

## Science, Technology and Innovation in China: Lessons for India<sup>1</sup>

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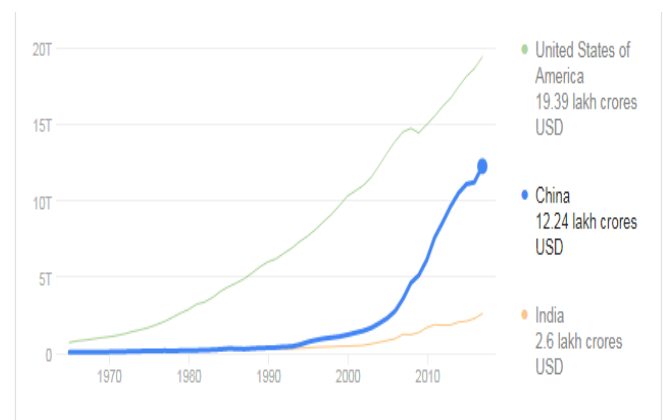
**T**alking about “Science, Technology and Innovation in China – Lessons for India”, my mind goes back by about 50 years, late years of my education and early years of my professional career. At that time, we all used to have Camlin pens and it was supposed to be a good pen. We would have liked to have a Parker pen but it was expensive. Some of my friends used to have Parker pens made in China but there was no doubt that they were only poor substitutes for the original. Why I am saying this is to basically recall that in the 60s and 70s, our perception of China was that it makes cheap consumer goods of questionable quality and by, what you may call, unfair means- for example, it used to be said that the Parker company was encouraged to set up a plant in China and then one day, they were asked to pack up and go and the company became a Chinese company making China-made Parker pens.

I now move forward by about 50 years. I see a newspaper report saying that a subsidiary of the Chinese Meteorological Department outbid Bharat Electronics to supply Doppler Weather Radars to India. It struck me odd because in the late 90’s, Bharat Electronics with technical assistance from the Indian Department of Space designed, built and installed a Doppler

Weather Radar in Sriharikota and it is still functioning. What China did ten years later was to outbid them. How a Chinese company is able to outbid an Indian supplier with demonstrated capabilities. The message is clear, the Chinese competition is no longer limited to small, low value items, it is extending into high technology, high value products as well.

Recently I came across the results of a study by a European think tank, (Veugelers 2017), on China’s technology led growth in the last two decades. The results were indeed revealing and I wish to share some of the results with you.

Figure 1 shows the Gross Domestic Product of three economies, USA, India and China over the last five decades.



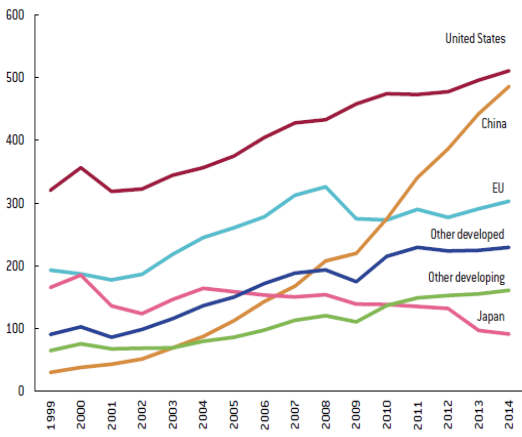
**Figure 1**

<sup>1</sup> This paper was presented at the 11th All India Conference of China Studies held at Christ (deemed to be University), Bengaluru, 15-17 November 2018

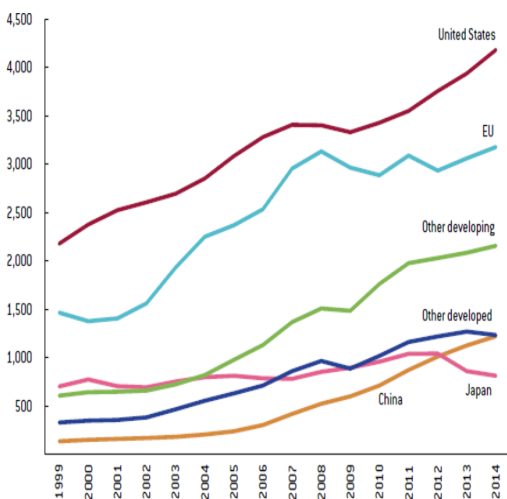
Can you miss the dramatic change that is taking place in China's economy since the beginning of this century? The report also identifies the growth as science and technology led.

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Figures 2 and 3 show value addition by high technology manufacturing and by business, financial and information services in billions of US Dollars.



**Fig. 2: Value addition by High-Tech Manufacturing (\$ billions)**

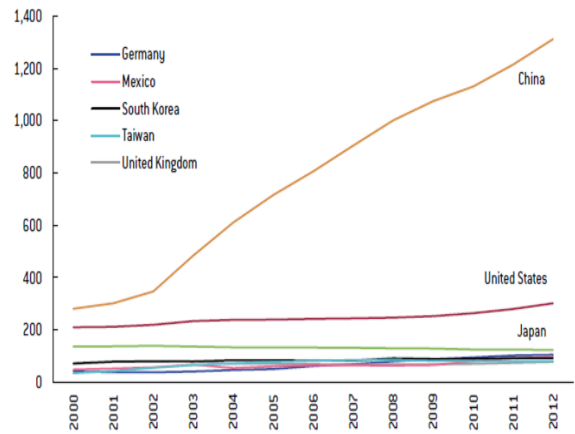


**Fig. 3: Value Addition by Business, Financial and Information Services (\$ billions)**

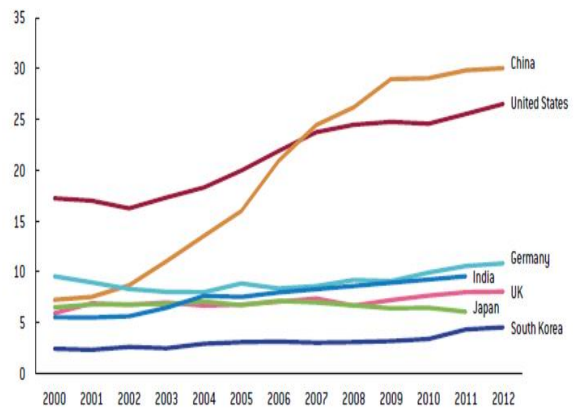
How did all these happen? The report interestingly links these to a major boost given

to education and research in China during the first decade of the twenty first century.

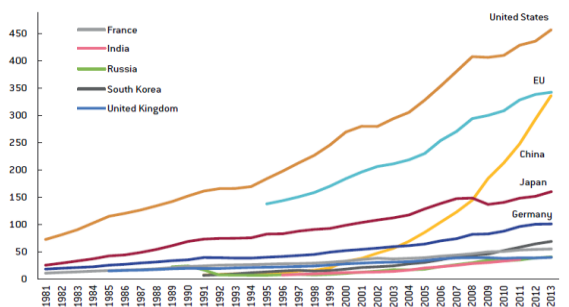
Figure 4 shows the growth of first university degrees in natural sciences and engineering while Figure 5 shows the growth of Ph.D. degree holders in natural sciences and engineering during these years. Figure 6 shows the growth in R&D spending (in billions of PPP \$) in the same period.



**Fig. 4**



**Fig. 5**



**Fig. 6**

Have these massive investments in higher education and research had any impact on China's performance in the global Science and Technology growth? Table 1 demonstrates the impact of these initiatives in China's performance in the area of Science. It is interesting that for the first time, China has overtaken the US this year in terms of the total number of Science publications (Tollefson 2018). China has also declared its ambition to lead the world not only in Science and Technology but also in Design and Manufacturing of technological products in the next two or three decades.

	Share of world scientific papers	Share of world scientific papers	Average annual growth rate in scientific papers
	2003	2013	2003-13
US	26.8%	18.8%	7.0%
EU	31.0%	25.4%	4.9%
Japan	7.8%	4.7%	1.7%
SKorea	2.0%	2.7%	10.4%
China	6.4%	18.2%	18.9%

Source: Bruegel based on NSF (2016).

**Table 1: Rise of China in Science**

It is well known that technology innovation and entrepreneurship were mainly responsible for the emergence of US as the global economic powerhouse in the seventies. Following the US model, China has also invested in Technology Business Incubation to identify and nurture new innovators and entrepreneurs. Started in a small way in late 80's, China today has nearly a thousand TBI's. Up to 2008, nearly 50000 ventures hosted in these TBI's generated 20 billion Euros and employed 1000000 persons.

The message is very clear. China has made a massive investment in R&D and the required human resource to carry out the R&D in the last two decades and built an innovation and entrepreneurship ecosystem to convert knowledge into wealth, effectively following the US model. China did not also have to wait for long to see the impacts of these initiatives on its economy.

How has India been faring in the same two decades? Are there lessons for India in this China story?

I won't say that we have been sleeping. We built over a period of time, a reasonably good educational infrastructure, a research infrastructure and industrial infrastructure. And in selected areas, we have achievements to our credit. We survived the technology denial regime of the seventies and eighties and the global competition following the economic liberalization of the 90's. Clearly we have been moving ahead but the question which we keep on asking ourselves is that at the rate at which China is moving in the science and technology led growth and the rate at which India is moving in the same path, can India survive Chinese competition in the coming years?

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### **What India needs to fix to retain its rightful place in the global space?**

**W**e need to fix our educational pipe line and bring more people into R&D. We have too many youngsters outside the educational system. An unacceptable number of our students coming out of our educational institutions are 'unemployable'. For every million population, China has about 1177 researchers while India has about 216. This has to be corrected. Education and R&D are not expenditures but are investments. China has shown that the payback on this investment is almost immediate.

We need to strengthen our ecosystem for Innovation and Entrepreneurship. China and India ventured into technology based innovations and entrepreneurship band wagon approximately at the same time (1987-90) with support from United Nations Fund for Science and Technology. While the Chinese program grew, the Indian program was almost dormant till 2000 when India started its TBI program with a clear policy strategy. By then, China had

already established nearly 200 TBIs. By the end of the first decade of the twenty first century, there were only about 120 TBIs in India. Ironically, India played a major role in preparing the early Chinese program of Incubators with Indian experts from the Entrepreneurship Development Institute, Ahmedabad, employed by UNFS&T. One of them, Dr. Rustam Lalkaka continued to be a leading consultant to the Chinese incubator program even after the UN project.

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The Chinese political system also allows long term strategies. The Government could identify national needs, unique strengths, have a long term strategy and act. The story of China wrenching the rare earth magnet industry from US over a period of few decades is a classic example (Mancheri et al 2013). China has repeated the story in several other sectors including some in the strategic sector. I often wonder whether we are paying a heavy price for the “dance of democracy” in India where everything is decided by the next election which is only 2.5 years ahead on the average. Long term strategies do not seem to sell in the political space with many critical projects going through near-death experiences. At the same time, I am sure that none of us will like any other form of governance. Can we convince the public and the leadership that this country deserves long term strategies beyond the political compulsions that will propel it towards its rightful place in the world milieu? I am of the view that India and

China are not only similarly placed but they also have similar strengths and weaknesses in the areas of Education, Research and Development, Innovation and Entrepreneurship. The different political systems do impose special constraints but not enough to disrupt their march into the twenty first century.

While discussing India and China, I am always reminded of a story, a story of two village boys going for an early morning swim in the local pond. The water was understandably cold. Both the boys started going round the pond, testing the water temperature on and off by dipping their feet. One of the boys soon lost his patience and jumped into the water, soon got used to the water temperature and had a good swim. The other boy continued to go round the pond waiting for the water to warm up. It is your guess, India or China, who is having a good swim. ■

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*The views expressed here are those of the author and not necessarily of the Institute of Chinese Studies.*

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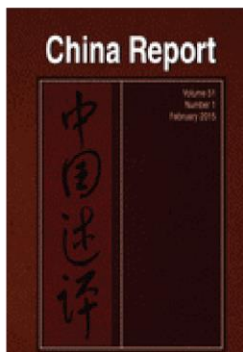


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