How to Build a Vibrant Technology Industry

(by attracting top scientists to your country)

Yann LeCun, 2025-05-27

This piece is a much expanded version of this [LinkedIn post](#) which attracted a lot of attention and comments.

Scientific research is the main engine of economic growth

Economic growth is powered by product innovation.
Product innovation often builds on technological progress.
When a new technology platform becomes widely available, it creates an innovation ecosystem that opens the door to new products.
But technological progress often relies on fundamental research carried out 5, 10, or 20 years earlier in universities, public research institutions, and (more rarely) in industry research labs.

Crucially, technological progress cannot exist with a continuous flow of new scientists, almost all of whom are trained in university PhD programs. A PhD in engineering science trains students to become scientists as well as engineers, i.e. to invent new artifacts and demonstrate that they improve the state of the art.
In most countries, PhD students are largely supported by government-funded research grants or fellowships. The causal chain is self-evident:

- Without government research funding, no research professors and no PhD students.
- Without research professors and PhD students, no academic research and no PhD graduates.
- Without PhD graduates, no new research scientists and no new professors.
- Without research scientists, no technological progress.
- Without technological progress, no product innovation.
- Without product innovation, no economic growth.

But that is not sufficient. A vibrant innovation ecosystem requires other ingredients:

- Interesting career prospects in academia, public research, or industry research for PhD graduates. Without that, the most talented students will not be motivated to pursue a PhD and a career in research.

- High-quality graduate schools and research career prospects that attract the best talents from around the world, from graduate students to senior researchers. Research is worldwide scene that knows no borders.
- A permeable boundary between academia and industry to facilitate technology transfer.
- Access to capital for scientists-entrepreneurs willing to turn their research into products.
- Access to large amounts of capital for startups ready to scale up. Without this, startups get outcompeted or have to get acquired.
- Attractive research careers in industry for those whose research horizon is too long for a startup.
- Employers with a long-term vision that value technical talent.

GDP growth in the US has outpaced that of other OECD countries largely because of the meteoric growth and resulting dominance of its technology industry. To a large extent, the US has managed to provide a good combination of incentives and systemic ingredients to attract the best scientists and engineers from around the world and lead the world in technology innovation.

Most countries or regions that want economic prosperity have a strong desire to emulate the success of the US, particularly the success of Silicon Valley.
As the US seems to be set on dismantling its own system of public research funding and destroying its top research universities, scaring away some of its most talented scientists, and discouraging top graduate students from studying in the US, other countries, particularly in Europe and Asia, are wondering whether this creates a window of opportunity for them to beef up their R&D firepower.
But how can they go about that?

What attracts the best scientists

To achieve excellence, a research ecosystem must (1) attract the best students to research careers, (2) retain the best talents, (3) attract the best talents from around the world.
The best scientists will go wherever they have the means to be the most creative and productive.
Here are the criteria that attract them:

1. access to top students and junior collaborators.
2. access to research funding with little administrative overhead.
3. good compensation (comparable with top universities in the US, Switzerland, and Canada at purchasing power parity).
4. freedom to do research with few constraints, on topics they think are most promising.
5. access to research facilities (e.g. computing infrastructure, etc).
6. ability to consult with, have part-time appointments in, or short-term positions in industry or startups.
7. moderate teaching and administrative duties.

They will seek the best trade-off between these criteria in academia, public research, or industry.

European academia rates high on 1 and 4, low on 2 (even if you can get an ERC grant), 5, 6 and 7, and **indecently low** on 3.
European industry rates low on almost every criterion, particularly on 4, but also on 3 and 5 compared to top US industry labs.

To attract the best scientific and technological talents, simply make science and technology research professions attractive. It's pretty straightforward, really.

Some will claim that European research positions must be attractive (despite the low compensations), since there are always many more applicants than open positions. But the question is whether the most talented students are sufficiently attracted by research careers to pursue a PhD. Although things are evolving, in many European countries, getting a PhD was not seen as a way to a brilliant career, and a career spent in research was not seen as successful.

An example of academic salaries

Let's take an example comparing the status of early career scientists in engineering disciplines in France and the US (as of mid 2025).
Annual salary, minimum wage worker in France: 21621 € (reference)
Annual salary, early-career scientist at CNRS: 32496 € (reference) (includes 4200 € bonus)
Annual salary, early-career assistant professor: 26654 € (reference)
Best case ratio of early-career scientist to minimum wage: 1.5x

Annual salary, minimum wage worker in California: $34320 (reference)
Annual salary, early-career U of California assistant professor: $103700 (reference)
Now, this is a 9-month salary. In most US universities, faculty do not get paid during the summer, and can fund their summer salary through research grants and other means. This effectively constitutes a 33% bonus for faculty who are productive researchers. The 12-month salary then becomes $138000.
The ratio of early-career scientist compensation to minimum wage is about 4.0x
Additionally, US faculty can do consulting for one day per week.
Note: The University of California is a public university system in which academic salaries are not particularly high. Many private universities have higher salaries.

The autonomy of junior academics in North America

Junior faculty in North America are so-called "tenure-track assistant professors"
They are, in effect, in a temporary position for a maximum of 6 years. In their 6th year, they are "up for tenure", i.e. their home department and school must decide whether to grant them tenure or not. The department asks for evaluation letters from senior scientists in their field outside

their university. The letters evaluate research contributions, standing in the field, and service to the community.
If the candidates are granted tenure, their position becomes permanent. If not, they have one year to find another job.

But junior professors have a lot of autonomy in how they conduct their research. They are given a “startup package” to fund their lab before they are able to raise money from grants, private contracts, or donations. The funds support their PhD student stipends, postdocs, summer salary, equipment, supplies, and travel.
Contrary to most junior positions in Europe, they can officially recruit and advise PhD students from day one. There is no North-American equivalent to the European “habilitation”, without which mid-career European faculty cannot become full professors and cannot officially advise PhD students.