interpharma

Study on behalf of Interpharma

The Importance of the Pharmaceutical Industry for Switzerland

BAK Economics AG
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Foreword

Dr. René Buholzer
Managing Director and Delegate of the Board of Interpharma

This study impressively demonstrates the enormous economic importance and unique success story of the research-based pharmaceutical industry in Switzerland: It currently accounts for 5.4 per cent of Switzerland's total economic output. Swiss economic growth over the past ten years would have been 1/3 weaker without the pharmaceutical sector. This growth is not the result of price increases, on the contrary: The study demonstrates that over the past ten years, drug prices in Switzerland have declined on average.

The study also points out that Switzerland cannot just rest on its laurels of recent years. Other locations such as Ireland, Denmark, the San Francisco Bay Area and Singapore, to name a few, are becoming stronger and are serious competitors. They have developed attractive strategies designed to actively attract pharmaceutical companies. In Ireland, for example, the pharmaceutical industry already accounted for 11.4 percent of the country's economy as a whole in 2019 – more than in Switzerland. The current COVID-19 pandemic has intensified this international location competition in the pharmaceutical sector even further.

Thus Switzerland must take steps to ensure that the framework conditions remain attractive and the country continues to be a successful and internationally competitive pharmaceutical location in the future. This includes stable relations with the European Union. The uncertain future of those relations, however, poses a multitude of risks that could have a negative impact on Switzerland as a production and research location

already by now. Such stable, sustainable, contractually regulated relations with the EU and thus regulated market access are essential for the survival of not only the pharmaceutical sector but also for other sectors linked to it. Our country needs access to European research programmes, which are essential to both the country's competitiveness as a research and innovation location and to highly innovation-driven Swiss companies.

Politicians must act now to prevent our country from falling behind. An additional 28,000 jobs have been created in the pharmaceutical sector since 1996, which means that 2.4 times as many people are currently employed in the pharmaceutical industry as nearly 25 years ago. At the same time, real value added in the pharmaceutical industry has increased more than ten-fold since 1996. If we want this success story to continue in Switzerland, we have to develop our strengths, correct our weaknesses and learn from competitors. That means Switzerland must identify and seize opportunities in order to create sustainable framework conditions for the country as a research and production location.

Interpharma

Dr. René Buholzer
Managing Director and Delegate of the Board of Directors

FACTS & FIGURES

Innovation

The basis for high productivity and competitiveness

28,500 employees with a tertiary degree

9,800 scientists (FTE)

2.5% p.a. employment growth over the past 10 years

Employment

47,000 employees work in the Swiss pharmaceutical industry thereof 20,600 women

Multiplier effects: total employment is **5.4** times higher

5 times higher productivity than the Swiss industry average

8% p.a. productivity growth over the past 10 years

209,200 additional people are employed in other industries, due to the activities of the pharmaceutical industry

Source: BAK Economics, FSO

PHARMACEUTICAL INDUSTRY

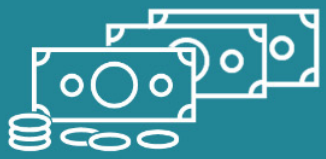
> CHF **7** bn
R&D expenditures

This makes the pharma industry the most research-intensive industry in Switzerland

10.7% p.a. value added growth over the past 10 years

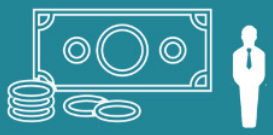
which contributed one third to aggregate GDP growth

Value added



CHF **37** bn
of value added is generated by the Swiss pharmaceutical industry

Productivity



CHF **820,300**
of value added per workplace

Multiplier effects:
total value added is
1.7 times higher

CHF **25** bn
of value added is generated in other industries, due to the activities of the pharmaceutical industry

Data for 2020, except for innovation related indicators (2019)

Executive Summary

The pharmaceutical industry is the flagship of Switzerland as a workplace. In connection with the production, research and development of pharmaceutical products in 2020, around 61.4 billion Swiss francs of value added was created along the entire value chain, in fact, one of every eleven Swiss francs earned in Switzerland was generated this way. Numerous businesses in other economic sectors benefit from the success of pharmaceutical companies. Some 40 per cent of all value added is generated in companies outside the pharmaceutical industry. The pharmaceutical industry's innovative strength has made it extremely competitive internationally and allowed it to expand greatly over the past decade. As a driving force of the Swiss economy, the sector was responsible for more than a third of the country's GDP growth between 2010 and 2020. It was even able to boost real economic output and create new jobs during the pandemic year of 2020. Including indirect effects, some 206,000 jobs were linked to activities in the pharmaceutical industry in 2020.

More than 26,000 additional jobs since 1996

Contrary to the general trend toward job cuts in the manufacturing sector, the pharmaceutical industry has greatly expanded its HR capacities in the past 25 years. Boasting a workforce of around 47,000, there were nearly two and a half times as many people employed in the manufacturing sector in 2020 as in 1996. Job growth in the sector was driven not only by numerous companies that settled in Switzerland, but primarily by a successful focus on innovative, research-intensive products. The demand for a highly qualified workforce increased steadily as a result of the growing innovation intensity. The proportion of employees with a tertiary qualification (higher-level vocational training or university degree) is now at over 60 per cent, and nearly one in two employees has a university degree. Without access to international labour markets, local pharmaceutical companies would be far from able to cover such high demand for skilled workers. Around one in five employees travels to Switzerland on a daily basis as a cross-border commuter and 44 of every 100 employees residing in Switzerland comes from another country, or as many as 70 of 100 employees in R&D. These figures show that the pharmaceutical industry is particularly dependent on efforts that prevent today's good framework conditions governing the free movement of persons from deteriorating.

Pharmaceutical industry is the most important growth driver

The coronavirus pandemic prompted treatments at doctors' surgeries and hospitals to be postponed. Yet even despite the corresponding slowdown in demand for non-essential medicines and therapies, the pharmaceutical industry was still able to boost its real economic output in 2020. Gross value added of around 36.8 billion Swiss francs was generated in Switzerland, which is roughly equivalent to 29 per cent of industrial value added. Even in the latest economic crisis, the pharmaceutical industry was once again a central pillar of the Swiss economy. In the past 10 years, more than one third of Swiss economic growth was attributable to the pharmaceutical industry.

EU is more than just an important market

A total of around 99 billion Swiss francs in export revenue was generated in 2020, 46 per cent of which stemmed from European countries. Good framework conditions, such as the mutual recognition of conformity agreements between the EU and Switzerland, also played a pivotal role in this. Not only do these promote sales, they also ensure that cross-border value chains can be organised efficiently. An erosion of the bilateral approach between the EU and Switzerland would therefore weaken Switzerland's competitiveness as a pharmaceutical location. That would both lead to higher annual costs and pose the risk that pharmaceutical companies might relocate some of their activities from Switzerland to the EU in the future. What's more, it would detract from Switzerland's appeal as a location and have a correspondingly negative impact on the likelihood that other international pharmaceutical companies might settle in the country.

The recipe for success: strength in innovation and growth in productivity

The pharmaceutical industry's strong growth is largely due to its phenomenal increase in productivity. For every job, the value added is five times as high as the average for the overall economy. Even in an international comparison, the Swiss pharmaceutical industry outstrips other countries in terms of productivity. While some of the sharp increase in productivity in recent years came as the result of greater capital investment and automation, the decisive factor behind this extraordinary growth in productivity is the high level of intense research and innovation. Companies in Switzerland's pharmaceutical sector invest more than 7 billion Swiss francs every year in the research and development of new medicines and therapies.

Apart from the enormously successful innovation activities of the big pharmaceutical groups, innovation is also being driven by a growing number of successful start-ups, particularly in the field of biotechnology. These are usually spin-offs from universities that play a particularly important role in the transfer of knowledge and technology between universities and the pharmaceutical research industry.

EU research framework agreement important for pharmaceutical location

The joint research agreement with the EU also plays an important role in research collaboration. This agreement offers Swiss universities and companies the opportunity to carry out projects together with top European researchers. It gives them access to one of the world's leading research networks ("Champions League of Research"). Swiss researchers' extensive involvement in biotech/pharmaceutical projects of the European Research Council (ERC) reflects just how immensely important these framework agreements are for pharmaceutical research in Switzerland. Researchers at Swiss universities and research institutions were awarded around EUR 470 million in ERC grants between 2007 and 2020. That corresponds to a share of 9.6 per cent of the total volume of all ERC grants awarded in the field of biotech/pharma during this period. That puts Switzerland in fourth place among all member countries. Only researchers from Germany, the UK and France were more successful in their requests for ERC funding.

Other sectors also benefit from the success of the pharmaceutical industry

For the manufacture of its products, the pharmaceutical industry needs a considerable amount of goods and services from other sectors. The demand for these preliminary goods and services in the pharmaceutical industry generates jobs in these sectors (as well as among other suppliers, etc.). Trade and industry also benefit from consumer spending by employees in the pharmaceutical companies. A model-based impact analysis shows that companies and employees from other sectors profit greatly from pharmaceutical company activities. The impact analysis concludes that for every Swiss franc of value added in the pharmaceutical industry, another approximately 70 centimes of value added is generated in other Swiss sectors. That means this industry generated around 24.6 billion francs of additional value added for the economy in 2020. The total amount of value added contributed amounted to around 61.4 billion Swiss

francs in 2020, which corresponds to 8.9 per cent of Switzerland's total economic output.

Around 209,200 people were indirectly involved in the value chain of the production, research and development activities of pharmaceutical companies in 2020. These employees were people from a wide range of sectors (chemical, consumer and investment goods, energy, construction, transport, financial, ICT, consulting, cleaning, security, etc.). A cumulative employee income of around 15.4 billion Swiss francs was associated with the additional jobs in other sectors of the economy. Thus, for every 1,000 Swiss francs of salary paid to employees in the pharmaceutical industry, an additional 2,600 Swiss francs of pay was generated on average in 2020 for employees from companies in other sectors.

Effects in …	the pharma industry	other industries	Total effect	Multiplier
Gross value added [CHF m]	36,759	24,621	61,380	1.7
in % of total economy	5.4	3.6	8.9	
Employees	47,010	209,169	256,179	5.4
in % of total economy	0.9	3.9	4.8	
Employees [FTE]	44,812	161,121	205,933	4.6
in % of total economy	1.1	3.8	4.9	
Hours worked [m hrs]	80	292	372	4.6
in % of total economy	1.1	3.8	4.9	
Gross wages and salaries [CHF m]	5,832	15,392	21,224	3.6
in % of total economy	1.5	3.9	5.4	
Exports [CHF m]	98,993			
in % of total goods exports	44.5			
in % of total exports	22.1			

Source: BAK Economics, FSO; possible rounding differences

Good relations with the EU are enormously important

The failure of the framework agreement threatens to undermine the bilateral agreements in their entirety in the medium to long term. That, in turn, jeopardises the extent to which Switzerland is able to benefit from the bilateral agreements. Simulations devised by BAK Economics show that a dilution or the discontinuation of bilateral agreements would lead to substantial losses in the pharmaceutical industry, as well. Not only would adjustment effects cause a general deterioration (declining sales, cost increases, losses of efficiency), but the negative impact on growth would result in increasingly dynamic losses in the long term. Value added would be 7 per cent lower just 13 years later.

Contents

1 The pharmaceutical industry as an employer

While jobs were being cut in the rest of the manufacturing industry, the number of jobs in the pharmaceutical industry has risen substantially in the past 25 years. As innovation intensity has picked up in the sector, there has been a corresponding increase in the need for highly qualified professionals, in particular. Over half of all employees now have a university degree.

1.1 Number of employees

Steady increase in capacities since 1996

In the first half of the 1990s, companies' adjustments to structural changes as well as a pronounced macroeconomic growth crisis led to the loss of almost one in three jobs in the entire chemical and pharmaceutical industry. This trend bottomed out in 1996 when Swiss pharmaceutical companies only had around 19,300 people left in their workforce.

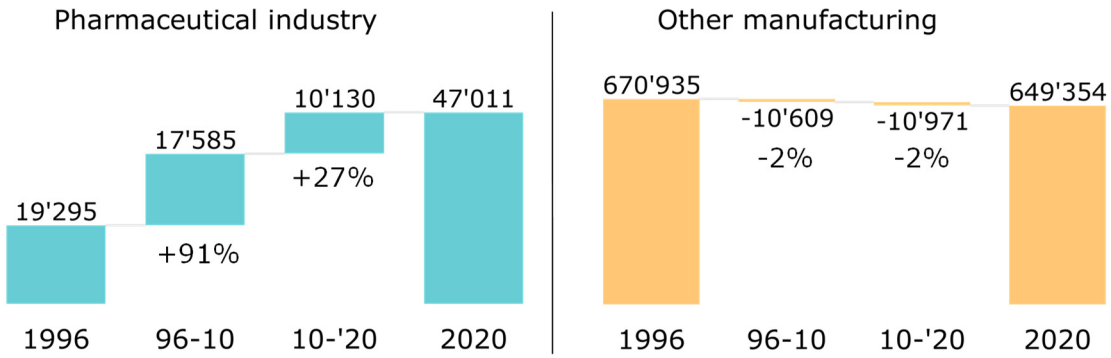
Since 1996, however, the upward trend observed in the pharmaceutical industry has been nearly uninterrupted. This turnaround was ushered in through large investments in research and development as well as a systematic strategic focus on innovative technologies. Structural growth drivers such as demographic change and a growing middle class in emerging markets created ideal conditions for this growth. Over the past 25 years, for example, this has caused employment to expand so strongly that even international economic crises have barely slowed it down. Better external economic conditions (e.g. the conclusion of bilateral agreements with the EU) and the establishment of other companies provided additional momentum.

More than 47,000 people were employed in 2020, which means that the number of employees has risen by a total of around 27,700 since 1996. This corresponds to cumulative growth of 144 per cent. By way of comparison, employment in the overall economy only increased by 31 per cent in Switzerland in the same period. A comparison of developments in the pharmaceutical industry with those in other manufacturing industries highlights Switzerland's importance to the pharmaceutical industry as a manufacturing location. While the number of people employed by the rest of the manufacturing sector in 2020 ultimately dropped by 21,580 compared to 1996, pharmaceutical firms managed to create a large number of additional job opportunities during this period. Increased capacities in

the pharmaceutical industry have had a slightly positive impact on employment in the Swiss manufacturing sector as a whole since 1996 (+6,136 people or +0.9%).

Fig. 1-1 The number of employees has risen by 27,716 since 1996

Number of employees, 1996-2020



Source: BAK Economics, FSO

Momentum in the pharmaceutical industry has slowed down in recent years but is still considerably higher than the average for the overall economy. Job creation remains dynamic, particularly in biotech production. Some classic, chemically manufactured pharmaceutical products can be produced at a lower cost at other locations, however.

Employment growth also seen during the pandemic year of 2020

Last year, the COVID-19 pandemic triggered a short-term job loss of -1.0 per cent in the Swiss manufacturing sector. This also had a negative impact on parts of the pharmaceutical industry. Treatments in doctors' surgeries and hospitals were postponed due to the pandemic and demand for non-essential medicines and therapies dropped. All in all, however, employment in the pharmaceutical industry also rose by 0.8 per cent during the pandemic year of 2020 and the sector once again demonstrated that it is more crisis resistant than other industries and the overall economy. The sector's enormous resilience is also evident in statistics on short-time work. While many industrial sectors were dependent on this instrument during the past year, some of which quite heavily, only a small number of pharmaceutical companies introduced short-time work. The reported number of hours not worked in 2020 was equivalent to merely 0.4 per cent of the total volume of work performed in 2019. In the overall economy, this figure was many times higher at 4.7 per cent.

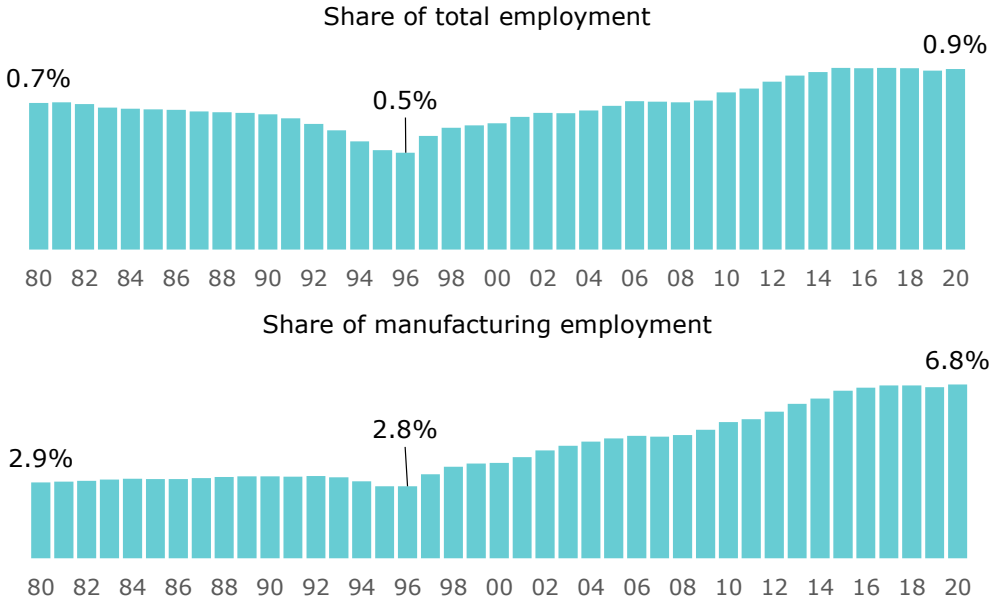
One explanation behind the positive employment trend in the pharmaceutical sector during the pandemic year of 2020 is its role in pandemic control. Many companies in Switzerland are involved in this, whether in drug development, along vaccine production chains, or in the development and production of testing methods. These are the areas where new HR capacities were added. Here it should be mentioned that Lonza, a pharmaceutical supplier and vaccine producer, is not classified as being in the pharmaceutical industry (NOGA section 21) but in the chemical industry (NOGA section 20), instead. If the enormous increase in headcount at the Lonza production facility in Visp in connection with the company's production of the COVID-19 vaccine from Moderna were included, the impact on employment in the pharmaceutical industry would have been even more positive.

Importance for the job market

Pharmaceutical companies' relevance for the Swiss labour market has risen substantially over the past 25 years. Greater job growth caused the proportion of people in employment in the overall economy to climb to just under 0.9 per cent in 2020, while the number of people employed in the manufacturing sector was already 6.8 per cent (see Fig. 1-2). The pharmaceutical industry therefore provides nearly one in fifteen jobs in the manufacturing sector.

Fig. 1-2 One in fifteen employees in the manufacturing sector works for a pharmaceutical company

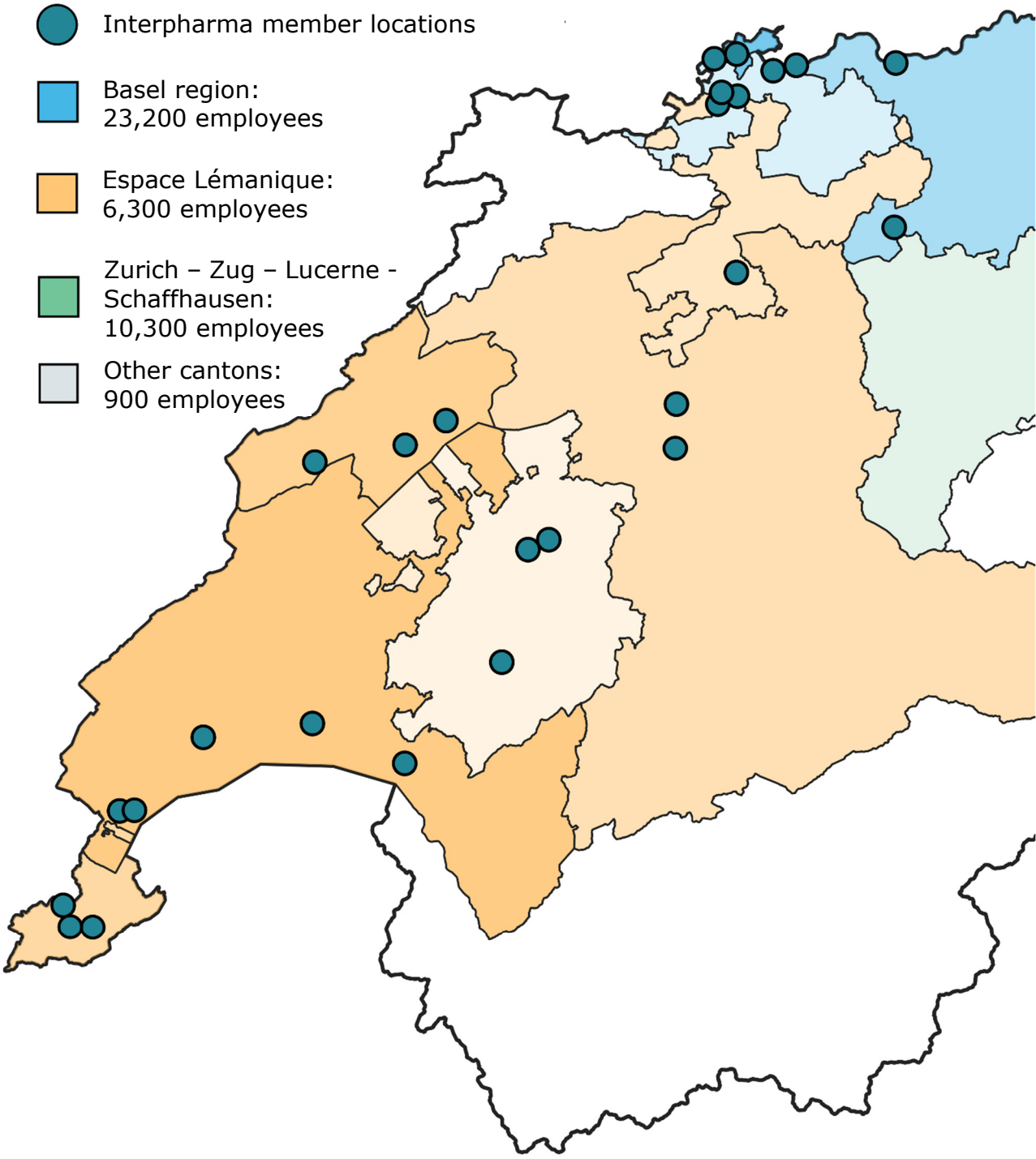
Pharmaceutical industry share in total employment, 1980-2020

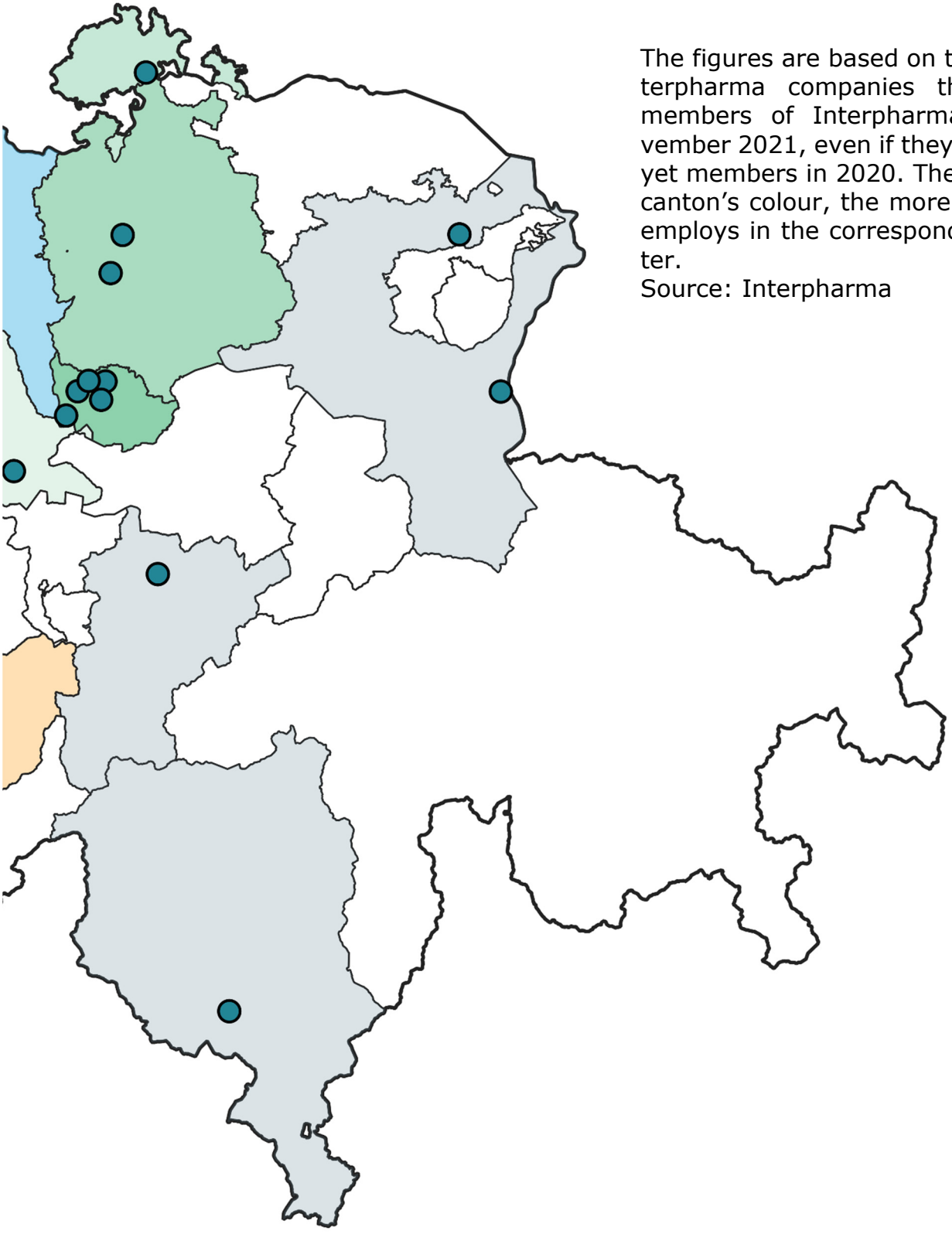


Source: BAK Economics, FSO

Fig. 1-3 Regional distribution of Interpharma members

Number of employees and locations of Interpharma member companies by pharma cluster as at the end of 2020





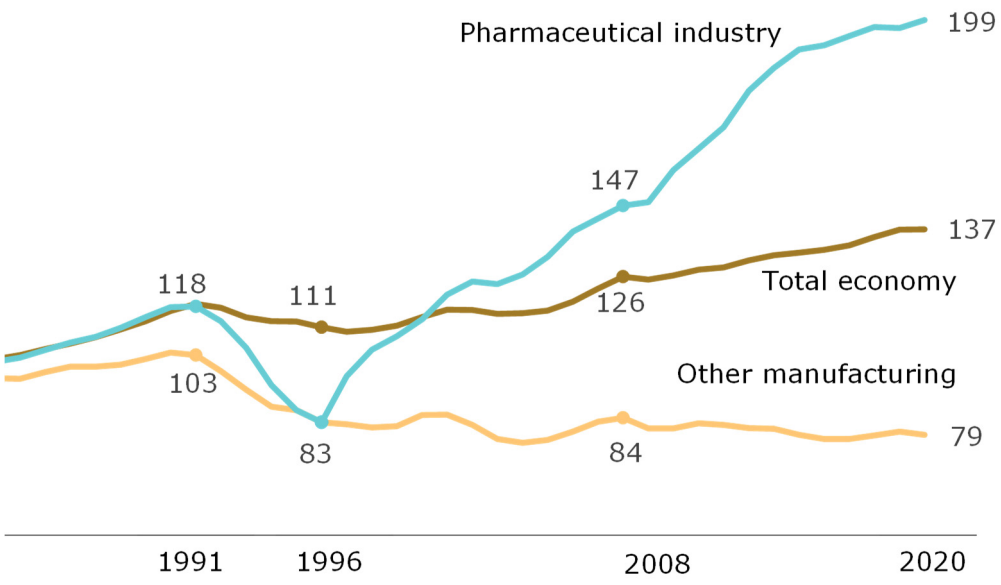
The figures are based on the 23 Interpharma companies that were members of Interpharma in November 2021, even if they were not yet members in 2020. The darker a canton's colour, the more people it employs in the corresponding cluster.
Source: Interpharma

Full-time equivalent employment

Measured in full-time equivalents, there were around 44,800 jobs in the pharmaceutical industry in 2020. This corresponds to 1.1 per cent of the jobs in the economy as a whole and 7.0 per cent of all jobs in the manufacturing sector. The figure below shows the job cuts of the first half of the 1990s that were mentioned above as well as the upward trend that initially began in 1996 and has continued uninterrupted until today. As a result of this trend, the number of full-time equivalent jobs in 2020 was almost double the number in 1980 (index value of 199). A declining employment trend has been observed since 1991 in the rest of the manufacturing sector, however. While the various economic cycles are still clearly recognisable in the rest of the manufacturing sector, it is also apparent that the development in the pharmaceutical industry has decoupled from the national economic trend over the past 25 years.

Fig. 1-4 The number of jobs has doubled since 1980

Number of jobs [FTE], 1980-2020, index 1980 = 100



Source: BAK Economics, FSO

Definition of full-time equivalent employment (FTE)

Differences in part-time structures mean that employment figures for the different sectors are only comparable to a limited extent. For this reason, full-time equivalent (FTE) employment is used as a measure for such comparisons. FTE indicates the theoretical number of employees there would be if the total volume of work were performed exclusively by full-time employees.

Employment structure

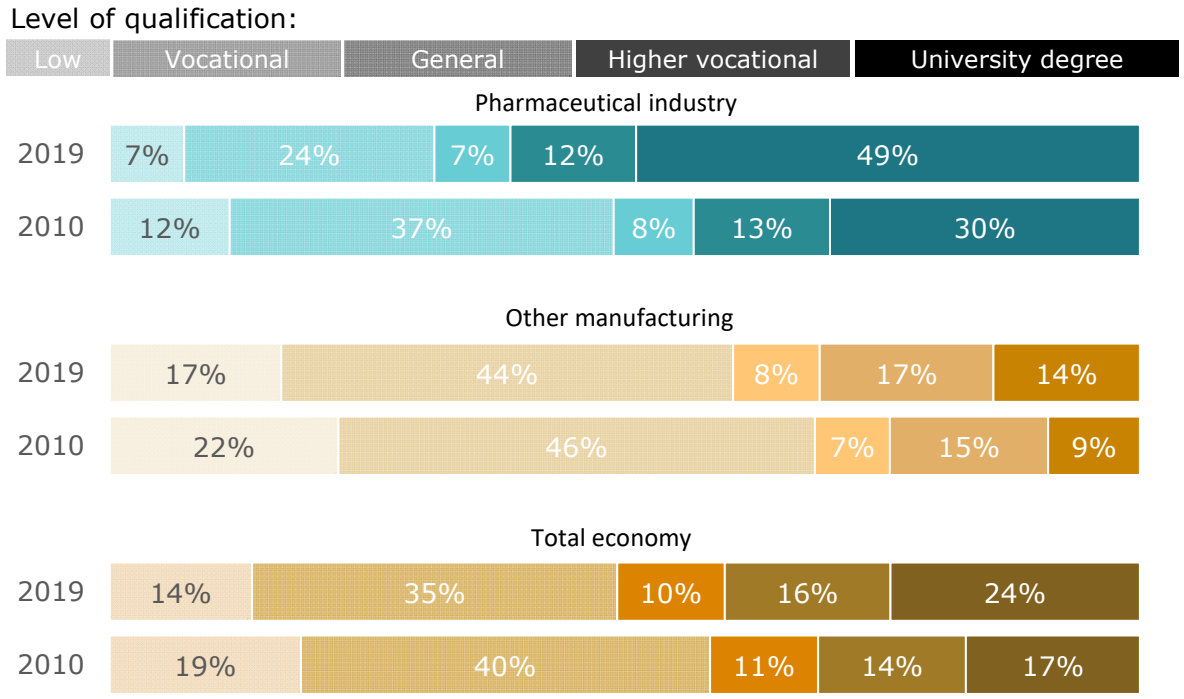
Qualification structure

The pharmaceutical industry boasts an extremely high level of research intensity. Companies in the pharmaceutical sector invested more than 7 billion Swiss francs in research and development (R&D) in Switzerland in 2019.

The number of employees in R&D climbed from around 6,000 to around 9,800 (FTE) between 2004 and 2019. That corresponds to 19 per cent of all R&D staff in Switzerland. Increasing research intensity has increased demand for a highly qualified workforce. Automation and outsourcing activities in medium- to low-skilled jobs, however, dampened the momentum in employment. These trends are also visible in the employees' qualification structure. The proportion of employees with a tertiary qualification (higher-level vocational training or university degree) in the pharmaceutical industry rose from 43 per cent to 61 per cent from 2010 to 2019. Nearly one of every two employees now has a university degree. In the same period, the share of employees with less than upper secondary education dropped from 12 per cent to 7 per cent.

Fig. 1-5 61 per cent of employees have a university degree

Qualification structure in 2010 and 2019



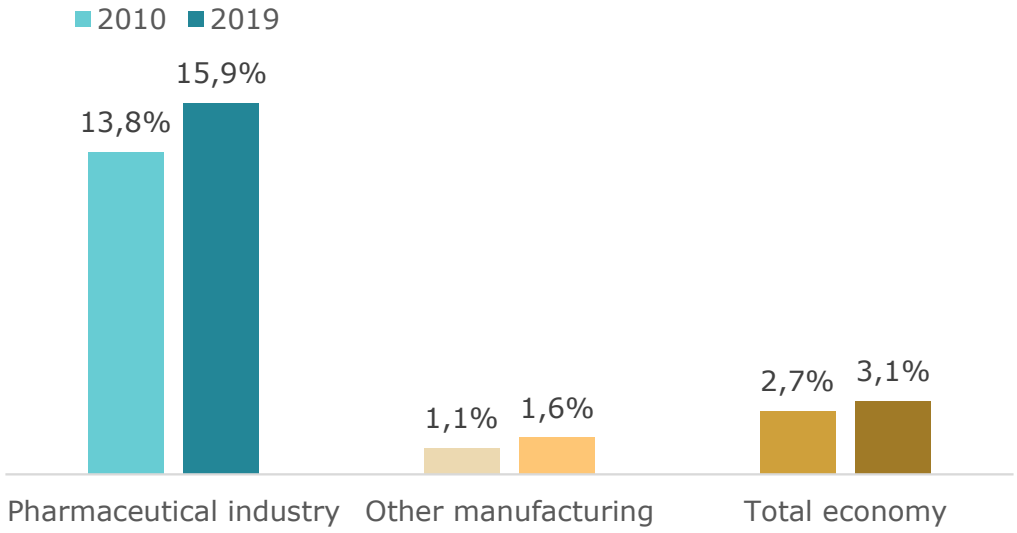
Employees' level of educational achievement (low = lower secondary)
Source: BAK Economics, FSO

Vocational training (apprenticeships) continues to be the most common level of education in the rest of the manufacturing sector and the overall economy (44% and 35%, respectively). However, at 31 per cent and 40 per cent, respectively, the percentage of highly qualified employees was much lower than in the pharmaceutical industry in 2019. While the rest of the manufacturing sector and the overall economy have also seen a substantial increase in demand for better qualified employees since 2010, the gap between the pharmaceutical industry and other industries has once again widened in terms of the proportion of employees who have been through tertiary education.

One other notable aspect is that almost one in six employees in the pharmaceutical industry has completed a doctoral or postdoctoral degree in 2019. This corresponds to 15.9 per cent of total employment in the sector. The percentage of the workforce that has completed a doctoral or postdoctoral degree is much lower in the rest of the manufacturing sector and the overall economy (1.6% and 3.1%, respectively).

Fig. 1-6 16 per cent of employees have completed a doctoral or postdoctoral degree

Percentage of workforce with a doctoral or postdoctoral degree in 2010 and 2019



Source: BAK Economics, FSO

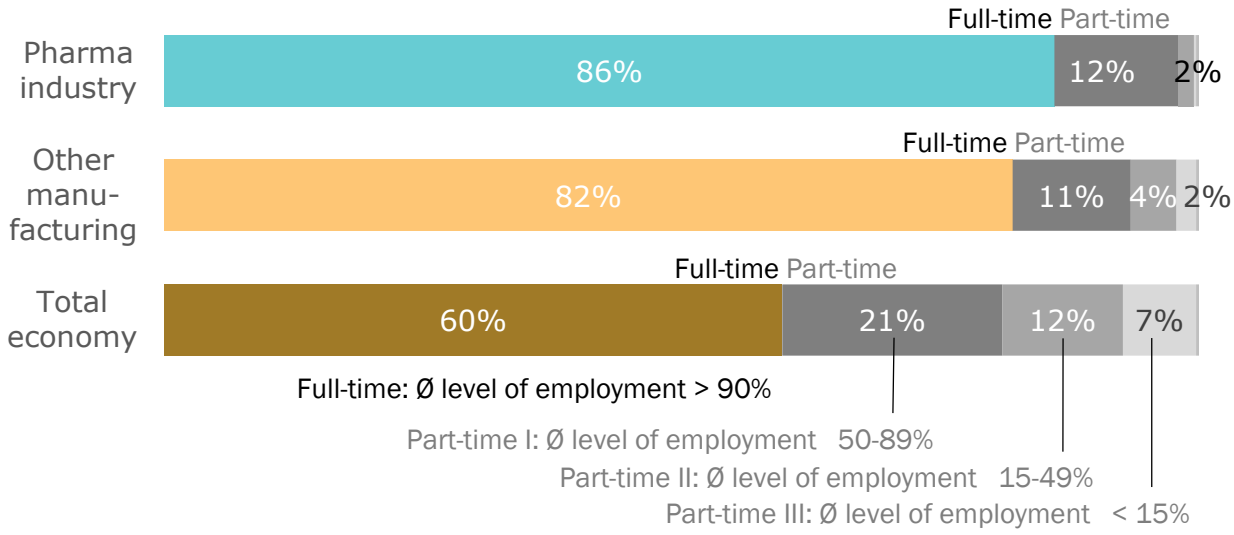
The employees' above-average level of qualification in the pharmaceutical industry is also reflected in average wages that are higher than those seen in other industries. Swiss pharmaceutical companies paid a total of more than 5.8 billion Swiss francs in gross wages and salaries to employees in 2020 – ultimately to the benefit of the public sector in the form of income tax revenue.

Part-time structure

The part-time structure in the pharmaceutical industry is roughly comparable to the employment pattern found in the rest of the industrial sector. Full-time employees (with a workload of more than 90 per cent) accounted for 86 per cent of employees in 2020, placing the sector only slightly higher than the rest of the manufacturing sector (82%). In the service sector, there are some industries such as the retail trade or the hospitality industry that have a much higher share of part-time jobs than the manufacturing sector. The proportion of full-time employees in those industries only amounted to 60 per cent in 2020 as a result.

Fig. 1-7 Average level of employment is higher than in the manufacturing sector and much higher than in the overall economy

Percentage of employees by level of employment in 2020



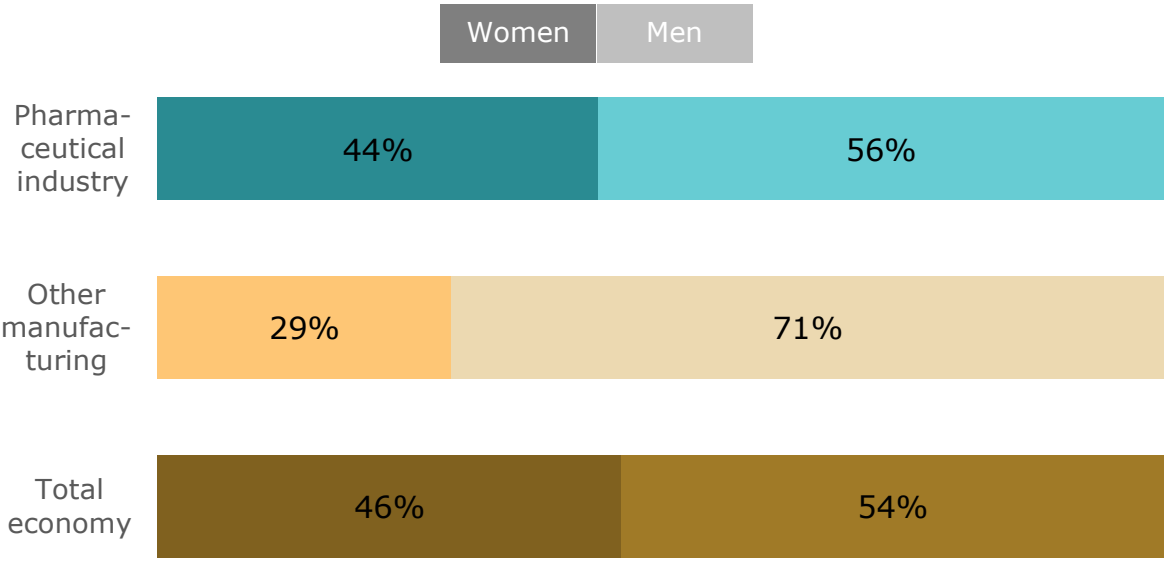
Source: BAK Economics, FSO

Share of women

The pharmaceutical industry differs significantly from the rest of the manufacturing sector in terms of the proportion of female employees. While the proportion of women working in the pharmaceutical industry in 2020 was around the national average (46%) at 44 per cent, the percentage of women working in the rest of the manufacturing sector was much lower (29%).

Fig. 1-8 The share of women is clearly above the manufacturing sector average

Employees by gender as a percentage of total employment in 2020

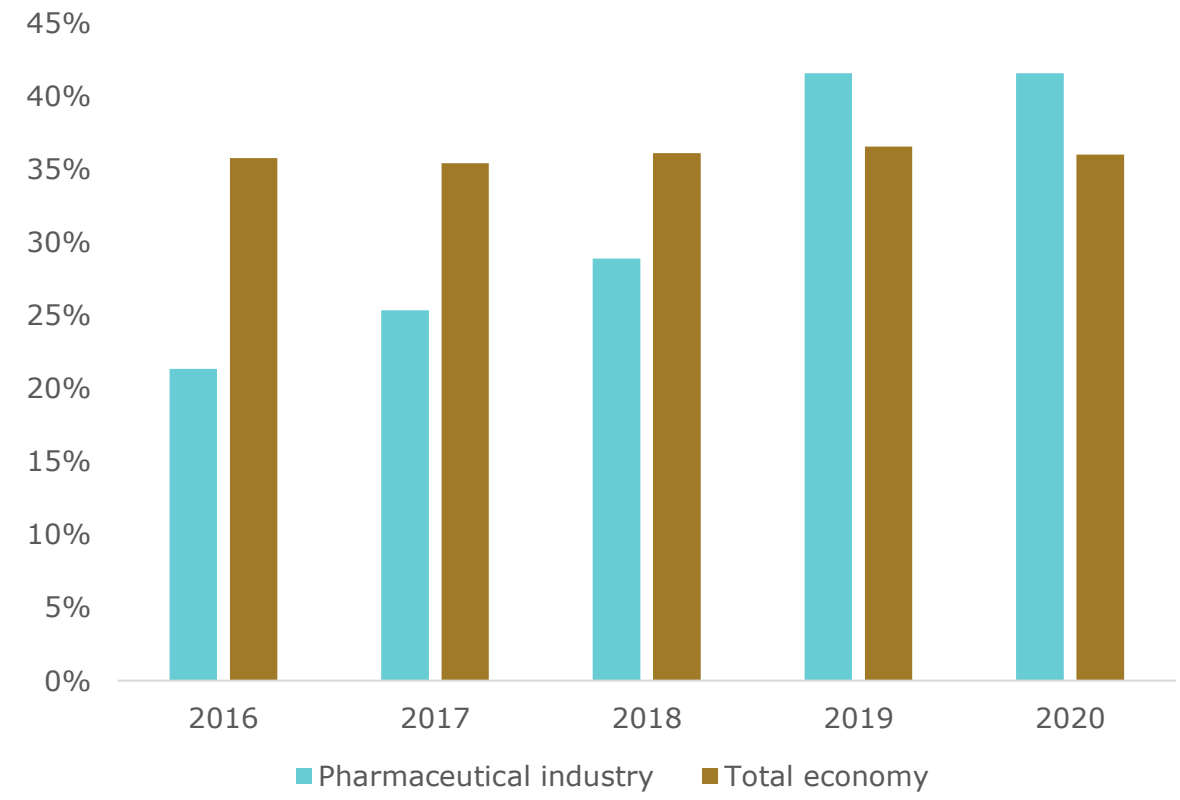


Source: BAK Economics, FSO

Another remarkable aspect is that the share of women in positions of leadership in the pharmaceutical industry has risen sharply in the past few years. In 2016, women only accounted for 21 per cent of employees with a line manager function at pharmaceutical companies, which put them far below the national average (36%). Since then, the share of women in positions of leadership in the pharmaceutical sector has doubled to 42 per cent in 2020. By contrast, the proportion of women in the overall economy stagnated during that same period.

Fig. 1-9 Share of women with a line manager function has risen sharply

Employees by gender with a line manager function from 2016 - 2020



Source: BAK Economics, FSO

1.2 Importance for other sectors

At first glance, the pharmaceutical sector accounts for a modest 1.1 per cent of all employment (FTE) in the overall economy (FTE). The effective importance of the pharmaceutical industry is much greater, though, since pharmaceutical companies' activities create additional jobs in other sectors.

For the pharmaceutical production, preliminary goods and services are sourced from companies in a variety of other industries, sectors and from abroad. Examples of preliminary goods and services are machinery, chemical substances, insurance services, building/plant maintenance, cleaning and security services, IT services as well as energy.

Consumer spending by people employed in the pharmaceutical companies also generates sales in trade and commerce. The intertwined nature of these businesses is the reason why jobs in other sectors are connected with the production activities of pharmaceutical companies.

For this study a macroeconomic impact model was used to calculate the extent to which the production, research and development activities of the pharmaceutical industry impacted employment in the overall economy in 2020. This model can be used to analyse and quantify all relevant payment flows in an integration across the entire value chain (cf. section 5.1). This impact analysis shows that in 2020 some 209,200 people were employed in other Swiss sectors thanks to the activities of Swiss pharmaceutical companies. The total impact on employment therefore amounts to around 256,200 jobs or 4.8 per cent of total employment in Switzerland.

Fig. 1-10 Total impact on employment is five times higher in the pharmaceutical industry due to multiplier effects

Impact on the labour market, direct and in other sectors, 2020

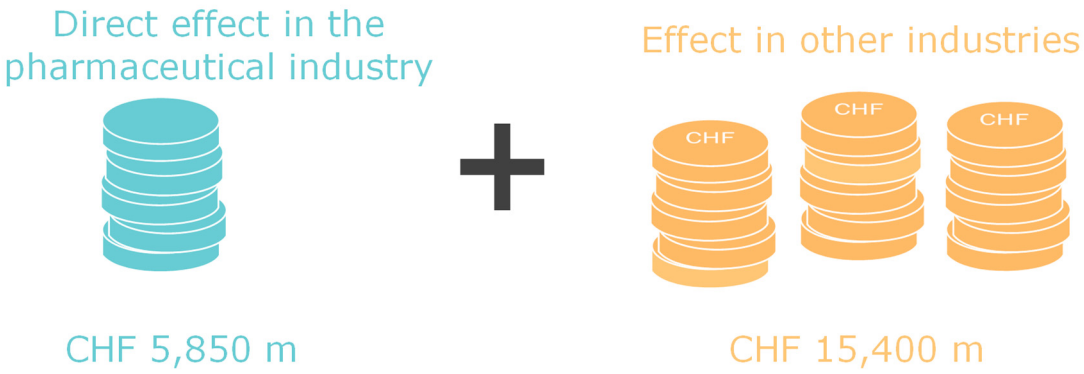
Note: figures are rounded
Source: BAK Economics

Income effects

Cumulative employee income of around 15.4 billion Swiss francs was generated through additional jobs in other sectors of the economy in 2020. Thus, for every 1,000 Swiss francs of salary paid to employees in the pharmaceutical industry, an additional 2,600 Swiss francs of pay was generated on average for employees from companies in other sectors. All in all, the pharmaceutical industry triggered around 21.2 billion Swiss francs in national employee income, which corresponds to around 5.4 per cent of the overall economy.

Fig. 1-11 For every 1,000 Swiss francs of salary paid in the pharmaceutical industry, an additional 2,600 Swiss francs of employee income is generated in other sectors

Income effects, direct and in other sectors, 2020



Note: figures are rounded
Source: BAK Economics

The table below offers a summary of employment and income effects. The multiplier indicates the factor by which the overall impact is greater than the direct impact. For example, the employment multiplier 5.4 indicates that the overall impact is 5.4 times higher than the direct impact. This means that for every person employed in the pharmaceutical sector, an additional 4.4 people are employed on average in other sectors.

Tab. 1-1 Labour market effects, direct and in other sectors, 2020

Effects in …	the pharma industry	other industries	Total effect	Multiplier
Employees	47,010	209,169	256,179	5.4
in % of total economy	0.9	3.9	4.8	
Employees [FTE]	44,812	161,121	205,933	4.6
in % of total economy	1.1	3.8	4.9	
Hours worked [m hrs]	80	292	372	4.6
in % of total economy	1.1	3.8	4.9	
Gross wages and salaries [CHF m]	5,832	15,392	21,224	3.6
in % of total economy	1.5	3.9	5.4	

Note: Rounding differences are possible
Source: BAK Economics

Relations between Switzerland and the EU
Excursus 1, focus: Free movement of persons

What are the issues?

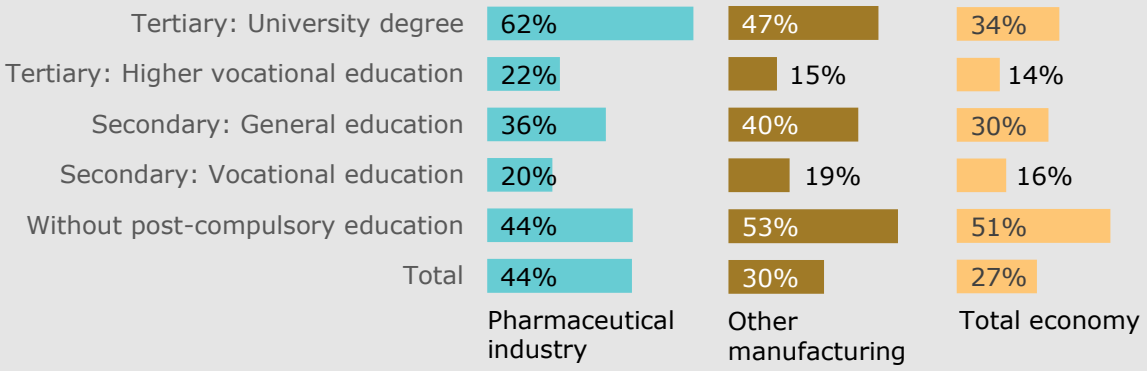
The Agreement on the Free Movement of Persons (AFMP) has been in effect between Switzerland and the EU since 1 June 2002. This agreement resulted in the gradual introduction of the free movement of persons for economically active persons (employees and self-employed persons) and for non-active persons (students, pensioners and other non-active persons), as well as in the partial liberalisation of cross-border personal services. The Agreement on the Free Movement of Persons made it much easier for Swiss companies to recruit workers from the EU. Barrier-free access to the entire EU labour market allows better, productivity-enhancing matching of supply and demand with respect to qualifications on offer and those in demand and that, in turn, alleviates the shortage of skilled workers. The free movement of persons also made it easier for Swiss companies to place employees in the EEA. The principle of the Free Movement of Services enables services to be provided for a period of up to 90 days without any need for a permit.

Relevance for the pharmaceutical industry

Surveys conducted by the Federal Statistical Office (FSO) demonstrate the importance of access to international labour markets especially for the Swiss pharmaceutical industry. More than one in five employees travels to work from a neighbouring country as a cross-border commuter. In Northwestern Switzerland this figure is actually one in three. Of the workforce living in Switzerland, 44 per cent are foreign citizens. The figure for the rest of the manufacturing sector is 30 per cent and the average for the overall economy is 27 per cent.

When recruiting highly qualified employees with a university degree, cross-border access to labour markets is particularly important. According to a structural survey conducted by the FSO, 62 per cent of the workers in the pharmaceutical industry who live in Switzerland and have a university degree are foreign citizens. This figure is 66 per cent among employees with a doctoral or postdoctoral degree. If only employees working in the areas of pharmaceutical research and development are taken into account, 7 out of 10 people come from a foreign country.

Fig. 1-12 Share of foreign workers domiciled in Switzerland, 2019



Source: FSO, BAK Economics

Impact of a deterioration of the agreement

A continuous deterioration of the agreement would make it more difficult to recruit qualified workers from the EU. Particularly in knowledge-intensive sectors like the pharmaceutical sector, this would noticeably intensify the shortage of skilled workers.

Furthermore, the introduction of a quota system would result in higher administrative costs for companies. The explanatory report on the draft bill (FDJP, 2015) assumes that regulatory costs will increase from CHF 25 to CHF 419 per case for workers from EU-25/EFTA countries.

Employment structure statistics show clearly that the free movement of persons is enormously important to the pharmaceutical industry, far more than to the overall economy on average. That means the pharmaceutical industry is one of the sectors that would be hit strongly by a deterioration of the framework conditions for the free movement of persons.

2 Value added contribution of the pharmaceutical industry

Generating a total value added of 36.8 billion Swiss francs, the pharmaceutical industry is Switzerland's most important industrial sector. Its strong dynamic has made this sector an important growth engine in Switzerland for many years. In fact, the pharmaceutical industry was able to increase its real value added considerably in 2020, even despite the COVID-19 pandemic. Without the sector's strong growth, the slump in the Swiss economy would have been even more pronounced. Many companies from other sectors also benefited from the success of pharmaceutical companies. The activities of the pharmaceutical industry in 2020 enabled value added of 23.9 billion Swiss francs to be generated in other sectors. The total direct and indirect value added effect thus stood at 60.7 billion Swiss francs.

2.1 Economic output (value added)

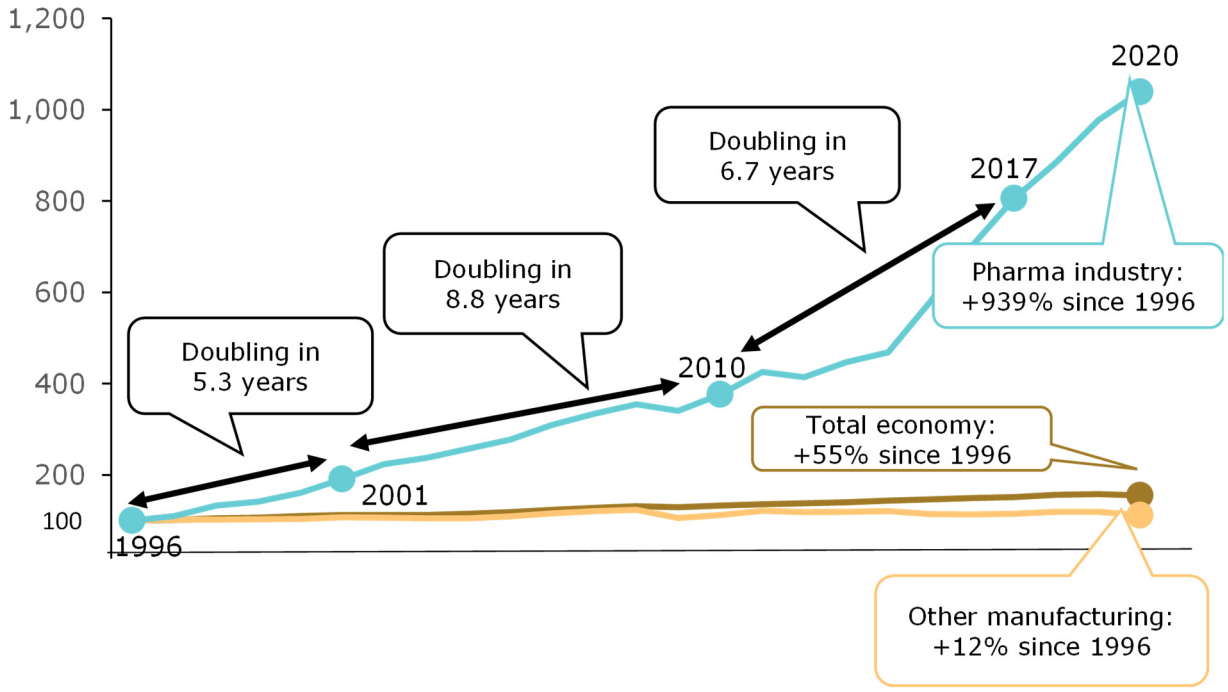
Real value added has increased more than ten-fold since 1996

Switzerland's rise to become one of the world's leading pharmaceutical and biotechnology locations has been accompanied by a strong increase in pharmaceutical production and value added in the past 25 years. Once the pharmaceutical industry had completed its restructuring phase in the mid-1990s, a sustained dynamic upward trend set in that led to a doubling of real economic output between 1996 and 2001. Real gross value added then doubled two more times between 2001 and 2017 at intervals of nearly 9 and 7 years. All in all, real value added was 939 per cent higher in 2020 than in 1996.

The development of the Swiss economy has been much more subdued over the past 25 years. The real economic output of the economy (real GDP) has only risen by 55 per cent since 1996. That means Switzerland's economic output is around 1.5 times higher than in 1996, whereas the real value added of the pharmaceutical industry is more than ten times higher than in 1996.

Fig. 2-1 Real gross value added was more than ten times higher in 2020 than in 1996

Index of real gross value added, 1996 = 100



Reading aid: Real value added is depicted as an index (base year 1996). The index value for 1996 is therefore the same for all rows (= 100). The value of 155 in 2020 for the economy as a whole means that the real value added was 55 per cent higher in 2020 than in 1996. Double this figure would equate to a value of 200.

Source: BAK Economics, FSO

Growth during the pandemic year of 2020

While real growth in value added may have slowed down in the pharmaceutical sector as well in 2020, a growth rate of just over 6 per cent shows that momentum in the industry remained at a high level. That made the pharmaceutical sector a central pillar of the Swiss economy during the pandemic year of 2020 and one of the few industries that was able to grow despite the COVID-19 crisis. The overall economy contracted by 2.2 per cent in 2020 and real value added declined by 6.6 per cent in the rest of the manufacturing sector. Without the pharmaceutical industry's strong growth, the decline in the Swiss GDP would have been even more pronounced. That means the enormous importance of Switzerland's crisis-resilient pharmaceutical sector is another key reason why the Swiss economy slumped to a lesser degree in 2020 than nearly all other European countries.

During times of crisis, demand for drugs is less sensitive to the economic cycle than demand for other industrial products. While the COVID-19 pandemic caused demand to slump in certain market segments of the pharmaceutical sector, efforts to combat the pandemic also opened up new sales potential at some pharmaceutical companies (see section 1). Roche, for example, rolled out a variety of rapid tests and antibody tests for COVID-19 in 2020. Another example is Janssen Vaccines in Bern-Bümpliz, which played a major role in the development of the Johnson & Johnson vaccine.

Definition of gross value added

Aside from employment gross value added is the most important macroeconomic measure regarding the importance of an industry. The value added is the barometer of economic output and represents the value added that an industry creates with the production of a product or the provision of a service.

Mathematically, the gross value added is the difference between the overall production of an economic entity and the preliminary goods and services needed for the output of that sector. These preliminary goods and services include all external production factors that are sourced from third parties and feed into production as input factors (e.g. raw materials, energy, rents, ICT services, etc.).

In terms of income, gross value added represents the amount disposable for the remuneration of the production factors labour and capital less amortisation (= net value added).

Nominal versus real gross value added

Economic accountants distinguish between real and nominal gross value added. While nominal value added represents the effective performance observed, real value added considers the impact of changing prices. This deflation happens on a gross production value level (by means of production prices) as well as on a preliminary goods and services level (by means of the production prices of the supplying sectors). Real value added shows the development of effective value added over time. It is unaffected by price trends and reflects the dynamic nature of production output in the sense of the quantity of products or services produced.

Value added deflator
The value added deflator is the ratio of nominal to real gross value added and shows the price trend for the proportion of production value relating to the respective sector's activity, namely the value added. If the nominal value added increases at a faster rate than the real value added, this is reflected by an increasing deflator. Conversely, if the real value added develops more dynamically than the nominal value added in terms of value, this leads to a declining deflator.

Increasing pressure on prices is reflected in declining sector deflator

The pharmaceutical industry's nominal value added growth in terms of value has been unable to keep up with the pace of real development since 2010. With average nominal growth of just 4.5 per cent per annum between 2010 and 2020, its development was much less pronounced than the increase in real value added (+10.7% p.a.).

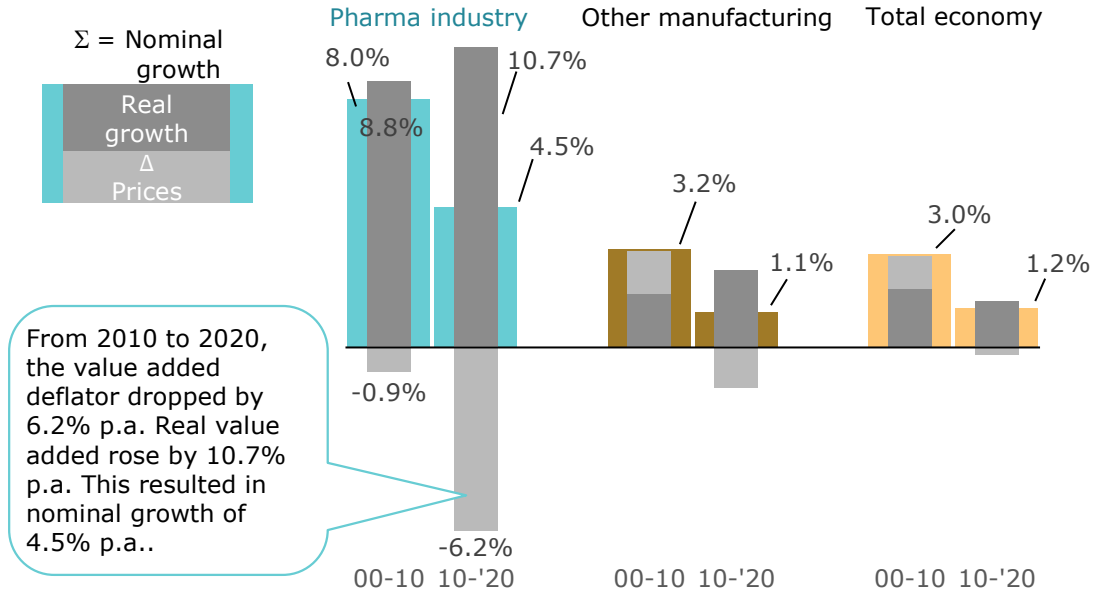
This is mainly due high-cost pressure in the healthcare system, intense global competition and declining margins due to the strength of the Swiss franc in the last decade. The value added deflator has shown an annual average decline of 6.2 per cent since 2010. The deflator measures the price trend for the portion of the production value that is attributable to the pharmaceutical industry's activity (i.e. its value added as a share of the total production value).

One explanation for the strong decline in the deflator seen in the pharmaceutical industry since 2010 is that, on average, drug prices in Switzerland have declined over the past ten years. This is substantiated by statistics on the topic such as the FSO consumer price index as well as drug reviews by the Swiss Federal Office of Public Health (FOPH). The FOPH reviews drug prices every year as part of its drug reviews. In 2020, the prices of more than 300 drugs were reduced by eleven per cent on average. This is expected to bring savings of at least 60 million Swiss francs. Persistently high price pressure in the pharmaceutical industry is also reflected in production prices in the pharmaceutical industry, which continued their downward trend in 2020, falling by 4.4 per cent.

The high degree of price pressure in the pharmaceutical industry is also evident if the sector is compared with the rest of the manufacturing sector or the overall economy. Although the appreciation of the Swiss franc had a much more profound effect on the rest of the manufacturing sector, its deflator only declined by 1.4 per cent per annum on average between 2010 and 2020. On average, the deflator for the overall economy declined even less (-0.3% per annum).

Fig. 2-2 Over the past 20 years, the pharmaceutical industry has seen an above-average decline in prices

Breakdown of nominal value added growth, 2000-2010 and 2010-2020



Reading aid: The illustration shows how nominal value added growth (wide column) is achieved by combining (stacked columns) the change in real value added and prices (deflator). Real value added rose by 10.7 per cent per annum between 2010 and 2020, while the deflator dropped by 6.1 per cent per annum. This resulted in an average increase in nominal gross value added of 4.5 per cent per annum (+10.7% + (-6.2%) = 4.5%).
Source: BAK Economics, FSO

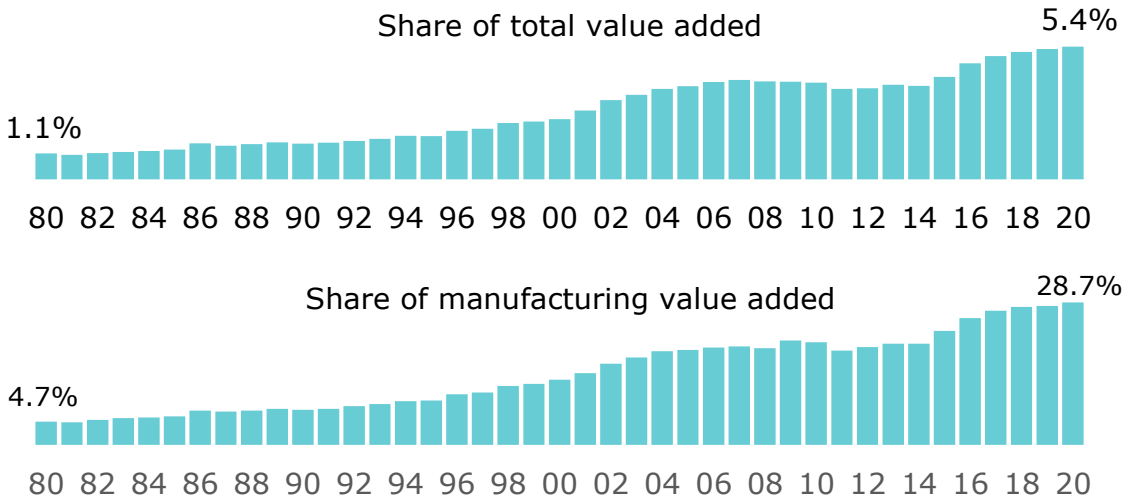
Share of the overall economy currently over 5 per cent

Even if nominal development in the pharmaceutical sector was slowed down by high price pressure, the sector's growth was much more dynamic than in the rest of the manufacturing industry and the overall economy. The pharmaceutical sector's share of the manufacturing industry and of the overall economy has risen substantially since 1996 as a result.

In 2020, the pharmaceutical industry's nominal gross value added amounted to nearly 36.8 billion, meaning that the pharmaceutical industry now accounts for 5.4 per cent of Switzerland's total economic output. The proportion of manufacturing value added amounted to 28.7 per cent.

Fig. 2-3 The share of manufacturing value added amounts to 28.7 per cent

Pharmaceutical industry's share of the total gross value added, 1980-2020



Source: BAK Economics, FSO

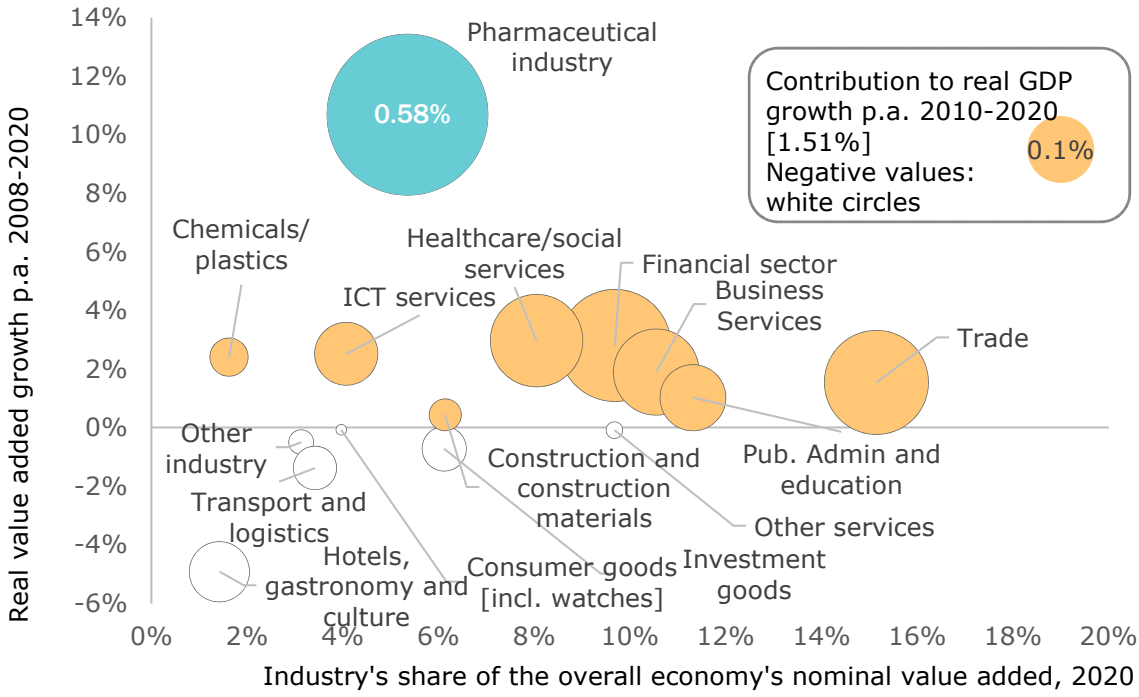
2.2 Contribution of the pharmaceutical industry to growth

The pharmaceutical industry has been the most important growth engine of the Swiss economy in the last decade. On average, the pharmaceutical sector was responsible for 0.58 percentage points (pp) of Swiss economic growth per year from 2010 to 2020 (1.51% per annum), meaning that around 38 per cent of the country's economic growth was attributable to the pharmaceutical industry. That also makes this the industrial sector that made the biggest contribution by far to growth. The rest of the manufacturing industry has had major problems with the strong franc in the past decade and, with a few exceptions (e.g. the chemical industry), was unable to contribute to real GDP growth (or rather, reduced the average growth of the overall economy). The investment goods industry in 2020,

for example, lagged behind its 2010 level by around 7 per cent in terms of real value added. The financial sector made the second-largest contribution to GDP growth (+0.28 pp). Trade (wholesale and retail, garage trade) came in third place with +0.24 pp. The exceptionally strong momentum in the transit trade in particular had a positive effect. Together, the financial sector and trade account for 25 per cent of the overall economy, making them more than four times as large as the pharmaceutical industry. Yet despite this, their joint contribution to GDP growth was not as high as that of the pharmaceutical industry. That shows just how extraordinary the pharmaceutical industry's performance was and how important it is as an engine for Swiss economic growth.

Fig. 2-4 More than a third of Swiss GDP growth over the past ten years is attributable to the pharmaceutical industry

Industry contribution to real GDP growth, 2010-2020



Reading aid: The size of the bubbles shows how much individual sectors have contributed to the overall growth of the Swiss economy. The growth contribution is derived from combining the size of a sector (proportion of the overall economy) at the outset with its growth. For the current classification, the representation on the horizontal axis shows the current percentage of the economy (and not the percentage at the starting point on which the calculation of the growth contribution is based).
Source: BAK Economics, FSO

2.3 International comparison

The establishment of different international pharmaceutical companies in recent years shows that Switzerland and the current pharmaceutical cluster are highly appealing to global pharmaceutical companies. Regional pharmaceutical clusters play an exceptional role not only in terms of their respective regional economic significance but also on a national scale. In this respect, the Swiss pharmaceutical sector distinguishes itself from other countries.

Significance for the national economy

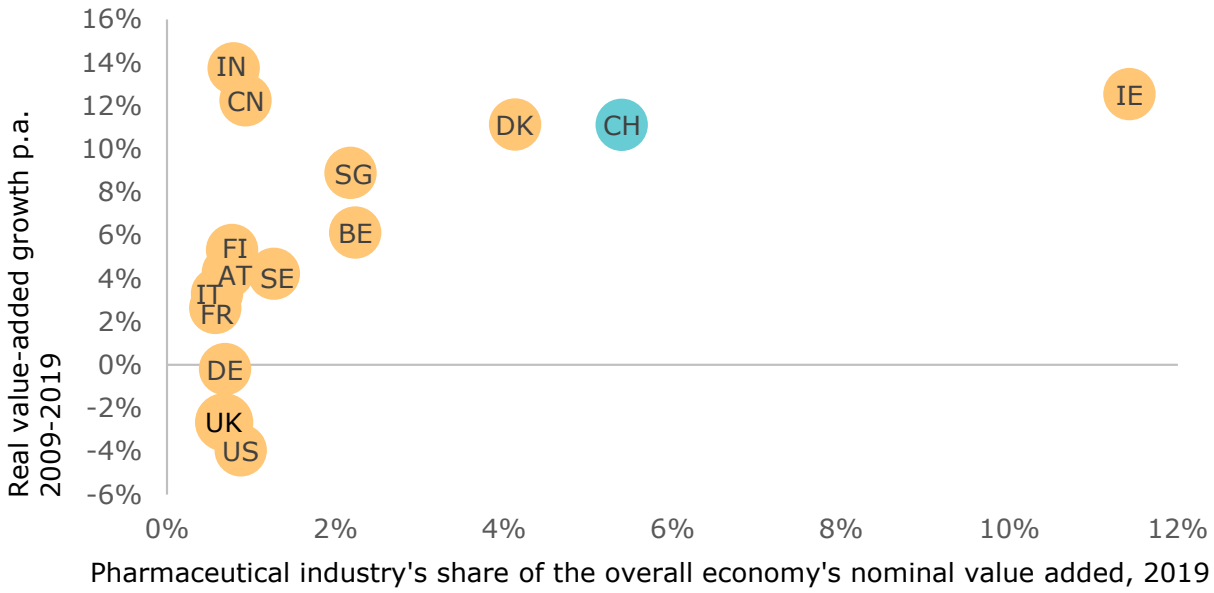
In Switzerland, the pharmaceutical industry accounted for 5.4 per cent of value added for the overall economy in 2020 (cf. section 2.1). Only in Ireland is the pharmaceutical industry's share of the overall economy than in Switzerland (11.4% in 2019). A tax reform transformed Ireland into a very attractive tax location and it has been able to attract many international companies since 2015 as a result, including some in the pharmaceutical industry. This caused the value added share in the statistics to rise sharply. Denmark (4.1%), Belgium (2.2%) and Singapore (2.2%) also report above-average figures, but still much lower than in Switzerland. In numerous industrialised nations of Europe, such as France, Germany, Italy, Austria and the United Kingdom, the corresponding figure is less than one per cent. While the US has the largest pharmaceutical industry in terms of the absolute pharma value added, the industry plays a less important role in the US overall economy accounting only for a share of 0.9 per cent.

Growth

By international standards, the Swiss pharmaceutical industry thus outstrips the peer group of leading countries (consisting of India, China, Denmark, Ireland and Switzerland) in terms of value added growth. All these countries were able to achieve real value added growth in their pharmaceutical industries of over 10 per cent per annum between 2009 and 2019. Growth momentum was much lower in the other European countries. In the US and the United Kingdom, the pharmaceutical industry even reported a decline in real economic output from 2009 to 2019.

Fig. 2-5 The pharmaceutical sector in Switzerland is very important and growing at a high rate

Importance for the national economy and growth of the pharmaceutical industry compared to other countries



Source: BAK Economics

2.4 Importance for other sectors

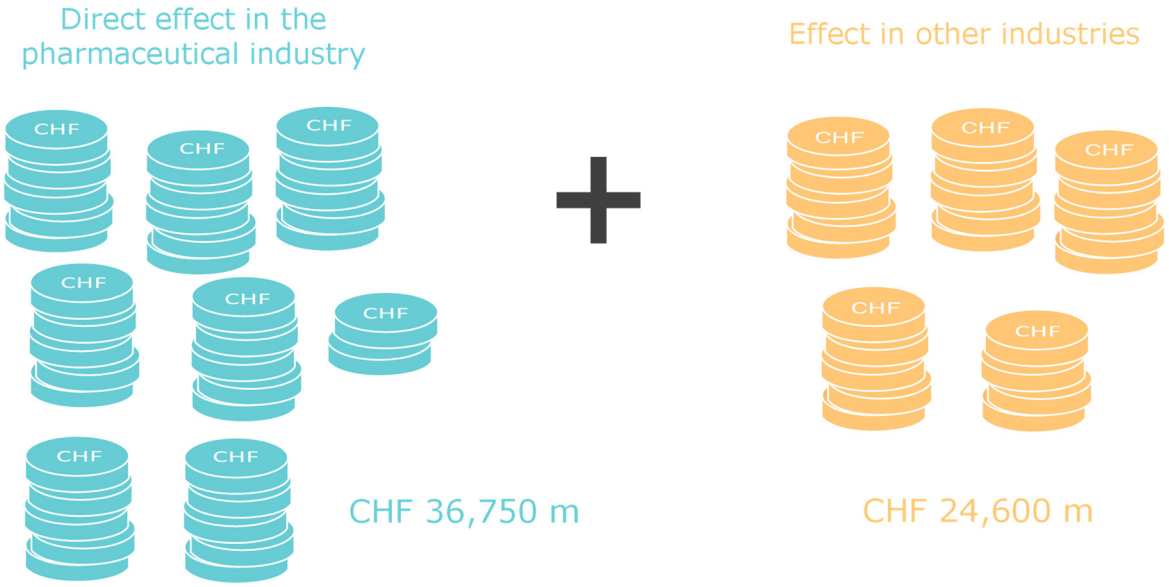
The principle of impact analysis and the calculation of multipliers can also be applied by analogy for analysing job market effects on value added. With the aid of the impact model, all effects along the entire value added chain can be considered. It can be used to calculate the value added generated by other sectors through the research, development and production activities of pharmaceutical companies.

Non-sector value added activities initiated by pharmaceutical products affect companies from a wide range of industries, such as the chemical industry, the consumer and investment goods industry, the energy and water supply, construction, transport, the financial sector, the ICT sector and the consulting industry as well as numerous other business services such as facility management, cleaning and security services.

Model calculations reveal that, thanks to the production and research activities of the pharmaceutical industry in 2020, a value added of around 24.6 billion Swiss francs was generated in other sectors.

Fig. 2-6 Activities in the pharmaceutical sector generate a total of 60.7 billion Swiss francs in Switzerland

Value added effects, direct and in other sectors, 2020



Source: BAK Economics

If the direct and indirect effect that arises through production and research activities in the pharmaceutical industry is added, this results in a total value added of nearly 61.4 billion Swiss francs in 2020 or 8.9 per cent of Switzerland's total economic output. The value added multiplier for 2020, calculated based on the BAK Economics model (cf. annex), stood at around 1.7. For every Swiss franc of value added in the pharmaceutical industry, approximately 70 centimes of additional value added is generated in other Swiss sectors.

Tab. 2-1 Value added effects, direct and in other sectors, 2020

Effects in …	the pharma industry	other industries	Total effect	Multiplier
Gross value added [CHF m]	36,759	24,621	61,380	1.7
in % of total economy	5.4	3.6	8.9	

Source: BAK Economics

Relations between Switzerland and the EU
Excursus 2, focus: Research agreement

What are the issues?
In the past few years, the agreement on research collaboration has allowed Switzerland to participate as a full-fledged partner in the EU's Framework Programmes for Research (FPR), most recently in the Horizon 2020 Programme. That means Swiss researchers were able to participate in the Framework Programmes For Research, received funding for their work and were able to initiate their own projects and/or assume responsibility for coordination tasks.

This agreement offers Swiss universities and companies the opportunity to conduct projects together with top European researchers. It gives them access to one of the world's leading research networks ("Champions League of Research"). International cooperation and networking offer enormous value added – also when it comes to implementing research results at a later point in time (indirect effects of research cooperation). What's more, many research projects conducted within the scope of the FPR lead to the establishment of spin-offs/start-ups or the creation of new jobs at companies involved.

That networking gains and participation in international research know-how cannot be achieved in purely domestic programmes is something that has been confirmed by expert discussions and surveys (BAK 2015). Econometric studies (see Zagame 2010) estimate that international networking results in an efficiency gain of 15 to 20 per cent compared to research activities carried out independently.

Switzerland is currently only a non-associated third country

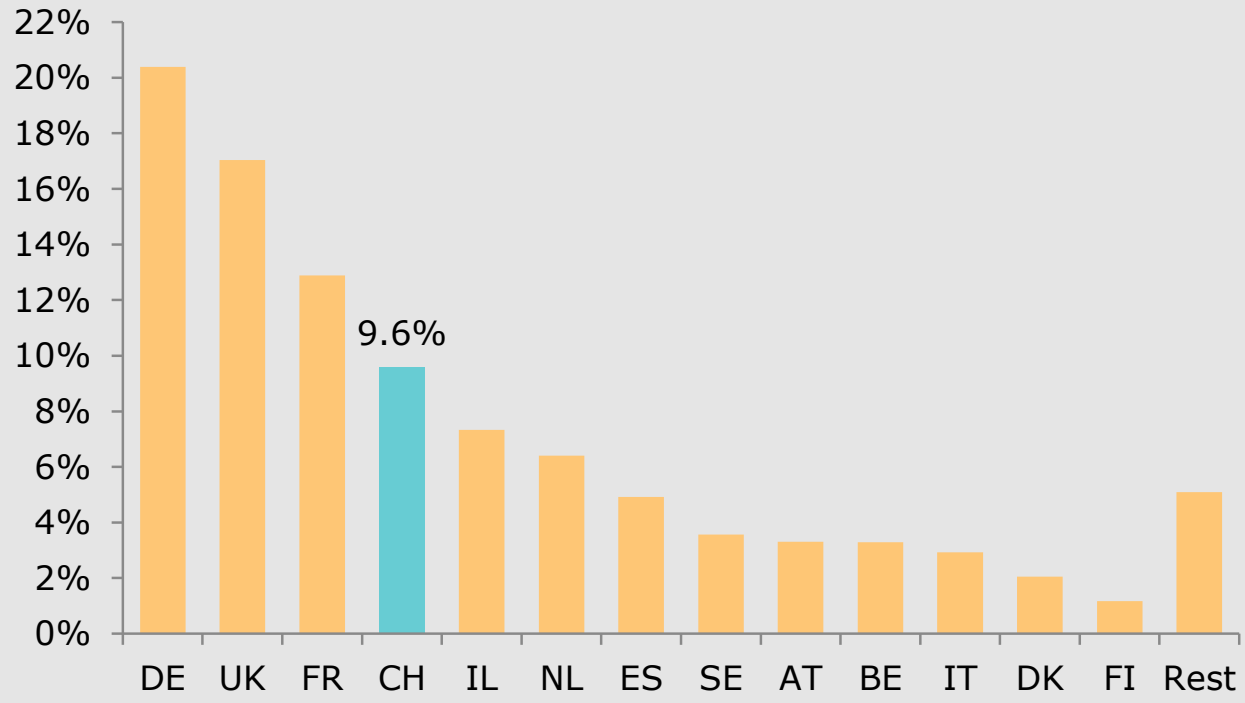
In July 2021, the EU Commission announced that Switzerland will only be treated as a non-associated third country in its new Horizon Europe programme until further notice. While researchers and institutions may still take part in EU projects to a limited degree, their participation must be financed by Switzerland. Additionally, the projects can no longer be conducted or coordinated from Switzerland. Participation in individual projects, such as new tenders from the European Research Council (ERC), is also not possible until further notice.

ERC grants represent a highly prestigious funding instrument. Although Switzerland is attempting to make up for this by putting transitional measures in place, the limitations on participation weaken Switzerland's reputation as a research location and reduce its attractiveness for talented early stage and top researchers. Switzerland was already briefly considered a third country from 2014 to 2016 in the wake of the mass immigration initiative and participation in European research projects declined considerably at the time (see FUTURE 2021).

Relevance of the FPR for the pharmaceutical industry

The pharmaceutical industry is one of Switzerland's most research-intensive sectors. As described in section 1, this sector accounts for 19 per cent of all R&D staff in Switzerland. What's more, nearly one of every six workers in the pharmaceutical sector has completed a doctoral or post-doctoral degree. In that context, having access to top researchers and the latest research results is immensely important for Swiss pharmaceutical companies. Unrestricted participation in European Framework Programmes For Research is vital to Switzerland's ability to hold on to its status as one of the most innovative pharmaceutical locations in the world.

Fig. 2.7 Share of ERC grants for biotech/pharmaceutical projects 2007-2020



Source: ERC

Swiss researchers' widespread involvement in past biotech/pharmaceutical projects of the ERC reflects just how immensely important these framework agreements are for pharmaceutical research in Switzerland. Researchers at Swiss universities and research institutions were awarded around EUR 470 million in ERC grants between 2007 and 2020. That corresponds to a share of 9.6 per cent of the total volume of all ERC grants awarded in the field of biotech/pharma during this period. That puts Switzerland in fourth place among all member countries. Only researchers from Germany, the UK and France were more successful in their requests for ERC funding. In fact, in terms of the per capita results adjusted for population size, Switzerland is clearly in the lead in attracting ERC funding.

Opportunities offered by the Horizon Europe programme from the Swiss pharmaceutical industry's perspective

Horizon Europe is the 9th FRP and the world's largest, most comprehensive funding programme for research and innovation. The swift lifting of current restrictions on participating in Horizon Europe would open up a host of different opportunities for the Swiss pharmaceutical industry.

Research projects in the Swiss pharmaceutical sector that can be coordinated and financed directly through programmes within the scope of Horizon Europe 2021-2027 will in all likelihood be more efficient since this programme facilitates international collaboration and networking. Efficiency gains of this nature have a lingering future impact, even on projects that are not directly related to the FRP. Researchers can draw on networks established under the umbrella of the EU FRP for the rest of their lives.

The FRP would additionally make Switzerland more attractive to top researchers from around the world as a research location since they would also be able to participate in the Champions League of Research within the scope of the FRP. Better chances of success when recruiting top researchers also results in a higher level of research efficiency. Added to that is the possibility that less funding will be needed for publicly funded.

All in all, this makes it immensely important for Switzerland as a research location to become a fully associated country in the Framework Research Programmes.

3 Labour productivity of the pharmaceutical industry

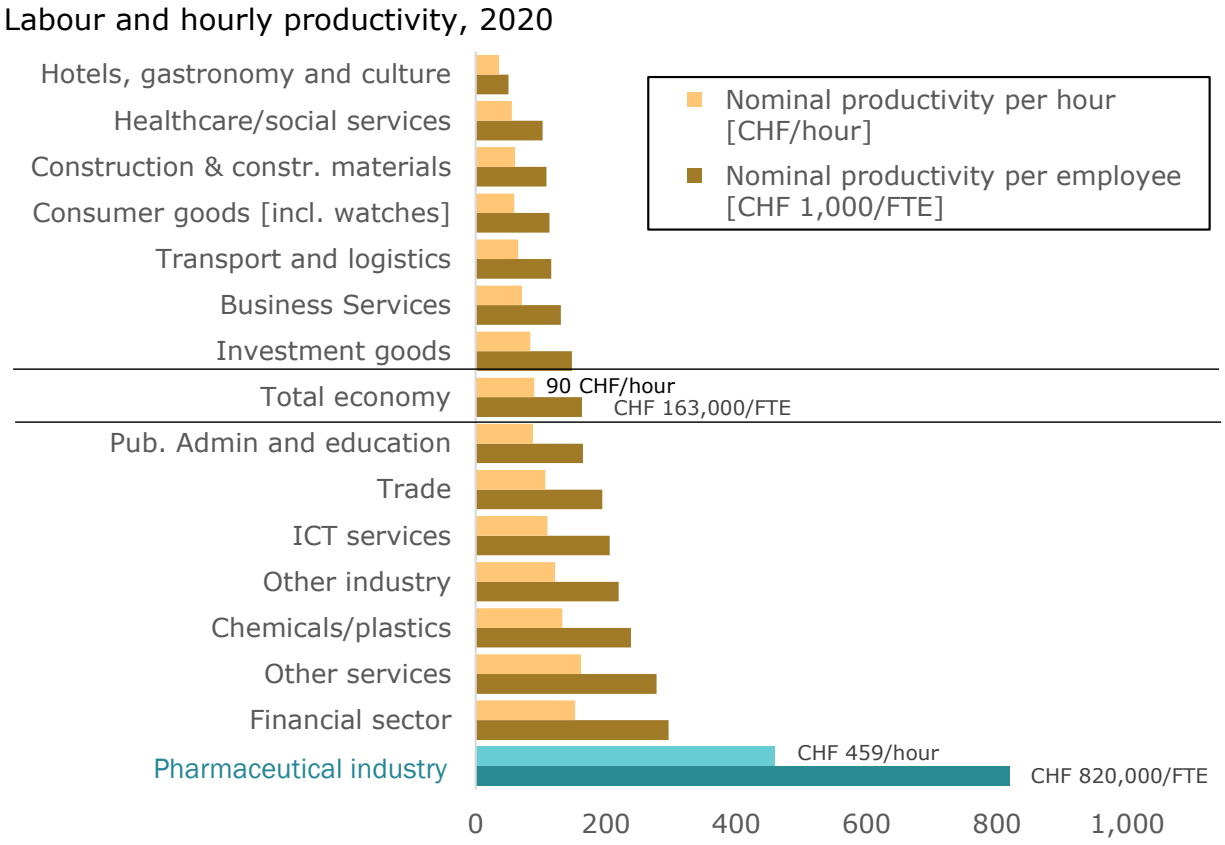
The pharmaceutical industry is Switzerland's most productive sector by far. The country generates five times as much value added per job as the Swiss industry average. Even in an international comparison, the Swiss pharmaceutical industry outstrips other countries in terms of productivity. The Swiss pharmaceutical industry's strong increase in productivity in the past few years was triggered by greater capital investment, growing intensity in research and innovation as well as steadily increasing employee qualifications. This high level of productivity is one key success factor behind the sector's high growth in value added.

3.1 Level of labour productivity

When assessing a sector's performance capabilities and competitiveness, labour productivity is an important indicator. It reflects the relationship between value added and work effort. Labour productivity depends on several different factors such as capital intensity (workplace equipment (systems, software, etc.)), organisational efficiency, intensity of innovation and employee performance (qualifications, adaptability, etc.).

The Swiss pharmaceutical industry is characterised by a high level of capitalisation, modern and efficient research and production facilities, above-average employee qualifications and intense innovation activities. Considering this, it is hardly surprising that the pharmaceutical industry generates by far the most value added per job when compared with other industries in Switzerland. In 2020, labour productivity in the pharmaceutical industry was at around 820,000 Swiss francs of value added per full-time equivalent (FTE), or 459 Swiss francs per hour worked. The value added in relation to the work effort required is thus around five times higher in the pharmaceutical sector industry than in the Swiss economy.

Fig. 3-1 Pharmaceutical industry generates five times as much value added per job as the national average



Source: BAK Economics

3.2 Growth of labour productivity

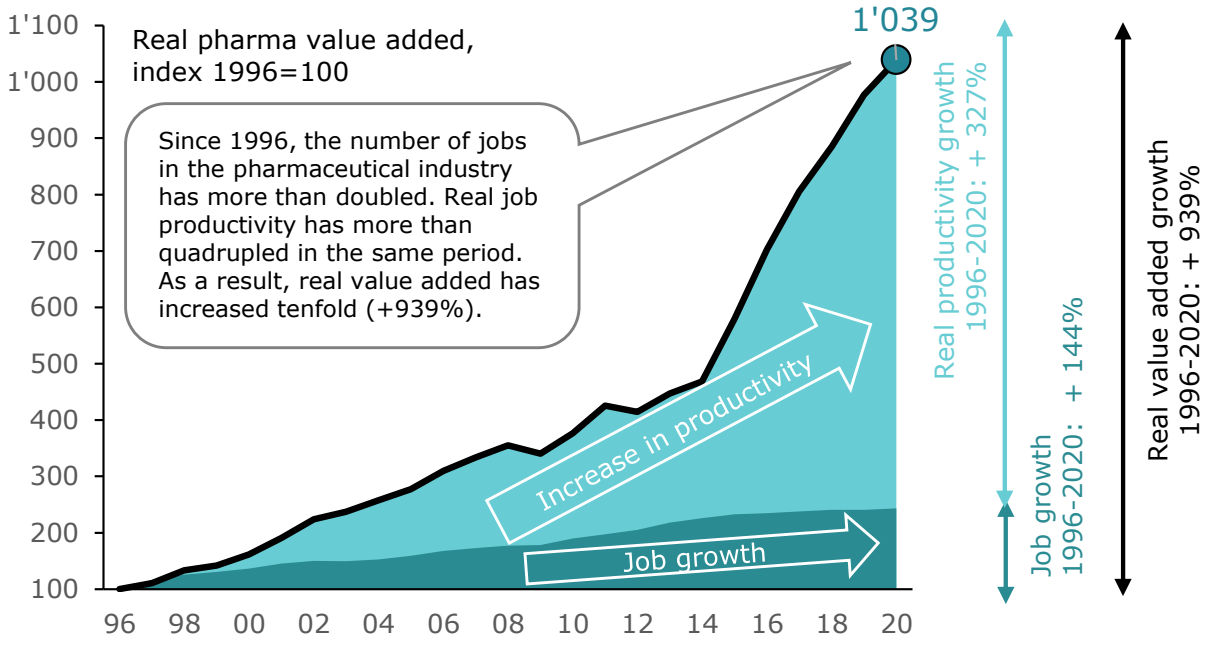
The Swiss pharmaceutical industry's ability to hold on to its excellent competitive position is based on a steady increase in productivity. Productivity growth reduces costs and boosts profitability, thus allowing companies to create reserves for real investments, finance rising research and development costs, achieve dividend growth and increase wages.

Statistics from the past 25 years show that labour productivity in the pharmaceutical industry has increased substantially as a result of greater capital investment, growing intensity in research and innovation as well as steadily increasing employee qualifications. It was the main factor behind the Swiss pharmaceutical industry's high level of growth in value added during that period.

Real labour productivity, in other words the value added achieved per full-time equivalent, more than quadrupled (+327%) between 1996 and 2020. The number of jobs rose by 144 per cent during that same period. Combined, both effects caused real value added in 2020 to increase to an amount 10.4 times higher than in 1996 (up 939%).

Fig. 3-2 Increasing productivity played a key role in pharmaceutical industry growth between 1996 and 2020

Real labour productivity, jobs and real value added, 1996-2020, index 1996 = 100



Source: BAK Economics

3.3 Contribution to overall economic growth

The pharmaceutical industry's high productivity growth in the past 10 years has made it the most important driver of the economic productivity. 0.41 percentage points of this growth between 2010 and 2020 can be traced to increases in the pharmaceutical industry, meaning that most of the productivity growth in the overall economy during that period (+0.47% p.a.) is attributable to the pharmaceutical sector. Without the pharmaceutical industry's contribution to growth, the productivity of the Swiss economy would have stagnated.

The chart below uses circles of different sizes to indicate the size of the contributions made by each individual sector.

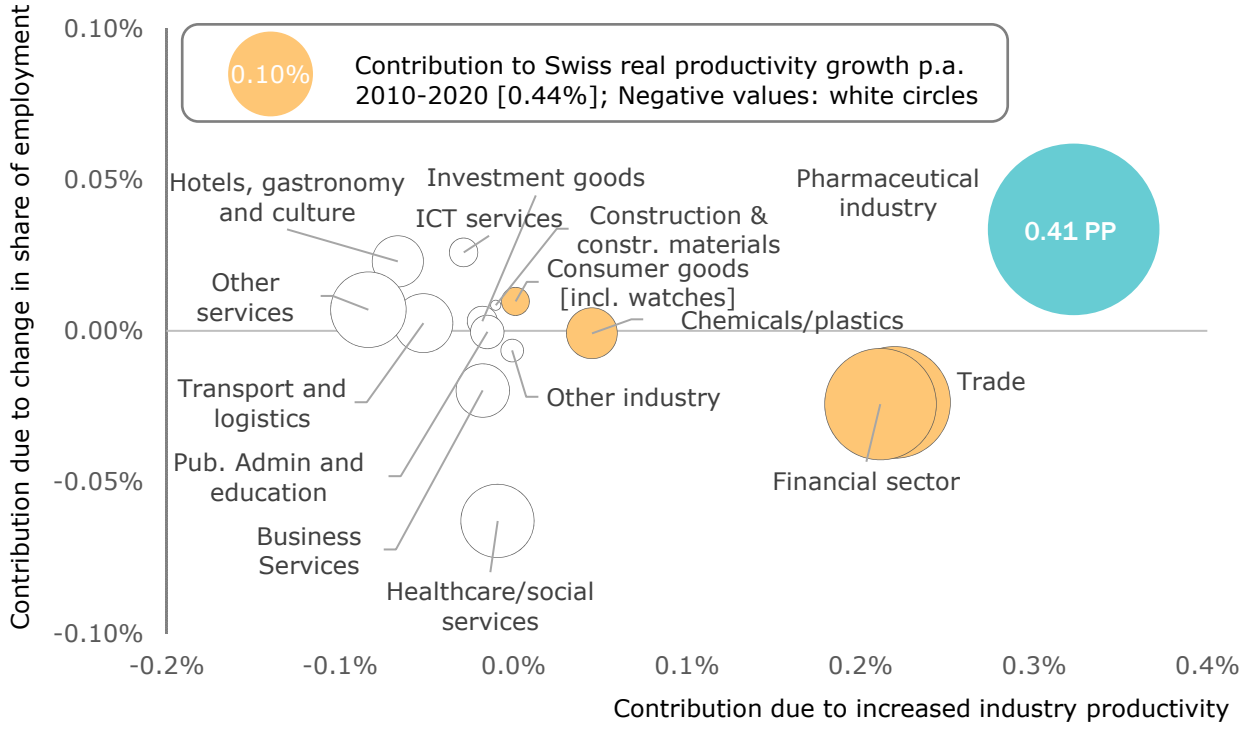
Besides the pharmaceutical industry, positive contributions were made only by the trade and financial sector (+0.17 pp each). Other (smaller)

positive contributions came from the chemical industry and the consumer goods industry. The remaining sectors, on the other hand, made negative contributions to overall productivity growth.

The industries' contribution to growth can be broken down into three effects: a straightforward growth in productivity (impact of an increase in industry productivity on overall productivity), structural change (impact of a change in the share of employment on overall productivity) and (minor) interaction resulting from a combined change in equity and productivity.

Fig. 3-3 A majority of overall productivity growth is attributable to the pharmaceutical industry

Industry contributions to growth in Swiss productivity, 2010-2020



Reading aid: The size of the bubbles shows the contribution made by each individual sector to the overall growth of labour productivity. This contribution is derived from a combination of three effects: (1) the productivity growth of the respective sector weighted by the share of employment at the outset, (2) the change in the share of employment of the sector in combination with the level of productivity at the outset relative to the average for the overall economy and (3) an interaction effect resulting from the combination of changes in the share of employment and productivity growth in the manufacturing sector.
Source: BAK Economics, FSO

The first two effects (productivity growth and structural change) are shown in figure 3-3. One notable aspect is that productivity and structural change alone have a substantial and positive effect in the pharmaceutical industry. That not only means the pharmaceutical industry has become more productive, but that employment has also expanded at a rate that

is well above average, which is reflected in the growing number of employees in this sector as a per cent of total employment. By contrast, the productivity effect dominates alone in trade and the financial sector, for example.

3.4 International comparison

Since industries are frequently concentrated in a small number of locations in one country (so-called clusters), an industry analysis at a purely national level is often insufficient. It is therefore also important that regional clusters are compared with one another when analysing a sector's international competitiveness.

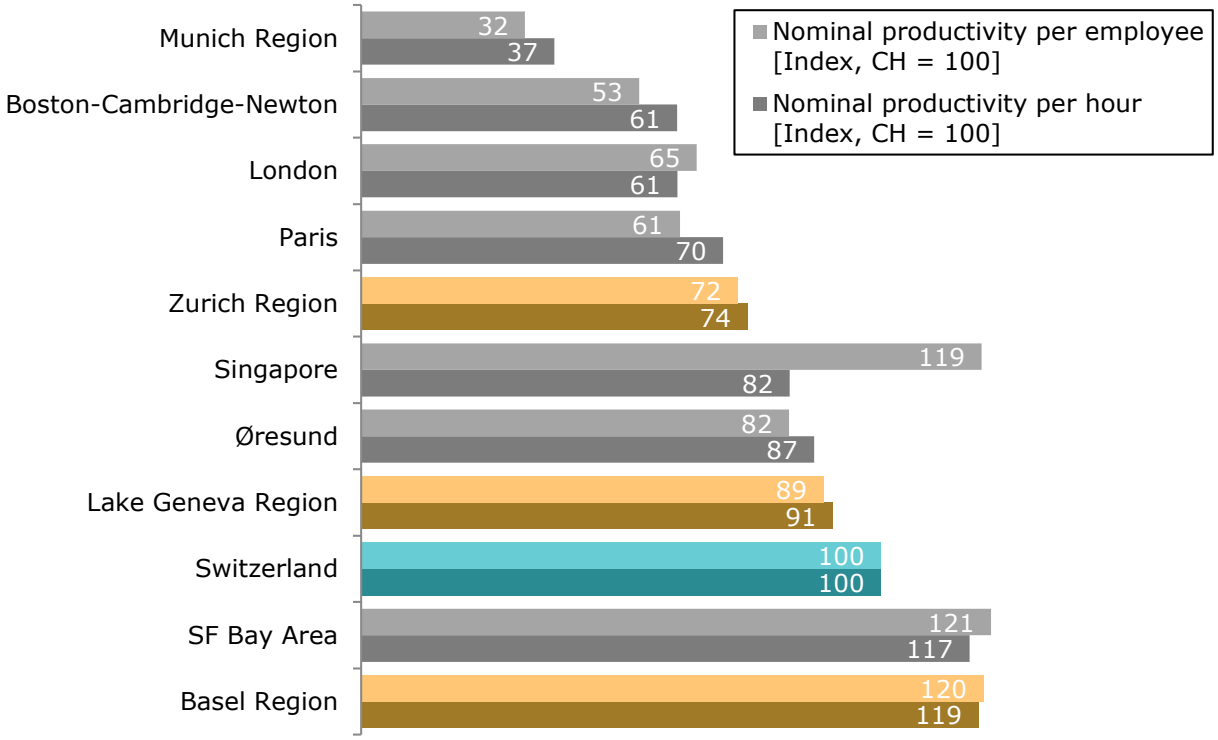
The following illustration shows a comparison of labour productivity for a selection of important international pharmaceutical clusters. This comparison is presented as an index in relation to the average Swiss value (index CH = 100) for both hourly productivity (dark coloured) and labour productivity (light coloured).

Regarding the indicator for hourly productivity by region, the Basel region tops the list with an index value of 119. Here, value added per hour worked is 19 per cent higher than in the whole Swiss pharmaceutical industry.

The San Francisco Bay Area is a close second (117). All other regions in the comparison are lower than the Swiss average in terms of the indicator for hourly productivity, with the Lake Geneva region in 4th place and thus in the upper middle of the rankings. This clearly highlights the extremely high level of productivity in Switzerland's pharmaceutical industry.

Fig. 3-4 By international standards, the productivity of the Basel region exceeds that of other regions; the Lake Geneva region occupies the upper middle rankings

Nominal labour productivity compared to other countries, 2020
Adjusted for purchasing power, indexed: CH = 100



Source: BAK Economics

In terms of value added per employee (labour productivity), the Basel region and Singapore share second place (both with 119 index points each). One thing that stands out in Singapore is that there is a substantial gap between the index values for labour productivity and hourly productivity. This is due to the high number of regular working hours in Singapore, which generate a much higher value added per employee. In terms of labour productivity, the San Francisco Bay Area is in the lead with 119 index points.

Switzerland follows in fourth place regarding labour productivity. All other regions, including the Lake Geneva and Zurich regions, are below the Swiss average.

Relations between Switzerland and the EU
Excursus 3, focus: Technical trade barriers

What are the issues?

Currently, technical regulations often represent the greatest trade barrier in the international movement of goods, not customs duties. The mutual recognition of conformity assessments means that Swiss companies no longer have to have their products certified twice, both in Switzerland and the EU, meaning that access to the EU market entails less bureaucracy and is less time-consuming. In areas where differences in legislation previously required two different product versions, one for Switzerland and one for the EU, the harmonisation of legal provisions also makes it possible to only have one version for both markets. This has made the exchange of goods much easier.

The "Good Manufacturing Practice" and "Good Laboratory Practice" agreements are particularly important for the pharmaceutical industry. The recognition of inspections and documents associated with these agreements reduces the amount of administrative effort involved in (cross-border) manufacturing processes. The procurement of many preliminary goods and services is also more cost-effective and more efficient overall. Incidentally, this applies not only to preliminary goods and services sourced from the EU. These can also be sourced more cost-effectively from Switzerland, since they, too, benefit from more efficient value chains. The lower financial expense and elimination of administrative hurdles generates additional trade between Switzerland and the EU (trade creation) or divert it from other exporters/industries to Switzerland / the benefiting industries (trade diversion). The more intense exchange guarantees smoother access to the EU market overall.

Whether the conformity assessments will continue to be updated in the pharmaceutical segment is up for debate. An update of the Mutual Recognition Agreement was cancelled in May 2021 after negotiations on the framework agreement on medical devices failed. This also marked the elimination of other trade facilitating effects for medical products. For example, manufacturers are now required again to register a natural person or legal entity domiciled in the EU or in Switzerland ("Authorised Representative"), respectively, to be able to sell the product in the corresponding export country.

Intensive trade integration between Switzerland and the EU

Even if markets such as the US and Asia have become considerably more important in the past twenty years, the EU is still Swiss pharmaceutical companies' foremost trading partner (see section 4). Pharmaceutical exports to the EU amounted to 47.9 billion Swiss francs in 2020, which corresponds to 46 per cent of total pharmaceutical exports. Even more important is the EU's role in imports of pharmaceutical products. Here, the EU's share of total imports was over 70 per cent in 2020. But Switzerland is also an important partner for the EU: 35 per cent of pharmaceutical imports to the EU come from Switzerland.

What's more, international supply and production chains are now an integral part of drug research, development and manufacturing. Because of this, a significant share of pharmaceutical imports from the EU undergoes further processing in Switzerland. Even within companies, drug ingredients are sent back and forth several times between various production facilities during the production process. Since many pharmaceutical companies with operations in Switzerland also have foreign locations in the EU, it is extremely important that these international production chains function as smoothly as possible.

Given the EU's role as Switzerland's most important trading partner and the intense international production chains currently in place, it is obvious how very relevant this agreement is in terms of dismantling technical trade barriers (MRAs), both for Switzerland and for the EU.

What is at stake if the mutual recognition of conformity assessments erodes?

Without the agreement on technical trade barriers or in the absence of updates, Swiss pharmaceutical companies would incur significantly greater costs every year due to the need to have certifications and inspections performed in duplicate. The cost of double product certification is estimated at around 0.5-1 per cent of the value of the product in question (Meier/Hertig 2008). However, higher costs when sourcing preliminary products and services will also reduce price competitiveness since the producers of preliminary products and services from the EU and Switzerland will also see an increase in redundancies and inefficiencies. New product launches in the EU would be delayed, as well.

Switzerland would additionally lose its appeal to investors from Germany and abroad. If exporters in both regions are required to register an authorised representative again, this will result in additional expenses that

could be significant in some Swiss companies (start-ups and SMEs), especially for those without an agency in the EU. If a company from a third country (such as the USA) wants to establish a branch office in the EU, Switzerland becomes much less appealing as a location if a branch office in Switzerland is no longer sufficient for sending exports to the entire EU. Effects such as these could result in the relocation of existing pharmaceutical companies and a reduction in the number of new companies setting up branch offices in Switzerland. While these negative effects would not occur all at once, bit by bit they would put a damper on Switzerland's growth as a pharmaceutical location.

The security of supply would also suffer, as well. If the smooth movement of goods can no longer be ensured, this could give rise to supply bottlenecks for some drugs, which would have correspondingly negative repercussions for patients.

Higher trade barriers and the decoupling of production processes suggest that trade with EU countries will be less dynamic overall. While the EU will still be an attractive market, its export potential will be exploited to a lesser extent than if agreements were continued and adjusted to the technical trade barriers.

Studies on the consequences of a no-deal Brexit for the pharmaceutical industries in the UK and the EU allow a better understanding of the negative consequences that could arise through an erosion of the trade agreement. The Institute for International and Development Economics calculated that in a no-deal Brexit, meaning a fallback to WTO terms for the trade in goods, pharmaceutical exports from the UK would decrease by more than 22.5 per cent. A Brexit with a new trade agreement including an agreement regarding technical trade barriers, on the other hand, would reduce this decrease to 12.6 per cent. Here, the better result is largely due to the reduction in technical trade barriers since most pharmaceutical products are not subject to customs duties under WTO terms (WTO Zero-for-Zero Pharmaceutical Annex). A Brexit would also cause pharmaceutical exports from the EU to decline slightly due to the higher trade barriers.

In summary, an erosion of the mutual recognition of conformity assessments between the EU and Switzerland would weaken Switzerland's location competitiveness. Not only would this result in higher annual costs, but it also increases the risk that pharmaceutical companies might relocate some of their activities from Switzerland to the EU in the future.

4 The pharmaceutical industry as an export sector

The pharmaceutical industry is Switzerland's most important export sector by far. Structural growth drivers such as the ageing population in industrial nations and the rising standard of living in emerging markets are fuelling a steady increase in foreign demand for Swiss pharmaceutical exports. Pharmaceutical exports have demonstrated a comparatively strong growth as a result, even during periods of economic weakness. That also became evident during the coronavirus pandemic in 2020, when pharmaceutical exports were an important pillar of the Swiss export economy. All in all, pharmaceutical exports as a percentage of total goods exports have continued to rise over the past few years and stood at 44.5 per cent in 2020. Export revenue in 2020 amounted to nearly 99 billion Swiss francs. While Europe is still the most important market with nearly 50 per cent of total pharmaceutical exports, the importance of the US market has risen sharply since 2010.

4.1 Percentage of total goods exports in Switzerland

Despite the coronavirus pandemic, the export volume of the pharmaceutical industry hit a new record high of nearly 99 billion Swiss francs in 2020 and enabled the pharmaceutical industry to expand its lead even further as the country's most important export sector.

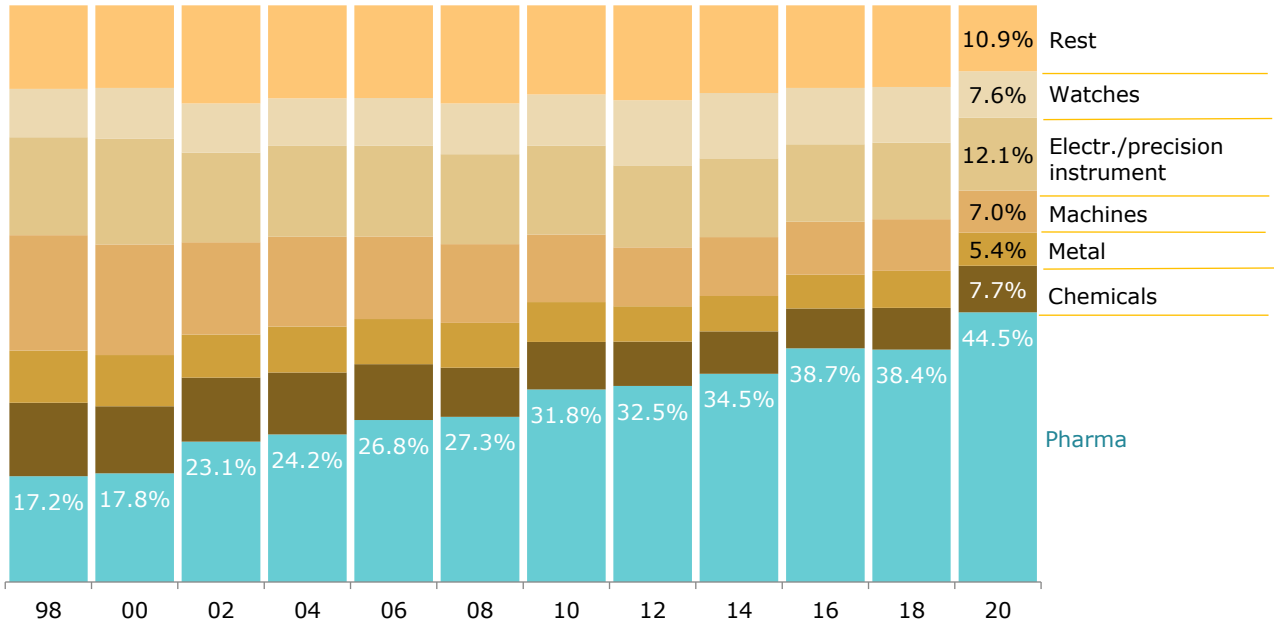
The sector's growth has been extremely dynamic since 1998. This development has been linked with rapid growth in nominal annual exports of 8.0 per cent on average (despite falling prices). The rest of the export industries only succeeded in growing by an average of 1.5 per cent per year during the same period.

The marked increase in the importance of the pharmaceutical sector for the export economy is reflected in the increase in the proportion of exports from around 17 per cent in 1998 to 44.5 per cent in 2020. Nominal pharmaceutical exports also experienced more dynamic growth between 2018 and 2020 than the rest of the Swiss export industry. Whereas the coronavirus crisis caused a pronounced slump in exports in many sectors in 2020, including the mechanical engineering and metal industries, for example, the pharmaceutical sector was also able to boost its exports by 1.6 per cent in 2020, as well.

The pharmaceutical industry's development is much less cyclical than the rest of the manufacturing industry due to its strong structural potential growth. Demand for medicines remains robust even in times of crisis. This correlation is also reflected in the following illustration by the percentage of pharmaceutical exports in total goods exports. The percentage shows a rising underlying trend as well as a stair-like trend in every economic contraction. The percentage of pharmaceutical exports thus rose significantly with both financial crises at the beginning and end of the previous decade as well as with the Swiss currency crisis ("Frankenschock") in 2015. It experienced another substantial increase in 2020, the year of the pandemic.

Fig. 4-1 Pharmaceutical exports as a percentage of total goods exports rose from 17.2 per cent in 1998 to 44.5 per cent in 2020

Percentage of exports, 1998-2020



Percentage of nominal exports of an industry in total exports
Source: FCA, BAK Economics

4.2 Exports by destination

With an export volume of 47.9 billion Swiss francs, the European Union remained the most important market for pharmaceutical products from Switzerland in 2020, as well (46% of exports). Germany (15%), Italy (5%) and France (4%) are the most important markets within the EU. Nominal pharmaceutical exports to the EU rose by a total of 3.8 per cent in 2020.

Europe's significance as a market for the Swiss pharmaceutical industry has decreased in the past ten years. Whereas the European share of total pharmaceutical exports was 59 per cent in 2010, it only amounted to 49 per cent in 2020.

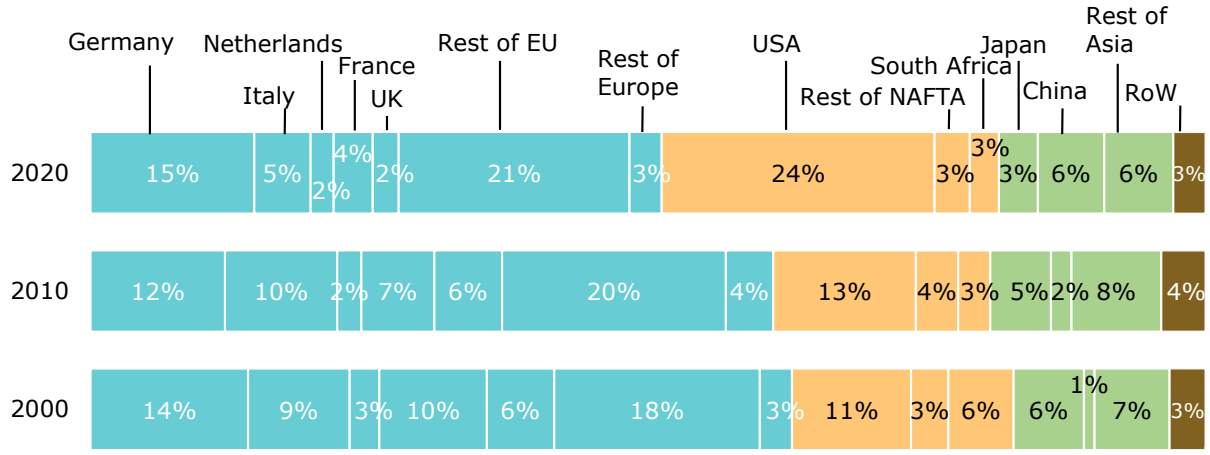
Other markets are growing at a faster pace and becoming increasingly important. Swiss pharmaceutical exports to China have risen substantially in the past few years, for example. The structural growth driver there is the growing middle class. Whereas pharmaceutical products worth 1.1 billion Swiss francs were being exported from Switzerland to China (incl. Hong Kong) 10 years ago, the value of exports to this country came to 5.9 billion Swiss francs in 2020. This corresponds to average growth of 18 per cent per year and China's share of pharmaceutical exports rose from 2 to 6 per cent as a result. Yet despite this rapid growth, China's importance as a market for Swiss pharmaceutical exports is still much less significant than that of the EU or the US. China's share of exports is considerably higher in some of Switzerland's other industrial sectors, such as the MEM industry. Even if Swiss pharmaceutical exports to China continue to grow by 18 per cent per year, it would still take until 2029 for China to reach the current export volume of the USA.

A ten-year comparison (2010–2020) also shows a clear increase in North America's share of Swiss pharmaceutical exports (from 13 to 24 per cent). At the country level, that puts the US ahead of Germany as Switzerland's most important export market. Several factors contributed to this strong increase in exports to the US: One key reason is that demand for drugs and therapies has grown more strongly in the US than in Europe in the past, largely due to more dynamic population growth in the US. Price pressure for drugs and therapies is also lower in the US than in Europe since prices for drugs and therapies can be negotiated relatively freely. Furthermore, numerous acquisitions have taken place between Swiss and US pharmaceutical companies in the past. Novartis, for example, acquired the US biotech Avexis in 2018 and The Medicines Company in 2019, while

Johnson & Johnson took over Actelion in 2017. The largest acquisition, however, was Roche's purchase of Genentech in 2009. Company acquisitions such as these frequently result in a higher degree of interconnectedness between the companies since intermediate products are sent back and forth between a group's foreign branches and Swiss production facilities for further processing or products manufactured abroad are exported to their target destinations via Swiss head offices.

Novartis, however, started reorganising its export model in 2019. Under the new model, products manufactured abroad are more frequently being exported directly to their target destination through distribution centres outside Switzerland, meaning that the Swiss head offices are slowly losing their role as export location. Due to this change, the exports affected are no longer showing up in the FCA's export statistics, even though the profit margin that accrues in Switzerland in connection with transit trade is still recorded as Swiss value added. As a result, Novartis' new approach is likely to have lessened export growth in 2019 and 2020 during the change.

Fig. 4-2 Growth of pharmaceutical exports by destination, 2000-2020



Source: FCA, BAK Economics

Excursus 4: Overall importance of bilateral agreements between Switzerland and the EU for the Swiss pharmaceutical industry

The failure of the framework agreement threatens to undermine the bilateral agreements in their entirety in the medium to the long term. That, in turn, jeopardises the extent to which Switzerland can benefit from the bilateral agreements. Although this is not yet the case, simulations calculated by BAK Economics provide an impressive demonstration of the economic potential in Switzerland that would be at risk if the framework agreement fails and the bilateral route is challenged.

If the bilateral agreements are eliminated, Switzerland's per capita gross domestic product (GDP) - an indicator of an economy's prosperity - would be 4.4% lower within 13 years than under the bilateral agreements. This corresponds to around 3,700 Swiss francs for every person residing in Switzerland, from infants to pensioners (all values expressed in today's terms and are therefore adjusted for prices and growth).

Since population growth will also decline if the bilateral agreements are eliminated, the effect on GDP would be even higher: Overall economic performance would be 6.5 per cent or nearly CHF 50 billion lower in the thirteenth year following the elimination of the treaties.

The various provisions of the bilateral agreements contribute to these losses to varying degrees. The most important points from a quantitative perspective are restrictions on the free movement of persons, less international dialogue in research, production and trade as well as the country's general loss of attractiveness as a location. The simulation examines all effects together as well as the interactions between them.

As already explained in the first three excursuses, the pharmaceutical industry cannot escape these effects. While an analysis of the overall impact on the wide range of Swiss sectors reveals that the pharmaceutical industry would be impacted to a lesser degree than industries with a particularly high level of exposure, such as vehicle manufacturing, a discontinuation of the bilateral agreements would still be accompanied by losses that are substantially higher than the level actually possible.

According to the simulations, the level of value added in the pharmaceutical industry 13 years after the simulated discontinuation of bilateral agreements is 7 per cent lower than the level actual possible. This year, the value added lost in the pharmaceutical industry would have amounted to 4.4 billion Swiss francs (expressed in today's prices). The

enormous importance of research and innovation leaves the sector highly exposed to both the repercussions of any discontinuation of bilateral agreements and its enormous need for highly and extremely highly qualified employees.

The fact that the sector is not being affected even more severely is attributable to its global focus, which is more pronounced than that of the rest of the manufacturing industry. The highly competitive nature of Swiss pharmaceutical companies also lends them something of a defensive wall that prevents their market position from deteriorating if additional trade barriers are put in place. That is the only reason why the pharmaceutical industry's performance is not significantly worse.

As the simulations also show, the result is not merely one big shock – neither for the economy as a whole nor for the pharmaceutical industry. Instead, it is a sustained loss of growth that gains more and more momentum over time – and is not over at the end of the 13-year period examined in the simulations but continues to put a damper on growth even in the years thereafter. The discontinuation of bilateral I agreements harms growth potential, above all. That applies both to Switzerland as a whole and to the pharmaceutical industry – the Swiss economy's most important driver of growth.

5 Annex

5.1 Concept of impact analysis

The basic idea

The basic idea behind the impact analysis is to show all payment streams triggered in the context of the pharmaceutical industry's business activities and to quantify the associated impact on value added, employment and income. This gives a vertical integration of the impact along the entire value chain, from procurement through production to the sale of goods.

Impact levels

In principle, a distinction can be drawn between three impact levels. The first impact level includes the direct effects of the pharmaceutical industry, which concern the immediate economic output of the industry (gross value added) and the associated impact on employment and income. On the second impact level, various secondary effects arise that have to be specified; they include the orders placed with other companies in relation to production (preliminary goods and services) and also the consumer demand of the employees. The third impact level involves the overall economic effects that arise because of the various secondary effects.

The impact analysis is about quantifying the economic effects in the business cycle that occur as a result of the various secondary effects. Here, an impact model is used to consider the numerous multiplier effects that arise because of the various business relations between companies. For example, the production of pharmaceuticals requires machinery, semi-finished goods and electricity that are sourced from other companies. For their part, the suppliers of goods and services also generate value added and create jobs.

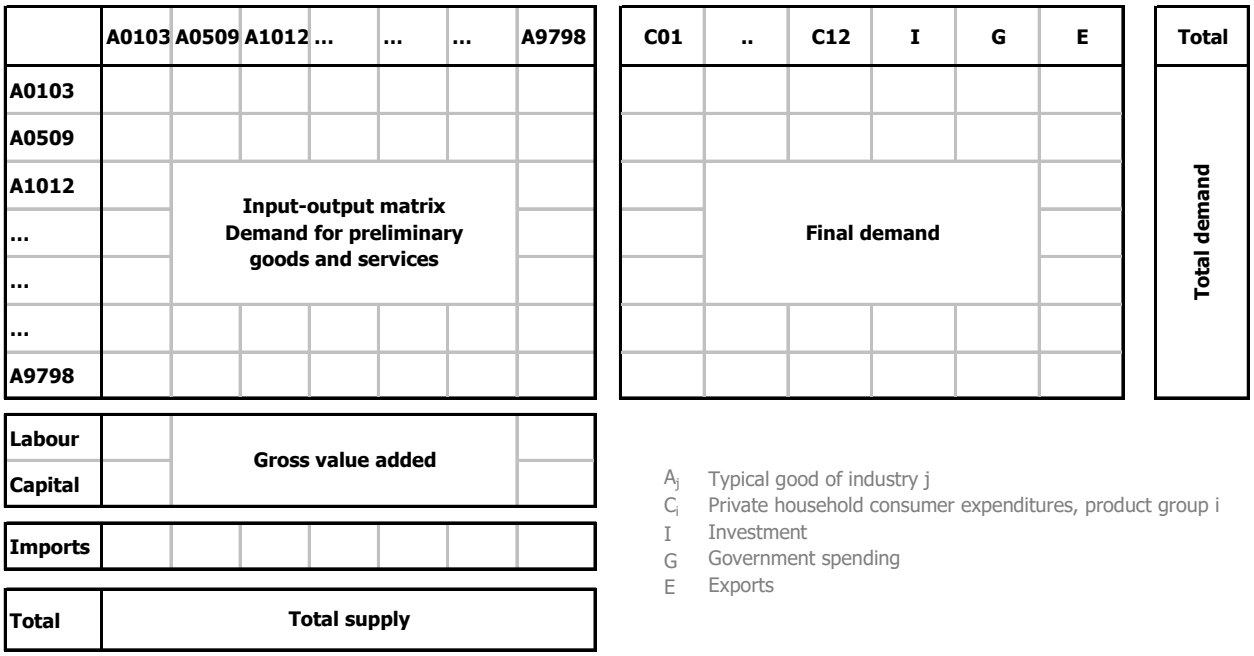
Aside from these effects, the impact analysis considers the fact that the producers of semi-finished goods and other suppliers also obtain services from other companies, which in turn are also obtained from other providers, which likewise generate value added. The value added effects become smaller in each additional "round". The impact model enables the thought experiment to be solved mathematically and calculate all knock-on effects that arise from the secondary effects.

Impact model

The key analytical instrument of impact analysis is the input-output model. This is a static-equilibrium model whose equation system is derived from the structural information about the composition of supply and demand for goods and services in an industry.

The basis of the input-output model is a schematic assessment of the economy that illustrates how industries are intertwined and consumer demand, domestic production and goods imports are interrelated (cf. the following figure).

Fig. 5-1 Schematic diagram of an input-output table



Source: BAK Economics

The use of services and goods manufactured in the given industries is plotted on the horizontal axis. These either flow into other industries as preliminary goods and services or are directly used for consumer demand, invested or exported. The sum obtained from preliminary goods and services and consumer demand gives the aggregate demand.

The vertical axis shows the composition of total supply, which must correspond to total demand in a state of equilibrium. The overall supply is made up of domestic production ("gross production value") and imports. Deducting the preliminary goods and services of an industry that are needed for production from the gross production value gives the gross value added of the industry concerned. The gross value added serves to remunerate the production factors labour and capital.[1]

There are various forms of input-output (IO) models. The classic IO model (type I) considers only the immediate effects with the suppliers involved at the different stages of the value chain ("indirect effects"). The use of income arising at these stages is not considered or specified model exogenously.

In the extended IO model (type II), the (partial) endogenisation of private households takes into account the fact that a part of income is fed back into the economic cycle in the form of consumer spending. In a further extension step, company profits and the investments financed with these profits are also taken into account in the same way. In the economic cycle, the spending considered here (consumer spending or investments) also generates value added and employment ("induced effects").

To a certain extent, use of the extended type II model is viewed critically because the causal link of the induced income effect with the primary impulse is much looser than that of the indirect effect (relationships concerning preliminary goods and services). For example, consumer spending at the individual level is financed not only by employee income but also by other kinds of income (income from assets or state transfers).

The correlation between primary impulse and the induced consumer spending of the employees involved is much less stable than that with the production effects of the suppliers involved along the value chain. If additional production units are created by the suppliers involved using existing capacity, no additional jobs are generated, but very likely additional value

[1] In the interest of simplification, taxes and subsidies on products are excluded from the schematic diagram (but not from the model).

added. The more links there are between primary impulse and the corresponding effect in the value chain, the more uncertain the correlation becomes between primary impulse and the corresponding effects on jobs.

Based on further-reaching assumptions, it has to be assumed that the effects in the fully extended model, taking into account the income-induced effects at each impact stage, overestimate the actual interdependence between the economic activity of a sector or a company and the resulting overall macroeconomic effect. On the other hand, an analysis that uses the simple standard model in individual cases may fall short of its objective.

A middle way is to limit the induced effect to the impact exerted by the income of directly involved employees in the industry that is the focus of the analysis. A semi-extended IO model of this kind is used in this study by considering only the consumer spending of employees in the pharmaceutical industry.

A further restriction of the model considers opportunistic income. Excluded from the analysis is (autonomous) consumer spending that is unrelated to employment in the pharmaceutical industry, as well as spending abroad (e.g. cross-border commuters in the pharmaceutical industry). The analysis thus considers only the endogenous consumer spending of people directly employed in the pharmaceutical industry that is related to the level of employee income.

5.2 Pharma multipliers compared with other countries

The influence of the pharmaceutical industry on the overall economy is likewise analysed in other countries. This section provides a brief overview of the results obtained in these studies.

The multipliers calculated for Switzerland's pharmaceutical industry can be ranked as somewhat below average overall in terms of value added (type I). On the one hand, this expresses the high profitability of the Swiss pharmaceutical industry, which results in a particularly high value added contribution in the manufacturing industry (direct effect) and has a dampening effect on the multiplier. On the other hand, the Swiss pharmaceutical industry traditionally has a high degree of international integration along the upstream value chain. Imports might account for a higher share of total preliminary goods and services than in other countries.

For methodological reasons, the multiplier calculated for Switzerland is significantly lower than the type II multipliers from the studies for other countries, as BAK Economics differentiates more conservatively the consumption effects triggered by wage income. The analysis considers only the endogenous consumer spending of people directly employed in the pharmaceutical industry that is related to the level of pharmaceutical employee income. Also taken into account is the fact that the salaries of cross-border commuters from abroad are largely spent in their country of residence.

As regards employment, however, the multipliers calculated for Switzerland are much higher than the comparative type I multipliers for other countries. This can be explained by the fact that the productivity differential between the pharmaceutical industry and the remaining industries involved in the whole value added process is particularly high in Switzerland. Therefore, far more indirect jobs are dependent on a pharmaceutical job in Switzerland than abroad.

Tab. 5-1 International impact analyses of the pharmaceutical industry

Country/authors	Variable	Year	Type I	Type II
USA				
Battelle Technology Partnership Practice (2013)	Value added	2011	1.6	2.4
	Employment		2.3	4.1
TEConomy (2016)	Value added	2014	1.7	2.4
	Employment		3.0	5.2
Europe				
WifOR (2016)	Value added	2014	1.8	2.3
	Employment		3.6	5.7
pwc (2019)	Value added	2016	1.5	2.1
	Employment		2.2	3.9
Germany				
Pavel et al. (2015)	Value added	2012	-	3.1
	Employment		-	4.8
Nora et al. (2016)	Value added	2014	1.8	2.3
	Employment		3.6	5.7
Baden-Württemberg				
WifOR (2015)	Value added	2014	1.6	2.0
	Employment		1.7	2.3
UK				
pwc (2017)	Value added	2015	1.5	2.1
	Employment		2.4	3.4
Portugal				
Apifarma (2018)	Value added	2016	1.6	2.2
	Employment		-	-
Scotland				
University of Strathclyde (2018)	Value added	2015	-	1.8
	Employment		-	3.4
Australia				
Medicines Australia (2018)	Value added	2016	3.3	3.9
	Employment		1.9	-
Global				
WifOR (2020)	Value added	2017	2.5	3.5
	Employment		9.2	13.5

Type I: Consideration of immediate effects on the upstream and downstream stages of value added (direct and indirect effects); type II: additional consideration of income effects (induced effects) on all upstream stages of the value chain.
Source: BAK Economics

5.3 Literature

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Figures

Tables

List of abbreviations

ABPI	Association of the British Pharmaceutical Industry
FOPH	Swiss Federal Office of Public Health
FSO	Federal Statistical Office
GDP	Gross domestic product
CH	Switzerland
CHF	Swiss francs
ERC	European Research Council
EU	European Union
FCA	Federal Customs Administration
FTE	full-time equivalent
R&D	research and development
ICT	information and communications technology
IO model	input-output model
IT	information technology
KVG	Bundesgesetz über die Krankenversicherung (Swiss Federal Law on Health Insurance)
CPI	national consumer price index
NOGA	General Classification of Economic Activities
pp	percentage points
RoW	rest of the world
SF Bay Area	San Francisco Bay Area
UK	United Kingdom
USA	United States of America

fig.	figure
e.g.	for example
spec.	specifically
i.e.	that is
avg.	average
et al.	et alia
etc.	etcetera
incl.	including
YRLY	yearly
m	million
pub. admin	Public administration
p.a.	per annum
resp.	respectively

hr(s)	hour(s)
tab.	table
thou.	thousand
esp.	especially
cf.	compare
vs	versus
e.g.	for example
Σ	total
Δ	difference
%	per cent

About Interpharma

Interpharma was founded in 1933 and is the association of research-based pharmaceutical companies in Switzerland. The 23 member companies account for more than 90 per cent of the market share for patented drugs in Switzerland and invest more than 7 billion Swiss francs per year in research and development in Switzerland. Interpharma is a driving force for efficient and high-quality healthcare that offers patients quick and easy access to innovative therapies and the best possible treatment. Our mission both at home and abroad is to ensure that patients receive first-class treatment, that innovations are rewarded and that our industry is able to contribute significantly to the welfare, growth and competitiveness of Switzerland.

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