, it is a bare truth of fact). But differences in agricultural and/or industrial productivities are ultimately reflected in the differences in PCI. What is more, relative differences in unemployed labour force are also accounted for by PCI. Thus, it can be interpreted as an indicator of country-level human productivity, which takes care of individual sectors. For the sake of understanding, South Asia mean real PCI is also provided at the appropriate staircase in each column. Some interesting findings follow from this table.

First, if we cluster the countries above and below South Asia average then it is clear that economic conditions of the countries have remained unaltered on both sides over the last quarter century (see Table 5(b) for rank correlation of countries in PCI). The countries like Sri Lanka, Maldives and Bhutan, whose growth rates also happen to be higher, have maintained their above-average positions throughout the period. Although below the South Asian average, India has finally improved her position, which is also justified by her IDI. Second, Nepal is the only country whose income ranking is consistently the worst in South Asia and also over time. Finally, the performance of Pakistan in 2001-02 has been below the mean.

Like IDI here also the composition of the countries has not significantly changed during the last quarter century. Whereas the average per capita income

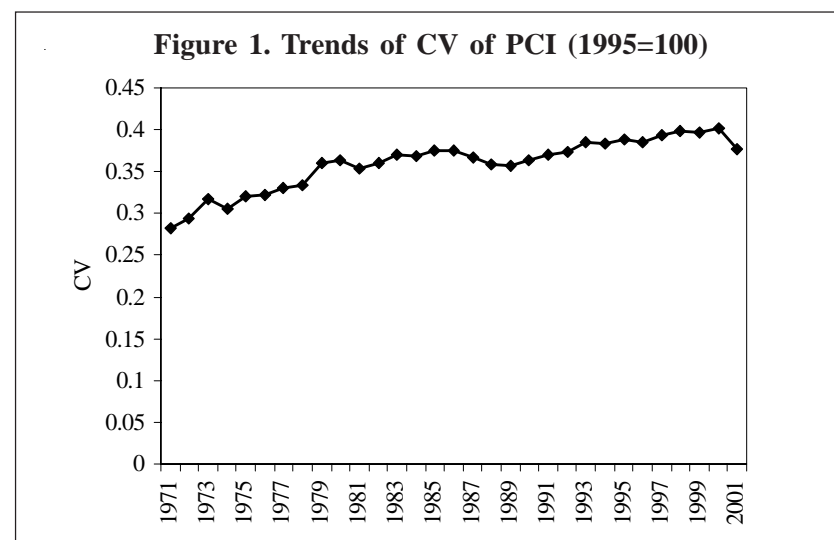
Table 5(a). Ranking of Countries in terms of PCI (1995=100)

Countries	1971-72 PCI	1971-72 Rank	1981-82 PCI	1981-82 Rank	1991-92 PCI	1991-92 Rank	2001-02 PCI	2001-02 Rank
Nepal	143.05	7	157.0	7	195.8	7	248.13	7
Bangladesh	228.99	5	242.0	5	282.4	6	386.11	6
Bhutan	229.56	4	250.0	4	389.9	4	553.62	3
Maldives	620.70	1	980.5	1	1450.3	1	1937.92	1
India	211.75	6	237.1	6	320.5	5	477.06	5
Pakistan	267.47	3	333.7	3	459.1	3	517.20	4
Sri Lanka	348.58	2	474.6	2	637.1	2	876.37	2
Mean	292.87		382.1		533.6		713.77	
Standard Deviation	145.57		261.2		396.4		530.43	
CV	0.50		0.68		0.74		0.74	

Table 5(b). Year-wise Rank Correlation of PCI

	1971-72	1981-82	1991-92	2001-02
1971-72	1	1.000	0.964	0.929
1981-82		1	0.964	0.929
1991-92			1	0.964
2001-02				1

of South Asia has doubled from US\$ 293 to US\$ 714 over 30 years, the 7th country (Nepal) has recorded an increase from US\$ 143 to US\$ 248, and the best performing country (Maldives) from US\$ 621 to US\$ 1937. What is more, the combined population of these seven countries is 1.35 billion in 2001, i.e. 22 per cent of world's total population, or less than twice the population of the USA, or the combined population of Russia, France, Sweden, Germany, Italy, the UK and Australia. Another way of visualising this type of individual disparity is to compare the ratio between mean income and own income. On the whole, the coefficient of variation (CV) is increasing, and the hypothesis of rising regional disparity has strengthened. It has been seen from Figure 1 (representing time series trend of CV) that there is an exponentially rising tendency of income disparity across the countries.



Therefore, the evidences support the fact that the poorer countries in South Asia have remained poor and the richer countries have remained rich, relatively speaking. Specifically, inter-South Asia disparity in income has been rising steadily, particularly during the post-liberalisation period.

5. Relationship between Infrastructure and Income

Beyond the neo-classical simplification of classifying different factors into only capital and labour, the indispensable role played by social overhead capital, which is used to build up infrastructure, in helping productive activities directly and indirectly was recognized by the pioneers of development economics (Fleming, 1955; Hirschman, 1958; Myrdal, 1958). An economy's infrastructure network, broadly speaking, is the very socio-economic climate created by the institutions that serve as conduits of commerce. Some of these institutions are public, others private. In either case, their roles can be conversionary – helping to transform resources into outputs - or diversionary – transferring resources to non-producers. Its role is very critical in reducing natural inequality among different regions within a country.

In general, infrastructure is a social concept of some especial categories of inputs external to the decision-making units, which contribute to economic development both by increasing productivity and by providing amenities, which enhance the quality of life. It requires a long period of time to create the facilities.⁴ For example, Hansen (1965) in looking into the role of public investment in economic development divides public infrastructure into two categories: economic overhead capital (EOC) and social overhead capital (SOC). Mera (1973), examining the economic effects of public infrastructure in Japan, extends Hansen's definition of EOC to include communication systems. The absence of these facilities in a region may result in lower "productive efficiency" of the population (Munnell, 1990). These are the common set of characteristics that make an economic system successful while another, a failure, and these characteristics are substantial enough to explain most, if not all, of the differences in prosperity that separate nations today.

The linkage between infrastructure and economic growth is multiple and complex, because not only does it affect production and consumption directly, but it also creates many direct and indirect externalities, and involves large flows of expenditure thereby creating additional employment. Most of the studies on macroeconomic impact were generated in the 1980s as a resultant of the initial failure to account for the productivity slowdown in the developed

nations particularly USA (Aschauer, 1989). There are many studies which suggest that infrastructure does contribute towards a hinterland's output, income and employment growth and quality of life.⁵ But much less has been focused on the LDCs. Generally, unequal distribution of basic infrastructure facilities across different regions within South Asia may be so pervasive as to nullify the operation of the law of diminishing returns in the neo-classical sense (Kaldor, 1972). And ultimately, economies of agglomeration create a "backwash effect" against the waning regions. In fact, much before the recent resurgence of the theory of convergence, the pioneering works of Myrdal (1958) and Hirschman (1958) showed why economic activities starting from "historical accident" are concentrated in a particular region. The very recent works of Krugman (1991, 1995) have been largely responsible for the renewed interest in geographical and locational factors as possible determinants of regional inequality in the context of trade.

Although quite a large number of studies have addressed the problem of regional disparity in South Asia during the last few decades, only a few of them have dealt directly with infrastructure and economic development. Barnes and Binswanger (1986), Elhance and Lakshmanan (1988), Binswanger, Khandkur and Rosenwing (1989), Ghosh and De (2000c), Datt and Ravallion (1998), Sahoo and Saxena (1999), Khondker and Chaudhury (2001), Jayasuria (2001), deal more directly with infrastructure and income. Binswanger *et al.* (1989) show that the major effect of roads in rural India does not work through their impact on private infrastructure but rather through marketing and distribution scopes, and also through reduced transportation costs of agricultural goods. Yet electricity and other rural infrastructures have more direct impact on agricultural productivity through private investment in electric pumps (Barnes and Binswanger, 1986). Elhance *et al.* (1988) using both physical and social infrastructures have shown that reductions in production costs in manufacturing mainly result from infrastructure investment. In a detailed study, Dutt and Ravallion (1998) prove that states starting with better infrastructure and human resources, among others, have seen significantly higher long-term rates of poverty reduction. Ghosh and De (2000c) using physical infrastructure facilities across the South Asian countries over last two decades have shown that differential endowments in physical infrastructure were responsible for rising regional disparity in South Asia. Sahoo and Saxena (1999) using production function approach have concluded that transport, electricity, gas and water supply, and communication facilities have a significant positive effect on economic growth, and while concluding this they have found increasing returns to scale.

Table 6. OLS Regression Outputs

Year	Independent Variables	Coefficients	t-stat	R ²	Adj. R ²	F value	DW	N
1971-72	Intercept	195.758	3.952	0.865	0.581	4.462	2.147	6
	IDI	-0.744	-0.080					
	IDI ²	0.294	0.848					
1981-82	Intercept	226.029	3.249	0.854	0.757	8.783	2.439	6
	IDI	-5.659	-0.446					
	IDI ²	0.708	1.494					
1991-92	Intercept	458.388	4.574	0.882	0.804	11.265	2.536	6
	IDI	-47.398	-2.358					
	IDI ²	2.740	3.226					
2001-02	Intercept	772.115	4.881	0.905	0.842	14.296	1.737	6
	IDI	-83.896	-3.047					
	IDI ²	4.101	3.904					

As is well known, building up of additional infrastructural facilities at the initial scale may not have immediate, high and positive impact on income. After the critical minimum level of overhead infrastructure level is crossed, the impact of IDI on PCI exponentially helps increase income. The economic rationale behind this may be that at the initial scale building up of infrastructure facility may act as a downward pressure (or burden) on income thereby implying a sort of sacrifice, and beyond that level various external economies may multiply the contribution of infrastructure to income exponentially. Such a relationship may be captured in the following equation: $PCI = a + b IDI + c IDI^2$.

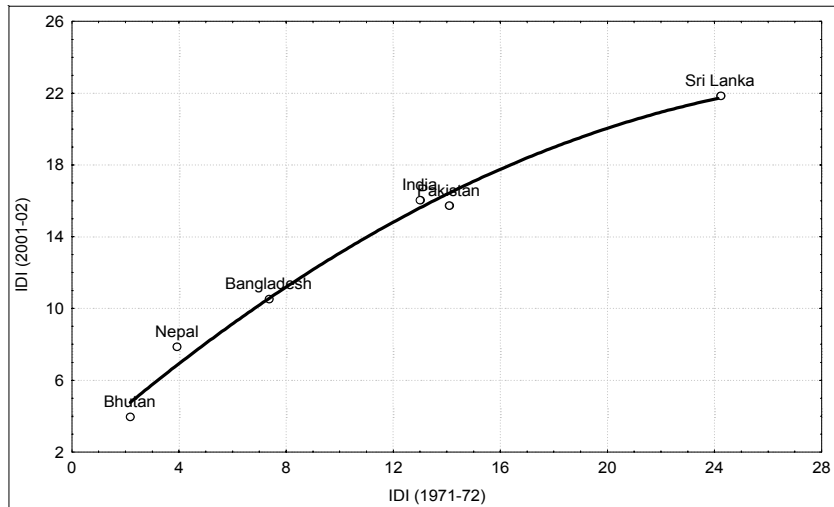
The fitted results of this non-linear regression are presented in Table 6 with corresponding values of the coefficients, t-statistics, adjusted R², DW statistics and F-statistics for four different years. The fitted curves with the corresponding scatters are presented in Appendix 2 (a, b, c and d). The regression results are very satisfactory. A brief analysis of the results is as follows.

First, given the cross-section nature of the data, the value of adjusted R² confirms the fact that the composite index of infrastructure development alone explains a reasonably high proportion of income across the countries. As expected, the square term is highly significant and positive in all cases. The role of infrastructure in the initial scale with high level of significance and negative coefficients confirms the nature of relationship between PCI and IDI as discussed above. The values of DW statistic (and also serial correlation) are high in all the cases. This proves the high level of confidence in favour of the regression tests. One implication of this relationship is that if the existing infrastructural differences across the countries persist (most likely unless otherwise reversed), the rate of regional divergence is bound to increase in the years to come.

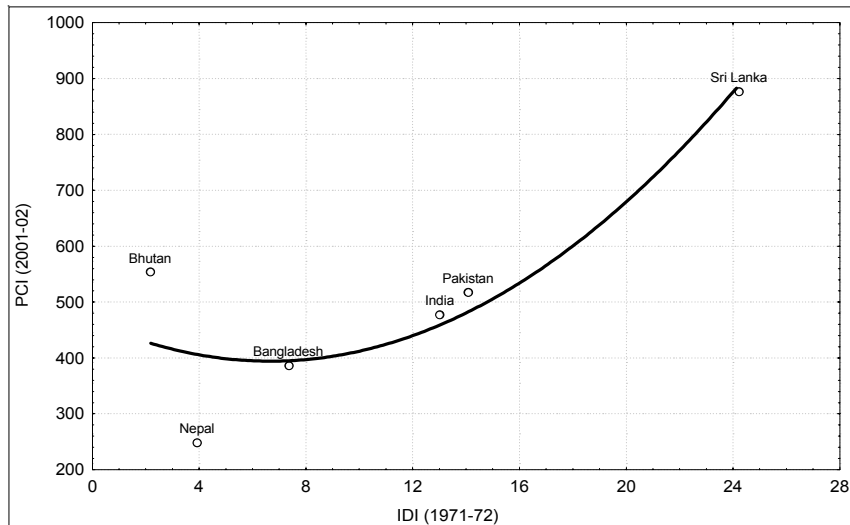
We have seen in earlier sections that infrastructurally best endowed countries in 1971-72 have more or less remained in the same position relative to poorer counterparts. A cursory look into the Figure 2 (a, b) makes it clear that, perhaps, infrastructure endowment of 70s has sealed the fate of countries in beginning of the new century of the new millennium in South Asia. In other words, unequal opportunities among the countries in terms of the most crucial utility resources on which depends the locus for further economic development have been the order of South Asia's regional development over the last quarter century.

Figure 2. Scatter Diagram of IDI and PCI: 1971-72 and 2001-02

(a) IDI vs. IDI



(b) IDI vs. PCI



6. Summary and Implications

Let us briefly summarize the major findings of the study. First, after a long period of State Planning and protected industrial regime, South Asia has failed to foster a balanced regional development. The available evidence shows that inter-South Asia disparity in both basic infrastructure facilities and per capita income has been rising over the years. Rising inequality in major infrastructure facilities across the countries might be responsible for widening income disparity over time. On the whole, there have been enormous differences in individual performance among the countries in terms of all the basic indicators of development. But the relative positions of the countries have remained definitely unchanged during last quarter century in terms of any definition of development.

These findings have very important policy implications. Given that geo-political situation has failed to make SAARC an economically prosperous bloc, the question: whether with diverse geo-political complexities does SAARC has any role to play in fostering balanced regional development? As we know, unequal distribution of infrastructure facilities across the countries is largely responsible for enormous differences in income performance of the countries. To start with, it would be wrong to assume that performance difference is caused by unequal distribution of public investment alone. There are reasons to believe that the efficiency of utilisation of public investment is not equal in all the countries. This difference has serious repercussion on the level and rate of private capital accumulation. Under liberal economic regime, the free play of market forces may further accentuate the problem of regional imbalance in South Asia. Therefore, coordinated policy under liberal economic regime, in sharp contrast to general belief, must play very critical and decisive role in order to cure regional imbalance in this region.

Until and unless South Asian countries consolidate their group existence leading to higher income, this sub-continent will further suffer the onslaught of “free trade” under implementation of the WTO. For this, these countries have no alternative than to concentrate on their respective infrastructure development.

It goes without saying that the present paper suffers from some limitations. First, our aggregate indexation fails to synchronize between the varying

perceptions of what is meant by development by different communities in different localities with which a state is composed of. For example, the people of Kalahandi district in the State of Orissa in India, most of whom just fail to manage two meals a day, cannot think of sending their children to schools. Or, a recently electrified village in the district of Jessore in Bangladesh will hardly care for internet facility and overcrowded traffic in local trains and buses towards Kolkata. In general, people who live marginally from hand to mouth will have very different perceptions of development from those who are much well-placed. The question is: whether indexes constructed for various communities will be legitimately incorporated in a Rawlsian index of some kind or some conservative welfarist assimilation. While an aggregate index is useful in evaluating the effectiveness of a particular investment programme in a situation of tremendous resource scarcity and unequal distribution, it may still beg some fundamental groundwork with a smaller geographical area as a unit of analysis for defining a meaningful comprehensive indicator for the extreme diversities that South Asia manifests.

Second, it fails to incorporate institutional factors representing political will, work ethics and social networking by which to judge the quality of life, rule of law, motivation for development and economic reasoning on the part of both government and the people. Quite contrary to general belief, 'political stability' may not necessarily act as a favourable factor of development in a premature democratic polity.

Third, efforts should also be given for collecting representative environmental factors which contain information regarding intergenerational equity as well as short run versus long run rationality (e.g. farmers using indiscriminate doses of fertilisers and pesticides, or housewives throwing non-degradable garbage from the sixth floor of a multistoried housing complex at the dawn, or even educated people using a busy and populous road as an open urinal).

Fourth, future work may be undertaken (if data permit) to test whether infrastructure facilities of the countries even before the seventies sealed the fate of the countries in the new century of the new millennium.

Finally, sophisticated dynamic analysis may be tried for verifying the strong findings of this paper derived from artless statistical techniques.

Notes

1. In essence, all these countries undertook such economic policies specifically from the late eighties and early nineties which, to coin World Bank terminology, is called the 'structural adjustment programme'. This essentially involves removal of licensing and monopolistic practices, de-nationalization, permission of foreign equity participation in domestic industries, and so on and so forth. In this endeavor, Sri Lanka is the only country which was embarked upon the path of economics of reforms as early as in 1977. For details, see RIS (1999, 2002); Kelegama (1998).
2. Given the fact that supply of infrastructure is a sort of static stock available over different discrete time points, that makes it difficult for continuous treatment in a framework of typical neo-classical growth regression. On the other hand, an individual infrastructure facility on overhead basis is certainly more important than the mere amount of capital investment on the facility. The point is not that investment is unimportant. Had there been complete information on investment for each of the infrastructures for a long period of time and at least some quantitative knowledge on public corruption at various layers of fund disbursement and execution, it would have been nice to work with investment or capital stock pertaining to infrastructure. Over and above, due to non-availability of a consistent and reliable set of data on various infrastructure facilities across South Asian countries over a reasonably long period of time, we have proxied some infrastructure variables by close substitutes like in cases of education and health care services, where we have considered literacy and infant mortality rates as indicators to represent state of education and health care in the region. One can certainly use some other representative variables replacing the variables those we have considered here.
3. The values of the mean, S.D. and C.V. of the raw infrastructure variables over time are given in Appendix I.
4. For example, construction of a dam or a power plant in a backward region, or an underground railway in a congested city (the underground rail of Delhi), or a new port (extension of port of Colombo) needs very long term perspective planning. The interested readers may consult Gramlich (1994).
5. For details, see Aschauer (1990); Munnell (1990); Gramlich (1994); Esfahani and Ramirez (2003); Kumar (2002).

References

- Aschauer, D. A. 1989. "Is Public Expenditure Productive?". *Journal of Monetary Economics*, Vol. 23, No.1.
- Aschauer, D. A. 1990. "Why Is Infrastructure Important?" in Munnell (1990).
- Banuri, T. 1991. *Economic Liberalization: No Panacea*, New York: Clarendon Press.
- Barnes, D. F. and H. P. Binswanger. 1986. "Impact of Rural Electrification and Infrastructure on Agricultural Changes, 1966-1980." *Economic Political Weekly*, Vol. 21.
- Barro, R. J. 1991. "Economic Growth in a Cross-Section of Countries". *Quarterly Journal of Economics*, Vol. 106, pp 407 - 43.
- Barro, R. J. and X. Sala-i-Martin. 1995. *Economic growth*. New York: McGraw Hill.
- Basu, Kaushik. 2001. "India and the Global Economy: Role of Culture, Norms and Beliefs". *Economic and Political Weekly*, Vol. 36, No. 40.
- Binswanger, H. P, S.R Khandkur, and M. R. Rosenzweig. 1989. "How Infrastructure and Financial Institutions affect Agriculture Output and Investment in India". Policy Planning and Research Working Paper No. 163, World Bank, Washington, D. C.
- Datt, G. and M. Ravallion. 1998. "Why Have Some Indian States Done Better than Others at Reducing Rural Poverty." *Economica*, Vol. 65, No. 1.
- Elhance, A. P. and T. R. Lakshamanan. 1988. "Infrastructure- Production System Dynamics in National and Regional Systems: An Economic Study of the Indian Economy". *Regional Science and Urban Economics*, Vol. 18.
- Esfahania, H. S and M. T. Ramírez. 2003. "Institutions, Infrastructure, and Economic Growth". *Journal of Development Economics*, Vol. 70.
- Fruchter, B. 1967. *Introduction to Factor Analysis*. New Delhi: Affiliated East West Press,
- Ghosh, B and P. De. 1998. "Role of Infrastructure in Regional Development: A Study of India over the Plan Period." *Economic and Political Weekly*, Vol. 33, Nos. 47-48.
- Ghosh, B and P. De. 2000a. "Linkage between Infrastructure and Income among Indian States: A Tale of Rising Disparity since Independence". *Indian Journal of Applied Economics*, Vol. 8, No.4.
- Ghosh, B. and P. De. 2000b. "How do Economic and Social Infrastructure Services affect Regional Economic Performance? An Investigation with Major Indian States". Conference Proceedings, National Council of Applied Economic Research, New Delhi and Sir Ratan Tata Trust, Mumbai.
- Ghosh, B and P. De. 2000c. "Infrastructure, Economic Growth and Trade in SAARC" *BISS Journal*, Vol. 21, No. 2.
- Ghosh, B. and P. De. 2003a. *India Infrastructure Database 2003*. Bookwell, New Delhi, Forthcoming.
- Ghosh, B. and P. De. 2003b. "How Different Categories of Infrastructures Affect Regional Level of Development: Evidence from Indian States". *Economic and Political Weekly*, Forthcoming.
- Ghosh, B., S. Marjit, and C. Neogi. 1998. "Economic Growth and Regional Divergence in India: 1960-1995." *Economic and Political Weekly*, Vol. 33, No. 26-27.
- Gramlich, E. M. 1994. "Infrastructure Investment: A Review Essay." *Journal of Economic Literature*, Vol. 32, No. 3.
- Hansen, N. M. 1965. "Unbalanced Growth and Regional Development." *Western Economic Journal*, Vol. 4.
- Hirschman, A. O. 1958. *The Strategy of Economic Development*. Yale University Press, New Haven.
- Jayasuria, L. 2001. "Rethinking Social Development: Towards an Equitable Future for Sri Lanka". *South Asia Economic Journal*, Vol. 2, No. 1
- Kaldor, N. 1972. "The Irrelevance of Equilibrium Economics," *The Economic Journal*, Vol. 82, No. 328.
- Kelegama, S. 1998. "Economic Development in Sri Lanka during the 50 Years of Independence: What Went Wrong?" Occasional Paper No. 53, Research and Information System for the Non-aligned and Other Developing Countries, New Delhi.
- Khondker, B.H. and A. H. Chaudhury. 2001. "Growth with Equity: A Bangladesh Perspective". *South Asia Economic Journal*, Vol. 2, No. 1
- Krugman, P. 1991. *Geography and Trade*. Leuven University Press, Leuven.
- Krugman, P. 1995. *Development, Geography and Economic Theory*. MIT Press, Cambridge.
- Kumar, Nagesh. 2002. "Infrastructure Availability, Foreign Direct Investment Inflows and Their Export-Oriented: A Cross-Country Exploration". RIS Discussion Paper No. 26/2002, Research and Information System for the Non-aligned and Other Developing Countries, New Delhi.

- Marjit, S and S. Mitra. 1996. "Convergence in Regional Growth Rates: Indian Research Agenda." *Economic and Political Weekly*, Vol. 31, No. 1
- Mera, K. 1973. "Regional Production Function and Social Overhead Capital: An Analysis of the Japanese Case". *Regional and Urban Economics*, Vol. 3, No. 2.
- Munnell, A. H. 1990. "How does Public Infrastructure affect Regional Economic Performance?". Federal Reserve Bank of Boston, Conference Series No. 34. This paper also appeared in the September/October 1990 issue of *New England Economic Review*, pp. 11-32.
- Myrdal, G. 1958. *Economic Theory and Underdeveloped Regions*. Vora & Co., Bombay.
- RIS. 1999. *SAARC Survey of Development of Cooperation, 1998/99*. Research and Information System for the Non-aligned and Other Developing Countries (RIS), New Delhi.
- RIS. 2002. *South Asia Development and Cooperation Report, 2001/02*. Research and Information System for the Non-aligned and Other Developing Countries (RIS), New Delhi.
- Sahoo, S. and K. K. Saxena. 1999. "Infrastructure and Economic Development: Some Empirical Evidence". *The Indian Economic Journal*, Vol. 47, No. 2.
- Vickers, J. 1995. "Concept of Competition". *Oxford Economic Papers*, Vol. 47, No. 1.

Appendix 1

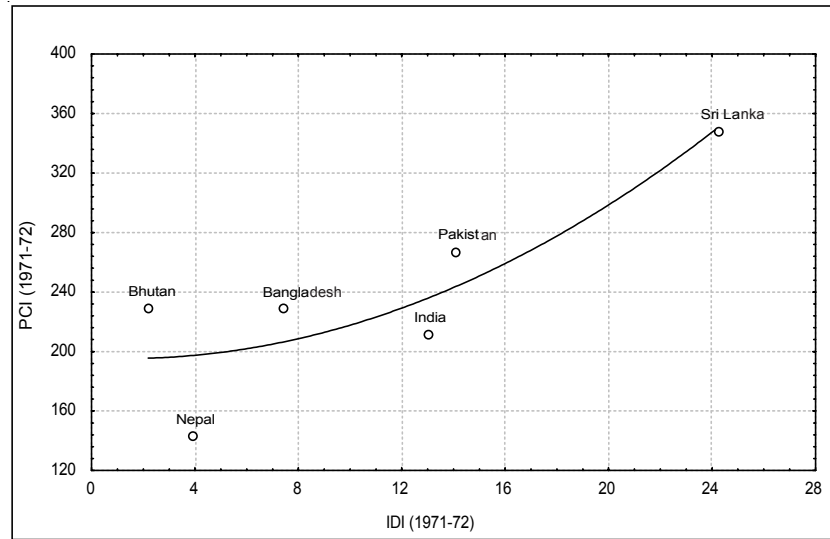
Mean, SD and CV of Infrastructure Variables

Variables	1971-72	1981-82	1991-92	2001-02	1971-72	1981-82	1991-92	2001-02	1971-72	1981-82	1991-92	2001-02
	Mean	Mean	Mean	Mean	SD	SD	SD	SD	CV	CV	CV	CV
IL	20.567	27.859	34.422	37.440	20.458	21.258	22.134	23.151	0.995	0.763	0.643	0.618
PCE	36.097	59.025	116.891	169.097	37.907	58.251	114.007	145.573	1.050	0.987	0.975	0.861
PC	50.971	50.507	52.541	57.453	44.748	43.794	45.635	50.714	0.878	0.867	0.869	0.883
TL	2.277	3.547	9.259	35.331	1.455	2.704	10.582	28.987	0.639	0.762	1.143	0.820
TF	62.374	93.323	122.092	344.073	73.137	106.339	119.911	405.108	1.173	1.139	0.982	1.177
FC	273.211	461.676	745.637	1011.993	456.291	564.626	660.672	942.172	1.670	1.223	0.886	0.931
LR	29.335	35.399	42.650	48.904	22.125	21.738	20.126	19.349	0.754	0.614	0.472	0.396
IMR	0.007	0.008	0.014	0.022	0.005	0.007	0.012	0.015	0.743	0.799	0.877	0.712
BC	17.641	34.174	32.324	40.178	18.054	20.388	16.579	14.683	1.023	0.597	0.513	0.365
AM	0.299	0.338	0.422	0.511	0.619	0.468	0.462	0.558	2.070	1.385	1.096	1.091
TC	8.083	9.070	10.519	10.794	4.380	3.997	4.495	2.889	0.542	0.441	0.427	0.268

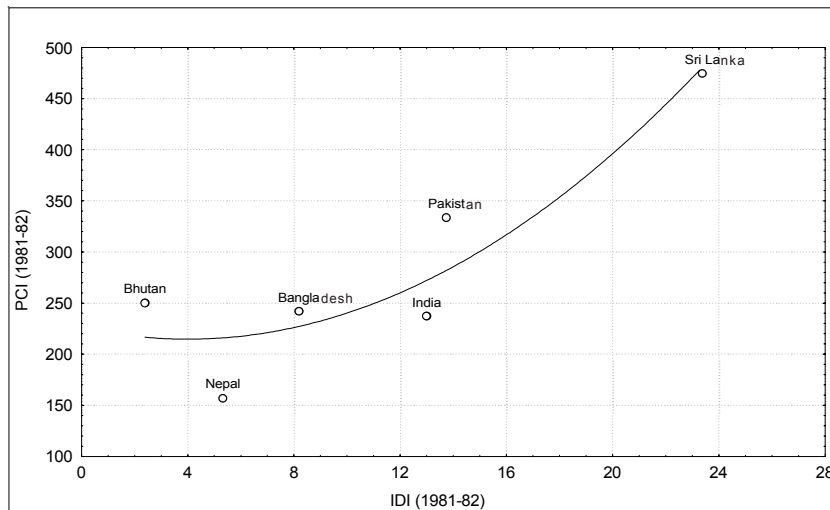
Appendix 2

Scatter Diagram of IDI and PCI

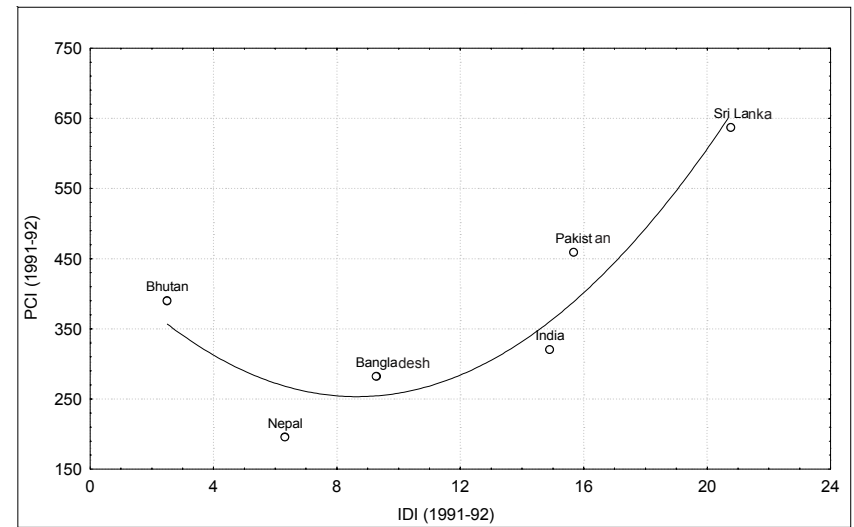
(a) 1971-72



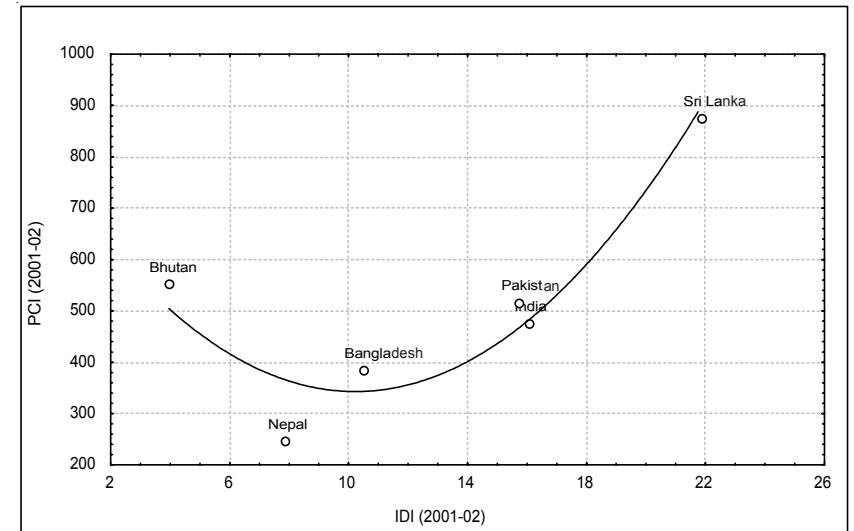
(b) 1981-82



(c) 1991-92



(d) 2001-02



RIS Discussion Papers

Available at http://www.ris.org.in/risdiscussion_papers.html

- DP# 65-2003 *Liberalization, Foreign Direct Investment Flows and Economic Development: The Indian Experience in the 1990s* by Nagesh Kumar.
- DP# 64-2003 *India's Monetary Integration with East Asia: A Feasibility Study* by Sweta Chaman Saxena.
- DP# 63-2003 *Rise of Service Sector Outward Foreign Direct Investment from India: Trends, Patterns, and Determinants* by Jaya Prakash Pradhan
- DP# 62-2003 *Short-term Forecasting of India's Export: Developing a Framework by Countries and Commodities* by Rajesh Mehta and Parul Mathur.
- DP# 61-2003 *Evolving a National System of Biotechnology Innovation Some Evidence from Singapore* by Sachin Chaturvedi.
- DP# 60-2003 *"Ecosystemic Multifunctionality" – A Proposal for Special and Differentiated Treatment for Developing Country Agriculture in the Doha Round of Negotiations* by A. Damodaran.
- DP# 59-2003 *WTO Non-Agriculture Marketaccess Modalities: A Case Study Of Impact On A Developing Country* by Rajesh Mehta and Pooja Agarwal.
- DP # 58-2003 *Implementation Issues in SPS: A developing Country Perspective for Development Agenda on the Meandering Pathways from Doha to Cancun* by Rajesh Mehta and J. George.
- DP # 57-2003 *WTO Negotiations Towards Cancun: Implication on Indian Paper and Newsprint Industry* by Rajesh Mehta and Pooja Agarwal
- DP # 56-2003 *Investment on the WTO Agenda: A Developing Country Perspective and the Way Forward for the Cancun Ministerial Conference* by Nagesh Kumar.
- DP # 55-2003 *Economic Cooperation Between India and Egypt*, Abdel Hamid Saba Elregal.
- DP # 54-2003 *Nepal-India Bilateral Trade Relations Problems and Prospects* by Gyanu Raja Shrestha.

- DP # 53-2003 *Economic Cooperation between India and Central Asian Republics with Special Reference to Uzbekistan* by Abdurahim Okhunov Abduraxmonovich.
- DP # 52-2003 *Performance Requirements as Tools of Development Policy: Lessons from Experiences of Developed and Developing Countries for the WTO Agenda on Trade and Investment* by Nagesh Kumar.
- DP # 51-2003 *India and the Asian Economic Community* by Mukul G. Asher and Sadhan Srivastava.
- DP # 50-2003 *ASEAN's Contribution to the Building of an Asian Economic Community* by K.Kesavapany.
- DP # 49-2003 *A Road to Common Prosperity – Examination of An FTA between India and China* by Li Wei.
- DP # 48-2003 *Regional Trade Liberalisation under SAPTA and India's Trade Linkages with South Asia: An Empirical Assessment* by S.K. Mohanty.
- DP # 47-2003 *Towards and Economic Community: Exploring the Past* by Vineeta Shanker.
- DP # 46-2003 *Towards a Multipolar World of International Finance* by Ramgopal Agarwala and Gauri Modwel.
- DP # 45-2003 *Possibility of Close Economic Cooperation between India and Singapore* by S.K. Mohanty.
- DP # 44-2003 *Determinants of Outward Foreign Direct Investment Form A Developing Country: The Case of Indian Manufacturing Firms* by Nagesh Kumar and Jaya Prakash Pradhan.
- DP # 43-2003 *Export Competitiveness in Knowledge-based Industries: A Firm-Level Analysis of Indian Manufacturing* by Nagesh Kumar and Jaya Prakash Pradhan.
- DP # 42-2003 *Export Performance of Indian Enterprises in Knowledge-based Industries: Recent Trends, Patterns and Implications* by Nagesh Kumar and Jaya Prakash Pradhan.
- DP # 41-2003 *Economic Co-operation Between India and Singapore: A Feasibility Study* by Rajesh Mehta.
- DP # 40-2003 *Liberalisation, Firm Size and R&D Performance: A Firm Level Study of Indian Pharmaceutical Industry* by Jaya Prakash Pradhan.

DP # 39-2002 *Addressing Sanitary and Phytosanitary Agreement: A Case Study of Select Processed Food Products in India* by R. Mehta, M. Saqib, and J. George.

DP # 38-2002 *Analysis of Environment related Non-Tariff Measures in the European Union: Implications for South Asian Exports* by S.K. Mohanty and T.R. Manoharan.

DP # 37-2002 *The Determinants of India's Exports: A Simultaneous Error-Correction Approach* by Saikat Sinha Roy.

DP # 36-2002 *WTO and Product related Environmental Standards: Emerging Issues and Policy Options before India* by Sachin Chaturvedi and Gunjan Nagpal.

DP # 35-2002 *India, the European Union and Geographical Indications (GI): Convergence of Interests and Challenges Ahead* by Sachin Chaturvedi.

DP # 34-2002 *Towards an Asian Economic Community: The Relevance of India* by Nagesh Kumar.

DP # 33-2002 *Towards an Asian Economic Community: Monetary and Financial Cooperation* by Ramgopal Agarwala.

DP # 32-2002 *Towards an Asian Economic Community – Vision of Closer Economic Cooperation in Asia: An Overview* by Nagesh Kumar.

DP # 31-2002 *WTO and Indian Poultry Sector: Lessons from State Support Measures in Select Countries* by Rajesh Mehta.

DP # 30-2002 *Measuring Developments in Biotechnology: International Initiatives, Status in India and Agenda before Developing Countries* by Sachin Chaturvedi.

DP # 29-2002 *Persistence in India's Manufactured Export Performance* by Saikat Sinha Roy.

DP # 28-2002 *Status and Development of Biotechnology in India: An Analytical Overview* by Sachin Chaturvedi.

DP # 27-2002 *Foreign Direct Investment, Externalities and Economic Growth in Developing Countries: Some Empirical Explorations and Implications for WTO Negotiations on Investment* by Nagesh Kumar and Jaya Prakash Pradhan.

DP # 26-2002 *Infrastructure Availability, Foreign Direct Investment Inflows and Their Exportorientation: A Cross-Country Exploration* by Nagesh Kumar.

DP # 25-2002 *Intellectual Property Rights, Technology and Economic Development: Experiences of Asian Countries* by Nagesh Kumar

DP # 24-2002 *Potential of India's Bilateral Free Trade Arrangements: A Case Study of India and Thailand* by Rajesh Mehta.

DP # 23-2002 *Establishment of Free Trade Arrangement Among BIMST-EC Countries: Some Issues* by Rajesh Mehta

DP # 22-2001 *Product Standards and Trade in Environmentally Sensitive Goods: A study of South Asian Experience* by Sachin Chaturvedi and Gunjan Nagpal.

DP # 21-2001 *Perceptions on the Adoption of Biotechnology in India* by Biswajit Dhar.

DP # 20-2001 *Implementation of Article X of the Biological Weapons Convention in a Regime of Strengthened Intellectual Property Protection*, by Biswajit Dhar.

DP # 19-2001 *Indian Software Industry Development in International and National Development Perspective* by Nagesh Kumar.

DP # 18-2001 *Review of the WTO Agreement on Agriculture: The Current State of Negotiation* by Biswajit Dhar and Sudeshna Dey.

DP # 17-2001 *The Public-Private debate in Agricultural Biotechnology and New Trends in the IPR Regime: Challenges before Developing Countries* by Sachin Chaturvedi.

DP # 16-2001 *India-ASEAN Economic Co-operation with Special Reference to Lao PDR-India Economic Relations* by Mr. Thatsaphone Noraseng, Senior Officer, Institute of Foreign Affairs, Ministry of Foreign Affairs, Lao PDR.

DP # 15-2001 *India-Central Asian Republics Economic Co-operation with Special Reference to Kazakhstan – India Economic Relations* by N. Makhanov, Chief Economist, MoF, Republic of Kazakhstan.

DP # 14-2001 *WTO's Emerging Investment Regime and Developing Countries: The Way Forward for TRIMs Review and the Doha Ministerial Meeting* by Nagesh Kumar.

DP # 13-2001 *Post-Reforms Export Growth in India: An Exploratory Analysis* by Saikat Sinha Roy.

DP # 12-2001 *Indo-Japanese Trade: Recent Trends* by Rajesh Mehta.

DP # 11-2001 *Alternate Forms of Trading Arrangements in Indian Ocean Basin: Implications for India from IOR-ARC* by Rajesh Mehta and S.K. Mohanty.

- DP # 10-2001 *India's Trade in 2020: A Mapping of Relevant Factors* by Nagesh Kumar.
- DP # 9-2001 *Market Access for Industrial Sector in WTO Negotiations: An Agenda for Developing Countries* by Rajesh Mehta.
- DP # 8-2001 *China as No.1: Threat or Opportunity?* by Ramgopal Agarwala.
- DP # 7-2000 *Liberalization, Outward Orientation and In-house R&D Activity of Multinational and Local Firms: A Quantitative Exploration for Indian Manufacturing* by Nagesh Kumar and Aradhana Agarwal.
- DP # 6-2000 *Explaining the Geography and Depth of International Production: The Case of US and Japanese Multinational Enterprises* by Nagesh Kumar.
- DP # 5-2000 *Multinational Enterprises and M&As in India: Patterns and Implications* by Nagesh Kumar.
- DP # 4-2000 *Natural Resource Accounting: Economic Valuation of Intangible Benefits of Forests* by T.R. Manoharan.
- DP # 3-2000 *Trade and Environment Linkages: A Review of Conceptual and Policy Issues* by T.R. Manoharan, Beena Pandey and Zafar Dad Khan.
- DP # 2-2000 *WTO Regime, Host Country Policies and Global Patterns of Multina Enterprises Activity: Implications of Recent Quantitative Studies for India* by Nagesh Kumar.
- DP # 1-2000 *World Trade Organisation and India-Challenges and Perspectives* by V.R. Panchamukhi.