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4. R&D Underspending in India - Economy

India's chronic underspending on Research and Development (R&D) has long been identified as a structural weakness in its pursuit of innovation-led growth and technological self-reliance. The problem, however, is not reducible to a single cause. It reflects a complex web of systemic, historical, financial, and cultural factors interacting over decades to produce an innovation ecosystem that remains significantly underdeveloped relative to India's overall economic scale and ambition.

1. India's R&D Expenditure - A Quantitative Baseline

India's Gross Expenditure on Research and Development (GERD) as a percentage of GDP has remained stagnant between 0.6% and 0.7% — significantly below the global average of approximately 1.8% and far below innovation leaders such as South Korea (4.9%), the United States (3.5%), and China (2.4%). Perhaps more significantly, India's private sector contributes only around 36% of total R&D expenditure, whereas in comparable innovation-driven economies, private sector contribution exceeds 70%. The Central Government alone contributes 43.7% of India's total R&D spending — a structure that reflects the dominance of public research institutions and the comparative absence of industrial R&D.

2. Reasons for Low R&D Spending

1. **Large domestic market with limited competitive pressure** – India's vast domestic consumer market has historically allowed firms to grow and profit without facing the intense global competitive pressure that compels firms in smaller, export-oriented economies to innovate. Profitability through market access, rather than technological differentiation, has been the dominant corporate logic.
2. **Colonial legacy of deindustrialisation** – British colonial policies systematically dismantled India's indigenous manufacturing capacity and oriented the economy toward raw material extraction and import of finished goods. This historical trajectory left behind a business culture oriented toward trade and distribution rather than manufacturing and innovation.
3. **Premature financialization of the corporate sector** – Increasing orientation of corporate governance toward short-term shareholder returns — quarterly earnings targets and dividend expectations — discourages investment in R&D, which is characterised by long gestation periods, high uncertainty, and delayed payoffs.
4. **High uncertainty and risk aversion** – Long-gestation R&D projects face multiple layers of uncertainty — regulatory approval timelines, uncertain market demand, unclear returns, and the risk of technological obsolescence. In this environment, firms apply high discount rates to future gains and prefer shorter-term, lower-risk investments.
5. **Weak industry-academia linkages** – The disconnect between research institutions and industrial applications means that academic research rarely translates into commercially viable innovation, further reducing private-sector motivation to invest in basic and applied research.

3. Why R&D Investment Matters

1. R&D is the foundational driver of long-run productivity growth and technological advancement, enabling breakthroughs in fields such as artificial intelligence, biotechnology, clean energy, and advanced materials.

2. It directly creates high-quality, knowledge-intensive employment and stimulates entrepreneurial ecosystems.
3. It addresses critical social challenges — from disease to climate — that market forces alone cannot resolve at the necessary scale or pace.
4. For India's geopolitical ambitions, technological sovereignty in strategic sectors — semiconductors, space, defence, pharmaceuticals — is non-negotiable. Sustained R&D investment is the only path to genuine self-reliance.
5. It enhances India's attractiveness as a destination for high-value foreign direct investment in knowledge-intensive industries.

4. Government Initiatives

1. The **Research, Development and Innovation (RDI) Scheme**, approved with a Rs 1 lakh crore corpus, is the most ambitious recent intervention. It provides long-term, low- or zero-interest loans and equity investments for private-sector R&D and deep-tech startups, channelled through a new Deep-Tech Fund of Funds under the Anusandhan National Research Foundation.
2. The **Anusandhan National Research Foundation (ANRF)**, established in 2023, provides strategic direction for research, innovation, and entrepreneurship across science and technology domains. It targets mobilising Rs 50,000 crore between 2023 and 2028.
3. The **National Quantum Mission** has been allocated Rs 6,003 crore for 2023–31 to develop quantum computing, communication, and sensing technologies.
4. The **India AI Mission** has scaled computing infrastructure from 10,000 to 38,000 GPUs, democratising AI research access for startups and academic institutions.
5. The **India Semiconductor Mission (ISM)**, established in 2021, is building a domestic semiconductor and display manufacturing ecosystem, with 10 projects already approved across six states.
6. The **BioE3 Policy (2024)** incentivises biomanufacturing, Bio-AI hubs, and a national biofoundry network to accelerate biotech R&D commercialisation.
7. The **National Supercomputing Mission (NSM)**, launched in 2015, provides advanced computing infrastructure to universities and research institutions across the country.

5. Challenges and Gaps

Despite these policy initiatives, several structural gaps persist. The tax incentive regime for corporate R&D remains inadequate relative to global best practices. India's patent ecosystem — both in terms of filing culture and enforcement — is weak. The quality of research output from universities, as measured by international rankings and citation indices, remains below potential. Brain drain continues to deprive India of trained researchers at the very point they would be most productive.

6. Way Forward

1. Introduce **weighted tax deductions for private-sector R&D expenditure** to meaningfully alter the cost-benefit calculus for corporate innovation investment.
2. Strengthen **university-industry collaboration** through co-funded research programmes, technology transfer offices, and industry-sponsored chairs.
3. Build **intellectual property protection** capacity and awareness to make innovation investment more commercially rewarding.
4. Develop **risk capital ecosystems** — venture funds, angel networks, deep-tech accelerators — that can absorb the financial risk of early-stage innovation.
5. Expand **science and technology human capital** by improving the quality, salaries, and career trajectories of researchers in both public institutions and industry.

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