

ILLUSTRATION BY AJAY MOHANTY



How to reform Indian public research

Freeze budgetary allocation to national laboratories in nominal terms and allocate the annual increase to the higher education sector

BIn India's R&D imperative, in an earlier column (Business Standard, 06 December, 2018) we showed that India is an outlier in global R&D, both in the proportion of national R&D done in industry (44 per cent vs a global average of 71 per cent) and in the small proportion of national R&D done within the higher education system (4 per cent vs a global average of 17 per cent). We argued that India needs to increase its investment in in-house R&D by industry by a factor of 5 (to go from 0.3 per cent of GDP to the global average of 1.5 per cent) and increase public research done within the higher education system by a factor of 10 (to go from 0.04 per cent of GDP to the global average of 0.4 per cent). This article is about public research. How is it best done to maximise social welfare? Even more, where is it best done to maximise social welfare?



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one-quarter of global R&D is funded by government, amounting to around 0.5 per cent of global GDP. India is no exception. Our first Prime Minister, Jawaharlal Nehru, took a keen interest in Science, and our first two decades as an independent country saw us establish many of the public laboratories that to this day conduct much of the publicly-funded research in this country. By the late '70s, India was investing 0.6 per cent of GDP in Public Research, uniquely for a developing country, and matching government investment in R&D of the richest countries. This share has remained at about this level for the last 40 years. But while India's overall public investment in research is very healthy, the location of this research is heavily skewed. The world does most of its public research within the higher education system; we do over 90 per cent in autonomous R&D laboratories. This skewed investment starves the higher education sector of funding for research. The consequence is an order of magnitude gap: India invests 0.04 per cent of GDP in research done in the higher education system, against a global average of 0.4 per cent.

Why do public research in the higher education system?

Most observers place America's research universities at the core of its successful innovation ecosystem. There are manifold advantages to doing public research in universities. First is the apprentice-jour-

ney-man benefit. Students learn how to do research by working alongside their professors. The graduates industry hires come trained in doing research. Second, the industry-institute linkage issue is immediately drastically reduced: every university has an automatic, costless and strong linkage with industry through students. Each time industry hires a graduate, a new link is formed. Third, not only does teaching benefit from combining research and teaching, but research benefits too. A steady flow of bright young students keeps the research environment constantly refreshed.

The critical point, though, is that research is not the key output of doing research in universities — it is the flow of talent. Stanford University is often held up as a poster-child for doing great industry-relevant research. Whether it is biotechnology, computer science or semiconductors, Stanford has been the source of great break-throughs. But a clear-eyed assessment of Stanford would say that the world would not be markedly poorer without its research output. But the world would be markedly poorer without the output of its graduates — who founded Google, Hewlett Packard, Varian, Yahoo, Biogen and a hundred other great companies, which have powered the research done in a thousand other companies, and who lead the world in so many fields. The same holds true for any other leading Research University. The purpose of a Research University is articulated as both education and research, but the talent produced far outweighs the research produced in impact. By doing public research in autonomous laboratories, we completely miss the essential benefit of doing public research.

How should we reform Indian public research?

The current level of investment in public research is around ₹80,000 crore (the exact figure is hard to get at, as it needs to be extracted from the budgets of several line ministries). This increases by approximately ₹7,000 crore each year. We have a modest proposal: Freeze the current budgetary allocation to the national laboratories at their current level in nominal terms. Allocate the annual increase in public research funding to the higher education sector. We will, at a stroke, almost treble the research done in the higher education system — increasing the current ₹4,000 crore by ₹7,000 crore. And we can add ₹7,000 crore more each year. Universities — public and private — should be forced to compete for these extra funds by writing proposals for new centres of excellence, recruiting leading faculty and researchers working worldwide to come and teach and do research in India, investing in new disciplines. We would at a stroke transform the research environment in our education system, and directly impact the quality of education provided. This one act — which costs us nothing — would have a greater impact on the country's innovation system than any amount of extra funding for our national laboratories.

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Governments world-wide invest in public research — and India fits in well

Policy-makers worldwide have long argued that left entirely to private initiative, society underinvests in research as the benefits that flow are either too uncertain or not fully captured by the investor. Seminal papers 60 years ago by Richard Nelson (1959) and Kenneth Arrow (1962) provided a strong theoretical basis for state subsidy of public research. Consequently, even the most free-market of governments invest heavily in public research. Around