

# Innovation and India's Growth

## How Inclusive Are Its Achievements?

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Innovation and inclusive development are watchwords for both policymakers and empirical researchers in India today. While the former is considered the means to achieve accelerated and competitive economic growth, the latter is a sociopolitical necessity as well as an economic desire, arising out of the prolonged realisation that the benefits of economic growth did not percolate to the “bottom of the pyramid” (BoP)—either in the period of “economic planning” or in the period of “economic liberalisation” so far. It is in this context that the book under review assumes significance.

In Chapter 1, Shyama V Ramani, the editor of the volume, describes the context in which India's National System of Innovation (NSI) was founded—the need for assessing India's industrialisation as part of planned economic development. This chapter has a conceptual framework that synthesises the different chapters of the book. Ramani stresses on the need to look at the NSI approach to describe the process of catching-up by developing countries—particularly the emerging economies of today. NSI has

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**Innovation in India: Combining Economic Growth with Inclusive Development** edited by Shyama V Ramani, *New Delhi: Cambridge University Press, 2014; pp 404, Rs 795.*

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emerged as a major conceptual framework in the past three decades to organise historical evidence on the accumulation of scientific and technical innovations, and industrial capabilities of late-comer countries attempting to catch up with the developed ones.

Ramani identifies the change in the rules and regulations after India's independence in 1947, in two broad periods: (i) building indigenous capabilities through import substitution policy (characterised by the various controls and regulations on economic activities and enterprises), and (ii) promoting economic liberalisation, the seeds of which were laid intermittently in the 1980s, though full-scale liberalisation of policies were pursued only after 1990. The scope and nature of policy efforts for inclusive development in the meantime underwent a shift, from exclusively rural India to include urban India as well. Various schemes and

programmes were introduced for this purpose. As Ramani rightly points out, the ultimate test of any mission or development programme lies in its outcome, that is, economic growth and development covering structural change, trade, foreign direct investment (FDI), investment in research and development (R&D) and innovation. Though India's performance on this front has been encouraging in absolute terms, it pales in comparison to China—and other leading Asian economies. However, Ramani expresses optimism. She hopes innovations will catch up because the NSI is stronger, vibrant, dense and complex as compared to the past.

### Universities and Public Labs

India has developed an elaborate network of educational institutions and public laboratories. In Chapter 2, Gita Surie discusses the evolution and contribution of universities and public laboratories as catalysts of innovation and entrepreneurship during three different periods: (i) prior to India's independence, (ii) from 1947 till 1991, and (iii) during the liberalisation period that began in 1991. After independence, policies and programmes led to the development of nationwide institutions and laboratories, pulling science and technology (S&T) out of the rut it was stuck in during the colonial period. After 1991, there has been much stress on promoting university–industry partnerships

to foster innovation, disseminate technology and enhance entrepreneurial capabilities. Over a period of time, India has made considerable progress in terms of the diversity and capability of its s&t infrastructure. The country has made significant achievements in the field. But there is a flip side to this story. Surie shows that science education has suffered.

She makes no reference to the Indian Space Research Organisation (ISRO). This is a major omission. ISRO, by any standards, is an outstanding example of India's innovation capability building programme and has contributed immensely to the communication revolution in the country.

**Demand for Innovation**

In Chapter 3, Smita Srinivas makes a case for understanding the nature and complexity of the demand for innovation in India. Srinivas separates demands into four broad categories: (i) effective demand, (ii) need that is not recognised as one, (iii) a need that is recognised, but not as a demand, and (iv) a demand that is recognised but is unfulfilled. She

cites the example of Jaipur Foot developed by a non-profit organisation, Bhagwan Mahaveer Viklang Sahayata Samiti (BMVSS). Today BMVSS generates a global market and its products cater to amputees from across the world.

Srinivas contends that with the involvement of states, firms and non-governmental organisations, more such needs can be converted into demand. She argues that there are unrecognised needs in areas such as paediatric health and women's reproductive health in India.

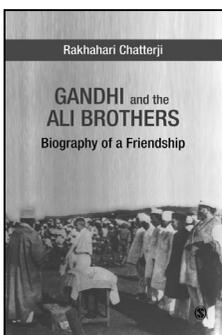
**Seed and Biotechnology**

The growth of seed/biotechnology industry has important implications for the Indian economy, where agriculture plays a prominent role. In Chapter 4, Carl Pray and Latha Nagarajan deal with the evolution, current structure and innovations in the seed and biotech industry in India. They trace the evolution of seed sector innovation during four periods: (i) colonial period, (ii) the period of Green Revolution (started in the mid-1960s), (iii) the period starting from the mid-1980s when hybrids were developed,

and (iv) the period of biotechnology that started in the 21st century. India has developed one of the largest and most complex agricultural research systems in the world and there has been a considerable increase in public investments in agricultural research and education.

Public sector innovations led to the development of high-yielding open pollinating varieties of wheat, rice and pulses. The protective policies followed by the country till the 1980s facilitated the public sector's growth. The policy of liberalisation introduced thereafter opened the field for private sector enterprises including multinational corporations (MNC). As a result, the size and structure of the Indian seed market industry changed substantially between the mid-1990s and the mid-2000s. While industry size more than tripled, the share of the private sector almost doubled. An increasing number of foreign seed and biotech companies entered the Indian market. At the same time, Indian firms acquired an international character through acquisitions of firms in the us, Europe and South America and research

*Pay homage to our Father of the Nation!*

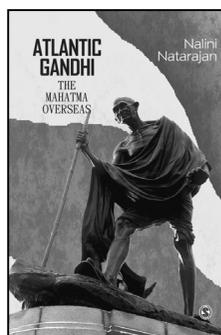


**Gandhi and the Ali Brothers**  
Biography of a Friendship  
**Rakhahari Chatterji**

This book is a study of the relationship between Gandhi and the Ali brothers mainly in the context of the Non-cooperation and Khilafat Movements, focusing on the period of 1919–1931. Gandhi's involvement in the Khilafat agitation was his first direct intervention in an exclusively Muslim question, translating it into a national question.

This was his way of bringing the Muslims out of their community cocoons into the mainstream of India's national politics. However, as his relationship with the brothers broke down, this turned out to be also his last such intervention. Consequently, the issue of Muslim participation remained unsettled till Partition.

2013 • 248 pages • Hardback (978-81-321-1125-2) • ₹ 750.00



**Atlantic Gandhi**  
The Mahatma Overseas  
**Nalini Natarajan**

Using the frames of diaspora theory, post-colonial discourse theory and the recent Atlantic turn in studies of resistance, this book brings into relief Gandhi's experience as a traveler moving from a classic colony, India, to the plantation and mining society of South Africa.

The author forwards the argument that this move between different modes of production brought Gandhi into contact with indentured laborers, with whom he shared exilic and diasporic consciousness, and whose difficult yet resilient lives inspired his philosophy. It reads Gandhi's nationalistic (that is, anti-colonial) sentiments as born in diasporic exile, where he formed his perspective as a provincial subject in a multiracial plantation.

2013 • 272 pages • Hardback (978-81-321-0968-6) • ₹ 795.00

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alliances with American, European and Chinese institutions.

The authors throw light on a pertinent question: who benefited from the progress in R&D and innovations of the seed and biotech industry? The Green Revolution led to a substantial increase in wheat and rice yields, it benefited both the large and the small farmers and led to more employment in the agricultural sector. Both poor and rich consumers gained. The introduction of hybrid seeds led to an increase in yields of cotton, maize, millets, benefiting farmers and the consumers alike. The biotech revolution improved yields, reduced pesticide use and also resulted in health benefits. Though the private sector has emerged as a major player, the authors suggest a larger role for the public sector to promote R&D and innovations in the seed industry.

### Software Industry

The unprecedented growth of software industry, particularly in the era of liberalisation, has given a unique identity to the Indian economy in the global arena. In Chapter 5, Nagesh Kumar deals with the outstanding achievements of the Indian software industry and its contribution to the Indian economy in the first decade of economic liberalisation: 1989–2000. Kumar also examines technology upgrading and innovative activities of the industry and analyses NSI's role in it.

But the pertinent question is—how has India achieved this growth? The bulk of the software activity of Indian enterprises comprised “body shopping” or on-site exports, primarily due to relatively low labour costs. However, with technological upgradation and movement up the value chain, the share of on-site exports declined, duly compensated by a rise in the share of “offshore” development. An important feature of Indian software industry's maturity is the shift towards high-end consulting with the development of diversified domain expertise and export packaged software, particularly proprietary software products. This enabled an increasing number of Indian companies to penetrate the international market, both

in terms of investments and exports. As a result, the subsequent entry of MNCs did not make any dent, either on the domestic software industry or on its exports. However, analyses in terms of (i) foreign exchange utilisation per unit of exports, (ii) labour productivity, (iii) unit cost of production, and (iv) profit margins, for a sample of 66 software companies comprising small, medium and large firms, do not reflect a clear improvement in the efficiency and competitiveness of Indian software industry. The author, though, appears reluctant to conclude in this manner.

The development and achievements of Indian software industry have been attributed to the NSI comprising the vast educational and institutional network developed over the years, S&T infrastructure, supply of trained manpower, infrastructure for technology development, R&D capability building, automation of public sector services and support for software exports. These have enabled India to be a successful participant in the international division of labour in software development.

However, this chapter is dated, at least by a decade. The size and structure of the industry and the challenges it faces have undergone considerable changes since 2000. Moreover, by confining the analysis to only secondary data, the author has missed an opportunity to dwell on the contributions made by this industry towards inclusive growth in the country since 1991. I have learnt from conversations in different parts of the country that kids of unorganised sector workers (such as maid servants, landless labourers, small and marginal farmers, auto and taxi drivers, cooks, carpenters) have joined unknown/lesser-known engineering institutions, obtained bachelor of engineering degrees, and joined the software industry. It is significant that such developments in different parts of the country have given “wings” to the aspirations of “new generation in the bottom of the pyramid.”

### Pharmaceutical Sector

In Chapter 6, Ramani and Samira Guennif trace the evolution of Indian pharmaceutical industry from virtually a cipher

at the time of independence to a leading industrial power by the turn of the century. At the time of independence, MNCs supplied more than 80% of India's pharmaceutical needs. During 1947–70, to reduce the dependence on imports and MNCs, the government set up two public sector undertakings, and adopted an import substitution policy. This involved price controls, high import duties along with export subsidies and the introduction of industrial licensing. But this did not alter the ownership structure and Indian firms could develop capabilities only in respect of formulations.

The adoption of the Indian Patent Act of 1970 enabled domestic firms to develop copies of branded drugs independently, through process innovations, leading to “duplicative imitation” and “creative imitation.” By the mid-1980s, Indian firms were producing both bulk drugs and formulations, resulting in a steady improvement in the access of basic drugs to the poor. India also became an exporter. The authors give credit to the role of government-promoted biotechnology. The considerable growth of biotechnology in India, particularly after 2000, was characterised by the internationalisation of firms both in terms of activities and earnings.

It is important to note that all these developments took place when India moved to a regime compliant with The Agreement on Trade-Related Aspects of Intellectual Property Rights (TRIPS). This indicates that such a movement has not hurt the industry.

### Nanotechnology

How did India respond to the challenge of promoting emerging nanotechnology in the country? Manish Anand answers the question in Chapter 7. Since nanotechnology promotion is considered beneficial across sectors, various government departments, public laboratories, universities, industrial enterprises, start-ups, industry associations and even private research institutes and not-for-profit foundations are involved in the endeavour.

The state responded to the challenge by adopting a four-pronged strategy:

(i) setting up centres of excellence in premier science and engineering institutions across the country, (ii) sponsoring R&D projects, (iii) promoting international collaborations, and (iv) strengthening industry–institute interactions through public–private partnerships (PPP). Incentives are provided to scientists to encourage the development and commercialisation of innovations by permitting them to hold equity in spin-offs and enabling them to move between academic institutions and industry. The outcomes of these efforts are yet to be seen, but there is some progress in terms of scientific publications and patents.

Nano-manufacturing is at its infancy covering nano materials, nano-bio, nano-electronics and nanotechnology instrumentation. Nanotechnology can address the needs of the poor in areas such as sanitation, healthcare, nutrition and energy. The author cites the use of Tata Swach, a radically new water purifier system, which uses rice-husk ash and silver nano particles to filter out bacteria and other germs. At Rs 749 a unit it is relatively inexpensive as well.

### Energy Policy

Ambuj Sagar and Anksuh Choudhary deal with the complex energy innovation system in India in Chapter 8. They do so by examining four case studies: (i) wind power, (ii) coal power generation, both of which are energy generating technologies, (iii) automobiles, and (iv) improved cook stoves, both of which are end-user technologies.

The authors discuss how the market-stimulating policies of the government enabled the entry and growth of Suzlon the third-largest wind turbine manufacturer in the world. In the coal power industry, Bharat Heavy Electricals Limited (BHEL), could achieve little in terms of innovations due to its limited R&D capability, as it relied solely on technology imports. The authors note that the absence of coordination between academia, research institutes and the industry prevented the emergence of a strong technological capability.

The authors have also analysed the introduction, promotion and performance of the National Programme on

Improved Chulha (NPIC) and highlighted the factors responsible for its limited success. India's automobile industry presented a different picture. It experienced a dynamic transformation and emerged as a competitive industry characterised by the entry of an increasing number of global players and significant inflow of technology and technical know-how. The R&D expenditure of Indian firms has increased.

However, the authors conclude that the overall performance of India's energy sector is far from satisfactory.

### Research in Medicine

The Traditional Medicine System (TMS) comprising Ayurveda, Yoga and Naturopathy, Unani, Siddha and Homoeopathy (AYUSH) plays an important role, particularly in meeting the primary healthcare needs of people in rural India. In chapter 9, Arijit Dutta traces the history and the growth of TMS. Dutta throws light on the innovation capability building facilitated by the state.

Within TMS, ayurveda has attracted more private investment and innovation. However, TMS has contributed considerably to inclusive development in terms of making medicines available, accessible and affordable.

### Pro-poor Innovations

In Chapter 10 Shyama V Ramani and Shuan Sadre Ghazi talk about addressing sanitation challenges. The provision of a product such as a toilet to the poorest segment of the population, which has never used this amenity, is a social innovation of sorts. But its diffusion poses different kinds of challenges. Through a case study in a Tamil Nadu village, Kameshwaram, the authors argue that the successful introduction of a social innovation such as a toilet depends on its sustainability in the local environment and its acceptance by the user population.

In Chapter 11, Dinesh Abrol analyses the development of rural technologies and rural industries to improve rural livelihoods, since independence. Abrol show that pro-poor innovation and the diffusion of such innovation has not been successful in India. Abrol believes the recent PPP initiatives and the move

to bring in the corporate sector as the partner of the state are unlikely to succeed in achieving pro-poor innovations. He argues that the rural poor must be guided to organise themselves into cooperatives and collectives and given opportunities to improve their bargaining power.

### Socio-economic Awareness Is Key

In the final chapter, Ramani reviews the key findings of each of the earlier chapters and makes five important observations with respect to India's NSI. The primary lesson of the book is that the success of innovation generation and diffusion hinges not only on an effective and pragmatic policy but also on its implementation through dynamic institutional reforms that suit the socio-economic contexts of local environments.

The book is the first attempt to throw light on the NSI of India covering the pre-liberalisation and the liberalisation periods and sectors as diverse as rural industries, traditional medicine, software industry and nanotechnology. It also analyses the building up of innovation capability in terms of infrastructure and personnel and examines the outcomes and achievements of this endeavour—particularly with a focus on inclusive development. Policymakers and researchers will find this book valuable. Its length and the uneven/varying time scales of the chapters, however, detract from the book's readability.

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