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1 / 2023
How Switzerland remains successful - the seven pillars of innovation capacity

20.01.2023

Executive summary

Innovation is not only one of the most important factors when it comes to creating prosperity, but also when it comes to dealing with major societal challenges such as climate change or demographic development. As a high-wage and high-cost country, Switzerland must do everything in its power to remain at the forefront of innovation. This is the only way it can stay one step ahead of the ever-increasing competition, secure its prosperity and make significant contributions to solving global problems. This paper outlines the seven most important pillars of a successful and sustainable innovation policy.

Contact and requests

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Positions of economiesuisse

- In order to increase its innovative capacity, Switzerland must strengthen the framework conditions for a competitive economy and improve social acceptance of technical innovations.
- Education is a crucial condition for innovation. A central success factor is the dual education system with a high permeability of educational pathways.
- To increase innovative capacity, STEM (science, technology, engineering, and mathematics) disciplines and entrepreneurship must be promoted in schools from an early age.
- Government spending on education, research and development must be prioritised. Since they only lead to innovations with a delay, a long-term policy is needed.
- Simple authorisation procedures and open access to global skilled workers are important prerequisites for strengthening innovation. Switzerland must be attractive for the best talents.
- International networking and cooperation promote cross-border research and business and thus strengthen innovative power.

→ Innovation parks, technocentres and innovation hubs can help SMEs and start-ups to strengthen their innovation capacity through their network effects.

Introduction

No innovation, no progress. Innovation is one of the most important factors to create prosperity and to combat major challenges such as climate change or demographic development. However, it does not emerge on the drawing board of the public administration or in politics. On the one hand, the greater public is unaware of how ideas develop, how they are transformed into adequate products and how these products can be established in the market. On the other hand, the incubation period from research to innovation is long and success highly uncertain. Innovation can therefore not be forced by means of political and regulatory measures. Due to its difficult demarcation and vague terminology, however, innovation repeatedly falls into the traps of political haphazardness and opportunism.

What is innovation actually? The term generally encompasses the creation of economic, technical, social or organisational innovations. From an economic perspective, however, it encompasses more: the implementation of ideas in the form of products, new services or processes is just as much a part of innovation as the successful implementation, marketability and sale of a product or service. Hence, a brilliant idea or a groundbreaking research result alone is not enough: innovation only comes into being when an idea is implemented in the real world.

Innovation policy includes not only state-directed education, research and innovation promotion. Private-sector innovation efforts are at least as important. [1] It therefore makes sense to consider innovation policy in a broader context. Any political action that creates optimal economic conditions - from financial to labour market to foreign policy - can also be considered as innovation policy.

Virtually every developed country has made innovation a focal point of its growth policy in recent years. The international battle for the best business locations will become even more intense in the future - the competition is constantly increasing. For Switzerland as a place to work and think, a successful innovation policy is therefore of the utmost importance. As a high-wage and high-cost country, Switzerland must remain at the forefront of innovation. Only in this way can it secure its prosperity and make a significant contribution to solving global problems.

How can this be achieved? For a country without natural resources, answering this question is of central importance. However, it is equally important to recognise which recipes do not work to strengthen the innovation location. The argument of improving innovative strength is often used for political initiatives of all kinds, although they often have counterproductive effects. One thing is clear: Innovation is not to be confused with a specific solution technology.

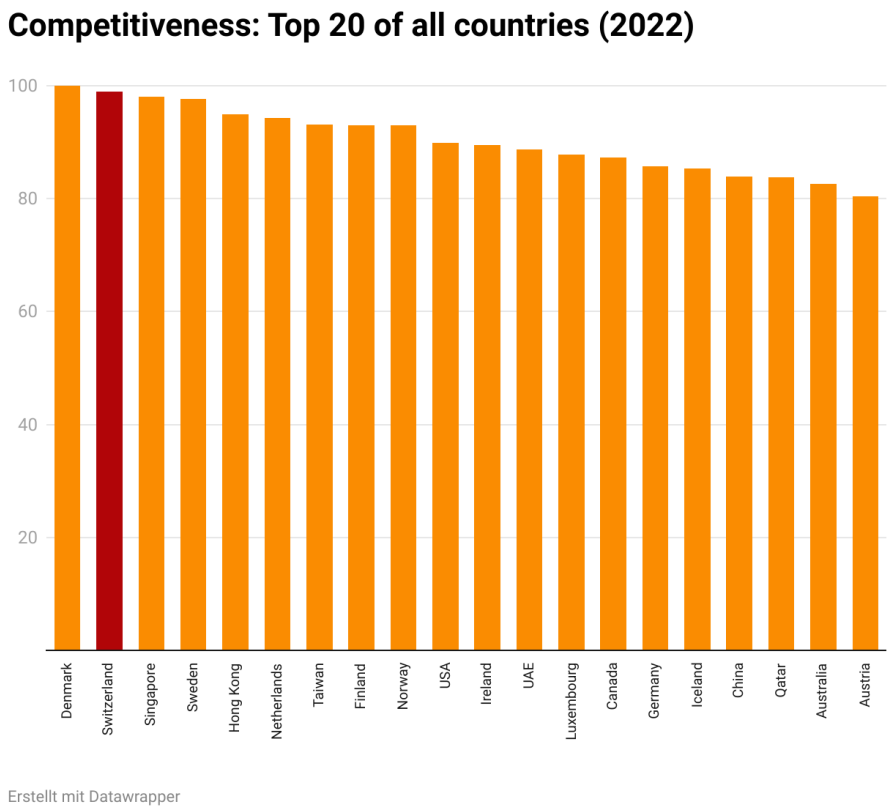
With this in mind, the seven main pillars of a successful and sustainable innovation policy will be outlined below. The aim is to show how Switzerland can continue to be one of the most innovative countries in the world. We will limit ourselves to the most important points and make no claim to completeness.

Pillar 1: High competitiveness due to excellent framework conditions

Innovation policy cannot be separated from competition and location policy. Optimal framework conditions are needed for companies to be able to develop. Switzerland has done well in this respect so far. Compared to other countries, it has not succumbed to political overactivism and has tended to be cautious about state intervention. No matter what international comparisons are made today: Switzerland is very well positioned overall.

Chart 1 shows a list of the most competitive countries by the IMD World Competitiveness Center. Switzerland ranks second behind Denmark but ahead of Singapore and Sweden. The index is made up of a wide range of indicators such as economic performance, administrative efficiency, country performance on the 17 UN Sustainable Development Goals (SDGs), the design of the tax system and the technological infrastructure. On the one hand, it is an assessment of the sustainable development of countries. On the other hand, it integrates additional efficiency criteria with regard to labour and product markets as well as factors that are conducive to innovation.

Graphic 1:



Source: World Competitiveness Ranking 2022, IMD World Competitiveness Center

If one compares competitiveness with innovative capacity, it becomes apparent that there is a clear correlation between the two variables. Of the 20 countries that are among the world's top innovators, 14 are also in the top 20 most competitive countries.

Competitiveness and innovative strength thus go hand in hand. This is not a new insight, for as early as the 1930s, Friedrich August Hayek noted that competition always leads to new discoveries and thus to an increase in knowledge. It is precisely those providers of products and services who succeed in "discovering" customer needs in the best possible way who are rewarded.

In order to strengthen Switzerland as a location for innovation, it is therefore of central importance to increase the country's competitiveness. It needs a balanced policy that, in conjunction with the economy, creates scope for innovation and good structural conditions for competition. This includes, for example, macroeconomic, political and legal stability, a low level of regulation, a low tax burden, access to world markets and effective protection of intellectual property. Equally important is the permanent effort to communicate new technologies transparently in order to promote their social acceptance and thus to encourage a general openness to technology among the population.

Intensive cooperation between public research institutions and the private sector plays an important role. It is crucial that the state focuses on these instruments when promoting innovative capacity. On the one hand, this ensures a very strong academic R&D network and good skilled workers, while at the same time it forces private companies to assert themselves in international competition without state aid.

While Switzerland has fared well so far, the lurking dangers should not be underestimated. Rising national debts, a rapidly growing public administration and ever tighter regulations are increasingly calling the Swiss model of success into question.

Takeaway 1: Competitiveness and innovation are closely intertwined. The creation of excellent framework conditions is the prerequisite for increasing the innovative capacity of a country.

Pillar 2: Excellent education system and strong dual apprenticeship programme

Education is nowadays one of the most crucial conditions for technical progress and innovation. Accordingly, the level of education should also develop in parallel with technical progress. There is a fundamental interaction between education on the one hand and research and development investment on the other when it comes to generating research capacity. An indispensable prerequisite for the sensible use of public and private funds is the availability of a sufficient supply of highly qualified and well-trained specialists.

When education is considered in the context of innovation, the importance of excellence cannot be emphasised strongly enough. Many well-known innovators graduated from one of the world's best universities. Universities also fulfil the important task of bringing together bright minds. The USA in particular, with its elite universities, has an international signal effect that is also reflected in economic performance. In Switzerland, the ETH domain plays a central role. If we look at the correlation between top universities per million inhabitants and the innovative strength of countries, it becomes apparent that there is a correlation regardless of causality. Countries with great innovative strength have a significantly higher density of top universities per inhabitant. Autonomous, strongly financed universities that are internationally competitive are therefore an important innovation factor.

The vocational and professional education and training (VET/PET) system, with its basic and advanced VET programmes, is another cornerstone of Switzerland's innovative capacity. The dual education system, with the option of simplified tertiary study after an apprenticeship, enables a broad, practice-oriented range of education. It is crucial for the higher permeability of educational pathways that young people can complete tertiary education after an apprenticeship in order to deepen the competences relevant in their professional field. VET also helps to ensure a higher capacity for innovation with a broad "skill mix" in companies. The cooperation of people with qualifications at different levels of education has an important added value for innovation.

Looking at today's labour market in Switzerland, it can be seen that degrees at the university of applied sciences and higher vocational education level are very much in demand from business and industry. This is presumably because a preliminary practical experience within a vocational apprenticeship provides practical expertise, which is a prerequisite in many professions for academic knowledge to be used in the first place. Thus, it becomes clear that not only excellent education, which above all covers in-depth knowledge, is decisive for innovation. Permeability and practical relevance are other crucial components for young people to fully showcase their abilities.

The trend for students to increasingly choose a grammar school instead of a vocational apprenticeship is evident in Switzerland and is likely to increase further.

While excellence in university education is central, an increased shift away from vocational training significantly weakens Switzerland's innovative strength. Switzerland's dual education system is probably unique in the world and a key success factor. However, it is crucial that the permeability of the educational pathways is further increased and that the various systems are made more compatible.

Not to be forgotten is the ever-increasing importance of lifelong learning. The rapid changes on the labour market require continuing education. In the future, however, it will no longer be possible to make such a clear distinction between education and training. The education system is required to react more flexibly than in the past in order to meet the changing demands of the labour market. Knowledge and skills are becoming outdated more quickly.

Takeaway 2: Good education is one of the most decisive conditions for innovation today. A key success factor is an excellent education system with strong dual vocational training, combined with a high degree of permeability of educational pathways.

Pillar 3: Promote STEM subjects and entrepreneurship

In the age of digital innovation, the STEM subjects (Science, technology, engineering, and mathematics) must be given a particularly high priority in education. The importance of technical specialists for technological change is enormous. They are an essential component for sustainable economic growth, which is why a shortage of skilled workers from these fields has a strong negative impact on the creative power, competitiveness and ultimately the innovative capacity of an economy in the medium and long term.

Even if the education system in Switzerland is in good shape overall in an international comparison, there are some areas where work needs to be done. One of these is the position of STEM subjects. These subjects still do not feature prominently enough in school curricula, especially in comparison to language subjects. And the number of STEM students at universities and technical colleges is also rather small relative to the humanities and social sciences. This is extremely problematic from the perspective of innovation policy.

If Switzerland wants to remain the world champion in innovation in the future, it must invest massively in education in the STEM subjects, be it through better teacher training or making STEM teaching professions more attractive. The emphasis in schools must also be adjusted, because this is the only way to create the necessary acceptance and strengthen the social anchoring of STEM professions. Interest in and understanding of technology and the natural sciences must be awakened at an early age - especially because training or study in these subject areas is considered more rigorous and depriving than in the social sciences and humanities. In today's curricula, linguistic talent is much more decisive for advancement at school than mathematical-technical skills.

There is still great potential among women. For example, their share in the total number of all graduates from Swiss STEM degree programmes is extremely low in international comparison. The necessary prerequisites and infrastructure to change this are certainly in place with the excellent education programmes at ETH/EPFL, universities and universities of applied sciences. It is now a question of using these properly.

As already stated in the introduction, an idea alone cannot be called an innovation. Only when an innovation also becomes established in the form of products, new services or processes, which are then successfully applied, marketed and sold, does innovation come into being. In other words, entrepreneurial skills are almost as important as the ideas themselves. The entrepreneurial competence to implement ideas in such a way that value is generated from them is therefore extremely important. The key qualities that go into this include creativity, critical thinking, initiative, perseverance, teamwork, project management and business skills. [2] Certain skills may well be innate or a matter of talent. However, much can also be

learned through targeted support and training.

According to the Global Entrepreneurship Monitor 2022, start-up activity [3] in Switzerland is slightly below the average for comparable economies. Fear of entrepreneurial failure is very high (ranked 36 out of 47). According to the report, entrepreneurship is often seen as a less favourable career path than in other countries. Already in earlier years, the status of successful entrepreneurs and media attention to entrepreneurship have declined. This development is a threat to the future prosperity of the Swiss start-up market and innovative strength.

It is therefore important that entrepreneurial thinking and business management skills are practised and promoted at a very early stage.

House of entrepreneurship
"libs Industrial Vocational Training Switzerland" is a total service provider in basic vocational training. Since 2000, it has deliberately and specifically focused on teaching its apprentices to think and act like entrepreneurs. Early on, libs realised that although they have a high level of practical knowledge in the respective occupational field, they often lack entrepreneurial understanding.

Therefore, the "House of entrepreneurship" (Unternehmerhaus) was initiated in 2020, which aims to instil an entrepreneurial mindset in learners from the dual vocational education and training world. Thanks to the numerous sponsors, over 1500 vocational apprentices from 16 trades are now empowered to implement innovations on their own. The libs entrepreneurship course is a compulsory subject for all first-year apprentices. It teaches the ability to structure and validate a business idea. The apprentices are not primarily taught by teachers, but by experienced entrepreneurs.

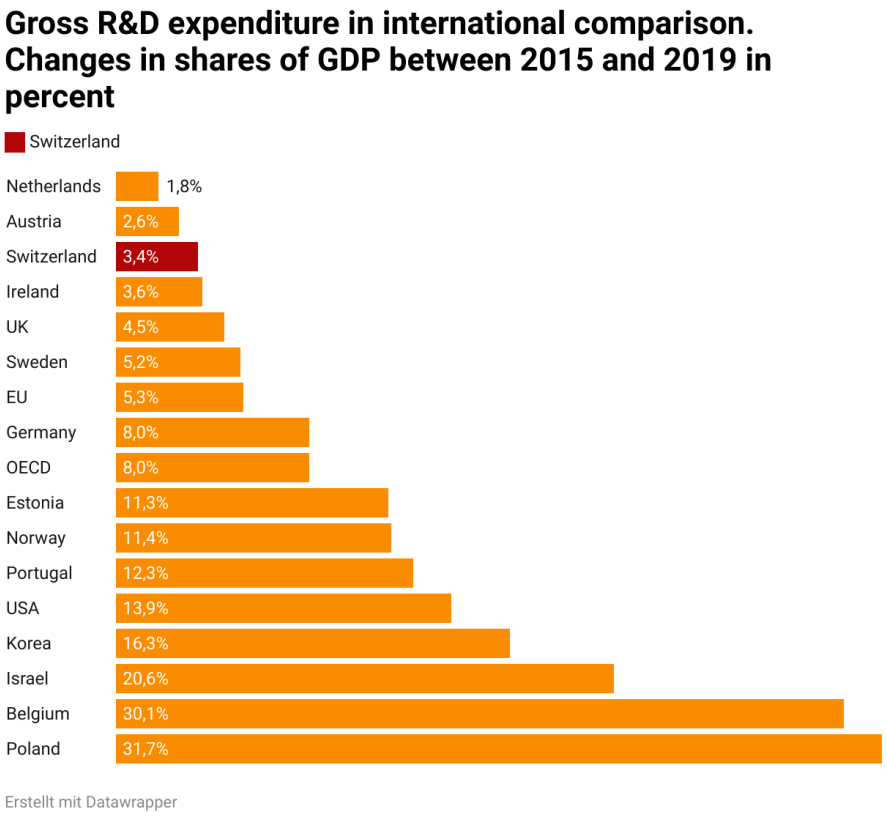
In the optional follow-up course in the second year of training, participants learn to bring a product to market and build a company from it. In addition, the Unternehmerhaus organises regular events on the topics of innovation, entrepreneurship and start-up investments to bring together different stakeholders and create a small innovation ecosystem.

Takeaway 3: In the age of digitalisation, technical skills and entrepreneurial ability are particularly important. Those who want to increase the capacity for innovation must promote STEM subjects and entrepreneurship at an early age in school.

Pillar 4: Prioritise funding for research and development

Government investment in education, research and development is central to the capacity to innovate. In recent years, many countries have increased their commitment to research and development in terms of strategic orientation towards innovation. The European Union, China and many emerging economies have launched programmes to increase the innovation and competitiveness of their countries. Large sums are being invested in research programmes and much is being done to attract top researchers from around the world. This development is also reflected in the statistics. They give rise to fears that Switzerland's strong position in innovation and research is in danger of eroding in the long term.

Graphic 2:



Source: ECD - MSTI database, STI / EAS department, Paris, March 2022; FSO - Research and Development (R&D) Synthesis Switzerland (FE Switzerland)

With an R&D share of (gross domestic product) GDP of 3.1 percent, Switzerland is in a good position overall. It ranks ninth in an international comparison and is clearly above the OECD average of 2.5 percent. The list is headed by Israel, followed by South Korea and Taiwan. Despite the good starting position, it can be seen in chart 2 that the growth of this expenditure has recently remained low in comparison. From 2015 to 2019, the share of R&D expenditure in GDP in Switzerland grew by 3.4 percent. This is below average in international comparison. In the same period, OECD countries increased the share by 8 percent. Not only those countries that spend significantly less than Switzerland have increased their spending. Countries such as Israel, South Korea, Sweden, Belgium and the USA have increased their spending in relation to their GDP significantly more than Switzerland. These are all countries that already had a higher R&D share of GDP than Switzerland in 2015.

And even Swiss companies are increasingly investing outside the country and taking advantage of the growing attractiveness of foreign locations. Expenditure on research and development made by Swiss companies at home (intramuros) has indeed increased by 20 percent from 2012 to 2019. However, investments made abroad (extramuros) have almost tripled in the same period.

It is imperative to take countermeasures here. The state must prioritise spending on education and research over other expenditures. However, this should not be accompanied by a fundamental shift in emphasis from the private sector to the state. On the contrary, it is one of Switzerland's great strengths compared to other economies that the largest share of investments in research and development comes from the private sector. The state's contribution (especially in basic research) forms the basis on which the private sector can build. Due to the long incubation period between government spending in education and research and the creation of innovation, a "policy of perseverance" is necessary. However, since research is always open-ended, there is never a guarantee that successful innovations will eventually emerge from government spending. Higher government spending on education and research, however, increases the likelihood that the private sector will be able to continue its high innovation performance in the future.

In addition to prioritising R&D spending, it is important that funders make as few demands as possible regarding the thematic design of research questions. For basically, the bottom-up principle must apply in research and development. So far, Switzerland has granted a great deal of autonomy to universities in particular, which has been reflected in good research and innovation performance. This must be maintained at all costs.

Takeaway 4: In order to increase innovative capacity, government spending on education, research and development must be prioritised. Since they only lead to innovations with a delay, a long-term policy is needed.

Pillar 5: Access to skilled workers from around the world

Innovation cannot be realized without qualified staff. In the previous chapters, the importance of education and, in particular, of technical knowledge and applied skills was emphasized. There has been talk of the "war for talent" as early as the 1990s. Intelligent personnel with a high level of understanding of technology and operational flexibility are considered to be extremely valuable and are hotly sought after in numerous countries. Ongoing demographic change and increasing digitization have further intensified the competition for these highly qualified specialists. This also applies to Switzerland, which has a long tradition of innovation by both foreign nationals and foreign companies.

A large number of studies underscore the positive influence of foreign skilled workers on the innovation capacity and the dynamics of a national economy. For example, studies from the U.S. clearly show that young, well-educated immigrants who come to the country as students or as highly qualified employees can create great added value in an economy. They have a high probability of being better paid than natives in the medium term. They are also more active in setting up companies. Such immigrants register about twice as many patents (in the U.S.) as natives. This already takes into account the fact that they disproportionately hold educational degrees in science and technology. A study from Norway used data from 500 Norwegian companies to examine the correlation between the employment of highly qualified foreigners and the innovative capacity of these companies. The results speak for themselves: foreign skilled workers increase their collaborative efforts with international partners and thus also the likelihood of product innovations.

Since the mid-1990s, immigration to Switzerland has focused on highly skilled workers. Highly talented international top executives but also workers in the service sector have since contributed decisively to alleviating the shortage of skilled labor. They have been able to counteract the effects of demographic aging, promoted the exchange of knowledge and have contributed to increased productivity and more tax revenues.

As demographic change is accentuating, the importance of foreign labor and skilled workers will increase even more in the future. Depending on the extent to which the domestic labor potential can be activated, there will probably be a shortage of around half a million workers in this country by 2030. It is not only the domestic labor supply that will shrink. The demographic situation will also worsen in countries such as Germany and France. These countries have so far served as large pools for qualified workers coming to Switzerland. Switzerland will therefore have less access to European skilled workers in the future. At the same time, it can be observed that global competition for skilled workers is increasing. According to a report by Deloitte and the Swiss-American Chamber of Commerce, Switzerland cannot keep up with other locations in terms of the framework conditions for the mobility of international top talent. This poses a major threat to Switzerland as a location for innovation.

A wide variety of efforts is needed to increase Switzerland's attractiveness for foreign specialists and to reduce the hurdles for companies as much as possible. This includes better exploitation of the potential for skilled workers from third countries, simplified retention of foreign students after graduation, fewer obstacles to cross-border internal mobility within companies, and greater digitization of approval processes. Switzerland is well advised to prepare for the future today and to alleviate the structural shortage of skilled workers and labor with preventive measures at an early stage.

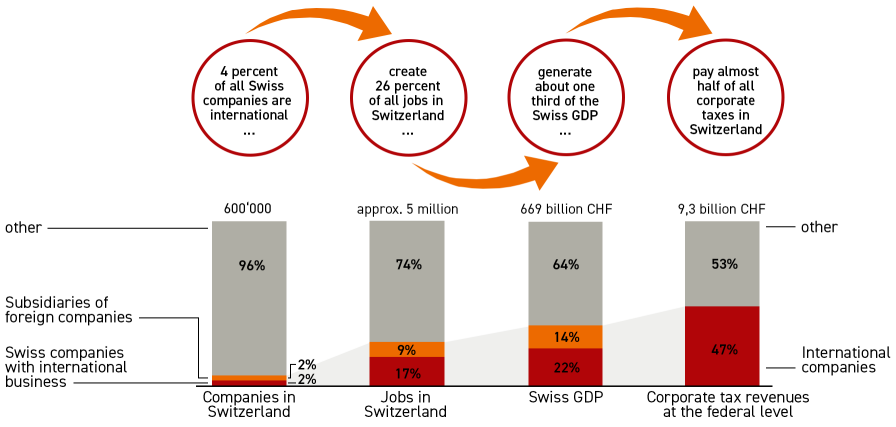
Takeaway 5: Innovation does not work without qualified staff. Simple approval procedures and open access to global specialists is an important requirement for strengthening innovative power.

Pillar 6: International networks and cooperation

Multinational companies are particularly important for innovation and progress. Although they account for only four percent of all companies in Switzerland, they are responsible for more than a quarter of local jobs. They also generate around one-third of Switzerland's GDP and pay around half of all corporate taxes (chart 3). One in six Swiss francs and nearly one in four people in R&D in Switzerland are attributed to foreign-controlled companies. These companies are often exposed to huge global competition and therefore rely on the best employees. With their top talent, they have above-average productivity.

One of the key drivers of the innovative capacity of large companies is their international network and the international teams that provide knowledge exchange across borders. The importance of the latter has already been shown in chapter 5. Open labor markets are an important part of being international. In principle, this advantage of international networking can also be transferred to an economy as a whole, for example in the form of open access to the world market. In this way, small Switzerland in particular can compensate to a certain extent for its size disadvantages. Knowledge and ideas do not stop at national borders, and innovative procedures are not limited to individual sectors. Consequently, an open, internationally oriented economy is attractive as a business location for foreign corporations.

Chart 3: The Importance of Multinationals for Employment, Value Creation and Taxes in Switzerland



Source: Deloitte and Swiss-American Chamber of Commerce 2020

The importance of internationality and thus foreign trade for Swiss prosperity can be illustrated with a simple figure: Switzerland earns two out of every five francs abroad. However, Swiss companies not only export and import services and goods, but also invest heavily abroad. The prosperity of our country is therefore essentially based on the export and import performance of the economy. Swiss companies are

present on the world markets and can successfully hold their own against international competition. Particularly in economically difficult times, it proves to be a great advantage that the Swiss export industry is broadly diversified and that exports are made by different sectors.

However, internationality is not only reflected in open labor, goods and services markets. Other areas, such as international research cooperation, are also central to Switzerland's ability to innovate. Cross-border cooperation and networking must be promoted in all areas. Private-sector networking cannot be prescribed politically. But politics can remove intergovernmental obstacles and create incentives. For example, it would be possible to increasingly tie government research funds to collaborations. In addition, it is essential to strengthen Switzerland's access to the international research community by means of bilateral research agreements or by joining research networks. Particularly large scientific projects, for example CERN in Geneva, are now based on the participation of researchers from all over the world.

Takeaway 6: International networking and cooperation promote cross-border research and business. This increases the attractiveness for researchers from all over the world and multinational companies. A high level of internationality strengthens innovative power.

Pillar 7: Living innovation ecosystems

Innovation ecosystems enable collaboration, networking, the exchange of ideas and knowledge, and thus the development of open innovation processes. The most important feature of functioning ecosystems is the interaction of the various players. Collaborative networks unleash new innovation potential by driving the flow of information, ideas, data and knowledge along the entire value chain.

Many countries are trying to harness these network effects with innovation parks, technocenters and innovation hubs to boost their innovation capabilities. A particular focus is being placed on start-ups. Various measures are being used to try to create a fertile start-up ecosystem. At the center of successful start-ups are always people with a special kind of talent: usually younger, well-educated, technically skilled people with creativity, ambition and entrepreneurial spirit. This type of talent is rare and highly mobile. Talented entrepreneurs quickly move to places that offer them the best mix of investments, tax and legal frameworks, and market access. With the advance of digitization and the rise of technology companies like Google and Facebook, awareness of the importance of startups has soared in recent years. This has prompted many countries to make targeted improvements to the relevant framework conditions. This includes the introduction of start-up visas. This gives people a residence permit for a specific purpose: the founding and further development of a start-up. The purpose of the measure is to attract talented young entrepreneurs to the respective country to realize their business idea.

While the existence of innovation ecosystems is important, it is not a silver bullet against innovation weakness. If the framework conditions are not right, the value of a government-supported innovation system will remain low. However, especially for SMEs that do not reach a certain critical size and struggle with the complexity of certain problems, network effects can be of great importance. A lack of systematic innovation processes and IP management can then be compensated by participation in innovation systems.

Takeaway 7: Innovation parks, technocenters and innovation hubs can help SMEs and startups to strengthen their innovative capacity through the flow of information, ideas, data and knowledge through their network effects.

Conclusion

With a good innovation policy, Switzerland can lay the foundation for long-term prosperity and growth. However, it is also quite possible that a poor innovation policy could do more harm than good. For example, state-imposed industrial policy can lead to inefficiencies and misallocations. This must be absolutely avoided. Even with good intentions, too much government intervention can have an inhibiting effect on innovation. Moreover, with its small domestic market, Switzerland does not operate in a weight class in which massive flows of money could help a technology to achieve a breakthrough. Many political ideas that at first glance appear to promote innovation turn out to be counterproductive on closer examination. Thus, good innovation policy must be "blind" to a certain extent: It must not succumb to the illusion that it already knows the technologies of the future today. This vagueness makes it difficult to sell good innovation policy in the political process. People want to solve today's problems quickly and comprehensively. Instead, goals must be set more modestly and for the long term: The foundations must be laid in an open-ended process to ensure that important problems can be solved in the future with a certain degree of probability. The incubation period from investment in education and research to concrete innovation can be long; moreover, the possibility of failure is an inherent part of this process. The reason is that innovation is not a linear, schematic process. Neither is there a clear differentiation of roles between universities and private industry, nor is a distinction between basic research, application-oriented research and concrete market development practical. Rather, many small pieces of the puzzle must fit together for innovation to occur. The state can improve some of these puzzle pieces and thus hope that someone will add more pieces and combine them correctly so that an idea, indeed a whole picture, emerges. Only this picture represents the innovation that has added value for the customer and our society in general. In the innovation process, therefore, trust must be placed in the functioning of the market economy.

It is also important to realize that many measures have only an indirect impact on the innovative power of a country because they influence its competitiveness. For example, a country's tax system and the level of its tax burden influence its competitiveness and thus have an impact, albeit only indirectly, on its ability to innovate. The seven pillars of innovative capability are intended to provide a rough guideline for everyday political life. Switzerland is currently in a comparatively good starting position. But the international competition never sleeps.

The seven pillars of innovative capability are intended to provide a rough guideline for everyday political life. Switzerland is currently in a comparatively good starting position. But the international competition never sleeps.

1. Two-thirds of all expenditure on research and development comes from private individuals (Source: Federal Statistical Office)
2. Pour plus de détails, voir : https://cms.hep-verlag.ch/api/downloads/factsheet_bedeutung-unternehmertum.pdf
3. start-up activity: Total early-stage Entrepreneurial Activity (TEA)