

Why India's Private Sector Contributes Less to R&D: A Comparative Analysis with Developed and Emerging Economies

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Abstract

Research and Development (R&D) acts as an important factor of innovation, technological advancement and economic growth of a nation. While developed economies such as United States, South Korea, Germany and China express great reliance on investment by private sector in R&D, India continues to depend on government-funded research. This study explores the reasons behind the comparatively low contribution of India's private sector to R&D and analyses India's performance in comparison to selected economies. The study, with the help of secondary data from OECD, WIPO, UNESCO, World Bank and government reports, identifies various gaps such as funding caps, risk averse behavior, weak industry-academia collaboration and reliance on imported technologies as major obstacles.

Keywords: Research and Development, Innovation, Private Sector, Comparative Study, R&D Expenditure.

1. Introduction

In the modern global economy, Research and Development (R&D) has turned out as one of the most impactful drivers of innovation, industrial competitiveness and sustainable economic growth. Nations investing heavily in scientific research, technological advancement and innovation experience higher productivity, stronger industrial capabilities and enhanced global competitiveness. The development of new technologies, efficient production systems, healthcare advancement, digital transformation and scientific discoveries that influence economic progress in the long run are possible only with the contribution of R&D.

Countries such as the United States, China, South Korea, Germany and Japan have established efficient innovation systems wherein private businesses contribute majorly in funding and conducting research activities. Significant investment in product development, semiconductors, pharmaceuticals, artificial intelligence (AI), manufacturing technologies and advanced engineering systems is done by large corporations. The contribution of R&D in many developed countries is nearly 66-81% of total R&D expenditure showcasing that private enterprises are the backbone of technological innovation.

Despite being one of the rapidly-growing economies and possessing a vast startup ecosystem, India continues to show low levels of R&D expenditure. The Gross Expenditure on Research and Development (GERD) remains approximately 0.6- 0.7% of GDP, which is considerably lower than the developed economies. The structure of India's R&D ecosystem differs considerably from countries such as United

States and China as government institutions contribute more to research expenditure than the private sector.

This low private sector contribution raises important concern regarding the structure and efficiency of India's innovation ecosystem. India continues to depend heavily on research institutions funded by the government and technology imported from outside, while on the other hand, countries like China and South Korea have succeeded in developing strong industrial R&D systems supported by private enterprises. This gap exists because the private sector in India often focuses more on short-term profits and service-based growth rather than long-term scientific and technological research investment.

A number of factors are responsible for this situation. Factors such as high financial risks in association with research activities, lack of commercialization opportunities, limited venture capital support for deep-tech innovation, weak collaboration between industries and universities and policy related barriers reduce the interest of businesses to take efforts and invest heavily on R&D. India's service-sector-oriented economy also adversely affect industrial research intensity in comparison to manufacturing-driven economies.

The purpose of this study is to assess why India's private sector contributes less towards R&D activities and compare India's R&D ecosystem with selected developed and emerging economies such as United States, China, Germany and South Korea. The aim of the study is to analyze structural, financial and policy-related barriers that affect industrial research investment in India and identify major differences between India and innovation-driven economies.

Objectives:

1. To study the private sector's contribution towards R&D expenditure in India.
2. To compare India's private sector R&D contribution to that of selected developed and emerging economies.
3. To identify the major reasons behind the low participation of private sector in R&D in India.

2. Literature Review

OECD Research and Development Statistics (2026) highlights that majority share of R&D expenditure in advanced economies comes from private enterprises. The report shows that countries such as United States, Germany, Japan, South Korea and China rely heavily on research systems that are obtain funds from businesses. According to OCED data, there is a close link between corporate investment in scientific research and product development and industrial innovation. The report suggests that economies with stronger manufacturing and technology sectors usually display higher contribution towards R&D expenditure by private sector [1].

WIPO, Global Innovation Index (2025) examines innovative performance and evaluates factors such as institutional quality, knowledge output, research capability and technological advancement. The report indicates that countries that possess better academia-industry collaboration, higher patent generation and strong investment in innovation activities generally have a robust innovative ecosystem. Noticeable improvement is shown in innovation rankings by India over the years but still displays limitations in overall innovation performance due to weaknesses in industrial R&D intensity and commercialization systems [2].

UNESCO Institute for Statistics (2026) aim to analyze global science and technology indicators lined with research expenditure, researchers and innovation systems. Key highlights of the study are the significant difference between developed and developing countries regarding research infrastructure and

industrial participation in innovation activities. The report suggests that challenges such as weak institutional settings, lack of funds and low private sector participation in scientific research are observed in the case of developing countries.[3]

NITI Aayog (2026) highlights challenges faced by India's innovation ecosystems and a major concern in the form of weak private sector contribution. The report suggests that instead of investing in in-house research and development, Indian industries give preference to imported technology. It also identifies barriers such as lack of commercialization opportunities, weak academia-industry collaborations and lack of support for deep-tech innovation for private sector participation in R&D [4].

Department of Science and Technology, Research and Development Statistics at a Glance 2022-23 (2023) show the R&D expenditure structure of India and that national research expenditure is still dominated by government institutions. The report highlights that industrial R&D intensity in India continues to be relatively low even though there is growth observed in startup culture and digital entrepreneurship. Several factors discourage private companies from investing in long-term research projects such as rigid policy barriers, risk averse behavior and lack of sufficient incentive [5]

OECD Science, Technology and Innovation Outlook (2024) states that economies that focus on innovation possess ecosystems which involve governments, industries, universities and financial institutions working together. The report highlights that countries with innovation systems that work in coordination with each other achieve better efficiency in commercializing research and transform scientific discoveries into industrial growth. India's fragmented innovation structure limits large-scale private sector participation in industrial research in comparison to developed nations [6].

Economic Survey of India 2025-26 (2026) is suggestive of the importance of increasing investment in R&D for improving India's economic competitiveness and technological self-reliance in the long run. The report states that India's R&D expenditure is significantly lower than major economies and identifies weak participation by the private sector as one of the primary factors behind India's comparatively low innovation intensity. The survey also puts emphasis on the need for sturdier industry-driven innovation and improved research commercialization system [7].

WIPO Innovation Tracker Report, (2025) studies innovation trends across the globe and industrial research patterns across major economies. It suggests that better technological advancement, greater patent generation and stronger industrial competitiveness is generally observed in countries with strong private sector participation in R&D. The study highlights that India has displayed growth in innovation output in the last few years but limited investment in industrial research continues to be a major obstacle for the country's innovation ecosystem [8].

World Bank Research and Development Expenditure Database (2026) provides comparative information about the national R&D expenditure as a percentage of GDP. The data highlights that countries like South Korea spend more than 4% of GDP on R&D whereas the United States and China spend more than 3% and 2% respectively. India's expenditure, in this case, remains below 1%, which shows a comparatively weaker research ecosystem. The data is also suggestive of the fact that countries with strong industrial and manufacturing bases generally invest more in research and innovation activities [9].

3. Research Gaps

Existing literature discusses overall R&D expenditure of India, Innovation performance and technological development. Reports by OECD, WIPO, UNESCO, NITI Aayog and the Department of Science and

Technology throw light on the comparatively lower intensity of India's R&D and the need of strengthening innovation ecosystems. However, most studies focus either on national R&D expenditure trends or broad innovation indicators. Only a few research specifically examines why India's private sector contribute a very small share of R&D expenditure in comparison to leading innovation- driven economies such as United States, South Korea, Germany and China.

Further, existing studies often focus on individual factors such as lack of funds, policy challenge or industrial structure separately. Very limited comparative analysis exist that presents a combination of the forementioned factors to explain the structural reasons that lead to lower private sector participation in research and development in India. Therefore, this study aims to bridge the gap by examining the major economic, industrial and policy-related barriers that affect R&D expenditure by private sector in India and compare them with selected developed and emerging economies.

4. Research Methodology

The study makes use of descriptive and comparative research approach based on the insights obtained from secondary data. Sources of information include international databases, policy report, government publications and academic research studies linked to R&D expenditure and innovation ecosystems. Major sources include OECD Research and Development Statistics, Global Innovation Index reports, UNESCO Institute for Statistics, World Bank, NITI Aayog publications, Department of Science and Technology reports, Economic Survey of India and OECD Science and Technology Outlook reports. The study shows a comparison between India's R&D structure with selected developed as well as emerging economies such as the United States, China, Germany and South Korea by analyzing variables such as total R&D expenditure, private sector contribution, innovation ecosystem quality, manufacturing strength and industrial research capability. The collected information has been analyzed using descriptive interpretation and comparative analysis methods to identify the major reasons behind the comparatively lower contribution by the private sector in India towards research and development activities.

5. Data Analysis and Interpretation

Table 1: R&D Expenditure as Percentage of GDP

Country	GERD (% of GDP)
India	0.65
United States	3-4-3-6
China	2.58
Germany	3.1
South Korea	4.9-5.1

Source: World Bank Research and Development Expenditure Database (2026), OECD Research and Development Statistics (2026); UNESCO Institute for Statistics (2026).

Note: Annual country data from the World Bank database has been synthesized into multi-year ranges by the author, where applicable, to account for different national reporting years and to reflect broader investment trends.

The table shows important differences in the intensity of research among major developed and developing economies. India spends only about 0.65% of its GDP on R&D, while countries such as United States, China, South Korea and Germany invest higher proportion. This indicates that the overall commitment of

India to research and innovation remains relatively low in comparison to global innovation leaders. Higher R&D expenditure gives countries the strength to develop technological capabilities, enhances productivity improve industrial capabilities.

Table 2: Business Enterprise Performance of R&D (% of total GERD)

Country	Business Enterprise/Private Sector Contribution (%)
India	36-41
United States	75-76
China	77-78
Germany	67-68
South Korea	79-81

Source: OECD Research and Development Statistics (2026); Department of Science and Technology (2025), R&D Statistics at a Glance.

Note: Figures for global economies represent the Business Enterprise Sector Performance of R&D measured as a percentage of Gross Expenditure on R&D (GERD). International values reflect the most recent standardized data year available per individual country within the current OECD reporting cycle.

The table highlights major structural gap between India and leading innovation-driven economies. Government institutions continue to play the dominant role in India while private enterprises contribute the major share of R&D expenditure in countries such as South Korea, China and the United States. This is indicative of the fact that India's innovation ecosystem does not contain the industrial capabilities as that of developed economies.

The R&D expenditure of India remains significantly lower than many developed and innovation-driven economies. Countries such as South Korea and Israel spend more than 4% of GDP on R&D, while India spends only about 0.65% of GDP on R&D. The United States spends above 3% while China spends above 2%. This highlights the lack of India's research intensity in comparison to global innovation leaders.

The contribution of private enterprises towards total R&D expenditure is also a major indicator of difference. In countries such as South Korea, Germany, Japan and the United States, nearly 66–81% of national R&D expenditure is contributed by private businesses. India's private sector contribution remains between 36–41% of total R&D spending. Government institutions continue to be the major contributors towards the scientific research activities.

High-risk nature of research activities is one of the primary reasons behind low private R&D expenditure in India. Large financial investments and long development periods without guaranteed returns are one of the key requirements of research projects. Short-term profitability, operational efficiency and cost reductions are preferred by many Indian firms rather than long-term investment in scientific research and technological development.

The structure of Indian industries also influences the participation of private sector in R&D. Countries having strong manufacturing sectors usually invest heavily in industrial research and product innovation. However, services such as information technology, finance and telecommunications dominate Indian economy instead of advanced manufacturing industries. As a result, industrial R&D intensity remains comparatively lower.

Weak academia-industrial collaboration is another important issue. According to innovation rankings and international reports, higher levels of industrial private sector innovation and technology commercialization are shown by countries with stronger university-industry collaboration. In developed economies, universities and industries work closely on product development and scientific research and technological commercialization. University-industry collaboration systems of India continue to be comparatively underdeveloped which in turn limits innovation efficiency and commercialization opportunities.

Being dependent on imported technology further discourages indigenous research efforts. Many Indian firms prefer purchasing foreign technologies instead of investing in expensive internal R&D efforts. This limits incentives for long-term technological advancement and industrial research.

Private R&D expenditure is also affected by limited venture capital support for deep-tech and scientific innovation. Most investments are concentrated in e-commerce, fintech and digital platforms in India even though India has a rapidly growing start-up ecosystem. This limits the growth of research-intensive industries.

Policy-related barriers also influence participation of private sector in R&D. Components such as Complex regulations, limited tax incentives, insufficient commercialization support and bureaucratic delays reduce motivation of industries to invest in research activities. India's industrial innovation ecosystem remains less integrated and less research-focused in comparison to countries such as South Korea and China.

The comparison with other countries clearly shows that countries with robust manufacturing ecosystems, coordinated innovation systems and better industry-academia collaboration experience significantly higher contribution by private sector towards R&D activities. Therefore, to increase the private sector participation in India, it will require structural reforms; stronger innovation incentives and greater collaboration between government institutions, industry and academia.

6. Findings

The analysis of secondary data and international comparisons led to the following findings:

- The overall R&D expenditure of India as a percentage of GDP continues to be significantly lower than that of major developed and innovation-driven economies.
- Compared to countries such as United States, China, Germany and South Korea, the contribution of private sector to the total R&D expenditure of India is considerably less.
- Funding and conducting research activities in India are majorly carried out by government institutions.
- Higher levels of private sector investments in research and innovation are generally demonstrated by countries with strong manufacturing sectors.
- Indian firms are discouraged from investing heavily in R&D due to high financial risks, long gestation periods and uncertain returns.
- Innovation and commercialization opportunities are limited by weak collaboration between universities, research institutions and industries.
- Dependence on imported technologies reduce incentives for home research and technological development.
- Growth of private-sector-led innovation is restricted due to limited funding for deep-tech innovation and research-intensive startups.

- Policy and regulatory challenges continue to affect industrial participation in research and development activities.

7. Recommendations

Based on the findings of the study, the following recommendations are proposed:

- Stronger tax incentives and financial benefits should be introduced by the Government of India to encourage corporate investment in research and development.
- Industry-academia collaboration should be strengthened through collaborative research projects, innovation hubs and technology transfer programs.
- Deep-tech startups and research-incentive enterprises should be provided with greater financial support through venture capital funds and innovation grants.
- Policies should be formulated in such a way that they focus on promoting indigenous technology development and reducing excessive dependence on foreign technologies.
- Procedures related to regulation of innovation, patents and research funding should be simplified to encourage greater industrial participation.
- Manufacturing-intensive sectors should be encouraged through innovation-focused industrial policies, as manufacturing industries generally exhibit higher R&D intensity.
- Public-private partnerships should be expanded to facilitate information sharing, commercialization of research and technological advancement.
- Developing long-term national innovation strategies to create a more inclusive and industry-driven research ecosystem in India.

8. Limitations of the Study

- The study is based completely on the secondary data collected from reports, databases and published literature and does not include any primary data.
- The analysis may not represent all the global innovation systems and is limited to selected developed and emerging economies.
- Cross-country comparisons may be affected due to differences in data collection methodologies across international organizations.
- The study does not examine firm-level R&D behavior within specific industries and limits its focus to macro-level trends,
- Future research outcomes may be influenced due to rapid changes in government policies, innovation ecosystems and private sector investment patterns.
- The findings do not establish direct causal relationships between variables and are primarily descriptive and comparative in nature.

9. Conclusion

Research and Development plays a very significant role in innovation, industrial growth and economic competitiveness. The study highlights that the private sector of India contributes less towards R&D expenditure in comparison to countries such as United States, China and South Korea, where private enterprises form the primary source of research investment. Factors such as weak industry-academia collaboration, dependence on foreign technologies, risk-averse behavior of firms and limited deep-tech

funding affects participation of private sector in R&D activities in India negatively.

The comparison with other countries brings to the light that stronger manufacturing ecosystems, innovation-driven policies and better research commercialization systems improve contribution of private sector significantly towards innovation. The study concludes that India requires better policy support, more incentives and collaboration between industries and research institutions on a large scale to make its private R&D ecosystem stronger and more efficient and improve its technological competitiveness in the long run.

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