interpharma:ph

Study on behalf of Interpharma

The Importance of the Pharmaceutical Industry for Switzerland

BAK Economics AG
Michael Grass, Simon Fry

In collaboration
with Polynomics AG
Stephan Vaterlaus

Published by

Interpharma, association of research-based
pharmaceutical companies in Switzerland, Basel

Obtainable from:
Interpharma
Petersgraben 35, Postfach
CH-4009 Basel
Email: info@interpharma.ch
Website: www.interpharma.ch

Design:
Continue AG, Basel

Print:
Birkhäuser+GBC AG

Disponible en traduction française
Deutsche Version verfügbar

Contents

Foreword by Interpharma

Dr. René Buholzer, General Secretary Interpharma

The pharmaceutical industry has been the most important growth driver for Switzerland as an industry hub over the past few years, contributing significantly to the growth of the economy and accounting for around a fifth of Switzerland's GDP growth in real terms! The pharmaceutical sector is thus not only of crucial importance for the economy as a whole, but also serves as the linchpin of Switzerland's industry: the sector accounts for around three-quarters of all industrial growth.

The number of jobs directly within the pharmaceutical industry has also increased by 12,000 in the last ten years, whereas around 16,500 jobs have been lost in other industrial sectors over the same period. In 2016, there were about 43,000 full-time positions (FTEs) in Switzerland's pharmaceutical companies. At the various Swiss sites employees are engaged in research and development, in production or in administrative HQ functions. With a productivity level of 350 francs per hour worked, the pharmaceutical industry ranked well ahead of all other industries in Switzerland. For every job in the pharmaceutical industry, the value added is achieved around four times as high as the average for the economy as a whole.

Other sectors also benefit from this. For every franc of value added that the pharmaceutical industry generates, a further 70 cents of value added is accrued in other sectors in Switzerland through orders for suppliers. There is a direct and indirect value-added contribution of 49.6 billion francs or almost eight percent of the gross value added for the economy as a whole.

In terms of jobs, this means that, aside from the approximately 43,000 jobs within the pharmaceutical industry, there are a further 138,000 or so jobs in other companies that are dependent on pharma. In other words, for every job in the phar-

maceutical industry, an additional 3.2 FTEs are created in companies of other sectors.

In the ever-fiercer global competition for inward investment, the commitment of global pharmaceutical companies to Switzerland is not something that can be taken for granted, which makes the investments of these companies in Switzerland all the more gratifying. It is not only the pharmaceutical companies in the Basel region that testify to this, but also companies such as Janssen (which exports biotech medicines to countries all over the world from Schaffhausen), Celgene (which has its global production facility for tablets in Boudry on Lake Neuchâtel), MSD with its ultra-modern biotechnology plant in Entlebuch, or UCB, in Bulle (district of Gruyère), which not only has a large fermentation plant, but also operates the largest microbial biotech facility in Europe. The latest example is the biotech company Biogen, which is investing 1.5 billion francs in the construction of a state-of-the-art production plant in Luterbach, canton Solothurn. This will lead to the creation of up to 600 new jobs as from 2019.

The pharmaceutical industry is committed to Switzerland, but it also faces challenges. Besides the sustained pressure on drug prices, there is also concern over the preservation of attractive framework conditions – in particular, continued unbureaucratic access to important export markets, the availability of qualified people, the assurance of Switzerland's excellence as a research hub and competitive levels of corporation tax. For the pharmaceutical sector, which exports 51 percent of its products to the European Union, settled relations with the EU are particularly crucial. Access to the EU market has been made easier thanks to the bilateral agreements between Switzerland and the EU – and technical barriers to trade have been dismantled. Inspections for the granting of manufacturing and import licences, for example, only have to be conducted once. To ensure the pharmaceutical industry also remains an important pillar of Switzerland's economy and other sectors can also continue to benefit from the pharmaceutical industry in the future, due care must be taken of the framework conditions.

Interpharma
Dr. René Buholzer, General Secretary

In brief

Despite a difficult economic environment, Switzerland's pharmaceutical industry has continued to expand in the past two years and today accounts for 25 percent of total industrial value added. As such, the pharmaceutical sector is a major pillar of Switzerland's export industry. With its high average real growth in value added of 7.2 percent per annum, the sector has made a significant contribution to the growth of Switzerland's economy over the past decade. This expansion has also led to an increase in the number of jobs by more than 12,000 over the last ten years, bringing the total number of people employed in the industry to 45,500. Businesses in other sectors also benefit from the success of Switzerland's pharmaceutical companies. As shown by a macroeconomic impact analysis, 2016 saw an additional value added of 20.7 billion Swiss francs generated in other sectors due to the economic activity of the pharmaceutical industry. This accounted for around 138,000 jobs in these sectors.

Open markets are an important success factor for the pharmaceutical industry

In the difficult economic environment of the past few years, Switzerland's pharmaceutical industry has proved itself to be extremely robust and managed to achieve a further substantial increase in its global sales in 2016. Around half of export revenue is achieved in European countries. The high degree of integration in foreign trade shows that Switzerland's pharmaceutical industry is heavily dependent on access to international markets. Aside from sales markets, access to international procurement and labour markets also plays a crucial role. The pharmaceutical industry recruits its specialists from all over the world, and a substantial proportion of its workforce comes from neighbouring European countries. And the industry also benefits from European research collaboration thanks to the intensity of its research activities. From the standpoint of the pharmaceutical industry in this country, therefore, the free-trade agreement and the bilateral accords, especially those concerning research, freedom of movement and the removal of trade barriers, need to be addressed with care for the long-term development of Switzerland as a pharmaceutical hub.

Appreciation of the franc left its mark offset by steadily strong real growth

The strong appreciation of the Swiss franc in 2015 led to a fall in the profit margins of Switzerland's pharmaceutical companies because, in the case of medicines with regulated prices, any currency fluctuations are immediately reflected in the value of sales. Thanks to continuing strong growth in sales volumes and efficiency enhancements, this effect could be offset and the nominal value added further increased in 2015. The positive trend also continued in 2016 and an increase of 1.9 percent was achieved. In 2016, the gross value added reached 28.9 billion Swiss francs. This corresponds to 4.5 percent of the economy as a whole and 25 percent of the industrial value added. In relation to the real value added, growth in the past two years was actually accelerated again. Despite the increasing size of the pharmaceutical sector, growth continues to be achieved at a very high level.

Macroeconomic impact analysis shows major importance for other sectors

For the manufacture of its products, the pharmaceutical industry needs not only labour and capital, but also further input factors in the form of goods and services from other sectors. The demand for these goods and services in the pharmaceutical industry generates jobs in these sectors (and also among other suppliers, etc.). Trade and industry also benefit from consumer spending by employees in the pharmaceutical companies. In the framework of an impact analysis, all relevant payment streams initiated by the economic activity of the pharmaceutical industry were analysed and quantified in a vertical integration across the entire value chain.

In relation to the number of jobs (full-time equivalents or FTEs), model calculations result in a multiplier of 4.2; that is to say that, for every job in the pharmaceutical industry, 3.2 additional FTEs are created in companies from other sectors that benefit indirectly from the production and research operations of the pharmaceutical industry. Thus, aside from the 43,000 or so people directly employed in the pharmaceutical industry in 2016, around 138,000 additional jobs in other businesses were dependent on the pharmaceutical companies. These additional jobs accounted for a payroll sum of around 12.9 billion Swiss francs in 2016. This means that every 1,000 francs of pay in the pharmaceutical industry generates additional pay of around 2,200 Swiss francs on average among employees from companies in other sectors.

Macroeconomic importance

Possible rounding differences

		Direct	Indirect	Total	Multiplier
Gross value added	million CHF	28,864	20,749	49,613	1.7
	in % of economy as a whole	4.5	3.2	7.8	
Employees	number of persons	45,524	180,575	226,099	5.0
	in % of economy as a whole	0.9	3.5	4.4	
Employees (FTE)	number of persons	43,168	138,271	181,439	4.2
	in % of economy as a whole	1.1	3.4	4.5	
Hours worked	million hours	82	273	356	4.3
	in % of economy as a whole	1.0	3.5	4.5	
Gross wages and salaries	million CHF	5,982	12,932	18,914	3.2
	in % of economy as a whole	1.6	3.5	5.1	
Exports	million CHF	80,185			
	in % of all goods exports	38.7			

Source: BAK Economics, Polynomics, FSO.

A multiplier of 1.7 was calculated for the gross value added. This means that for every Swiss franc of value added in the pharmaceutical industry, another 70 cents of value added is generated in other Swiss industries. Overall, Swiss companies in other sectors benefit from the production and research activity of the pharmaceutical industry to the tune of a value added amounting to around 20.7 billion francs. The total direct and indirect value-added contribution in 2016 stood at 49.6 billion francs. This corresponds to 7.8 percent of the total gross value added of the economy.

1 The pharmaceutical industry as employer

Despite fierce international competition, Switzerland remains an attractive location for multinational pharmaceutical companies. The industry's comparatively low share of total employment in Switzerland, at 0.9 percent, belies the continual expansion of employment in a highly productive sector. In the past ten years, more than 12,000 additional jobs have been created in the pharmaceutical industry, while a total of around 16,500 jobs have been axed in the remaining industrial sectors on balance.

1.1 Number of employees

Pharmaceutical industry strengthens Switzerland as an industrial location

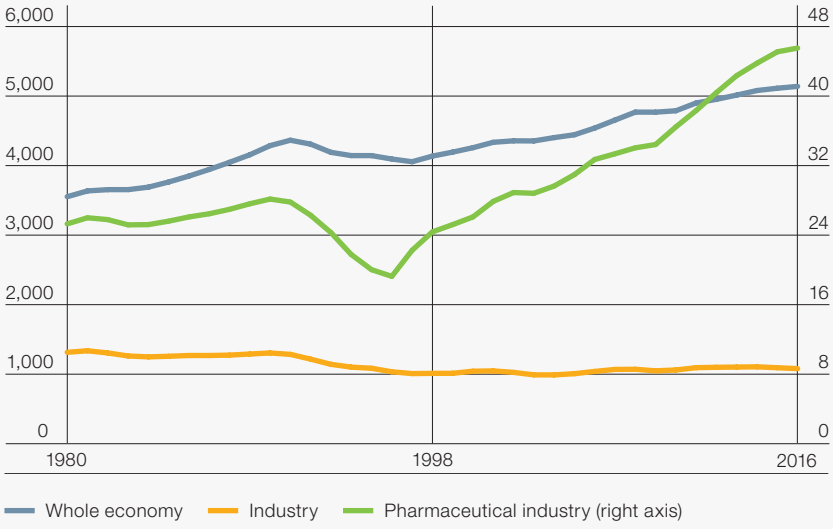
In 2016, around 45,500 people were employed in Switzerland's pharmaceutical companies. While about 25,300 people worked in the pharmaceutical sector in the 1980s, the sector has seen an increase in the workforce well above the average compared with industry as a whole, especially since the second half of the 1990s (see Fig. 1.1).

Particularly between 1990 and 1996, the chemical and pharmaceutical industry went through a period of structural change that was marked by major job cuts and was further accentuated by economic gloom in industry as a whole. Between 1990 and 1996, almost one-third of all jobs were axed. In 1996, employment in the pharmaceutical industry actually fell below the level of 1980. But this was the turning point, and it was followed by a phase of strong employment growth.

High investments in research and development, as well as added stimulus from global industry trends, such as demographic change, new technologies and the growing middle class in emerging markets, led to what has been a comparatively steady growth in employment since the mid-1990s, which also continued practically unchecked in times of international economic crisis. The number of jobs has almost doubled since 1996, and Switzerland is now one of the world's most important pharmaceutical and biotech hubs.

Figure 1.1 | Employment over time

Number of employees (in thousands), 1980–2016

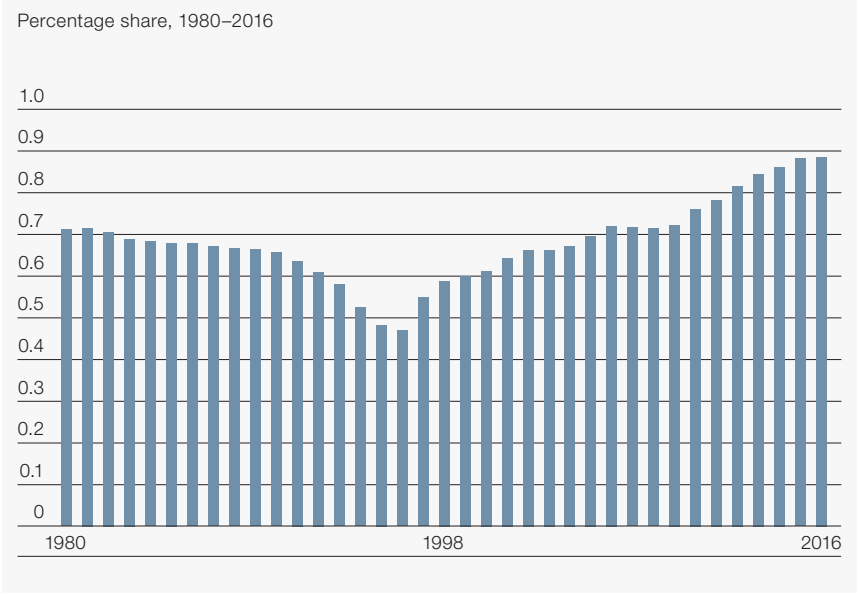


Source: BAK Economics, Polynomics, FSO.

The pharmaceutical industry has thus played an important part in helping to secure and expand the position of Switzerland as an industry hub. While the past ten years have seen job losses in numerous industrial sectors, around 12,000 new jobs have been created in the pharmaceutical industry.

Following the strong growth in employment over the past two decades, the momentum has now somewhat slowed, albeit at a high level. The reasons for this are to be found mainly in digitalization, the progressive outsourcing of business-related services and also restructuring in production. The chemical production of pharmaceutical products in particular is experiencing a slowdown in further employment growth as a result of restructuring processes: the active ingredients are becoming evermore potent, and production volumes are thus getting smaller. In addition, it is increasingly the case that several medicines are manufactured in the same plant, which leads to a more efficient utilization of capacity and less maintenance.

Figure 1.2 | Employment in pharma as percent of total employment



Source: BAK Economics, Polynomics, FSO.

Importance for the job market continues to increase

Various major projects show that Switzerland remains an attractive production location for multinational pharmaceutical companies. The growth of jobs in the pharmaceutical sector continues to be above average compared with other industries, which reflects a steadily increasing importance of the sector for the Swiss job market. In 2016, the pharmaceutical sector accounted for around 0.9 percent of all employment in the economy as a whole (see Fig. 1.2).

Regional distribution of Interpharma member companies

Interpharma, the association of research-based pharmaceutical companies in Switzerland, has a membership comprising more than 20 multinational companies from the pharmaceutical industry.

The member companies employ around 38,600 people in total and are spread over 18 cantons of Switzerland. Their various sites in Switzerland have a variety of functions: from research and development through production to company headquarters. The regional distribution of these sites shows clear agglomerations, or so-called clusters. The pharma cluster in the Basel region (cantons Basel-Stadt, Baselland and Jura, as well as the Fricktal and Dorneck-Thierstein districts) acts as the national locomotive in this field. The region is the principal location of traditional pharmaceutical companies such as Novartis and Roche, the biopharmaceutical company Actelion, Bayer, Boehringer Ingelheim and, with a total workforce of around 24,100, accounts for about 63 percent of all employees of Interpharma member companies.

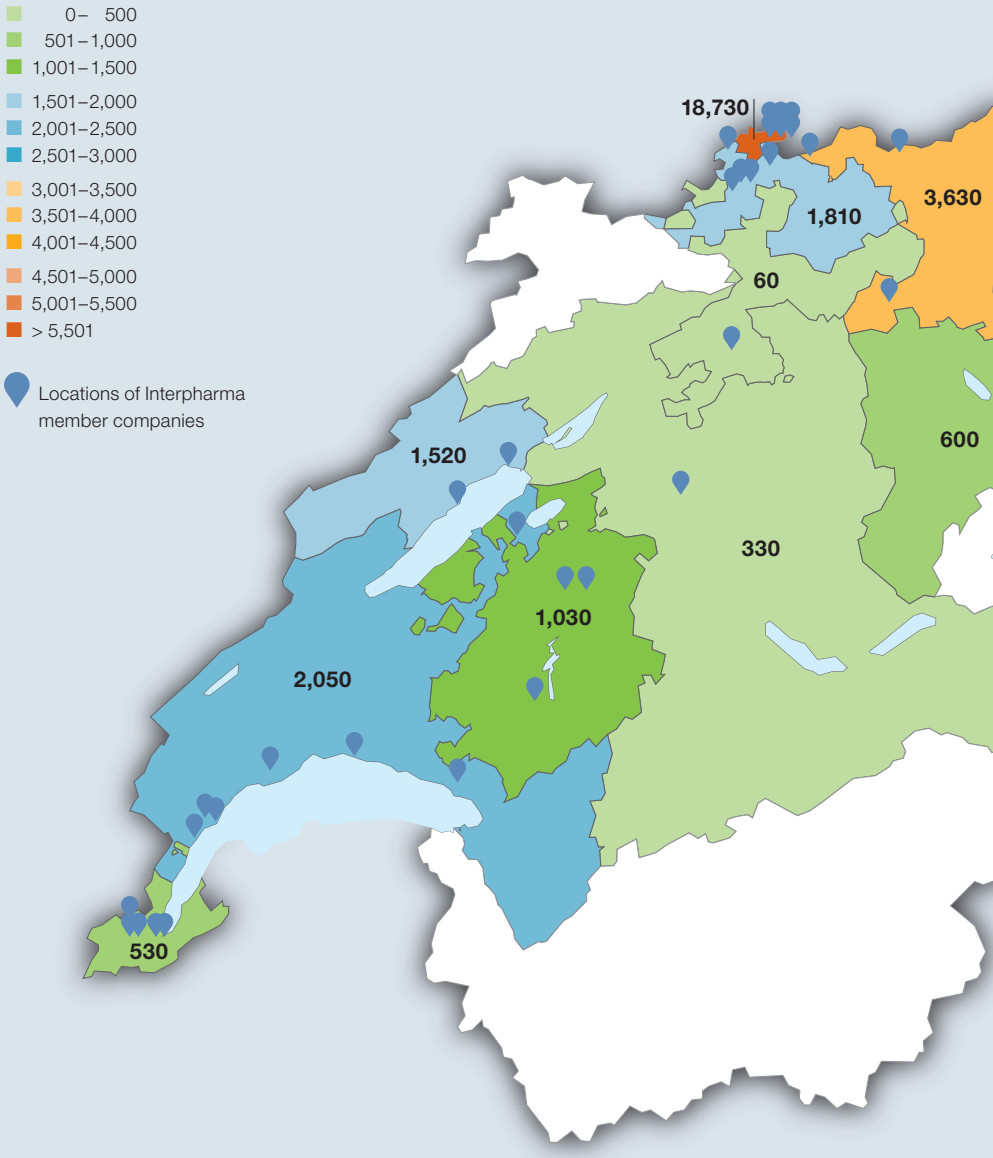
A further concentration of pharmaceutical companies can be found in the Lake Geneva region (cantons of Geneva and Vaud) and the Espace Mittelland (cantons of Bern, Fribourg, Neuchâtel and Solothurn). This large region is home, for example, to the new production site of Biogen, which will start operations in 2019, Celgene, Eli Lilly, GlaxoSmithKline (GSK), Merck, Sanofi, UCB and Vifor Pharma. In this cluster, around 5,500 people are employed by Interpharma member companies. This corresponds to 14 percent of people employed by Interpharma companies throughout Switzerland.

A third pharma cluster can be found in the region of Zurich, Zug and Lucerne. Various sites of Interpharma companies AbbVie, Amgen, AstraZeneca, Bayer, Biogen, Bristol-Meyers-Squibb, Gilead, Janssen, Lundbeck, Merck, MSD (Merck Sharp & Dohme), Novartis, Pfizer, Roche, Shire, Takeda and Vifor Pharma are located in this region. With around 6,700 employees, the Zurich-Zug-Lucerne cluster accounts for about 17 percent of all people employed by Interpharma member companies.

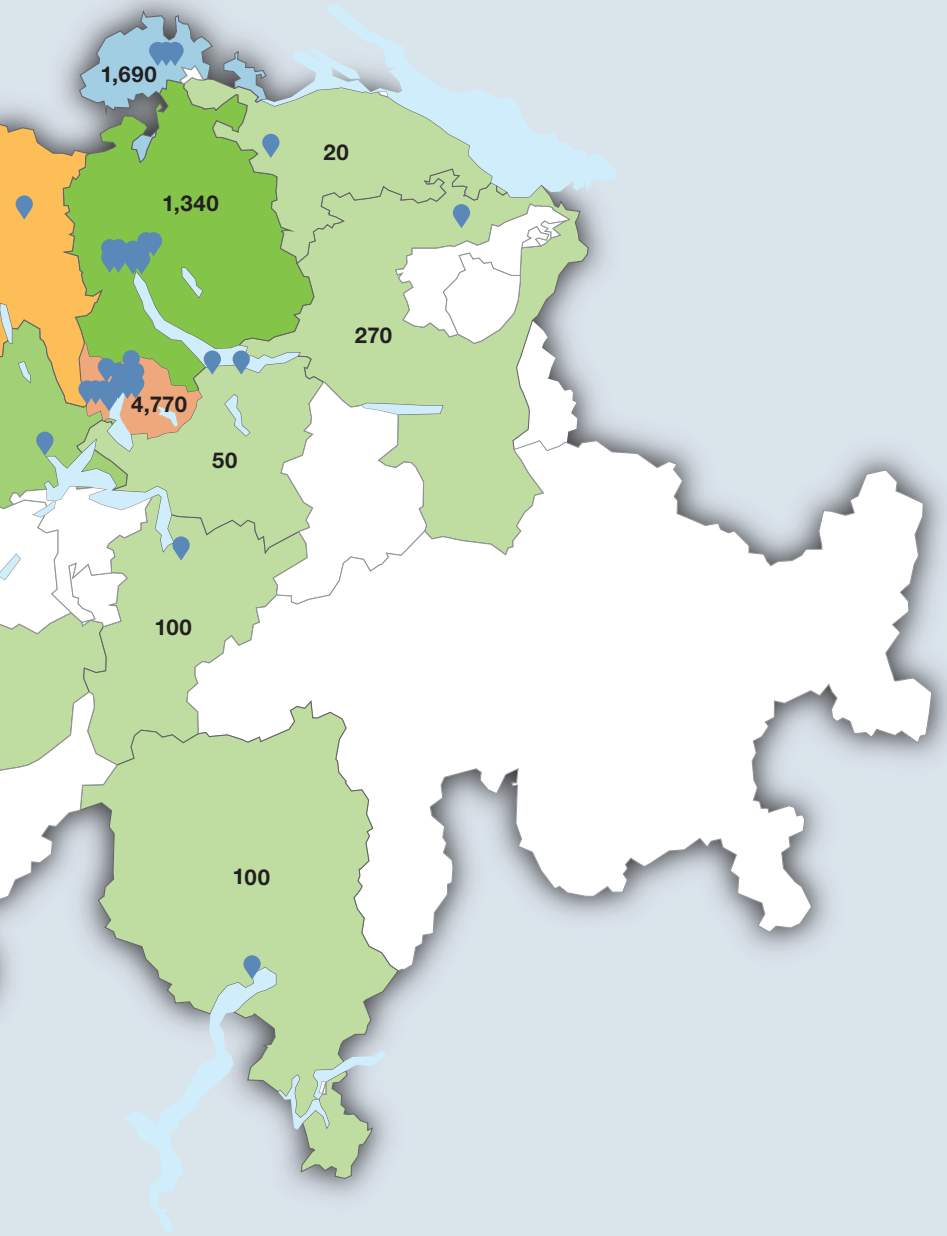
Aside from these major pharma clusters, Interpharma member companies also have a substantial presence in other locations, such as the canton of Schaffhausen.

Figure E1 | Regional distribution of Interpharma member companies

Number of employees[1] and locations of Interpharma member companies based on canton as at end of 2016



1 The figures are based on the 24 companies that were members of Interpharma in September 2017, even if they were not yet members in 2016. The total workforce (of all divisions) within Switzerland was included. In the case of two companies, the figures are based on data from 2015.



Source: Interpharma

1.2 Employment structure

Qualification structure

The vigorous research and development activities of the pharmaceutical industry have led to a steady increase in the need for highly qualified staff over the past years. In 2015, more than 50 percent of employees in the pharmaceutical sector already have a tertiary qualification. The proportion of highly qualified employees in industry and the economy as a whole is much lower at one-third. The above-average need for specialists makes the pharmaceutical sector more dependent on access to the international labour market than other sectors. Besides people from EU and EFTA countries, specialists from third countries also play an increasing role in the recruitment of highly qualified people.

The demand for better qualified personnel continues to grow not only in the pharmaceutical industry, but also in other sectors: the proportion of employees with low qualifications is continuing to fall both in industry and in the economy as a whole. But this is driven not only by demand, but also by the supply side of the economy: the dual education system, which is unique to Switzerland, leads to a steadily increasing and generally higher level of education among the local population. That Switzerland benefits enormously from this system is also evident from the international recognition and growing interest in the Swiss model for success.

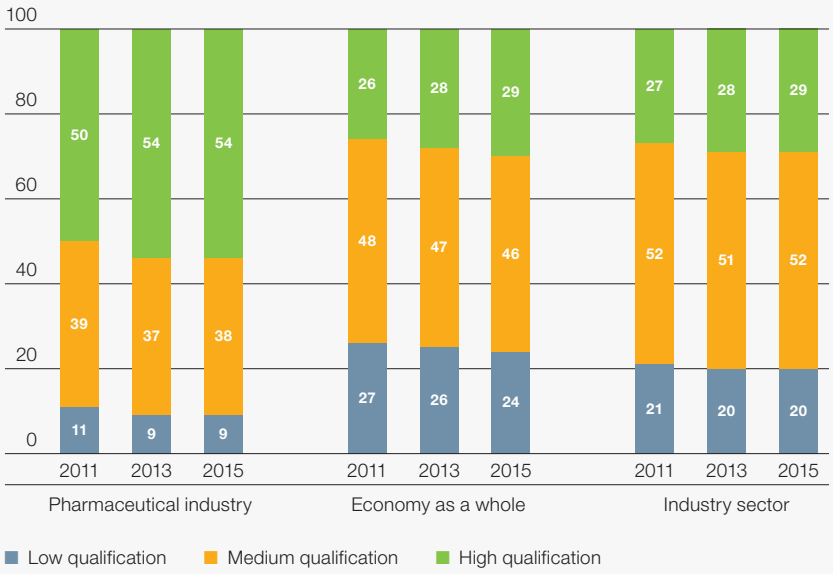
Part-time structure

A glance at the employment statistics shows that structures in the pharmaceutical sector have hardly changed over the years. In 2016, 85.7 percent of employees worked full-time or at least 90 percent. Only 2.2 percent work in a part-time arrangement of less than 50 percent (part-time II+III) and 12.1 percent in a part-time arrangement of between 50 and 89 percent of standard working time (part-time I). In this respect, work in the pharmaceutical sector does not differ significantly from the employment pattern in industrial sector. Services sectors such as the retail trade or the hospitality industry typically have a much higher proportion of part-time jobs than industry.

Figure 1.3 | Qualification structure

Percentage of all employees in chemical/pharmaceutical sector (NOGA 2008), the economy as a whole and industry (in percent), 2011–2015

Possible rounding differences



Source: BAK Economics, Polynomics, FSO.

Full-time equivalent employment

Differences in part-time structures mean that employment figures for the different sectors are only comparable to a limited extent with regard to their size or importance for the labour market as a whole. For this reason, so-called full-time equivalent (FTE) employment is used as a measure for such comparisons. This gives the number of employees there would theoretically be if the volume of work done was performed exclusively by full-time employees. For the pharmaceutical industry, this calculation gives a figure of around 43,000 full-time equivalent employees. When measured in FTEs, employment in the pharmaceutical sector as a percentage of total employment rises to around 1.1 percent.

Digitalization and personnel

Digitalization and its impact on the job market

Digitalization and networking already began to leave their mark on Switzerland's job market some years ago. The most important impact of these developments includes what is known as "job polarization", the shifting of jobs from industrial sectors to the services sector and also the emergence of new forms of work, such as increased project work, temporary appointments, self-employment, etc. (see Zenhäusern/Vaterlaus, 2017). The term "job polarization" here refers to the development over the last few years in which the demand for highly qualified and low-skilled people has increased and that for people with average qualifications has fallen. This phenomenon is also discernible in Switzerland. For example, the demand for office staff and related jobs in Switzerland fell by around 170,000 between 1995 and 2015, whereas the number of academic professions increased by 500,000 over the same period (see Federal Council, 2017).

Aside from the change in workforce structure regarding qualifications, a further consequence of digitalization on the labour market is that the existing forms of work are changing. While around 85 percent of people in gainful employment still work in the classical employee relationship today (Huwiler, 2017), it is assumed that new forms of work will become increasingly important in the future. This will include, for example, an increase in fixed-term appointments and a greater demand for on-call work or project appointments with more than one employer at the same time in some cases or an increase in self-employment.

To what extent these new forms of work will prevail and the effect of job polarization will continue in the future depends not least on the automation potential in the various sectors. In this respect, the situation appears good for Switzerland in the international context. According to an analysis by McKinsey (2017), only in a few sectors does Switzerland show greater automation potential when compared with more than 50 countries. Industry and the healthcare sector are not among them.

Impact of digitalization on pharmaceutical companies

Digitalization has already affected the pharmaceutical industry and will continue to do so. As shown in a survey among five selected pharmaceutical companies (Roche, Novartis, Biogen, Celgene and Johnson&Johnson), digitalization affects a wide variety of divisions. A distinction is to be drawn here between the effect of digitalization on the development of new business models and its effect on the efficiency enhancement of processes. In the area of diagnostics, for example, existing analytical methods will come under pressure from issues such as real-time data or artificial intelligence. In this regard, the field is also likely to see an increase in "industry outsiders" entering the market in future. In pharmaceuticals, it is the impact on research, production and the individualization of medication that will affect not only existing business models, but also existing processes. Finally, the companies taking part in the survey also named sales and marketing as an area that will be heavily affected by digitalization. In this area, the challenge is likely to be above all the way in which staff cope with the new technologies. As a result, employees in the pharmaceutical sector will be much more heavily occupied by digitalization in future. For example, almost a third of German pharmaceutical industry managers surveyed expect a considerable increase in the time required for addressing digital issues (Hays, 2016). As illustrated by the statements of the Swiss pharmaceutical companies surveyed, the USA is likely to play a key role here in future innovations, although Switzerland has some notable success stories to its name, especially when measured in relation to its size.

Company survey: current personnel structure

The pharmaceutical companies surveyed are fundamentally optimistic that digitalization will not lead to any job losses. But the content of the work is expected to change. As shown also in the survey of German managers in the pharmaceutical industry, willingness of employees to embrace changes will become increasingly important. This will include an increase in the IT skills that will be necessary. The companies surveyed believe that recruitment of the specialist personnel needed will be one of the big challenges in the future – in particular also because digitalization will lead to new job profiles in a variety of fields. Here it will be necessary to find a good combination of in-house and external specialists.

When the present personnel structure of the pharmaceutical companies surveyed is considered with regard to the requirements of digitalization, the following points are worth noting:

Age structure: at the end of 2016, a quarter of employees at the companies surveyed were aged between 50 and 64, and around a third were aged between 40 and 50. Compared with previous years, there has been a further fall in the proportion of those aged less than 40, which currently stands at around 43 percent. Compared with the age structure of the permanent population in Switzerland aged between 18 and 64, the pharmaceutical companies surveyed have a lower proportion of younger employees (25 percent versus 32 percent) and a higher proportion of employees aged between 40 and 50 (33 percent versus 23 percent). In the case of employees aged between 50 and 64, they make up about the same proportion of people of working age in the permanent population at 45 percent as they do in the pharmaceutical companies surveyed.

Internationalism: the proportion of non-Swiss employees in the pharmaceutical industry continues to be well above the average in Switzerland overall. At the end of 2016, around two-thirds of employees in the five companies surveyed were foreigners, most of them from the two neighbouring countries France and Germany. This can be explained above all by the proximity of major pharmaceutical centres to the border.

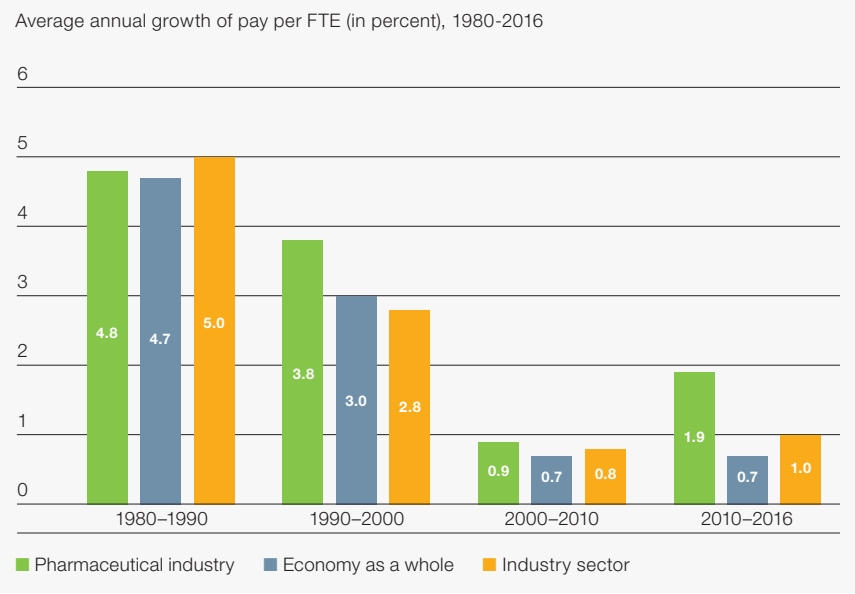
Women and part-time employees: the question as to the proportion of women and part-time employees arises with regard to the new forms of work. In the pharmaceutical industry, the proportion of these employees remains below average compared with the economy as a whole. At the end of 2016, 42.9 percent of the 31,000 or so employees reported to be working for the five companies surveyed were women, which is 3.3 percentage points below the proportion in the economy as a whole. In the case of part-time employees, the difference is even greater: a good 87 percent of people in these companies are in full-time employment (proportion across all sectors in Switzerland: 61 percent), although – of the male employees – only one in twenty-five is not full-time. Pharmaceutical companies offer numerous programmes to ensure that employees can combine their professional and private commitments. At Novartis, for example, employees can spend 40 percent of their work time working from home. And in exchange for a pay reduction of 5 or 10 percent, they can take an additional 13 or 26 days' vacation. Roche has similar programmes in place. Both companies also offer places in daycare centres, which the companies partially finance.

Qualifications structure: the qualifications structure plays an important role when it comes to digitalization. As various studies have made clear, industries with an above-average proportion of highly qualified employees are more likely to benefit from digitalization in terms of job growth over the next few years than sectors that have an above-average proportion of employees with medium-level qualification. The relevant data of the Federal Statistical Office show that the pharmaceutical industry employs an above-average number of people with a tertiary education compared with the economy as a whole.

Pharmaceutical industry probably well prepared

Digitalization has an impact on the job market and will continue to do so in the future. The pharmaceutical industry will also be affected by this in various ways, whether through the emergence of new business models or through efficiency enhancements in its processes. From the perspective of the job market, it is mainly job polarization and the emergence of new forms of work that are often mentioned in relation to the advance of digitalization. Today's personnel structure, when viewed on the basis of the five companies surveyed, indicates that the pharmaceutical industry is probably well prepared particularly by comparison with the rest of industry. A distinguishing feature of the pharmaceutical industry, for example, is the higher qualifications structure of its workforce, which is to be seen as a positive factor with regard to job polarization. Its high degree of internationalism is likewise to be seen as positive as regards the recruitment of the IT experts needed. There is potential for improvement when it comes to the proportion of women and part-time employees – the latter especially in relation to the anticipated emergence of new forms of work in the IT sector. Finally, the question arises as regards the extent to which the more advanced age structure in the pharmaceutical industry will lead in future to more external specialists having to be called on in the context of digitalization.

Figure 1.4 | Growth of pay compared with other industries



Source: BAK Economics, Polynomics, FSO.

1.3 Wages and salaries

The key to the pharmaceutical sector's success is its high capacity for innovation and steady investments in research and development. This requires a highly qualified workforce. As has already been shown, the pharmaceutical industry has an above-average proportion of employees who have been through tertiary education compared with other industries. To retain the best of these employees and attract highly qualified new people to the industry, competitive salaries are essential.

In 2016, the pharmaceutical industry paid gross salaries and wages amounting to around 6 billion Swiss francs. The average annual salary per full-time position stood at around 139,000 Swiss francs, making it around 49 percent higher than the average of all industries. The gap between the pharmaceutical sector and industry as a whole has widened in recent years. Despite what has been a difficult environment in some cases as a result of the economic crisis and the appreciation of the Swiss franc, the years since 2010 have seen a further increase in the dynamics of pay compared with the 2000–2010 period, while in most industries there has been a clearly discernible slowdown in pay dynamics.

Estimation of induced tax revenue and consumer spending

The above-average pay in the pharmaceutical industry benefits not only its employees, but also the state in the form of taxes, social security in the form of contributions and also trade and commerce through the consumer spending of the employees.

The fiscal effect arising out of the wages and salaries of employees in the pharmaceutical industry can only be calculated approximately, because little differentiation is provided in the information available regarding the income distribution of pharma employees and their places of residence (by income class). Nevertheless, a rough estimation and classification should be undertaken.

With a blanket adjustment for income by the proportion of cross-border commuters in the workforce (17%) and assuming a distribution of payrolls proportional to the number of employees between the group of employees resident in Switzerland and those resident abroad, the income and withholding tax revenues are estimated to be around 700 million Swiss francs.

Around 12 percent of gross salaries goes to social security in the form of contributions to old-age and survivor's insurance, disability insurance, compensation insurance for loss of earnings, unemployment benefit and the pension funds. In addition, the employees contribute to the mandatory health insurance. Altogether, the contributions to social security and to the mandatory health insurance (basic insurance only) run to an estimated 750 million Swiss francs.

After deduction of all taxes, social security contributions, insurance premiums, fees and other deductions, around 69 percent of gross income remains on average. On the basis of a typical savings ratio according to the average income level of pharma employees, the expenditure volume is calculated to be around 3 billion Swiss francs.

This consumer spending benefits producers and suppliers of consumer goods and personal services. Model calculations show a value-added effect of 1.9 billion Swiss francs in total. However, it must be borne in mind here that the correlation between this induced effect and the primary impulse (pharmaceutical industry production) cannot be interpreted as a strictly causal association, because consumer spending at the individual level is financed not only by the employee's income, but also by other types of income (investment income or state transfers). The model calculations take this into account accordingly by only including the income-dependent, endogenous proportion of consumer spending, which is differentiated from the autonomous consumption that is unrelated to employee income.

1.4 Importance for other sectors

The effective importance of the pharmaceutical industry for Switzerland's job market is much greater than its 1.1 percent proportion of all jobs (FTEs) might suggest, because pharmaceutical production creates further jobs in Switzerland's economy outside the pharmaceutical industry. For the manufacture of pharmaceutical products, goods and services are sourced from companies in a variety of other industries, sectors and abroad. For example, the production of medicines requires machinery, chemical substances, insurance services, cleaning and security services, IT services and also energy. In addition, local trade and industry also benefit from the consumer spending of pharmaceutical company employees.

The intertwined nature of these different businesses means that jobs in other sectors of industry are likewise tied up with the production operations of pharmaceutical companies. The extent to which the production and research activities of the pharmaceutical industry impacted employment in the economy as a whole in 2016 is calculated on the basis of a macroeconomic impact model. This model is used to analyse and quantify all relevant payment flows in a vertical integration across the entire value chain (see section 7.1).

The impact analysis shows that, besides the 43,000 or so jobs [FTEs] in the pharmaceutical industry, around 138,000 jobs in other companies and sectors were also associated with pharma in 2016. So for every job in the pharmaceutical industry there were more than three additional FTEs in companies that benefited indirectly from the production and research activities of the pharmaceutical industry.

A total salary income of around 12.9 billion Swiss francs was associated with the additional jobs in other sectors of the economy. Thus, for every 1,000 francs of salary paid to employees in the pharmaceutical industry, an additional 2,200 francs of pay was generated on average for employees from companies in other sectors.

Table 1.1 | Direct and indirect impacts of the pharmaceutical industry on the job market 2016

Rounding differences possible

		Direct	Indirect	Total	Multiplier
Employees	number of persons	45,524	180,575	226,099	5.0
	in % of economy as a whole	0.9	3.5	4.4	
Employees (FTE)	number of persons	43,168	138,271	181,439	4.2
	in % of economy as a whole	1.1	3.4	4.5	
Hours worked	million hrs.	82	273	356	4.3
	in % of economy as a whole	1.0	3.5	4.5	
Gross wages and salaries	million CHF	5,982	12,932	18,914	3.2
	in % of economy as a whole	1.6	3.5	5.1	

Source: BAK Economics, Polynomics.

2 Contribution of the pharmaceutical industry to value added

When the Swiss National Bank lifted the cap on the franc against the euro in January 2015, broad sections of Swiss industry were severely affected. This, together with the euro crisis, compelled Swiss exporters to make what in some cases were painful adjustments. The pharmaceutical industry, too, did not come off unscathed, but despite the currency-related impact on margins it managed to continue expanding and making a positive contribution to the economic growth of Switzerland.

2.1 Direct contribution to value added: economic performance

The second important measure for ranking the importance of an industry aside from employment is the gross value added as a contribution to the gross domestic product. The value added is the barometer of economic output and represents the economic value added that a company or an industry creates with the manufacture 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 economic entity. These 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.).

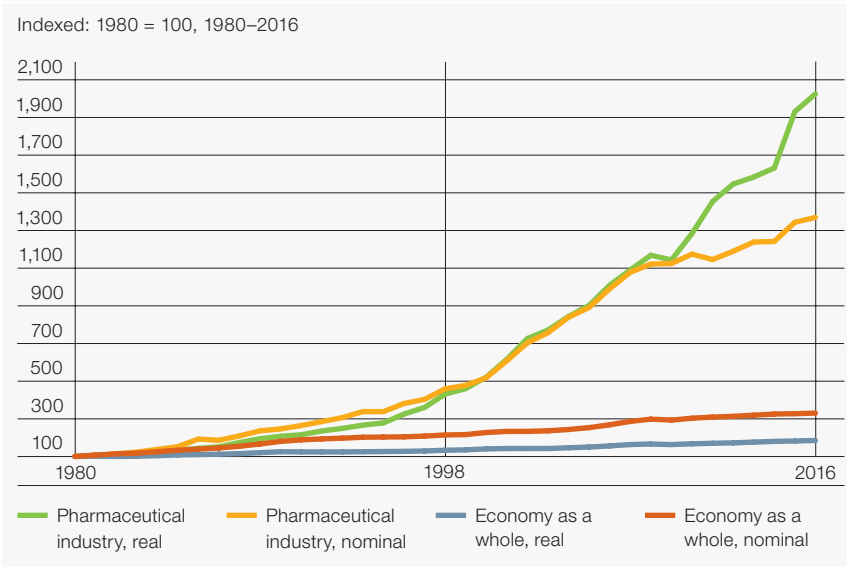
The end of restructuring in 1996 and the rise of Switzerland to become a major global pharmaceutical and biotechnology hub led to a rapid increase in the pharmaceutical value added, which lasted until 2008 and brought with it almost a doubling of the value added during this period. The last few years have seen a continued sharp increase in production volume, which is reflected in growth rates that have been consistently above average in real terms. While Switzerland's economy in the past 20 years has grown by 45 percent overall in real terms, the pharmaceutical industry has expanded by more than 500 percent.

The pharmaceutical industry has shown itself to be largely resistant to economic crises – even in the past two years, for example, during which there was a substantial increase in the gross value added in real terms, despite the sharp appreciation of the Swiss franc, and the pharmaceutical industry managed to achieve much stronger growth than the Swiss economy as a whole.

The nominal development in terms of value has not kept pace with real growth in the past few years. This is due to the increasing pressure on prices (e.g. adjustments to the prices of medicines and restrictions on national healthcare expenditure) and to the erosion of margins as a result of the marked appreciation of the Swiss franc.

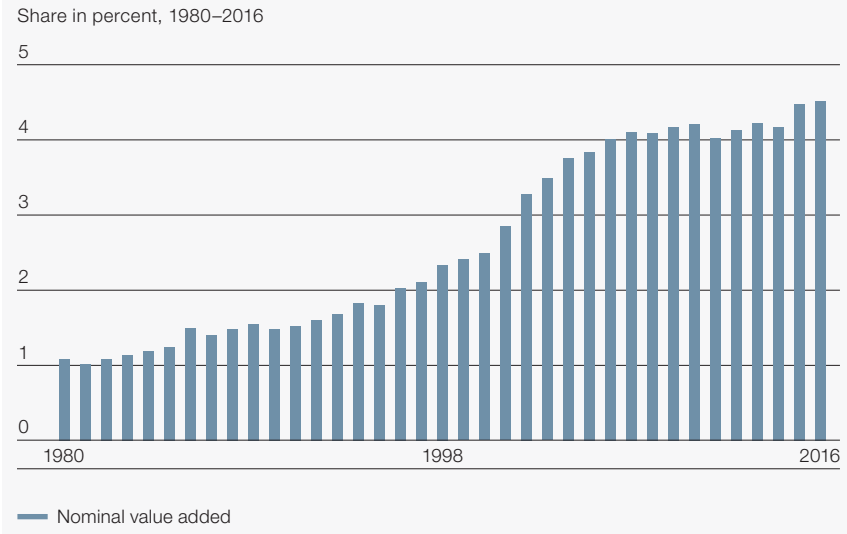
But the substantial growth in real terms is also reflected in the nominal value added. In 2016, the pharmaceutical value added increased to 28.9 billion francs, thus accounting for 4.5 percent of Switzerland's total economic output. The pharmaceutical industry's share of the overall economy's value added was thus much higher than its share of employment, which is attributable to its above-average labour productivity.

Figure 2.1 | Gross value added of pharmaceutical industry over time compared with economy as a whole



Source: BAK Economics, Polynomics.

Figure 2.2 | Pharmaceutical industry's share of the overall economy's gross value added



Source: BAK Economics, Polynomics.

2.2 Contribution of pharmaceutical industry to growth

In the past few years, the pharmaceutical industry has been the most important driver of Switzerland's industrial growth and, as a result, has contributed significantly to the growth of the economy as a whole. Between 2000 and 2016, Switzerland's pharmaceutical industry accounted for an annual 0.36 percentage points – around one-fifth – of GDP growth in real terms. Only the public sector (at 0.35 percentage points) and the retail trade (at 0.50 percentage points) made a comparable contribution to GDP growth during this period.

Thanks above all to its high degree of competitiveness, the pharmaceutical sector also managed to make positive contributions to growth in the difficult economic environment. In contrast to the pharmaceutical industry, the average contributions to Switzerland's gross domestic product by other, mostly export-oriented sectors, such as the metal and engineering industries, have been negative since 2000. The hospitality industry has likewise been hard hit by the economic situation, recording a decline in overnight stays due to a combination of strong international competition and the strength of the Swiss franc.

The pharmaceutical sector is not only hugely important for the economy as a whole, but also serves as the linchpin of Switzerland's industry. It accounted for around three-quarters of the total industrial growth of 1.76 percent per year. Positive signals have likewise been emerging from the electrical and precision engineering sector, which also includes the watch industry. Despite the watch industry crisis in 2015 and 2016, this sector accounted for almost a quarter of industrial growth.

Table 2.1 | Growth contributions

Contributions to average annual growth of the real gross value added of the economy as a whole (in percentage points), 2000–2016

	Economy as a whole	Secondary sector/industry
Pharmaceutical	0.36	1.35
Chemical	0.04	0.16
Metal	–0.02	–0.07
Electrical/precision engineering	0.10	0.37
Mechanical engineering	–0.01	–0.03
Trade	0.50	–
Hospitality	–0.03	–
IT/communication	0.07	–
Financial sector	0.13	–
Business services	0.11	–
Public sector	0.35	–
Economy as a whole	**+1.77%**	**–**
Secondary sector/industry	**–**	**+1.76%**

Source: BAK Economics, Polynomics.

2.3 International comparison

When it comes to the global competition for inward investment, Switzerland remains an attractive alternative in the business planning of multinational corporations. This is also reflected in the above-average growth in value added of the pharmaceutical industry here – not only within Switzerland itself, but also compared with other countries.

Value added of pharmaceutical industry

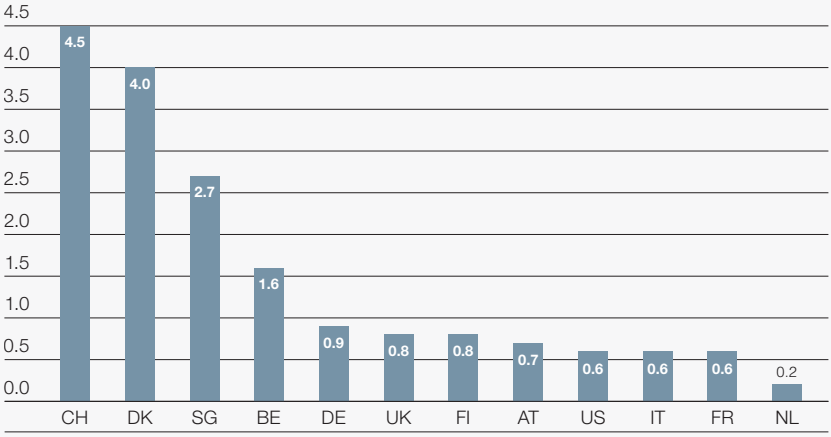
The value added of the pharmaceutical industry in Switzerland as a share of the overall economy's value added is very high compared with other countries. In Switzerland, the pharmaceutical industry accounted for 4.5 percent of value added for the economy as a whole in 2016 (see section 2.1). Likewise above-average figures, but still much lower than in Switzerland, were recorded in Denmark (4.0%) and Belgium (1.6%). Outside Europe, Singapore (2.7%) also features as one of the world's major pharmaceutical centres in terms of value added. In numerous industrialized nations such as France, Germany and the United Kingdom, the corresponding figure is less than one percent. The US has the largest pharmaceutical industry in terms of the absolute pharma value added. But in relation to the US economy as a whole, the industry plays a less important role (see Fig. 2.3).

Growth

Unlike in most benchmark nations, 2015 and 2016 saw the pharmaceutical sector in Switzerland gain in national importance. The prominent role of the pharmaceutical sector in Switzerland compared with that in other countries also increased in particular with regard to its above-average growth rates.

Figure 2.3 | International comparison of pharmaceutical industry's value added

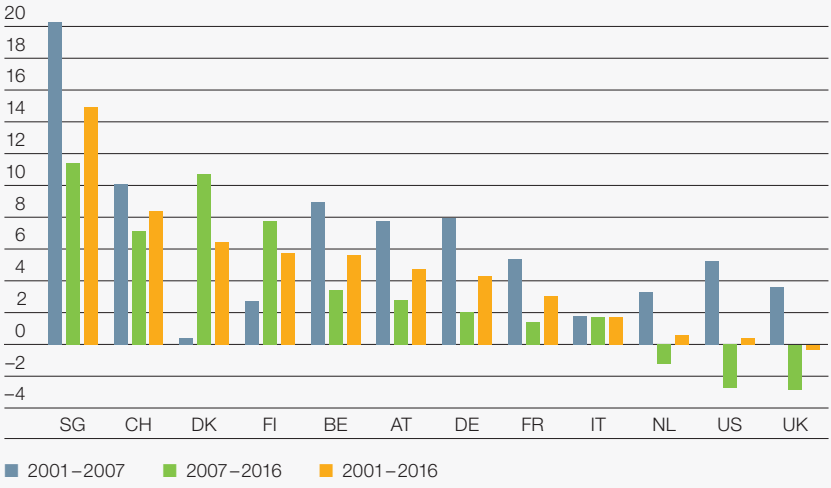
Nominal value added of the pharmaceutical industry as a percentage of national GDP (in percent), 2016



Source: BAK Economics, Polynomics.

Figure 2.4 | Value-added growth of pharmaceutical industry compared with other countries

Average growth of real gross value added of the pharmaceutical industry in various countries (in percent), 2001–2016



Source: BAK Economics, Polynomics.

Only in Singapore – where there has been rapid growth since the turn of the century – was the average annual growth in the gross value added of the pharmaceutical industry higher than in Switzerland between 2001 and 2016. But in the period of 2007–2016 the Scandinavian countries of Denmark and Finland showed higher growth than Switzerland. Between 2001 and 2016, the only country among the benchmark nations that did not see an increase in its value added was the United Kingdom (see Fig. 2.4). This development could be further accentuated with Great Britain's decision to leave the European Union. The planning uncertainty caused by Brexit is likely to be a further impediment to the expansion and establishment of new pharmaceutical companies. The US still showed positive growth rates during this period, but only because of a very dynamic development from 2001 to 2007. Since the financial crisis, the real gross value added in the US has declined.

In general, it is clear that, with a few exceptions (Finland, Denmark and Italy), the high growth rates achieved at the start of the new millennium have remained out of reach since 2007. Nevertheless, the pharmaceutical sector has held up well in what is sometimes a difficult economic environment.

Inward investment factors and bilateral agreements from the standpoint of the pharmaceutical industry

Studies show that various factors are of importance for the competitiveness of a region or an industry. These include, for example, the availability of people with appropriate qualifications, the freest possible access to sales markets and providers of preliminary goods and services as well as the intensity of competition to stimulate innovations. Many of these aspects are regulated today between Switzerland and the EU through bilateral agreements in the framework of Bilateral Accords I and II. The seven bilateral agreements of the Bilateral Accords I, which were accepted by Swiss voters in May 2000, are again being called into question by further popular initiatives following the pragmatic implementation of the mass immigration initiative adopted by the Swiss parliament in December 2016.

The following is designed to show what challenges the pharmaceutical industry would face if the agreements were terminated. The various phases in the development of a medicine serve to illustrate these challenges. For simplification purposes, these phases can be subdivided into Research, Preclinical Phase, Clinical Phase and Sales, but are further simplified here and are considered as the following two overarching phases: Research and Development on the one hand and Production and Sales on the other.

1. Research and development phase

Research cooperation and freedom of movement

Two bilateral agreements are particularly relevant for research and development: the research agreement and the agreement on freedom of movement. Research expenditure for a new medicine has steadily risen over the last decades. It is estimated that it costs more than 2 billion Swiss francs to get a medicine successfully launched onto the market, half of which is accounted for by research on new compounds and clinical research. According to the Federal Statistical Office, the pharmaceutical industry accounted for more than a third of the total intramural (internal company) R&D expenditure of 15.66 billion Swiss francs (2015) and, as a proportion of global sales, R&D investments in the pharmaceutical industry are also well above the average compared with other industries. Cutting-edge research today takes place at an international level; cooperation and the network of contacts with other researchers and research institutions are therefore key. Thanks to research agreement, Switzerland can benefit from European research collaboration. This is an asset not only to the research-intensive

pharmaceutical industry, but also to Switzerland's universities. The federal government has concluded, for example, that almost 200 new companies were established in Switzerland as a result of the country's participation in the EU's 6th Framework Programme for Research (2002–2007). Following an interim phase in 2016, Switzerland has also been a fully associated partner in the latest research programme, Horizon 2020, since the beginning of 2017.

Besides access to the European research community, a further important factor for the research and development phase is the availability of highly qualified researchers. European access has been secured to date through the agreement on freedom of movement. The intensity of research has resulted in the proportion of employees with an advanced qualification, which stood at 54 percent in 2015, being much higher than the corresponding proportion in the economy as a whole or in industry (29% in each case). The pharmaceutical sector differs from the other industries in Switzerland not only in relation to the qualifications structure. The proportion of foreign employees is also much higher. As shown by the survey conducted in the framework of this study among five pharmaceutical companies, around two-thirds of employees come from abroad, most of them from the neighbouring countries of France and Germany. To this extent, Switzerland is dependent on a functioning system of immigration, especially also of scientists and researchers. This is also illustrated in the fact that more than half of those who come from abroad have a university degree. A glance at demographic changes in particular suggest that the importance of free movement for the pharmaceutical industry is likely to increase further in the future. It is estimated that Switzerland's job market could be short of up to 300,000 people in the next 15 years.

2. Production and sales phase

Free trade and harmonization of approval procedures

The second phase in the development of a medicine concerns production and sales. The impact of the free-trade agreement and the agreement on the dismantling of technical trade barriers can be illustrated by the example of a specific medicine. Take the Novartis drug Entresto™. Certain precursors of the active ingredient for this medicine were produced in China and Japan and then delivered to the UK. Here the complete active ingredient LCZ696 was manufactured and then shipped to Switzerland. Here further preparatory work was carried out, as well as production of the film-coated tablets and the filling process for the US market. At the same time, the active ingredient was shipped to Italy, where the blistering and packaging took place for Europe and the rest of the world (excluding the US).

This brief outline of the various processing stages of Entresto™ shows that export and import activities within Europe are very important for the pharmaceutical industry. With exports to Europe amounting to around 40.8 billion Swiss francs, accounting for 51 percent of all exports, the EU remains the most important trading partner of the pharmaceutical industry, which thus also contributes substantially to the attractiveness of Switzerland as a business location. The use of different production sites during the creation of a product and the associated shipment of active ingredients and products within Europe are made both possible and simple mainly as a result of the free-trade agreement from 1972 and the agreement on the dismantling of technical trade barriers in the framework of the bilateral agreements. Thanks in particular to the latter agreement, product requirements were harmonized at the European level. Especially when it comes to the launch of a product, this agreement leads to a decrease in bureaucracy and the associated costs. Without the agreement to dismantle technical trade barriers, the pharmaceutical industry would have to get a medicine approved in all 28 EU countries, whereas today only a single approval procedure is necessary.

The pharmaceutical industry is an important pillar of growth for Switzerland's economy. Good framework conditions are necessary to ensure that it remains competitive. Since the mass immigration initiative was accepted, uncertainty has surrounded the future of the bilateral agreements. Especially for an export-oriented and research-intensive sector such as the pharmaceutical industry, the various bilateral agreements offer a lot of advantages. The research agreement means that an exchange of experience and information between European and Swiss research institutions can be pursued to the full. Freedom of movement makes sure the high demand in Switzerland's pharmaceutical industry for highly qualified people can be met, which is especially important with regard to the coming demographic challenges. And finally the free-trade agreement and the agreement on the dismantling of technical trade barriers ensure that trade with Europe – Switzerland's most important trading partner – can be conducted with as few complications as possible and the cost of product approvals can be kept to a minimum.

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. This shows the value added elicited in other sectors by the production operations of pharmaceutical companies and the associated orders to suppliers (see section 7.1).

The value-added multiplier for 2016 calculated on the basis of the input-output model stands at 1.7. Thus, for every Swiss franc of value added in the pharmaceutical industry, approximately 70 cents of additional value added is generated in other Swiss sectors.

Thanks to the production and research activities of the pharmaceutical industry in 2016, a value added of around 20.7 billion Swiss francs was generated in other sectors. The total direct and indirect value-added contribution thus stood at more than 49.6 billion Swiss francs. That corresponds to 7.8 percent of Switzerland's total economic output.

Table 2.2 | Direct and indirect value-added effects of the pharmaceutical industry 2016

		Direct	Indirect	Total	Multiplier
Gross value added	million CHF	28,864	20,749	49,613	1.7
	in % of economy as a whole	4.5	3.2	7.8	

Source: BAK Economics, Polynomics.

Importance of investment activity for other sectors

The pharmaceutical industry has expanded the Switzerland hub in the past few years in a way practically no other industry has done, and the expansion will also continue in the coming years. Examples of the vigorous investment activity include the development of the Novartis campus and the rejuvenation and expansion of the Roche headquarters in Basel. At present, Biogen is investing 1.5 billion Swiss francs in the construction of a new production site in the canton of Solothurn. In addition, a whole range of other companies are in the process of investing in Switzerland as a location for their business or in the expansion of existing capacity.

The high level of investment activity by the pharmaceutical industry will serve to strengthen Switzerland as a production and research hub and is a clear commitment to Switzerland. Companies from other sectors also benefit from these investments in the form of orders for the construction of buildings and the fitting of laboratories, for IT infrastructure and for other equipment. Model calculations show that a typical building investment costing a billion Swiss francs generates a total domestic value added of around 735 million francs. The value-added effect of a typical investment in equipment systems amounting to a billion Swiss francs stands at around 417 million francs.

3 Labour productivity of the pharmaceutical industry

The pharmaceutical industry's steady investments in research and development make it the most productive sector of the Swiss economy. For each hour worked in the pharmaceutical industry, 4.3 times as much value added is generated as the average of all industries in Switzerland. Also by international standards, the productivity of Switzerland's pharmaceutical industry outstrips that of other countries.

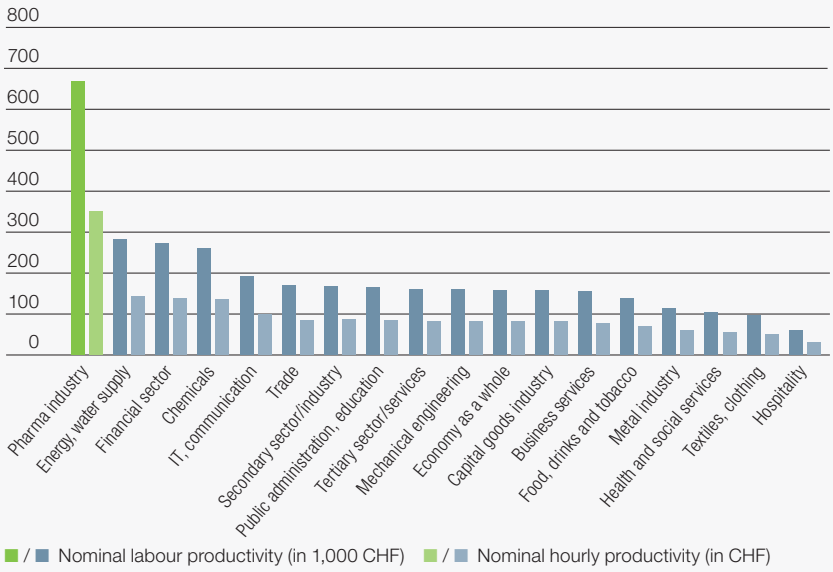
3.1 Level of labour productivity

Labour productivity is a reflection of the relationship between value added and work effort, this variable serving as an important indicator for assessing efficiency and competitiveness. In 2016, labour productivity in the pharmaceutical industry amounted to about 669,000 Swiss francs per full-time position (FTE) or 350 francs per hour worked. That means that for every job in the pharmaceutical industry around 4 times as much value added was generated as in the rest of industry.

The outstandingly high productivity of pharmaceutical companies is a result of their high level of capitalization, the high level of qualifications of their employees, their intensive innovation activities and their high level of efficiency. The high value added per job is not only the basis for an above-average level of pay, but also a prerequisite for the high level of financial investments that pharmaceutical companies need to make to remain competitive. On the one hand, many companies reinvest up to a third of sales revenue in research and development. On the other hand, risky investments have to be made, for example, to build new production plants, even if the product to be manufactured has not yet been through the clinical trial phase. High labour productivity is therefore absolutely essential to ensure the continuation of the pharmaceutical cycle.

Figure 3.1 | Labour productivity

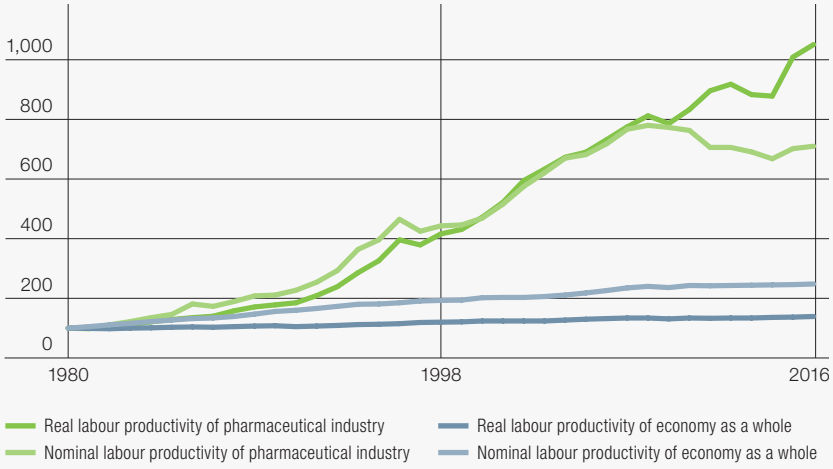
Nominal labour and hourly productivity achieved, 2016



Source: BAK Economics, Polynomics.

Figure 3.2 | Growth of labour productivity

Indexed: 1980 = 100, labour productivity per full-time equivalent, 1980–2016



Source: BAK Economics, Polynomics.

3.2 Growth of labour productivity

When measured against the productivity level of 1980, the real value added per full-time job (FTE) in the pharmaceutical industry in 2016 was around 10.5 times higher. This compares with an increase in labour productivity by a factor of only 1.4 for the economy as a whole over the same period.

The difference in growth is not quite so marked in terms of nominal values, where the price erosion in the pharmaceutical sector makes itself felt. Since the financial crisis, nominal labour productivity has fallen by 1.2 percent a year. In the past two years, however, the situation has stabilized again.

While other industries in the past few years have recovered somewhat in terms of nominal productivity, the pharmaceutical industry shows steadily marked growth over the long term. The nominal productivity index in 2016 stood at 710, i.e. productivity was around 7 times higher than in the baseline year of 1980. The average for the economy as a whole in 2016 shows an index value of about 250.

3.3 Contribution to productivity growth of the economy as a whole

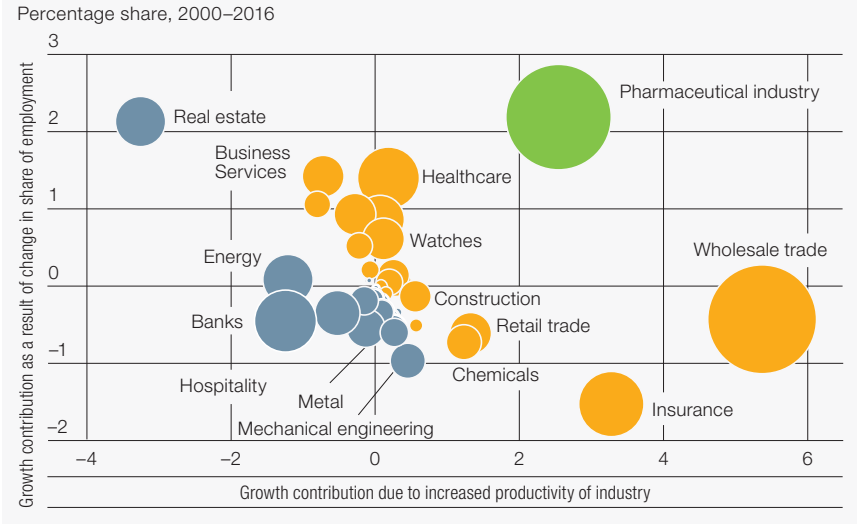
The pharmaceutical industry is the most important driver of Switzerland's industrial growth and through its above-average growth in productivity has also substantially contributed to the productivity increases of the economy as a whole. Thus, around 40 percent of the productivity growth in the economy as a whole between 2000 and 2016 was attributable to productivity increases in the pharmaceutical industry.

This is illustrated by Figure 3.3, in which the size of the circle for each industry represents its contribution to the productivity growth of the economy as a whole. Industries with a positive contribution to growth are orange, while those with a negative contribution are grey. By far the greatest contributions are made by the wholesale trade and the pharmaceutical industry at around 5 percent in each case.

The pharmaceutical industry shows not only a particularly large contribution to growth, but also stands out from other industries by the fact that the productivity growth was also accompanied by an above-average level of job creation at the same time. This aspect becomes clear when the growth contribution is broken down into two different components. Besides the straightforward productivity effect (plotted on the horizontal axis) the change in an industry's share of employment also impacts the productivity growth of the economy as a whole. The latter effect is plotted on the vertical axis.

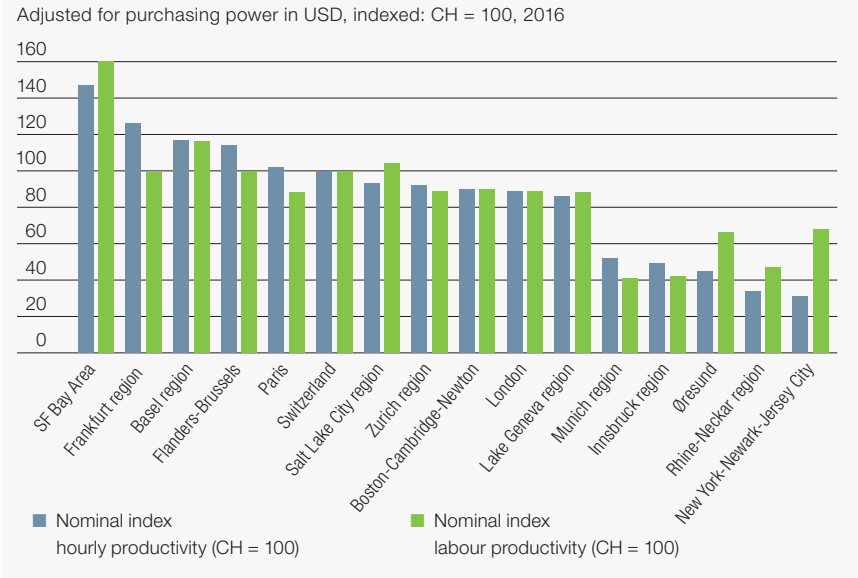
The breakdown of growth contributions clearly shows that a substantial part of productivity growth in the economy as a whole is also due to job creation in the pharmaceutical industry – and more so than in the case of any other industry. This aspect was negative in the wholesale trade, which is dominated by the straightforward productivity effect that came about as a result of the sharp increase in transit trade and was accompanied by a below-average growth of jobs. The difference in the two components is even more striking in the insurance sector, where there was actually a decline in jobs between 2000 and 2016.

Figure 3.3 | Industry contributions to the accumulated real productivity growth of the Swiss economy



Source: BAK Economics, Polynomics.

Figure 3.4 | International comparison of nominal labour productivity and hourly productivity of the pharmaceutical industry



Source: BAK Economics, Polynomics.

3.4 International comparison

Industries are frequently not evenly distributed in a country, but tend to be concentrated in a few locations (so-called clusters). For this reason, viewing an industry at a purely national level often falls short of the mark in an international analysis.

Analyses of the international competitiveness of an industry are therefore not based so much on national average values, because key performance indicators for regional clusters, such as labour productivity, can differ substantially from national averages. Analyses of competitiveness are accordingly performed at the level of regional clusters.

Figure 3.4 shows a comparison of labour productivity for a selection of important international pharma clusters. This comparison is presented as an index in relation to the average Swiss value (index CH = 100) for both labour and hourly productivity. In the case of hourly productivity, the highest value e.g. in the SF Bay Area stands at 147 percent of the Swiss mean value. With an index value of 117, the Basel region (BS, BL) likewise occupies one of the highest positions among the benchmark regions. The regions of Zurich (index value 92) and Lake Geneva (86) occupy the middle rankings in the international comparison.

However, it must be pointed out that the various currencies were converted on the basis of so-called purchasing power parity. If currency exchange rates are used to convert the various currencies instead of purchasing power parity, the results for the Swiss regions look even better.

4 The pharmaceutical sector as export industry

The pharmaceutical industry is an important pillar of Switzerland's export industry. Despite a tendency towards weakening foreign demand for pharmaceutical products as a result of the euro crisis and the lifting of the cap on the Swiss franc, the pharmaceutical sector once again showed itself to be crisis resistant. The industry now accounts for 39 percent of all goods exports. Its export revenue in 2016 amounted to around 80 billion Swiss francs. Around half of export revenue comes from European countries.

4.1 Total exports

The export volume of the pharmaceutical industry achieved a new record level in 2016 at around 80 billion Swiss francs. In the past 20 years, the industry has seen a period of impressive growth and increased nominal annual exports by an average of 9.1 percent (industry as a whole: +4.2%). The non-cyclical nature of the industry ensured that the demand for pharmaceutical products remained stable at the very least even in times of crisis. The weak export performance of 2015 was offset in 2016 by a 14.2 percent growth in nominal exports.

The increasing importance of the pharmaceutical sector to Switzerland's export industry becomes all the more apparent in an assessment of the relative share of exports. While pharmaceutical products accounted for only 18 percent of goods exports in 2000, then proportion of total exports in 2016 stood at 39 percent. The pharmaceutical industry thus remains by far the most important export sector. Watches (9%), machinery (9%) and chemical products (7%) accounted for substantially less of the total export volume in 2016.

4.2 Exports by destination

At an export volume of 40.8 billion Swiss francs, the European Union remained the most important market for pharmaceutical products from Switzerland in 2016, with 51 percent of all pharmaceutical exports being delivered to EU countries. Within the EU, demand in the different markets varies considerably. Of the pharmaceutical exports to the EU, around 30 percent went to Germany, 11 percent to Italy and around 8 percent each to France and Spain. The market in Great Britain grew, accounting for 13 percent of exports to the EU.

In 2016, a slight shift in export destinations was observed away from Europe (–3 percentage points compared with 2014) towards the US (+4 percentage points compared with 2014). Overall, pharmaceutical products worth 16.3 billion Swiss francs were delivered to the US in 2016. The United States is thus the most important single market for Switzerland's pharmaceutical products, accounting for 20 percent of exports. A comparison shows that 2016 three times more pharmaceutical products went overseas in 2016 than in 2007.

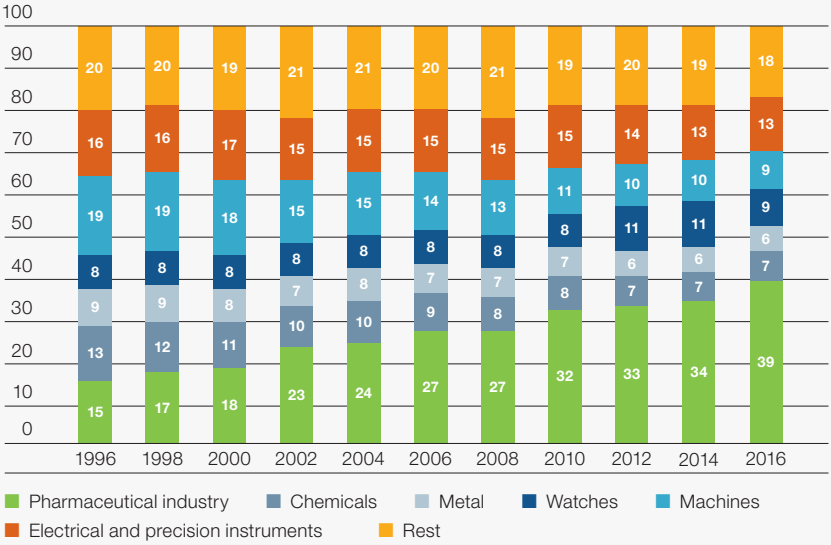
The growing middle classes and demographic changes in the populations of emerging nations have led to a steady increase in pharmaceutical exports to the BRIC states (Brazil, Russia, India and China). While pharmaceutical products worth 443 million Swiss francs were exported to the BRIC states in 1996, the value of exports to these countries in 2016 already stood at 5.9 billion Swiss francs. The principal market here is China, with exports worth 4 billion Swiss francs. Exports to Russia, however, have suffered a slump (–14% compared with 2014).

Exports to Japan increased in 2016 to 3.3 billion Swiss francs. Compared with 2014, this corresponds to an export growth of 32 percent and means that the Japanese market accounts for around a quarter of all exports to Asia.

Figure 4.1 | Exports of selected industries as percentage of total exports

Nominal exports of industries as a proportion of total exports (in percent), 1996–2016

Rounding differences are possible

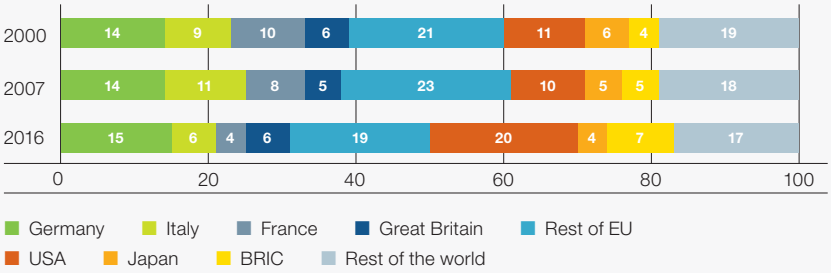


Source: EZV, BAK Economics, Polynomics.

Figure 4.2 | Growth of pharmaceutical exports by destination

Percentage share, 2000–2016

Rounding differences are possible



Source: EZV, BAK Economics, Polynomics.

5 Summary

This study presents the latest results on the importance of Switzerland's pharmaceutical industry to the economy as a whole based on updated figures.

Growing importance for the job market

In 2016, around 45,500 people were employed by Switzerland's pharmaceutical companies. In terms of full-time equivalents, this corresponds to around 43,000 jobs. In the past 20 years, the number of jobs has more than doubled. In the past ten years alone, more than 12,000 new jobs have been created. In the remaining industrial sectors, around 16,500 jobs in total were lost over the same period. The pharmaceutical industry is thus becoming an evermore important employer for Switzerland.

Productivity as prerequisite for competitiveness and financial muscle

Important success factors within the industry are a high level of capitalization, a workforce with an above-average level of qualifications, an intensive degree of innovation and a high degree of production efficiency. The associated high level of performance and competitiveness is reflected, for example, in labour productivity. In the pharmaceutical industry, 350 francs is earned per hour, which means that the value added generated is 4.3 times higher than the average for the economy as a whole. And the pharmaceutical industry here also shows top levels of productivity when compared with the industry in other countries. Not only is the high value added per job a prerequisite for the high levels of financial investment that pharmaceutical companies have to make to remain competitive. But the high level of productivity also allows an above-average level of pay.

The pharmaceutical industry is a key driver of Switzerland's export industry. Despite a difficult economic environment, Switzerland's pharmaceutical industry managed to grow its global sales further in the past few years to around 80 billion Swiss francs in 2016. This makes the pharmaceutical sector the key driver of Switzerland's export industry. This is reflected in its 39 percent share of the total export revenue earned by Swiss industry or a 25 percent share of the total industrial value added. Around three-quarters of industrial growth in the past decade is attributable to the pharmaceutical industry. With a real value-added growth of 7.2 percent per year on average, the sector has also contributed significantly to the growth of GDP in the past decade.

Table 5.1 | Direct importance of the pharmaceutical industry 1995 to 2016

	1995	2000	2005	2010	2014	2016
Employees						
Persons	20,017	26,090	30,961	36,453	43,784	45,524
in % of overall economy	0.5	0.6	0.7	0.8	0.9	0.9
Full-time positions (FTE)	19,143	24,735	29,268	34,491	41,624	43,168
in % of overall economy	0.6	0.7	0.8	0.9	1.0	1.1
Nominal value added						
in CHF millions	7,128	10,916	18,785	24,764	26,170	28,864
in % of overall economy	1.8	2.5	3.8	4.2	4.2	4.5
Productivity						
in CHF per employee (FTE)	372,340	441,305	641,816	717,981	628,736	668,639
Economy as a whole	116,071	129,277	139,495	155,394	156,930	158,765
in CHF per hour	182	217	318	373	340	350
Economy as a whole	58	64	70	81	83	81
Exports*						
in CHF millions	14,102	21,976	39,689	60,564	70,658	80,185
in % of overall economy	15.3	17.8	25.8	31.8	34.5	38.7

Source: BAK Economics, Polynomics, FSO.

*Data only as from 1996; FTE: full-time equivalent

Table 5.2 | Direct and indirect importance of the pharmaceutical industry 2016

		Direct	Indirect	Total	Multiplier
Gross value added	million CHF	28,864	20,749	49,613	1.7
	in % of economy as a whole	4.5	3.2	7.8	
Employees	number of persons	45,524	180,575	226,099	5.0
	in % of economy as a whole	0.9	3.5	4.4	
Employees (FTE)	number of persons	43,168	138,271	181,439	4.2
	in % of economy as a whole	1.1	3.4	4.5	
Hours worked	million hours	82	273	356	4.3
	in % of economy as a whole	1.0	3.5	4.5	
Gross wages and salaries	million CHF	5,982	12,932	18,914	3.2
	in % of economy as a whole	1.6	3.5	5.1	

Source: BAK Economics, Polynomics, FSO.

Access to markets and competitive corporate taxation are essential

The high degree interdependence in foreign trade shows that Switzerland's pharmaceutical industry is very heavily reliant on access to international sales, procurement and labour markets. A substantial proportion of employees come from neighbouring European countries. The freedom of movement in Europe is therefore key to the pharmaceutical industry in Switzerland. Besides access to markets, a competitive corporate taxation system also plays a fundamental role for the longer-term development of Switzerland as a pharmaceutical hub.

Compensation for price reductions through increased sales volumes and efficiency

The pharmaceutical industry has been facing strong pressure on producer and consumer prices since 2010, which has a correspondingly negative impact on the nominal value added. The marked appreciation of the Swiss franc in 2015 reinforced this development and led directly to a fall in the profit margin for Switzerland's pharmaceutical companies, because currency fluctuations are directly reflected in the value of sales for medicines with administered prices. This effect could be offset by the continuing strong growth of sales volumes and improvements in efficiency.

In 2016, the gross value added reached a value of 28.9 billion Swiss francs. This corresponds to a 4.5 percent share of the value added for the economy as a whole and 25 percent of industrial value added.

Macroeconomic impact analysis shows substantial importance for other sectors

For the manufacture of its products, the pharmaceutical industry needs not only labour and capital as input factors, but also preliminary goods and services from other sectors. The demand from the pharmaceutical industry for these goods and services creates jobs in these sectors (and with other providers, etc.). In addition, the retail trade and local businesses benefit from the consumer spending of employees of the pharmaceutical companies. An impact analysis was conducted in which all relevant payment streams generated by the economic activity of the pharmaceutical industry were analysed and quantified in a vertical integration across the entire value chain.

With regard to the number of jobs (full-time equivalents or FTEs), model calculations arrive at a multiplier of 4.2, i.e., for every job in the pharmaceutical industry an additional 3.2 FTEs are created in companies from other sectors that benefit indirectly from the production and research activities of the pharmaceutical industry. So aside from the approximately 43,000 jobs in the pharmaceutical industry in 2016, an additional 138,000 or so jobs at companies in other sectors were dependent on pharmaceutical companies. These additional jobs were associated with a payroll sum of around 12.9 billion Swiss francs in 2016. This means that, for every 1,000 francs of pay in the pharmaceutical industry, an average of around 2,200 Swiss francs in pay was distributed among employees from companies in other sectors.

For the gross value added, a multiplier of 1.7 is calculated. This means that, for every Swiss franc of value added in the pharmaceutical industry, another 70 cents of value added was generated in other sectors of Switzerland's industry. Overall, Swiss companies from other sectors benefit from the production and research activities of the pharmaceutical industry with a value added of more than 20.7 billion francs. The total direct and indirect contribution to the value added stood at 49.6 billion francs in 2016. This corresponds to 7.8 percent of gross value added for the economy as a whole.

Literature

Archstone Consulting Economic Impact of the Biopharmaceutical Sector on New York State [report]. – Stamford, CT: Archstone Consulting, 2009b.

Archstone Consulting The Biopharmaceutical Sector's Impact on the U.S. Economy [report]. – Stamford, CT: Archstone Consulting, 2009a.

Battelle Technology Partnership Practice The U.S. Biopharmaceuticals Sector: Economic Contribution to the Nation [report]. – [s.l.]: Pharmaceutical Research and Manufacturers of America (PhRMA), 2011.

Battelle Technology Partnership Practice The Economic Impact of the U.S. Biopharmaceutical Industry [report]. – [s.l.]: Pharmaceutical Research and Manufacturers of America (PhRMA), 2013.

Bundesrat «Bericht über die zentralen Rahmenbedingungen für die digitale Wirtschaft». – Bern, 2017.

Ewen Peters Associates Contribution of Pharma-Related Business Activity to the Scottish Economy [report]. – Edinburgh: Association of the British Pharmaceutical Industry (ABPI), 2006.

Huwiler U.J. «Arbeiten in der Wolke – wohin führt die Flexibilisierung der Arbeitswelt?» In: Volkswirtschaft(3): 68–71, 2017.

McKinsey https://public.tableau.com/profile/mckinsey.analytics#!/vizhome/InternationalAutomation/WhereMachinesCanReplaceHumans, page viewed in June 2017.

Milken Institute Biopharmaceutical Industry Contributions to State and U.S. Economics [report]. – Santa Monica, CA: Milken Institute, 2004.

Nora A. [et al.] The Economic Footprint of Selected Pharmaceutical Companies in Europe [report]. – Berlin: WifOR Berlin, 2016.

Nusser M. and Tischendorf A. Innovative Pharmaindustrie als Chance für den Wirtschaftsstandort Deutschland [report]. – [s.l.]: Fraunhofer-Institut für System- und Innovationsforschung, und A.T. Kearney, Studie im Auftrag von PhRMA (Pharmaceutical Research and Manufacturers of America), dem Branchenverband der forschenden Pharmaindustrie in den USA und der deutschen LAWG, 2006.

Pavel F. [et al.] Ökonomischer Fussabdruck von Novartis Deutschland: Die Bedeutung von Novartis für den Wirtschafts- und Wissenschaftsstandort Deutschland [report]. – 2015: Politikberatung kompakt 94, Deutsches Institut für Wirtschaftsforschung (DIW), 2015.

Polynomics Wirkung des Breitbandausbaus auf Arbeitsplätze und die deutsche Volkswirtschaft [report]. – New York, Olten: [s.n.], 2009.

TEConomy The Economic Impact of the U.S. Biopharmaceutical Industry: National and State Estimates [report]. – Ohio: TEConomy Partners LLC, 2016.

Vaterlaus, S., Zenhäusern, P. «Digitalisierung und Arbeitsmarktfolgen – Metastudie zum Stand der Literatur und zu den Entwicklungen in der Schweiz», Studie im Auftrag der Fondation CH2048, Polynomics. Olten, 2017.

Weiss J.-P., Raab S. and Schintke J. Demand for Pharmaceuticals – Impact on Production and Employment in Nearly Every Sector of the Economy [report]. – Berlin: Politikberatung kompakt 4, Deutsches Institut für Wirtschaftsforschung (DIW), 2005.

Weiss J.-P., Raab S. and Schintke J. Die pharmazeutische Industrie im gesamtwirtschaftlichen Kontext: Ausstrahlung auf Produktion und Beschäftigung in den Zulieferbranchen [report]. – Berlin: Politikberatung kompakt in Weekly Report 6/2005, Deutsches Institut für Wirtschaftsforschung (DIW), 2004.

Zenhäuser P. and Vaterlaus S. Digitalisierung und Arbeitsmarktfolgen: Metastudie zum Stand der Literatur und zu den Entwicklungen in der Schweiz [report]. – Luzern: Polynomics AG, 2017

7 Annex

7.1 Concept of impact analysis

7.1.1 The basic idea

The basic idea behind 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 virtual vertical integration along the entire value chain, from procurement through production to the sale of goods.

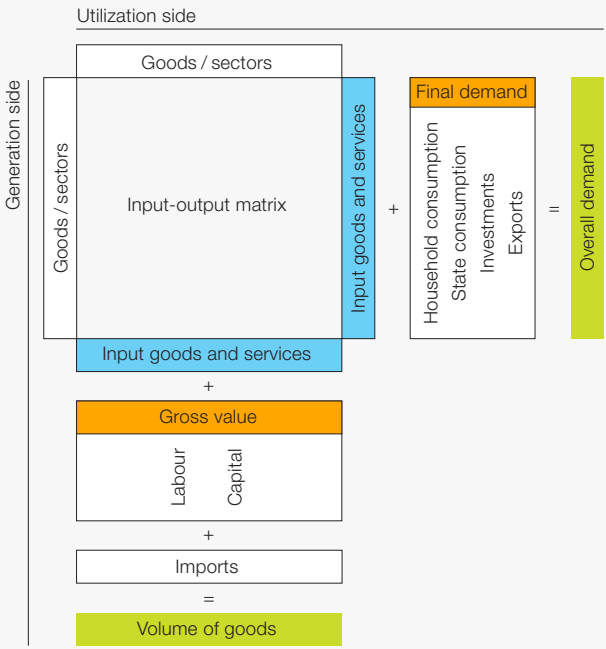
7.1.2 Impact levels

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, the various secondary effects arise, and these 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 an analysis and quantification of the overall economic effects that arise as a consequence of the various secondary effects.

In this impact analysis it is now 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 as a result of the various business relations of companies. For example, the production of medicines requires machinery, semi-finished goods and electricity, which 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 takes into account 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, etc. The value-added effects become smaller in each additional "round". Using the impact model, the thought experiment can be mathematically solved and all the effects that arise from the secondary effects can be quantified.

Figure 7.1 | Schematic representation of an input-output table



Source: BAK Economics.

7.1.3 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 capture of the economy that illustrates how industries are intertwined and consumer demand, domestic production and goods imports are interrelated (see Fig. 7.1). The use of services and goods manufactured in the given industries are 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) model. The classical 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.

In the extended IO model (type II), the (partial) endogenization 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").

Use of the extended type II model is often criticized, because the causal link of the induced income effect with the primary impulse is much looser than that of the indirect effect. 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).

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

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 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.

On the basis of 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. 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 taking into account only the consumer spending of employees in the pharmaceutical industry. A further restriction of the model takes into account opportunistic income and excludes from the analysis corresponding exogenous consumer spending that is unrelated to employment in the pharmaceutical industry, as well as spending abroad. 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.

7.2 Pharma multipliers compared with other countries

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

For the United States there is a study by Battelle Technology Partnership Practice (2011). They calculate both indirect and induced effects based on the input-output matrix of 2009. The value-added multipliers stand at 2.1 (type I) and 3.3 (type II), respectively. The multipliers for employment are much higher than those for value added at 3.1 for indirect effects and 5.9 for induced effects. As in Switzerland, the above-average labour productivity probably plays a decisive role here. The study update from 2013 is based on lower multipliers both for value added and for employment. The type I multipliers stand at 1.6 for value added and 2.3 for employment, while the type II multipliers stand at 2.4 and 4.1, respectively.

In their analysis, The Biopharmaceutical Sector's Impact on the U.S. Economy, the authors of Archstone Consulting (2009a) describe the multipliers for 2006. They arrive at an induced multiplier of 3.3 for the gross value added and 4.7 for employment. If the induced effects are disregarded and only the indirect effects are counted, much lower multipliers are obtained, namely 2.0 for real value added and 2.5 for the number of people in employment.

Aside from the national importance of the biopharmaceutical industry, Archstone Consulting (2009b) also calculated its importance for the regional economy of New York State in 2006. The multipliers are lower than those for the US economy as a whole both for employment (type I: 1.7; type II: 2.4) and for value added (type I: 1.5; type II: 1.8).

The analysis by the Milken Institute (2004), Biopharmaceutical Industry Contributions to State and U.S. Economics, arrived at multipliers with and without induced effects of 2.7 and 2.1 for gross value added and 4.5 and 3.0 for employment in 2003.

The report by TEConomy (2016), The Economic Impact of the U.S. Biopharmaceutical Industry, shows value-added multipliers of 1.7 (type I) and 2.4 (type II) in 2014. These multipliers for employment are expectedly higher at 3.0 and 5.2.

In Scotland, the study by Ewen Peters Associates (2006), Contribution of Pharma-Related Business Activity to the Scottish Economy, which was commissioned by the Association of the British Pharmaceutical Industry (ABPI), likewise considered the direct, indirect and induced effects. The study is based on an input-output table for 2003 and shows a type III multiplier of 1.6 both for value added and for employment.

In Germany, the multiplier values, including induced effects according to calculations by Polynomics (2009) based on the input-output table published for 2005, run to 2.1 for value added and 3.0 for employment. The value-added multiplier is still 1.5 when induced effects are disregarded. For the employment multiplier, a value of 1.8 is obtained when induced effects are disregarded.

Nusser and Tischendorf (2006) arrive at multipliers of 1.6 (type I) and 2.3 (type II) for employment based on the input-output matrix of 2003. The study by Weiss et al. (2004), *Die pharmazeutische Industrie im gesamtwirtschaftlichen Kontext: Ausstrahlung auf Produktion und Beschäftigung in den Zulieferbranchen* (The pharmaceutical industry in the overall economic context: impact on production and employment in the supplier sectors) focused only on the direct and indirect effects of the pharmaceutical industry.

The update of this study in 2005 (Weiss et al., 2005), which is based on adjusted employment figures, identifies a value-added multiplier of 1.7 for 1995 and 1.8 for both 2000 and 2002. In the case of the employment multiplier, Weiss et al. (2004, 2005) arrive at a value of 1.9 for 1995 and 2000 and 2.0 for 2002. In a company-specific study, Pavel et al. (2015) found a value-added multiplier (type II) of 3.1 and an employee multiplier of 4.8 for Novartis in Germany. This study also considers the multipliers of Novartis at regional level.

The study by Nora et al. (2016), which was commissioned by the European pharmaceutical industry association, shows value-added multipliers of 1.8 (type I) and 2.3 (type II) for 2014. The much higher employment multipliers of 3.6 and 5.7 also indicate a very high labour productivity of the pharmaceutical industry in the EU.

Ranking of multipliers for Switzerland's pharmaceutical industry

The multipliers calculated for Switzerland's pharmaceutical industry can be ranked as average overall in terms of value added (type I). Compared with the US studies, the Swiss pharma multiplier lies at the lower end of the scale. This is mainly due to the scope of the studies: in view of the smaller scope (e.g. Switzerland vs US) there is a greater outflow of funds abroad through the demand for preliminary goods and services. This correlation is also apparent in the two studies by Archstone Consulting, in which the multipliers for the biopharmaceutical industry were calculated both for the USA and for the regional economy of New York State: the regional multipliers were much lower.

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 additional jobs are dependent on a pharma job in Switzerland than abroad.

Table 7.1 | Overview of international impact analyses of the pharmaceutical industry

Country/authors	Variable	Year	Type I	Type II
USA				
Milken Institute (2004)	Value added	2003	2.1	2.7
	Employment		3.0	4.5
Archstone Consulting (2009a)	Value added	2006	2.0	3.3
	Employment		2.5	4.7
Archstone Consulting (2009b) New York State	Value added	2006	1.5	1.8
	Employment		1.7	2.4
Battelle Technology Partnership Practice (2011)	Value added	2009	2.1	3.3
	Employment		3.1	5.9
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
Scotland				
Ewen Peters Associates (2006)	Value added	2003	—	1.6
	Employment		—	1.6
Germany				
Weiss et al. (2004)	Value added	1995	1.7	—
	Employment		1.9	—
	Value added	2000	1.8	—
	Employment		1.9	—
Weiss et al. (2005)	Value added	2002	1.8	—
	Employment		2.0	—
Nusser and Tischendorf (2006)	Value added	2003	—	—
	Employment		1.6	2.3
Polynomics (2009)	Value added	2005	1.5	2.1
	Employment		1.8	3.0
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

Source: BAK Economics, Polynomics.

Type I: Consideration of immediate effects on steps upstream and downstream of value added (direct and indirect effects)

Type II: Additional consideration of income effects feeding back in (direct, indirect and induced effects)

Tables

Figures

Interpharma
Petersgraben 35, P.O. Box
CH-4009 Basel
Phone +41 (0)61 264 34 00
Fax +41 (0)61 264 34 01
info@interpharma.ch
www.interpharma.ch