

Research and development spending and patents: where does India stand among SAARC and BRICS

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Jana *et al.*¹ have provided some interesting insights into patenting trends among member countries of South Asian Association for Regional Cooperation (SAARC). The study by Jana *et al.*¹ perhaps, is the only one comparing patenting trends among member countries of SAARC. The study is of significance as SAARC is the largest regional cooperation in the world covering 1.5 billion people¹, mostly belonging to underdeveloped and developing nations. Out of eight member countries of SAARC, according to the World Bank classification of economies based on Gross National Income (GNI) per capita as on 1 July 2013, Afghanistan, Bangladesh and Nepal are classified as Low Income; Bhutan, India, Pakistan and Sri Lanka as Lower Middle Income, and Maldives as Low and Middle Income economies². The patenting trends, in addition to the number of publications in peer-reviewed, international scientific journals with impact factor (IF), are used as a measure

to gauge scientific output of a country³. The patenting trends and scientific output in terms of publications are also related to the amount spent by countries on research and development (R&D) and encouraging science and technology (S&T). The country-wise data, available from the World Bank's World Development Indicator: Science and Technology 2014, is useful in analysing the spending on S&T⁴. Table 1 shows the expenditure on R&D as percentage of Gross Domestic Product (GDP); scientific and technical journal articles; number of full time equivalent (FTE) researchers per million population, and patents filed by residents and non-residents among member countries of SAARC⁴.

As is evident, India is the largest member in terms of economy, demographics, size, population and political influence among the SAARC member countries. Despite being the largest member, the expenditure on R&D as percentage of GDP by India is not encouraging and so

is the output in terms of S&T journal articles compared to other members of SAARC (Table 1). Complete data for all countries in SAARC are not available and hence direct comparison is restricted between three countries, India, Pakistan and Sri Lanka. During 2009–10, India spent 0.87% of its GDP on R&D. Comparing the figures to member countries of BRICS, Brazil spent 1.17%, the Russian Federation 1.25%, China 1.70% and South Africa 0.93% of its GDP on R&D. The percentage of GDP spent on R&D was less than 0.5% by countries like Pakistan, Sri Lanka and Mexico⁵.

Table 2 shows the expenditure on R&D as percentage of GDP; scientific and technical journal articles; number of FTE researchers per million population and patents filed by residents and non-residents among member countries of BRICS⁴.

Among member countries of BRICS, India's performance in terms of R&D spending is not quite encouraging. The

Table 1. Some important indicators for SAARC countries

Country	Expenditure on R&D as percentage of GDP (2005–2011)	S&T journal articles (2011)	FTE researchers per million population (2005–2011)	Patents filed (2012)	
				Residents	Non-residents
Afghanistan	N/A	8	N/A	N/A	N/A
Bangladesh	N/A	291	N/A	67	287
Bhutan	N/A	8	N/A	N/A	N/A
India	0.76	22,481	137	9,553	34,402
Maldives	N/A	0	N/A	N/A	N/A
Nepal	0.30	64	N/A	N/A	N/A
Pakistan	0.33	1,268	149	96	798
Sri Lanka	0.16	130	103	225	235

Source: World Bank data.

Table 2. Some important indicators for BRICS countries

Country	Expenditure on R&D as percentage of GDP (2005–2011)	S&T journal articles (2011)	FTE researchers per million population (2005–2011)	Patents filed (2012)	
				Residents	Non-residents
Brazil	1.6	13,148	710	4,804	25,312
Russian Federation	1.12	14,151	3,120	28,701	15,510
India	0.76	22,481	137	9,553	34,402
China	1.84	89,894	963	535,313	117,464
South Africa	0.87	3,125	389	608	6,836

Source: World Bank Data.

country stands last among members of BRICS when it comes to R&D spending. The R&D spending by China is more than twice that of India. However, China is way ahead of other members of BRICS when it comes to S&T journal articles and patents filed. The number of patents filed by Chinese researchers is noteworthy. Strikingly, more number of patents in China are filed by residents than non-residents, which is quite contrary to the patents filed in Brazil, India and South Africa. The figures suggest that the amount spent by China towards R&D leads to substantial outcome in terms of publications and patents. Even in terms of FTE researchers per million population, India stands last among BRICS member countries. This certainly should come as a disappointment when the Government of India is giving more importance to creating a culture of R&D among researchers.

Though comparison of R&D expenditure and scientific output by India with BRICS and SAARC member countries is neither advisable nor meaningful, it provides us with a benchmark as to where our country stands among these member countries. This analysis may provide us with insight as to what measures India needs to adopt to be equally competitive or superior among member countries. It is important to note that among BRICS member countries, India stands last in terms of spending on R&D, whereas it is ahead in R&D spending among SAARC member countries like Pakistan and Sri

Lanka. In terms of patent applications filed per 100,000 inhabitants, among BRICS member countries, India has the least patents⁶, despite the fact that the number of patent applications by residents has seen upward trend in recent years. Most of the patents in India are owned by non-residents and foreign inventors, predominantly from the US. Additionally, inventive activity in India has slowed down. The higher education sector in the country has failed to contribute towards technology generation and outsourcing technology to industry⁷. Non-productive research among higher education institutions in India has been a matter of concern and accounts for lower percentage of patents in the country⁷. Lowest population, GDP, R&D expenditure and R&D personnel among SAARC member countries have not been obstacles for Sri Lanka in providing a better and favourable innovation ecosystem¹.

In absolute terms, India is ahead of its small neighbours among SAARC, but when the numbers are weighted in terms of economic size and population, Sri Lanka fares better than India. Also, India is behind members of BRICS, even in absolute terms, in certain parameters like number of researchers, spending on R&D and patents filed.

Not only increase in R&D expenditure by the Government of India is essential, the Indian higher education institutions must also encourage 'socially useful' research leading to innovation, increasing patenting and higher number of pub-

lications. The measureable output should be qualitatively superior too. India's performance in terms of R&D expenditure and patenting is healthy among SAARC member countries, whereas it is dismal among the member countries of BRICS. The R&D expenditure and patenting activities in India need a boost in order to create a 'culture of innovation' in the country.

1. Jana, T. *et al.*, *Curr. Sci.*, 2014, **106**(9), 1190–1195.
2. <http://data.worldbank.org/news/new-country-classifications>
3. Griliches, Z., *Patent Statistics as Economic Indicators: A Survey in R&D and Productivity: The Econometric Evidence*, University of Chicago Press, USA, 1998, pp. 287–343; <http://www.nber.org/chapters/c8351.pdf> (accessed on 17 May 2014).
4. World development indicators: science and technology, 2014; <http://wdi.worldbank.org/table/5.13> (accessed on 17 May 2014).
5. Research and development statistics at a glance 2011–2012. Department of Science and Technology, Ministry of Technology, Government of India, 2013.
6. Bagchi, N., *ASCI J. Manage.*, 2011, **41**(1), 1–20.
7. Kadri, H. and Saykhedkar, M., *J. Intell. Property Rights*, 2011, **16**, 217–224.

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