

SPOTLIGHT ON SWITZERLAND

Innovation in middle Europe

Switzerland's innovation success lies in superior financial and support systems which allow for effective working.

IN THE GLOBAL population stakes, Switzerland is something of a minnow. With around 8.1 million inhabitants, it ranks as the 97th largest country, just behind Honduras and Tajikistan. Take a different set of metrics however and the nation is a great white shark. It tops the United Nations Global Innovation Index and the 2014-15 World Economic Forum's Global Competitiveness Report. Switzerland's 20 scientific Nobel laureates mean it has the most winners per capita, except for a couple of small countries with just one or two prizes. Only Japan has more patents as a proportion of its population. Despite its small size, Switzerland is the world's 15th largest exporter.

With innovation so intrinsic to economic prosperity, such impressive performance indicators evoke more than a few envious glances. Switzerland is clearly doing something right when it comes to its investment approach to education, science and R&D. The multi-billion dollar questions are: what is the secret to Swiss success and can it be emulated?

Precision innovation

In 2014 a third of Switzerland's exports were pharmaceutical products. The genesis of its strength in the sector lies in the industry's emergence from Basel-based dye and chemicals businesses in the 1880s. More recently its commanding position in pharmaceuticals, along with its history of working with complex and precise technology – most famously watches – has helped attract a cluster of biotechnology and medical technology companies.

“Switzerland does not have any natural resources or a coastline, and so could not produce heavy goods that need transportation,” says Jean-Paul Clozel, the chief executive officer and co-founder of Actelion, the largest biotech company in Europe. “It also has a long tradition of working very precisely, so from that perspective the growth of the pharmaceutical and biotech industries make a lot of sense.”

In these sectors and others, the Swiss have a long tradition of significant investment in research and development. In only a handful of countries is the proportion of their GDP on R&D higher



The impressive main building of ETH Zürich, a technical and scientific university in Switzerland.

than the 3% Switzerland invests. Across the European Union, for example, the average is 2%. Crucially some 60% of Swiss R&D investment comes from the private sector with the majority of public R&D spending going to the country's universities. Indeed for some, the country's success in attracting companies willing to invest in innovation is more to do with things its politicians don't do than those they do.

Flexible innovation

Clozel says that the government's light touch on employment laws and other “bureaucracy” makes Switzerland a highly attractive place for R&D compared to more regulated places like France (See **Bottom up**). “Biotechnology is a risky business because it is difficult to predict whether a new drug is going to work. In Switzerland people understand the need for flexibility, and that it might be necessary to adjust your workforce if a drug is not working out as expected, in a way that is not possible in more bureaucratic countries.”

This is not to underestimate the public sector's role in stimulating innovation. “The role the government sees for itself is not to subsidise or pump prime industry, but rather to provide a framework to help it flourish by facilitating top class science, knowledge transfer and networking,” says Lutz-Peter Berg, head of science and innovation at the Swiss embassy in London.

Collaborative innovation

Encouraging links between university researchers and businesses is a key function of Switzerland's four multi-disciplinary federal research institutes. “At universities it is usually sufficient to do excellent science and education, and industry often works to short-term time scales,” says Gian-Luca Bona, director of the Zürich-based Swiss Federal Laboratories for Materials Science and Technology (EMPA), which carries out applied research focusing key challenges facing society and industry. “We provide a bridge or perhaps the glue between industrial and public partners to go beyond the basic research to facilitate the transformation of new



knowledge into businesses and jobs.” Bona adds that EMPA currently receives funding for around 120 projects from the Swiss Commission for Technology and Innovation (CTI), which encourages and funds collaborations between education institutions and businesses for the benefit of the Swiss economy.

In March 2015 the federal government further underlined its commitment to knowledge transfer by providing financing and planning permission for the Zürich Innovation Park in Dübendorf, which will provide a dedicated site for collaborations between companies and university researchers. It will form part of the Swiss Innovation Park, a network due to incorporate at least three other sites in Lausanne, the canton of Aargau and in northwestern Switzerland.

This is a project that is only possible because different public bodies and businesses agree on the importance of bringing together researchers in different sectors. “The development of the Swiss Innovation Park is only possible thanks to tight collaboration between cantonal authorities,

research institutions both federal and cantonal, and industry,” says Joël Mesot, director of the Paul Scherrer Institute (PSI), the largest of the four federal research institutes.

The PSI, which focuses on natural sciences and technology, and runs several particle accelerators, exemplifies how serious the Swiss are when it comes to working across traditional subject boundaries. “Running large scale research facilities requires a very high level of multidisciplinary,” says Mesot. “Physicists and engineers are working closely with chemists, biologists or medical staff, and such collaborations are extremely fruitful in terms of creation of novel ideas.”

This approach is being extended at Campus Biotech, a neuroscience and bioengineering centre of excellence opened in Geneva in May 2015. Groups from both academic institutions and industry share work spaces organised around platforms such as those for medical imaging, for example. “Those working on neuroprosthetics, affective and functional neuroscience, for example, all use the same facilities,” says Benoit Dubuis, director of Campus Biotech. “As well as

avoiding duplication, it encourages collaboration across disciplines. We’re creating a new ecosystem in which innovation can flourish.”

Supporting innovation

Part of Switzerland’s innovation success lies in superior support systems that allow effective working. The Swiss Institute of Bioinformatics (SIB), for example, provides cutting-edge bioinformatics resources to scientists in fields such as genomics, proteomics and systems biology. It develops and maintains databanks, promotes research and provides computer-based resources. “If you want people to do innovative work, you need to provide them with the right context and framework,” says Christine Durinx, SIB associate director.

Some say researchers in Switzerland are better able to narrow their focus on breaking new ground thanks to the availability of highly skilled support staff, and attribute this to the country’s “dual education” system whereby from the age of 16 or 17, 70 % of pupils opt for apprenticeships that include on-the-job training. “Those who take the vocational route get good training, which means our scientists are usually able to team up with high-quality engineers and technicians,” says Bona.

Open innovation

The country’s size is not as disadvantageous as might first appear. The smaller numbers of specialists in specific fields and shorter distances involved help facilitate the numerous national and regional networking initiatives. “It’s easy to promote interactions because most people know each other already,” says Dubuis.

In fact Switzerland’s size has fostered a receptive environment for foreigners and their ideas. “Because it is such a small country, the only way it can succeed and compete is by being open to people and ideas from the outside,” says Clozel. Almost a quarter of the population are foreigners, including around half of professors at the country’s 12 general universities.

This partly explains why many science and business leaders have voiced their alarm about the result of the February 2014 referendum in which 50.3 % of voters backed a proposal to limit immigration



María Rodríguez Martínez outlining a gene regulatory network analysis at IBM.

through quotas. Some fear the resulting requirement to renegotiate labour market agreements with the European Union could put important EU research funding opportunities at risk.

One scientist who illustrates the attraction of Switzerland to foreign scientists and the benefits they bring to the country is Maria Rodríguez Martínez. After completing her undergraduate studies in her native Spain and a PhD in France on developing cosmological models of the early evolution of the universe, she worked in Israel and the US before taking up a job at IBM in Zürich in 2013. She is currently researching the use of high-throughput technologies to build molecular models of disease, especially cancer, to help improve diagnosis and facilitate personalised treatment.

“Switzerland is a great place for young researchers to develop their careers,” she says. “The Swiss really value learning, new ideas and entrepreneurship. I have found them very welcoming and open to collaboration, and there are good funding opportunities.”

As a keen hiker, climber and skier, Rodríguez Martínez also appreciates having the Alps on her doorstep. She adds that she is “extremely happy” to have moved from New York thanks to a near unbeatable combination of professional opportunities, the close proximity to spectacular mountains and a work-life balance she compares favourably with that in the US.

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BOTTOM UP

It’s not uncommon for politicians and authoritative bodies to backtrack on promises to devolve powers away from the centre. In Switzerland however, regional and local autonomy are enshrined in a constitution dating back to 1848.

Many attribute this long tradition of decentralised decision-making as a key driver of the country’s record for innovation. Switzerland’s 26 regional cantons have a high degree of financial autonomy, including tax-raising powers, and they take the lead when it comes to funding higher education. In 2013 they paid for 54 % of university funding compared to the 27 % contributed by the federal government.

“This means funding levels for universities are partly down to local taxpayers,” says Lutz-Peter Berg, head of science and innovation at the Swiss embassy in London. “The system creates greater local accountability and acts as an incentive to drive up teaching and research standards.”

This devolution of power also extends to individual university departments and academics. Compared with those elsewhere, Swiss academics are less likely to complain about frequently having to apply for funding and demonstrate short-term economic benefits of their work.

The combination of relatively generous public funding of the universities, and most of their budgets being provided in the form of core grants as opposed to competitive funding, means researchers have greater freedom to pursue riskier, more innovative work.

“An optimal mix of competition and endowment-based funding helps ensure a balance between risk and return,” says Detlef Günther, vice president research and corporate relations at ETH Zürich. “The endowment funds allow for development of high-risk ideas and traditional competitive grant structures ensure calculated risks and well thought-out research planning.”



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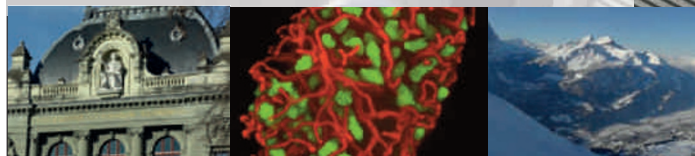
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