Introduction

Since the 1980s the South Asian countries have been growing faster than the rest of the world. However, the international environment is becoming more competitive and demanding. In addition, higher education and innovation are becoming more critical for countries to be able to benefit from the increasingly globalised international environment. Therefore, South Asian countries have to improve their skills and innovation capabilities. Here we will assess the position of South Asian countries and propose some of the key actions that they need to take to strengthen their technology and innovation capabilities to improve their economic performance and welfare.

This paper covers the five largest South Asian countries. They range from Sri Lanka and Nepal, which have around 20 million inhabitants each, to India, the second most populous country in the world with slightly more than 1 billion people. In terms of gross domestic product (GDP) per capita, four are in the World Bank’s low income category (per capita income less than US$765 in 2003) with Nepal at the very low income level, to Sri Lanka, which just makes it into the lower middle income category (US$766–3,035) (Table 5.1).

Each of the five has had rates of growth above the world average for the period 1980–90 and 1990–2003, with Pakistan having the highest rate of growth in the decade of the 1990s and India the highest in the 1990–2003 period (Table 5.2). In fact in the last years India has achieved a spectacular rate of growth of 8 per cent.
Table 5.1: Population, GDP, and Exports 2003

<table>
<thead>
<tr>
<th>Country</th>
<th>Population (Millions)</th>
<th>GDP (US$ Billion)</th>
<th>GDP/Capita</th>
<th>Merchandise Exports (US$ Millions)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bangladesh</td>
<td>138</td>
<td>55</td>
<td>400</td>
<td>6,942</td>
</tr>
<tr>
<td>India</td>
<td>1,064</td>
<td>571</td>
<td>540</td>
<td>55,982</td>
</tr>
<tr>
<td>Nepal</td>
<td>25</td>
<td>6</td>
<td>240</td>
<td>662</td>
</tr>
<tr>
<td>Pakistan</td>
<td>148</td>
<td>78</td>
<td>520</td>
<td>11,930</td>
</tr>
<tr>
<td>Sri Lanka</td>
<td>19</td>
<td>18</td>
<td>930</td>
<td>5,125</td>
</tr>
<tr>
<td>World</td>
<td>6,273</td>
<td>34,577</td>
<td>5,510</td>
<td>7,578,698</td>
</tr>
</tbody>
</table>


Table 5.2: Growth of GDP

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Bangladesh</td>
<td>3.7</td>
<td>4.9</td>
</tr>
<tr>
<td>India</td>
<td>5.7</td>
<td>5.9</td>
</tr>
<tr>
<td>Nepal</td>
<td>4.6</td>
<td>4.6</td>
</tr>
<tr>
<td>Pakistan</td>
<td>6.3</td>
<td>3.6</td>
</tr>
<tr>
<td>Sri Lanka</td>
<td>4.0</td>
<td>4.7</td>
</tr>
<tr>
<td>World</td>
<td>3.3</td>
<td>2.8</td>
</tr>
</tbody>
</table>


To put them in the global context it is instructive to compare their shares in the global population with those in global GDP and trade. Because they are low income countries, their share in global GDP is much lower than that in global population. At the higher end, Sri Lanka’s share in global GDP is 17 per cent of its share in population, while that of Nepal is just 5 per cent. With respect to exports, Sri Lanka’s share of global exports actually exceeds it share of global GDP by 40 per cent, indicating it is an export-driven economy. The shares of the four other countries range from just 44 per cent (India, the least export oriented) to 70 per cent (Pakistan). While the share of exports in global exports between 1990 and 2003 increased by 80 per cent for Bangladesh and 40 per cent for Sri Lanka and 45 per cent for India, Pakistan and Nepal just maintained their relative shares (Table 5.3).

Table 5.3: Percentage Share in World Totals

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Bangladesh</td>
<td>02.20</td>
<td>00.16</td>
<td>00.09</td>
<td>00.05</td>
</tr>
<tr>
<td>India</td>
<td>16.96</td>
<td>01.65</td>
<td>00.74</td>
<td>00.51</td>
</tr>
<tr>
<td>Nepal</td>
<td>02.36</td>
<td>00.23</td>
<td>00.16</td>
<td>00.16</td>
</tr>
<tr>
<td>Sri Lanka</td>
<td>00.30</td>
<td>00.05</td>
<td>00.07</td>
<td>00.05</td>
</tr>
</tbody>
</table>

Source: Computed from World Bank, 2005.
In terms of the share of exports of goods and services in GDP, only Sri Lanka, with 36 per cent, is above the world average of 24 per cent (Table 5.4). India is particularly low at just 14 per cent, in fact, one of the lowest in the world in spite of its considerable service exports particularly in the information technology services for which it is so well-known worldwide. With respect to merchandise exports, the majority in all countries are manufactured products. With the exception of India and Sri Lanka, the share of manufacture in merchandise exports exceeds the world average. However, only a very small percentage of them are high technology products.

### Table 5.4: Various Indicators of Trade Structure

<table>
<thead>
<tr>
<th>Export Goods and Services/GDP</th>
<th>Per Cent Manufactured Exports</th>
<th>Per Cent Hi-Tech in Manufactured Exports</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bangladesh</td>
<td>6</td>
<td>14</td>
</tr>
<tr>
<td>India</td>
<td>7</td>
<td>14</td>
</tr>
<tr>
<td>Nepal</td>
<td>11</td>
<td>17</td>
</tr>
<tr>
<td>Pakistan</td>
<td>16</td>
<td>20</td>
</tr>
<tr>
<td>Sri Lanka</td>
<td>29</td>
<td>36</td>
</tr>
<tr>
<td>World Average</td>
<td>19</td>
<td>24</td>
</tr>
</tbody>
</table>


### The New Competitive Context

The world is in what could be called a knowledge revolution. There has been a speed up in the production and dissemination of knowledge based, in part, on advances in information processing and communications technologies, as well more general advances in the science base and in ability to codify knowledge.

The rapid reduction of transportation and communications costs made possible by technological progress in all means of transportation and information technologies (IT), combined with liberalisation of trade in goods and services, are leading to a rapid increase in the volume of goods and services that are traded. Between 1990 and 2003, the share of imports and exports in GDP increased from 38 to 48 per cent of global GDP. In addition, 27 per cent of global value added is being produced by multinational corporations (MNCs), meaning that nearly one-third of world GDP is produced by corporations spanning multiple markets and national jurisdictions. This is actually an underestimate of the degree to which global production is interlinked because it does not include all the indirect effects through the integration of supply and distribution chains.

MNCs are also the key agent in the creation of knowledge since the resource and development (R&D) done by multinationals accounts for the large majority of R&D done by the private sector, and private R&D has become larger than public R&D as
a result of the decrease in global defense budgets that occurred after the end of the
cold war.

Combined with the trend toward liberalisation of product, service, and financial
markets, greater globalisation means increasing global competition. Capital markets
move capital to where they expect the highest risk adjusted returns, while MNCs
redirect their resources in line with the global dynamics of markets, driven by size and
growth potential, and the creation of endowments, among which knowledge stands
out. Thus, countries like China and India have become magnets in the creation of
major new platforms in the exports of production and services.

The nature of competitiveness is also changing. Traditionally, it was based on lower
capital or labour costs, or of other local inputs, including infrastructure services,
while also depending on the economic and business environment. Although these
fundamentals continue to play a key role, given the very rapid rate of development
and dissemination of new knowledge globally and the pressure to restructure, there
are important new elements, including the ability to:

- Rapidly redeploy resources in order to capture new opportunities.
- Ensure the quality, skills, and flexibility of labour force (and management).
- Keep up with rapidly changing technological and organisational advances.
- Move to higher value parts of value chain (research/design and marketing, branding,
  and managing of customer information).
- Make effective use of IT to reduce transactions costs and improve capacity to
  respond quickly to changing opportunities and threats.

As a result there is increased attention across countries on improving their overall
business environment and the flexibility and speed of their economies to respond to
rapidly changing circumstances, improving education and skills systems, and improving
their innovation systems and their information infrastructure. With the exception of
India, the South Asian countries are not so well placed to take advantage of these
changes in the competitive environment because they lack the critical mass of high-
skilled human resources and technological capability necessary to do so.

South Asian Countries in the Context of the Knowledge Economy

World Bank Knowledge Assessment Methodology

The World Bank Institute has developed a useful benchmarking tool that helps to
rank countries in terms of their readiness to use knowledge for their development.
The methodology consists of examining a country’s global rank ordering in four pillars. The four pillars are:

- An economic and institutional regime that provides incentives for the efficient use of existing and new knowledge and the flourishing of entrepreneurship; this is critical because it affects not only the incentive to improve performance, but also the ease with which better knowledge can be put into practice.
- An educated and skilled population that can create, share, and use knowledge well; this is critical because, as argued earlier, this is the key enabler to make effective use of knowledge as well as to produce it.
- A dynamic information infrastructure that can facilitate the effective communication, dissemination, and processing of information; this has become critical for access to knowledge and to reduce transactions costs.
- An efficient innovation system of firms, research centres, universities, consultants, and other organisations that can tap into the growing stock of global knowledge, assimilate, and adapt it to local needs, and create new technology.

The rationale for including the economic incentive and institutional regime as one of the pillars of the knowledge economy is that it sets the broader framework for the more structural pillars. In addition, an economy needs to have the flexibility to adjust to the rapidly changing opportunities created by the rapid development and dissemination of new knowledge. An effective economic and institutional regime that permits such rapid adjustment is critically important.

Knowledge Assessment Methodology (KAM) consists of a set of 80 structural and qualitative variables that serve as proxies for the four pillars (roughly 20 per pillar) that are critical to the development of a knowledge economy. The comparison is undertaken for a group of 128 countries that includes most of the developed Organisation for Economic Cooperation and Development (OECD) economies and more than 90 developing countries. A reduced index of the KAM called the knowledge economy index (KEI) based on three indicative variables in each of the four pillars has been developed to give a quick summary index of a country’s overall position.  

**Relative Position of South Asian Countries**

Figure 5.1 presents the KEI for the six developing regions, the Group of Seven and Western Europe, as well as some key developing countries and the five South Asian countries for which we have data. Several interesting aspects stand out. First, as a whole the developed countries (with the notable exception of Finland) have lost some of their relative ranking as some middle income countries have made faster
relative progress. Second, some developing countries such as Brazil, China and Jordan have made significant relative improvements. Other middle income countries such as Argentina and South Africa have lost ground.\(^5\)

South Asia does worse than the other developing regions except Africa. Within South Asia, India does the best, although it does not show any improvement over time. Its higher knowledge economy index is largely due to its high index on innovation (Figure 5.2 and Table 5.5, which give the breakdown in the composition of the indices and their change over time) given the large absolute size of scientists and
engineers in R&D as well as the absolute volume of scientific and technical publications.  

Sri Lanka is the second highest among the South Asian countries, and it shows some improvement over the period. The biggest improvement is in the economic incentive and institutional regime, where it gets the highest ranking among the South Asian group. It made significant improvements in the ICT index where it moves from second to first. While it makes a small improvement in the innovation index, it actually loses ground in the education variable even though it still remains the highest in education among the group.

Pakistan, Bangladesh, and Nepal all lose ground in the aggregate KEI. Most notable is the sharp fall in the economic incentive regime in Nepal which considerably pulls down its overall average. Nepal also loses in the information communications technologies (ICT) indicator. Pakistan also loses in the economic incentive, and in the ICT indicator as well as in the education indicator, and ends up with the lowest score among the group in the latter. Bangladesh slips most in the innovation index and also slips in the economic incentive regime, but makes some gains in the ICT and a smaller gain in the education index.
See the Appendix 5.1 for individual basic scorecards with changes between the
two periods for each of the countries. The appendix also includes more detail data
on the economic incentive and institutional regime as well as the information and
communications indicators because they are not the main focus of this paper.

Global Trends in Education and the Situation
of South Asian Countries

Global Trends in Education and Training

Education is the fundamental enabler of the knowledge economy. Well-educated
and skilled people are key to creating, sharing, disseminating, and using knowledge
effectively. Critical is no longer just basic or even secondary education, but higher
education and the constant upgrading of skills. This is a challenge for all countries.
There is also increasing competition for people with high-level skills, which makes
their education and effective employment a central aspect of development strategy.

The development of a knowledge economy demands a flexible education system.
It begins with basic education that provides the foundation for learning; continues
with secondary and tertiary education that develops core, including technical, skills;
and encourages creative and critical thinking that is key to problem solving and
innovation, extending into a system of lifelong learning. Such a system is one that
encompasses learning from early childhood to retirement and includes formal training (schools, training institutions, and universities) and non-formal learning (on-the-job training, and skills learned from family members or people in the community). The basic elements of such a system are comprehensiveness, new basic skills (acting autonomously, using tools interactively, and functioning in socially heterogeneous groups), multiple pathways, and multiple providers.

Thus, the knowledge revolution means that higher levels of education are needed to keep up with and make effective use of rapidly changing knowledge. It also means that high-level scientific and technical manpower is needed to create new knowledge. But because the half life of knowledge is getting shorter and there are new skills to learn, it also means that there is a need for a system of continuous training in order to constantly upskill or reskill people who have already passed through the formal educational system.

Countries are, therefore, paying more attention to education as part of their development and competitiveness strategy, putting great efforts into increasing the levels of educational attainment. Between 1990-1 and 2002-3, for instance, enrolment rates at the secondary level increased from 55 to 71 per cent and from 16 to 26 per cent at the tertiary level. For high-income countries, in particular the increases, were from 94 to 107 per cent and from 47 to 66 per cent for the secondary and tertiary levels, respectively. For Korea, an economy that has traditionally placed a very high value on education and is now well known as a knowledge economy, the increase in tertiary enrolment rates was from 39 to 85 per cent, which put it second only to Finland (with 86 per cent), the other well-known knowledge-based economy (World Bank, 2005).

Related to the need to keep up with new skills and functions – in computer literacy, communication skills, and the ability to work in groups, is the need for constant upskilling and reskilling of persons who have already left the formal educational system. This is reflected in the very high percentage of adults who are taking additional courses at work, in specialised institutions, or even going back to tertiary institutions for formal education (in Finland, this is true for more than 50 per cent of adults). This is also reflected in the number of students at universities who are older than the typical university age cohort of 18–24 years old. In the United States, more than 40 per cent of undergraduates are over 25 years of age. In Australia, New Zealand, Denmark, Norway, and Sweden, more than 20 per cent of first-time entering students were over the age of 27 in 2000.

In addition there is a trend for an increasing number of private educational institutions all the way from nursery schools to the university level that have arisen to fill in the needs not adequately addressed by public education. Firms are undertaking increasing amounts of in-house training to give their workers the skills they need to compete. In addition, some of the larger firms are even setting-up their own
in-house universities to provide the most advanced specialised skills needed to be competitive. Firms are also more proactive in approaching universities and specialised training centres to get them to develop specific training programmes to meet their needs.

Equally noteworthy is the increasing use of information-based technologies, which has been gathering speed as the technology has improved and more experience acquired on its use. In the United States, 16 per cent of tertiary-level students are taking at least one course online, and 40 per cent of those are full-time online. E-learning is expanding very rapidly and much is being provided by nontraditional universities (new entrants, including publishers and mass media). E-education, by crossing boundaries, has also facilitated the internationalisation of education. In 2005, there were 2.1 million students in tertiary education outside their home countries, which combined with a growing tendency for foreign universities to set up facilities abroad, is increasing competition in the education sector worldwide.

Finally, there is also increasing competition for high level human capital across countries because there is clear understanding that to be globally competitive and to be able to innovate, countries need high-level human resources. It is telling, for example, that while there is no free trade in labour, the exception is for highly trained persons, where even the US has had more liberal immigration policies and developed a programme for the temporary immigration of specialised manpower in the ICT sector.

**Education and Skills in South Asian Countries**

South Asian countries are in a weak position in terms of education and skills. As a group they have high illiteracy rates, low enrolment ratios at the secondary and tertiary levels, very low average educational attainment among the adult population, extremely low percentage of professional and technical workers among the labour force, low quality of math and science education, little staff training even among firms in the modern sector, and a very serious problem of emigration of the highly skilled workers.

As can be seen from the spider charts (Figure 5.3) for individual countries there is considerable variations among the five countries. Nepal and Bangladesh are much weaker on all the variables. Pakistan ranks somewhat better. Sri Lanka and India score much higher. Sri Lanka has the highest literacy, enrolment rates, and average educational attainment.

However, India is ranked higher in terms of the quality of science and math education, extent of staff training, and availability of management education. India has the world-renowned Indian Institutes of Technology and Indian Institutes of Management, which produce world-class graduates. These institutes, along with many other lesser known regional colleges, have given India a critical mass of highly skilled
### South Asia, Normalisation Group: All

- **Adult Literacy Rate (% age 15 and above)**: 57.06
- **Average Years of Schooling**: 4.16
- **Secondary Enrolment**: 49.16
- **Tertiary Enrolment**: 8.18
- **Life Expectancy at Birth, Years**: 64.56
- **Internet Access in Schools**: 2.88
- **Public Spending on Education as % of GDP**: 6.00
- **Prof. and Tech. Workers as % of the Labor Force**: 3.78
- **Quality of Science and Math Education**: 3.15
- **Extent of Staff Training**: 4.22
- **Availability of Management Education**: 2.40
- **Well Educated People do Not Emigrate Abroad**: 2.59

### South Asia, Normalisation Group: India

- **Adult Literacy Rate (% age 15 and above)**: 61.03
- **Average Years of Schooling**: 5.06
- **Secondary Enrolment**: 48.47
- **Tertiary Enrolment**: 10.58
- **Life Expectancy at Birth, Years**: 63.20
- **Internet Access in Schools**: 3.80
- **Public Spending on Education as % of GDP**: 5.50
- **Prof. and Tech. Workers as % of the Labor Force**: 3.80
- **Quality of Science and Math Education**: 3.80
- **Extent of Staff Training**: 5.70
- **Availability of Management Education**: 2.83
- **Well Educated People do Not Emigrate Abroad**: 2.83

### South Asia, Normalisation Group: Bangladesh

- **Adult Literacy Rate (% age 15 and above)**: 47.10
- **Average Years of Schooling**: 3.88
- **Secondary Enrolment**: 25.81
- **Tertiary Enrolment**: 3.55
- **Life Expectancy at Birth, Years**: 63.80
- **Internet Access in Schools**: 3.00
- **Prof. and Tech. Workers as % of the Labor Force**: 2.60
- **Quality of Science and Math Education**: 3.00
- **Extent of Staff Training**: 4.10
- **Availability of Management Education**: 4.10
- **Well Educated People do Not Emigrate Abroad**: 2.48

### South Asia, Normalisation Group: Pakistan

- **Adult Literacy Rate (% age 15 and above)**: 44.01
- **Average Years of Schooling**: 3.88
- **Secondary Enrolment**: 25.81
- **Tertiary Enrolment**: 3.55
- **Life Expectancy at Birth, Years**: 63.80
- **Internet Access in Schools**: 3.00
- **Prof. and Tech. Workers as % of the Labor Force**: 2.60
- **Quality of Science and Math Education**: 3.00
- **Extent of Staff Training**: 4.10
- **Availability of Management Education**: 4.10
- **Well Educated People do Not Emigrate Abroad**: 2.48

### South Asia, Normalisation Group: Nepal

- **Adult Literacy Rate (% age 15 and above)**: 92.08
- **Average Years of Schooling**: 6.87
- **Secondary Enrolment**: 80.77
- **Tertiary Enrolment**: 5.32
- **Life Expectancy at Birth, Years**: 73.60
- **Internet Access in Schools**: 2.90
- **Prof. and Tech. Workers as % of the Labor Force**: 9.60
- **Quality of Science and Math Education**: 4.20
- **Extent of Staff Training**: 4.10
- **Availability of Management Education**: 3.50
- **Well Educated People do Not Emigrate Abroad**: 2.26

### South Asia, Normalisation Group: Sri Lanka

- **Adult Literacy Rate (% age 15 and above)**: 92.08
- **Average Years of Schooling**: 6.87
- **Secondary Enrolment**: 80.77
- **Tertiary Enrolment**: 5.32
- **Life Expectancy at Birth, Years**: 73.60
- **Internet Access in Schools**: 2.90
- **Prof. and Tech. Workers as % of the Labor Force**: 9.60
- **Quality of Science and Math Education**: 4.20
- **Extent of Staff Training**: 4.10
- **Availability of Management Education**: 3.50
- **Well Educated People do Not Emigrate Abroad**: 2.26

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**Figure 5.3: Education Scorecards for South Asian Countries**
Improving Technology, Skills and Innovation in South Asia

people. These high quality English-speaking human resources are a large part of the reason why India has been able to develop the information technology export services that have moved up from simpler back office functions and call centres to software design and innovation services. Many of the highly skilled Indians have immigrated to the United States and Europe in search of higher paying jobs. However, some of this brain drain has been turned into a brain gain as they have started to outsource highly skilled services from India. 10

This strong high-skilled ICT service sector has not developed in the other South Asian countries because of their smaller scale and less prevalence of English in their education systems. However, this is a very small sector in India relative to its total population, and that the average levels of educational attainment in India are very low. Therefore, improving education and skills is a challenge for all the South Asian countries.

Global Trends in Innovation and Situation of South Asian Countries

Global Innovation Trends

Innovation is becoming a critical element of competitiveness and growth as there is greater mobility of factors, products, services, and knowledge. A larger percentage of a country’s economic growth can be attributed to more effective use of knowledge, even in developed countries. Countries behind the global frontier can dramatically increase their performance by improving their ability to innovate.

Expenditures on R&D globally have been increasing, particularly the share contributed by the productive sector. In OECD countries the share of R&D in GDP averages around 2.2 per cent and 70–80 per cent is undertaken by the private sector. In developing countries the share of R&D in GDP tends to average below 1 per cent, and 70–90 per cent tends to be undertaken by the public sector. The R&D effort undertaken by private firms is oriented toward commercially relevant applications, while the R&D effort undertaken by the government is usually more oriented toward basic knowledge and military research. As noted earlier, MNCs are the main producers of commercially oriented knowledge and they are also the main disseminators of such knowledge throughout the world. That is why it is important for developing countries to attract foreign investment that is relevant to their development strategies.

The innovation system plays an important role in acquiring, creating, adapting, and disseminating knowledge, which is crucial for success in the knowledge economy. It consists of the network of institutions, rules, and procedures that affect how the country acquires, creates, disseminates, and uses knowledge. Innovation in a developing
country does not just concern domestic development of knowledge on the global frontier. It also concerns the application and use of existing knowledge to the local context. For the countries of South Asia, which are still far behind the global frontier in many sectors, tapping into and making effective use of existing global knowledge will have a greater economic impact than directing most of its resources to develop frontier knowledge, no matter how prestigious the latter may be.

The concept of innovation encompasses not only technological innovation, that is, diffusion of new products and services of a technological nature into the economy, but equally includes nontechnological forms of innovation, such as organisational innovations. The latter includes the introduction of new management or marketing techniques, adoption of new supply or logistic arrangements, and improved approaches to internal and external communications and positioning.

The concept of a national innovation system rests on the premise that understanding the linkages among the various actors involved in innovation are key to improving a country’s technology performance. These actors include private enterprises, universities, research institutes, think tanks, and consulting firms. The innovative performance of a country depends to a large extent on how these actors relate to each other as elements of a broader system. Linkages can take the form of joint research, personnel exchanges, cross patenting, licensing of technology, purchase of equipment, and a variety of other channels.

**Innovation in South Asian Countries**

As a region the South Asian countries do better on the innovation pillar than on any of the others, and that is largely because of the capabilities of the large countries, India in particular, but also Pakistan and to a lesser extent Bangladesh. The main strength comes from the large absolute number of scientist and engineers in R&D as well as the number of scientific and technical journal articles. Bangladesh also has a strength in the very high science and engineering enrolment ratios in higher education, although that is diluted by the very low tertiary enrolment rates (Figure 5.4).

Another area of relative strength is a strong state of cluster development, although this is mostly concentrated in India (where it includes not just IT services but pharmaceuticals, textiles, and metal engineering industries), Pakistan (medical instruments, sporting goods, textiles, and garments), and Sri Lanka (textiles and garments).

The overall formal R&D effort of the South Asian countries is very small. R&D expenditures as a share of GDP average 0.48 per cent, with a high of only 0.78 per cent in India. In general, the vast majority of the research done in the South Asian economies is done in public R&D laboratories. An area where India shows some strength though is in patenting. India has a large public research network and recently
Improving Technology, Skills and Innovation in South Asia

South Asia (Most Recent), Normalisation Group: All

- Gross Foreign Direct Investment as % of GDP (0.66)
- (2.83) Private Sector spending on R&D
- (1.45) High-Tech Exports as % of Manuf. Exports
- (3.83) State of Cluster Development
- (0.14) Patent Applications Granted by the USPTO / mil. pop.
- (90.25) Patent Applications Granted by the USPTO
- (2.90) Availability of Venture Capital
- (3.75) Admin. Burden for Start-Ups
- (3.76) Scientific and Technical Journal Articles / mil. pop.
- (1953.00) Scientific and Technical Journal Articles
- (48.16) Cost to Enforce a Contract (% of GNI per capita)
- (75.28) Cost to Register a Business (% of GNI per capita)

India (Most Recent), Normalisation Group: All

- Gross Foreign Direct Investment as % of GDP (0.60)
- (5.50) Private Sector spending on R&D
- (5.00) High-Tech Exports as % of Manuf. Exports
- (4.10) State of Cluster Development
- (0.33) Patent Applications Granted by the USPTO / mil. pop.
- (355.00) Patent Applications Granted by the USPTO
- (3.80) Availability of Venture Capital
- (4.00) Admin. Burden for Start-Ups
- (9217.00) Scientific and Technical Journal Articles
- (95.00) Cost to Enforce a Contract (% of GNI per capita)
- (49.80) Cost to Register a Business (% of GNI per capita)

Bangladesh (Most Recent), Normalisation Group: All

- Gross Foreign Direct Investment as % of GDP (0.20)
- (2.30) Private Sector spending on R&D
- (0.20) High-Tech Exports as % of Manuf. Exports
- (3.20) State of Cluster Development
- (0.01) Patent Applications Granted by the USPTO / mil. pop.
- (1.00) Patent Applications Granted by the USPTO
- (2.00) Availability of Venture Capital
- (3.30) Admin. Burden for Start-Ups
- (1.15) Scientific and Technical Journal Articles / mil. pop.
- (148.00) Scientific and Technical Journal Articles
- (48.20) Cost to Enforce a Contract (% of GNI per capita)
- (75.50) Cost to Register a Business (% of GNI per capita)
Figure 5.4: Innovation Scorecards for South Asian Countries
Improving Technology, Skills and Innovation in South Asia

there have been some reforms which are strengthening the incentive regime to produce more commercially relevant output.

The private sector, with the exception of some of the larger Indian groups, does very little research. In addition, the relatively little research done by the public sector is not commercially relevant, and there are poor mechanisms to get it out to the productive sectors. It is also generally quite burdensome to start up new businesses, particularly technology-based business that also face the additional challenge or raising funds for risky new technology projects. The overall business environment is somewhat more supportive in Sri Lanka.

Another area of weakness of the innovation system in South Asian countries is the poor links between university and company researchers. This is a little stronger in India than in the other countries, but is still quite weak by the standards of developed countries.

However, it should be noted not all innovations are done through formal research. In all countries there are informal innovation efforts. In India some of this effort is being collected through an organisation called the Honey Bee network, which has documented more than 12,000 small indigenous innovations, mostly in the agricultural sector. Furthermore, the government is beginning to pay attention to supporting and scaling up this indigenous effort.

All five countries with a partial exception of Sri Lanka, however, do not draw very much on global knowledge. This is revealed by the very low share of foreign direct investment to GDP, which is just a fraction of 1 per cent for all countries except Sri Lanka (where it is 1.4 per cent) and by very low formal purchase of foreign technology as shown by very low royalty or licensing fee payments (US$0.33 per person in India where it is the highest followed by US$0.12 in Pakistan, and virtually nil in the others). This contrasts with the situation of East Asian countries where the average share of gross direct foreign investment as a share of GDP is 8.26 per cent, and the average royalty and licensing fees per population are US$30.82.

In addition, again with the exception of Sri Lanka, the share of manufactured trade (imports and exports as proxy for access to embodied knowledge and pressures to keep up with global technology) in GDP is less than 25 per cent (and in India it is only 13 per cent) compared to an average of 99 per cent for East Asian countries.

In short, although the South Asian countries do relatively better on the innovation pillar than on the other, they still have relatively small R&D effort relative to their needs. Also, the little that they do is not well integrated into the production system. In addition, as will be stressed under, they have a majority of the population in traditional subsistence sectors of the economy, and very little of this effort gets out to them except for some work on agricultural research and extension. Finally, these countries are not drawing very much or very effectively on the rapidly growing stock of global knowledge.
Overall Assessment

The South Asian countries are significantly behind the global frontier in education and innovation and ICT. While their GDP growth has been higher than the world average, they also have high population growth rates. Competing on the international stage is becoming more demanding.

There is considerable diversity among the five South Asian countries analysed in this paper. India is clearly ahead in its skills, technology, and innovation capability because of its much larger size and the critical mass in the absolute number of highly skilled population; number or researchers in R&D, resources allocated to R&D, and the vast network of public research laboratories, universities, and large private companies that are already undertaking research. Nepal is at the other extreme because of its very small population, much lower per capita income, and much less-developed technology infrastructure.

Keeping in mind these differences in scale and in the degree of development of their human and technological infrastructure, there are still some generic actions that all the countries can take. These will be treated under five headings, although the details under each will have to be adjusted to the specificities of each country. However, there is an overriding reality that cuts across all these recommendations that needs to be addressed. It is that in all South Asian countries the modern sector is just a small part of their economies. Two-thirds or more of their population are rural, and agriculture is still a large part of economic activity. The share of agriculture in GDP ranges from 19 per cent in Sri Lanka to a high of 41 per cent in Nepal, compared to the world average of just 4 per cent. In addition, with the exception of Sri Lanka (where it is only 8 per cent) the share of the population below US$1 a day is in the double digits, ranging from 13 per cent in Pakistan to 38 per cent in Nepal. Furthermore, the South Asian countries have very high illiteracy rates ranging from 29 to 50 per cent for males and from 51 to 74 per cent for females (Table 5.6).

<table>
<thead>
<tr>
<th>Country</th>
<th>Rural</th>
<th>Agricultural</th>
<th>Below US$1/Day</th>
<th>Illiteracy, Male/Female</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bangladesh</td>
<td>73</td>
<td>22</td>
<td>36</td>
<td>50/69</td>
</tr>
<tr>
<td>India</td>
<td>72</td>
<td>22</td>
<td>35</td>
<td>32/55</td>
</tr>
<tr>
<td>Nepal</td>
<td>87</td>
<td>41</td>
<td>38</td>
<td>38/74</td>
</tr>
<tr>
<td>Pakistan</td>
<td>66</td>
<td>23</td>
<td>13</td>
<td>–</td>
</tr>
<tr>
<td>Sri Lanka</td>
<td>76</td>
<td>19</td>
<td>8</td>
<td>29/51</td>
</tr>
<tr>
<td>World Average</td>
<td>51</td>
<td>4</td>
<td>–</td>
<td>20/27</td>
</tr>
</tbody>
</table>

This means that there needs to be a massive effort to increase the educational and technological level of the large population that is still not integrated into the modern sector. This population tends to be largely the rural population, although it also includes
a large portion of the urban population eking out a marginal subsistence in urban slums in the informal urban sector. This will be a major focus of policy action and will be built into the recommendations for actions that follow. An additional recommendation will be the value of networking and cooperation among the South Asian countries.

### Key Actions

#### Improving the Economic Incentive and Institutional Regime

Although Sri Lanka does better than the others, South Asian countries need to improve their economic and institutional regime. This includes increasing the depth and flexibility of capital and labour markets, strengthening social safety nets and competition policy, and improving governance and the rule of law, all of which are part of the basics of development. From the knowledge economy perspective, an additional area that needs to be improved is participation in international trade. Imports of capital goods, components, and products embody much knowledge. Exports also force companies to reduce costs and improve quality, which stimulates greater technological effort. With the exception of Sri Lanka, where the ratio of exports and import of goods to GDP is 57 per cent, the share of trade in goods to GDP is below the weighted world average of 42 per cent in 2003. The share in India is one of the lowest in the world at only 21 per cent (World Bank, 2005). India is missing out in the benefit of specialisation and exchange and access to global knowledge. China, where the trade in goods is 60 per cent of GDP, has benefited greatly from this greater global integration. Clearly there is room to lower tariff and non-tariff barriers in the South Asian economies to create more competitive pressure to improve performance as well as to get greater access to embodied global knowledge.

#### Strengthening Education and Skills

As noted earlier, education and skills are critical for countries to be able to make effective use of new knowledge, let alone to develop new knowledge. Here the challenges for South Asian countries are enormous. They have five challenges:

- Expand literacy. All five countries have female illiteracy rates over 50 per cent and male illiteracy rates from 29 to 50 per cent. Clearly they all have to undertake major literacy drives.
- Expand basic formal education to the large number of children not in school and who drop out. Primary enrolment rates are still less than 100 per cent, and primary completion rates are even lower. The share of first grade students reaching the
fifth grade is only 61 per cent for males and 65 per cent for females (World Bank, 2005). At the same time they have to expand secondary education. Secondary enrolment rates average just 49 per cent.

- Expand higher education where enrolment rates average just 6 per cent compared to a world weighted average of 26 per cent.
- Improve the quality of education at all levels. Most countries have outdated curriculums and do not teach the basic skills needed by students to continue to learn throughout their lives no matter at what level they leave formal education.
- Develop ways of effectively retraining adults who have left formal education, but need new skills demanded by rapidly changing technology.

Hard choices of priorities on budget allocations will be needed to be made as public sector budgets are clearly insufficient. Moreover, it is necessary to move on the various fronts as they are all critical and none can be completely unattended. Thus, ways have to be found to make more resources available for the challenge.

Three types of actions can be helpful. First, increase efficiency in the use of existing budgets. In all countries there are many inefficiencies and waste in educational expenditure. Better monitoring and incentive mechanism need to be put in place.

Second, make effective use of the private sector. This includes charging tuition for private education, particularly at the higher educational level. China, for example, has increased enrolments at the entering class at the tertiary level by 50 per cent per year since 1997 and has been able to increase the enrolment rates from 6.5 per cent in 1997 to 21 per cent today. It did this in part by raising student tuitions to cover from 25 to 40 per cent of public tertiary education costs. It also includes allowing entry of private providers of education, again especially at the higher education level since the government has the obligation to provide basic education as a public good. In China there are now more than 4 million students in non-government institutions.

Third, use the potential of new technologies to extend access and improve quality of education. In India, for example, Tata Consulting has developed a computer-based functional literacy program based on a multimedia program with animated characters and voiceover that allows students to acquire a 300 to 500 word vocabulary in their own language or dialect in 30 to 45 hours. It is being piloted successfully in Andhra Pradesh and has the potential to help make a large proportion of India functionally literate in just a few years. There is also great potential to add new Internet- and satellite-based educational delivery mechanism to more traditional radio- or television-based distance education programmes.

Tapping into Global Knowledge

All five countries could do better at tapping into global knowledge in addition to
greater trade with the rest of the world. All could benefit by trying to attract more
direct foreign investment. India in particular has great potential. Surveys of investors
such as those done by A.T. Kearny find that executives rank India as a top potential
destination.

However, little of this investment materialises for various reasons. One is that
many sectors are still reserved for the state and other are only partially open. The
second is the poor power and road infrastructure. The latter, in particular, inhibits
investments that have to move goods in and out of the country. By contrast, investment
in the services area that need only good Internet bandwidth such as back-office
functions, call centres, engineering services, and software are not as inhibited because
all they really need are good telecommunications and backup power. Liberalisation
of foreign investment restrictions and more proactive policies to attract foreign
investment need to be put in place. Recall that the MNCs are the main producers and
disseminators of applied knowledge.

South Asian countries also are not very active in purchasing foreign technology.
Licensing payments per million population are extremely low, compared to East
Asian countries (average of US$0.16 in South Asia versus US$30.82 average in East
Asia). Overly restrictive technology transfer policies that inhibit purchase of foreign
technology need to be relaxed.

Another means of tapping into foreign knowledge that needs to be strengthened
is attracting back nationals who have gone abroad for studies and have acquired not
only academic knowledge but practical experience from working in foreign countries.
All the South Asian countries have a significant diaspora that can be tapped. Economies
such as Korea and Taiwan started doing this decades ago with great success. China
has also launched major programmes to attract its diaspora by offering attractive
incentives and special hi-tech parks dedicated exclusively for returning nationals. While
India has begun to do some of this, it is still far behind China, and other countries in
South Asia are even further behind.

Finally, much more can be done by South Asian countries to take advantage of the
extensive amount of technical information and knowledge that can be tapped through
technical publications and databases, especially now with the advent of the Internet.
Some of the issues here are how to reap economies of scale in subscriptions to and
dissemination of such information.

Creating Knowledge

As noted, the five South Asian countries, with the partial exemption of India, are
relatively weak in creating knowledge. Part of the reason for that is the still relatively
weak pressure for improving performance for the economy as they generally are less
open to international trade (although Sri Lanka is an exception here). It could be
argued that they all need to increase expenditures on research and development. However, before pushing for an increase in public resources for R&D (as the bulk of spending is currently done by the government) it would be appropriate to improve the use of the resources that are currently being allocated. The productivity of the public resources allocated to R&D is very low. It is necessary to improve the efficiency in the allocation of public resources to R&D.

Some of the mechanisms that should be strengthened in the allocation of public funds for research are competitive bidding, peer review, and more monitoring and accountability in the use of the funds. In addition, it is necessary to improve the micro incentive regimes in the public R&D laboratories to that they use their resources more efficiently to focus on the needs of the respective economies.

It is also necessary to get the private sector to do more research of its own. Increasing competitive pressure in the economies should help. In addition, the government should stimulate more private research by strengthening various incentive mechanisms including matching R&D grants, tax subsidies for increases in R&D, and special programmes to foster collaboration between public R&D laboratories, private firms, and universities (for example, by earmarking some of the matching grants for programmes that actually involve such collaborations).

The latter should also include a review to remove disincentives for university researchers to do collaborative work with industry. Instead there should be strong incentives for public laboratory and university researchers to work with industry by allowing them to share in the benefits of the technologies developed through consultancy contracts and profit sharing in royalties. There should also be a special emphasis on publicly funded research to address the needs to the very large part of the population in all these countries that still live at close to the subsistence level. These should include preventive health programmes as well as programmes to help them make more effective use of their limited resources, as well as how to extend to them the benefits of information technology by developing low-cost ICT solutions for them.

In all countries more can be done to set up special mechanisms and institutions to foster greater technology spin off from public research laboratories and universities. These mechanisms should include technology transfer offices in the public laboratories and universities, science-based industrial parks, and business incubator programmes. These will make more sense in the larger economies such as India, Pakistan, and Bangladesh than in Nepal and Sri Lanka, although Sri Lanka is making efforts in this direction even in spite of its small size. In addition for the start up of new technology-based firms, it is necessary to help these firms to develop realistic business plans and provide them assistance in getting capital as it is very difficult for start ups with no assets to get loans from the banking sector.

It is also necessary to integrate these policies to allocate more resources to research and to strengthen the research infrastructure and collaboration among the main
innovation agents with policies to develop the high-level scientific, engineering, and technical persons who are to create new knowledge. This should also include strengthening business and entrepreneurship programmes for scientists and engineers so that they are more attuned to identifying business opportunities.

The governments also have to strengthen programmes to support grass root innovations and to support the scale up and broader dissemination of these innovations, as is being done by the Indian government.

**Disseminating Existing Knowledge, Especially to the Very Large Traditional Sectors in Each Country**

This is perhaps the most important area given to the very large percentage of the total population in these economies that has not yet benefited from the modern economy. In addition, this does not have the risk involved in the creation of new knowledge. It is the application and adaptation of already existing knowledge. In some cases there is the issue of purchasing existing proprietary knowledge. However, there is a tremendous amount of knowledge in the public domain that is not being used. This may be due to lack of information on its existence, lack of understanding of its relevance, lack of education or skills to make use of it, or lack of access to complementary inputs or supporting infrastructures and institutions to use it efficiently. A combination of these factors explains why it is not so easy for developing countries to catch up with developed countries, or for poor people to use knowledge that may be very relevant for them. The most relevant actions to address the lack of use of knowledge differ according to the nature of the problem (Table 5.7). They range from the more straightforward action of increasing access to information to the need to build up domestic institutions and domestic capabilities in terms of people's skills and ability to make effective use of knowledge.

But while it is easy to say this needs to be done, it is quite difficult in practise. There are various mechanisms that need to be strengthened to disseminate knowledge. They include technical information services; extension services in agriculture, industry, and services; productivity organisations; and strengthening the metrology, standards, and quality control infrastructure. These should be given stronger priority than they are usually given by most governments that tend to focus too much on developing new knowledge rather than supporting the broader dissemination of knowledge to the large population in their economies who are still in the traditional sectors.

The kinds of knowledge that are needed for development are not just hard technical knowledge such as how to manufacture engines or produce steel or fertilizers or petrochemicals. Also important are organisational and managerial knowledge: how to set up transportation or distribution systems, and not just for goods but also for services. Some examples are how to set up effective tax collection and revenue
Networking and Collaboration Among South Asian Countries

A sixth action recommendation is to set up a system for networking and collaboration among the South Asian countries in the areas of education and training as well as in technology and innovation. As noted, in spite of their differences, there are many generic actions similar across the South Asian countries, and all the countries share the need to find more effective ways to extend education and technology to the large part of their population outside the modern economy. Sharing the experiences that each country has in dealing with the issues identified would be very beneficial to others.

In addition countries that are less advanced in a particular area could learn from those that have more experience of successful programmes in that area. There is also scope for collaboration across countries in tackling similar issues, and even in doing joint research on common problems. An excellent example of such knowledge sharing across a region as well as a formal framework for joint research is given by the European Union's programme in education and in research.

In 2000, the European Union set itself the ambitious target of becoming the most competitive and dynamic knowledge-based economy of the world by 2010. To achieve this the European Union developed number of programmes to transform education and training. These include sharing of experiences and working toward

<table>
<thead>
<tr>
<th>Nature of the Problem</th>
<th>Actions to Solve the Problem</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lack of information of existence of knowledge</td>
<td>• Provide more technical information through print, radio, television, and Internet</td>
</tr>
<tr>
<td>Lack of understanding of its relevance</td>
<td>• Educate people on the value and relevance of different types of knowledge and how to look for an access to it</td>
</tr>
<tr>
<td>Lack of education or skills to be able to use it</td>
<td>• Beyond general education train people with the specific skills necessary to use the knowledge</td>
</tr>
<tr>
<td>Lack of access to complementary inputs or supporting infrastructures and institutions to be able to use it</td>
<td>• Provide easier access to finance</td>
</tr>
<tr>
<td></td>
<td>• Provide extension services and other technical assistance to demonstrate the proper use of the new knowledge and to support its application; remove regulations that make it difficult to access the knowledge or to start up new business or activities with it</td>
</tr>
<tr>
<td></td>
<td>• Provide a supportive environment in terms of good rule of law and contract, and enforceability of contracts</td>
</tr>
</tbody>
</table>
common goals and learning from what works best elsewhere. It also includes programmes to encourage mobility of students teachers and researchers within the European Union and with outside countries, as well as programmes for mutual recognitions of degrees.

The European Union has even more ambitious collaboration programmes in the area of research. The Sixth Framework Programme for Research was launched in 2002 with a budget of £17.5 billion (about 5.5 per cent of the total R&D effort), and was subsequently increased to £19.2 billion, to foster joint research across countries and between firms, universities, and enterprises and includes the creation of 25 technology platforms as well as an open method of coordination to contribute to policy learning and policy integration by encouraging and facilitating mutual exchange of knowledge and best practice.14

The European Union’s programmes are extremely ambitious and may be to more than what is feasible at the current time for South Asian countries, because South Asian countries do not yet have the formal integration of the European community. However, these programmes do indicate the importance of cross-country collaboration and learning within a region, as well as the rationale for funding of research across national boundaries. Clearly it would make sense to start some of this cross-country sharing of experience and learning among the South Asian countries, and even consider some more formal exchange and joint-funding programmes.

In conclusion, there is a great need to upgrade technology, skills, and innovation in South Asian economies to help improve their productivity and growth potential and to increase the welfare of their people. Fortunately, there is useful experience of the kinds of policies, mechanisms, and institutions that can be used to do this. The first thing that is needed is to raise awareness among policymakers, the business community, and the population at large of what can be done. The second step is to launch some concrete programmes that begin to make a difference in order to demonstrate what can be done. The third is to publicise the scale up of the successful project.
Appendix 5.1

Basic Scorecards for South Asia and Five Countries

South Asia (most recent and 1995), Normalisation Group: All

GDP Growth (%) (4.42)
Internet Users per 10,000 People (87.13)
Computers per 1,000 People (6.34)
Telephones per 1,000 People (48.84)
Tertiary Enrolment (6.18)
Secondary Enrolment (49.16)
Adult Literacy Rate (% age 15 and above) (57.06)
Patent Applications Granted by the USPTO (90.25)

India (most recent and 1995), Normalisation Group: All

GDP Growth (%) (5.80)
Internet Users per 10,000 People (174.86)
Computers per 1,000 People (7.20)
Telephones per 1,000 People (71.00)
Tertiary Enrolment (10.58)
Secondary Enrolment (48.47)
Adult Literacy Rate (% age 15 and above) (61.03)
Patent Applications Granted by the USPTO (355.00)

Bangladesh (most recent and 1995), Normalisation Group: All

GDP Growth (%) (5.20)
Internet Users per 10,000 People (17.98)
Computers per 1,000 People (3.40)
Telephones per 1,000 People (15.60)
Tertiary Enrolment (6.07)
Secondary Enrolment (46.88)
Adult Literacy Rate (% age 15 and above) (41.09)
Patent Applications Granted by the USPTO (1.00)
<table>
<thead>
<tr>
<th>Country</th>
<th>GDP Growth (%)</th>
<th>Internet Users per 10,000 People</th>
<th>Computers per 1,000 People</th>
<th>Telephones per 1,000 People</th>
<th>Tertiary Enrolment</th>
<th>Secondary Enrolment</th>
<th>Adult Literacy Rate (% age 15 and above)</th>
<th>Patent Applications Granted by the USPTO</th>
<th>Scientific and Technical Journal Articles</th>
<th>Researchers in R&amp;D</th>
<th>Rule of Law</th>
<th>Regulatory Quality</th>
<th>Tariff and Nontariff Barriers</th>
<th>Human Development Index</th>
<th>Tariff and Nontariff Barriers</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Pakistan</strong></td>
<td>(3.80)</td>
<td>(102.77)</td>
<td>(4.20)</td>
<td>(44.10)</td>
<td>(3.55)</td>
<td>(25.81)</td>
<td>(47.10)</td>
<td>(1.00)</td>
<td>(277.00)</td>
<td>(318.00)</td>
<td>(346)</td>
<td>(–0.77)</td>
<td>(2.00)</td>
<td>(0.50)</td>
<td></td>
</tr>
<tr>
<td><strong>Nepal</strong></td>
<td>(3.70)</td>
<td>(34.48)</td>
<td>(3.70)</td>
<td>(17.80)</td>
<td>(5.37)</td>
<td>(43.87)</td>
<td>(44.01)</td>
<td>(n/a)</td>
<td>(39.00)</td>
<td>(313.00)</td>
<td>(n/a)</td>
<td>(–0.50)</td>
<td>(2.00)</td>
<td>(0.50)</td>
<td></td>
</tr>
<tr>
<td><strong>Sri Lanka</strong></td>
<td>(3.60)</td>
<td>(105.56)</td>
<td>(13.20)</td>
<td>(95.70)</td>
<td>(5.32)</td>
<td>(80.77)</td>
<td>(92.08)</td>
<td>(4.00)</td>
<td>(84.00)</td>
<td>(315.00)</td>
<td>(3448.00)</td>
<td>(0.23)</td>
<td>(6.00)</td>
<td>(0.74)</td>
<td></td>
</tr>
</tbody>
</table>
### Economic Incentive and Institutional Regime

**South Asia (most recent), Normalisation Group: All**

<table>
<thead>
<tr>
<th>Indicator</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>GDP Growth (%)</td>
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</tr>
<tr>
<td>Press Freedom</td>
<td>57.20</td>
</tr>
<tr>
<td>Control of Corruption</td>
<td>-0.51</td>
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<tr>
<td>Political Stability</td>
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</tr>
<tr>
<td>Voice and Accountability</td>
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</tr>
<tr>
<td>Government Effectiveness</td>
<td>-0.33</td>
</tr>
<tr>
<td>Rule of Law</td>
<td>-0.34</td>
</tr>
<tr>
<td>Regulatory Quality</td>
<td>-0.51</td>
</tr>
<tr>
<td>Domestic Credit to Private Sector (% of GDP)</td>
<td>30.18</td>
</tr>
<tr>
<td>Local Competition</td>
<td>5.30</td>
</tr>
<tr>
<td>Exports of Goods and Services as % of GDP</td>
<td>19.80</td>
</tr>
<tr>
<td>Soundness of Banks</td>
<td>4.83</td>
</tr>
<tr>
<td>Intellectual Property is Well Protected</td>
<td>2.80</td>
</tr>
<tr>
<td>GDP per Capital</td>
<td>2372.00</td>
</tr>
<tr>
<td>Human Development Index</td>
<td>0.57</td>
</tr>
<tr>
<td>Poverty Index</td>
<td>34.98</td>
</tr>
<tr>
<td>Composite ICRG Risk Rating</td>
<td>64.75</td>
</tr>
<tr>
<td>Unemployment Rate, % of Total Labour Force</td>
<td>5.44</td>
</tr>
<tr>
<td>Employment in Industry (% of total employment)</td>
<td>13.84</td>
</tr>
<tr>
<td>Employment in Services (% of total employment)</td>
<td>26.34</td>
</tr>
<tr>
<td>GDP (current US$) (bil)</td>
<td>148.80</td>
</tr>
<tr>
<td>Gross Capital Formation</td>
<td>22.08</td>
</tr>
<tr>
<td>General Govt Budget Balance as % of GDP</td>
<td>-5.42</td>
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<tr>
<td>Trade as % of GDP</td>
<td>45.16</td>
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<tr>
<td>Tariff and Nontariff Barriers</td>
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<tr>
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<tr>
<td>Gross Capital Formation</td>
<td>22.08</td>
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<tr>
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<tr>
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<tr>
<td>Tariff and Nontariff Barriers</td>
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<td>GDP per Capital</td>
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<td>Human Development Index</td>
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<td>Composite ICRG Risk Rating</td>
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<tr>
<td>Employment in Industry (% of total employment)</td>
<td>12.90</td>
</tr>
<tr>
<td>Employment in Services (% of total employment)</td>
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<tr>
<td>GDP (current US$) (bil)</td>
<td>599.00</td>
</tr>
<tr>
<td>Gross Capital Formation</td>
<td>22.90</td>
</tr>
<tr>
<td>General Govt Budget Balance as % of GDP</td>
<td>-6.10</td>
</tr>
<tr>
<td>Trade as % of GDP</td>
<td>30.82</td>
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<tr>
<td>Tariff and Nontariff Barriers</td>
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<td>GDP (current US$) (bil)</td>
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<td>Gross Capital Formation</td>
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<tr>
<td>General Govt Budget Balance as % of GDP</td>
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</tr>
<tr>
<td>Trade as % of GDP</td>
<td>30.82</td>
</tr>
<tr>
<td>Tariff and Nontariff Barriers</td>
<td>2.00</td>
</tr>
<tr>
<td>GDP per Capital</td>
<td>1786.00</td>
</tr>
<tr>
<td>Human Development Index</td>
<td>0.51</td>
</tr>
<tr>
<td>Poverty Index</td>
<td>42.40</td>
</tr>
<tr>
<td>Composite ICRG Risk Rating</td>
<td>83.00</td>
</tr>
<tr>
<td>Employment in Industry (% of total employment)</td>
<td>10.30</td>
</tr>
<tr>
<td>Employment in Services (% of total employment)</td>
<td>23.50</td>
</tr>
<tr>
<td>GDP (current US$) (bil)</td>
<td>51.90</td>
</tr>
<tr>
<td>Gross Capital Formation</td>
<td>20.90</td>
</tr>
<tr>
<td>General Govt Budget Balance as % of GDP</td>
<td>33.32</td>
</tr>
<tr>
<td>Trade as % of GDP</td>
<td>33.32</td>
</tr>
<tr>
<td>Tariff and Nontariff Barriers</td>
<td>2.00</td>
</tr>
</tbody>
</table>
Figure A5.1: Global View: Information Infrastructure
South Asia (most recent), Normalisation Group: All

- Telephones per 1,000 People (48.84)
- Main Telephone Lines per 1,000 (28.12)
- Mobile Phones per 1,000 (20.72)
- Computers per 1,000 People (6.34)
- TV Sets per 1,000 (83.40)
- Radios per 1,000 (105.60)
- Daily Newspapers per 1,000 (38.80)
- Internet Hosts per 10,000 (0.64)
- Internet User per 10,000 People (87.13)
- International Telecommunications, Cost of Call (38.80)
- E-Government (3.38)
- ICT Expenditure as % of GDP (2.78)

India (most recent), Normalisation Group: All

- Telephones per 1,000 People (71.00)
- Main Telephone Lines per 1,000 (46.30)
- Mobile Phones per 1,000 (24.70)
- Computers per 1,000 People (7.20)
- TV Sets per 1,000 (83.00)
- Radios per 1,000 (120.00)
- Daily Newspapers per 1,000 (60.00)
- Internet Hosts per 10,000 (0.82)
- Internet User per 10,000 People (174.86)
- International Telecommunications, Cost of Call (174.86)
- E-Government (5.18)
- ICT Expenditure as % of GDP (2.78)

Bangladesh (most recent), Normalisation Group: All

- Telephones per 1,000 People (15.60)
- Main Telephone Lines per 1,000 (5.50)
- Mobile Phones per 1,000 (10.10)
- Computers per 1,000 People (3.40)
- TV Sets per 1,000 (59.00)
- Radios per 1,000 (49.00)
- Daily Newspapers per 1,000 (53.00)
- Internet Hosts per 10,000 (0.00)
- Internet User per 10,000 People (17.98)
- International Telecommunications, Cost of Call (17.98)
- E-Government (1.71)
- ICT Expenditure as % of GDP (2.47)
Pakistan (most recent), Normalisation Group: All

- Telephones per 1,000 People (44.10)
- Main Telephone Lines per 1,000 (26.60)
- Mobile Phones per 1,000 (17.50)
- Computers per 1,000 People (4.20)
- TV Sets per 1,000 (150.00)
- Radios per 1,000 (105.00)
- Internet Users per 10,000 People (3.60)
- International Telecommunications Cost of Call (3.87)
- E-Government (3.60)
- Internet Hosts per 10,000 (40.00)
- Daily Newspapers per 1,000 (1.01)

Nepal (most recent), Normalisation Group: All

- Telephones per 1,000 People (17.80)
- Main Telephone Lines per 1,000 (15.70)
- Mobile Phones per 1,000 (2.10)
- Computers per 1,000 People (3.70)
- TV Sets per 1,000 (8.00)
- Radios per 1,000 (12.00)
- Internet Users per 10,000 People (5.28)
- International Telecommunications Cost of Call (34.48)
- Internet Hosts per 10,000 (0.39)
- Daily Newspapers per 1,000 (0.39)

Sri Lanka (most recent), Normalisation Group: All

- Telephones per 1,000 People (95.70)
- Main Telephone Lines per 1,000 (46.50)
- Mobile Phones per 1,000 (49.20)
- Computers per 1,000 People (13.20)
- TV Sets per 1,000 (117.00)
- Radios per 1,000 (215.00)
- Internet Users per 10,000 People (29.00)
- International Telecommunications Cost of Call (29.00)
- E-Government (3.92)
- Internet Hosts per 10,000 (0.98)
- Daily Newspapers per 1,000 (0.98)
Notes

1. We examine the situation of five of the South Asian countries: Bangladesh, India, Nepal, Pakistan, and Sri Lanka. Unfortunately, it was not possible to include Bhutan or the Maldives because of data limitations.

2. Based on calculations from UNCTAD (various years).

3. See www.worldbank.org/kam. Knowledge Assessment Methodology is designed to help countries understand their strengths and weaknesses in making the transition to the knowledge economy. It provides a preliminary knowledge economy assessment of a country, which can form the basis for more detailed sector-specific work.

4. The actual indicators used for each of the pillar are as follows. Economic and institutional regime: tariff and non-tariff barriers, regulatory quality, and rule of law. Education and human resources: adult literacy rate (percentage 15 and above), secondary enrollment, and tertiary enrolment. Innovation system: researchers in R&D, patent applications granted by the US Patent and Trademark Office, and scientific and technical journal articles (all weighted per million people). Information infrastructure: telephones per 1,000 persons, computers per 1,000 persons, and the Internet users per 10,000 persons.

5. Countries can lose ground in one of two ways. They may have an actual decline in an indicator or they may not improve an indicator as fast as other countries so they fall behind relative to the rest of the world. In South Africa, for example, both elements are at work. In secondary education, the actual enrolment rates declined. In the information communications technologies indicators, even though South Africa made significant improvements in the penetration ratios increasing some by a factor of six times, the rest of the world moved much faster so South Africa fell behind relative to the rest of the world. The KAM score cards also show that Africa as a whole is particularly weak in the innovation pillar variables.

6. All the indicators in the methodology were scaled by population. However, because knowledge is not consumed in its use, for the innovation variables the indicator was also computed based on absolute values, which is how it is reported here. In the full KAM database it is possible to use the innovation variables normalised by population.

7. In most countries, in spite of rapid expansion of higher education, the relative wage differences between college graduates and high school grades is not narrowing. This is surprising given the very large increase in supply. The explanation for this is that rapid technological change and higher education are complementary. Higher education is becoming increasingly important to take advantage of the rapid advances in knowledge.


9. Figure 5.3 shows the position of the region or country relative to all the other countries in the world. Being on the outside perimetre indicates ranking among the top 10 per cent of countries in the world and being at the centre of the circle indicates ranking in the bottom 10 per cent.

10. For more on education and skills in India including the rise of the high technology service exports, see Dahlman and Utz, 2005.

11. The innovation scorecards have a small glitch in that the variables on the cost of registering a contract and on the cost to register a business were inversely scaled. In their case, the higher
the cost, the higher the ranking shown. To be consistent with the scaling of all the other variables, they should have been scaled inversely: the higher the cost, the lower the ranking. This inversion should be taken into account in interpreting the high rankings on the two variables in this section.


13. Cisco for example has developed a full day-by-day Internet-based curriculum to teach math in Arabic from kindergarten to twelfth grade that is being piloted in Jordan in 400 discovery schools through a joint programme with the Ministry of Education. It has also developed online training programmes for skills ranging from installing local area networks of its own systems to basic plumbing and electricity for workers in the United Kingdom.

14. For more information see the European Union’s website and look under the various education and research programmes: http://europa.eu/index_en.htm.

References


