Knowledge Revolution and Social Development *

It gives me great pleasure to deliver the inaugural address at the IX Economic Convention 2001 at the H.R. College of Commerce & Economics for more than one reason. First and the foremost, it provides me an opportunity to be amongst students who would add to the vast pool of knowledge workers that our economy commands. If this convention helps shape their future and add to their knowledge bank, I would be most happy to play my part. Second, I learnt that the annual Convention which is less than a decade old, has already acquired a place of honour among the academic initiatives being taken in this city. The last eight conventions all have been on topics of contemporary relevance for the Indian economy. I am happy that the present convention has participation from two developed countries, an indication of growing globalisation of the Indian economy, which in fact was the theme of the first Economic Convention held in 1993. Lastly, I am happy to talk on the theme of this convention, *viz*., 'Knowledge Revolution and Social Development'. The theme is instantly thought provoking and immensely relevant for bringing about social and economic transformation in India as well as other parts of globe.

'Knowledge' is as old as any form of life with a cognitive process. It is about knowing or the familiarity gained by experience. Human life relates knowledge to a person's range of information and this information can take a codified or a tacit form – a distinction to which I return later when I discuss the public policy implications of these two broad forms of knowledge acquisition. Human history is replete with phases of knowledge advancement at rapid and slow paces with frequent temporal clustering. Clustering is natural as isolated breakthroughs provide revolutionary impetus for more new knowledge. The term 'knowledge revolution' in the present milieu connotes the information society that we are headed for with the support of information technology as well as attendant cultural changes. Computerisation-led information technology certainly wasn't the first knowledge revolution the mankind has seen, but is perhaps no less important than the others witnessed, including the discovery of fire or the inventions that led to industrial revolution. Comparisons would lead to more unsettled questions than they would settle, so I would not elaborate. I choose to play safe and use the term knowledge revolution in the contemporary sense as indicating the scientific and economic changes that have resulted in emergence of 'knowledge economy' or the 'new economy'. After describing this knowledge revolution, my address would try to provide a perspective to what it has meant or can potentially mean for social development. I would cover this both from the viewpoint of the Indian and the world economy. In doing so, the role being played by public policies in supporting this whole process of knowledge revolution and social development would get a special attention. We would also very briefly touch upon the proactive function of the Reserve Bank in this regard.

The Role of Information

Knowledge is sometimes confused as a pure 'public good' in the sense of its two main characteristics – non-excludability and non-rivalrousness. Students of economics would know that the first of the characteristics imply that knowledge is available to all and that no one could be excluded from its potential use. This would mean that we operate in a world in which no information asymmetries exist. If it were so, the Royal Swedish Academy of Sciences would not have awarded the Bank of Sweden Prize in Economic Sciences in Memory of Alfred Nobel for the year 2001 to George Akerlof, Michael Spence and Joseph Stiglitz. This year's Nobel Prize was awarded to them for their analyses of markets with asymmetric information.

Akerlof demonstrated in his seminal paper on "Markets for Lemon" that market where

failure where either no trade will occur or trade will occur with *adverse selection* of low-quality products [i]. Akerlof analysis, for instance, provided an explanation for high interest rates in rural credit markets or for difficulties for the aged population to find individual medical insurance. Spence showed that better informed individual market participants take costly actions in an attempt to improve on their market outcome by credibly transmitting information to the poorly informed. This may explain why education is used as a productivity *signalling* in job markets or why firms may use dividends to signal their profitability to agents in the stock market. Stiglitz established that less informed participants extract information from the better informed, by mechanisms such as the *screening* performed by insurance companies dividing customers into risk classes by offering a menu of contracts where higher deductibles can be exchanged for significantly lower premiums. He also provided an understanding of many observed market phenomena, including unemployment and credit rationing in terms of prevalence of information asymmetry. The key point in the research of these three is that markets fail or work imperfectly because information is not symmetrically available to all. Knowledge is clearly not a public good, but is important for increasing returns. It may be worthwhile to obtain more knowledge, whether through screening, signalling or through codified material or even in form of skill acquisition.

The Importance of 'Tacit' Knowledge

There is a growing recognition that comparative advantage of the firms, organisations or nations are imbued not just in their factor endowments that include the amount of capital or size of labour or workforce, but in human capital and knowledge; and especially in tacit knowledge [ii]. Tacit knowledge nowadays is understood as form of personal knowledge that is not codified in form of books, magazines, web pages, audio or video material. As such, it is not possible to straight away transmit this knowledge as information from one user to another. Personal knowledge by its very nature is private information and is used to extract profits and sometimes monopoly rents. Tacit knowledge, therefore, is substantially rivalrous in nature. The acquisition of tacit knowledge with one user may not seem to reduce the amount of tacit knowledge with another, but the very acquisition of such knowledge reduces it private characteristic and its market valuation in terms of the profits it give or the wages it earn.

The Role of State

State has played an important role in the transformation of the Indian economy to a knowledge-based one. In May 1998, the Prime Minister of India formed a National Taskforce on Information Technology and Software Development to formulate a long term National IT policy for the country and also remove impediments for the growth of the infotech industry. The main objective of this was to help India emerge as an IT software superpower. The Taskforce submitted three very useful reports to the government. This heralded the launch of one of the rare partnerships between government and industry that propelled India towards reaping the comparative advantage that the country had in knowledge industry. The trend has continued unabated with sub-national governments competing with national government in providing IT infrastructure, education and good electronic governance. In the last few years, 18 state governments have announced IT policies.

More recently, the Government of India has come up with the Software Technology Park (STP) and Electronics Hardware Technology Park (EHTP) Schemes that take the form of 100% Export Oriented Schemes. The former is targeted for undertaking Software

including export of professional services for rendering consultancy services and development of software. The latter is for undertaking manufacture of electronic hardware equipment/components and other items. Both these schemes are liberally encompassing and are benefiting a wide range of enterprises that are in the business of knowledge industry.

The Export-Import policy and the customs duty regime have also helped spur the knowledge revolution in the Indian economy. We have a liberal customs duty regime. Computer software can be imported duty free with no duties, additional duties or surcharges levied thereupon. Books, magazines and periodicals on CD-ROM are also exempt from import duty. Under the Exim Policy 1997-2002 announced on 31 March 2000, the Government provided for recognition to software companies who have acquired ISO 9000 series or IS / ISO 9000 Series or ISO 14000 Series or HACP or WHO-GMP or SEI CMM Level 2 and above accreditation / certification. Double weightage is being given on FOB or NFE exports made by such units for granting status certification (e.g. Export House, Trading House, Star Trading House, Super Star Trading House). Regarding the tax regime, profits derived from export of software (including some of IT enabled services) are exempt from Income Tax under Section 80 HHE. Some encouraging tax holidays are also available to export-oriented units under various schemes. For venture capital firms or funds, a complete pass through has been provided on distribution of income as well as undistributed income by the Venture Capital Company under Section 115U. Further, any income on any investments made in Venture Capital Undertaking qualifies for exemption under Section 10(23FB). Clearly the fiscal incentives are plenty for the IT-sector.

The Reserve Bank has also joined the Government to reinforce the role of the State in development of the knowledge industry. In a bid to further a more liberalised regime for the knowledge industry, the RBI has taken several steps. These include, (i) permission to Indian software companies to offer ADR/GDR-linked Stock Option Scheme to their non-resident as well as resident permanent employees (including Indian and overseas working Directors) that allows remittance of up to US$50,000 in a quinquennium period related to the ADRs/GDRs, (ii) provision for remittance towards import of software through Datacom Channels / Internet, (iii) reproduction of software in India in agreement with overseas copyright holder with provision for royalty payments without any specific approval, (iv) permission, without limit, for remittance towards fee payable to accredited agency abroad for ISO certification, (v) procedures for making remittance out of EEFC account towards participation by Indian companies in a JV / WOS overseas under normal route, fast track window and in respect of large investments, (vi) provision for IT software and services companies in India to acquire companies overseas through ADR / GDR stock swaps without prior approval up to US$ 100 million, ten times the exports earnings of the previous year and for acquisition of values above US$ 100 million with provision for easy and quick approvals (vii) simplified SOFTEX form that needs to be filled by all non-physical exporters of software, (viii) allowance for use of international credit cards for import of software through internet up to US$ 25,000 in advance of even download of a software, and (ix) liberal allowance for individuals and firms executing software service contracts abroad, with only a stipulation of repatriation to India of an income equivalent of at least 30 percent of the contract value.

Apart from the regulatory steps to further knowledge revolution, the RBI has also taken a proactive lead in promoting knowledge infrastructure and knowledge practices in the Indian financial sector. Operationalisation of the Indian Financial Network (INFINET) and facilitation of the Computerised Cheque Clearance (CCC) and Electronic Funds Transfer (EFT) has changed the face of financial system. The INFINET now operates with Structured Financial Messaging Solution (SFMS) as its part. SFMS is based on international message standards (SWIFT) and ensures secured message transmission to support inter-bank transactions. The Reserve Bank is making rapid progress towards setting-up the Real Time

Gross Settlement (RTGS). The RTGS when operational would provide a new generation of high value payments systems that would enable the core of the banking system across the country to make secure inter-bank payments across the country. The transactions will cover all the general transactions and central accounting of the RBI, including the bank's general ledger. It is expected to enable about 205 Indian banks and financial institutions to interface directly. By underwriting all payments with collateral held at the Reserve Bank of India, the RTGS system will reduce 'systemic risk' in the Indian banking system, thereby providing increased integrity and security for all inter-bank transactions. Improvements are also being brought about in the payment system through Centralised Funds Management System (CFMS), which enables funds managers of banks to obtain a national position of balances in their accounts with the Reserve Bank. The CFMS covers the four major metropolitan centers and would soon be extended to most other locations of RBI offices. The initiatives exemplified above are expected to reduce all kinds of costs that exist in the financial marketplace. These costs result in the widening the bid-ask spreads and form a kind of social tax or a deadweight loss on savers and investors in the economy. A favourable impact of the IT initiatives is evident on the transaction costs, inventory-carrying costs and most importantly on adverse information costs and the spreads, in general, are beginning to narrow down in the Indian banking sector.

Education Policy

The role of state has been pronounced, *inter-alia*, due to the potential of knowledge economy in bringing about social and economic development. Education forms the cornerstone of this process, both because of its knowledge enhancing and capacity building characteristic that reflects in individual higher incomes and also because this knowledge acquired as part of education makes a better society and a better economy with network externalities, lower information costs, lower social losses due to corruption and better benefits from information spillovers. Education policy is, therefore, central to knowledge revolution.

India spends 3.8 per cent of its GNP on education, higher than the 2.6 per cent that the China spends. However, 46 per cent of India's population above the age of 15 years is illiterate as against only 22 percent of such population in China. While India still spends less than the world average of 4.9 per cent of GNP on education and there does appear to be scope for increasing both public and private spending on education, the resources would need to be used more carefully to improve benefits. In addition, more balance would be needed between competing uses for the earmarked funds.

Some attention also needs to be given to the regional balance in the spread of education as it has an important bearing on the life of the citizens and the polity of the nation. In India, Kottyam district of Kerala has a literacy rate of 95.7 per cent, while the Jhabua district of Madhya Pradesh has a literacy rate of only 19.0 per cent. In fact, 9 of the top 10 districts in terms of literacy come from Kerala, with Mahe district of Pondicherry being the notable other. Barmer and Jalor district of Rajasthan have female literacy rates of around 7.7 per cent. In framing our planning process, we need to give more attention to how national policies could be translated for those who are being left out from the social development.

Multilateral Initiatives

There is an urgent need for multilateral initiatives to strengthen the knowledge revolution. Knowledge revolution is of relevance to all humanity and can specially be an instrument for convergence, whereby the laggards in development from the third world countries are able to catch-up with the developed countries in terms of levels of per capita income. Present empirical evidence shows that per worker output differentials between rich

that at this rate it would take roughly 35 years to reduce the gap in two countries' per capita income to half of its present. Data for the developing countries show even slower convergence possibilities. Odds are that absolute convergence is difficult. If possible at all it has most probably to come from knowledge resources. Following the works of Mankiw, Romer and Weil and the subsequent literature on endogenous growth or the new growth theory, we now know the importance of knowledge embodied in the human capital. [iii]

In this context, I draw your attention to some important documents and initiatives that testify to the growing recognition for use of knowledge to bring about social development. First, the first ever summit of heads of States and Government on social development which gathered under the UN auspices in 1995 recognised the vital role for knowledge in social development. The Copenhagen Declaration on Social Development that it produced explicitly stated that new information technologies and new approaches to and use of technologies by people living in poverty can help in fulfilling social development goals and therefore emphasise the need to facilitate access to such technologies.

Second, the Organisation for Economic Co-operation and Development (OECD) brought out a document in 1996, very clearly recognising the interaction of knowledge and economics. [iv] The document discussed the trends and implications of knowledge-based economies, the role of science systems in such economies and the measurement issues related to knowledge inputs and outputs and of stocks and flows of knowledge. I find the document important as it drew world-wide attention to the role of knowledge. It also recognised that traditional national accounts frameworks do not offer convincing explanations of trends in economic growth, productivity and employment.

Third, the World Development Report, 1998-99, published by the World Bank has examined the role of knowledge in improving economic and social well-being. It emphasises these technologies for acquiring and disseminating knowledge base of countries and what countries need to do and do much faster to take advantage of new technologies for acquiring and disseminating knowledge by investing in educating their people. Countries that postpone this will fall behind those that move faster, and the adverse consequences for their development will be hard to remedy.

The World Development Report suggested three lessons that are particularly important to the welfare of the billion of people in developing countries. First, developing countries must institute policies that enable them to narrow the knowledge gaps. In a sense the convergence in knowledge precedes, convergence in growth or levels of income. Second, developing country governments, multilateral institutions, non-governmental organisations, and the private sector must work together to strengthen the institutions needed to address the information problems that cause markets and governments to fail. Third, no matter how effective these endeavours are, problems with knowledge flows will persist. But recognising that knowledge is at core of all our development efforts will allow us to discover unexpected solutions to seemingly intractable problems.

The Report is the first widely circulated international document that very clearly called for access to financial, technical and medical knowledge for improving health and living standards of the poor. It noted that the new communications technology and plummeting computing costs are "shrinking distance and eroding borders and time", so that ever remote villages can tap into rapidly expanding global store of knowledge.

The United Nations is also laying stress on capacity building in its programme, especially to address problems of poverty and environment. Capacity 21 is one such project which has a good outreach. All these documents and initiatives are useful for policies, though there are finer aspects of policies that we fine-tune to meet country-specific circumstances. I have

mentioned these multilateral initiatives, mainly for the benefit of the predominant student audience that might like to improve their knowledge base.

What the Poor Can Do

Any policy on knowledge systems would be misplaced if it does not provide emphasis on knowledge transmission and knowledge distribution. Knowledge should serve to empower people and provide their entitlements. The focus has to be on capacity building and enabling them to do things themselves. The World Bank President, Mr. James D. Wolfensohn has made this the focal point of the World Bank which he now describes as the "Knowledge-bank". He warns that, "in our enthusiasm for information super highway we must not forget the villages and slums without telephones, electricity or safe water, the primary schools without pencils, papers or books." He adds that "for the poor, the promise of the new information age – knowledge for all – can seem as remote as a distant star." The UNDP Human Development Report 2001 analyses the divides, be it digital, scientific or technological. The measures and actions to enable access to new technologies are essential to reducing world poverty and facilitating sustainable development.

While there is recognition in the multilateral forums over the need for using knowledge to address poverty, commensurate effort is missing. The words are not translated into policies with equal intensity and policies are not translated into actions with proportionate force. It is imperative that we in developing countries make our voices heard. For instance, bio-technology has the promise of precision tools to deal with soil toxicity, drought resistance, water stress, and increasing nutritional content for sustainable agriculture, food security and human health. The bio-technology research has, however, hardly begun and it would be tragic if it were curtailed by often emotional debates in some parts of developed world. Similarly, there is urgent need for governments to support development of environmentally sound energy technologies to mitigate potentially devastating impacts of climate change on the world's life supporting ecosystems and not just rely on market solutions for such problems. As Stiglitz points out that government interventions for knowledge development may be useful because fiscal incentives do not necessarily bias the relative prices, but may instead address the problem of market failures amidst large externalities.

Knowledge transfers also depend on domestic policies. Countries whose policies encourage this stand to gain. Forty years ago, Ghana had the same per capita income as South Korea. By early 1990s, Korea's income was six time higher. Some development economists claim that at least half of the disparity can be explained by Korea's greater success in acquiring knowledge. Costa Rica stands out in effective use of knowledge to improve social conditions. In Costa Rica, life expectancy and infant mortality are on par with that of many developed countries, even though incomes are only about a tenth of that in United States. Experts believe that governmental efforts to provide people with information about sanitation and health has helped. Apart from government, internet could be a powerful media today to disseminate information on health and education.

Competition Policy

Finally, let me make some more public policy suggestions that one could examine to further knowledge revolution and social development. First, knowledge revolution has enabled greater competition by enabling smaller firm sizes with low capital and labour requirements to operate with telling effect. But there are ever-greater dangers that firms with knowledge advantage could indulge in monopoly practices, backed by patents or other IPRs

operating systems. We need stronger and ever more vigilant anti-trust institutions in India that curb such practices, but not necessarily the business. The global institutions need to consider a more effective IPR regime that strikes the right balance. A balance is needed between incentive to demand knowledge reflected in firms' desire to invent and innovate or its spending on R&D and supply of new knowledge that needs inputs of past knowledge. IPRs provide the former to the detriment of the latter. For socio-economic development to take place at an optimal pace, it is necessary to frame IPRs correctly in terms of their coverage and time span. I am sure the presentation by the Union College of USA at this Convention would afford the colloquium an opportunity to debate this further.

Second, in India we have perhaps paid more attention to codified knowledge than tacit knowledge. We are low on skill formation than the potential provided by our education structure. This is due to some flaws in education policy as also our poor work culture and ethics. Low labour mobility between firms and regions has been an important causal factor. I see from my experience in public sector banks that single point entry and virtually negligible exit options breed inertia in these entities. They miss out on tacit knowledge that is brought by employees moving from one firm to another. The sub-theme for the National College may enable us to reflect on the exit policy for firms as well as for labour.

Third, a logical extension to the argument above relates to knowledge that may be obtained with increased openness of the Indian economy, specially with cross-border travel. I am glad that multinational corporations as well as tourism find a place in the sub-themes of this Convention. We need to think out clearly over how far we should go on liberalisation of capital account and the timing for the moves in this direction.

Conclusion

We live at a unique and defining moment in history. It is unique in relation to the progress in science and technology that has been achieved in the last half a century. Beginning with men on the moon in 1960s, the Green revolution of the 1970s, the information revolution of the 1980s and genetic revolution of the 1990s, the 20th century ended with mapping of the human genome. And it is a defining time. As all this opens a new era of knowledge based actions and decision-making that can put the world on a path of equity and sustainability. It is knowledge that is available, accessible and affordable that will drive progress in the 21st century, and even likely to be as important if not more so than capital endowment. The Convention may wish to deliberate some of the issues that I have raised and some others that would follow in course of the presentations. I wish the Convention all success.

Thank you.

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* Inaugural address delivered by Shri Vepa Kamesam, Deputy Governor, RBI at the IX Economic Convention 2001 at H.R. College of Commerce & Economics, Mumbai on December 6, 2001.

i. The term "Lemon" is an American slang for poor quality cars and Akerlof used the analogy of the American used car market to explain how adverse selection may take place. See Akerlof, G.A, "The Market for 'Lemons': Quality Uncertainty and the Market Mechanism", *Quarterly Journal of Economics*, August 1970, 84(3): 488-500.

ii. The term was introduced by Michael Polanyi, who described it as that part of knowledge, which is distinct from, but complementary to the knowledge explicit in conscious cognitive processes. See Polanyi, Michael (1958), *Personal Knowledge: Towards a Post-Critical Philosophy*, London: Routledge & Kegan Paul.

iii. See Mankiw, N. Gregory, David Romer and David N. Weil (1992), "A Contribution to Empirics of Economic Growth", *Quarterly Journal of Economics*, May, 107: 407-37.

iv. OECD(1996), *The Knowledge-based Economy*, Paris: Organisation of Economic Co-operation and Development.