

RESEARCH & DEVELOPMENT STATISTICS

AT A GLANCE

2017-18



DEPARTMENT OF SCIENCE & TECHNOLOGY

MINISTRY OF SCIENCE & TECHNOLOGY

GOVERNMENT OF INDIA

NEW DELHI-110016 (INDIA)

December 2017

FOREWORD

The Department of Science & Development (DST) is primarily a policy making body for S&T sector in India. New STI Policy 2013 of the government lays special emphasis on scientifically derived and evidence-based policy formulation for a strong and viable Science, Research and Innovation System for India. The role and criticality of data in the formulation of evidence-based policies are widely appreciated. National Science and Technology Management Information System(NSTMIS),DST has been continuously engaged in generating Databases for S&T sector since 1973 and for convenience of comparisons with databases of other countries, guidelines of UNESCO / OECD have been adopted for statistics on S&T related information.

Salient findings of the survey launched in the year 2015 for compilation of the latest Research and Development Statistics and Indicators are presented here mainly in the form of graphical presentations. Scope and coverage of data on R&D expenditure and human resources has been enlarged this time to include multi-national companies and companies not covered by the Department of Scientific and Industrial Research (DSIR) under its recognition scheme. Further the survey analysis has been complemented and enriched by the secondary sources such as Higher Education in S&T, Patents etc. including Bibliometric analysis of Scientific Publications.

Planning and execution of the National Survey is an in-house exercise of DST. It is a culmination of the NSTMIS, DST team effort comprising Dr. Parveen Arora, Dr. A.N. Rai and Mr. P. K. Arya.

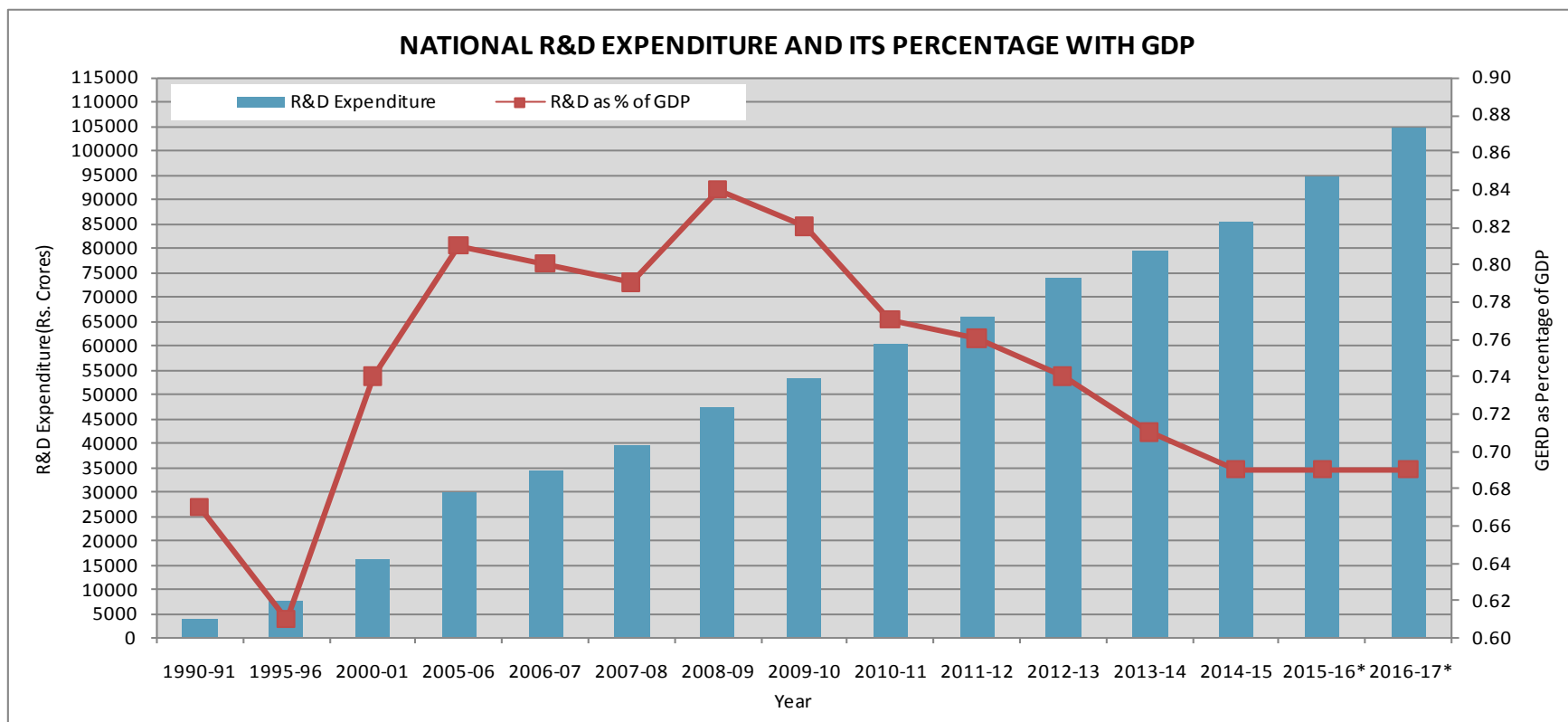
I thank all scientific agencies and in-house R&D labs for providing data / inputs contained in this compilation. It is hoped that this publication would be useful for evidence based planning for Indian Science Sector.

(Prof. Ashutosh Sharma)
Secretary
Department of Science & Technology
Government of India

December, 2017

MAJOR HIGHLIGHTS

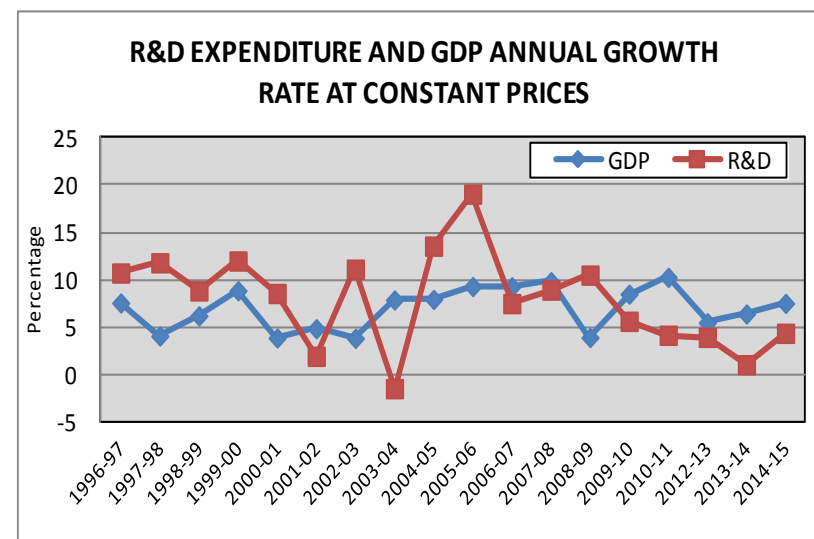
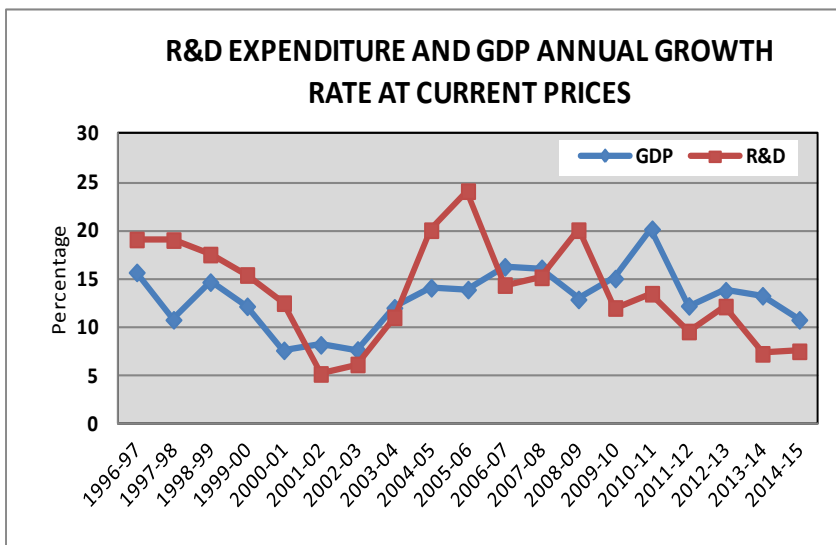
- ❖ The Gross expenditure on R&D (GERD) in the country has been consistently increasing over the years and has tripled in a decade from Rs.24,117.24 crores in 2004-05 to Rs. 85,326.10 crores in 2014-15. It is estimated to be Rs. 94,516.45 crores in 2015-16 and Rs. 1,04,864.03 crores in 2016-17.



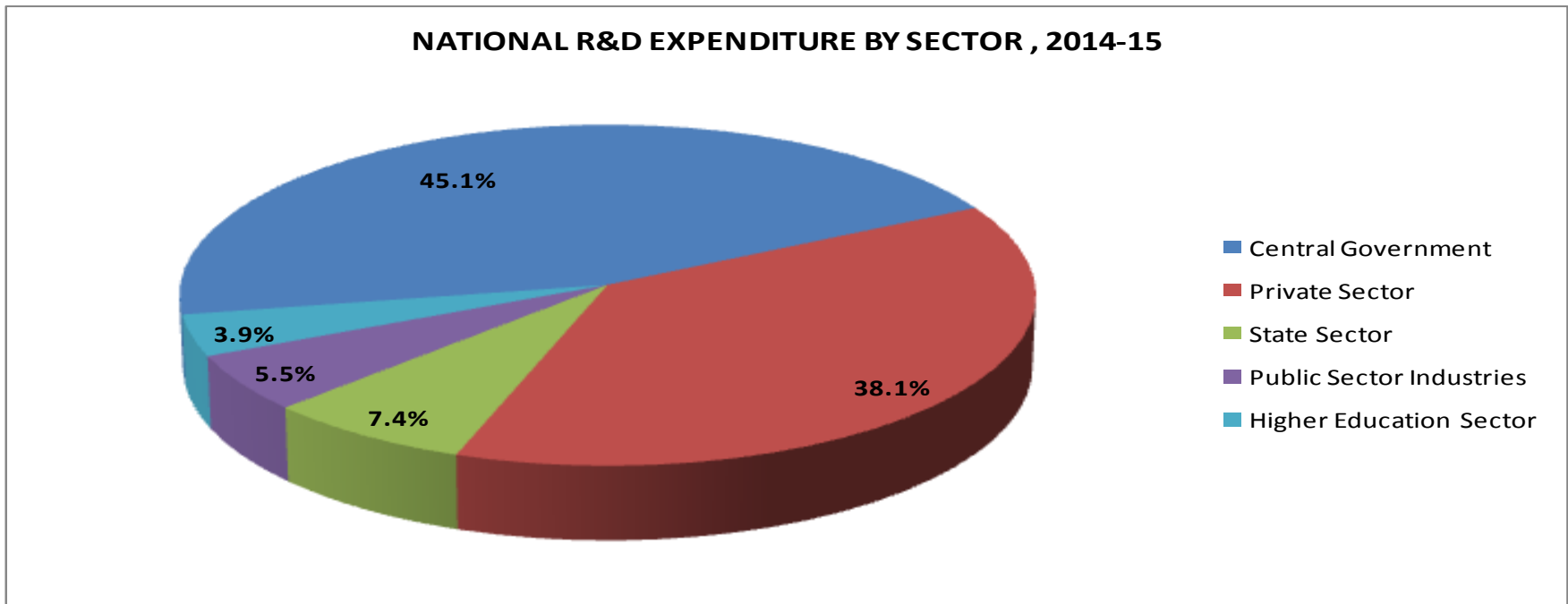
Source: Department of Science & Technology, Government of India.

- ❖ India's Gross Expenditure on R&D (GERD) as percentage of GDP was 0.69% during the year 2014-15.
- ❖ India's per capita R&D expenditure has increased to Rs. 659/- (US\$ 10.8) in 2014-15 from Rs. 217/- (US\$ 4.8) in 2004-05.

- ❖ GDP since 2009-10 onwards (both at current and constant prices) has surpassed the annual rate of growth of R&D. One of the reasons could be the revision of the GDP series with a new base year 2011-12 involving a comprehensive coverage of industrial and service sectors, thus leading to higher GDP and its growth rate.



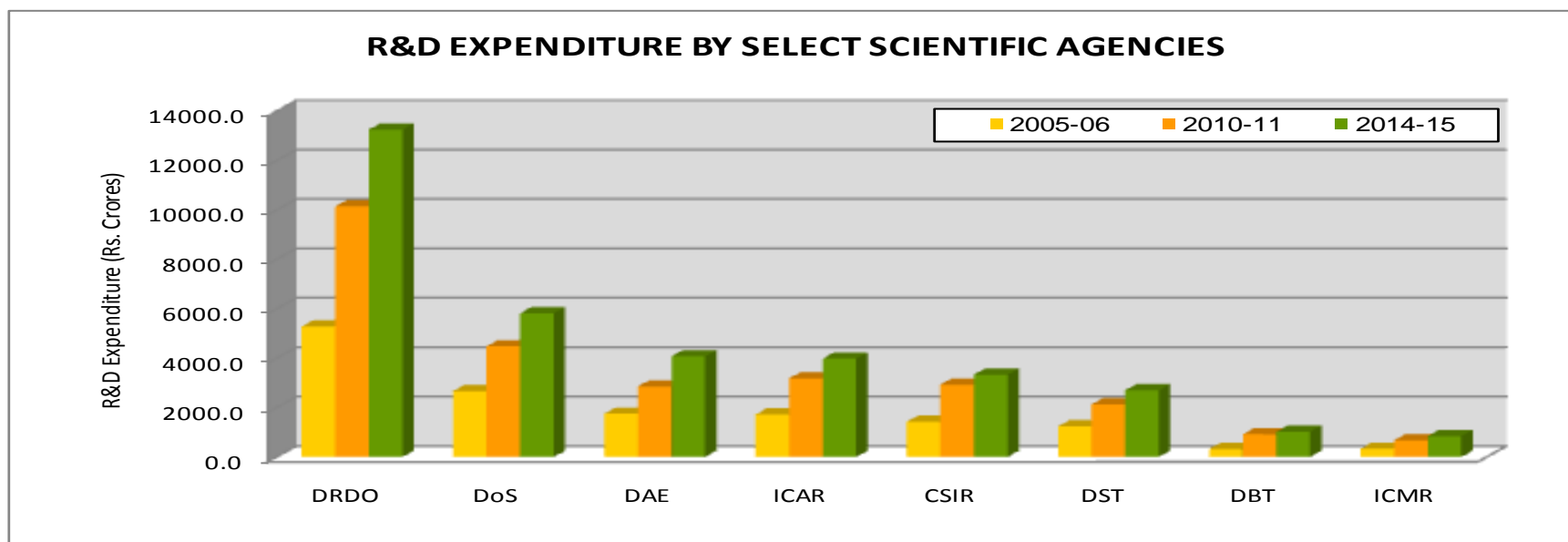
- ❖ In terms of PPP\$, India's Gross Expenditure on R&D (GERD) increased from 40.2 billions PPP\$ in 2009-10 to 50.3 billions PPP\$ in 2014-15. It is estimated to be 52.6 billions PPP\$ in 2015-16 and 55.0 billions PPP\$ in 2016-17.
- ❖ India accounted for 2.7 % share in World GERD during 2014-15 to 2016-17.
- ❖ World GERD increased from 1359.14 billions PPP\$ in 2009-10 to 1832.86 billions PPP\$ in 2014-15. It is estimated to be 1946.49 billions PPP\$ in 2015-16 and 2067.18 billions PPP\$ in 2016-17.



Source: Department of Science & Technology, Government of India.

- ❖ Gross Expenditure on R&D (GERD) is mainly driven by the Government sector comprising of Central Government 45.1%, State Governments 7.4%, Higher Education 3.9% and Public Sector Industries 5.5% with Private Sector Industries contributing 38.1% during 2014-15.

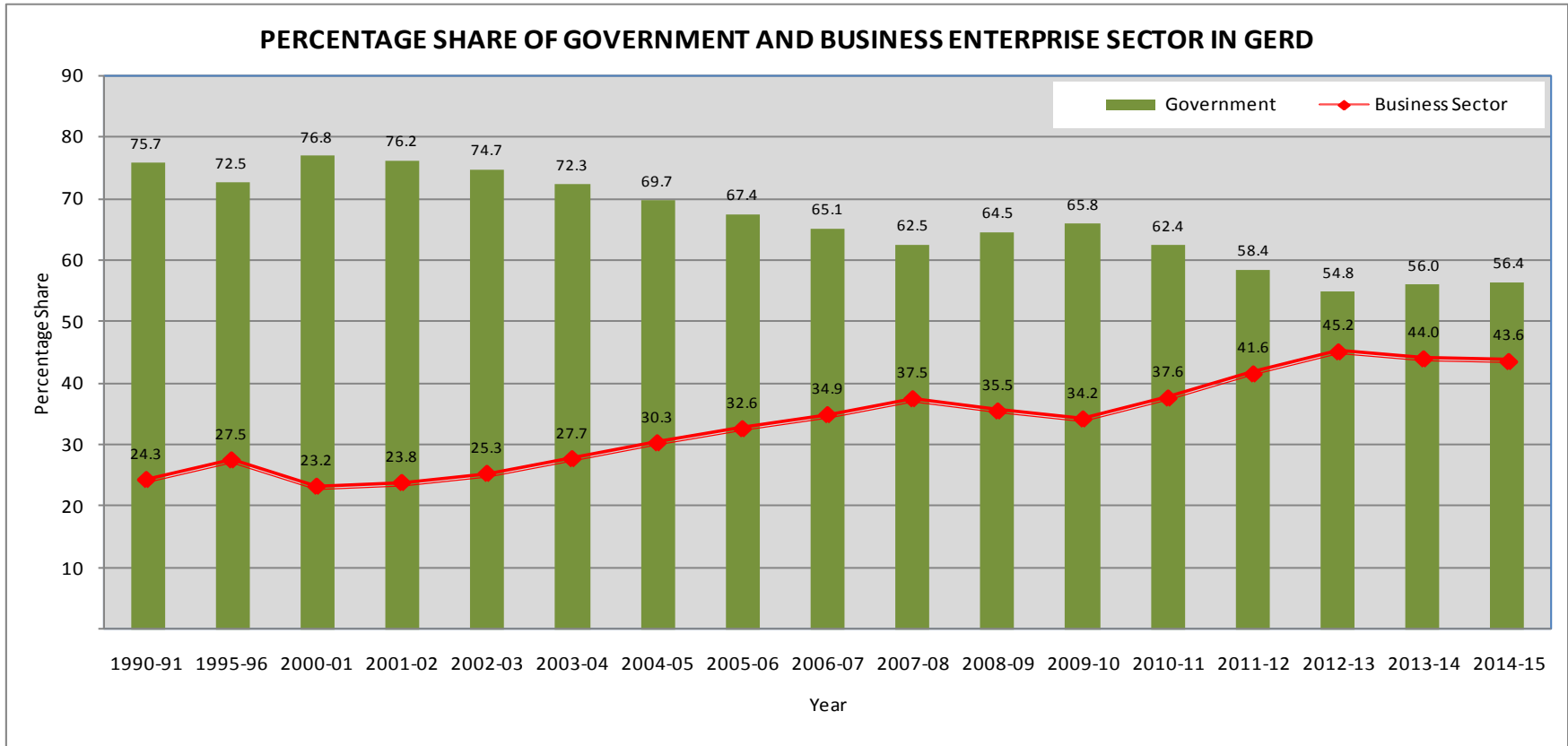
- ❖ During the year 2014-15, 81.3% of the R&D expenditure incurred by Central Government sources came from 8 major scientific agencies.



Source: Department of Science & Technology, Government of India.

- ❖ Amongst the 8 Central Government major scientific agencies, DRDO accounted for the maximum share of 37.8% of R&D expenditure followed by DOS (16.6%), DAE (11.6%), ICAR (11.4%), CSIR (9.5%) and DST (7.7%), DBT (2.9%) and ICMR (2.4%) during 2014-15.

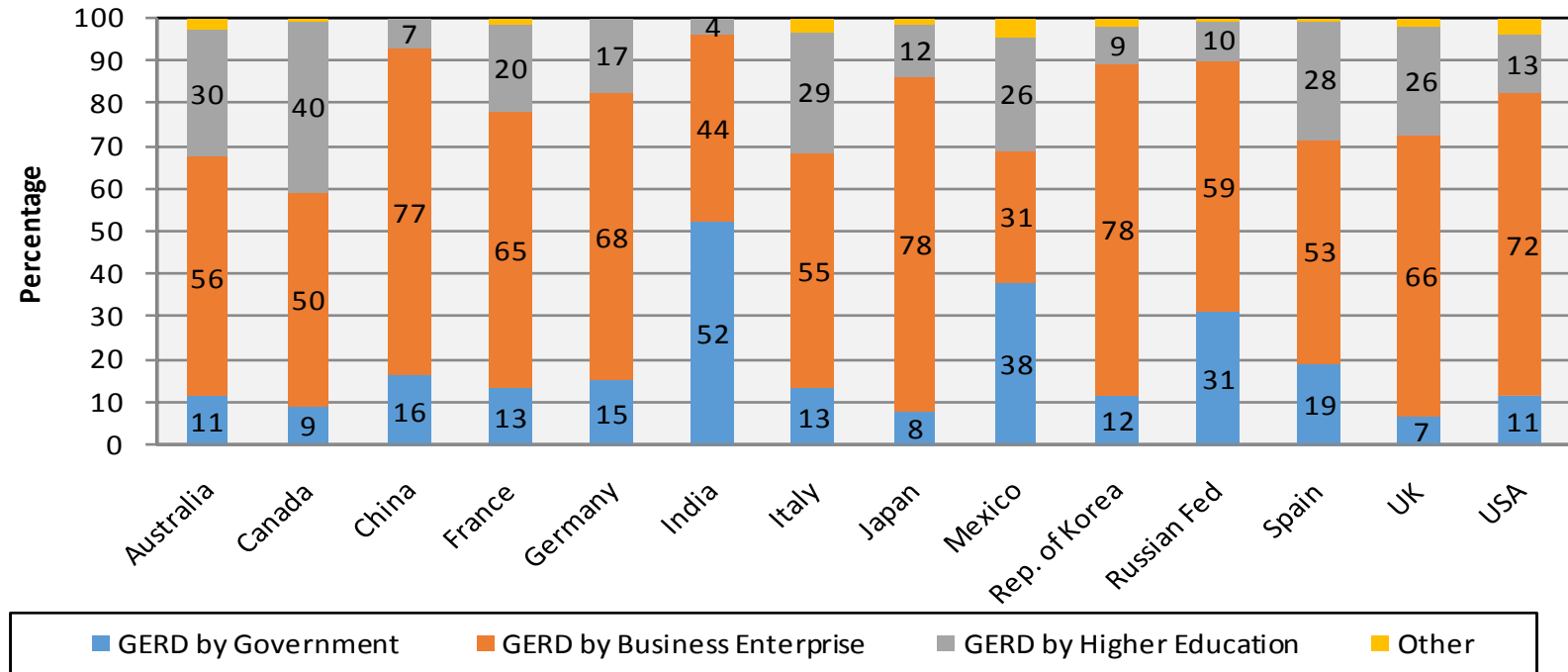
- ❖ Business Enterprise (Industrial) sector participation in GERD showed an increasing trend with a share 43.6% in 2014-15 as compared to 34.2% in 2009-10.



Source: Department of Science & Technology, Government of India.

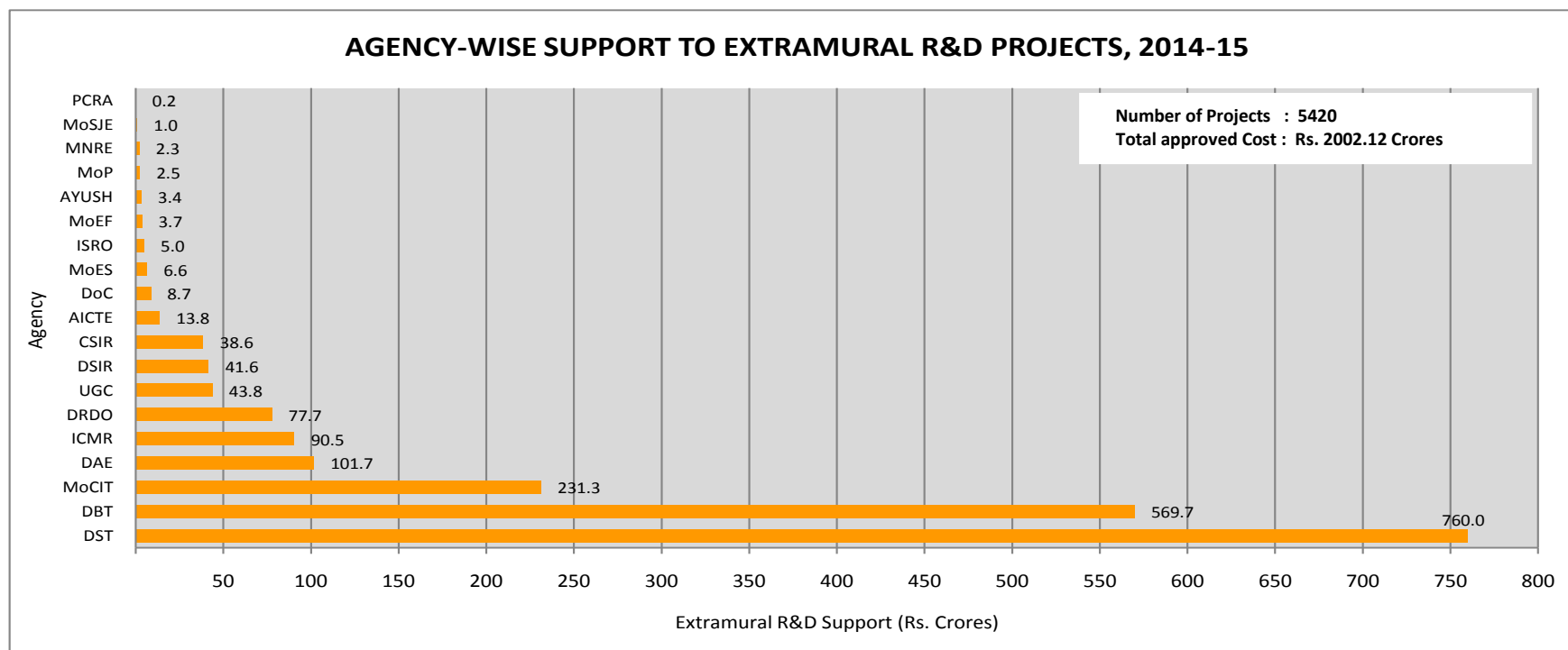
- ❖ During 2014-15, Public Sector R&D was led by Defense Industries and Fuels while Private Sector R&D was dominated by Drugs and Pharma and Transportation.

PARTICIPATION OF GOVERNMENT AND BUSINESS ENTERPRISE SECTOR BY COUNTRY, 2015



- ❖ India stands in contrast with select developed and emerging economies with 50% participation in GERD being made by the government. Further, Higher Education Sector participation in GERD by India is quite low among the select countries.

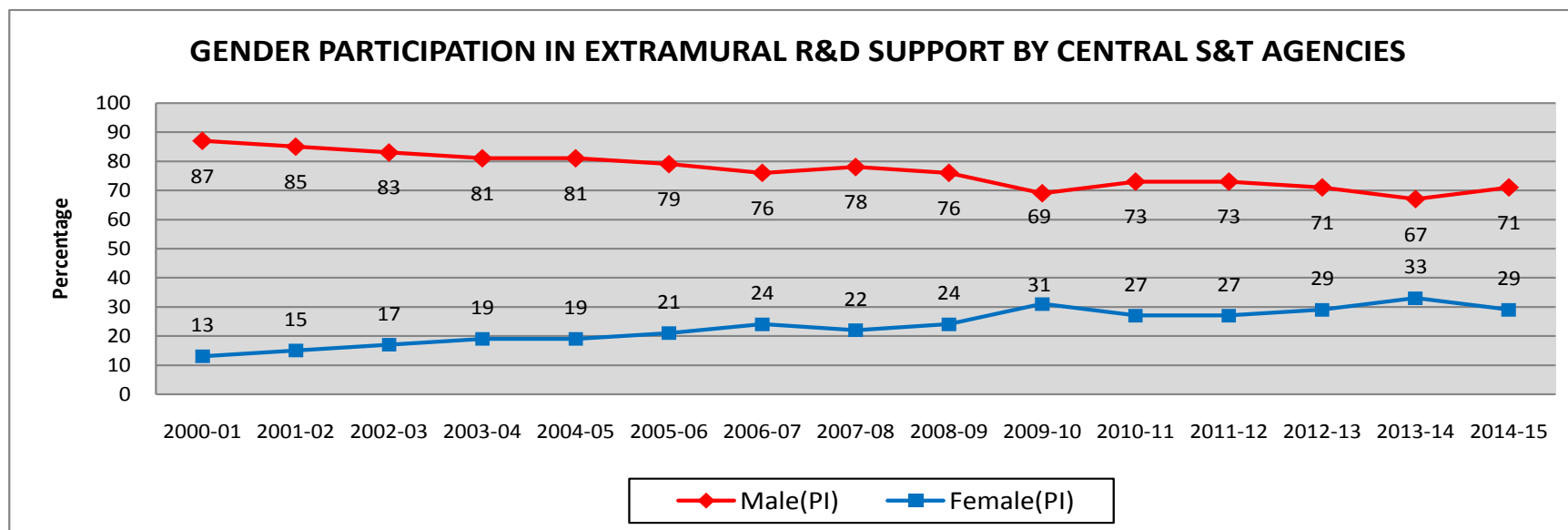
- ❖ Extramural R&D support by Central Government Agencies has increased from Rs. 1,358.04 crores in 2009-10 to Rs 2002.12 crores in 2014-15. Its share in the national GERD was 2.3% during 2014-15.
- ❖ The Department of Science and Technology (DST) and Department of Biotechnology (DBT) were the two major players contributing nearly 66.4% of the extramural R&D support in the country.



Source: Department of Science & Technology, Government of India.

- ❖ Academic sector received 58% of the total extramural R&D support during the year 2014 -15.

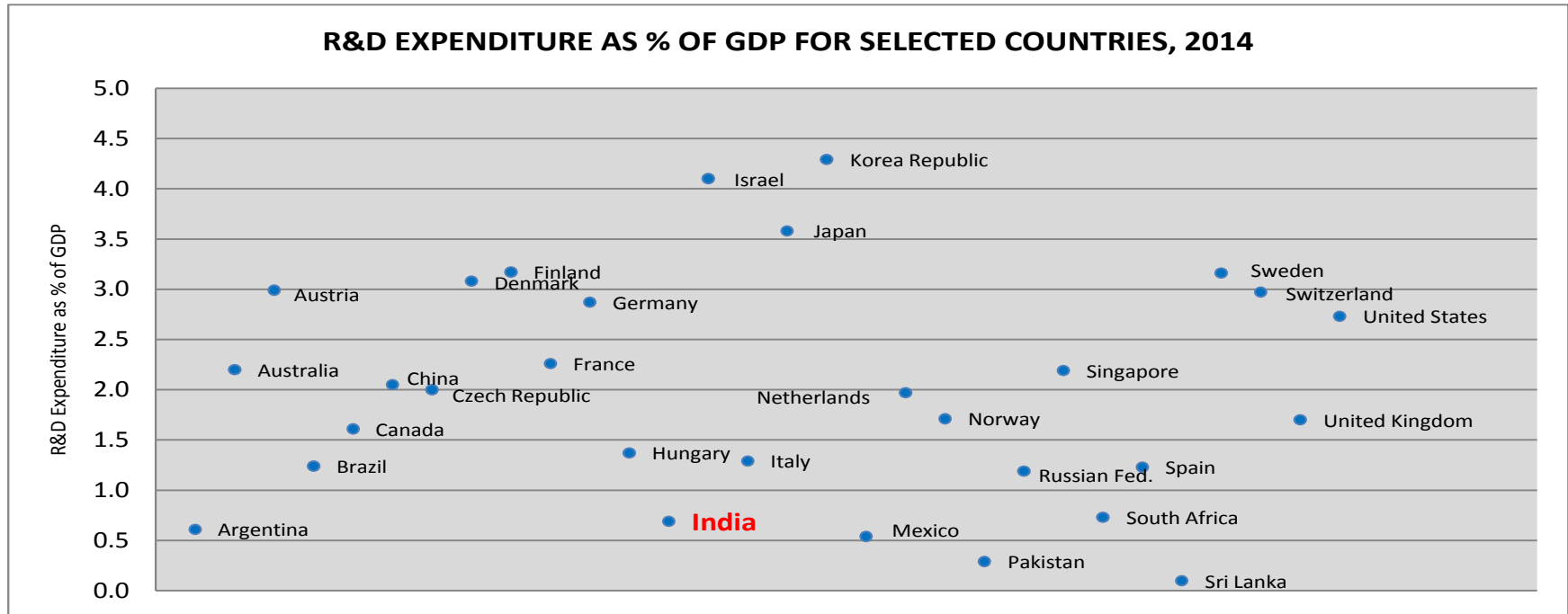
- ❖ Women participation in extramural R&D projects has increased significantly to 29% in 2014-15 from 13% in 2000-01 due to various initiatives undertaken by the Government in S&T sector. In absolute terms, 1,301 women Principal Investigators (PIs) during 2014-15 availed extramural R&D support as against 232 in 2000-01.



Source: Department of Science & Technology, Government of India.

- ❖ As on 1st April 2015, nearly 5.28 lakhs personnel were employed in the R&D establishments in the country including in-house R&D units of public and private sector industries. 2.83 lakhs (53.6%) were performing R&D activities while 1.25 lakhs (23.7%) and 1.2 lakhs (22.7%) each were engaged in auxiliary and administrative / non-technical support activities.
- ❖ As on 1st April 2015, there were 39,388 (13.9%) women out of total 2.82 lakhs R&D personnel directly engaged in R&D activities.
- ❖ Out of the total 27,327 Doctorates in the country, 15,246 (56.4%) Doctorates were from the S&T discipline during 2014-15. India occupies 3rd rank in terms of number of Ph. D.'s awarded in S&T after China (30,017) and USA(26,520).

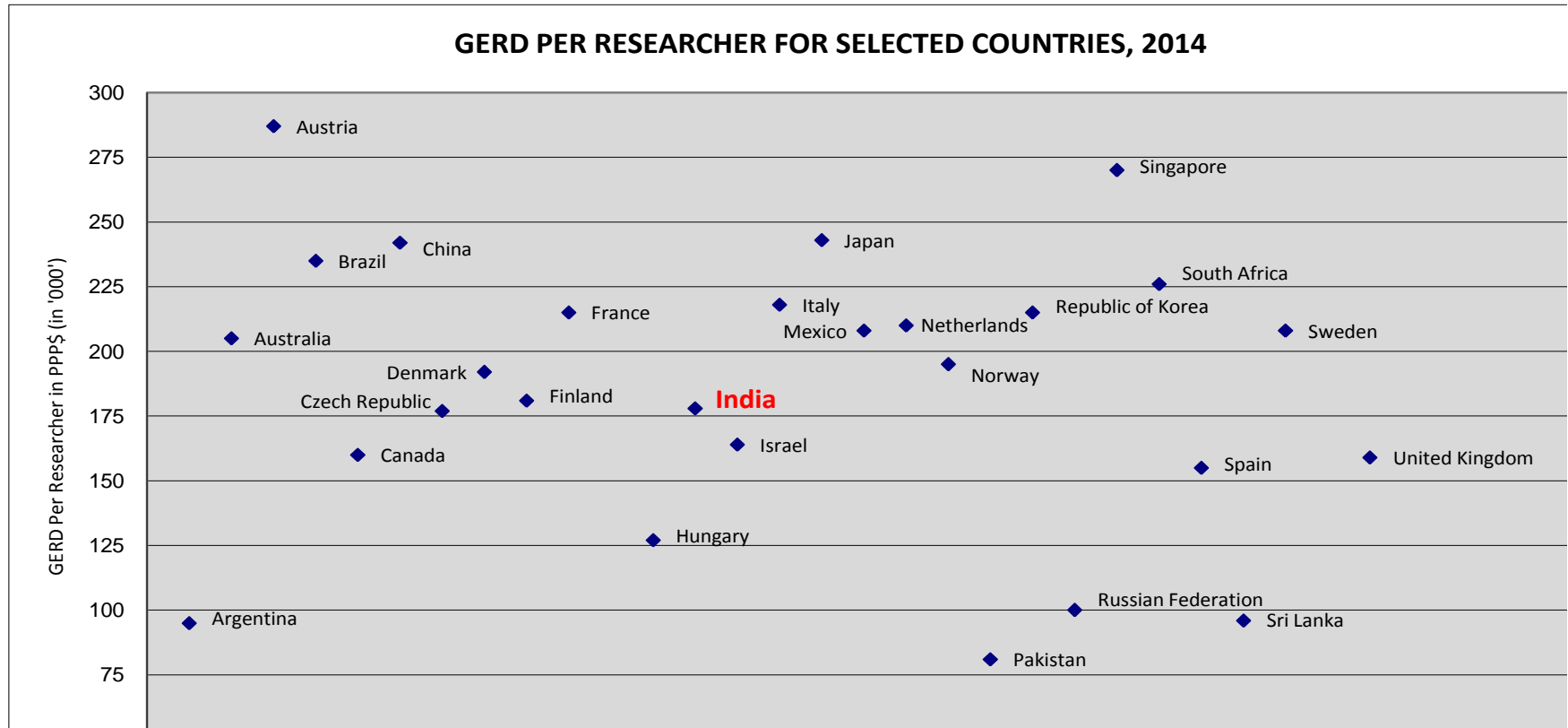
- ❖ India spent 0.69% of its GDP on R&D in 2014-15, while the same among other developing BRICS countries was Brazil 1.24%, Russian Federation 1.19%, China 2.05% and South Africa 0.73%. This ratio was less than 0.5% for countries like Pakistan (0.29%) and Sri Lanka (0.10%).



Source: Department of Science & Technology, Government of India.

- ❖ Most of the developed countries spent more than 2% of their Gross Domestic Product (GDP) on R&D.
- ❖ The number of researchers per million population in India increased from 110 in the year 2000 to 218 in 2015.

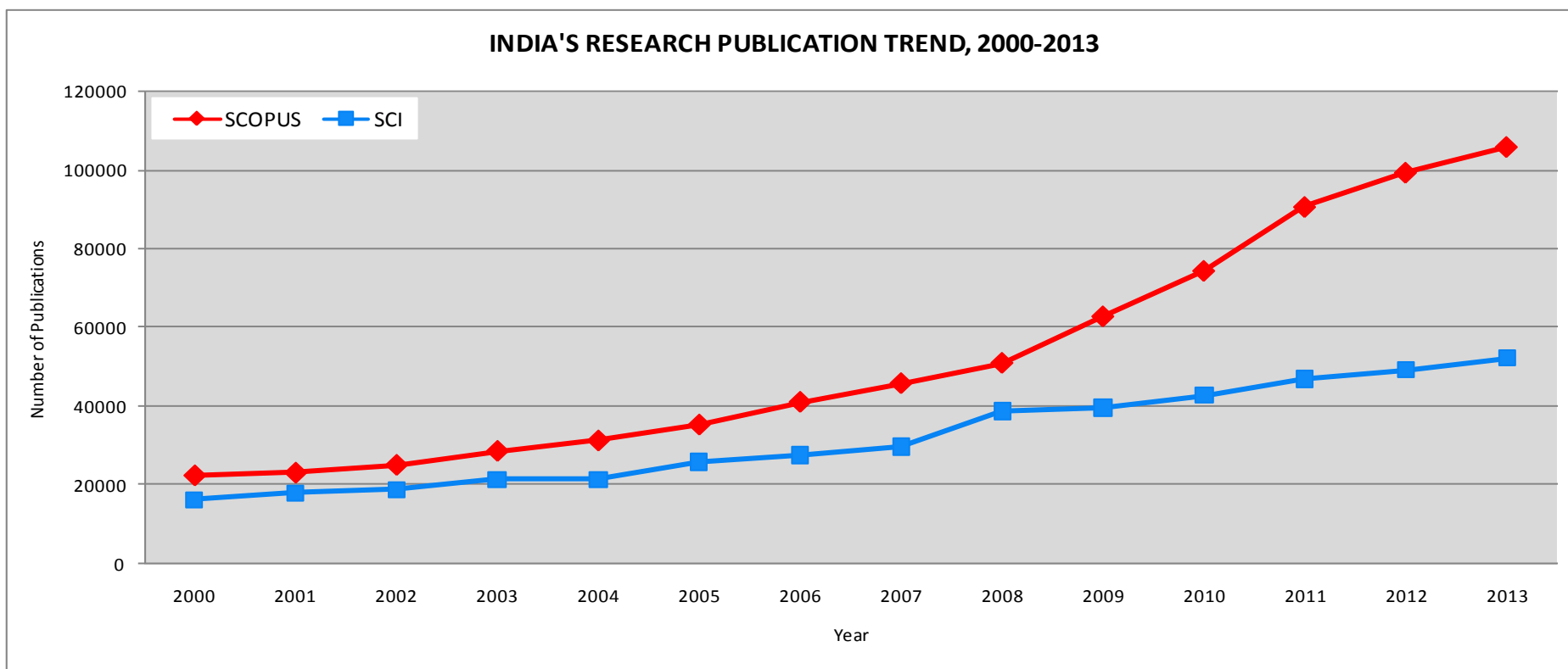
- ❖ Among the other developed countries, Israel topped the list having more than 8255 researchers per million population in the world followed by Denmark (7,198), Republic of Korea (6,899) and Finland (6,986) during 2014.



Source: Department of Science & Technology, Government of India.

- ❖ India's R&D expenditure per researcher was 178 '000 PPP\$ during 2014-15, which was ahead of Russian Federation, Canada, Israel, Hungary, Spain and UK.

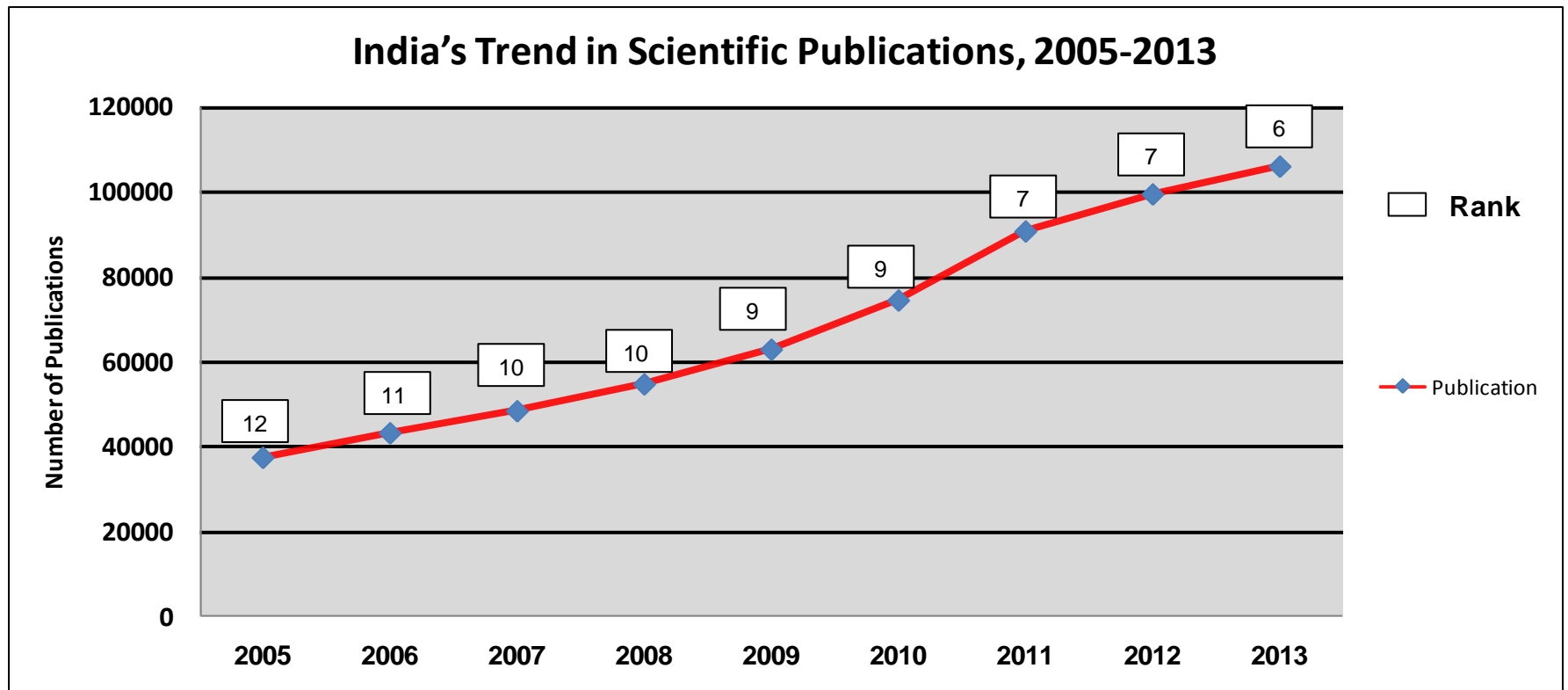
- ❖ India's scientific publication output has shown a rising trend during the last decade. As per the SCOPUS database, research output increased by 68% from 62,955 in 2009 to 1,06,065 in 2013. Similarly, it increased by 31.5% from 39,672 in 2009 to 52,165 in 2013 as per the SCI database.



Source: DST Commissioned Study (SCI ; SCOPUS Database)

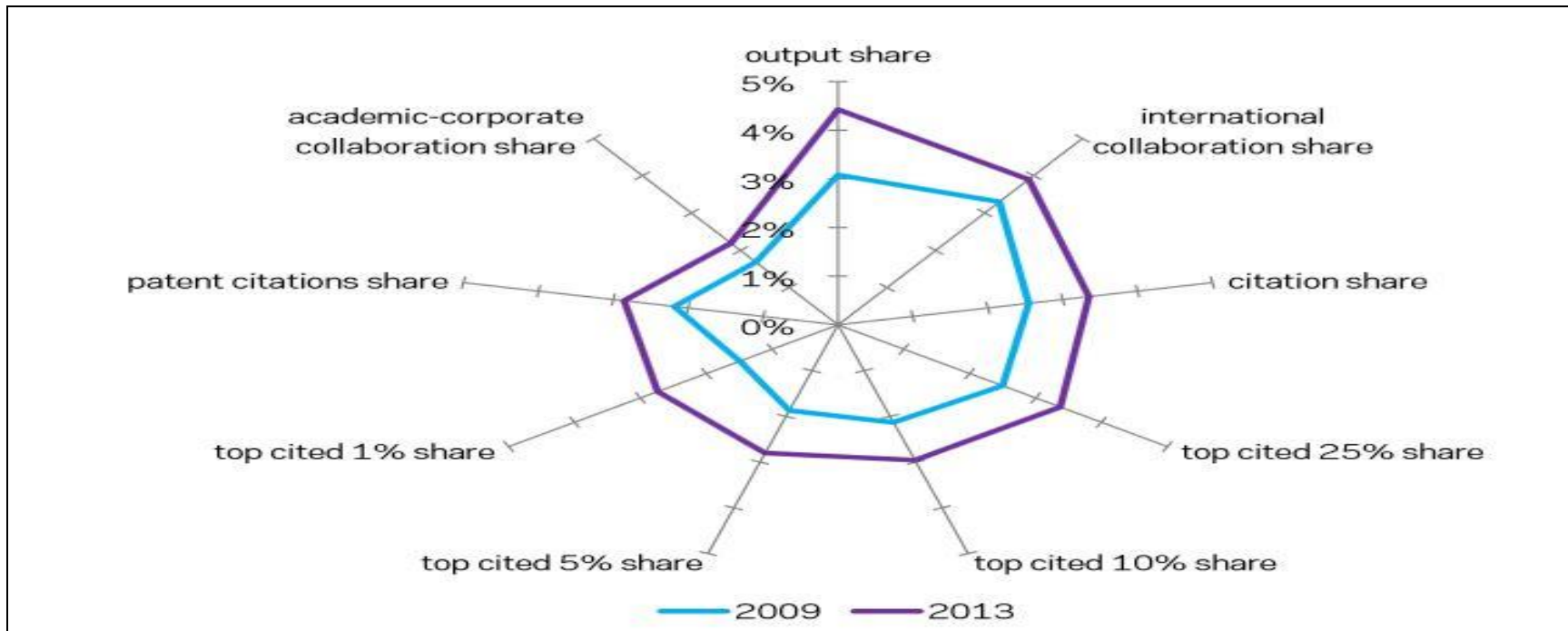
- ❖ During 2009-2013, India's growth rate of scientific publication as per the SCOPUS and SCI was 13.9% and 7.1% as against the world average of 4.4% and 4.1% respectively.
- ❖ India's share in global research publications increased from 2.2% in 2000 to 3.7% in 2013 as per SCI database.

- ❖ During 2009-13 as per SCI database, India's largest share of global research publications were in Chemistry (6.8%), Agricultural Sciences (6.6%), Pharmacology and Toxicology (6.3%), Material Science (6.1%), Microbiology (4.9%), Physics (4.6%), Biology and Bio-chemistry (4.3%) and Engineering (4.1%).
- ❖ India ranked at 6th position in the world in scientific publications ahead of France, Spain and Italy as per the Scopus database during 2013.



Source : DST Commissioned Study (SCOPUS Database)

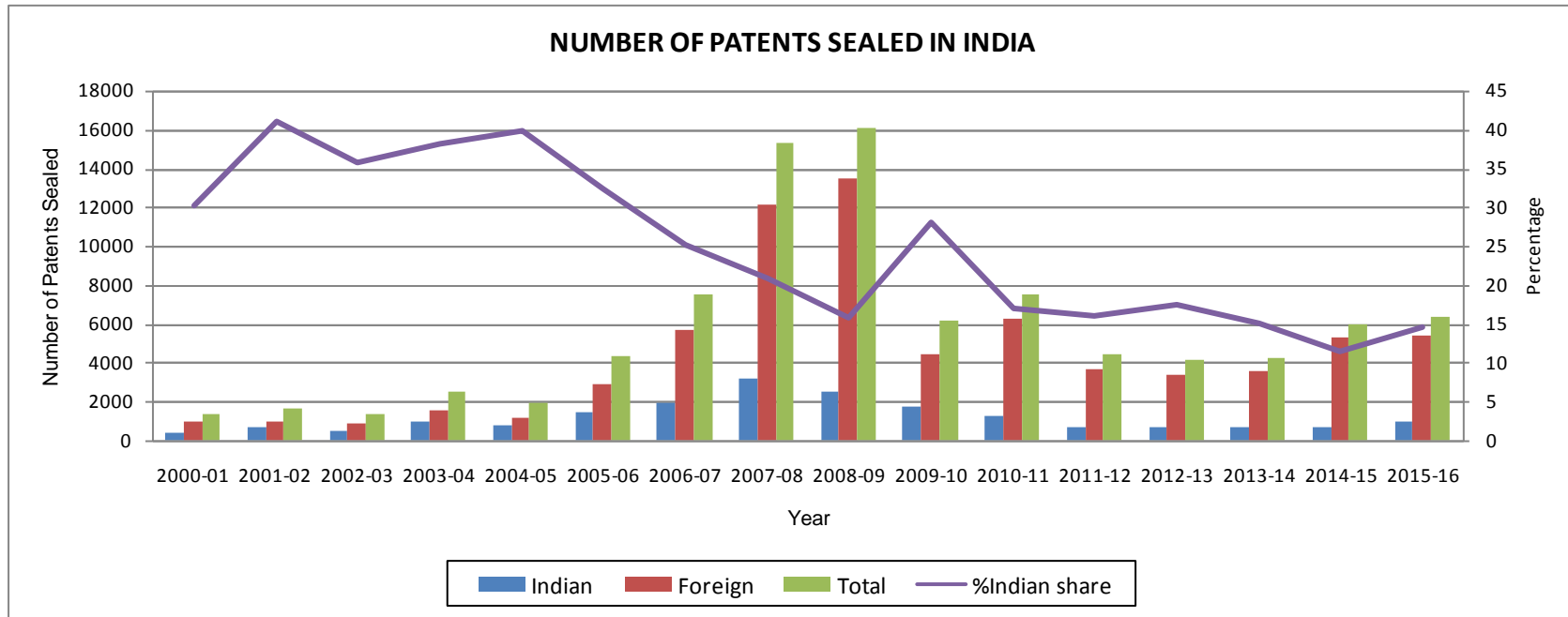
INDIA'S OUTPUT, IMPACT AND KNOWLEDGE TRANSFER, 2009-13



Source: DST Commissioned Study (SCOPUS Database)

- ❖ India's global share in scientific research publications increased from 3.1% in 2009 to 4.4% in 2013 as per SCOPUS database.
- ❖ During 2009-13 as per SCOPUS database, India's largest share of global research publications were in Pharmacology and Toxicology (12.4%) followed by Veterinary Sciences (7.1%), Chemistry (6.7%), Chemical Engineering (5.6%), Environmental Science (5.1%), Material Science (5.0%), Agricultural and Biological Sciences (4.9%) and Physics & Astronomy (4.5%).
- ❖ In 2013, India's global share of Citations and of Top Cited Papers (25%, 10%, 5% & 1%) was around 3% as per SCOPUS database.

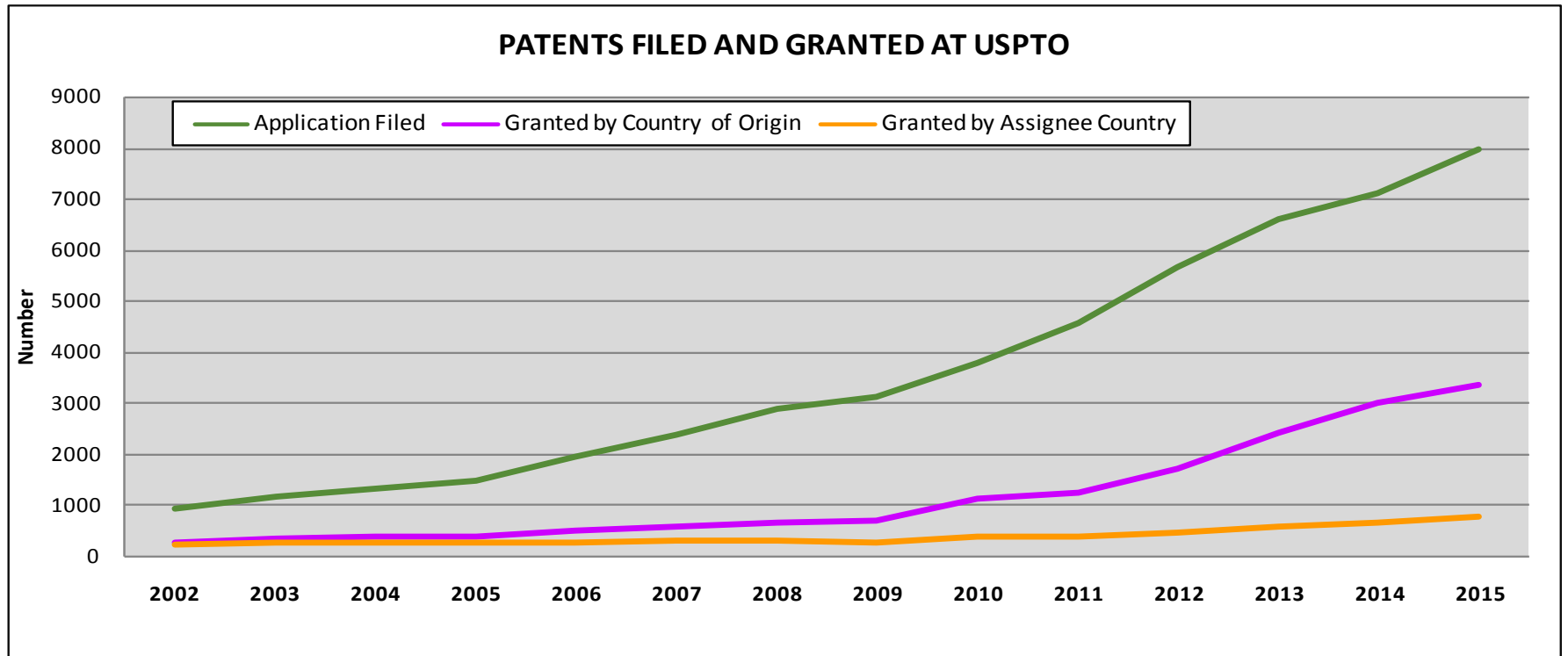
- ❖ During 2015-16 a total of 46,904 patents were filed in India. Out of which 13,066 (28%) patents were filed by Indian residents. As per WIPO report 2016, India is ranked at 10th position in terms of Resident Patent Filing activity.
- ❖ Patent applications filed in India are dominated by disciplines like Mechanical, Chemical, Communication and Computer/Electronics.



Source: Controller General of Patents, Design and Trade Marks-Annual reports

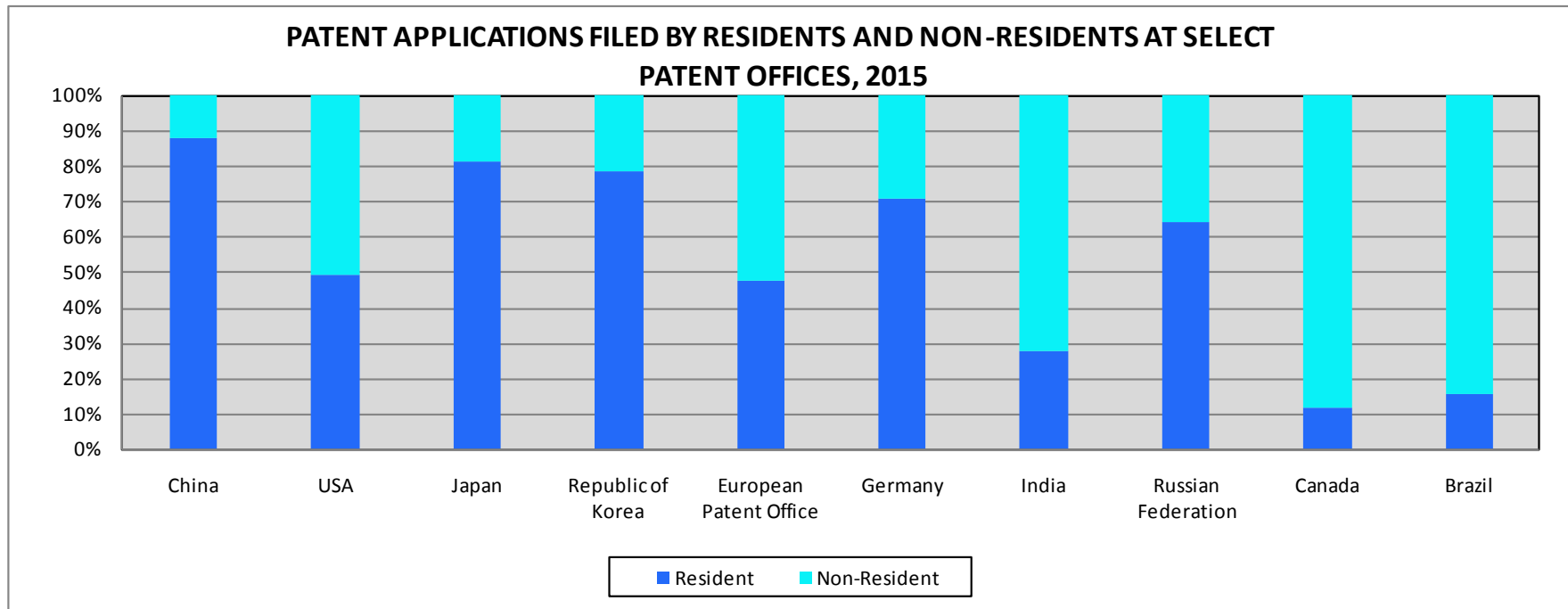
- ❖ Nearly 60% of the foreign patents filed in India during 2015-16 were from three countries viz USA (34.9%), Japan (14.3%) and Germany (8.8%).

❖ India's Patent Applications Filed and Granted at USPTO have shown a rising trend since 2005 onwards.



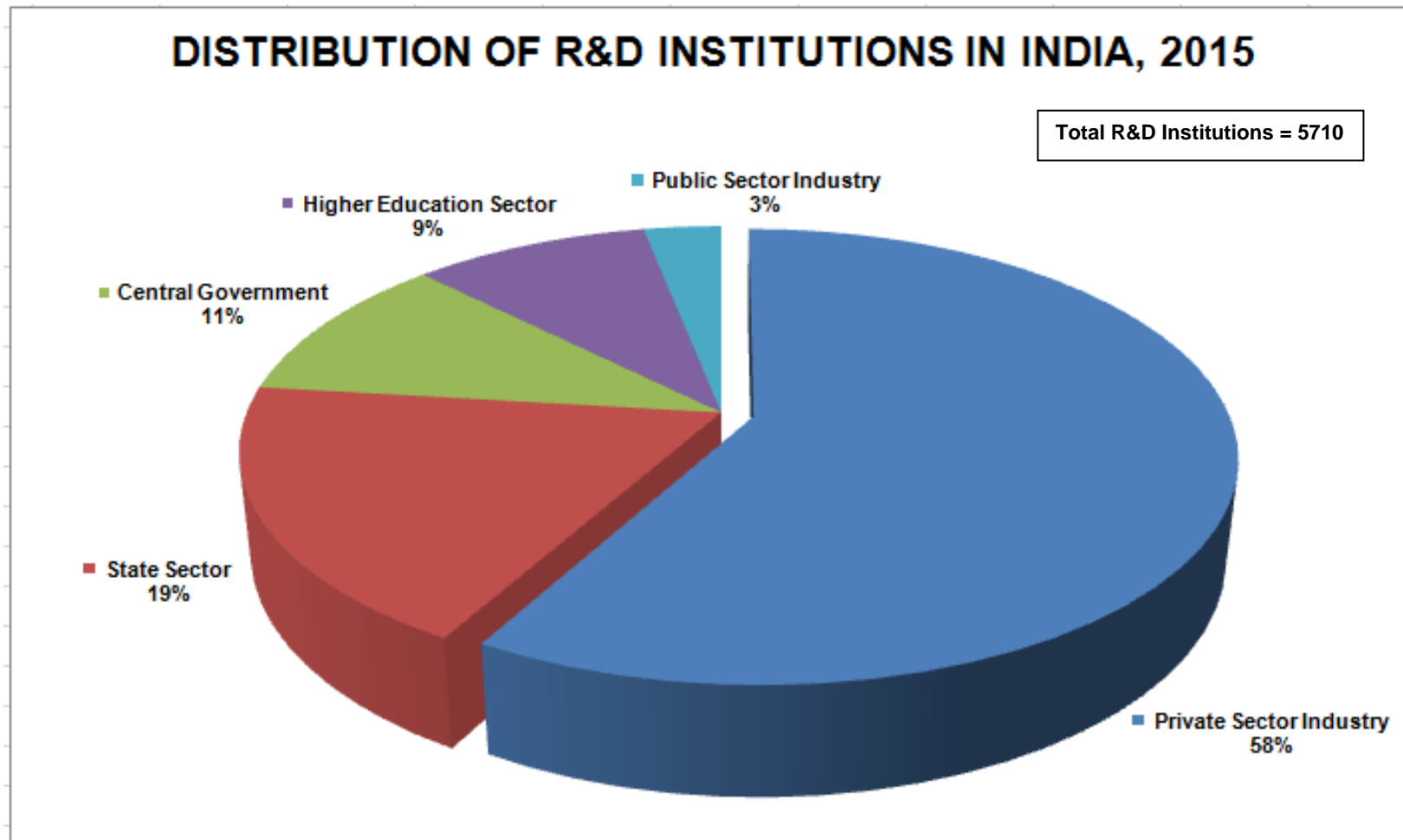
Source: USPTO

❖ According to WIPO, India's Patent Office stands at the 7th position among the top 10 Patent Filing Offices.



Source: WIPO Report, 2016

- ❖ Total 5,710 R&D institutions were surveyed as a part of the National R&D Survey 2015. 58% of the R&D Institutions surveyed were in the private sector.



Source: Department of Science & Technology, Government of India.

SALIENT FEATURES

The forthcoming edition of the Research & Development Statistics 2017-18 contains detailed S&T Indicators Tables on the following themes:

- National R&D expenditure and break-up of this into various sectors;
- National R&D expenditure and percentage of Gross National Product
- National R&D expenditure at current and constant prices
- R&D expenditure by Major Scientific Departments/Agencies.
- R&D expenditure by Public/Joint Sector companies
- Sector-wise R&D Manpower

Research & Development Statistics 2017-18 will also provide information from secondary sources on Enrolment and Outturn of S&T personnel, Patents as well as International S&T comparisons. The report is referred as a source book on S&T by the policy makers, planners, researchers, scientists and technologists both nationally and internationally.

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Acronym:

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| AICTE: All India Council of Technical Education | DoC: Department of Coal | ISRO: Indian Space Research Organisation | MoP: Ministry of Power |
| AYUSH: Dept. of Ayurveda, Yoga, Naturopathy, Unani, Siddha & Homoeopathy | DRDO: Defence Research & Development Organisation | MoCIT: Ministry of Communications & Information Technology | MoWR: Ministry of Water Resources |
| CSIR: Council of Scientific & Industrial Research | DSIR: Dept. of Scientific & Industrial Research | MNRE: Ministry of New & Renewable Energy | PCRA: Petroleum Conservation Research Association |
| DAE: Department of Atomic Energy | DST: Department of Science & Technology | MoEF: Ministry of Environment & Forest | UGC: University Grants Commission |
| DBT: Department of Bio-Technology | ICMR: Indian Council of Medical Research | MoES: Ministry of Earth Sciences | |

Unit: 1 Crore = 10 million; 1 million = 10 lakhs