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Technology, Development and the Role of the State

South Asian countries like India and Pakistan had in the beginning placed the State at the "commanding heights of the economy". Later, the State was justifiably displaced from that high pedestal. However, there is a strong case now for the State to play a catalysing role in engineering a technology-driven path of economic growth.

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Is South Asia on the path to reach high and sustained rates of economic growth? Has it got the fundamentals to attain the levels of growth that will match those attained by the 'miracle economies' of East Asia in the quarter century after the mid-1970s? Have the countries of the sub-continent appropriately defined the role of the state in promoting economic progress? The answers to these questions are "no", mostly because the

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countries in the region have yet to understand the role the state can play in moving their economies and societies forward. The role of the state is particularly important in improving the technological base of the South Asian economies.

The easier part of the growth process in the sub-continent has been achieved. This involved the movement of millions of workers from low-productivity jobs in the countryside to the relatively more productive ones in towns and cities. Now that about one-half of the region's 1.6 billion people live in urban areas, they need to be engaged in more productive activities. This is where the state enters the picture. The governments in the region need to recognise that technological growth will need to play a critical role in this phase of their development; for that to happen the state's involvement is critical. In two South Asian nations – India and Pakistan – those who currently hold the reins of political power are inclined to push the state back in order to create greater space for private enterprise. Taken to an extreme, this will give rise to highly distorted patterns of growth, as the private sector is unlikely to invest in developing the technologies needed by South Asian nations at this stage in their development.

In the 1990s, theory caught up with economic reality, and a new approach to development came to dominate the thinking of economists. For decades, economists were trying to understand the process of growth; they believed that two factors of production were needed for advancement. These were labour and capital. Combine the two, and the result will be growth! However, when some thinkers in the area of economic growth tried to use the available data on labour, capital and the rate of increase in the national product, they found that only about two-fifths of the increase in GDP could be explained by the use of labour and capital. The rest, in the words of Robert Solow, the MIT economist, was a residual in the growth equation. Solow went on to win the Nobel Memorial Prize in Economic Sciences for this work and left his fellow academics with an intriguing question: How to define the "Solow residual?"

Among the many who took up this challenge were the economists from Chicago University, some of whom also went on to get Nobel Prizes for their work. They and

others postulated that economic growth is very closely related to the cognitive skills of the population, especially the workforce. A significant advance in growth theory was made by Paul Romer, then of Stanford University; he published a paper in 1998 in which he suggested that technology and the quality of human capital were as important as labour and capital for explaining growth. His thinking changed the way economists and other development planners looked at growth. Among those that were influenced was the World Bank where a great deal of analytical work was done on explaining the various aspects of the process of development. Much of the work the Bank did was published in the form of the annual World Development Reports. Each year, the Bank selected one area for deep analysis. In 1998/99 it chose knowledge as its subject and titled its report, *Knowledge for Development*.[2]

Some of the early work done on understanding what went into the 'Solow Residual' led to the identification of not just labour but "human capital" as a factor of production. What mattered was not only the application of human labour in the production process but also the quality of that labour. Better-educated and trained workers would contribute more to output than those who were poorly educated and poorly trained. Education, in other words, began to enter the equation as a major determinant. Adding education and, therefore, knowledge reduced the part of growth that could not be explained earlier.

This was an important conclusion as academics and policy analysts attempted to understand what produced the economic 'miracles' in a number of East Asian countries – in particular in the two land-scarce economies, Hong Kong and Singapore. Education was a key ingredient in their success, but not just improving literacy. Before their transition from developing to developed economies, their school enrolment rates had been much higher than those of other developing nations. They had also emphasised advanced scientific and technical education – as measured by the higher ratios of students in technical fields – thus increasing their capacity to import and absorb sophisticated technologies. Looking beyond the East Asian 'miracle economies', other growth-

[2] The World Bank, *World Development Report, 1998/99: Knowledge for Development*, Washington DC, 1998.

accounting studies examined larger samples of countries. Even when human capital is factored in, the unexplained part of growth remained high. It is now evident that education without openness to innovation and knowledge will not lead to economic progress. The people of the former Soviet Union, like the people of East Asia, were highly educated, with nearly 100 per cent literacy. But Moscow placed severe restrictions on foreign investment, foreign collaboration, and innovation. Its work force did not adapt to change as new information became available elsewhere in the world. Its economy suffered and did not grow and modernise.

The World Bank 1989/99 Report emphasised that knowledge, not capital, was the key to sustained economic growth and improvement in human well-being. That the World Bank would pay greater attention to knowledge than to capital was itself interesting, since the institution's raison d'etre was the provision of capital to the developing world. The report distinguished between two sorts of knowledge: knowledge about technology or simply know-how, and knowledge about attributes, processes and institutions. It focused on the unequal distribution of know-how across and within countries, and the difficulties posed by having incomplete knowledge of attributes. The first was called "knowledge gaps", the second "information problems".

Some other factors not directly associated with knowledge certainly add to economic progress. Some path-breaking work done by such economists as Douglas North shows that the quality of institutions and economic policies explains a significant part of the differences in growth among countries. Well-designed institutions and well-considered policies foster the creation, accumulation and distribution of knowledge.

Poor countries and poor people differ from rich nations and rich people not only because they have less capital but also because they have less knowledge and poor institutional development. Knowledge is almost always costly to create, and that is why much of it is created in industrial countries. This is one reason why the state that has more resources than the people needs to step in to advance growth in the developing countries. Even in rich nations some of the more important technological advances were made by the

government's providing of finance and guidance. The Internet was developed by the Department of Defence in the United States. Some of the more significant advances in aviation technologies were made by firms such as Boeing, Lockheed Martin and Airbus under government contracts to develop new generations of bombers, fighters and refuelling platforms. The mapping of human genes in the Genome Project was made possible by government finance. Government financing of path-breaking technologies was not confined to rich nations, though.

The "green revolution" technologies that saved South Asia from being burdened by large food shortages were developed by government-funded institutions in Mexico and the Philippines. Even when new seed-varieties became available, it needed government intervention to spread their use. But why was government needed to spread the green revolution technologies? The answer is that the knowledge-driven potency in the seed of new plant-varieties is not easily appropriated by any breeder, seed company, farmer or even country. The varieties most suitable for transfer to developing countries, once transferred, could be easily replicated. That meant no repeat business for the seed developers, and not enough profit for the private sector to make the effort of spreading the technology worthwhile. In other words, improved seeds, like many other research outputs, have many of the characteristics of a "public good".

A "public good" is one whose full benefits in the form of profits cannot be captured by its creator but can, instead, spread out to the society at large. As the World Bank put it in its above-cited report: "Because private entrepreneurs have diminished incentives to provide such goods, the tradition of entrusting public entities for providing them is long. Indeed, it is widely recognized in many fields that, without some collective action, there will be far too little research into developing new knowledge".

There are three critical steps that developing countries must take to broaden their base of knowledge. In all three, there are serious gaps in their abilities and those of the developed parts of the world. The first involves tapping and adapting knowledge that already exists. There are several ways of doing this. Knowledge can be acquired by encouraging foreign

enterprises to invest in the domestic economy. The large investments made by American and European firms in India's IT sector have helped that country to become an "outsourcing" powerhouse. However, the Indian Government's reluctance to open the retail sector to foreign investment has kept that sector relatively under-developed.

The second involves absorbing knowledge. This requires universal basic education; creating opportunities for lifelong learning, and supporting tertiary education, especially in science and engineering. India is a good example of the role played by the state. The country's famed institutes of technology, the IITs, were the result of a government initiative. The third area of considerable importance for the developing world is the need for communicating knowledge, providing the poor with access to knowledge.

Three considerations call for a deeper understanding of the relationship between knowledge and development – not just economic growth but also political development and modernisation of society. First, the world is becoming ever more integrated, and countries have little leverage on global trends, neither can they isolate themselves for long. International trade has grown steadily from 24 percent of the world's Gross Domestic Product in 1960 to one-half of the global product. Multinational Corporations (MNCs) today dominate the global economic landscape: a third of the world trade is now among the MNCs or their subsidiaries. A significant proportion of the MNC trade is in knowledge-intensive products. Second, high-technology output has an increasing share of the global product. There are now in the developed world more workers employed in knowledge-intensive industries than in making physical goods. Third, information technology is expanding at a phenomenal rate. Today one country's advantage over others in many lines of production and trade can no longer be viewed in terms of such relatively unchanging tangible factors as labour, land and natural resources. If that were the case, it would be hard to explain the extraordinary performance of Hong Kong and Singapore. Once knowledge and the potential to improve it are taken into account, the dynamic comparative advantage – the relative advantage that countries can create for themselves – is what matters and will determine how well the countries do.

If the acquisition, absorption and communication of knowledge are critical for this phase of economic development in South Asia, the state has to be actively involved. It was appropriate at one point to displace the state from the "commanding heights of the economy" – Lenin's phrase made popular by Jawaharlal Nehru, India's first Prime Minister – and this was done in both India and Pakistan in the early-1990s. Then both countries adopted policies to bring in private enterprise as a partner in development. The state's role as the owner of economic assets was misplaced. It needed to climb down and it did. Slowly the two countries have sold the assets the state was poor at managing. But as was to be expected, private entrepreneurs are motivated by personal gain, not "public goods". The latter needs the involvement of the state, and that is the case, in particular, in technological development.

For South Asia to climb on to a higher growth plane, for it to trade in more technology-intensive products, for it to reduce the still-significant levels of poverty, and for it to narrow the growing regional and interpersonal income inequality, the state will have to get deeply involved. It needs to be engaged in promoting the adaption of existing technologies, developing its own technologies, and in communicating all these to all segments of the population. These important tasks should not – in fact, must not – be left to the private sector.

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