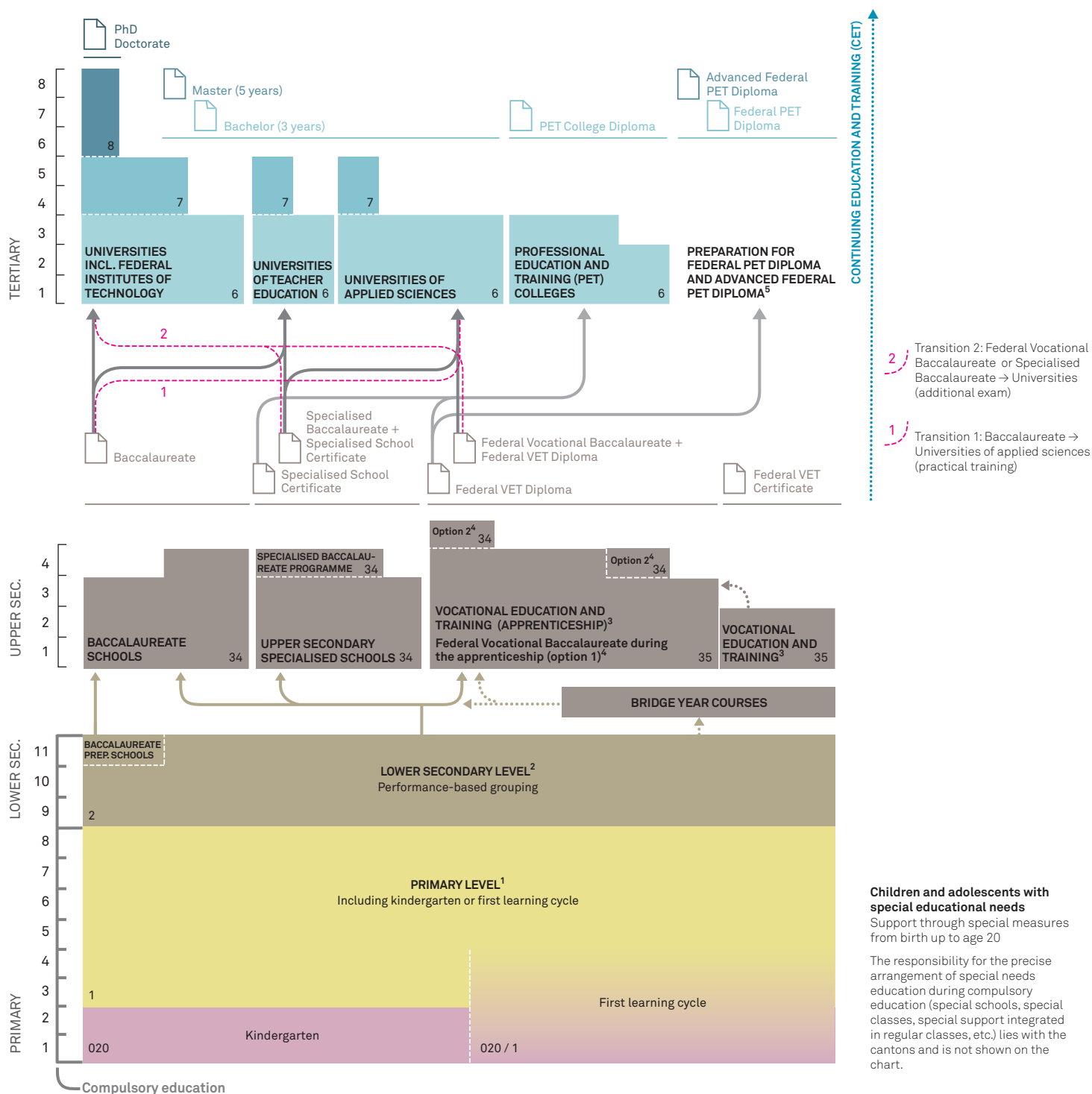


Swiss Education Report | 2018



THE SWISS EDUCATION SYSTEM



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ISCED | International Standard Classification of Education 2011

- ISCED 8
- ISCED 7
- ISCED 6
- ISCED 4
- ISCED 34 + 35
- ISCED 2
- ISCED 1
- ISCED 020

¹ Two years of kindergarten or the first two years of a first learning cycle: included in compulsory education in the majority of cantons

² Lower secondary level: 4-year scuola media in the Canton of Ticino (pursuant to exception clause in Art. 6 HarmoS Agreement)

³ Vocational education and training (apprenticeship): training company + VET school + intercompany courses; full-time school education possible

⁴ Federal Vocational Baccalaureate: combined with an apprenticeship (option 1) or after an apprenticeship (option 2); duration option 2: full-time 1 year, part-time 1.5 – 2 years

⁵ Federal PET examination / Federal PET diploma = ISCED 6
Advanced federal PET examination / Advanced federal PET diploma = ISCED 7

Swiss Education Report | 2018

Aarau, 2018

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Foreword by the report commissioners

You are holding the third issue of the Swiss Education Report in your hands. This reference work on education in Switzerland provides a compact and up-to-date overview of our education system. It is organised according to educational level and considers the aspects of effectiveness, efficiency and equity.

A REFERENCE WORK ON EDUCATION IN SWITZERLAND | First published in 2010, the Education Report has become well established and is now an important reference work for many players in the world of education. It answers numerous questions and at the same time highlights the areas in which we lack reliable knowledge. What do we know about the impact of class size on pupils' performance? How high is the drop-out rate at universities and do we know why students break off their studies? What is the link between educational careers and the skills tested by PISA? What educational returns do the various study courses offer?

DECISION-MAKING ON THE BASIS OF RELIABLE KNOWLEDGE | People making education policy decisions or involved in quality development need access to reliable knowledge. There is a plethora of studies and research results out there. New reports appear on an almost daily basis, which the media love to pounce on and chatter about. However, education policy-makers and players in education need reliably and expertly presented research results. The results that prove to be relevant and reliable are drawn together by the Education Report. It is addressed at anyone with an interest in educational issues, whether in the communes or cantons, or at intercantonal, national or international level.

THE KEY PRODUCT IN EDUCATION MONITORING | The Federal Constitution requires the Confederation and the cantons, within the scope of their constitutionally assigned powers, to jointly ensure the high quality and accessibility of the Swiss Education Area. A system of education monitoring has been built up in order to fulfil this mandate. This instrument forms the basis for developing education, funding and advisory offerings; reinforcing cooperation among educational players; examining the processes at work at transitions in education; ensuring the permeability of the education system; and maintaining the systematic nature of qualifications and the connectivity between them.

FURTHER DEVELOPING OBJECTIVES IN EDUCATION POLICY | The information compiled in the Education Report allows us to make a more reliable assessment of the quality and permeability of the education system than was the case in 2010. It provides the Confederation and the cantons with a basis for assessing the impact of measures and the extent to which their jointly formulated policy objectives have been achieved, and for developing these measures and objectives further. It also creates a picture of the quality of the data available in the various fields and at the various levels of the education system. Information gaps make it difficult to make sound assessments or plan measures; this report helps to identify such gaps, and further studies will help to close them.

DIGITALISATION CREATES NEW OPPORTUNITIES | The Education Report does more than provide a statement of account for the Swiss education system. It spurs us to think about future developments: data acquisition and data analysis, for example. Digitalisation, that much-discussed topic, offers many ways of en-

riching education reporting. It gives access to ever greater amounts of information, which can be linked intelligently, allowing us to better describe and understand the quality and permeability of the education system in Switzerland. This creates considerable scope for improving the quality of the system.

MUCH ACHIEVED; THE CHALLENGES AHEAD | Looking back at eight years of education reporting in Switzerland, it is clear that we have managed to obtain systematically prepared and reliable information for many areas of the system. This information is used to develop quality, plan measures and draw up strategic objectives. One of the challenges ahead is to improve the usability of increasing amounts of data, so that causal relations can be better understood and further insight gained into the education system.

We would like to thank everyone who was involved in compiling this comprehensive report.

Bern, June 2018
Education Monitoring Switzerland

For the report commissioners

Susanne Hardmeier
Secretary General
Swiss Conference of Cantonal
Ministers of Education

Mauro Dell'Ambrogio
State Secretary
State Secretariat for Education,
Research and Innovation

Introduction

Structure and aim of the Report

The 2018 Education Report has been structured in the same way as the 2010 and 2014 versions. All education levels and education types are described in dedicated chapters based on the available administrative information, statistics and research. The individual chapters on each level and type also include analysis of exogenous factors that impact on education, as well as analysis of the outcomes. These refer to the effects of education on the individual and on society as a whole from a biographical or longer-term perspective.

The chapters on compulsory education, upper-secondary education and tertiary-level education cover topics that span different education types. Such topics are either relevant to all education types or can be used for the purposes of a comparative perspective in which the various types are compared and contrasted. As in the earlier reports, the chapters on education types, with the exception of the chapters dedicated to upper-secondary specialised schools and tertiary-level education, are divided into the same five sections. The «Context» section describes those factors that arise outside of the education system and have a specific impact on the education type concerned. Such factors include, for example, pupil or student forecasts specific to a particular level or type. The «Institutions» section describes the key institutional parameters applicable to the respective education type. Particularly for those education types for which most or all of the responsibility lies with the cantons, common features across the various cantons and differences between them are considered in greater detail, these being critical to the interpretation of different educational outcomes from one canton to another. The final three sections cover the «Effectiveness», «Efficiency» and «Equity» of the education type. Effectiveness relates to the extent to which the aims of education, as stipulated in education policy, are actually achieved. Generally, this involves the particular competencies that pupils will be expected to have achieved upon completion of the corresponding education level. Analysis of efficiency considers the monetary and non-monetary resources, such as time, in relation to the performance of the education type. Meanwhile, the sections on equity examine the extent to which educational attainment is influenced by pupils' origin and gender. The underlying expectation is not that all pupils should achieve the same results but that all learners should have the same opportunity to exploit their individual potential to the full regardless of their background.

Effectiveness, efficiency and equity can only be evaluated to a limited extent given the incomplete nature of the statistical information and lack of research evidence. Consequently, it is the aim of the Education Report to delve into those questions that cannot be answered or can only be answered insufficiently on the basis of the available findings in just as much detail as those questions that can be answered. The 2018 Swiss Education Report raises more than 500 relevant education-related questions, presents the current knowledge, as in the earlier reports, and provides information on any gaps in that knowledge.



General context of the Swiss education system

Introduction

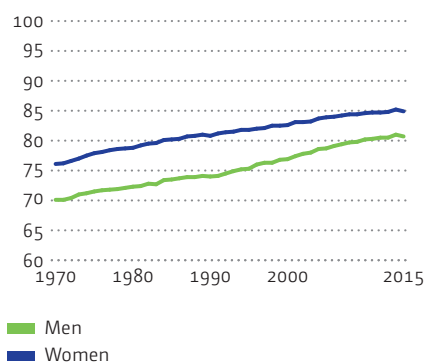
This chapter provides an overview of three groups of factors with a direct or indirect impact on all or part of the Swiss education system. The first of these is demographics, which affects not only the number of people passing through the school system but also the number of people who are in gainful employment and thereby paying the taxes that finance education. Secondly, the focus will be on factors relevant to social developments such as family structures or the behaviour of children and young people outside school. This information helps to understand the wider context of the needs and requirements of the children and young people in Swiss schools, which the education system needs to cater for. Thirdly, a series of economic factors will be analysed, including economic growth and public debt, which determine the scope for investment in education and, at the same time, define the economic opportunities facing more or less well trained workers. Particular attention will be paid to the impact of automation and digitalisation on demand for skills, as technological changes and potential combine to define many of the requirements made of a forward-looking education system.

Demographics

Demographic trends are one of the most important factors affecting the education system. While cyclical fluctuations in the number of students can generally be accommodated by adjusting class sizes accordingly, long-term demographic changes need to be tackled by expanding or reducing the education places on offer. Since demographic changes affect the individual school levels and school types differently and at different points in time, these changes will also be analysed in greater detail in the following chapters.

1 Life expectancy of women and men, 1970–2015

Data: FSO



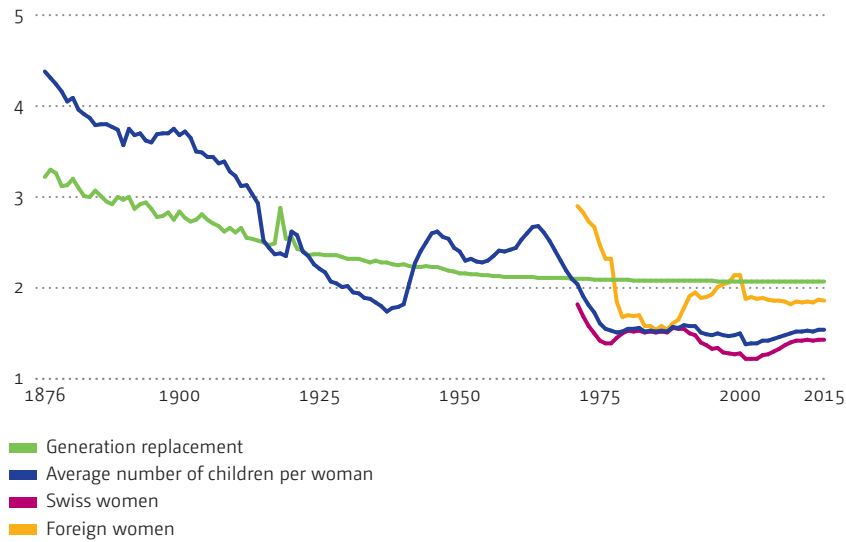
Dynamic population growth

Switzerland's population has almost tripled in size since the start of the 20th century, growing from 3.28 million in 1900 to 8.33 million by 2016. Population growth is driven by birth rates and immigration on the one hand, countered by deaths and emigration on the other. If there are more births than deaths in a given year, a birth surplus is recorded, while the balance of the immigration and emigration figures gives the net migration figure.

The birth surplus has been dominated by two opposing processes over recent decades. On the one hand, increasing life expectancy has had a positive impact (→ Figure 1), while the falling birth rate has had a negative effect. The average number of children born to each woman of child-bearing age fell almost continuously in the 100 years leading up to 2001 (→ Figure 2), before stabilising again in that year. The number of children needed for generation replacement has fallen over the past hundred years as a result of rising life expectancy. However, at just over 2 children per woman, the figure is still higher than the birth rate. This difference is not, however, resulting in a declining population as net migration is more than offsetting the shortfall.

2 Development of the fertility rate and generation replacement, 1876–2015

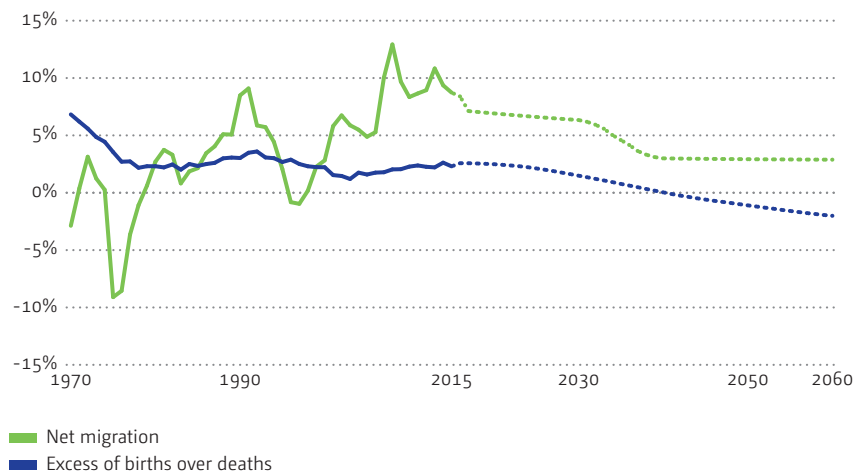
Data: FSO



The population scenarios prepared by the Federal Statistical Office (FSO) assume that while net migration will fall (→ Figure 3) it will remain positive up until the end of the forecast period in 2060, thereby also compensating for the predicted negative birth surplus after 2040.

3 Population development 1971–2060

Data: FSO, forecasts 2015–2060 according to the medium-growth scenario, per 1000 inhabitants

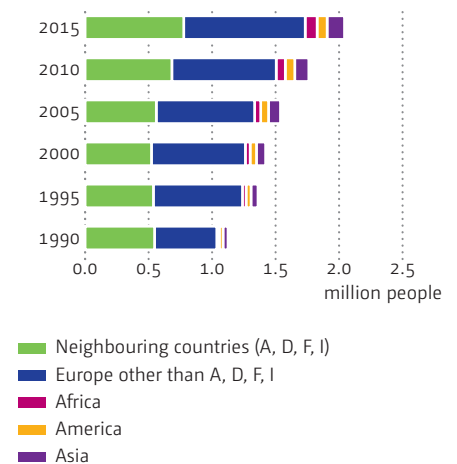


Migration: strong growth since the turn of the millennium

Since measures were introduced to liberalise labour migration from the mid-1990s onwards, and since the introduction of the freedom of movement with the European Union (EU) in 2002, the number of foreign nationals living in Switzerland has practically doubled (→ Figure 4). Out of the 8.4 million living in Switzerland (2016), approximately 2.1 million were foreign nationals. The proportion of foreign nationals has risen from 16.7% (1990) to 25% (2016). While it was primarily people from neighbouring European

4 Foreign residents in Switzerland by nationality, 1990–2015

Data: FSO



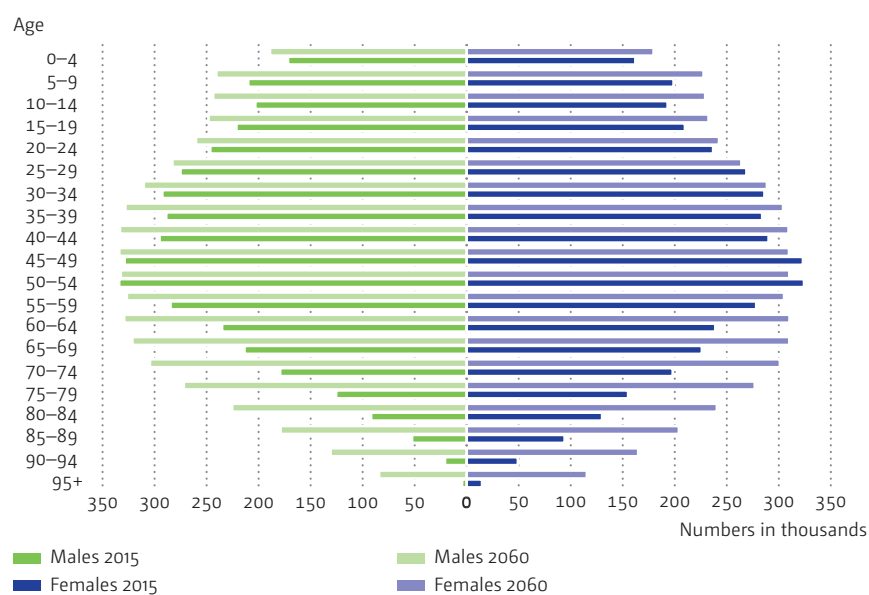
states who migrated to Switzerland in the 1990s, it was only from 2005 onwards that the number of foreign nationals from neighbouring countries rose significantly. Most immigrants came from Italy and Germany, accounting for 300 000 people each. The number of people migrating to Switzerland from outside of Europe has developed even more dynamically than the number of people from within Europe, despite the freedom of movement with the EU. In 1990 the proportion of foreign residents who had migrated from non-European countries was still around the 7.9% mark. By 2015 it had almost doubled to reach 15.1%.

From the age pyramid to the «age balloon»

By the year 2060 the age distribution of the population will differ markedly from the current situation in two respects (→ Figure 5). For both genders, the proportion of under-40s as well as the proportion of over-80s will increase significantly. The age pyramid so typical in all countries a hundred years ago has changed shape over recent decades and is starting to resemble a balloon instead, i.e. the majority of the population is between 30 and 60-years-old. In future both the base of the pyramid, i.e. the youngest cohorts, and the tip of the pyramid comprising the oldest people will expand more strongly, creating a polarised age structure.

5 Age distribution 2015 and 2060 by gender

Data: FSO



Concentration of young population in the centre of the country

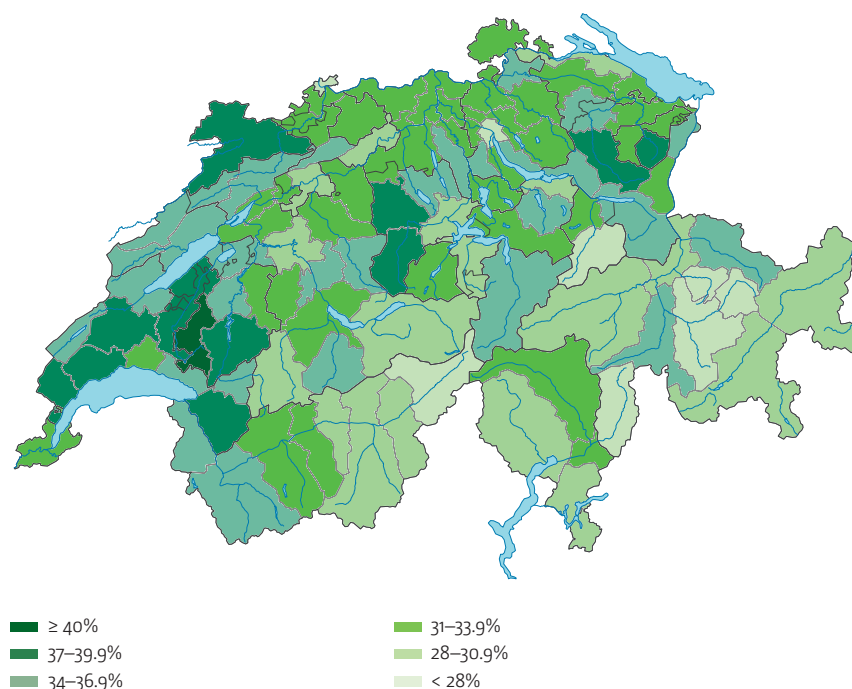
Switzerland's young people are very unevenly distributed across the country's cantons and regions, with marked differences between the cantons as well as uneven distributions within individual cantons. The youth quotient (→ Figure 6), i.e. the proportion of people aged under 20 relative to the working-age population (aged 20 to 64), provides an indication of the financial burden to be borne by the working population in relation to the school-age

population (up to and including upper-secondary education). On average, there are approximately three people of working age for every young person below the age of 20, most of whom are still in education or training.

6 Youth quotient by region, 2015

Proportion of those aged under 20 relative to the population aged 20 to 64

Data: FSO; map: Swisstopo

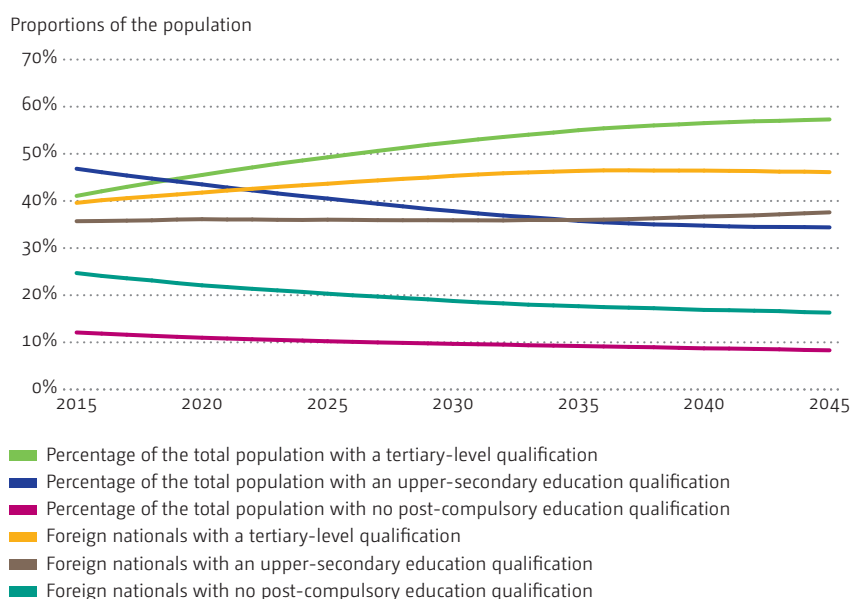


Dynamic growth in tertiary sector starting to tail off

In its scenarios on the development of the population's education level, the FSO assumes, firstly, that the proportion of people with no post-compulsory education qualification will only fall slightly (→ Figure 7). Although the older cohorts, among whom a higher proportion has no post-compulsory education qualification, will be replaced by younger cohorts, the overall rate will only fall slowly given that the younger cohorts are currently recording qualification rates at upper-secondary education level that are not much higher than 90%. Secondly, the education scenarios assume that the tertiarisation process that began twenty years ago will persist, albeit less dynamically. By 2045 around 60% of the population should have a tertiary qualification. In contrast, only around one third of the population will hold education qualifications at «just» upper-secondary education level as their highest qualification. The FSO is also assuming, as in the past, that this tertiarisation will mainly take place in Switzerland. In other words, it will not be the result of people with tertiary training migrating to Switzerland from elsewhere.

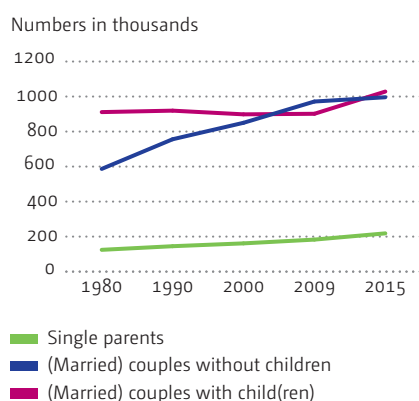
7 Education level of the population by nationality, scenarios up to 2045

Data FSO, reference scenario 25 to 64-year-olds



8 Composition of family households by household type, 1980–2015

Data: FSO



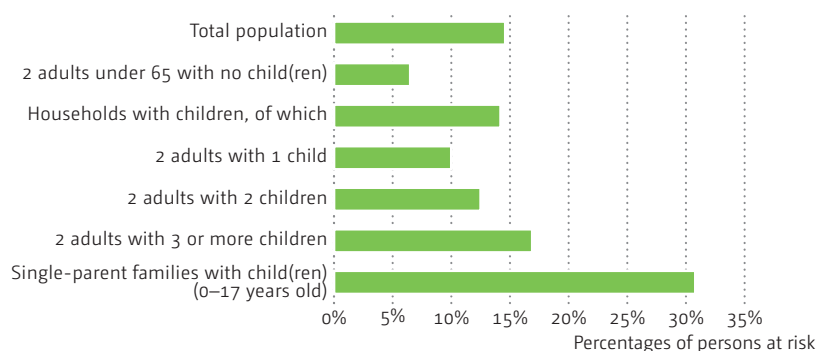
Family and living structures

The classic family with two parents or a single parent and one or more children has been accounting for an ever smaller proportion of family households in Switzerland since the 1980s. Only around half of these households still comprise a couple or a single parent with one or more children (→ Figure 8). However, for the first time in 35 years, there is a new trend emerging in relation to (married) couples with children: the number of such households has grown by 14% since 2009. At a lower level, the number of family households with a single parent is also growing steadily (+20% compared with 2009). By comparison, the level of growth in (married) couples without children is small (+2% compared with 2009). The low level of growth in households comprising a couple without children can be partly explained by the latest baby boom.

The size and composition of families influence the probability of being at risk of poverty and therefore have a direct effect on the children and young people's life situation. Families with many children are generally at greater risk of poverty than households made up of couples without children or families with just one child. Around 15% of all family households in Switzerland are at risk of poverty (→ Figure 9), while adults of working age without children are only half as likely to be at risk (7%). For single-parent families with children, the probability of being at risk of poverty is twice as high, at 31%, as it is for family households with children. The older the youngest child in the family, the lower the risk of poverty. This can be attributed to the fact that there will be fewer children living in the household and the parents themselves being older and therefore tending to have a higher income. Conversely, this also means that the younger the children, the higher the likelihood of them growing up in a household that is at risk of poverty, which in turn means that it is primarily state schools that are confronted with the phenomenon of poverty (FSO, 2016a).

9 Risk of poverty by household type, 2015

Data: FSO; the at-risk-of-poverty figure at under 60% of the median equivalised income



The **poverty rate** is strongly dependent on the definition of poverty. According to the EU definition, the at-risk-of-poverty threshold is set at under 60% of the median income. However, if the threshold were to be set at 50% of median income, the rate would only be half as high.

Young people of school age

The following sections deal with aspects of juvenile behaviour and the characteristics of young people as external framework conditions for the education system. Particular attention will be paid to various aspects that are assumed to be linked with school attainment or for which a link has already been empirically proven. These include general health, involvement in sporting activities and substance use by today's children and young people, private use of the internet and various forms of deviant behaviour such as delinquency or drug use. The potential impact of education on health or criminality will be dealt with in *chapter Cumulative effects*, page 295.

Health

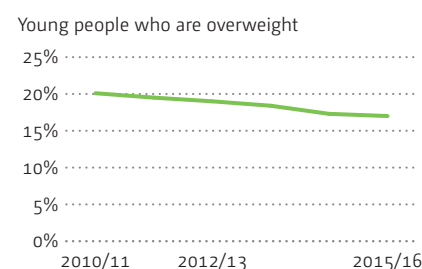
Using three different factors, the health of pupils in Switzerland will now be considered using examples. It is generally assumed that these factors, namely body weight, physical fitness and physical disabilities, impact on school attainment or on motivation levels.

While international studies show a positive correlation between being overweight and performing poorly at school (*Bustillo, Ocampo Eguigurems, Melendez et al., 2016; Johnston, Moreno, Chen et al., 2014*), most studies find that there is no causal link between the two aspects and that, actually, they are caused much more by external variables that impact on both weight and school attainment at the same time (see for example *Martin, Booth, McGeown et al., 2017; Helbig & Jähnen, 2013*).

The data on obese and overweight students obtained through monitoring the student weight records kept by school medical services in the cities of Basel, Bern and Zurich show that the slight trend towards a smaller proportion of overweight children and young people has continued. The proportion of overweight school children has fallen over the past five years, from 20 to 17% (→ Figure 10). This positive development is due in particular to the ongoing fall in the proportion of overweight children in the first two years of the primary level (pre-school) and to the stabilising of the number of overweight children in the upper level (*Stamm, Fischer & Lamprecht, 2017*).

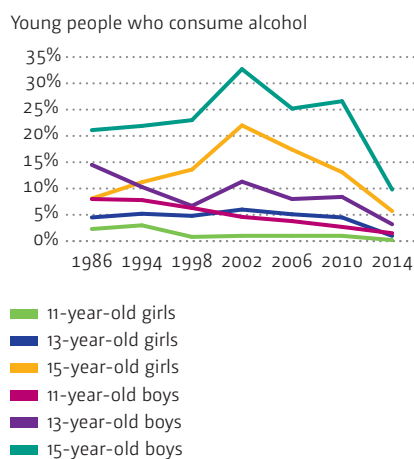
10 Development in the number of young people who are overweight 2010–2016

Data: Stamm, Fischer & Lamprecht, 2017



11 Development in weekly alcohol consumption by young people according to age and gender

Source: Marmet, Archimi, Windlin et al., 2015



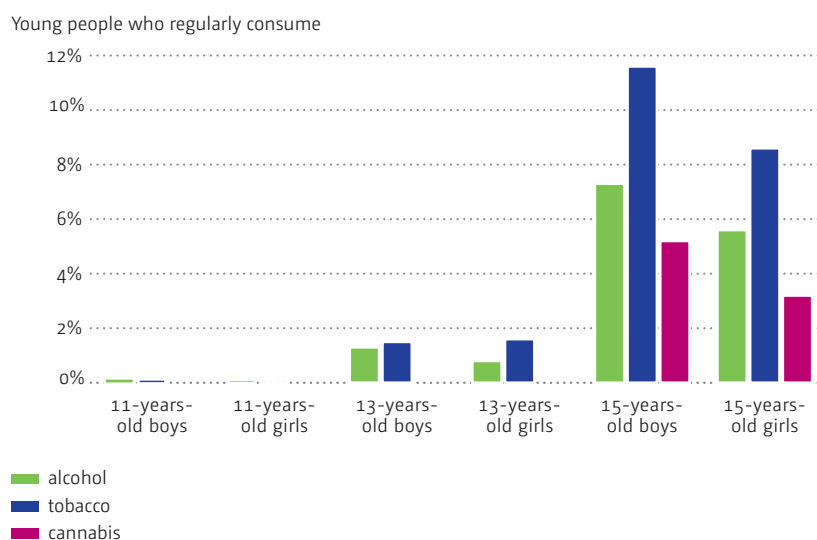
The link between sport and school performance is also the subject of many studies, with some research showing a positive correlation between the two (Marques, Gómez, Martins et al., 2017; Käll, Nilsson & Linden, 2014) while other studies are unable to find any empirical link (see for example Esteban-Cornejo, Martinez-Gomez, Garcia-Cervantes et al., 2017; Tarp, Domazet, Froberg et al., 2016). Fricke, Lechner and Steinmayer (2017) conducted a randomised experiment which showed that university sport had a positive effect on student performance.

Substance use

The proportion of young people in Switzerland who consume alcohol or tobacco has fallen considerably over recent years. The change is particularly noticeable in relation to alcohol, which remains the most frequently consumed psychoactive substance among young people. According to a national survey of more than 11 000 young people, weekly alcohol consumption fell by more than half between 2010 and 2014, falling from around 27% to 10% in the case of 15-year-old boys and from approximately 13% to 6% among 15-year-old girls (→ Figure 11) (Marmet, Archimi, Windlin et al., 2015).

12 Regular consumption of alcohol, cigarettes and cannabis by young people, according to age and gender

Source: Marmet, Archimi, Windlin et al., 2015



Around 10% of 15-year-olds regularly consume tobacco (on a weekly basis). Cannabis remains the most commonly used illegal substance. Approximately 2% of 15-year-old boys and 1% of 15-year-old girls regularly consume cannabis (i.e. several times per week)(→ Figure 12). Young people also use combinations of psychoactive substances. The combination of alcohol and cigarettes increases from the 11-year-old age group to the 15-year-old age group (*ibid.*).

Swiss studies also show a corollary between tobacco consumption and education type. Young people in vocational training smoke more frequently than young people who are in general education (Radtke, Keller, Krebs et al., 2011).

(Problematic) internet use by Swiss young people

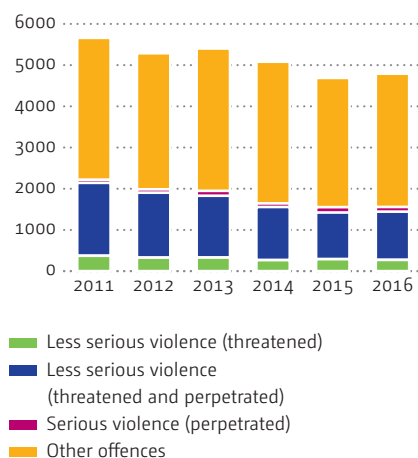
Approximately 84% of the Swiss population use the internet in their private lives, with the duration of internet use soaring among young people in particular. While around 40% of young people in the 15 to 19 age group spent at least two hours online per day back in 2013, this figure had increased to 60% by 2015 (*Marmet, Notari & Gmel, 2015*). According to a national survey of around 1100 young people (12 to 19-year-olds) around two hours per day are spent on the internet, with nearly all of those questioned using a smart phone to access the internet (*Waller, Willemse, Gennet et al., 2016*). 7% of 15 to 19-year-olds show problematic internet use (*Marmet, Notari & Gmel, 2015*). Behaviour in this regard differs according to gender. While boys tend towards problematic gaming behaviour, use of social media (online chat) is classed as dangerous among girls in some cases (*Rosenkranz, Müller, Dreier et al., 2017*). Swiss studies prove that problematic internet use at a young age is associated with habits that are bad for health including a lack of sleep and exercise and being overweight, or a low level of emotional wellbeing (*Piguet, Berchtold, Akre et al., 2015; Suris, Akre, Piguet et al., 2014*). Several studies also point to a link with substance use. A nationwide Swiss survey of around 3000 school children with an average age of 14 shows, for example, that young people who engage in problematic internet use are twice as likely to turn to cigarettes, alcohol or drugs (especially cannabis) compared with young people whose internet use is not a cause for concern (*Suris, Akre, Ambresin et al., 2014*; with regard to the link between substance use and problematic internet use, see also for example *Rücker, Akre, Berchtold et al., 2015*). Despite the fact that here too the causal effect and direction of links is not always completely clear, certain studies point to a causal relationship between internet use and performance at school. A study carried out for the canton of Ticino, for example, shows that the school attainment of primary pupils deteriorates the higher the level of media consumption by the pupils (*Camerini, Quinto & Cafaeo, 2014*). Similarly, studies covering the whole of Switzerland prove that a high level of digital media use has a negative impact on marks in mathematics and language (*Waller, Willemse, Gennet et al., 2013*) and that young people who engage in problematic internet use are twice as likely to do badly at school (*Suris, Akre, Ambresin et al., 2014*). International meta-analysis also confirms such findings (*Derbyshire, Lust, Schreiber et al., 2013; Secades-Villa, Calafat, Fernández-Hermida et al., 2014*), although there are some studies that have failed to determine any link between (problematic) internet use and school attainment levels (*Hassell & Sukalich, 2016; Samaha & Hawi, 2016*).

Juvenile delinquency

Juvenile delinquency can affect the educational prospects of both the victim and the perpetrator. Previous studies have shown that the victims of juvenile delinquency may suffer physical or psychological damage, which affects performance at school. As far as juvenile delinquents are concerned, they are frequently found to be less motivated at school than their peers (*Eriksen, Nielsen & Simonsen, 2012; Ribeaud & Eisner, 2009; Moret, 2006; Seeley, Tombari, Bennett et al., 2009*) while school attainment can also impact on the probability of being involved in crime (*Ribeaud, 2015; Müller, Fleischli & Hof-*

13 Number of convictions for criminal offences committed by minors

Data: FSO



Minors (aged 10–17) are sentenced according to the criminal law relating to juvenile offenders and thus listed separately from young adults (aged 18–25 years) in the statistics. The most frequent offences of which minors are convicted are offences against property (e.g. theft and damage to property) as well as public order offences (e.g. threatening behaviour and trespass) and offences involving physical injury (e.g. bodily harm, assault).

mann, 2013; Walser & Kiliyas, 2009). However, once again in the case of these studies, care should be taken before interpreting correlations as causal links.

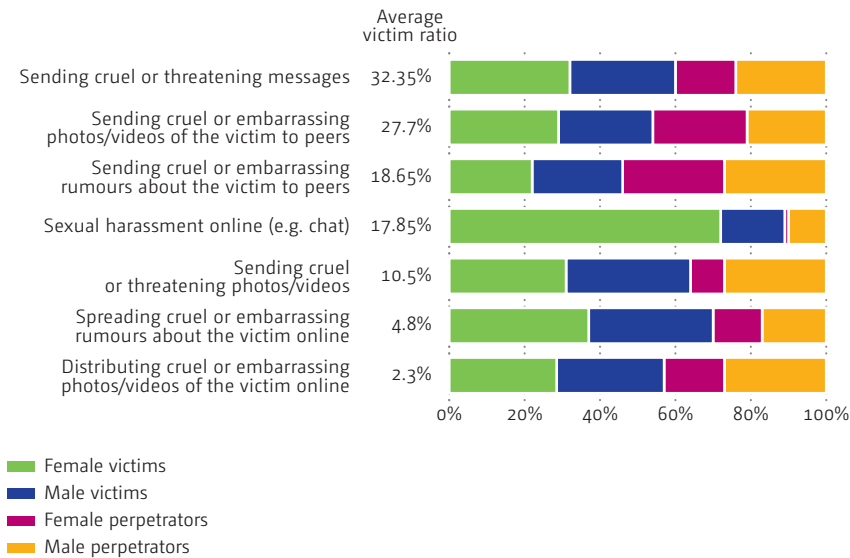
According to the FSO data, there was a strong increase in juvenile crime in Switzerland between 1999 and 2010, particularly in terms of the number of convictions for violent offences. Since 2011, however, the opposite trend has been observed (→ Figure 13). Minor violent offences in particular have fallen (e.g. minor bodily injury, assault or threatening behaviour). Meanwhile serious violent offences have tended to increase in number.

Given that not every violent offence will be reported and due to the lack of official statistics acquired through surveys on self-reported delinquency or through victim surveys, it is not possible to definitively say whether juvenile delinquency has actually fallen or not. Surveys carried out by the University of Zurich on victim and perpetrator experiences not included in the recorded figures back up the official figures but also indicate that the scale of violent crime being committed by young people should not be underestimated regardless of downward trends. According to the Zurich survey of young people, around 16% of those in the 9th to 11th year of school had been a victim of violence at least once while 10% had themselves committed a violent act (*Ribeaud, 2015*).

Alongside juvenile delinquency, violence in schools (bullying) is another serious phenomenon in Switzerland. Between 2 and 10% of pupils in the 5th to 9th school years reported being bullied at least once per week (*Perren, Dooley, Shaw et al., 2010; Lucia, 2009; Jaffé, Moody & Piguet, 2012*). Boys were more frequently involved than girls. Two studies, one for French-speaking Switzerland (*Lucia, 2016*) and one for the whole of Switzerland (*Ruggieri, Friemel, Sticca et al., 2013*), showed a negative correlation between a positive school climate and the likelihood of bullying taking place at that school. A new form of bullying, cyberbullying, has emerged recently, which makes use of new communication technologies and takes place in the digital environment (*Li, 2006; Smith, Mahdavi, Carvalho et al., 2008*). A Swiss study of pupils aged between 12 and 19 in the country's three major linguistic regions revealed that around one fifth (21%) of young people had experienced cyberbullying (*Waller, Willemse, Genner et al., 2015*). According to the Zurich youth survey (*Ribeaud, 2015*) 50% of young people in the 9th to 11th school years had already been subjected to cyberbullying, while 40% had been involved in this context as perpetrators with 1% regularly coming into contact with cyberbullying (at least weekly). While international meta-analysis indicates higher perpetrator rates among boys and higher victim rates among girls (*Aboujaoude, Savage, Starcevic et al., 2015; Baldry, Farrington & Sorrentino, 2014; Sun & Fan, 2016*), the Zurich-based survey did not indicate any general gender-based differences (→ Figure 14), although differences did apply with regard to the individual forms of cyberbullying.

14 Frequency of various forms of cyberbullying among young people (9th–11th school years) from the perspective of bullies and victims (12-month prevalence)

Source: Ribeaud, 2015



The economy and the labour market

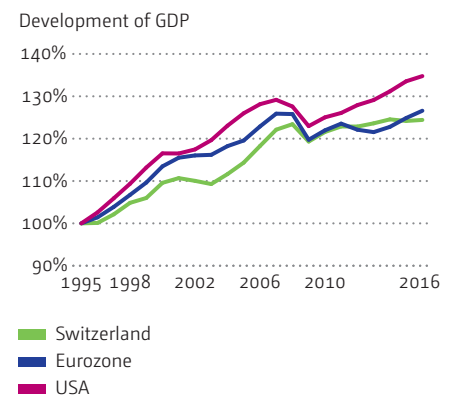
Low rates of growth

Switzerland experienced an unusually long period of economic stagnation during the early 1990s. This was followed by a short period of growth in the lead up to 2000, which came to an abrupt end with the bursting of the dot-com bubble (→ Figure 15). The renewed period of stagnation saw the growth differential with the USA widen to ten percentage points between 1995 and 2003 (and to around seven percentage points compared with the EU zone).

Switzerland dealt with the financial and economic crisis of 2009 better than the USA and eurozone relatively speaking, although per capita growth has been at a very low level ever since, not least due to the strong appreciation of the Swiss franc and consistent population growth. The Swiss employment rate is the second highest in the OECD and, at around the 80% mark, is higher than it was before the 2009 crisis (*OECD, 2017b*). The consistent growth in the number of people in employment has however been concentrated in those sectors of the domestic economy that are shielded from competition. Consequently, work productivity in Switzerland as a whole has developed very weakly, in turn sparking concern about Switzerland's competitiveness in the future (*ibid.*).

15 Development of GDP per capita at 1995 prices

Data: OECD



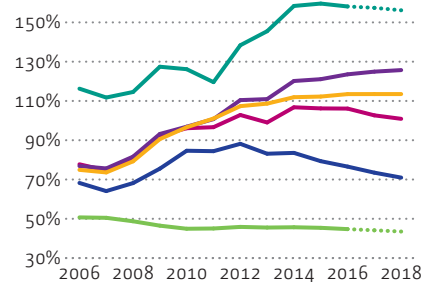
Government borrowing under control

The high government debt prevailing in many industrial nations limits these countries' ability to fund education with public money. When it comes to government debt measured in terms of GDP (→ Figure 16), Switzerland occupies one of the best positions at just under 45% (2015). Out of Switzerland's

16 Government debt as a proportion of GDP; forecasts from 2016 onwards

Data: OECD

Development of debt



■ Switzerland
 ■ Germany
 ■ Austria
 ■ OECD
 ■ France
 ■ Italy

neighbours, only Germany was in a position in recent years, thanks to its good economic performance, to reduce its level of government borrowing for the long term, albeit following a strong rise in debt levels in the wake of the 2009 financial crisis.

As most industrialised nations with high levels of government borrowing assume that they will need to generate primary surpluses for many years to come if they are to significantly reduce their high debt ratio, the fiscal scope for higher spending on education and research is restricted to a much greater extent than in Switzerland. At the current time, the greatest risk facing most countries is the low interest rate environment. Generally, these countries are able to make do with low levels of primary surpluses to cut their debt levels given that the interest-related costs of servicing their debts are at a historic low. However, were interest rates to rise again, the fiscal room for manoeuvre of heavily indebted state would be further restricted.

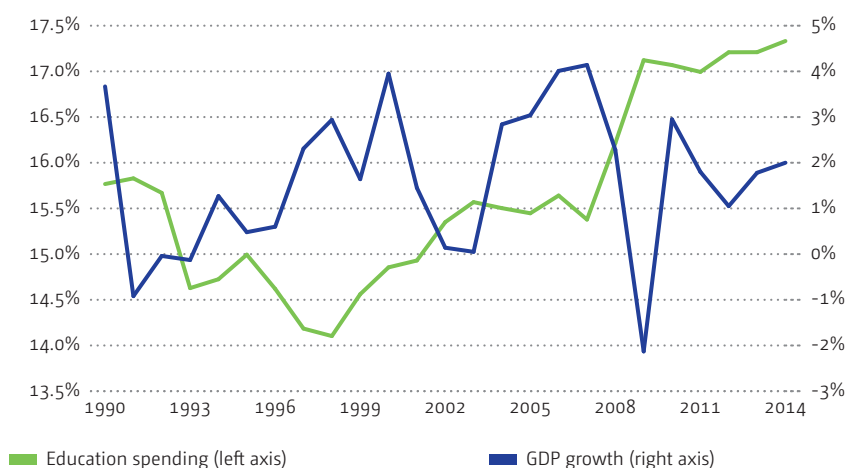
Education spending fluctuates strongly from canton to canton

In 2014 Switzerland spent 5.6% of its GDP on education. Measured against total public spending, education expenditure reached its lowest level for the past twenty-five years in the late 1990s due to economic and demographic factors. Since then, it has risen more or less continuously to above 17% (→ Figure 17). Yet the amounts dedicated to education fluctuate greatly among the cantons, as a result of a range of different factors, mainly encompassing the range of education opportunities on offer (e.g. whether or not there are higher education options in the area concerned), cantonal pricing levels and the relative number of people in education. Relative to total public spending at cantonal level, expenditure on education in 2014 ranged from 16.2% of total expenditure in the canton of Graubünden to as much as 31.7% in Fribourg. In absolute terms, spending on education in Switzerland totalled CHF 4394 per capita.

The figures varied considerably across the country, ranging from CHF 2493 in the canton of Nidwalden to CHF 7326 in Basel-Stadt per capita.

17 Education spending as a proportion of total public spending and economic performance in Switzerland (1990–2014)

Data: Seco and FSO



Education system ensures a relatively even distribution of income

While the economic collapse of 2009, the subsequent strength of the Swiss franc and the weak state of economic growth ever since compared with abroad have only resulted in a slight rise in unemployment, Switzerland also stands out internationally in relation to its highly even distribution of income before taxes and transfers. The equality of income distribution is higher in just two OECD states (Korea and Iceland (→ Figure 18). Even after taxes and transfers, Switzerland still ranks in the 50% of OECD states with a smaller range of income distribution. In other words, it can be concluded from the statistics that most countries require a much stronger redistribution policy in order to achieve a similar equality of income distribution to Switzerland. The low level of inequality in income distribution before taxes and transfers in Switzerland is an indicator of a good education system, which gives the majority of those in employment the chance to find a well-paid job, with no polarisation of earning opportunities.

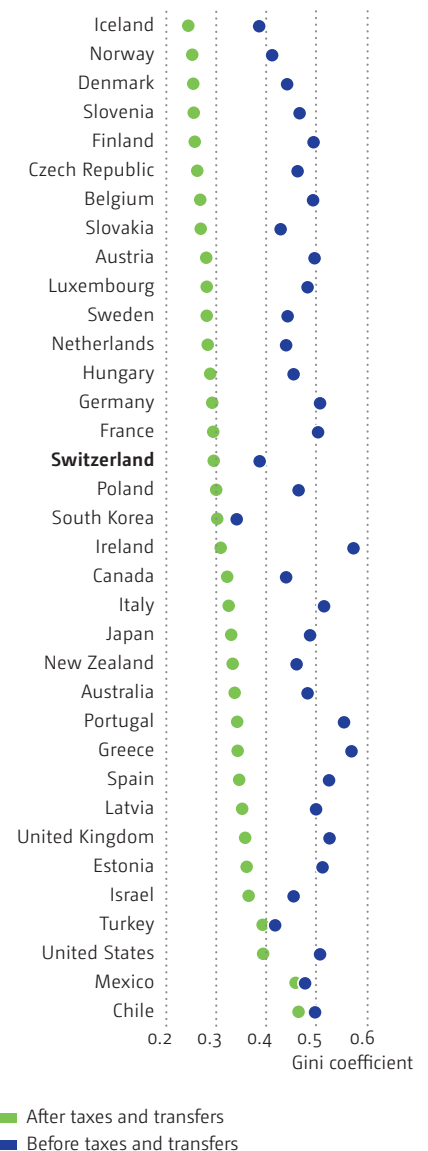
Further increase in unemployment risk for those with low qualifications

While the average jobless figures have only risen slightly despite the difficult economic environment and while changes in the world of work (→ *Digitalisation has been influencing the labour market for some time*, Page 26) have not resulted in any excessive polarisation of the income situation among the working population, the situation at the workplace is deteriorating for those people with no training beyond compulsory education (→ Figure 19). In contrast, the unemployment rates for people with an upper-secondary education qualification are not markedly higher than the rates for people with a tertiary qualification. Both rates moved in parallel, however, even during the major economic downturn. It can therefore be noted, at least on the basis of unemployment rates, that a post-compulsory education qualification at upper-secondary education level provides sufficient protection against unemployment. This is a statement that frequently does not hold true in other countries.

Yet unemployment rates only tell part of the story regarding the problems faced by people with poor qualifications on the labour market. Alongside people who are not in work but are looking for a job, the number of people who are not working and also not looking for work is again higher among the group with no education beyond compulsory schooling. While the employment rate for people between the ages of 25 and 64 and with at least an upper-secondary education qualification is above 80%, the equivalent rate for people with no post-compulsory education qualification is around 68% (2016). The high risk of being affected by unemployment, and the low employment rates for people without any post-compulsory education qualification, are a clear indicator of the importance of the education policy goal of ensuring that at least 95% of 25-year-olds gain an education qualification after compulsory education (→ *chapter Upper-secondary education*, page 99).

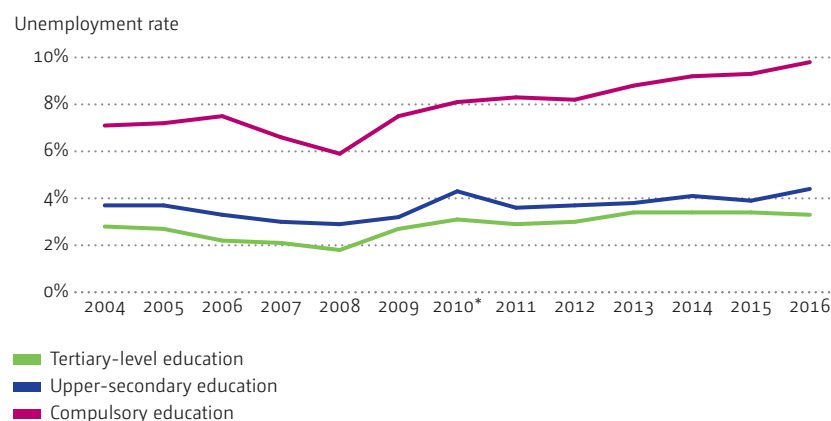
18 Gini coefficients of income distribution, 2014

Data: OECD



19 Unemployment rate by education level, 2004–2016

Data: FSO; unemployment rates based on ILO concept; * data collated quarterly as of 2010, previously only once per year in Q2 of the year concerned

**Digitalisation has been influencing the labour market for some time**

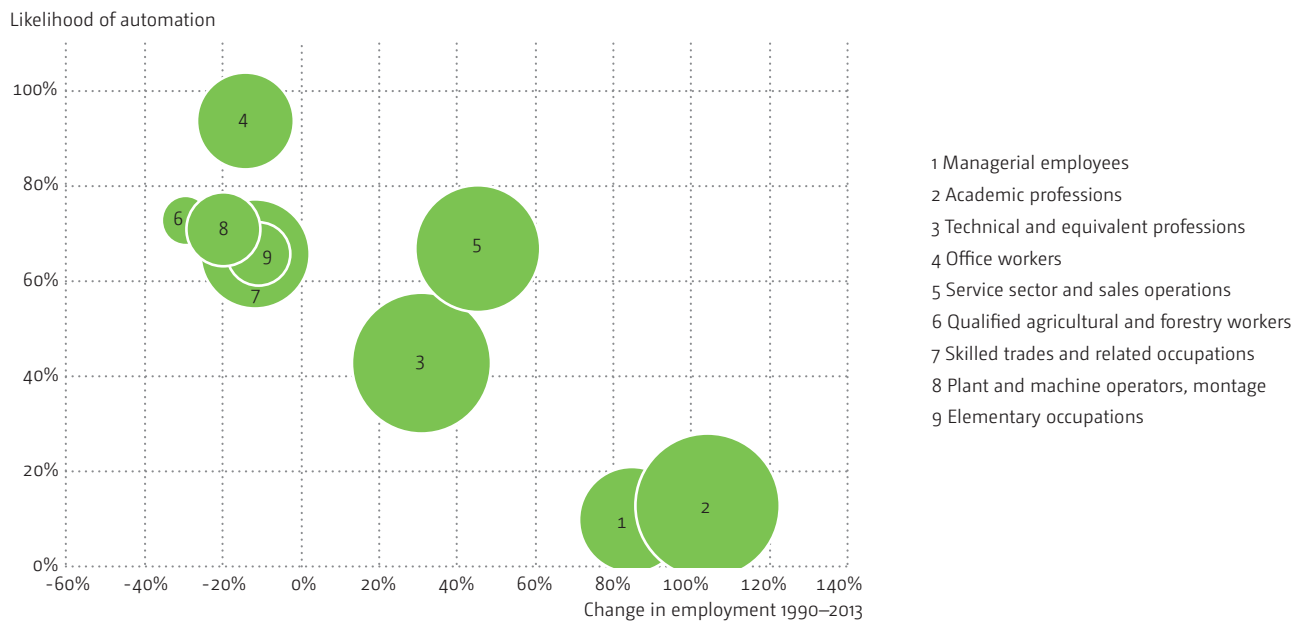
Technological changes have always shaped people's lives and working environment, thus influencing the skills that the education system needs to provide. At the same time, technological innovations also enable changes to be made to education itself, making it more effective and more efficient. The impact on the education system itself is studied in the individual chapters of the different education levels and types.

Digitalisation, often referred to as the Fourth Industrial Revolution, creates the same challenges for society, the economy and education, but is also opening up new opportunities and possibilities.¹ The increasing automation of work processes (*Autor, 2015*) is by no means a new phenomenon, however, and has already left its mark on the labour markets over recent decades. Accordingly, analysis carried out by *Deloitte (2015)*, for example, shows that employment has already been falling over the past twenty years in those sectors with a high likelihood of automation (assumptions regarding the likelihood of automation are based on a study by *Frey and Osborne, 2013*), and that, conversely, employment levels in those sectors that are only affected by potential automation to a small extent continued to grow strongly (→ Figure 20). There is, however, no direct link between the likelihood of automation and the average level of training required in a particular area of work. Occupations that have been hit particularly hard, such as labourers or office workers, may only require training at a low level or, at most, moderate level of skills. However, there are also professions with a moderate level of training requirements – such as care professions – that face a low risk of being automated. The risk of being replaced by new technologies has far more to do with the level of routine associated with an activity, and even activities that require a high level of formal qualification may involve routine tasks. In contrast, activities that frequently require social interaction and creativity, i.e. dealing with people and unpredictable tasks, are less at risk of being carried out by new technologies in the future, regardless of the formal training re-

¹ See also in this regard the Federal Council's Digital Switzerland strategy from April 2016, the Federal Council reports (2017) and *Aeppli, Angst, Iten et al. (2017)*.

20 Digitalisation – Likelihood of automation and change in employment in selected professions (based on ISCO classification)

The size of the bubbles represents the number of people employed in the respective category in 2013.
Source: Frey & Osborne (2013) and Deloitte (2016) as well as FSO data (SAKE)



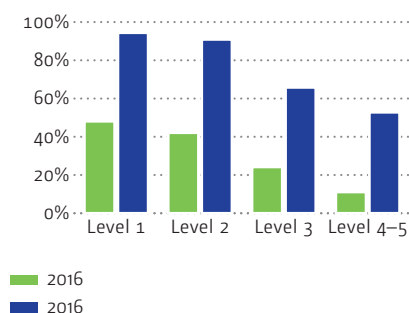
quirements associated with them (see also Chui, Manyika & Miremadi, 2016). Digitalisation not only impacts on the number of jobs needed. It also affects wages in the individual professions and sectors concerned. It has been found in the USA that the development of wages in local labour markets where robots are used at a high level lags behind those markets with less reliance on robots (Acemoglu & Restrepo, 2017).

Forecasting the future is difficult

While digitalisation and automation have already clearly been in evidence on the labour market over the past twenty years, it is difficult to make any predictions regarding the scope, and above all the speed, of the impact that these processes will have on the labour market in the future. According to expert opinions collated by Frey and Osborne (2013), 47% of workers in the USA are currently working in jobs where there is a relatively high probability (more than 70%) that they could be replaced by computers in the next ten to twenty years. If we apply the same method to the Swiss labour market and to all professions with an automation risk of more than 50%, we find that approximately 48% of those in employment are working in professions with a high likelihood of automation, which equates to around two million people. However, these calculations are disputed in some quarters and depend heavily on the underlying assumptions and on the level of aggregation of the statistical calculations. Bonin, Gregory & Zierahn (2015) replicated the analysis carried out by Frey & Osborne (2013) for Germany and concluded that the proportion of jobs with a high probability of automation was only about 12%. Also using an activity-based approach, Arntz, Gregory & Zierahn (2016) found that across the 21 OECD states included in the study, only approximately 9% of professions could be automated.

21 Proportion of PIAAC tasks, by requirement level, that could be solved by computers

Source: Elliott, 2017



Based on the Programme for the International Assessment of Adult Competencies (PIAAC), computer scientists have assessed (see Elliott, 2017) which of the tasks given to adults in the form of a test could be solved by a computer now and by the year 2026.

While most researchers agree that, regardless of profession, social competencies are likely to become more important (see for example Deming, 2017), computers do not meet this requirement, and are not capable, in interpersonal relations for example, of displaying empathy. Similarly, with regard to cognitive skills, computers cannot currently solve all of the problems at the lower end of the difficulty scale for the adult population (→ Figure 21). However, the expectation is that in ten years' time computers will be able to solve most of the problems that rank at the upper end of the difficulty scale for most of today's adult population.

On the one hand, these findings and predictions are concerning. Experience tells us that it is not possible to use training measures to get the majority of the population at a sufficiently high proficiency level to guarantee protection against being replaced by a computer in the foreseeable future. On the other hand, this form of the analysis exaggerates the risk of being replaced for two reasons. Firstly, the assessment is based on narrowly defined individual tasks, while most work situations involve combinations of tasks and problems that would be more difficult to solve with a computer. Secondly, the likelihood of being replaced relates to a reduced group of skills (reading, writing and arithmetic skills) and ignores the fact that solving real-life everyday problems and problems at the workplace requires further cognitive skills that were not tested during the assessments. Nevertheless these analyses show that the working population cannot actually protect themselves from being replaced by computers and robots by learning to do their work more quickly or better. Rather, they can protect themselves by developing skills that complement the technology.



Compulsory education

Issues affecting more than one level

22 Compulsory education in figures

Data: FSO

Pupils, 2015/16*

| | |
|--------------------------------------|---------|
| Compulsory education | 928 268 |
| 1st–2nd year of primary school level | 170 566 |
| 3rd–8th year of primary school level | 477 572 |
| Lower secondary level | 249 020 |
| Special curriculum | 31 110 |

Teaching staff in compulsory education, 2015/16**

| | |
|----------------------|--------|
| Number of staff | 91 219 |
| Full-time equivalent | 58 124 |

Public expenditure on education, 2014, in CHF millions*

| | |
|---|--------|
| Total education expenditure | 35 978 |
| Compulsory education | 15 834 |
| Proportion in percent | 44 |
| Proportion in percent including special schools | 49.3 |
| Average spending per head | 17 058 |

* including private schools

** only state schools, excluding special curriculum

Compulsory education encompasses the primary school level – including pre-school or the first two years of a first learning cycle – and lower-secondary level. According to the International Standard Classification for Education (ISCED 2011), the first and second years at primary school level, comprising pre-school or the first two years of a first learning cycle, correspond to ISCED Level 020 (pre-primary education), school years 3 to 8 are at ISCED Level 1 (primary education) and school years 9 to 11 are at ISCED Level 2 (lower secondary education) (UNESCO, OECD & EUROSTAT, 2016).

Some 95% of children and young people at compulsory-education age attend a state school at no cost, while around 5% receive their education from a private school (→ *Attendance at private schools*, page 47). Some private schools receive a degree of cantonal funding, while others must be self-sufficient.

Schools operating in the compulsory education segment were attended by approximately 928 270 pupils (2015/2016 school year), or around 69% of the entire pupil population from the start of the primary school level through to the tertiary level. At cantonal level, Zurich had 157 700 pupils of school age in 2015/2016, while Appenzell Innerrhoden counted only 1870. In line with the high number of school pupils and a teaching workforce that exceeds 91 000 people, compulsory education (including special schools) accounts for almost half (49.3%) of public expenditure on education (→ Figure 22). This figure rises at cantonal level to 80.1% for Appenzell Ausserrhoden, which has no university, closely followed by the cantons of Aargau (79.5%) and Solothurn (78.4%). In contrast, the cantons of Geneva and Basel-Stadt dedicate around a third of their education budget to compulsory education (34.7% and 35.3% respectively).

Collaboration at various levels

Switzerland's education system, like its system of government, is organised along federal lines. The Confederation, cantons and communities all have responsibility for education. Cantons are responsible for compulsory education. They also cater for the schooling of children and young people up to 20 years of age with additional support needs (Art. 62 para. 3 of the Swiss Federal Constitution, FC). Schools are operated by the communities, which permits the existence of diverse solutions that are adapted to local circumstances (*Educa.ch*, 2017b).

The FC stipulates that the cantons must cooperate with each other and the Confederation in jointly fulfilling their responsibilities for the high quality and accessibility of the Swiss Education Area (FC Art. 61A, para 1).

Moreover, collaboration at national level is enhanced through agreements, such as the HarmoS Agreement and the Agreement on Special Needs Education. There are also more concerted efforts to work together within the linguistic regions. For example, the three German-speaking EDK regional conferences (for Eastern, North-Western and Central Switzerland) teamed up to form the German-Speaking Swiss Conference of Cantonal Ministers of Education (D-EDK) in January 2011. The D-EDK supports the cantons in matters such as the introduction of cantonal curricula, and coordinates their teaching resource policy (*D-EDK*, 2017). The cantons in the French-speaking part of Switzerland and the canton of Ticino adopted the *Convention scolaire romande* (CSR) to coordinate the activities of the member cantons of the

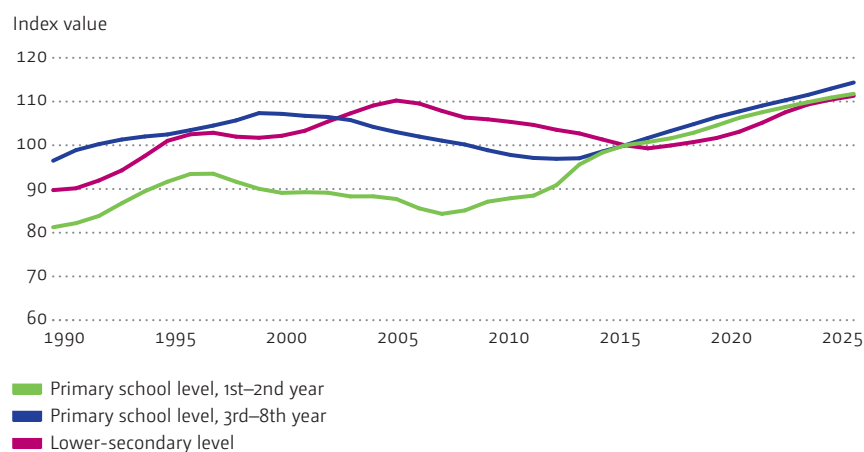
Intercantonal Conference of the Public Education System in French-speaking Switzerland and Ticino (CIIP) at the same time as signing the HarmoS Agreement (CIIP, 2007). In its Annual Report 2015, the *Convention scolaire romande* showed that regional cooperation had resulted in the comprehensive introduction of the *Plan d'études romand* (PER) and the *Piano di studio* curricula. Cooperation has also been achieved in the training and further education of teachers and an agreement on objectives, priorities and the implementation of the *épreuves romandes communes* joint examinations (CIIP, 2015).

Development of pupil numbers

The forecasts of the Federal Statistical Office (FSO) indicate that demographic change is a major factor affecting compulsory education, alongside structural and institutional change. Since 2017, the number of pupils attending compulsory education in Switzerland has been rising. This development will continue for at least ten years. The latest figures in the reference scenario predict a 12% (20 000) increase in pupil numbers in the first and second years at primary school level by 2025 compared with 2015. A 14% (67 600) rise is forecast over the same period at years 3 to 8 of the primary school level, while the estimates also indicate 12% (29 000) additional pupils at lower-secondary level (→ Figure 23). These trends differ strongly at cantonal level. The reference scenario predicts growth to be highest in the cantons of Basel-Stadt (22%) and Zurich (18%), in contrast to Neuchâtel (−0.5%) and Uri (−2%), where numbers are projected to fall (FSO, 2015b) (→ *chapter Primary school level, page 51*).

23 Development of pupil numbers in compulsory education, 1990–2025, reference scenario, index 2015 = 100

Data: FSO



The numbers of pupils anticipated for 2025 are unprecedentedly high in the history of Swiss state education, with consequences for demand for resources and people. The assumed average growth of 38 800 pupils by 2025 will affect the infrastructure (school buildings) and result in a greater need for teachers. Based on an average class-size of 19.2 pupils, around 2000 extra teachers will be required by 2025. This corresponds to around half of the graduates from the universities of teacher education in 2015 (→ *chapter Universities*

of teacher education, page 241). Assuming that two thirds of school-leavers of compulsory school will opt for vocational education and training (VET), in 2025 an additional 25 800 apprenticeship places will be needed (→ chapter Vocational education and training, page 111).

Challenges for the Swiss education system

Among the many issues currently occupying education policymakers and administrators, migration and digitalisation are the two that predominate.

Many studies have long revealed a series of disadvantages suffered by migrants in compulsory education, such as entry to primary school level and in transition (increased repetition of the first years of the primary school level). Despite the various measures to support migrants, including German as a second language and *Corsi di lingua e cultura di paesi d'origine* (LCO), their performance at school is lower and they are over-represented in schools with lower requirements (Cattaneo & Wolter, 2015; Meunier, 2011; Kronig, 2007; Lanfranchi, 2005, 2007; Becker, 2005). Nevertheless, a migration background on its own is not an indicator of actual migration-specific disadvantage, since migrants may differ from Swiss-born pupils in many other aspects that impact their progress at school, such as level of parents' education and language spoken at home. Statistical coverage of this information is frequently patchy, and as a result a migration background is sometimes unjustifiably identified as a reason for differences at school, instead of social status or the level of education in the family.

The migrant population is also very diverse, not only in relation to the length of residence in Switzerland (first generation vs. second, third or even fourth generation) but also in terms of geographic origin (neighbouring countries vs. geographically and culturally distant countries of origin). According to Swiss Structural Survey, 32.2% of 15 to 17-year olds have a migration background. When this is broken down to first-generation migrant families, the figure falls to 13.9%. However, when only considering the nationality of the young people, 21.8% are foreign citizens, although many were born in Switzerland. More detailed research into questions about the integration of migrants would require better statistical data to include language, cultural origin, socio-economic background and length of residence in the country.

The arrival of asylum-seeking minors who are subject to compulsory education has been a new challenge for the Swiss education system, and the phenomenon cannot yet be adequately described by statistics in terms of school performance and general problems. It is equally dubious whether the experience with the integration of children who have arrived in Switzerland predominantly because of their parents' work can provide answers to the challenges arising from the integration of asylum seekers at school. In some cantons the existing knowledge has been documented in publications on «Refugee children in compulsory education» (e.g. in the cantons of Lucerne, Bern and Zurich).

The rapid progress of digitalisation is an additional challenge (→ chapter General context of the Swiss education system, page 13). It affects both teachers and pupils, as well as the education system itself. Teachers require training and further education to acquire the skills required to meet changing demands in the classroom and to handle the potential consequences for their

profession (replacement of teachers by educational software, digital education landscapes, etc.). Cantonal curricula across all of the linguistic regions embed media and ICT skills in all school subjects.¹ The Swiss Conference of Cantonal Ministers of Education (EDK) is supporting the cantons in the use of ICT in schools and in lessons. Together with the Confederation, it runs the specialist agency for ICT and education Educa.ch, the output of which in 2017 included the FIDES Framework (Federation of Identity Services for the Swiss Education Area) (*Educa.ch, 2017a*). The potential offered by ICT must also be tapped in special needs education. A multidisciplinary network «ICT and special needs education» involving the Swiss Centre for Special Needs Education, Educa.ch and other partners was formed for this purpose in 2015. In April 2016, a special edition of the Swiss Journal for Special Needs Education entitled «ICT und Sonderpädagogik» was dedicated to exploiting the potential benefits of ICT for people with disabilities (*SZH, 2016*).

HarmoS Agreement

Pursuant to the articles on education that were added to the Federal Constitution in 2006, the cantons are required to harmonise certain key principles, such as school entry age, compulsory school attendance, the duration and objectives of levels of education, transition from one level to another, and qualifications (FC Art. 62 para 4). In the Intercantonal Agreement on Harmonisation of Compulsory Education (HarmoS Agreement) the Swiss Conference of Cantonal Ministers of Education (EDK) defined a roadmap for setting these principles in stone (*EDK, 2015*). The HarmoS Agreement contains provisions relating to the duration of educational level and to education standards, as well as to language teaching (→ *Language teaching, page 38*), class hours and school-based day-care facilities. By the end of 2017, fifteen cantons had signed up to the agreement since it passed legislation in 2007. Four cantons are still considering whether to join in, while seven have rejected the idea (→ Figure 24). There has been no change in the list of accession cantons (which includes all French and Italian-speaking cantons) in the four years since the last education report. These cover 76% of the residential population. In 2015 EDK reviewed the extent to which the constitutional principles (FC Article 62 para. 4) on compulsory education had been harmonised in an evaluation of progress made in the individual cantons. A further review by EDK is planned for 2019, building on the research in this education report (*EDK, 2015*).

24 Membership of HarmoS Agreement

Data: EDK; as at June 2017

Already members (in order of membership date): SH, GL, VD, JU, NE, VS, SG, ZH, GE, TI, BE, FR, BS, SO and BL

Membership pending: AG, AI, OW, SZ

Membership rejected: AR, GR, LU, NW, TG, UR, ZG

Structural harmonisation

As part of the implementation of the HarmoS Agreement, the duration of compulsory schooling has been harmonised and set at eleven years. This is accomplished by integrating the two-year pre-school stage or the first two years of a first learning cycle, which was already widely established be-

¹ Digitalisation projects within the cantons are concerned with the frameworks for and implementation of ICT, media and computing projects at various levels (see list of cantonal digitalisation projects at edudoc.ch).

fore the HarmoS Agreement, with the compulsory school. The preparatory phase according to the HarmoS Agreement primarily refers to the entry to compulsory education. When considered from a pan-Swiss perspective, the years of compulsory schooling are therefore counted from 1 to 11 (→ Figure 25).

25 Counting method in linguistic regions of Switzerland

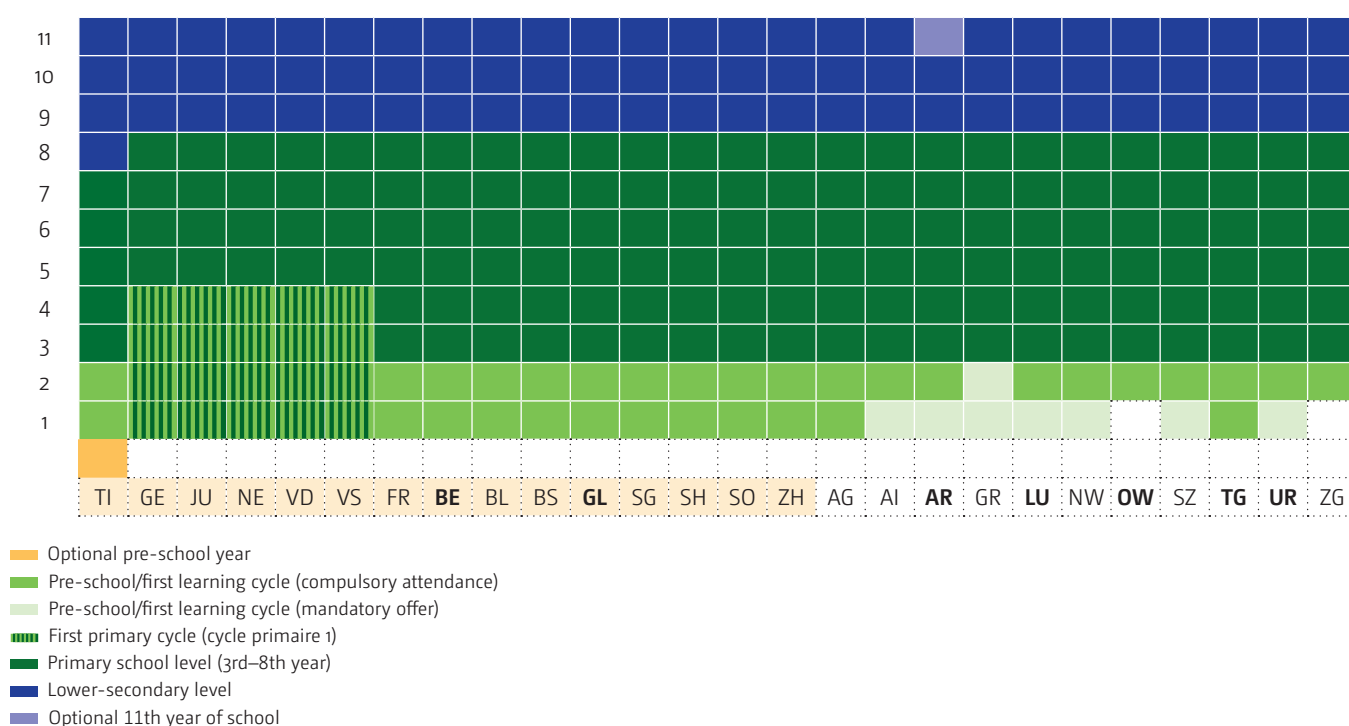
Data: EDK

| Compulsory education | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 |
|----------------------|----------------------|---|-------------------|---|------------------|---|---|---|------------------|----|----|
| German-speaking | Pre-school | | Primary school | | | | | | Secondary school | | |
| French-speaking | Cycle primaire 1 | | | | Cycle primaire 2 | | | | Cycle secondaire | | |
| Ticino | Scuola dell'infanzia | | Scuola elementare | | | | | | Scuola media | | |

The EDK 2015 report reveals that the length of the primary school level has been harmonised at eight years (HarmoS Agreement, Article 6 para. 1) in two thirds of the cantons (→ *chapter Primary school level, page 51*). In the remaining third, the shape of the first two years of primary school level or the first two years of a first learning cycle varies. The three-year lower-secondary level is established by statute in all cantons. However, the four-year variant mentioned in the HarmoS Agreement means the lower-secondary level remains one year longer in Ticino, while in Appenzell Ausserrhoden the final year of lower secondary level is not mandatory (although more than 95% of pupils attend this optional 11th school year) (→ Figure 26).

26 Structure of the cantonal school systems, 2016/17

Source: EDK, 2015



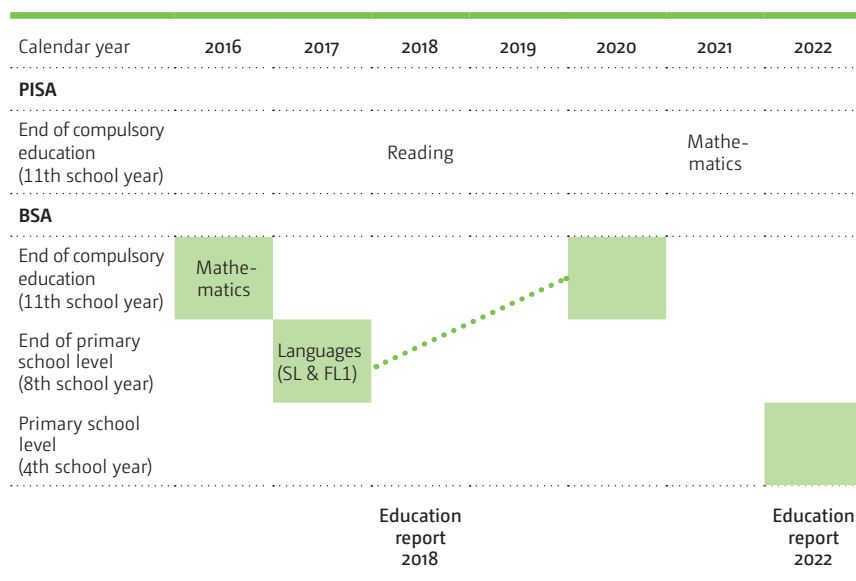
The cantons indicated in yellow are signatories to the HarmoS Agreement. The cantons indicated in bold offer the four-year or three-year model in some communities.

Harmonisation of objectives

The HarmoS Agreement stipulates the overall objectives for compulsory education in the areas of basic education and in particular language teaching (HarmoS Agreement, Articles 3 and 4). The EDK 2011 formulated national educational standards (education objectives). These education objectives define the basic skills that pupils must achieve in the school's language, two foreign languages, mathematics and science at the end of the fourth, eighth and eleventh school years (corresponds to grades 2, 6 and 9), whereby the foreign-language objectives only apply to the end of the eighth and eleventh school years. These basic skills are incorporated into curricula in the form of objective specifications and must also be taken into account when developing teaching resources and evaluation schemes (HarmoS Agreement, Article 8). Achievement of the baseline skills are measured across Switzerland as a whole. The first measurement exercise in mathematics took place at the end of the compulsory education phase (eleventh school year) in spring 2016, while the second was carried out in languages (school language and foreign languages) at the end of the primary school level (eighth school year) in spring 2017 (→ Figure 27). Some 24 000 pupils across all cantons participated in these assessments. They count as Switzerland's first national performance measurements in the compulsory education stage outside PISA. The results allow statements to be made about the effectiveness of the Swiss education system down to the level of each canton. An EDK publication planned for 2018 will publish the outcomes of the first two measurement exercises. In June 2017, the EDK resolved to carry out a review of basic skills in two subjects from the school language and the first and second foreign language in 2020. A decision on which two subjects will be tested will be made in 2018. A further assessment of basic skills in the fourth year of compulsory education will be carried out in an as yet undecided area in 2022 (EDK, 2017e).

27 Basic skills assessment

Source: EDK, 2017e; Additional information: SCCRE. School years counted to include all years of the compulsory education phase (1–11) (→ Figure 25).



School language or classroom language (SL): German, French, Italian or Romansch, according to linguistic region

First foreign language (FL1): either second national language or English

Second foreign language (FL2): either second national language or English

The **dashed green line** connects test cohorts.

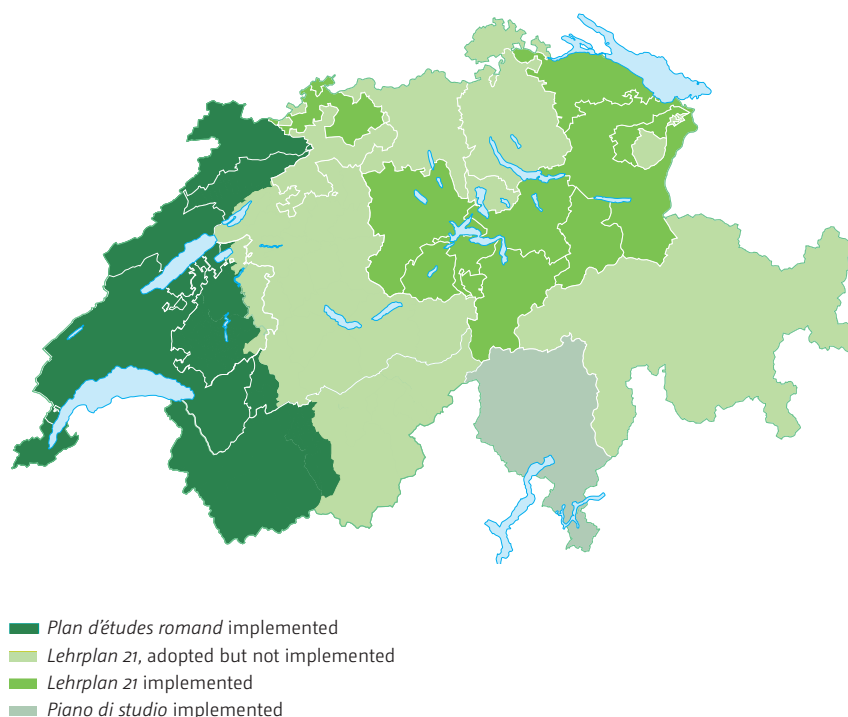
Linguistic-region curricula

The core task for all three linguistic regions was to develop and implement the harmonised curricula and coordinate teaching resources (HarmoS Agreement Article 8). The first part has been accomplished in all three regions. The *Plan d'études romand* (PER), *Piano di studio della scuola dell'obbligo ticinese* (canton of Ticino) and *Lehrplan 21* have been completed and approved for use by the cantons.

In the French linguistic region, the CIIP has issued the *Plan d'études romand*, which the cantons have the responsibility of introducing. In German-speaking Switzerland, the cantons will decide on the introduction of *Lehrplan 21*. There has been a phased introduction of the *Piano di studio* in Ticino since 2015/16. While introduction of the PER has also already been completed in all of the French-speaking cantons, some German-speaking cantons have introduced *Lehrplan 21*, with the others still at the decision stage (→ Figure 28). The majority of the cantons had started the implementation stage by the end of 2017, with the exceptions being Aargau (2020/21), Fribourg (2019/20) and Zug (2019/20). The cantons of Schwyz, Zurich and Basel-Landschaft have opted for a phased implementation.

28 State of implementation of cantonal curricula

Data: EDK, as at end of 2017; map: Swisstopo



Language teaching

The key concepts for the teaching of languages are established by the Har-moS Agreement (2007) and the Federal Act on the National Languages and Understanding between the Linguistic Communities (Languages Act [LangA] of October 2007). Both of these are based on the National Languages Strategy adopted by the EDK 2004 for coordinated further development of language teaching in Switzerland. Key principles include the promotion of

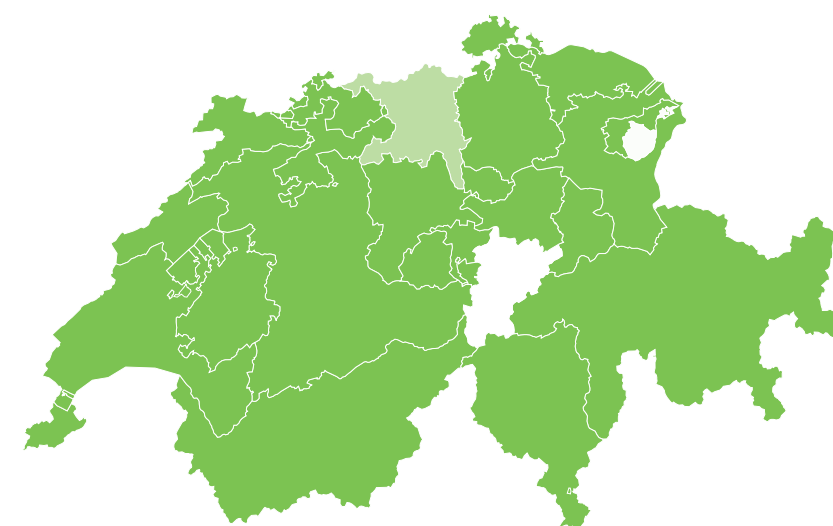
the local national language at all school levels, promotion of multilingualism in compulsory education, and the principles of the exchange programme between linguistic regions and promotion of the mother tongue of pupils with migration backgrounds (courses in home language and culture) (→ *chapter Primary school level, page 51*).

The Languages Act provides for teaching in a second national language and an additional foreign language to meet the requirement to promote individual multilingualism of all learners in compulsory education. There is no statutory definition of the age at which foreign language tuition must start. The HarmoS Agreement stipulates in accordance with the language strategy that the first foreign language should start no later than the fifth school year and the second no later than the seventh (referred to as the 5/7 Model). One of the two languages is a second national language while the other is English. The HarmoS Agreement allows for the sequence in which these are learned to be coordinated at regional level (→ Figure 29). Pupils should have achieved comparable skills in both languages by the end of their compulsory education (→ *chapter Lower-secondary education, page 77*).

More than a decade after adoption of the languages strategy, 24 cantons have implemented the structural specifications. The exceptions are the cantons of Appenzell Innerrhoden and Uri, where only one foreign language is taught at primary school level (UR: Italian offered as a compulsory elective subject from the seventh school year). The HarmoS 5/7 Model has now been implemented in 22 cantons (→ Figure 30). An exception has been created for the canton of Ticino, where there are three foreign languages in the compulsory education stage.

30 Implementation of the languages strategy and 5/7 Model

Data: EDK, as at October 2017; map: Swisstopo

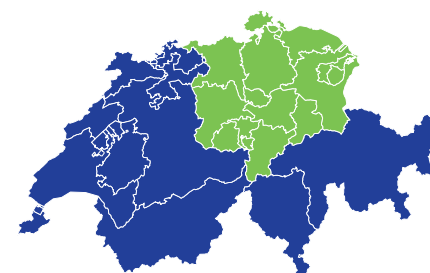


- 5/7 Model implemented
- Languages strategy implemented (AG 5/8)
- Variation from the languages strategy (AI and UR: 5/9)

Political processes aiming to reduce to just one foreign language at primary school level have been observed in individual cantons in recent years. At the same time, the Confederation has seized the initiative and started a revision of the Languages Act. In 2017 it became apparent that the processes at can-

29 Sequence of introduction of foreign languages

Data: EDK, as at October 2017; map: Swisstopo

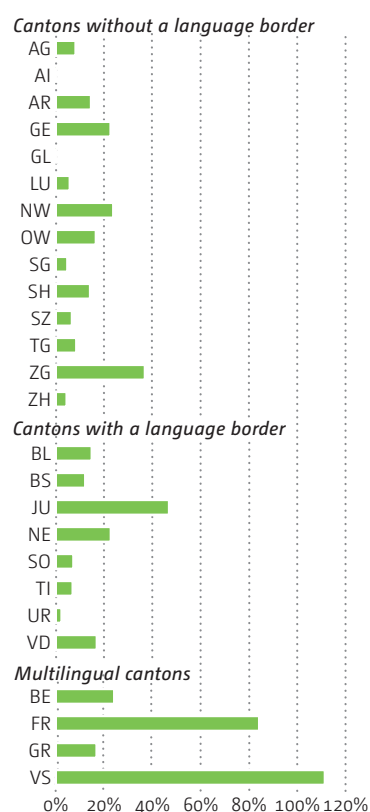


- National language / English
- English / French

- GR Some schools introduce Romansch from the 3rd school year; German, Italian or Romansch from the 5th school year, English from the 7th school year
- TI French 5th–9th school year, German from the 9th school year, English from the 10th school year

31 Class exchanges in Switzerland during compulsory education, 2014/15

Data: ch-Stiftung für eidgenössische Zusammenarbeit (now: Movetia); calculations: SCCRE



Explanations on the chart

On the assumption that every pupil should have at least one opportunity during their compulsory education to participate in a school exchange, one ninth of the school cohort in the 3rd to 11th school years corresponds to the annual approximate value. The 100% value in the chart corresponds to the cantonal approximate value. Double-counting has been avoided by using the figures for class exchanges (no single exchanges).

Legend

The number of pupils in the canton of Aargau who participated in a class exchange in 2014/15 makes up 8% of the approximate value. The canton of Valais is above the approximate value at around 112%. In 2014/15, 12 percentage points more than one ninth of schoolchildren took part in an exchange, which presumably means that many children took part in more than one exchange during the course of their compulsory education.

tonal level would not reverse the harmonisation; consequently the revision of the law was temporarily suspended. The EDK issued updated recommendations on the teaching of foreign languages as its contribution to further development of language teaching and to support the work ongoing in the cantons (EDK, 2017a).

The promotion of exchanges of pupils and teachers between the language communities is also established in statute (Article 14 LangA). The Movetia agency (formerly «ch-Stiftung für die eidgenössische Zusammenarbeit») is a joint venture of the Confederation and the cantons to support various forms of exchange and mobility at national and international levels, see also the Swiss strategy on «Exchanges and mobility of the Confederation and the cantons» published on 2 November 2017. The cantons' participation in these exchange programmes varies greatly (→ Figure 31).

Education for sustainable development

Education for sustainable development (ESD) is part of the state's educational responsibility and has the objective of promoting the skills needed to participate in environmentally, socially and economically sustainable development (Education21, 2015). At cantonal level, ESD and related skills have already been integrated with the linguistic regions' curricula. The planning for ESD teaching combines topics (five dimensions: society, environment, economy, space and time), skills (e.g. networked thinking, constructive approaches to circumventing conflicts of interest) and principles (such as alignment with vision) (Education21, 2016, 2015). Since January 2013, Education21, the national competence and services centre for education for sustainable development, has been supporting schools in a variety of ways. An evaluation of Education21 has shown that the competence centre is well established in political and administrative spheres, makes an important contribution to consolidating ESD in the Swiss education system and needs to improve its profile among teachers (Häring, Fontana, Amann et al., 2017). In addition, ESD is a component of the declaration on the jointly defined education policy objectives of the Confederation and the cantons (EAER & EDK, 2015).² ESD is also specifically mentioned in the «Education, Research, Innovation» action area of the national strategy Sustainable Development 2016–2019, and in the «Dispatch on the Promotion of Education, Research and Innovation 2017–2020». Work in the next few years will focus on the development of teaching resources, the need for interdisciplinary learning environments and the introduction of ESD modules for teacher training courses (Federal Council, 2016).

Special needs education

The Federal Constitution requires the cantons to ensure adequate provision for children and young people with disabilities (from birth to the age of 20)

2 The first declaration on the joint education policy objectives of the Confederation and the cantons in 2011 was revised on the basis of the national education report 2014 and transferred to the statement mentioned above (EDK & WBF 2015).

(Article 62 para. 3 FC). The Disability Equality Act (BehiG) forms the basis for the cantons' special needs education provision, and prioritises integration over separation (Article 20, paras. 1 and 2 BehiG). Various research findings confirm the positive effect of integration on academic as well as social and vocational development (*Altmeyer, Burkhardt & Hättich, 2016; Sermier Dessemontet, Benoît & Bless, 2011; Sahli Lozano & Neff, 2015; Eckhart, Haeberlin, Sahli Lozano et al., 2011*).

Agreement on Special Needs Education

The entry into force of the revised National Fiscal Equalization between the Confederation and the cantons moves the responsibility for education of children and young people with special needs away from the disability insurance providers and brings it under the auspices of the cantons. The EDK 2007 adopted an Intercantonal Agreement on Special Needs Education (Special Needs Education Agreement) in order to coordinate this transition. Sixteen cantons have signed the agreement in the intervening years. The agreement differentiates between the special needs education baseline offering³ and enhanced measures⁴ (Special Needs Education Agreement Articles 4 and 5). The latter are mandated by the Standardised Assessment Procedure (SAP) or an equivalent assessment (*Kronenberg, 2015*). Alongside the special needs education baseline offering there is also compensation for disadvantages (→ *Compensating for disadvantages, page 156*). Both the special needs education baseline offering and the enhanced measures may be provided in integrative or separate settings.

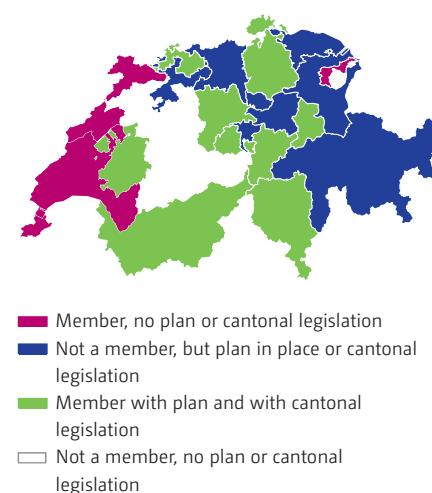
Irrespective of whether they have signed the Special Needs Education Agreement, the cantons are obliged to develop their own plan for special needs education. In a few cantons including Basel-Stadt, Uri and Solothurn, the cantonal plan must be approved by a cantonal authority (government or parliament) and is presented in the form of a report. Other cantons such as Schaffhausen, Zurich and Ticino incorporate the plan directly into their cantonal legislation (laws or regulations) (→ Figure 32). These differences in the legal basis and different measures and terminology used by individual cantons, both within and between the linguistic regions, make it difficult to compare one canton with another.

Data on special needs education

Integration in academic institutions refers to the full or part-time attendance by children or young people with special educational needs of a class in a mainstream school with the provision of not enhanced or enhanced measures. If attendance at mainstream classes is not possible, a special-needs

32 Cantonal membership of the Special Needs Education Agreement and/or with plans or legislation

Data: SZH, as at June 2017; map: Swisstopo



There are currently no cantonal plans and/or laws in the French-speaking parts of the cantons of Fribourg and Valais.

³ The special needs education baseline offering includes advice and support, therapeutic early education, speech therapy, psychomotor education, special needs education measures in a mainstream school or in a special school, as well as daily assistance or overnight accommodation at a special needs education establishment (Special Needs Education Agreement Art. 4).

⁴ The enhanced measures are characterised by their long duration, high intensity, highly specialised nature of the assistant/provider and far-reaching consequences for the daily life, social environment and CV of the child or young person (Special Needs Education Agreement Article 5).

Special classes/Special needs classes

Small classes, development classes, introductory classes, observation classes or classes for speakers of a foreign language (SZH, 2017).

Special schools

These are specialised in specific forms of disability (e.g. physical or mental) or learning and behavioural difficulties. Attendance at special schools is limited to children with enhanced measures (SZH, 2017).

class or (separate) special school may be attended instead (→ *text in left-hand margin*). Previously pupils in special schools and special needs classes were consistently counted separately for statistical purposes under the identifier «special curriculum». However, attendance by a pupil in a special needs class does not mean *per se* that the pupil is in receipt of enhanced special needs measures. The enhanced special needs measures relate individually to a specific student. The redesigned statistics for special needs education will allow the attendance of children with enhanced special needs measures to be statistically captured in integrative special schools or classes. These data are not yet available, however, as additional surveys are required. (→ Figure 33).

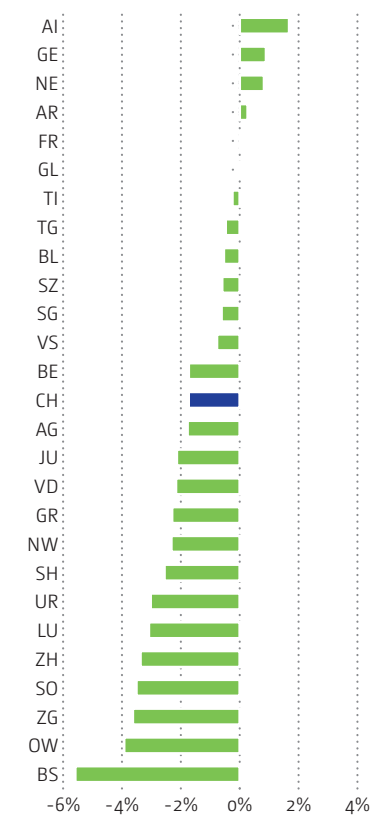
33 Proposed modernisation of statistics for special needs education

Simple special needs measures belong to the special needs education baseline offering (Special Needs Education Agreement Article 4).
Data: FSO

| | | | | | |
|------------|-------------------------------------|--------------------|-------------------------------------|-----------------------------|----------------------|
| Previously | Mainstream school | | | | Special school |
| | Mainstream class | Preparatory class | Class for foreign language speakers | Other special needs classes | Special school class |
| | Regular curriculum | Special curriculum | | | |
| Future | Mainstream school | | | | Special school |
| | Mainstream class | Preparatory class | Class for foreign language speakers | Other special needs classes | Special school class |
| | No or simple special needs measures | | | | |
| | Enhanced special needs measures | | | | |

34 Change in the proportion of pupils following special curricula in compulsory education, 1999/2000 to 2015/16

Data: FSO; calculations: SCCRE

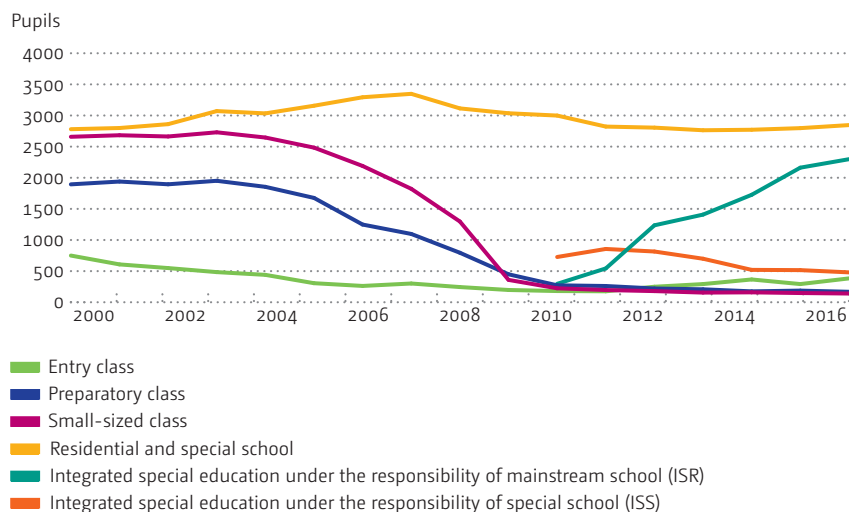


Looking at the previously reported figures for pupils with special curriculum (special needs classes and special schools), there has been a reduction from 5.1% to 3.4% in Switzerland as a whole. The picture of individual cantons does reveal differences, however. While the number of children and young people with a special curriculum in the cantons of Basel-Stadt, Obwalden and Zug has fallen, it is rising in both Appenzell Innerrhoden and Appenzell Ausserrrhoden, and in the cantons of Geneva and Neuchâtel (→ Figure 34). The data does not show whether there has been an actual increase or decrease in separate special needs education, or whether a redefinition of the categories has produced this result.

Evidence from the canton of Zurich reveals how such a change to the categories can impact results. Alongside separate special schools, integrative special teaching in mainstream classes has been recorded separately since 2010 (Bayard & Schalit, 2016). The new categories reveal that while the number of integrated special needs pupils under the responsibility of mainstream classes (ISR) has increased, the level of integrative special education under the responsibility of special schools (ISS) has fallen significantly (→ Figure 35).

35 Change in pupil figures in special classes, residential and special schools, and in integrated special education in Canton Zurich, 2000–2016

Data: Ministry for Education of Canton Zurich, education planning, education statistics



In Canton Vaud, the number of pupils being taught separately is also falling. Increased levels of integration have been observed since the 2009/10 academic year. The data does not reveal whether the participation in mainstream education is restricted to an individual subject, such as physical education and sport, or the majority of subjects (→ Figure 36).

Assessment of school and teaching quality at cantonal level

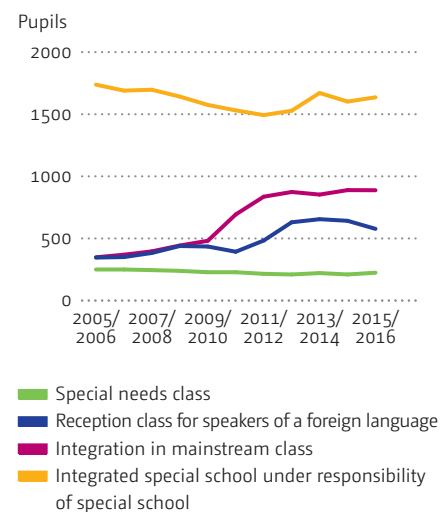
Having considered the coordination of strategic and development efforts at national and regional level (HarmoS Agreement and Special Needs Education Agreement, baseline skills assessments, linguistic region curricula), this section focuses on work at the cantonal level. The Federal Constitution and cantonal legislation state that the actors at the various levels of the education system are accountable for delivering high quality in line with their responsibilities. Accordingly, the cantons independently or in association with other entities also assess the quality of schools and teaching processes (*EDK-IDES, 2015*) so that pupils' learning and development are supported, and equal opportunities are provided (Article 61a, paras. 1 and 2 FC). In line with the expansion of school autonomy, school and lesson-based quality concepts have been developed at cantonal level. Their implementation will be assessed in the scope of internal and external evaluations. The information provided by these processes provides accountability to the cantonal authorities. In addition, it gives school staff a basis for further developing their institution and lessons.

Whereas traditional school inspections have always been concerned with compliance with legal standards, procedures and budgets, the quality control of school and teaching processes adopts various approaches.

In the French and Italian-speaking regions of Switzerland and in the North-Western Switzerland education area, there is, to a lesser or greater extent, an established system of standardised school testing that pupils must undergo at various points during their compulsory education. Assessments with a rather summative character are more widespread in these parts of the

36 Development in number of pupils in special schools in the canton of Vaud, 2005–2016

Data: Canton of Vaud, Office for Research in Pilot of Pedagogical Systems



country than in Switzerland's other regions. The evaluation of results and in some cases the actual process of running the tests falls under the responsibility of external agencies. The pupils, teachers, schools and cantonal authorities each receive appropriate evaluation that is intended to encourage or further develop the corresponding level (e.g. *Bayer & Moser, 2016; Geneva, SRED, 2015b; Vaud. URSP, 2014*). The cantons of central and eastern Switzerland have opted almost exclusively for mandatory use of the «*Stellwerk*» adaptive diagnostic testing, which was designed for the two final years of the compulsory education phase and aims to support pupils individually. Educators in these regions also have access to orientation or reference assessments (such as *Lernlot, Lernlupe* and *Klassencockpit*), which are used and can be evaluated voluntarily by teachers. The cantons of Schwyz and Lucerne have made such a diagnostic assessment compulsory at the primary school level (a project in Nidwalden also gathers information on pupil performance). Overall, these forms of diagnostic testing are intended to pinpoint individual pupils' progress on their learning journey, providing them with encouragement and giving teachers an opportunity to reflect on teaching (→ Figure 37).

37 Compulsory cantonal testing

Data: EDK-IDES, as at June 2017

| Academic year by HarmoS | French-speaking Switzerland and Ticino | | | | | | | | | | Education Area North-west Switzerland | | | | Central Switzerland | | | | | | East Switzerland | | | | | | | | | |
|-------------------------------|--|---------|---------|----|----|----|----|----|-------------|--|---|----|----|----|---------------------|-----|-----|-----|-----|-----|------------------|--|-----|----|----|-----|-----|-----|-----|-----|
| | BE d + f | FR d | FR f | GE | JU | NE | TI | VD | VS d + f | | AG | BL | BS | SO | | LU | NW | OW | SZ | UR | ZG | | AI | AR | GL | GR | SG | SH | TG | ZH |
| 3 | | | | | | 1 | | | | | | | | | | | | | | | | | | | | | | | | |
| 4 | | | 1 | 2 | | 1 | | 1 | 2 | | | | | | | | 2** | | | | | | | | | | | | | |
| 5 | | | | | | 1 | | | | | 2 | 2 | 2 | 2 | | | | | | | | | | | | | | | | |
| 6 | | | 1 | 3 | 2 | 1 | | 2 | | | | | | | | | 2** | | 3 | | | | | | | | | | | |
| 7 | | | | | | 1 | | | | | | | | | | 2 | | | | | | | | | | | | | | |
| 8 | | 2 | 2* | 3 | 3 | | | 3 | 2 | | 4 | 4 | 4 | 4 | | 3 | 2** | | | | | | | | | | | | | |
| 9 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 10 | | 1 S* | | 3 | 2 | | 1 | 2 | | | 5 | 5 | 5 | 5 | | 3 S | 4 S | 5 S | 5 S | 4 S | 5 S | | 5 S | | | 5 S | 5 S | 5 S | 5 S | 5 S |
| 11 | | | 5 | 3 | | | 3 | | 4 | | 5 | 5 | 5 | 5 | | 5 S | 5 S | | 5 S | 4 S | | | 5 S | | | 5 S | | | | |

■ Testing, mainly for individual encouragement, results generally disclosed to pupils and teachers

■ Testing for individual encouragement and additional evaluation at cantonal level

1 Normally mathematics (M) or teaching language (L1)

2 M, L1

3 M, L1 and first foreign language (L2)

4 M, L1, L2 and second foreign language (L3) or natural sciences

5 M, L1, L2, L3, natural sciences and some additional subjects

* FR-d: Biennial; FR-f: Only sampling

** temporary project

S = *Stellwerk* diagnostic test

In German-speaking Switzerland the diagnostic assessments have been complemented by a combination of internal school quality management processes (peer assessment by school managers, peer feedback) and external evaluations, the latter normally following a three to five-year cycle. The supervision and evaluation complex in the cantons takes a variety of forms and no general statements can be made about how results from evaluations are used and measures are determined. The German-Speaking Swiss Confer-

ence of Cantonal Ministers of Education holds a specialist conference entitled «Intercantonal Working Group for External Evaluation of Schools» (AR-GEV) to encourage intercantonal collaboration and coordination of external school assessment. The ARGEV Agreement, which came into force in 2013 and now has 15 Swiss German cantons and the Principality of Liechtenstein as signatories, lists its tasks as the qualification and professionalisation of experts in school evaluation and the provision of a network for agencies and people specialised in this area (→ Figure 38).

The results of these many different cantonal diagnostic assessments and school quality audits are probably not used systematically in all cantons, although cantonal management knowledge could be generated with relevant background information on pupil, teacher and school characteristics.

School leadership and teaching staff

Changes in compulsory education over the past two decades have resulted in greater autonomy being granted to individual schools, and thus greater flexibility. In conjunction with school autonomy, all cantons have now introduced school managers to the compulsory education phase, whose responsibilities are not only limited to administrative and organisational activities but now also extend to staff and pedagogical leadership and responsibility for school development. School managers therefore play a key role in the quality assurance process within individual schools (*EDK-IDES, 2015a*).

Owing to the functions and responsibilities bestowed on them, school managers are an important part of the education system and have been counted separately by the Federal Statistical Office since the 2011/12 academic year. 8808 school managers (2878 FTE) and 91 219 teachers (58 124 FTE) were employed in public schools (1st to 11th school year) in the 2015/16 academic year.

In both categories, females outnumber males (→ Figure 39). While teaching activities in compulsory education have mainly been performed by women for several decades, the greater proportion of female school managers is a newer phenomenon. The extent of the gender divide differs greatly according to level, both for school management staff and teaching staff. At primary school level around 63% of school managers and 86% of teachers are women. At lower secondary level, however, the proportion of females is significantly lower to 36% for school management and 54% for teaching staff. The average age of school managers is older than that of teachers, with the youngest age category under-represented. This is because school management roles are frequently filled by teachers with classroom experience. A survey of the Swiss school managers' association (VSLCH) reveals that 95% of respondents from throughout Switzerland previously worked as teachers. The association's survey also provides a summary of its members' workload and size of the teaching faculty for which they are responsible (→ Figure 41).

38 State of development in external school evaluations in German-speaking Switzerland

Source: ARGEV, 2017

Planning/pilot phase

BE, BS, SG

First evaluation phase completed

AR, BL, FR*, SO, SZ*, TG, UR*, ZG

Multiple cycles completed

AG, GL, GR, LU, NW, OW, ZH

No evaluations

AI**, SH, VS

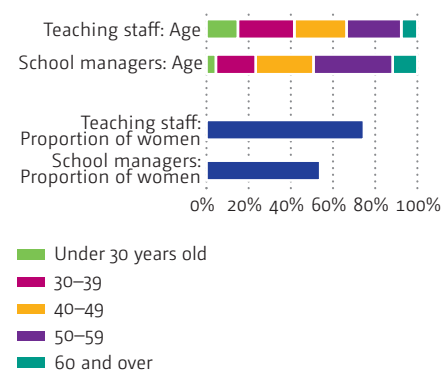
* No additional evaluations

** At the request of the school council

39 Age and gender of school staff in compulsory education, 2015/16

Only public schools

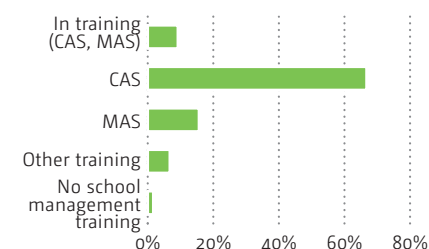
Data: FSO



40 School management personnel by school management certificate, 2017

Survey of VSLCH members, 2017 German-speaking Switzerland: 219 people, of whom 56% responded; French & Italian-speaking Switzerland: total of 324 people, 41% response rate

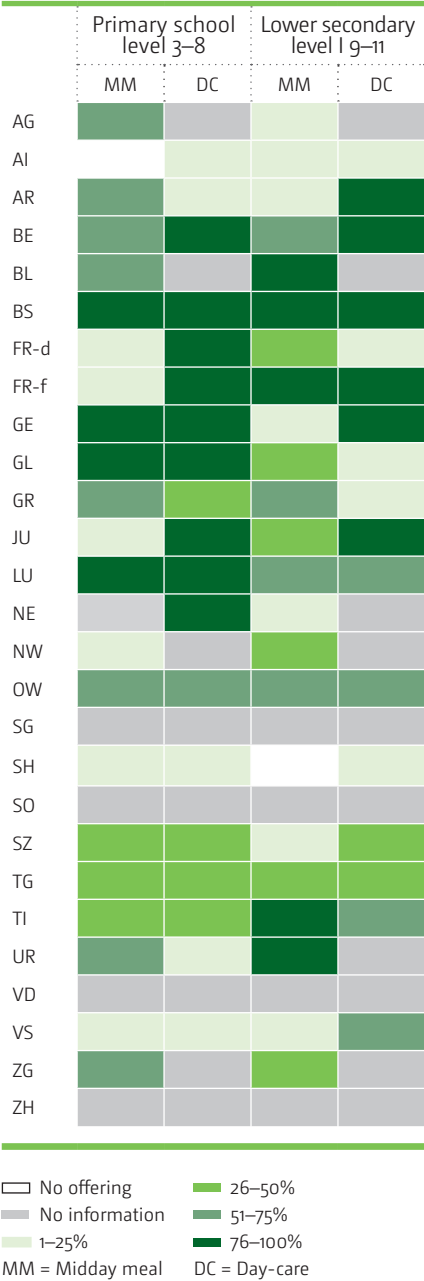
Data: VSLCH



A recent study in the USA has investigated the effects of school-management qualifications on pupil performance (*Fryer, 2017*). The findings demonstrate the positive impact of special training for school managers on pupil development.

42 Proportion of schools offering midday meals or school-based day-care facilities, 2017

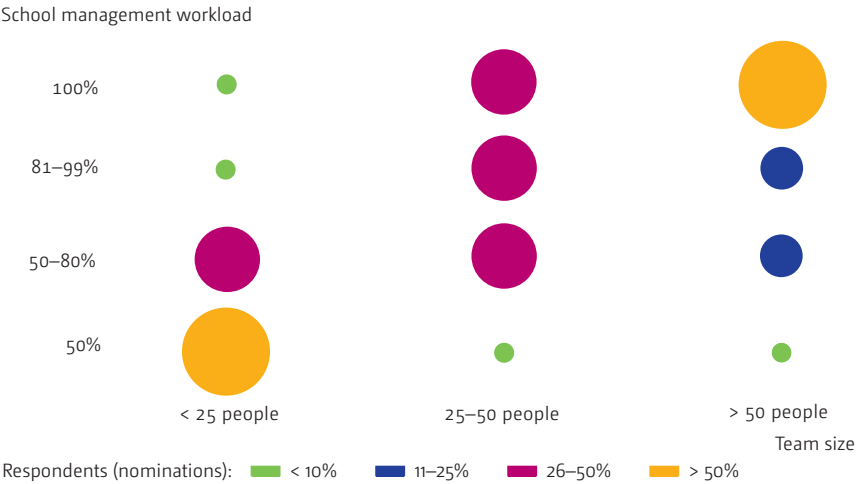
All-day schools (mandatory or voluntary participation in all-day activities) are not included in this list.
Data: EDK-IDES



«School-based day-care facilities» refer to all demand-led day-care offerings for children and young people from birth until the end of their compulsory education (up to 20 years of age for those in special needs education) outside the family.» (EDK & SODK, 2008). Cantonal names include: After-school activity, day-care, additional school care, out-of-school care and may include provision of a midday meal and supervised homework support.

41 School management workload and team size

Survey of VSLCH members, 2017 German-speaking Switzerland: 2119 people, of whom 56% responded; French & Italian-speaking Switzerland: total of 324 people, 41% response rate
Data: VSLCH



The findings also reveal that 38% of the respondents teach in addition to their school management functions. Developments in the compulsory education context (school autonomy, integration, part-time working, → *chapter Universities of teacher education, page 241*) mean that the personnel working in schools have varied qualifications and can be differentiated by function. In addition to teachers, there are school-based teachers for special needs education as well as experts in therapeutic measures (including psychomotrics and speech therapy) and school-based social work. Schools also employ classroom assistants, personal assistants and since 2016 in some cases young people carrying out their civilian service (in accordance with the Ordinance on Alternative Civilian Service, 2016). Future statistics will take greater account of this broader definition of school staff; no previous data is available, however. The high proportion of teachers in part-time employment and the interdisciplinary diversity of staff highlight the complex nature of managing the school staff and ensuring cooperation and coordination.

School-based day-care facilities

Changes in the forms of gainful employment and family patterns are prompting a growing demand for childcare facilities outside the family, especially for younger schoolchildren. The HarmoS Agreement (2007) took account of this situation by requiring signatory cantons to offer school-based day-care facilities care to meet demand during compulsory schooling. According to the subsidiarity principle, within each canton the communities are responsible for assessing demand and making appropriate provision available. This is primarily wraparound and childcare before and after school and on afternoons where there are no lessons, as well as supervised care at lunchtime. Schools classified as «all-day» are less common. Use of these facilities is voluntary and normally subject to a charge. The uneven spread of this day-care provision is obvious when looking at the proportion of schools that offer supervised midday meals or day-care facilities before and/or after lessons (→ Figure 42). In contrast to the field of early childhood, where all-day childcare of 0–4 year

olds to complement families' own capacities is common (→ *chapter Primary school level, page 51*), the availability of care for children after they have started in compulsory education is extremely patchy in many cantons. In just a few cantons, the majority of schools offer wraparound care from morning to evening, including midday meals, which would assist parents seeking to combine family and work.

As a result of the education policy efforts to make day-care to complement school available in all areas, quality specifications and guidelines for the provision of day-care have been developed in recent years (e.g. *Brückel, Kuster, Annen et al., 2017; EDK-SODK, 2016; Stern, Gschwend, Medici et al., 2015*).

Attendance at private schools

The vast majority of schoolchildren in Switzerland receive their compulsory schooling through the state education system. In the whole of Switzerland, 4.6% of pupils attend a privately funded school (academic year 2015/16). Since 2000, this rate has remained within a band between 3.2 and 4.6%. The proportions in the cantons of Basel-Stadt, Geneva and Zug are significantly higher than the national average. The strong economic centres attract more of the tertiary-educated migrants whose children are more likely to attend an international school. While the correlation between the proportion of migrants with a tertiary education and the proportion of children and young people attending private schools is very strong, it is not equally high in all cantons (→ Figure 43). Alongside international schools are other types of private school that do not principally target highly qualified foreign parents. In the canton of Basel-Landschaft, private schools have primarily been set up to offer reform pedagogical concepts, while the majority of private schools in the canton of Ticino are funded by the Church.

43 Private school attendance and proportion of migrants with tertiary education, by canton, 2015/16

Private schools not in receipt of a subsidy or in receipt of a subsidy of up to 49%; tertiary education excluding tertiary level B PET

Data: FSO; calculations: SCCRE

Pupils in private schools



Most recently, home-schooling has been gathering greater attention. As a result, some cantons are revising their legislation on this matter (for example *Zurich, 2016; Thurgau, 2017*). Nevertheless, the proportion of children of compulsory school age who do not attend an educational establishment is very low (<1%). Cantonal authorities' rules on home-schooling currently vary greatly, and the distribution of home-schooling is correspondingly uneven.



Primary school level

(Including two years of pre-school or the first two years of a first learning cycle)

Context

Developments in the individual cantons point to a harmonisation of structures in the primary school sector since the entry into force of the HarmoS Agreement (→ *chapter Compulsory education, page 31*). This chapter takes account of this Agreement, as a result of which the primary school level, including pre-school or the first two years of a first learning cycle, will now last eight years (special regulation for the Canton of Ticino). Even before they start their compulsory schooling, children are embedded in socialisation and educational processes that are key to their development and future career (Cappelen, List, Samek et al., 2016; Chor, Eckhoff Andersen & Kalil, 2016; Rossin-Slater & Wüst, 2016). The situation during the run-up to school will be addressed first.

Childcare provided outside the family

(EKFF, 2009)

Formal (and/or institutional): Childcare outside the child's own family in a state or privately financed establishment (e.g. crèche, childminder, wrap-around care, after-school care).

Informal (and/or not institutional): Childcare within the family by relatives (e.g. grandmother or aunt) or a paid individual (e.g. nanny, childminder or babysitter).

The «Zürcher Equity Präventionsprojekt Elternbeteiligung» [Zurich Equity Parental Involvement Project] (ZEPPELIN 0–3)

The most recent findings from the ZEPPELIN 0–3 project confirm the positive effects of early support for children from families with psychosocial problems. Families receive PAT («parents as teachers») training in the form of regular visits from a health visitor, a group activity is organised once a month, and social networking is encouraged. Children from families supported by the PAT parent training go on to have a wider vocabulary, can articulate more effectively and have better impulse control than children whose parents have received no such training (Lanfranchi, Schaub, Burkhardt et al., 2016; Lanfranchi & Neuhauser, 2011) (→ Figure 44).

Early childhood education and care

The provision of early support is designed to help with children's learning processes from birth until they enter the primary school level after their fourth birthday. It can be divided into general early support and special early support measures. General early support includes, for example, childcare outside the family in day-care centres and crèches, or with childminders. Special early support is needed by families with children who require specific resources such as early years special needs education or courses in German as a second language. Childcare outside the family can also be divided into informal/non-institutional provision and formal/institutional options (→ *text in left-hand margin*).

Early childhood education and care make an important contribution to children's social, emotional and psychological development. The fact that policymakers are now paying increasing attention to early childhood education and care is due not least to the results of research, and primarily international research demonstrating the positive impact on development and educational success (Cappelen, List, Samek et al., 2016; Chor, Eckhoff Andersen & Kalil, 2016; Cornelissen, Andresen, Raute et al. 2016; Baker, Gruber & Milligan, 2015; Müller, Spiess, Tsiasioti et al., 2013; Heckman, Pinto & Savelyev, 2013) – particularly for children from households with a low socio-economic status (Stern, Fliedner, Walther et al., 2016; Peter, Schober & Spiess, 2015; Felfe & Lalive, 2014). National projects (e.g. ZEPPELIN 0–3 or Tipi-Ticino Prima infanzia) have also shown the positive impact, in some cases long-term, of child care provided outside the family on children's cognitive and non-cognitive skills (→ *text in left-hand margin*). Intervention programmes also frequently focus on the promotion of adults' skills (Lanfranchi, Schaub, Burkhardt et al., 2016) and not just on strengthening the skills of children. Strengthening parents' skills is also a focus of the Swiss childcare network and the Swiss UNESCO Commission's orientation framework on early years provision (Wustmann Seiler & Simoni, 2016) as well as many cantonal language development projects such as «Schenk mir eine Geschichte – family literacy» (Diez Grieser & Dreifuss, 2015; Hutterli & Vogt, 2014; Grob, Keller & Trösch, 2014).

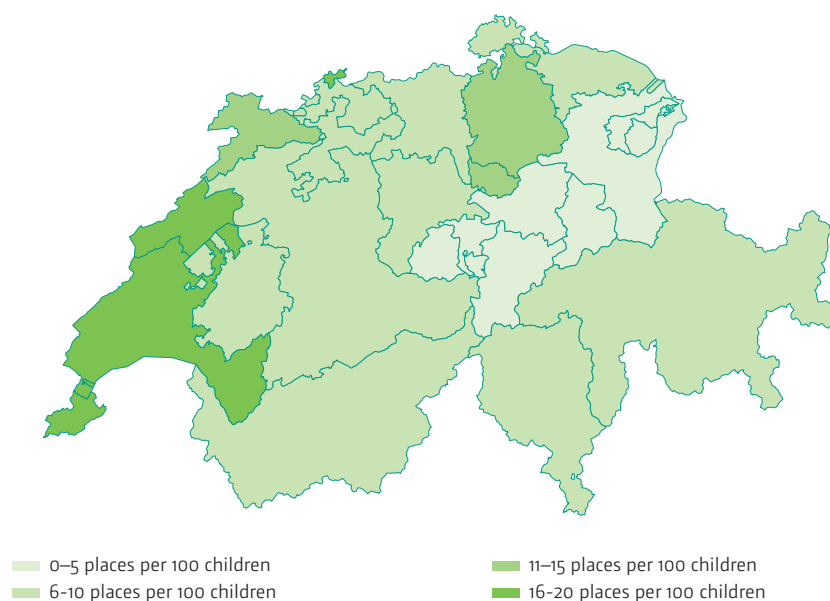
Geographically heterogeneous spread of childcare provision outside the family

According to figures from the Federal Statistical Office for 2014, more than 71% of parents make use of child care outside the family measures before their children start school. Around 54% of children attend day care to complement school alongside their regular schooling. With regard to programmes outside of the family and to complement school, non-institutional childcare is the predominant type (age 0–3: 21% institutional compared with 31% non-institutional; 4–12: 15% compared with 30%). While Switzerland's neighbours generally record their childcare provision available outside the family systematically and regularly (*Stern, Fliedner, Walther et al. 2012*), this is not the case in Switzerland due to a lack of information but mainly due to a lack of uniform, comparable and coherent data, particularly at the level of the cantons and communities. The heterogeneous mix of available childcare in Switzerland is also in evidence when considering the individual parts of the country and regions in more detail (*EKFF, 2009; Neumann, Tinguely, Hekel et al. 2015*). Significant disparities are also in evidence within individual cantons; this has been confirmed by, among others, a study conducted in the canton of Geneva (*Benninghoff, Martz & Jaunin, 2017*).

One area for which data is available for comparison purposes at a national level is the number of new crèche places created since February 2003 with financial support from the Confederation (*FSIO, 2017*). The Figure 45 shows the number of crèche places per 100 children up to the age of four created with the help of this incentive programme. The regions shaded dark green created the most new places. Leaving aside strongly urbanised areas such as Zurich, the newly created places have primarily been created in cantons and communities in French and Italian-speaking Switzerland (*FSIO, 2017; Mirante, Gali & Giudici, 2016; Neumann, Tinguely, Hekel et al., 2015*).

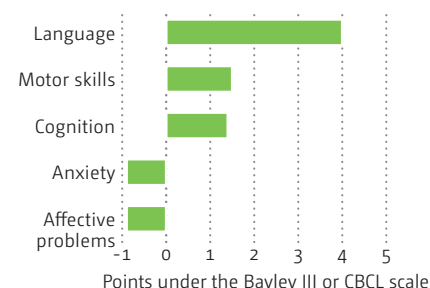
45 Newly created crèche places with financial support from the Confederation's Incentive Programme per 100 children aged 0 to 4, 2003–2016

Data: BSV; calculations: SCCRE; map: Swisstopo



44 Points difference between children from families given PAT training and children from families with no training, 2016

Source: Lanfranchi, Schaub, Burkhardt et al., 2016



Legend

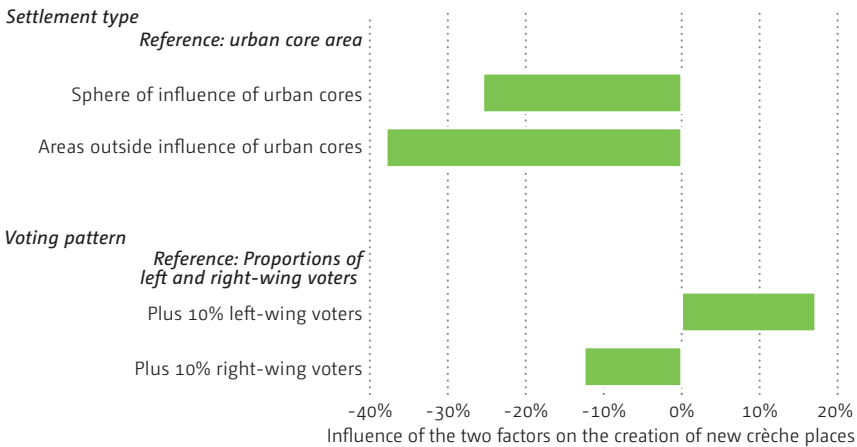
Child development was measured using Bayley III (Bayley Scales of Infant Development, 3rd Edition) in relation to language, motor skills and cognition and using the CBCL (Child Behavior Checklist 1.5–5) in relation to anxiety and affective problems. In the area of language, children with PAT averaged 89.6 points and performed significantly better than children in the control group, who recorded 85.6 points. PAT children recorded lower scores of 54.8 for anxious behaviour, compared with 55.7 points.

Taking into account factors at community level, we observe that in urban communities with a high proportion of under-4s and a left-wing political leaning, more new places tend to be created by the bodies responsible for day-care centres (mainly private institutions) (→ Figure 46).

46 Influence of type of settlement and political orientation on the number of newly created, financed crèche places, 0 to 4-year-olds, public and private, 2016

Multivariate regression with control variables for the number of 0 to 4-year-olds in the community, for young people per square kilometre and for the settlement area
 Data: BSV, FSO; calculations: SCCRE

Legend
 Communities with 10% more left-wing voters than the average community have used the stimulus financing to fund 17.2% more new crèche places. Those communities with 10% more right-wing voters have created 12.5% fewer new places. Rural communities (−37.9%) and communities in the agglomeration (−25.5%) have created fewer new crèche places with the stimulus finance than urban communities (reference category).



Given that the credit made available for the stimulus programme is likely to run out before the programme ends on 31 December 2019, the Federal Department of Home Affairs (FDHA) adopted a priority ranking, by law with effect from 1 February 2017, the aim of which is to achieve a regional allocation of the funding that is as balanced as possible. The total remaining credit is CHF 33.4 million, of which 80% is reserved for bids from those cantons that have received little funding to date, while the remaining 20% is available for applications from those cantons from which a disproportionately high level of funding has been applied for to date (FDHA, 2017).

Social composition of school population at primary school level (3rd–8th school year)¹

Social segregation and hence the geographical concentration of people on low incomes or social security and disadvantaged migrants, is evident in Switzerland (Ibraimovic, 2011). The social composition of the school population is influenced by a wide range of factors. The proportion of pupils with a migration background, for example, differs greatly from by canton. Across Switzerland as a whole, in the school year 2015/16 around one quarter (26.7%) of pupils in the first to eighth year of primary school level are foreign

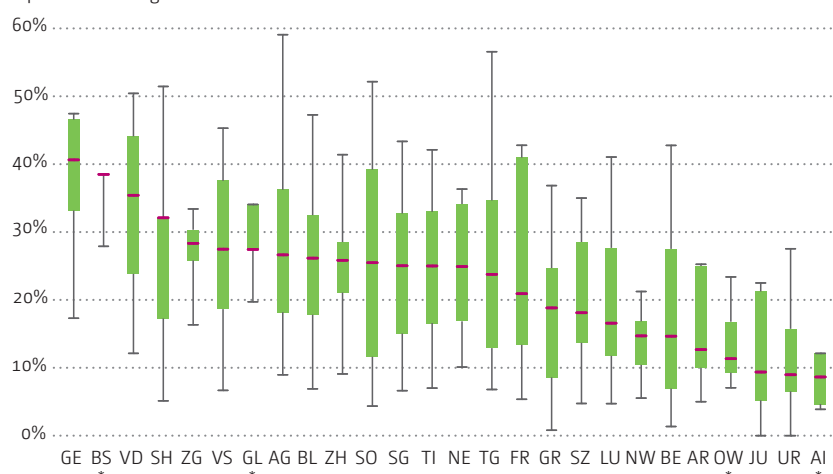
¹ This counting method is based on the years of compulsory education (1st to 11th years). This includes pre-school or the first two years of a preparatory stage. The 3rd to 8th year of primary school level encompasses Primarschule in German-speaking Switzerland, the 3rd and 4th year of the Cycle primaire I and all of Cycle primaire II in French-speaking Switzerland, and all of Scuola elementare in Ticino. With regard to the different levels, see Figure 25 in the Compulsory education chapter.

nationals. This figure varies considerably by canton. While Geneva (+16.6%), Basel-Stadt (+13.2%) and Vaud (+9.4%) have significantly higher shares of foreign nationals than the Swiss average, the cantons of Appenzell Innerrho-den (−19.1%), Uri (−15.1%) and Jura (−14.9%) have the smallest proportions of foreign pupils. The level of variation within individual cantons is also high. At primary school level (3rd to 8th year), the variation between communities within the same canton is particularly high in St. Gallen, Aargau and Solo-thurn, and low in Appenzell and Nidwalden (→ Figure 47).

47 Variation in proportion of foreign nationals among primary pupils (3rd–8th school year) between and within cantons, 2015/16

Data: FSO; calculations: SCCRE

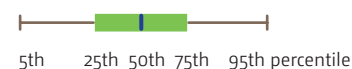
Proportion of foreign nationals



Legend

In the canton of St. Gallen the middle 50% of all communities have a proportion of foreign pupils ranging from 15.1% to 43.3%. In 90% of St. Gallen communities, the proportion is between 6.6% and 43.3% (horizontal lines above and below the box). The blue line shows the median.

The cantons marked with an asterisk have fewer than 10 observations; for Basel-Stadt and Glarus it is only three.



In order to counteract the disadvantages arising from the varied social composition of communities, such cantons as Geneva, Zurich and St. Gallen, as well as some cantons in north-western Switzerland, calculate a social index for the communities and ensure when allocating resources that schools in communities with a higher burden receive additional resources (SCCRE, 2014).

Development of pupil numbers

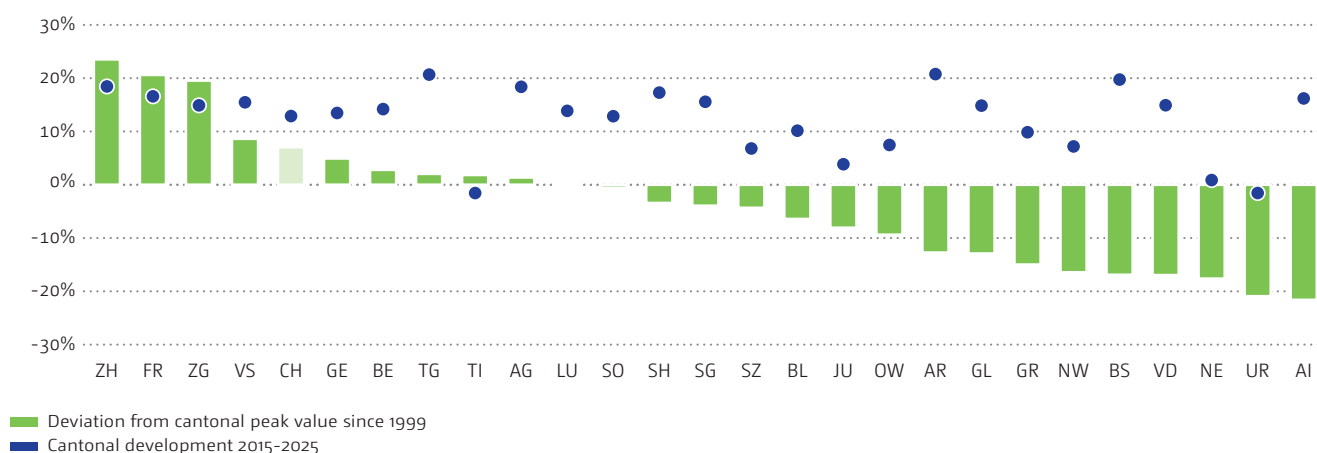
Total pupil numbers in compulsory education have fallen consistently for the past 10 to 15 years. Based on the forecast, however, they are set to rise as of 2015 for at least 10 years (→ *chapter Compulsory education, page 31*). In the cantons of Zurich, Fribourg, Zug, Valais, Geneva, Bern, Thurgau, Ticino, Aargau and Solothurn, the highest levels since 1999 are expected (→ Figure 48). In other words, even if no schools have been closed in these cantons in recent years and even if falling school rolls over recent years have initially resulted in better utilisation of the capacity in some instances, these cantons will probably need to invest more in their school infrastructure in the coming years. The strong growth in these ten cantons can be explained by international and intercantonal migration as well as by high birth rates (FSO, 2016d). In contrast, the figures in other cantons over the forecast period are more or less significantly below the historically highest value (Schaffhausen -3.4% and Appen-

zell Innerrhoden -21.6%). If we consider the development from today until 2025, the number of pupils will rise by as much as ten percent or more in 20 cantons. The heterogeneous nature of developments in school numbers are a consequence of intercantonal in and out-migration flows (e.g. Basel-Stadt).

48 Development of pupil numbers at primary school level (3rd–8th school year) up to 2025

Deviation from peak value since 1999 and deviation from 2015 pupil numbers (reference scenario)

Data: FSO; calculations: SCCRE



Legend

By 2025 there will be 23.54% more pupils in primary education in the canton of Zurich than at the previous all-time high (2014). Even compared with 2015, Zurich will then have 18.5% more primary children. In contrast, Appenzell Innerrhoden will have 21.6% fewer primary school pupils in 2025 compared with its peak figure (recorded in 2000), although this will still be up 16.2% on current numbers in 2015. For the development on the lower-secondary level: → *Chapter Lower-secondary education, page 77.*

School size and population density

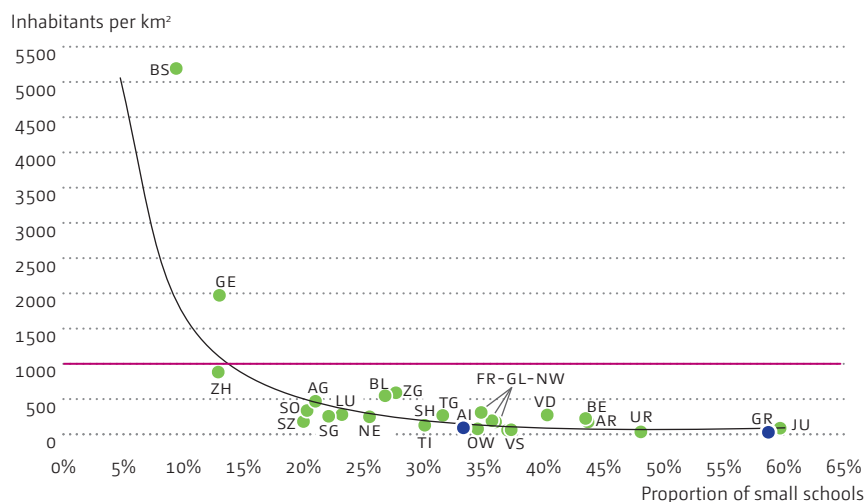
The fall in pupil numbers over recent years has generally triggered an adjustment of school rolls and, subsequently, as the downward trend has continued, has resulted in schools being closed or amalgamated (SCCRE, 2014). In rural cantons with a low population density that are particularly hard hit, schools are frequently kept open despite the critical size of the school roll, or mixed-age classes are introduced (see also *Périsset, Steiner & Ruppen, 2012*). There is a clear correlation at primary school level (3rd to 8th year) between population density and the proportion of small schools with no more than 50 pupils (→ Figure 49). On average, around 30% of Swiss schools are small schools with between 1 and 50 pupils. Yet some cantons, despite having similar levels of population density, have different proportions of small schools (e.g. Appenzell Innerrhoden has 33%, Graubünden has 60%). As well as population density, geographical factors and structural characteristics play a role. Among those cantons with a low population density, for example, the canton of Graubünden (blue dot in Figure 49) has a large urban sprawl and a large number of small communities, as a result of which it has a disproportionately high number of small schools. Meanwhile, in the canton of Appenzell Innerrhoden (blue dot in Figure 49), the population is concentrated in a small number of communities, making larger schools a viable option. Furthermore, there is likely to be a correlation between the organisation of the school system and the topographical characteristics of a can-

ton (e.g. many communities surrounded by mountains) given the desire to ensure that primary school-age children only have a short journey to school.

49 Proportion of small schools at primary school level (3rd–8th school year) and population density by canton, 2015/16

Schools with up to 50 pupils, excluding special and private schools

Data: FSO



Institutions

The picture for Switzerland as a whole is based on the years of compulsory education (1st to 11th years). This includes pre-school or the first two years of a preparatory stage. The 3rd to 8th year of primary school level encompasses Primarschule in German-speaking Switzerland, the 3rd and 4th year of the Cycle primaire I and all of Cycle primaire II in French-speaking Switzerland, and all of Scuola elementare in Ticino. Pupils change learning environment three times during their compulsory education. They begin by entering the first year of primary school level (pre-school or the first year of a first learning cycle) or enter formal education for the first time. Secondly, they transfer to primary school (Primarschule, Scuola elementare or Cycle primaire II) and finally, they move into lower-secondary education. This process may differ according to linguistic region. Parents may generally apply for their children to enter compulsory education early or to defer their start, stating the reasons for such a request. The school supervisory authorities at community level will generally make the final decision. Within the primary school level it is possible for classes to be skipped or repeated. Results from cantonal tests show that children skip classes at primary school level much more frequently than in lower-secondary education (*Bayard & Schalit, 2016; Brunner, Hug, Oppliger et al., 2016*).

First years of primary school level

According to the HarmoS Agreement (Article 5) children should start school after their fourth birthday (cut-off date of 31 July). While the cut-off date in

50 Changes in primary school level as a result of structural harmonisation

Data: EDK-IDES, as at September 2017

| | Cut-off date for school entry: 31 July | Two-year compulsory pre-school |
|--------|---|--------------------------------|
| AG | | |
| AI * | | |
| AR * | | |
| BE | | |
| BL | | |
| BS | | |
| FR | | |
| GE | | |
| GL | | |
| GR ** | | |
| JU | | |
| LU * | | |
| NE | | |
| NW * | | |
| OW *** | | |
| SG | | |
| SH | | |
| SO | | |
| SZ | | |
| TG | | |
| TI | | |
| UR | | |
| VD | | |
| VS | | |
| ZG *** | | |
| ZH | | |

* unchanged 2 years pre-school with 1 year mandatory offer and 1 year compulsory attendance

** 2 years pre-school with mandatory offer

*** 1 year pre-school (compulsory attendance)
In the 2015/16 academic year 29% effectively attended 2 years of pre-school in the canton of Obwalden and 95% in the canton of Zug.

school year 2015/16 has been set as 31 July in 15 cantons (→ Figure 50), it varies from 1 November (Lucerne) to 30 April (Appenzell-Ausser rhoden) in the rest. In the cantons of Valais, Basel-Landschaft and Zurich, a cut-off date of 31 July is gradually being introduced (EDK, 2015).

Before the introduction of the HarmoS Agreement (2006/07 academic year), only Basel-Stadt had rules on two years' compulsory attendance. In practice, however, the majority of children across Switzerland have been spending two years at pre-school (Kindergarten, École enfantine, Scuola dell'infanzia).for some years now. The extension of compulsory education from nine to eleven years was introduced in the form of the HarmoS Agreement. There is some scope for flexibility in the initial school years with the preparatory stage being offered either as a «Grundstufe» (two years at pre-school and the first primary class) or as a «Basisstufe» (two years at pre-school and the first two primary classes) (Hutterli & Vogt, 2014)². In the 2015/16 school year, 17 cantons (all HarmoS cantons plus Aargau and Thurgau) had eight mandatory years of primary school level. If we consider only these cantons, the children are aged between 4.55 years (Neuchâtel) and 4.71 years (Thurgau) upon entering compulsory education, controlling for age effects resulting from the different cut-off dates (→ Figure 51). As it can be assumed that there is no difference between cantons in the average age of the children, the difference must be attributable to the deferred start in compulsory education.

51 Age upon entry to 1st school year of primary school level in 13 HarmoS cantons, and in Aargau and Thurgau, 2015/16 academic year

Corrected to take account of age effects caused by differing cut-off dates. The HarmoS canton of Ticino is not listed due to a lack of data, while the HarmoS canton of Valais has been missed out due to different cut-off dates across the regions.

Data: FSO; calculations: SCCRE

School entry age



If we compare children's age upon entering the third year of the primary school level in all cantons (beginning of Primarschule, Scuola elementare and the second part of Cycle primaire I), we observe a variation, controlled for different cut-off dates, of 6.92 months between the different cantons. On average, children are 6.74 years old in the third year of the primary school level. There are on average six cantons within an age difference of one month (→ Figure 52). However, even one month of age difference means that in the canton with older children, more than 8% of pupils will repeat or be deferred by a year.

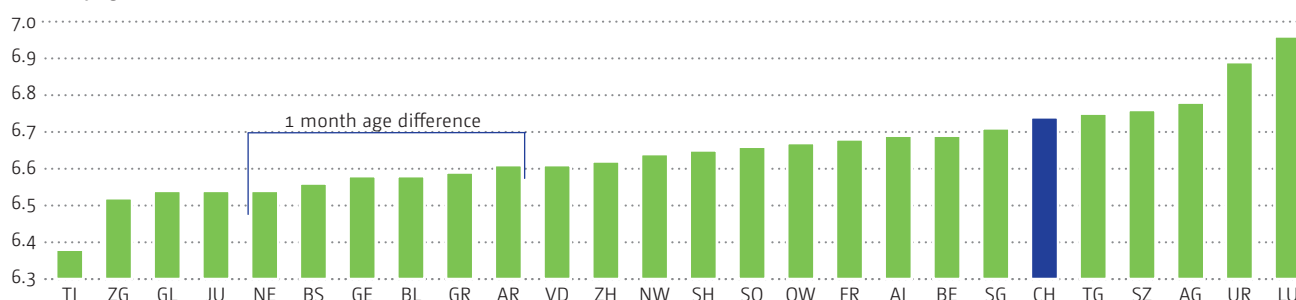
2 The following cantons offer the Basisstufe and or Grundstufe in some communities: Bern, Glarus, Appenzell Ausser rhoden, Lucerne, Obwalden, Thurgau and Uri (EDK, 2015).

52 Cantonal average age upon entering the third year of primary school level

Corrected to take account of age effects caused by differing cut-off dates. The canton of Valais is excluded due to differing cut-off dates in the different regions.

Data: FSO; calculations: SCCRE

School entry age



Content of the curricula for the different linguistic regions

It is not just the alignment of pre-school/the first learning cycle and primary school that has progressed since 2014. The introduction of the linguistic region curricula has also moved forward in the form of the Lehrplan 21, the Plan d'études romand (PER) and the Piano di studio della scuola dell'obbligo ticinese, and has either been concluded or is currently being implemented. The cantons of Western Switzerland and the canton of Ticino have already adopted and implemented «regional and/or cantonal» curricula. This has only been achieved in some of the cantons in German-speaking Switzerland (→ *chapter Compulsory education, page 31*). The PER and Lehrplan 21 are divided into three cycles (first cycle: four years; second cycle: four years; third cycle: three years). The Piano di studio della scuola dell'obbligo ticinese is also split into three cycles, lasting four, three and four years. The three cycles of the linguistic region curricula have specific priorities. The first cycle focuses on consolidating basic social competencies and working methods used in school, as well as on basic language skills. Cycles 2 and 3 (lower-secondary education) build on the competencies already acquired, going into more depth with subject-specific and over-arching competencies.

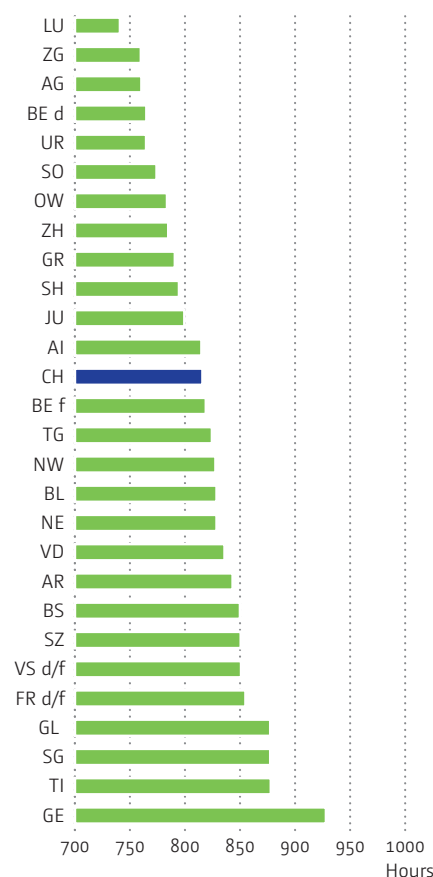
The cantonal curricula are divided into various subject areas, some of which are described in more detail here by way of example. In terms of language tuition, most cantons teach two foreign languages in addition to the language of instruction as early as primary school level (a second national language of Switzerland and English).³ Courses in German as a second language, German as a foreign language and French as a second language are all available in a large number of cantons. Additionally, in order to promote pupils' native languages, teaching in native language and culture is offered in around one third of cantons (e.g. Basel-Stadt and Geneva). Several studies have shown the positive impact that this language teaching has on the development of the children's first language. In contrast it has not been possible to prove the expected transfer effect to the standard language (*Caprez-Krompàk, 2015; 2011*). In the subject «Natur, Mensch, Gesellschaft» (Lehrplan 21), «Sciences hu-

³ The canton of Neuchâtel has introduced an immersion teaching pilot project at primary school level (PRIMA I and PRIMA II). Other cantons also offer immersion classes (e.g. French and German classes in Bern and English classes in Zug).

maines et sociales» (PER) or «Area scienze umane e sociali» (Piano di studio) teaching is provided in the natural sciences from as early as the first cycle (see also Metzger, Colberg & Kunz, 2016). In addition to curriculum guidelines, various different projects – such as the mobile laboratory (MobiLab) or technology days and weeks (NaTech Education) – in the context of the SWiSE⁴ education initiative promote the exchange of expertise and the networking of teachers and schools in the area of science teaching (Koch, Felchlin & Labudde, 2016). The increasing importance of information and communication technologies to society and the transition to an information society also impact on education and are being addressed in the subject Media and IT, which is a subject in its own right in the German-language Lehrplan 21 curriculum and integrated into general education in the PER and Piano di studio (PER: MITIC; Piano di studio Tecnologie e media). As referred to in the chapter on compulsory education, «education for sustainable development» has now been officially integrated into all three curricula (Education21, 2017). In addition to these subject-specific competencies, those competencies that span all subjects play an important role in the cantonal curricula.

53 Teaching time in lessons (60 minutes) at primary school level (3rd to 8th school year) by canton, 2016/17

Data: EDK-IDES, as at September 2017



Teaching time for primary school level⁵

The average annual teaching time/the number of lessons per week in individual subjects is stipulated in the cantonal timetables (EDK-IDES, 2016). The total teaching time varies from one canton to another and is affected by the duration of a lesson in the timetable, the number of lessons per week and the number of school weeks per year. With regard to the first and second year of primary school level, the cantons generally impose a range of teaching times on the local schools (D-EDK, 2014).

For the 3rd to 8th year of the primary school level, the average annual teaching time varies between the cantons both overall and also in terms of individual subjects (→ Figure 53). The figure for Lucerne is 741 hours, compared with approximately 928 hours in the canton of Geneva. In terms of the international comparison, the Swiss average, at 816 hours, is slightly above the average teaching time of 800 hours recorded for six to eleven-year-olds in the OECD (OECD, 2017a). The differing teaching time in the cantons is reflected in the differing lesson durations (45 or 50 minutes) as well as in the divergent number of school weeks (36.5 weeks in Ticino and 40 weeks in Basel-Stadt and Appenzell Ausserrhoden) or in the difference in the number of lessons per week (the cantons of Geneva or Ticino for example).

Teaching in the first and second foreign language

The HarmoS Agreement stipulates in accordance with the language strategy that the first foreign language should be taught from the fifth school year and the second language from the seventh year at the latest (referred to as the 5/7 Model). Currently, a total of 23 cantons fulfil this require-

⁴ Swiss Science Education

⁵ This counting method is based on the years of compulsory education (1st to 11th years). This includes pre-school or the first two years of a preparatory stage. With regard to the different levels, see Figure 25 in the Compulsory education chapter.

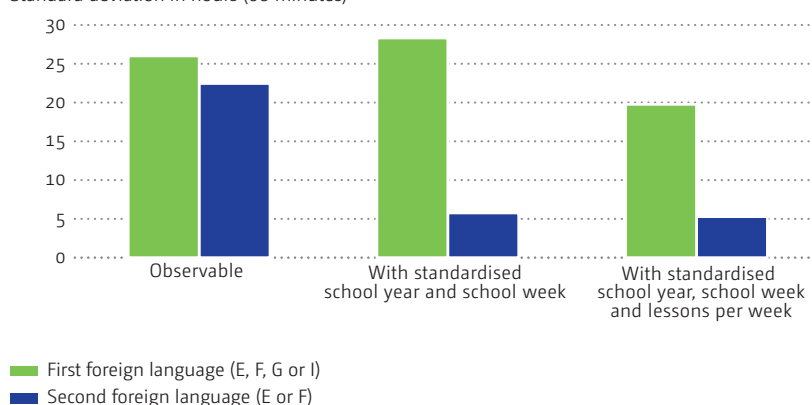
ment (→ *chapter Compulsory education, page 31*). On average, primary school pupils in Switzerland will have received around 287 hours of lessons in their first foreign language and around 128 hours in their second foreign language by the end of the primary school level. There are major differences between the cantons: for the first foreign language, the time spent varies from 234 hours in Schwyz and Jura to 347 in Graubünden. For the second foreign language, the total time varies from 111 hours (Valais) to 180 hours (Appenzell Ausserrhoden). As in the case of total teaching time, these differences are reflected in different numbers of school years and school weeks, different numbers of lessons per week and differing durations of a school lesson among the cantons. In terms of the first foreign language, differing numbers of lessons per week account for 26% of the differences between the cantons, while length of lesson accounts for 74%. As far as the second foreign language is concerned, around 76% of the difference can be attributed to the number of school weeks and 24% to the duration of a lesson. Consequently, while it is the duration of a lesson that differs the most in terms of the first foreign language, the number of school weeks is what differs the most in relation to the second foreign language (→ Figure 54).

54 Cantonal differences in the teaching time for the first and second foreign language from the 3rd to 8th year of primary school level, 2015/16

Standard deviation (variance around the average value)

Data: EDK-IDES; calculations: SCCRE

Standard deviation in hours (60 minutes)



Legend

The standard deviation between the cantons is 26 hours for the first foreign language (or second national language) and 22.5 hours in the case of the second foreign language. If the school years, school week, weekly number of lessons and duration of a lesson are standardised in succession, this standard deviation changes. The standardisation of school weeks and school years, for example, increases the standard deviation for the first foreign language to as much as 28.3 hours, while standardising the number of school weeks reduces the standard deviation to 19.4 hours. Standardising the duration results in the biggest reduction in standardisation.

Effectiveness

Any assessment of the effectiveness of primary school level would require a review of the extent to which the learning objectives in accordance with the cantonal curricula had been met, which would require an operationalised formulation of such aims. The elements to be measured, alongside core academic subjects (language of instruction, mathematics, natural sciences and foreign languages), would also include aims that span individual subjects (personal, social and methodological skills). This type of measurement is not available for either the learning objectives as a whole or for the individual objectives of all cantons, which makes it impossible to assess the effectiveness in this way. A further criterion for the effectiveness of the primary school level is the success,

or otherwise of the transition from primary school level to lower-secondary education. The procedure for determining whether pupils are ready to move on differs between the cantons, however. Generally, the teacher assesses the extent to which the learning objectives have been met (in the form of an overall assessment of achievement and behaviour). In contrast, some cantons also make use of comparative testing or guidance work (e.g. Appenzell Innerrhoden or Solothurn) or turn to a review process (e.g. Bern) if there is disagreement between the various parties involved (parents, teachers etc.).

First years of primary school level

The school years making up compulsory schooling, from the 1st to the 11th year, are counted. This includes pre-school or the first two years of a preparatory stage (→ Figure 25 in the Compulsory education chapter).

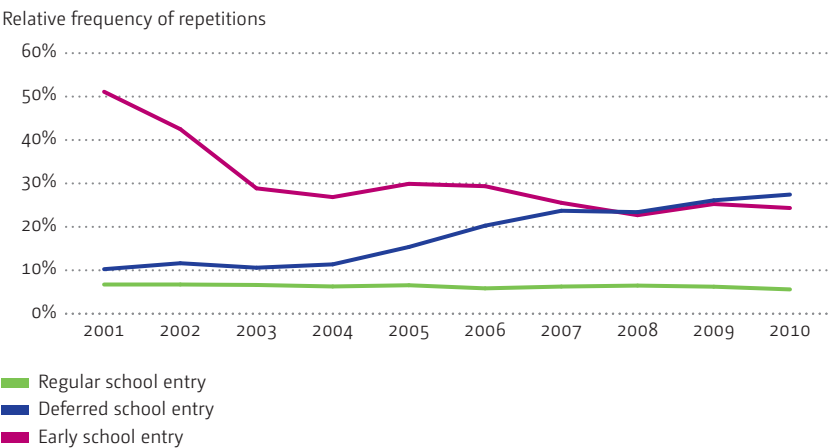
The integration of pre-school or the first two years of a first learning cycle into compulsory education based on the aim of harmonising structures has created more flexible transitions from pre-school to primary school in some cantons (Hutterli, Vogt, Mangold et al., 2014). With the Grundstufe or Basisstufe approach (e.g. Bern, Glarus, Lucerne) or mixed-age learning (e.g. Appenzell Innerrhoden), there is no longer any transition from pre-school to primary school (→ chapter Compulsory education, page 31). Whether and to what extent bringing forward the school entry age influences pupils’ future education path is something that cannot yet be determined. According to a survey conducted in the canton of Zurich, children who started school early (24%) or children with deferred entry (27%) needed to repeat a year of their lower level significantly more frequently in 2010 than those who started school at the regular age (7%) (Bayard & Schalit, 2016) (→ Figure 55).

National and international studies (e.g. Pagnossin, Arni & Matei, 2016, or PISA 2012) demonstrate that attending pre-school has a positive effect on scores in PISA reading tests. In almost all countries young people who attended pre-school record higher scores than those who, according to their own information, did not attend any pre-school education (OECD, 2015). However, these effects cannot in any way be interpreted causally and cannot be used to draw any definitive conclusions on the link between attending pre-school and the acquisition of competencies or subsequent educational success.

Legend
The figure shows the frequency with which children (cohort) who started pre-school in a particular year have to repeat a class by the end of the fifth year of primary school level (or the third primary class). Of the children who started pre-school early in 2001, 51% had repeated at least one class by 2006.

55 Timing of school entry and frequency of repetitions up to completion of the lower level in the canton of Zurich, 2016

Source: Bayard & Schalit, 2016



Foreign languages and teaching time at primary school level (3rd–8th school year)

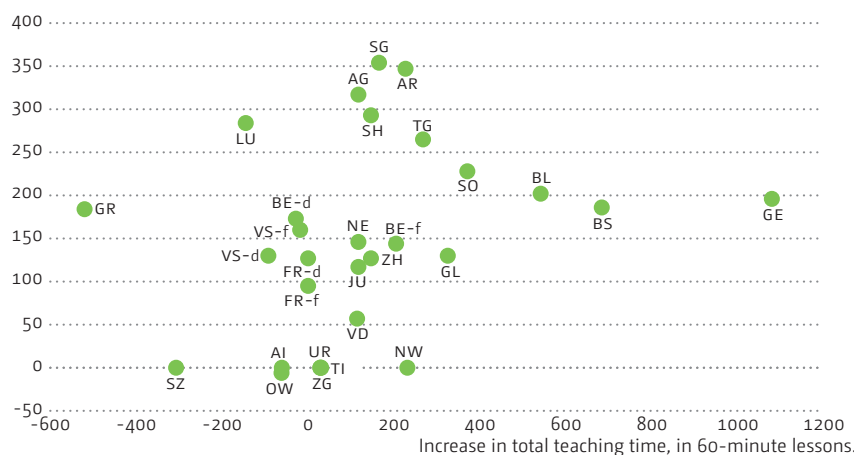
Most pupils (those in 23 cantons) are currently taught two foreign languages at primary school level. Foreign language teaching (first and second foreign language) as a proportion of total teaching time increased from 5.3% in the 2007/08 academic year to 8.2% by 2016/17. Overall, 38% of this increase, amounting to 144 hours, can be attributed to more teaching in the first language, with 62% attributable to more lessons in the second foreign language. The stronger increase in the second foreign language can be explained by the fact that 21 cantons⁶ still did not offer a second foreign language at primary school level in the 2007/08 academic year (→ Figure 56). The

56 Change in total teaching time and the number of hours of foreign language teaching at primary school level (3rd–8th school year) from 2007/08 to 2016/17

In the canton of Geneva, the teaching time has been increased by the addition of two extra school weeks per year.

Data: EDK-IDES; calculations: SCCRE

Increase in teaching time for foreign languages (FS1 and FS2), in 60-minute lessons.



Legend

In the canton of Appenzell Ausserrhoden the total teaching time is up by 227 hours and the teaching time for foreign languages is up by 347 hours. There are however cantons, such as Graubünden or Schwyz, where the teaching time has fallen due to the restriction of the number or duration of lessons but where the number of foreign language lessons has increased due to such factors as the introduction of a second foreign language.

additional teaching time for foreign language lessons can be created either by extending the total teaching time or by adjusting the distribution of lessons among the other school subjects. Across Switzerland, just under half of the increase in foreign language teaching was achieved over the past ten years by raising the total teaching time, with half being achieved (approx. 82 hours) at the expense of other subjects.

Increasing the level achieved in the first foreign language has been formulated as a long-term goal (EDK, 2011) and it has been stipulated that the same competencies should be achieved in both foreign languages by the end of the primary school level. In the 2016/17 academic year, however, the total teaching time in the first and second foreign language differed by an average of 159 hours. The much lower teaching time in the second foreign language raises the question of whether it is feasible for pupils to reach the same level in both languages, even taking into account they are older when they start learning the second foreign language and will already have advanced linguistics.

6 In the 2007/08 academic year, a second foreign language was taught at primary school level in the cantons of Zurich, Schwyz, Obwalden, Nidwalden and Zug.

tic knowledge in their language of instruction and first foreign language on which to build. Evaluations of foreign language teaching at primary school level show that more foreign language teaching, i.e. more hours of learning, results in significantly higher attainment (*Bayer & Moser, 2016; Peyer, Andexlinger & Kofler et al., 2016; Steidinger & Marques Pereira, 2016*).

Mathematics competencies in cantonal performance tests

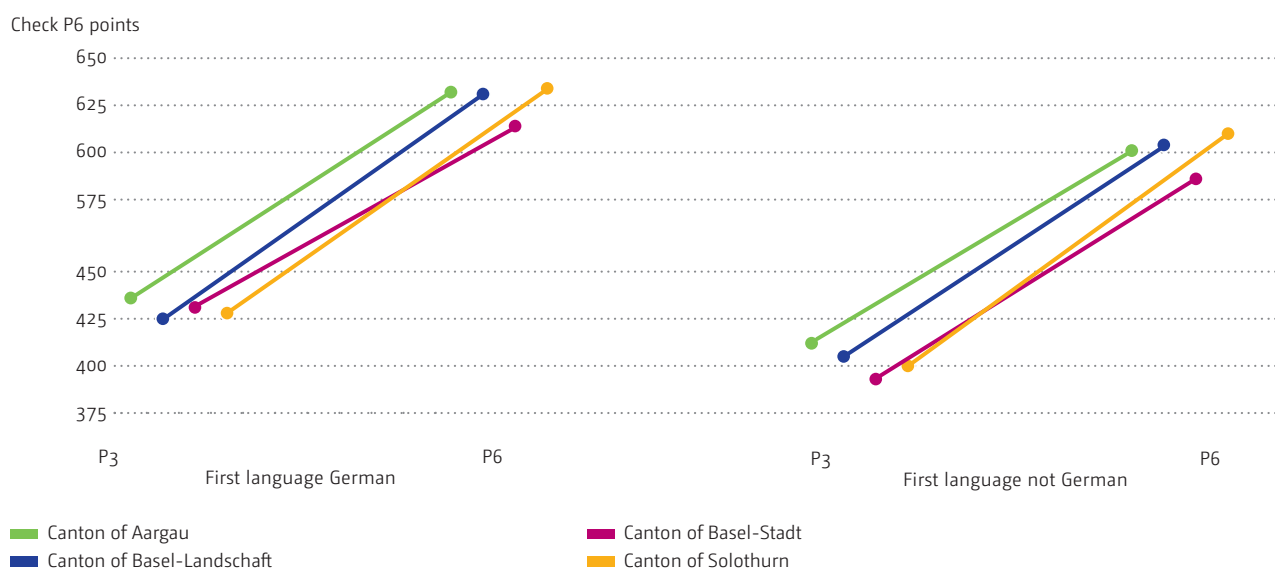
At primary school level there have been no national performance tests to date with only cantonal testing being carried out. These tests are held in various school years, subjects (national language, foreign languages, mathematics or natural sciences) and competence areas. It is not possible to compare these tests against each other as they are structured differently.

The results of the «Check P6» cantonal performance test for the cantons Aargau, Basel-Landschaft and Basel-Stadt, and Solothurn, show that the proportion of children achieving the mean proficiency level III in mathematics⁷ is practically the same in three out of four cantons while being considerably lower in one canton (AG: 55.5%; SO: 54.0%; BL: 53.5%; BS: 43.5%). The lower figure for Basel-Stadt is likely to be due to the fact that the number of pupils at the two lowest competence levels in that canton is significantly higher than in the other three cantons. It is not possible to conclusively determine the origin of these differences.

If, in addition, the mathematics scores of pupils whose first language is German is compared with the scores of other pupils, the latter lag a long way behind (between 20 and 38 points in the third grade and between 24 and 31 points in the sixth grade) (→ Figure 57). The parallel development shows

57 Development of the mathematics competencies of pupils whose first language is German and of those pupils whose first language is a foreign language in north-western Switzerland, 2016

Source: Ender, Moser, Imlig et al., 2017



⁷ A child achieves competence level III by obtaining between 591 and 670 points in the different areas of the subject of mathematics (*Zurich University, Institut für Bildungsevaluation, 2017*).

that the original performance deficits among pupils who do not speak the language of instruction as their first language remain more or less constant throughout primary school level but that individual learning progress is similarly high over time as for pupils who speak German at home.

In the cantonal tests conducted in Geneva, the average success rate in mathematics at the end of primary school is 77%. Pupils in Geneva who achieve a minimum of 64% of the stipulated curriculum aims are deemed to be successful (*Geneva, SRED, 2015a*).

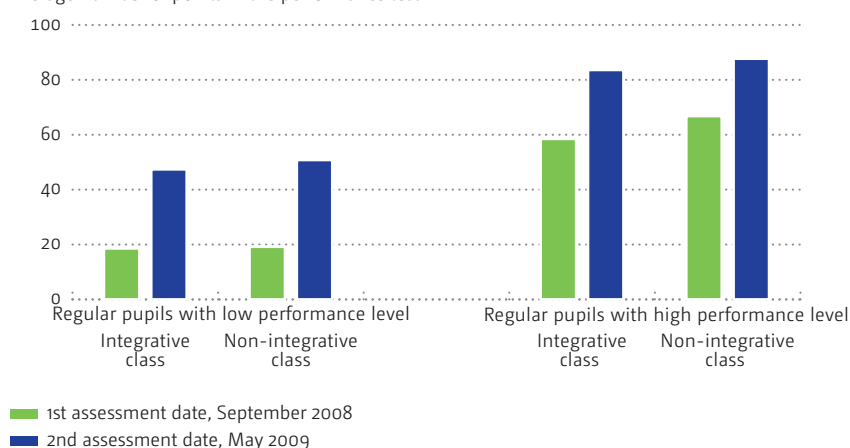
Integrative schooling

The effectiveness of integrative schooling is and will remain a central issue in education research. The advantages of an integrative approach for the children concerned is confirmed by various studies (*Gebhardt, Heine & Sälzer, 2015; Kocaj, Kuhl, Kroth et al. 2014; Knecht, 2012; Audéoud & Wertli, 2011; Schwere, 2011; Sermier Dessemontet, Benoit & Bless, 2011*). Moreover, no disadvantageous effects on those pupils being schooled alongside the children with special needs have been proven to date (for example → Figure 58). Various studies have shown that the teaching staff and their working relationship with the therapeutic education staff are key to the success of integrative schooling for children with special needs (*Benini, Fräulin & Neuenschwander, 2017; Florin, Lütolf & Wyder, 2015*).

58 Performance of regular pupils in integrative and non-integrative classes

Source: *Sermier Dessemontet, Benoit & Bless, 2011*

Average number of points in the performance test



Legend

Regular pupils who attend inclusive classes alongside children with additional support needs record the same levels of performance (difference between green and blue bars) as regular pupils in classes that have no children with additional support needs, regardless of whether they themselves are poor students or good students. (*Bosse, Dumont, Friedrich et al., 2015; Sermier Dessemontet, Benoit & Bless, 2011*).

All-day schools and the impact on school attainment

The latest findings from the «EduCare» study show, partially contradicting the existing literature, that attending an all-day school does not lead to significantly better attainment overall for the average German-speaking Swiss pupil (*Frei, Schüpbach, Nieuwenboom et al., 2017; von Allmen, Schüpbach, Frei et al., 2017*). For children who attend all-day schools and are from uneducated families, the study shows more positive developments in mathematics but not in reading or social behaviour. These findings are, however, based

on a non-random and non-representative sample of pupils, some of whom attended all-day schools and some of whom did not.

Current results of a project (SteG project) being carried out in Germany show that it is not just the quality of the educational offering but also individual conditions (e.g. reading habits or preferences) that have a key impact on the success of school-based day-care facilities (*Tillmann, Sauerwein & Hannemann et al., 2017*), which in turn means that not all pupils, regardless of their background, would automatically benefit from a school-based day-care facilities.

Efficiency / costs

Due to the lack of data on output (performance, personality development, socialisation) and the difficulties encountered in recording the input appropriately (e.g. individual characteristics such as migration background), assessing the efficiency of primary school level is practically impossible, as is also the case for all stages and types of education. Consequently, this section will focus on the differences in the monetary (costs) and real inputs in the cantons (such as class sizes and pupil/teacher ratio).

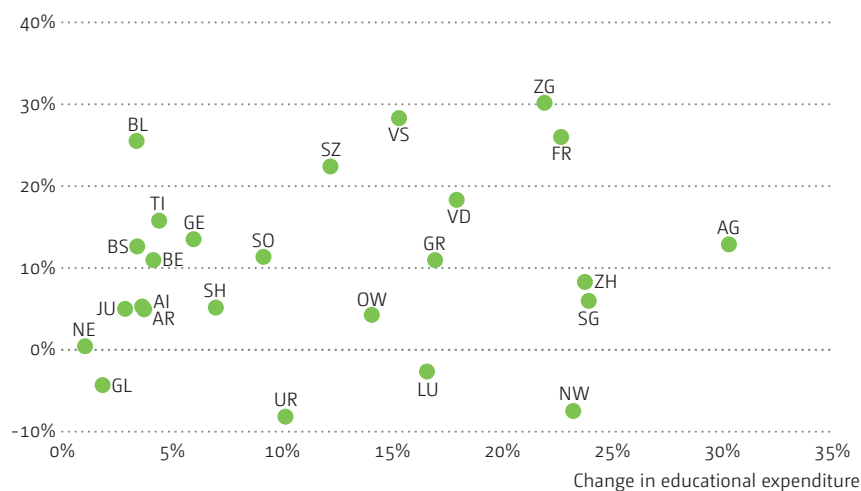
Total public expenditure and public expenditure on education in the cantons

Public spending on compulsory education (teachers' salaries only) has increased in many cantons since 2004, as has total public expenditure per canton. Meanwhile, the proportion of total public spending being allocated to education has tended upwards in twelve cantons, while falling by a minimal amount in the other cantons. There is no link between the developments in total public spending and in spending on compulsory education (teachers' salaries only) (→ Figure 59). However, there is a slightly negative correlation between the cantonal educational expenditure per pupil and total public expenditure (→ Figure 60). In other words, if a canton makes savings in terms of its overall spending, it will tend to allocate more to education spending (teachers' salaries only) per pupil. If a canton has higher total public expenditure, this will not necessarily mean that more is spent on the compulsory education per pupil. Despite the fact that this correlation cannot be interpreted causally, past experience teaches us that austerity efforts by the cantons do not automatically mean lower public spending on compulsory education, at least not if the education spending per pupil is used as the benchmark.

59 Development of total public expenditure and public expenditure for compulsory education, 2004 and 2014

Total public spending encompasses various budgetary items such as health, social security and defence. The budgetary allocation of money to different areas varies from one canton to another (FSO, 2016e). Education spending only includes teacher remuneration, as this is the least affected by the cantons' different cost accounting practices. Deflation-adjusted averages for the years 2004/05 and 2013/14
Data: FSO, EFV; calculations: SCCRE

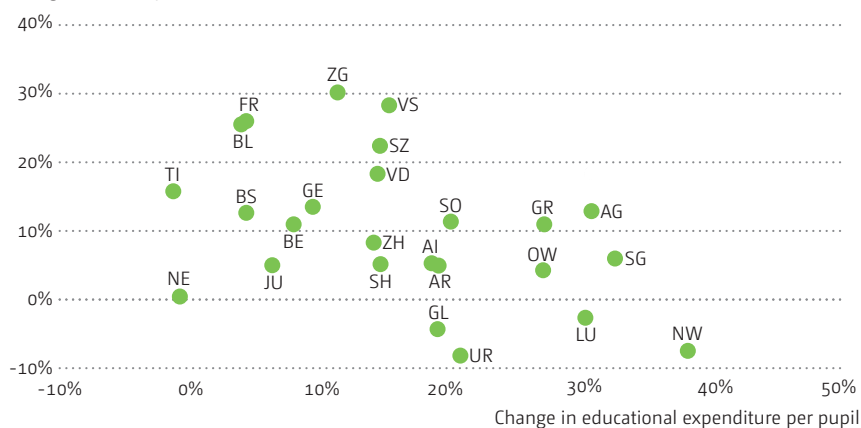
Change in total expenditure



60 Development of total public expenditure and public expenditure per pupil in compulsory education, 2004 and 2014

Education spending only includes teacher remuneration, as this is the least affected by the cantons' different cost accounting practices. Deflation-adjusted averages for the years 2004/05 and 2013/14
Data: FSO, EFV; calculations: SCCRE

Change in total expenditure



Class size and community-specific characteristics

As well as new and additional tasks facing the education sector, changes have arisen in compulsory education with regard to class size as a cost driver. The decline in pupil numbers from 2000 to 2010 resulted in more small classes and in higher real education spending per pupil. The latest education statistics can now be used for the first intracantonal analysis of differences in class size. In this way we can also address the question of whether the con-

The school years making up compulsory schooling, from the 1st to the 11th year, are counted. This includes pre-school or the first two years of a preparatory stage (→ Figure 25 in the Compulsory education chapter).

siderable differences among the cantons with regard to average class sizes can be explained by demographic and topographical differences (→ the same analysis for the lower-secondary level, *chapter Lower-secondary education*, page 77).

In the 2015/16 academic year, the average class size at primary school level in Switzerland (third to eighth school year) was 19.2 children. At cantonal level, Zurich, with 20.7 pupils per class, has the highest average class size, while Graubünden has the smallest classes on average, with 15.6 pupils. As regards average class size at community level based on the total number of pupils in that community (→ Figure 61), the average class size settles at around 20 from a total number of 350 pupils upwards. The higher the number of pupils in a community, the bigger the class sizes, although the relationship between the two factors is not linear. The funnel-shaped distribution of average class sizes also demonstrates that very low pupil numbers do not necessarily result in smaller classes. There are in fact many communities with low numbers of pupils that have disproportionately large classes.

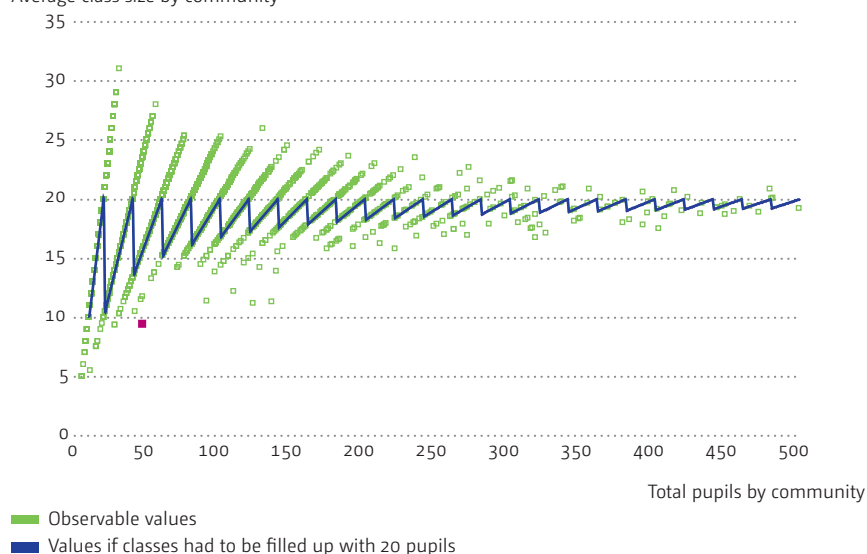
Were all communities to try and achieve the guideline class size of 20 pupils by filling up all classes until they contain 20 pupils, and only then opening a new class (fictitious rule), class sizes would be distributed differently based on the community-specific number of pupils in each case (blue line), resulting in larger classes for most communities with small pupil numbers than the empirically observed class sizes. In light of the findings of the research literature to the effect that small classes are not necessarily associated with better attainment levels (see for example *Angrist, Lavy, Leder-Luis et al., 2017; Leuven & Lokken, 2017; Coladarci, 2006*), it can be assumed that cantons with many communities with fewer than 350 pupils also offer potential for efficiency improvements.

61 Number of pupils at primary school level (3rd–8th school year) and average class sizes by community, 2015/16

Excluding pupils in special classes and private schools

Data: FSO; calculations: SCCRE

Average class size by community



Legend

The community shown in red has 47 pupils in primary school level (3rd–8th school year) education and an average class size of 9.4. There are five classes. If the creation of a new class (blue line) were only to be permitted with 20 pupils, these pupils would be distributed among three classes (giving an average class size of 15.7).

Intercantonal comparison of class sizes and pupil/teacher ratios

By analysing at community level the influence of such factors as pupil numbers, surface area of the community and degree of urbanisation on average class sizes, we can also answer the question of whether intercantonal differences are due to the different character of the communities. If these structural factors are ignored, the cantonal averages fluctuate relatively strongly compared with the national average (19.2) (→ Figure 62), from levels as high as 1.3 pupils more per class (Zurich) to 2.8 pupils fewer per class (Graubünden).

Taking into account the different composition of the individual cantons, and therefore assuming that all cantons are made up of average communities in terms of pupil numbers, surface area and degree of urbanisation, we can see that while these factors have an influence on the average class size in a community, they barely help to explain any of the intercantonal differences. The difference between the canton with the biggest classes sizes and the canton with the smallest classes remains almost unchanged at approximately 4 pupils per class. There must therefore be other reasons for the very major differences.⁸

However, it is not just class size that affects spending on education. Pupil/teacher ratios are another key factor. This can be similarly high even for a disproportionately large class if that class is taught by several teachers. A

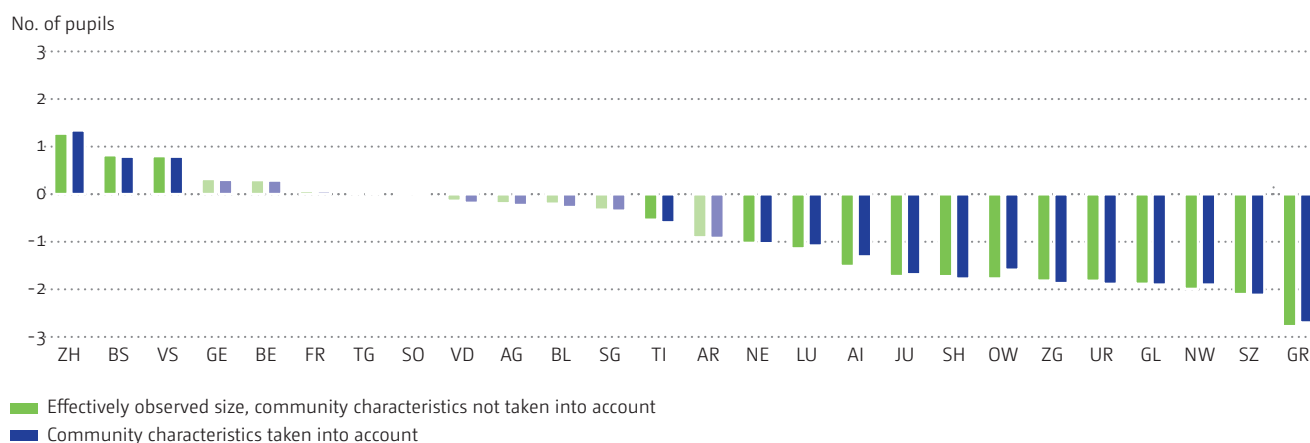
Pupil/teacher ratio

According to the Federal Statistical Office's definition, the number of pupils per teacher (full-time equivalent) at a specific educational level is the pupil/teacher ratio.

62 Average cantonal class size at primary school level (3rd to 8th school year), 2015/16

Excluding pupils in special classes and private schools; Deviation in the number of pupils from average for the communities

Data: FSO; calculations: SCCRE



Matt colours indicate that the class size does not deviate significantly for statistical purposes ($p \geq 0.05$) from the national average. The values are based on the average class sizes in the communities, weighted according to cantonal pupil numbers. The following characteristics were incorporated into the second calculations (blue bar): Pupil numbers, surface area, degree of urbanisation.

⁸ The factors investigated all appear to explain statistically significantly a certain portion of the differences in class size among the individual communities. The reason why they only account for so little of the major differences among the cantons lies in the fact that the overall impact of these factors is not very big. This in turn is due to the fact that, for example, a rural community with a low population density does not automatically have to have small class sizes as in empirical terms it will also be possible to find communities with the same characteristics that run classes where the number of pupils corresponds to the national average or is actually higher than the average.

Legend

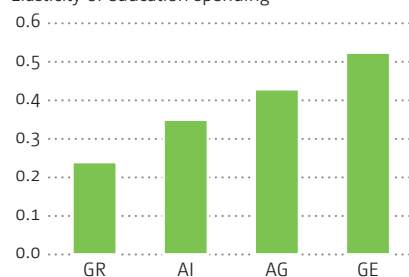
The middle 50% of all communities in the canton of Zurich (box) have a pupil/teacher ratio ranging from 18.9 to 19.6 pupils per teacher (FTE) in the first and second year of primary school level and from 15.9 to 16.9 pupils in the third to eighth year. The red line shows the median.

Less densely populated cantons, with their smaller schools and smaller classes, tend to have not only higher education costs per pupil but also **lower elasticity in their education spending**. In other words, their spending does not change as markedly in line with fluctuating pupil numbers. Figure 64 shows the empirical elasticity using the example of four cantons with differing levels of pupil density. In the canton of Graubünden the reduction in the school roll by one person cut education spending by around one quarter of the costs for one pupil, while in the canton of Geneva with a very high density more than half of the costs could be saved.

64 Examples of the elasticity of education spending, 1990–2014

Data: FSO; calculations: Centre for Research in Economics of Education at the University of Berne

Elasticity of education spending



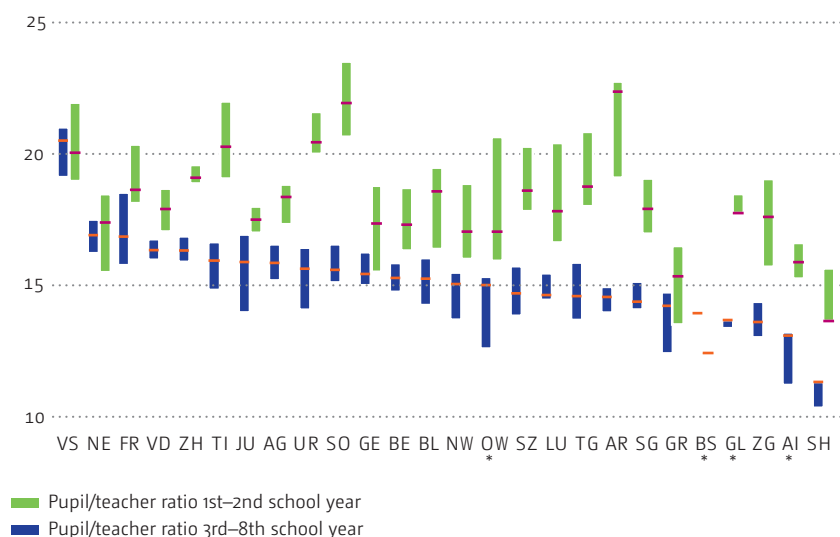
high correlation (0.53) is generally evident between the average pupil/teacher ratio and average class size. For Switzerland as a whole, the average pupil/teacher ratio in the first two years of primary school level is 17.9 pupils. The figure for primary school level (3rd to 8th school year) is 15.5. For the first and second years, the pupil/teacher ratio in the cantons fluctuates between 22.4 (Appenzell Ausserrhoden) and 12.7 (Basel-Stadt), while for the 3rd to 8th year it varies between 20.5 (Valais) and 11.4 (Schaffhausen). The level of fluctuation at primary school is also very high within many cantons (e.g. Lucerne, Solothurn, Basel-Landschaft, Schaffhausen, Appenzell Ausserrhoden, Graubünden or Valais) (→ Figure 63).

63 Pupil/teacher ratio by community at primary school level broken down into 1st–2nd year and 3rd–8th year, 2015/16

Excluding pupils in special classes and private schools

Data: FSO; calculations: SCCRE

Pupil/teacher ratio



The cantons marked with an asterisk have fewer than 10 observations; for Basel-Stadt and Glarus it is only three.

Intercantonal comparison of public expenditure on education

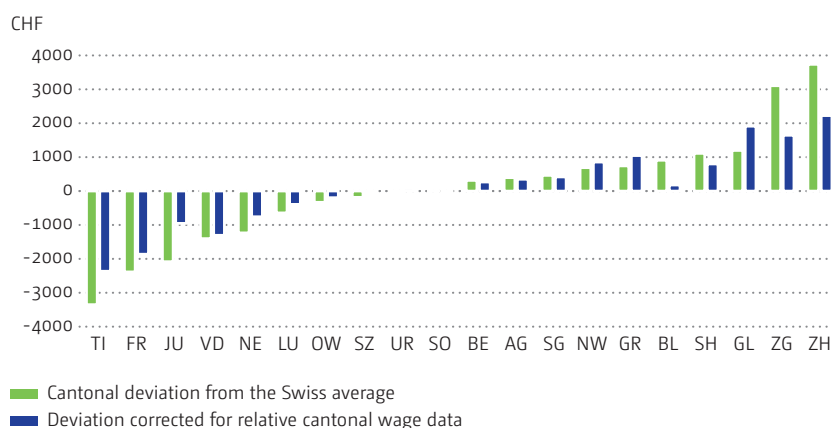
As the calculation of cantonal expenditure is not based on a uniform cost accounting model, various restrictions are applied in order to achieve as much comparability as possible. This also involves limiting the figures to staff costs. Some cantons have also been excluded from the comparisons due to their spending figures per pupil showing patterns over time that do not appear logical. This does not mean that all of the cantons used in the comparison have comparable costs; it is simply that there are no striking patterns for these cantons that would indicate a lack of comparability from the outset (→ see text in the margin on the next page). Despite all of these restrictions, the cantonal figures still differ greatly.

The range between the canton with the highest financial costs and the canton with the lowest is approximately 141% in the first two years of primary school level, which equates to a difference of CHF 9060 per pupil per school year (→ Figure 66). As far as the costs for year 3 to 8 of primary school level are concerned, the difference is around 76% or CHF 7090 (→ Figure 65).

65 Public expenditure on education by the cantons per pupil, primary school level 3rd-8th

Remuneration only, public education institutions (including special classes, excluding music schools), average for 2013 and 2014

Data: FSO, EFV; calculations: SCCRE



The differences can be attributed to various factors. Firstly, the staff remuneration costs are related to the general level of teacher wages and secondly, the age structure of the workforce and differences in social security charges also have an impact. Taking into account the fact that staff costs are in line with wages paid to other people in the canton with a tertiary education (corrected deviations in Figure 65 and 66), the differences between the cantons with the highest spending on staff wages and the canton with the lowest level of spending are reduced from CHF 9060 to CHF 7860 for the 1st and 2nd year of primary school level and from CHF 7090 to CHF 4590 for the 3rd to 8th school year. It can therefore be proven for primary schools, but not for pre-schools and the first learning cycle or basic stage, that a not insignificant portion of the major differences in the public education spending of cantons can be attributed to wage differences, which in turn are influenced by the differing wage levels for those with a tertiary education.

Determinants of intercantal differences

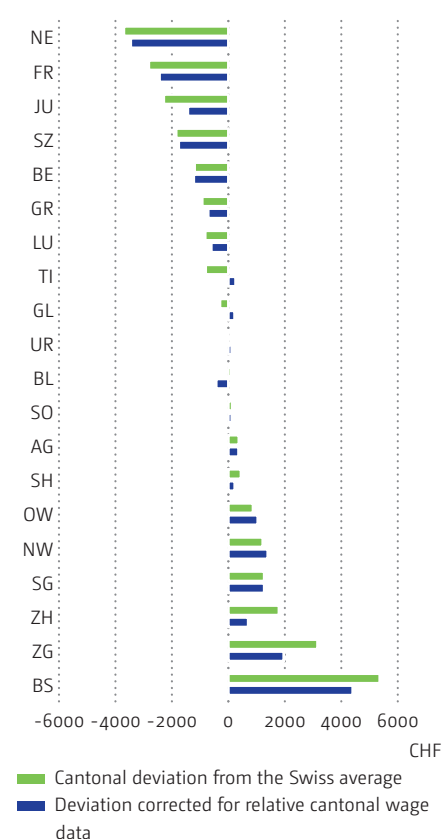
In addition to the demonstrated influence of the cantonal wage level on education spending, differences in real input factors (such as teaching time and class sizes) explain most of the remaining differences among the cantons. The explanatory significance of the individual real input factors (→ *calculation formula in the margin on the next page*) is as follows: the relative teaching time (ratio of workload of teacher working full-time to the teaching time given to pupils) explains around 55% of the variation in education spending, teacher wages account for around 46% and class size for 26% (→ Figure 67). Overall, more than 100% of the differences can be explained in this way. This is a consequence of the correlations between the individual factors.

For the figures on **public education expenditure**, figures from 20 cantons were used (for the first and second years, and for the third to eighth year of primary school level). The other cantons were excluded for three reasons: (1) If they reported multiple changes in spending of more than 10% for the period from 2008 to 2014; (2) If, after a single change of more than 10%, the spending per head was considerably lower than comparable neighbouring cantons – i.e. if costs were cut excessively as a result of structural change; or (3) if the canton itself expressed concerns regarding the accuracy of the data.

66 Public expenditure on education by the cantons per pupil, primary school level 1st-2nd

Remuneration only, public education institutions (including special classes, excluding music schools), average for 2013 and 2014

Data: FSO, EFV; calculations: SCCRE



Formula for calculating cantonal costs in

Figure 67

$$\frac{VP_{LP}}{UZ_S} \times \frac{Wage_{LP}}{KLGR} = \text{costs per pupil}$$

$$\frac{VP_{LP}}{UZ_S} = \text{relative teaching time}$$

$Wage_{LP}$ = Average wage earned by a teacher taking age structure into account (based on cantonal wage system)

$KLGR$ = Average class size

VP_{LP} = Average full-time workload of teacher

UZ_S = Average teaching time provided to pupils

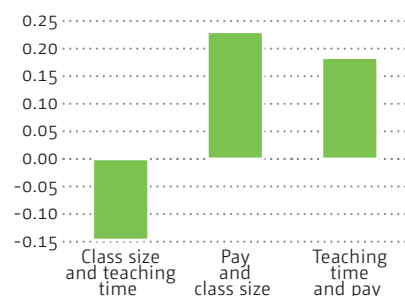
The wage calculations are based on data gathered from the EDK teacher survey in German-speaking Switzerland. The data includes information on the wage systems, the teaching workload of the teachers and the legal framework governing minimum and maximum teacher salaries. No comparable data is available for French or Italian-speaking Switzerland.

68 Correlations between the individual input factors

Real input factors: relative teaching time, class size and average teacher wage

Data: FSO, D-EDK, EDK-IDES; calculations: SCCRE

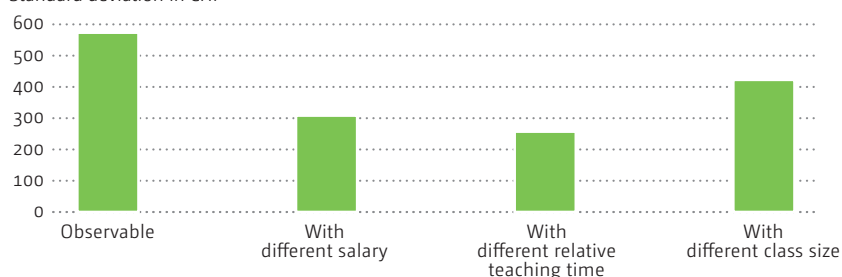
Correlation

**67 Cost differences between the cantons of German-speaking Switzerland, 2017**

Public spending on education per pupil at primary school level, 3rd to 8th school year (→ calculation formula in the margin); standard deviation (variance around the average value)

Data: FSO, D-EDK, EDK-IDES; calculations: SCCRE

Standard deviation in CHF

**Legend**

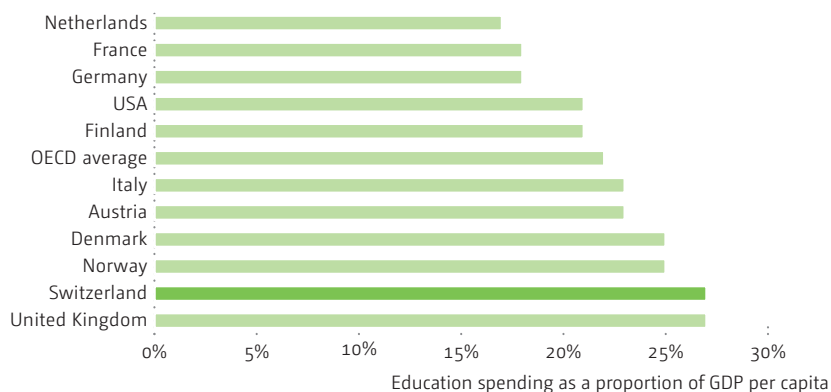
The observable standard deviation of around CHF 575 is based on the differences in all three input factors (wage, relative teaching time and class size). Differences in cantonal average wages, for the same relative teaching time and same class size, reduce the standard deviation by 46% to CHF 308.

There is, for example, a strong negative correlation between class sizes in a canton and relative teaching time (→ Figure 68); classes are large (reducing costs) particularly in those places where the teaching time for pupils exceeds the full-time workload of the teachers (increasing costs as more than one teacher is needed to take the class). The positive correlation between class size and teacher pay also shows that those teachers with larger classes on the basis of the intercantonal comparison earn more too. It is not possible to evaluate whether this is intentional or has happened by chance. In terms of the international comparison, Switzerland was spending USD 15 930 per pupil in the 3rd to 8th year of primary school level in 2014 (based on current prices), which is in relation to GDP per capita more than the OECD average (→ Figure 69).

69 Annual education spending in US dollars per pupil (3rd to 8th school year primary school level) in relation to GDP per capita, 2014

The spending on pre-school education is now no longer stated.

Source: OECD, 2016a



Equity

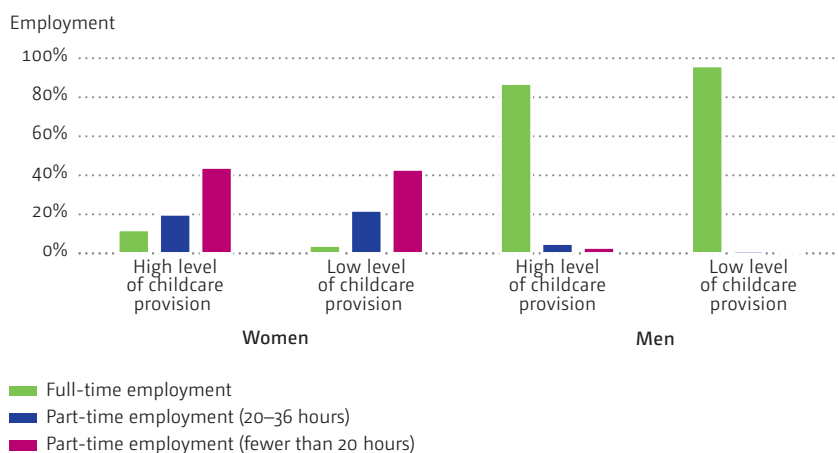
Equity is considered here from the angle of equal opportunity to access education and develop academic performance and also equal opportunity in respect of the educational path followed.

Compensating for unequal opportunity through early childhood education and care

Early childhood education and care can increase the educational opportunities of disadvantaged children even before they start school (*Wustmann Seiler & Simoni, 2016*). Current studies from Denmark and Norway demonstrate that early and thus longer attendance of early childhood education (between 0 and 4 years) with good care is associated with a higher educational qualification and has a positive impact on earnings in adulthood over the long term (*Rossin-Slater & Wüst, 2016; Havnes & Mogstad, 2015*). However, the costs facing parents are higher in Switzerland than in its neighbours (France, Germany and Austria) due to the lower level of state contribution. Childcare costs as a proportion of gross salaries are twice to three times as high in Switzerland (*Stern, Schultheiss, Fiedner et al., 2015*).

70 Estimate of the influence of available childcare on parents' employment (broken down by gender), 2014

Source: *Stern, Fiedner, Walther et al., 2015*



to → Figure 70

The proportion of women in **full-time employment** is three times as high in regions with a wide range of childcare on offer compared with regions with less childcare provision, while men are in full-time employment less frequently in areas where there is more childcare available. Women are 7% more likely to be in work in those regions that offer a wide range of childcare options outside of the family. Given that men and women differ in the individual regions with regard to non-observable characteristics, the estimates were made using an instrumental variable (IV) so that the causal influence of childcare outside of the family on employment behaviour can be isolated.

The availability of childcare outside of the family and school is potentially not just advantageous to the children but can also have positive effects on the parents' employment (→ Figure 70) (*Stern, Schultheiss, Fiedner et al., 2015; Stern, Iten, Schwab et al., 2013*). This correlation can in no way be interpreted causally. The proportion of mothers and fathers working part-time, for its part, is certainly boosting the creation of new crèche places.

Migrants and opportunities to access education

Differences between native Swiss pupils and those pupils with a migration background are evident from as early as school entry. Analysis from the can-

The school years making up compulsory schooling, from the 1st to the 11th year, are counted. This includes pre-school or the first two years of a preparatory stage. (→ Figure 25 in the *Compulsory education chapter*).

ton of Zurich, for example, shows that children who start pre-school with difficult starting conditions (not native speakers of the language of instruction and lower family resources) are much more likely to have their entry deferred (*Bayard & Schalit, 2016*).

Figures for Switzerland as a whole also indicate that foreign-speaking pupils more frequently have the start of their 3rd primary school year delayed than non-foreign-speaking pupils. Given the age of the children, it can be estimated that, on average, every fourth to fifth foreign-speaking child (22%) starts their 3rd primary school year with a delay, while only one sixth (17%) of non-foreign-speaking pupils start late. The delays can be caused by the pupils having their start deferred (in the first or third year of primary school) or by repeating the 3rd school year. The extent of the delays and the differences between foreign-speaking and non-foreign-speaking pupils differ according to canton (→ Figure 71).

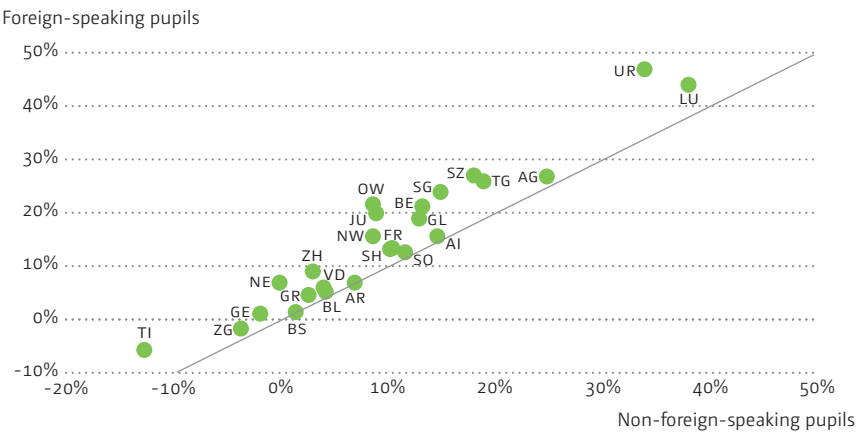
The rates were calculated on the basis of the difference between the observed age of the children in the 3rd primary class and the age that would have been expected on the basis of the cut-off date (without being deferred or having to repeat).

Legend

In the canton of Jura, 2 out of 10 foreign-speaking children start the 3rd primary class with a delay (20%). The equivalent figure for children with a foreign native tongue is only 1 in 10 (9%). In the canton of Appenzell Ausserrhoden, the proportion of children who start school late is exactly the same whether they have a foreign native tongue or not (7%).

71 Proportions of delayed school starts in the 3rd year of primary school level among foreign-speaking and non-foreign-speaking children, 2015/16

Corrected to take account of age effects caused by differing cut-off dates. The canton of Valais is excluded due to differing cut-off dates in the different regions.
Data: FSO; calculations: SCCRE

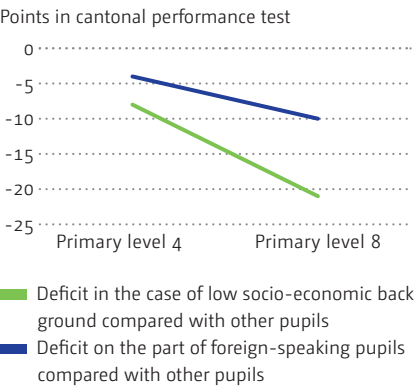


The benefit of delayed transitions and class repetitions is highly disputed. The research literature indicates a predominantly negative balance sheet with a small and only very short-term effect (*Zurich, Ministry for Education, 2016; Daepfen, 2011; Hess, 2010; Wu, West & Hughes, 2008*). Most children would apparently have made the same progress had they not been forced to repeat the year. Against this background in particular, the benefit of deferring a high number of pupils with a migration background must be questioned.

If pupils are not deferred and if they are not made to repeat a year, the school system must, however, also ensure that any attainment gap is not exacerbated over the further course of their education. The fact that this is a real risk is evidenced by the cantonal performance tests in the canton of Geneva in 2015, according to which the performance deficit of foreign speaking pupils or low socio-economic status grows even greater in mathematics between the 4th and 8th school year of primary school level (→ Figure 72). In the absence of any compensatory measures, such attainment gaps at the outset can therefore have a negative impact on the young people's future education.

72 Deficit in mathematics of foreign-speaking pupils and those pupils from a low socio-economic background, canton of Geneva, 2015

Data: Canton of Geneva, Service de la recherche en éducation



Performance by gender

With regard to the performance of girls and boys, the cantonal performance tests are the only basis on which statements can be made, with these being very varied and difficult to compare. In learning progress assessments carried out in Zurich, the scores recorded by girls for German are ahead of those recorded by boys, and this gap remains practically unchanged after nine years of schooling. If we consider the different learning needs, girls progress more in the first three school years (1st to 3rd year at primary school) in both mathematics and German (*Bayard, 2014*). After six years there is no longer any significant difference in mathematics between girls and boys (*Angelone, Keller & Moser, 2013*). At the end of primary school girls in the cantons in north-western Switzerland have a performance edge in German and French, whilst boys perform higher than girls in mathematics and nature & technology (*Giesinger, Oostlander & Berger, 2017*). In the canton of Geneva, in contrast, the results in reading comprehension and mathematics are very similar when broken down by gender (*Geneva, SRED, 2015a*). Overall, the differences according to gender tend to be small at primary school level.



Lower-secondary education

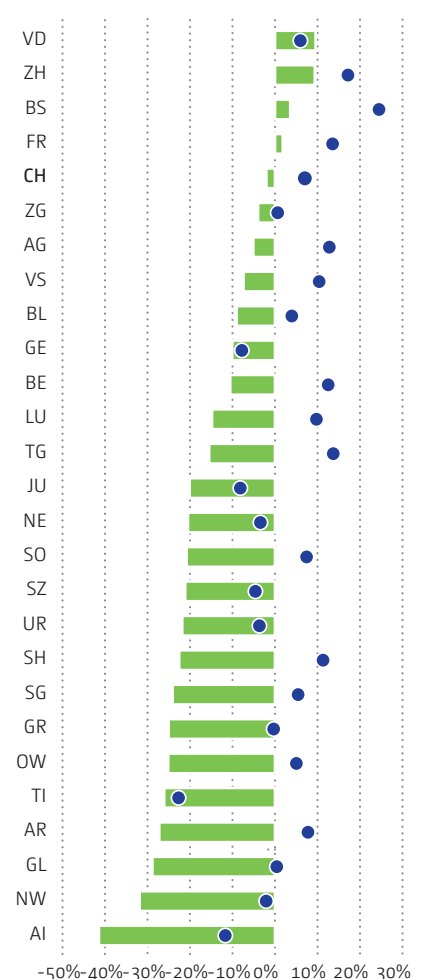
Context

Forming part of compulsory schooling, lower-secondary education can be described as the continuation of basic education and as preparation for upper-secondary education once compulsory schooling has been completed. As in the case of primary education, demographic developments and settlement patterns within Switzerland have a significant impact on lower-secondary education.

73 Development of pupil numbers in lower-secondary education up to 2025

Deviation from peak value since 1999 and deviation from 2015 level (reference scenario)

Data: FSO; calculations: SCCRE



■ Deviation from cantonal peak value (since 1999)
 ■ Cantonal development 2015–2025

Development of pupil numbers since the most recent peak figure

Between 2015 and 2025, the number of pupils in lower-secondary education will increase by around 7% on average across Switzerland. For most cantons, this means they will have a higher number of pupils to educate than is currently the case (e.g. Obwalden 4%, Basel-Stadt 24%). As far as the cantons of Vaud, Zurich, Basel-Stadt and Fribourg are concerned, pupil numbers are even expected to reach their highest levels since 1999 (→ Figure 73). In other words, even if no schools have been closed in recent years and even if falling school rolls have initially resulted in better utilisation of the capacity in some instances, these cantons will need to make greater investment in their school infrastructure in the coming years.

International and intercantonal migration, combined with high birth rates in recent years, have contributed to the growth in pupil numbers in most cantons (FSO, 2016d). School rolls in those cantons other than those referred to above that will have rising pupil numbers over the forecast period will, however, not reach previous all-time highs (Zug -4%, Appenzell Ausserrhoden -27%). Pupil numbers will decline in a total of eight cantons between 2015 and 2025, as a result of which the number of secondary pupils will be between 10% and 40% down on the peak values. These heterogeneous patterns can be attributed to major differences in international immigration (such as in Appenzell Innerrhoden or Schwyz) and in migration flows within Switzerland (high numbers moving from such cantons as Geneva, Neuchâtel and Uri to other cantons). Particularly in those cantons with a multi-strand lower-secondary education model (→ *Institutions*, page 80), falling pupil numbers will mean higher spending on infrastructure per pupil, while those cantons with rising numbers will be able to fill individual class streams more efficiently. In light of the ongoing rise in pupil numbers at primary level, the growth in numbers in lower-secondary education is also set to persist beyond the forecast horizon of 2025 (→ *chapter Primary school level*, page 51).

School size and population density

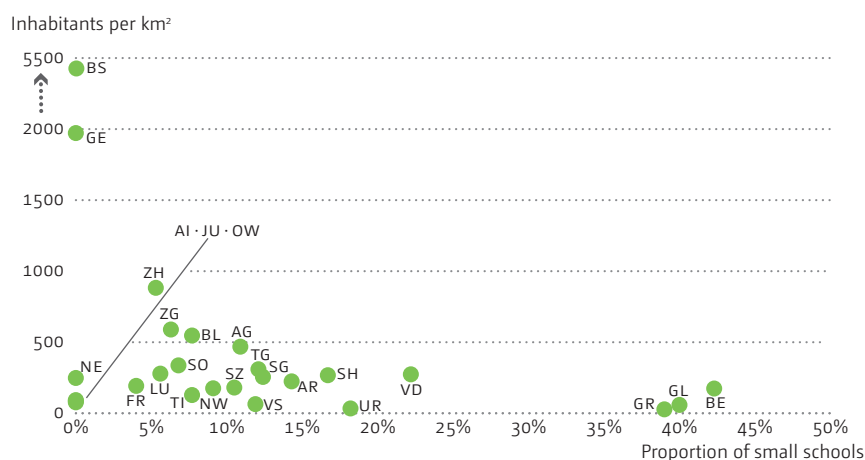
The population scenarios and related development of pupil numbers impact on the organisation of school locations in a two-stage process. When numbers decline, the communities initially react by adjusting class sizes as a short-term measure (SCCRE, 2014). The second step, if the decline continues, involves reviewing whether to merge or close individual schools. Some rural cantons with a low population density are affected particular-

ly quickly but keep schools open even when their roll dips below a critical level. The clear correlation in the primary sector between the proportion of small schools and the population density of individual cantons (→ *chapter Primary school level, page 51*) does not apply to the lower-secondary sector however (→ Figure 74). The share of small secondary schools in the cantons of both Basel-Landschaft and Ticino, for example, is around 8%, despite the very different population densities of the two cantons. This means that individual cantons can have similar proportions of very small schools despite major differences in population density. Some cantons have opted for a more centralised organisation of the locations of their secondary schools, adopting the view that older pupils are capable of travelling longer distances to school, while other cantons have maintained a more decentralised system. If we compare the average proportion of small schools at primary level (around 30%) against the average proportion of small secondary schools (18%), we can nevertheless see a greater concentration of school locations. Leaving aside infrastructure costs, a smaller number of very small schools does not automatically result in greater efficiency, however, as the provision of lessons in streamed classes and the range of optional subjects offered in lowersecondary education can result in small class sizes even in bigger schools than at primary level, generating higher costs.

74 Proportion of small schools and population density by canton, 2015/16

Lower-secondary education schools with up to 50 pupils, excluding special and private schools

Data: FSO

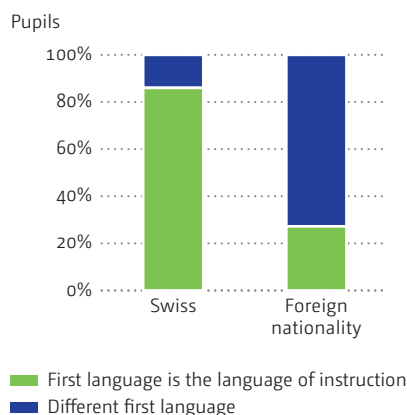


Socio-demographic characteristics of school roll

The socio-demographic characteristics of pupils in a given school (→ *Equity, page 95*) are important exogenous parameters for the school and its teaching. Key characteristics include the education and socio-economic position of the parents, the migration background of the pupils themselves and the question of whether the main language spoken in the home (first language) is also the language of instruction. In the 2015/16 academic year almost three quarters of all lower-secondary pupils were Swiss nationals. Nevertheless, there are more young people with a migration background than just the quarter who are not Swiss nationals. The first language and language of instruction need not be different for all foreign pupils, nor are

75 Pupils in lower-secondary education by nationality and first language, 2015/16

Data: FSO



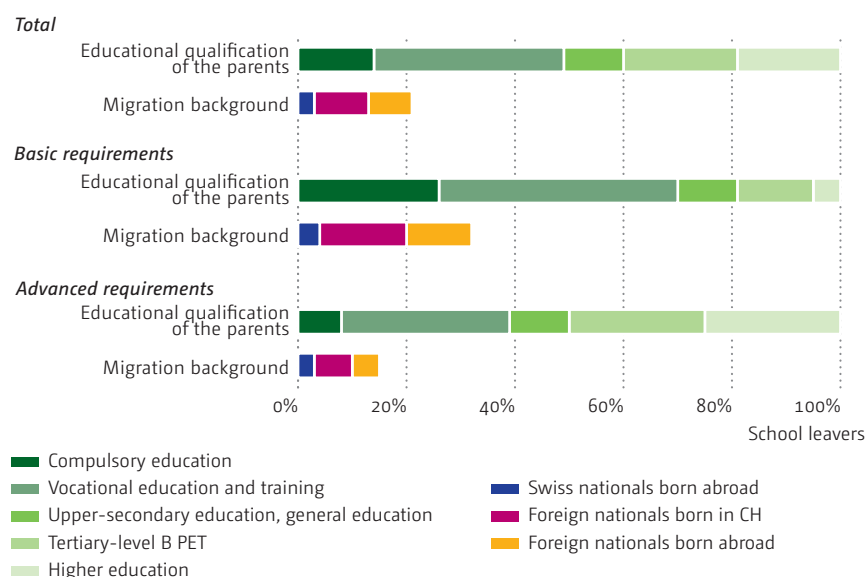
they identical for all Swiss young people, either because their (naturalised) parents have a migration background or because their Swiss parents come from a different linguistic region of Switzerland. With regard to Swiss young people, 14% speak a first language that is not the language of instruction. In the case of pupils who are foreign nationals, 73% have a first language that is not the language of instruction in their school (→ Figure 75).

The Federal Statistical Office can now provide information on parents' educational background, as well as on migration background (→ Figure 76). This differs greatly according to a requirements profile; the proportion of migrants in lower-secondary education classes with basic requirements is approximately twice as high as in classes with advanced requirements.

76 Lower-secondary school leavers broken down by migration background and highest educational qualification of their parents

School leaver cohort 2012; general education at upper-secondary level is likely to be mainly teacher training, which was raised from upper-secondary to tertiary level some 15 years ago.

Source: FSO, 2016b



Institutions

Following the implementation of the HarmoS Agreement, which entered into force in 2009, lower-secondary education in Switzerland now encompasses three years (9th to 11th year of schooling) in all cantons. An exception has been made for the canton of Ticino, where lower-secondary education lasts for four years. Five cantons were required to make structural changes to adapt to the new rules (→ *chapter Compulsory education, page 31*).

Various interim solutions (also known as bridge-year courses) are available in the cantons for pupils moving between compulsory education and upper-secondary education. These interim solutions are aimed at young people who are not transferring directly to upper-secondary education (→ *chapter Upper-secondary education, page 99*).

Diverse models in place at lower-secondary level

Switzerland still has a range of different structural models in place in lower-secondary education. In some cantons, the type of model to be used is prescribed for the canton as a whole, while other cantons allow the communities to decide which model to apply (→ Figure 77). The models can be summed up as follows:

- In the case of the streamed model, pupils are divided into different requirements profiles (also referred to as levels or school types) on the basis of an overall assessment carried out at the end of primary school and taught in separate classes for all subjects. There will generally be between two and three (or occasionally four) different profiles, the names of which still differ markedly, for example Realschule and Sekundarschule or levels A, B and C. For statistical purposes, these are grouped into the simpler profiles «classes with basic requirements» and «classes with advanced requirements».
- The cooperative model is usually based on two streamed core classes. As with the streamed model, pupils are allocated to a class on the basis of an assessment carried out at the end of primary school. The difference here is that mathematics, the language of instruction and in some cases also foreign languages are taught in two to three level-based courses spanning the core classes.
- With the integrated model, there is no selection based on an assessment at the end of the primary level. Pupils continue to attend the same class together. Level-based courses spanning the core classes are used to teach mathematics, the language of instruction, foreign languages and, in some cases, natural sciences.

The second two models generally leave scope for pupils switching level-based course in the subjects mentioned during a school year, making for a more accessible model than the streamed model with its high degree of selection. The latter does in theory allow for pupils to switch to a different profile during their lower-secondary education but this rarely happens in practice (*Neuenschwander, 2015*). This may be because it would also involve changing class and in some cases moving to a different school location.

While the influence of different school models on the average performance of a class ought to be small (*SCCRE, 2014*), current research findings indicate a stronger correlation between academic achievement and social origin in cantons with streamed models than in cantons with more accessible models (*Felouzis & Charmillot, 2017*). It is possible that other factors may have contributed to this correlation.

In light of falling pupil numbers, some regions are also creating mixed-age classes at lower-secondary level.

Figure 78 shows the allocation of pupils to classes with advanced requirements and to classes with basic requirements (cantonal averages). With three-strand models, the two higher requirements profiles as well as the preparatory baccalaureate schools and long-term baccalaureate schools are assigned to the «advanced requirements» statistical category. The figures include state and private schools. This also explains why cantons that use the multi-strand model nevertheless report some pupils in the category «no differentiation between levels»: only some private schools have this type of differentiation. The cantons of Jura and Ticino, despite using the integrated model, still report some figures for the «Basic requirements» and «Ad-

77 Most common model in lower-secondary education, 2017

Data: EDK-IDES

| Model | Cantons |
|-------------------------------|---|
| Streamed (No. of profiles) | AG (3), AI (2)*, BL (3), BS (3), FR (3), GE (3), SG (2)*, SH (2), SO (3), SZ (3), ZH (2.3)* |
| Cooperative | BE, GR*, LU*, OW*, TG, VD, ZG* |
| Integrated | AR, JU, NE, NW*, TI, UR*, VS |

in bold: only one model permitted

* These cantons also operate lower baccalaureate schools. Special-needs classes have not been included.

vanced requirements» categories, due to their statistically recording pupils according to level-based courses or because they offer a preparatory course for baccalaureate schools in the 11th school year that falls into the «Advanced requirements» category.

The distribution of pupils across the «Basic requirements» and «Advanced requirements» categories differs according to canton, and even with regard to cantons that have similar models in place.

78 Pupils in lower-secondary education by requirements profile and canton, 2015/16

Figures < 1% are not reported.

Data: FSO



Preparation for the transition to upper-secondary education

With the aim of optimising the transition to upper-secondary education, (→ *Effectiveness*, page 83, and *chapter Upper-secondary education*, page 99), most cantons took action a few years ago to redesign their lower-secondary education, making use of such tools as the «Vocational Training Case Management» (an initiative designed to coordinate support measures for young people in the cantons, see *SCCRE*, 2014). Key priorities have included the individual promotion of subject-specific and broader competencies, improvement of the processes in place to prepare for choosing a career and, more generally, optimal use of the final phase of compulsory education. To improve individual pupil evaluations in the 10th school year, the «Stellwerk» test, an adaptive test of learning attainment, is being implemented in around twelve cantons in German-speaking Switzerland. Meanwhile, the other cantons are also carrying out different types of assessment (→ *chapter Compulsory education*, page 31).

Career choice guidance is enshrined in the curriculum in all three linguistic regions. In the Lehrplan 21 curriculum, careers advice is a subject in its own right. As far as the cantonal timetables are concerned, however, the weight given to this area differs according to canton and requirements profiles of the lower-secondary education model (Nägele & Schneitter, 2016).

For individual and systemic reasons, any delay in the transition to upper-secondary education is generally viewed as problematic (→ *chapter Up-*

per-secondary education, page 99). Some cantons only allow pupils to repeat their 11th school year in exceptional cases (*Ender, Moser, Imlig et al., 2017; Solothurn, 2016; Bayard & Schalit, 2016*).

Teaching time in lower-secondary education

In Switzerland, the mean duration of tuition in lower-secondary education is approximately 2900 hours, which equates to around 965 hours per year. There continues to be a lot of variation from one canton to another (→ Figure 79). The difference ranges from as much as 11% more tuition time to 8% less than the Swiss national average. Most of the difference can be attributed to the varying length of a lesson in the timetable. If a lesson lasts for 50 minutes rather than 45 (as is the case in Fribourg, St. Gallen and Ticino), this means that pupils receive an extra 100 hours or so of schooling per year over the same number of school weeks and lessons per week. The remaining differences can be attributed to varying numbers of school weeks and varying numbers of lessons during a school week.

Efforts to harmonise structures and goals (→ *chapter Compulsory education, page 31*) also impact on cantonal timetables. In introducing the Lehrplan 21, some cantons have also made adjustments to their timetables.

The major differences in terms of real education input, in this case the tuition time, are relevant to any statements about the resulting effectiveness or efficiency. Given, however, the lack of data on all of the competencies acquired in school, it is not possible to make any statement on the overall effectiveness or efficiency of the hours spent in education. Yet the effects of differences in teaching hours may also impact on individual subjects (→ *Effectiveness, page 83*). In terms of technical¹ efficiency, it is at least clear that the highly diverse input of teaching hours would also indicate a highly diverse efficiency if the pupils in all cantons ended their compulsory education with similarly good attainment levels (→ *Efficiency / costs, page 90*).

Effectiveness

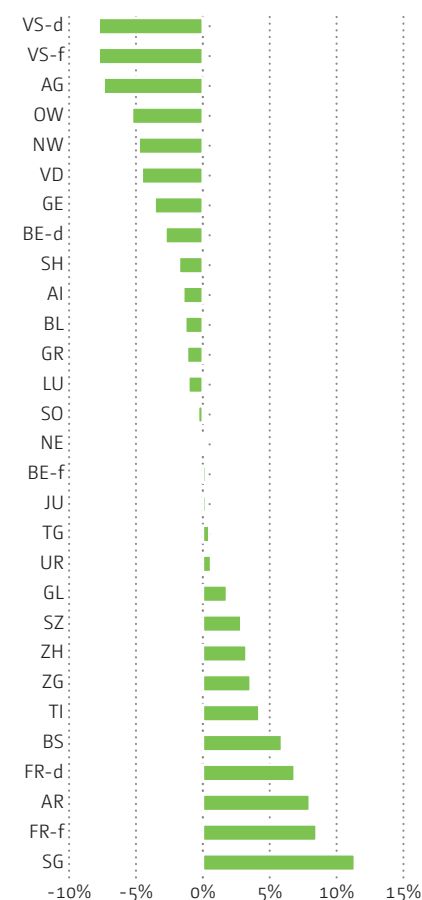
In order to assess the effectiveness of lower-secondary education, we need to review whether the learning aims as stipulated in the cantonal curricula have been achieved. Alongside basic competencies in such areas as mathematics, the language of instruction, foreign languages and natural sciences, broader aims such as skills in the handling of information and communication technologies, but also social competence and personal development are an integral part of the state school's remit to train and educate. To assess the output at the end of lower-secondary education, a review of whether multiple goals

¹ With regard to technical efficiency, we consider the efficiency of a real input (in this case teaching hours). This efficiency need not be as high or as low as economic efficiency, for which the efficiency of the monetary value of the input is considered. If for example it is particularly those cantons that use many hours that have a more favourable input, the technical efficiency would be lower (assuming the same attainment levels) but this would not necessarily apply to economic efficiency.

The teaching time **calculations** are based on the total for compulsory subjects and compulsory options by requirements profile. For the cantonal average, the teaching time for the different requirements profiles is weighted according to the distribution of pupils between the «Basic requirements» and «Advanced requirements» profiles. For the Swiss average, the cantonal averages were weighted according to the number of pupils in the canton. It should be noted that there are differences linked to school type and individual differences due to the availability of electives, and these cannot be recorded.

79 Teaching time in lower-secondary education, 2016/17

Average cantonal deviation from Swiss average (overall total 9th to 11th School year)
Data: EDK-IDES; calculations: SCCRE



have been achieved is therefore required, which makes an overall assessment of the effectiveness at cantonal and national level extremely difficult.

At a systemic and individual level, achieving a transition² from lower-secondary education to upper-secondary education that is as smooth and direct as possible is a further criterion for the effectiveness of lower-secondary education (→ *chapter Upper-secondary education, page 99*), not least as this paves the way for the education policy objective of having 95% of all 25-year-olds achieve an upper-secondary level qualification.

The impact of teaching time on school attainment levels

Given the major differences between cantons in teaching time, (→ *Institutions, page 80*) the question arises of whether pupils who attend more lessons also achieve better results. It is difficult to research the added benefit of extra tuition hours, however, as cantons or schools offering more or less teaching time may also differ in terms of other characteristics relating to the school, teachers or pupils that cannot be observed by the researchers.³ At an international level, there are various studies that demonstrate a causal link between additional teaching time and attainment (*Huebener, Kuger & Marcus, 2017; Lavy, 2015*). Based on cantonal random samples from the 2009 PISA study, a moderate causal link between teaching time and results is established for Switzerland (→ *Figure 80*): In terms of the impact of additional teaching time, it is clear that a deviation from the average number of tuition hours per week by one hour changes attainment by 35 to 50% of the effect of an average hour.

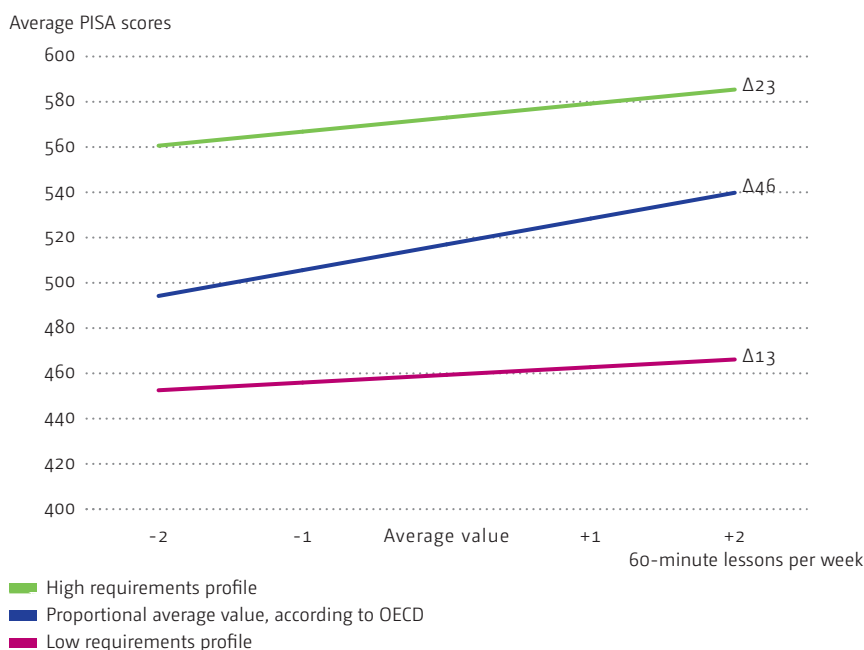
Analysis also shows that more teaching time does not have the same impact in each requirements profile in lower-secondary education. The impact of an additional teaching hour is twice as marked in the highest requirements profile as it is in the lowest. Although it is not possible to determine the differing effectiveness of the deployed resources, it is clear that providing more tuition time within the same requirements profile does not help in any way to make educational attainment more homogeneous. In fact, it actually makes attainment even more heterogeneous. Consequently, additional teaching time is not used in Switzerland as a means of evening out pupil attainment but is used consistently and practically independently of the different learning needs of pupils. This means that differences in attainment are widened, as opposed to being reduced, by the use of additional teaching.

2 A direct transition to a certified course in upper-secondary education would not then be a good aim for the assessment of lower-secondary education if, by means of an interim solution, either the likelihood of a post-compulsory education qualification being achieved could be increased or a «better» or «more suitable» training course completed. Studies analysing the effectiveness of interim solutions show, however, that neither the former nor the latter is achieved (→ *Chapter Upper-secondary education, page 99*).

3 If, for example, a canton were to use a particularly good teaching resource for mathematics enabling similarly good mathematics results to be achieved on the basis of a low number of maths lessons, the empirical conclusion drawn without knowledge of the effectiveness of the resource would wrongly be that devoting more teaching time to mathematics has no impact on attainment.

80 Impact of teaching time on school attainment by requirements profile, PISA 2009

Source: Cattaneo, Oggenfuss & Wolter, 2017, own presentation



Foreign language competencies and teaching time

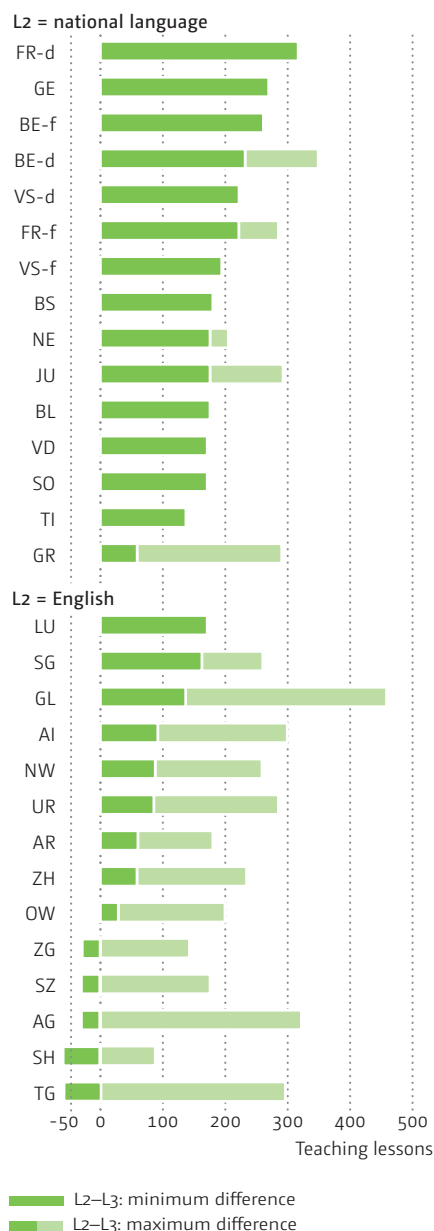
Against the background of the harmonisation enshrined in the Swiss constitution (Art. 62 para. 4) (→ *chapter Compulsory education, page 31*), the Swiss Conference of Cantonal Ministers of Education (EDK) adopted detailed descriptions of the basic competencies to be acquired back in 2011. With regard to the two foreign languages being taught, the goal is for the same level of competence to be achieved in each by the end of compulsory education (EDK, 2011).

The most up-to-date and representative cantonal and regional evaluations show that more foreign language teaching, and specifically a higher number of school years involving foreign language tuition, results in significantly higher attainment (Bayer & Moser, 2016; Peyer, Andexlinger & Kofler et al., 2016; Steidinger & Marques Pereira, 2016). Bearing this in mind, and given the major differences in the number of hours allocated to foreign language teaching, the question arises (→ Figure 81) as to whether pupils in the different cantons actually achieve the same competence levels in the foreign language taught as the first foreign language (L2). The difference in teaching time at primary level is around 110 hours, extending to approximately 200 hours over the course of secondary education. In lower-secondary education we therefore do not see any compensation for differing teaching hours at primary level.

82 Teaching time in both foreign languages, 2015/16

Minimum and maximum potential differences between the first (L2) and second foreign language (L3) at the end of compulsory education

Data: EDK-IDES; calculations: SCCRE



Legend

In the canton of Jura pupils will have attended a minimum of 175 hours more German (L2) tuition than English tuition in total by the time they reach the end of their compulsory education. Depending on requirements profile and compulsory options, the difference may be even higher, meaning that young people in the canton of Jura may well have attended more than 290 hours of German classes than English lessons by the end of their compulsory education.

81 Teaching time in the first foreign language (L2) at primary level and at lower-secondary level, 2015/16

Data: EDK-IDES; calculations: SCCRE

Lower-secondary education: Total converted into 60-minute lessons



Remarks on Charts 81 and 82

81 The teaching time is calculated by multiplying the number of lessons by the duration of one lesson, the number of school weeks and the number of school years with teaching in L2, shown in hours. The lines represent the Swiss average for primary level/lower-secondary education weighted according to the number of pupils in the cantons. With regard to lower-secondary education, only compulsory and compulsory elective lessons and a cantonal average for the requirements profiles (weighted according to distribution of pupils across the different requirements profiles) are taken into account. A minimum scenario is also shown for some cantons (red dots). This lower overall total arises when the obligatory choice between L2 and L3 is not made in favour of L2.

82 For the purposes of the values shown, the total teaching time in the second foreign language (L3) was subtracted from the total teaching time in the first foreign language (L2) (in hours). The following factors were taken into account: number of lessons, duration of a lesson, number of school weeks and number of school years during which the language is taught up until the end of compulsory education. Because the number of hours in lower-secondary education differs according to requirements profile and compulsory options (elective not taken into account), a minimum and maximum potential difference has been shown for each canton.

If more lessons result in better attainment, it is likely that there will not be comparable competencies in the two foreign languages at the end of compulsory education (→ Figure 82). In most cantons pupils receive considerably more lessons in their first foreign language (L2) than in their second foreign language (L3). This is related to the fact that the later introduction of L3 is not offset by a higher number of lessons compared with L2. Certainly, some compensation may occur due to the fact that pupils will be able to build on better language skills (L1 and L2) when learning their second foreign language and therefore learn L3 more quickly. Whether this is sufficient to achieve a comparable level of competence by the end of compulsory education cannot yet be conclusively determined.

Depending on the requirements profile and range of compulsory options, there is a minimum and maximum scenario within a canton for the teaching times for L2 and L3. Particularly marked differences arise where the first foreign language is compulsory and the second is not. Even if the obligatory choice between the two languages is made in favour of the second foreign

language, pupils are only offered more teaching time in the second foreign language in some cantons (Aargau, Schaffhausen, Schwyz, Thurgau, Zug).

PISA scores of 15-year-olds

The PISA study currently provides the only opportunity for Switzerland to compare the attainment of its 15-year-old school pupils internationally. As well as this international comparison, it also enables various different aspects to be analysed at a national level (such as gender comparison or comparison of young people with different origins), something that would not be possible without this data basis. In 2015, however, in contrast to earlier PISA studies, no random samples were tested for individual cantons meaning that it was no longer possible to compare cantons with each other.

In the most recent PISA study, young people in Switzerland achieved an average score of 506 points in science, 521 points in mathematics and 492 in reading. Compared with its neighbours, Switzerland achieved the best scores in mathematics (→ Figure 83).

As well as testing performance, the PISA study also investigates such aspects as attitudes on various school subjects. It was observed in most countries in 2015 that higher-performing young people reported enjoying science more than those with a lower attainment level. The correlation is somewhat weak and varies considerably from one country to another (OECD, 2016b). Whether the correlation between attitudes and school attainment is a causal link cannot be determined from the results. A converse causality is also conceivable, namely that good pupils enjoy the subject more on account of their better attainment (Peyton, Rayan & van de Ven, 2016).

84 Proportion of pupils with a migration background with low PISA competencies (Level ≤ 1), 2000–2015

Young people who were themselves born in Switzerland and whose parents were both born in Switzerland, and who speak the test language at home

Data: OECD; calculations: SCCRE



As part of the Lisbon objectives formulated by the EU in 2003, the goal was set of achieving a proportion of less than 15% of 15-year-olds with insufficient

2015 PISA study

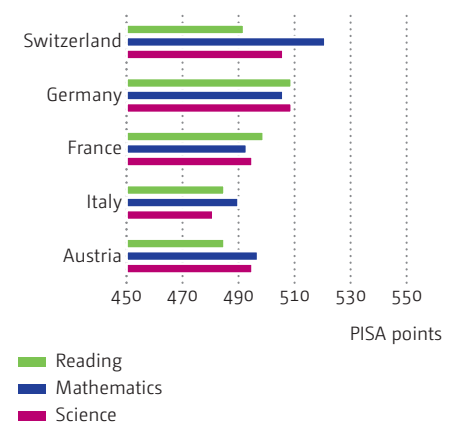
In contrast with previous PISA studies, the 2015 study included computer-based assessments. The OECD also introduced further adjustments to the measuring methods used. This has resulted in the assumption that the latest PISA results are not fully comparable against earlier results. There are indications in the literature of differences in the measurements of attainment due to the measuring method used (on paper or computer-based) (see Noyes & Garland, 2008, for an overview).

A major change was also made to the composition of the random samples in Switzerland between PISA 2012 and PISA 2015. Among other factors, the proportion of foreign-speaking young people increased very strongly, which is not solely attributable to demographic changes (OECD, 2016b).

83 International comparison of PISA scores, 2015

Focus on science

Data: OECD



proficiency levels (test scores below PISA level 1). This goal was repeatedly confirmed by the EU (*European Commission, 2015*). Applying this benchmark to Switzerland, this goal was only achieved in 2015 for those young people who were themselves born in Switzerland and whose two parents were born in Switzerland (→ Figure 84).⁴ The proportion of young people who do not achieve the minimum level according to PISA has previously followed the pattern that the proportion of those people with inadequate reading proficiency was similarly low in the case of mathematics and science if reading was not the main focus of the survey (2003, 2006 and 2012). The 2015 study represents an exception in this regard, which is difficult to explain and for which there are various competing explanations.

Use of ICT and self-assessment of ICT skills

Use of IT in schools and pupils' self-assessment of their ICT competence are shown by means of two indices. (1) A high index value means that the 15-year-olds make frequent use of ICT at school. (2) The higher the index value for ICT competence, therefore, the better the young people's assessment of their own skills. With regard to the international comparison of self-assessments, cultural differences may impact on the result.

Being able to make competent use of digital media is one of the overriding goals of the education system (→ *chapter Compulsory education, page 31*) and one that has been the subject of greater focus in lower-secondary education, particularly in light of the digitalisation of various professional fields. As well as skills in reading, mathematics and science, the PISA study also periodically reviews young people's skill levels in handling information and communication technologies (ICT) by asking 15-year-olds to complete a self-assessment.

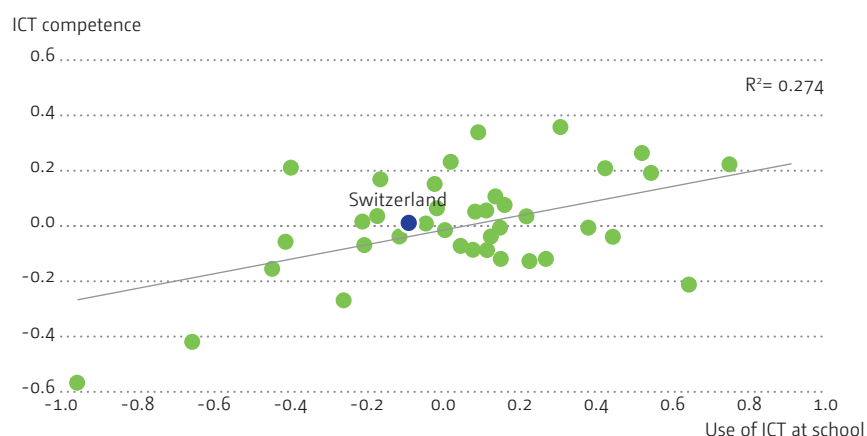
Generally, there is a positive correlation between use of digital technologies and the self-assessment of competence in ICT (→ Figure 85), but this is not an indication of any causal link or an indication that the self-assessment accurately reflects actual skills.

However, statements can now be made regarding the links between the use of ICT in and outside school and competencies in other school subjects. Individual and meta-analysis reveal the lack of causal links. Greater availability,

85 Use of ICT in school and self-assessment of ICT competence, PISA 2015

International comparison

Data: OECD



4 If we consider Switzerland's PISA population as a whole, the proportion of pupils with very weak performance levels in reading is 20%, compared with approximately 16% for mathematics and 19% in science.

widespread use by young people or major use of ICT during teaching therefore generally does not have a positive impact on other school competencies (see for example *Faber, Sanchis-Guarner & Weinhardt, 2015; Fairlie & Robinson, 2013; Fairlie & London, 2012*). The latest analysis shows that this can also be due to inappropriate use of ICT in the classroom, for example if computers replace conventional learning techniques in instances where the latter would be preferable or if they are used too infrequently in areas in which they would actually be the superior option (see *Falk, Mang & Wössmann, 2018*). If the use of digital technology is also associated with a change in teaching style, improvements in school performance can however be achieved (*Hull & Duch, 2017*).

Non-cognitive competencies and attainment

As well as laying the foundation for subsequent education and training and for personal development, the aims of lower-secondary education also encompass developing the pupil's personality as a whole and the promotion of a sense of responsibility for oneself and for society (see for example the Act on State Schools in the canton of Lucerne). The research literature (→ *chapter Cumulative effects, page 295*) also confirms the view that both cognitive and non-cognitive competencies are relevant to future educational success. There can be a positive correlation between cognitive and non-cognitive competencies, in which case pupils with low levels of school (cognitive) skills would be disadvantaged twice. However, there is no correlation between certain cognitive and non-cognitive abilities, in other words certain skills may potentially offset shortcomings in others. This is illustrated by the example of punctuality, which was also covered by the PISA questionnaire. Being on time is an aspect of conscientiousness, one of the «big five» personality traits established in research as being the most reliable indicators of future success (*Almlund, Duckworth, Heckman et al., 2011*). In Switzerland, a positive link has been proven between the cognitive skills measured in PISA and punctuality (→ Figure 86). It is less likely that pupils with high cognitive competencies will report having been late. We can only speculate about a potential causal link. However, analysis of future educational paths reveals that both cognitive skills and punctuality are independent predictors of the future educational path, particularly among those individuals who choose a vocational option (*Wolter & Zumbühl, 2017b*). There is therefore, potentially, a two-fold advantage or disadvantage for some people.

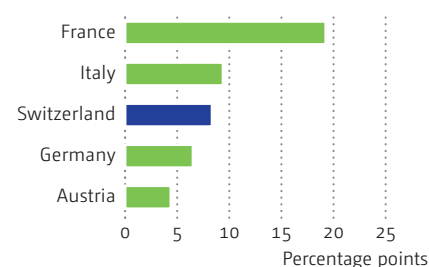
Yet the link between cognitive skills and punctuality is less marked in Switzerland than in neighbouring countries. It is, however, worth noting when comparing different countries that cultural differences in self-declaring personal traits (such as being late) could also come into play.

Paid private tutoring

In order to assess the effectiveness of what schools are doing, one key aspect is the proportion of academic skills that were not developed in school but outside of the classroom (at home with parents, by means of private coaching etc.). It is not possible to directly quantify this proportion. It is also not possible to compare the competencies of randomly selected young people

86 Probability of being late, international comparison, PISA 2015

Difference between Level 2 and Level 5 (Science)
Data: OECD; calculation: SCCRE



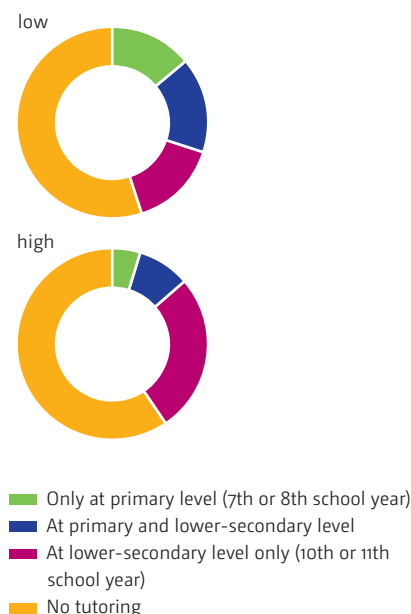
The information on lateness is based on data provided by the pupils themselves, according to which they had been late for school on three or more occasions over the past two weeks. Due to the pupils submitting their own information, cultural differences may have influenced the data reported.

Legend

In Switzerland, the probability of a 15-year-old with low competencies (PISA level 2) reporting frequent instances of being late is 8 percentage points higher than the probability of a young person with identical socio-demographic characteristics but high competencies (PISA level 5). The difference cannot therefore be attributed to different characteristics such as age, gender, origin etc.

87 Rates of private coaching by requirements profile, PISA 2012

Source: Hof & Wolter, 2014



who have and who have not received tutoring (Hof, 2014). Additionally, the nature of tutoring differs greatly, both qualitatively and quantitatively. Updated figures from the additional PISA survey (2012) on learning support provided outside school and in exchange for a fee show, however, that the proportion of children and young people in Switzerland who receive regular and intensive coaching should not be ignored and has increased since the first survey was carried out in 2009.

More than 34% of young people reported in 2012 that they had received paid private tutoring in their 10th or 11th school year, which equates to a 10% increase compared with the 2009 survey (Hof & Wolter, 2014). Two thirds of these children and young people receive regular tutoring. The children concerned are frequently from privileged homes. The representative results for the whole of Switzerland show that most use is made of private coaching at the time of the transition to upper-secondary education (in the 10th or 11th school year). The pattern observed in terms of the timing of tutoring, unlike the probability of tutoring being used, differs greatly between pupils in school types with advanced requirements and those with lower requirements (→ Figure 87). The former make greatest use of private tutoring towards the end of their compulsory education, generally to secure a place in a general education school or an apprenticeship with high requirements. The latter are more likely to receive tutoring before entering lower-secondary education, possibly in order to gain access to a higher requirement level. Consequently, the results show that pupils from classes with low requirements invest less in compensatory tuition outside of school at secondary level than young people from classes with high requirements.

Efficiency / costs

Efficiency can be estimated in two different ways. We can try to assess the level of frugality in the deployment of monetary and non-monetary resources in achieving education goals, or we can consider whether the resources used achieve the maximum reward. As in the case of the Swiss education system as a whole, it is difficult to make any statements on the efficiency of lower-secondary education. The focus here is on the differences in the monetary (costs) and real inputs (such as class sizes and teacher/pupil ratios).

Class sizes and community-specific characteristics

The real cost increase in spending per pupil in compulsory education observed in the recent past (→ *chapter Primary school level, page 51*) also relates to new tasks that have been assigned to the cantons and communities in the sphere of education. The changes in class sizes are, however, another central factor. A fall in pupil numbers over recent years has triggered an increase in the number of small classes, thereby pushing up costs considerably (SCCRE, 2014). Conversely, the cantons have always taken advantage of periods with rising pupil numbers to fill up classes (and schools), which cushioned the cost impact of rising pupil numbers. While fluctuations in class sizes and teacher/pupil ratios have been relatively well documented, it is only now, with

updated education statistics to hand, that we can analyse differences in class size within the cantons of Switzerland. This analysis can also be used to now answer the question of whether the quite considerable differences in average class size from one canton to another can be attributed to demographic and topographic variations (see also the same analysis for the primary level (→ *chapter Primary school level, page 51*)).

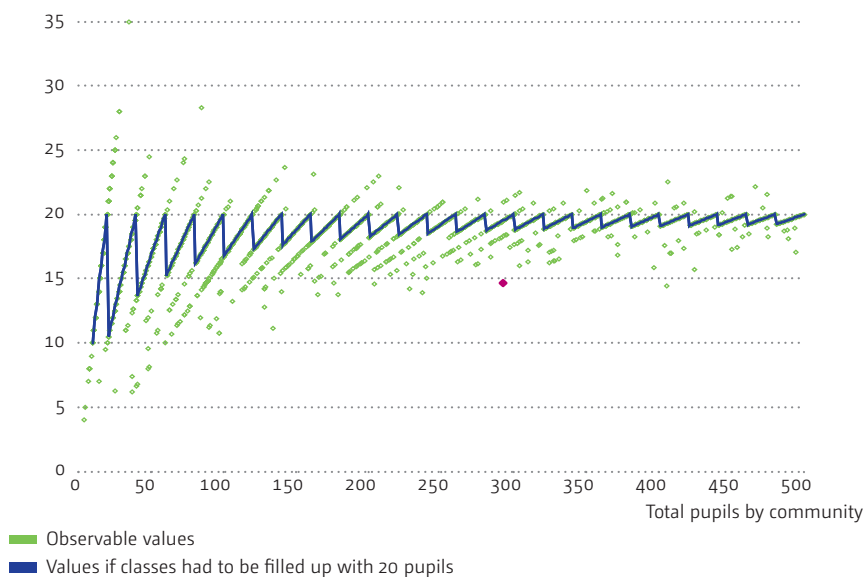
In the 2015/16 academic year, communities in Switzerland had an average class size at lower-secondary level of 18.6 pupils. However, across the different communities, class sizes varied from as little as five to as many as 35 pupils. If we consider the average class size per community in relation to the respective school roll, we observe a funnel-shaped distribution of the average class sizes.

89 Number of pupils in lower-secondary education and average class sizes by community, 2015/16

excluding pupils in special classes and private schools

Data: FSO; calculations: SCCRE

Average class size by community



Legend

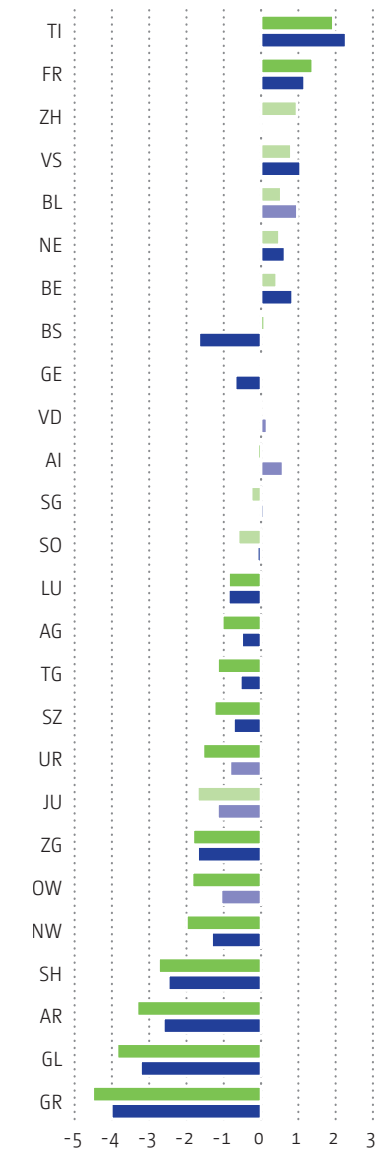
The community shown in red has 293 pupils in lower-secondary education and an average class size of 14.6. There are 20 classes. If the creation of a new class (blue line) were only to be permitted with 20 pupils, these pupils would be distributed among 15 classes (giving an average class size of 19.5).

With very low school rolls it is not just the case that class sizes are small. They also vary very significantly from the national average. This means that there are communities with very small average class sizes alongside communities with a comparable total number of pupils and very large classes (→ Figure 89). The higher the number of pupils in a community, the bigger the class sizes, although the relationship between the two factors is not linear. From a school roll of around 350 pupils, the average class size lies at around 20 young people per class. If there were now to be a rule that all communities must fill up their classes so that they contain 20 pupils (as in the case of *Angrist & Lavy, 1999*), the distribution of class sizes based on community-specific school rules (blue line) would differ somewhat from the empirically observed distribution. Were such a rule to be applied, it is striking to

88 Average cantonal class size in lower-secondary education, 2015/16

Deviation in number of pupils from average for Swiss communities; excluding pupils in special classes and private schools

Data: FSO; calculations: SCCRE



Effectively observed sizes, community characteristics not taken into account
Community characteristics taken into account

Matt colours indicate that the class size does not deviate significantly for statistical purposes ($p \geq 0.05$) from the national average. The values are based on the average class sizes in the communities, weighted according to cantonal pupil numbers. The following characteristics were incorporated into the second calculations (blue bar): School roll, surface area, degree of urbanisation.

note that there are more communities in which the effective average values would be below this guideline than communities with higher values. In light of the findings in the research literature to the effect that smaller classes do not necessarily mean better attainment (see for example *Angrist, Lavy, Leder-Luis et al., 2017; Leuven & Lokken, 2017; Coladarsi, 2006*), it can be concluded that the average class sizes in communities with fewer than 350 pupils demonstrate potential to improve efficiency.

Some of the differences observed can be explained by the degree of urbanisation in a community. In urban areas, population density and thus the density of schools are higher, or the routes to the nearest school are shorter, so that classes are more likely to be filled up. Empirically, it can also be established that a rising proportion of foreign pupils in secondary education is associated with smaller class sizes (in contrast to the situation at primary level). This could be due to the fact that communities with a high proportion of foreign nationals tend to create classes with basic requirements, which are more likely to have smaller numbers.

Intercantonal comparison of class sizes and pupil/teacher ratios

Analysis at community level of the factors that influence average class size such as number of pupils, surface area and degree of urbanisation can now be used to answer the question of whether these factors also help to explain the differences from one canton to another. If the structural characteristics of the cantons are disregarded, the cantonal averages fluctuate very strongly (→ Figure 88). The average class size is highest in the canton of Ticino and the lowest in the canton of Graubünden, where the average class is smaller by more than 6.5 pupils.

If the different demographic and topographical composition of the individual cantons is factored in, and it is therefore assumed that all cantons are similar in this regard, the difference between the cantons with the largest class sizes and those with the smallest class sizes changes only very slightly, from an original level of more than 6.5 pupils per class to just below six. Consequently, the very large differences between the cantons can only be explained to a small extent by the average number of pupils, surface area and degree of urbanisation of a community, and must therefore be caused by other unknown factors.⁵

It is not just class size that influences spending on education. Rather the teacher/pupil ratio is key. This can be similarly high even for a disproportionately large class if that class is taught by several teachers. Generally, however, there is a high correlation (0.65) between average cantonal class sizes and average cantonal teacher/pupil ratios. As with class sizes, there is a similarly large variation in teacher/pupil ratios within individual cantons (→

Pupil-teacher ratio

According to the Federal Statistical Office's definition, the number of pupils per teacher (full-time equivalent [FTE]) at a specific educational level is the pupil/teacher ratio.

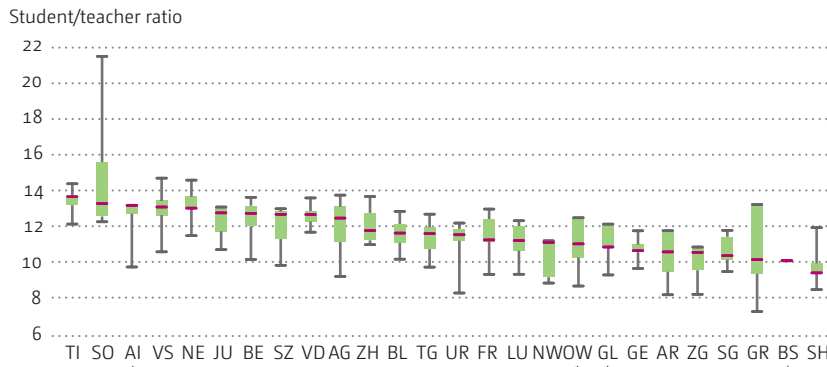
⁵ The factors investigated all appear to statistically significantly explain a certain portion of the differences in class size between the individual communities. The reason why they only account for so little of the major differences between the cantons lies in the fact that the overall impact of these factors is not very big. This in turn is due to the fact that, for example, a rural community with a low population density does not automatically have to have small class sizes as in empirical terms it will also be possible to find communities with the same characteristics that run classes where the number of pupils corresponds to the national average or is actually higher than the average.

Figure 90). The median teacher/pupil ratio for the canton is between 9 and 14 pupils per teacher (FTE) in all cantons.

90 Teacher/pupil ratio by canton and community, 2015/16

Excluding pupils in special classes and private schools

Data: FSO; calculations: SCCRE



Legend

The median (horizontal line inside the green box) for the canton of Solothurn is 13.3. The pupil/teacher ratio is above the median in half of the communities and below the median in the other half.

The middle 50% of all communities in the canton of Solothurn (green box) have a pupil/teacher ratio ranging from 12.5 to 15.6 pupils per teacher (FTE). The ratio in 95% of all Solothurn communities is between 12.2 and 21.5 pupils per teacher (FTE), see horizontal line above and below the green box.

*The cantons marked with an asterisk have fewer than 10 communities.

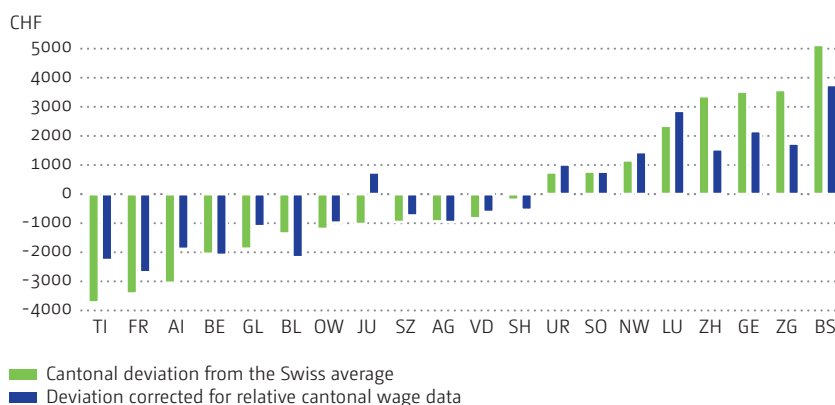
Intercantonal comparison of public expenditure on education

The statistics on cantonal expenditure on lower-secondary education are based, as for the entire field of compulsory education, on calculations that take account of all payments made at the level of the community and the canton. Consequently, the aggregated figures at cantonal level are only made available after a considerable delay. Indeed the figures currently available relate to 2014 (→ Figure 91). As the calculations of cantonal expenditure are not based on a uniform cost accounting model, various restrictions are applied in order to achieve as much comparability as possible. This includes limiting costs to the category of remuneration. Some cantons are also excluded from the comparisons due to their spending figures per pupil showing patterns over time that do not appear logical. This does not automatically mean that all of the cantons used in the comparison are reporting comparable costs. It is simply that there are no striking patterns for these cantons that would indicate from the outset that their data cannot be compared to that of other cantons (→ *text in the right margin*).

91 Public expenditure on education by the cantons per pupil, lower-secondary level

Remuneration only, public education institutions (including special classes, excluding music schools), average for 2013 and 2014

Data: FSO, EFV; calculations: SCCRE



The data from 20 cantons has been used for the **public expenditure on education** figures. The other cantons were excluded for three reasons: (1) If they recorded multiple changes in spending of more than 10% between 2008 and 2014; (2) if, after a single change of more than 10%, they record much lower spending per capita than comparable neighbouring cantons – i.e. if costs have been cut excessively due to structural change or (3) if the canton has reported its own doubts regarding the accuracy of the data.

Formula for calculating cantonal costs

in Figure 92

$$\frac{VP_{LP}}{UZ_S} \times \frac{Wage_{LP}}{KLGR} = \text{costs per pupil}$$

$$\frac{VP_{LP}}{UZ_S} = \text{relative teaching time}$$

$Wage_{LP}$ = Average wage earned by a teacher taking age structure into account (based on cantonal wage system)

$KLGR$ = Average class size

VP_{LP} = Average full-time workload of teacher

UZ_S = Average teaching time provided to pupils

The wage calculations are based on data gathered from the EDK teacher survey in German-speaking Switzerland. The data includes information on the wage systems, the workload of the teachers and the legal framework governing minimum and maximum teacher salaries. No comparable data is available for French and Italian-speaking Switzerland.

Legend

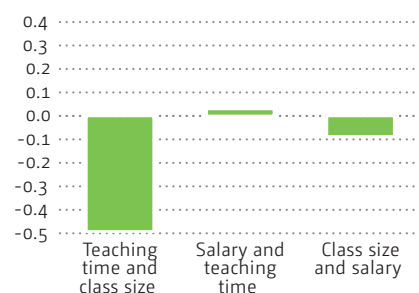
The observable standard deviation of around CHF 760 is based on the differences in all three input factors (wage, relative teaching time and class size). Differences in cantonal average wages, for the same relative teaching time and same class size, reduce the standard deviation by 70% to CHF 220.

93 Correlations between the real input factors

Real input factors: relative teaching time (full-time workload of teacher/teaching time provided to pupils), class size and teacher wage

Data: FSO, D-EDK, EDK-IDES; calculations: SCCRE

Correlation value



Despite all of these restrictions, the cantonal figures differ considerably. In the canton with the highest spending, the annual costs per pupil are some CHF 8900 higher than in the canton with the lowest costs.

The differences can be attributed to various factors. Firstly, the remuneration costs are related to the general level of wages and secondly, the age structure of the workforce and differences in social security charges also have an impact. If we consider that the wages paid to teaching staff are in line with the remuneration paid to people with tertiary training in the canton (corrected deviation in Figure 91), the difference between the canton with the highest staff costs and the canton with the lowest expenditure falls from CHF 8900 to 6400. Around one third of the differences in public expenditure on education can therefore be attributed to the fact that cantons, when setting wage levels for their staff, base the level on the wages earned by other workers with tertiary training.

In addition to the influence of the cantonal wage level on education spending, differences in real input factors (such as teaching time and class size) explain most of the remaining differences between the cantons in terms of what they spend per pupil.

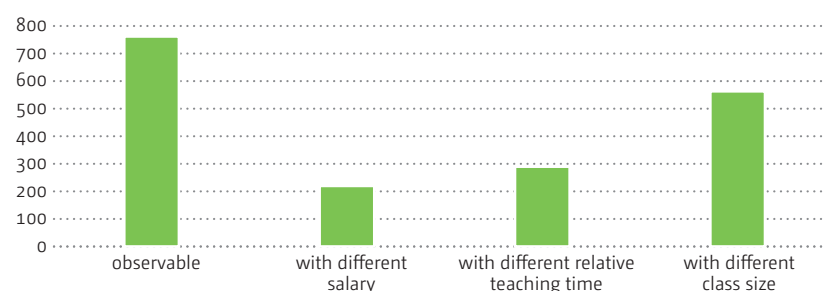
The explanatory significance of the individual real input factors (→ *calculation formula in the left-hand margin*) is as follows in this model: Teachers' wages account for around 30% of the difference in educational spending, all other things being equal (→ Figure 92). The relative teaching time (ratio of workload of teacher working full-time to the teaching time given to pupils) explains around one third. Cantonal differences in average class sizes account for around three quarters. Overall, these individual effects would account for more than 100% of the variation in spending.

92 Cost differences between the cantons of German-speaking Switzerland, 2017

Public spending on education per pupil in lower-secondary education (→ Calculation formula in the margin); standard deviation (variance around the average value)

Data: FSO, D-EDK, EDK-IDES; calculations: SCCRE

Standard deviation in CHF



This result is partly caused by the correlations in the individual input factors (→ Figure 93); when combined, these factors can have a compensatory effect on spending or cause spending to increase. There is a strong empirical link between class size and relative teaching time. Classes tend to be large in those cantons where the number of teaching hours attended by pupils is higher than the working hours of a full-time teacher (thereby increasing costs as more than one teacher is needed for one class). This link has a compensatory effect but does not mean that it is the class size causing the higher number of teaching hours in relative terms. In practice there is no link between wages and either of the two other input factors. Where a canton

records a high figure for wages (relative to the other cantons), this does not indicate a high or a low value for teaching time or for class size. The combination of these input factors is different in every canton, without any discernible pattern.

Equity

Equal opportunities in lower-secondary education can be considered on the basis of various criteria. Primarily, however, it is a question of whether all young people are given the opportunity to develop their full potential in education regardless of gender and social background. Yet it is not generally possible to provide a clear answer to this question, either for an individual or for a group, as this potential is unknown. If, however, persistent differences were to emerge in the educational attainment of a particular group, for example women or men, despite the assumption that their average potential would be the same, the equity of the system would have to be called into question. Given the overall difficulty in determining an individual's potential in education and, correspondingly, the degree to which that potential has been exploited, only group-specific attainment gaps that could indicate a lack of equity in the system are documented below.

The PISA data can be used to identify any such group-specific attainment gaps at the end of compulsory education relatively reliably. While it is not possible to state how these differences arose and when during a pupil's time at school they arose, the fact that a specific group of pupils records considerably higher or lower results at the end of their compulsory education is significant in terms of those individuals' future in education (→ *chapter Cumulative effects*, page 295) and should therefore be analysed in order to determine if there is unexploited potential, which could represent a lack of equal opportunities.

Change in gender difference in PISA

Swiss boys perform considerably less well than Swiss girls in the reading tests forming part of the PISA study, as is also the case in most other countries. In contrast, girls record poorer average scores in mathematics and science. Based on the assumption that neither boys nor girls have different levels of potential or gender-specific potential, and that the differences are not simply reflecting different, gender-specific preferences, these results indicate a lack of equal opportunities.

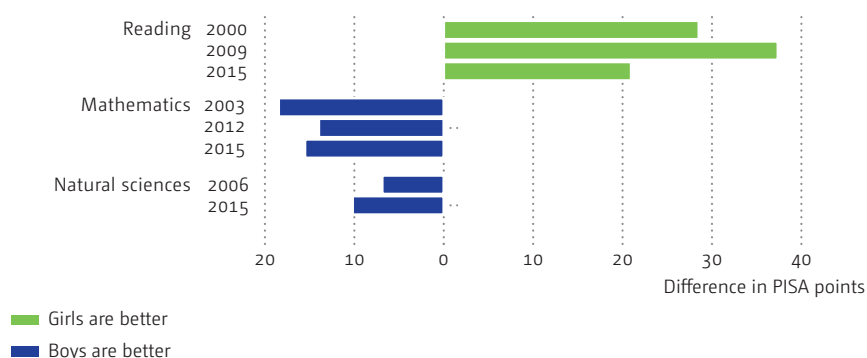
It is interesting to note that the gender difference, despite being observed for some time, still persists. It has remained stable for the duration of all six PISA studies, over the period from 2000 to 2015 (→ Figure 94). The only striking change is that the difference between boys and girls shifted in favour of boys in the most recent study compared with the 2009 study. With regard to reading scores, the gender difference almost halved from 37 PISA points to 21 points.

The reasons for the **change in gender difference** are difficult to determine. However, internal analysis by the OECD shows that the switch to computer-based testing could be an explanation with boys proving to be more motivated to take a computerised language test. Subsequent tests in adult life (results of the Programme for the International Assessment of Adult Competencies (PIAAC) with computer-based measurement) also show that for most countries the gender difference in reading scores measured at the age of 15 in PISA tests subsequently disappears, which can also have other explanations besides the test technology.

94 PISA scores in 2015, difference in PISA points between girls and boys

Based on the same socio-demographic characteristics such as age, language, social origin and migration background

Data: OECD; calculations: SCCRE



Legend

In 2000, the PISA scores in reading recorded by girls were on average 28.5 points higher than the scores recorded by boys. The gender difference in 2009 was 37.4 points (both studies focused on reading). By 2015 the gender difference was 21 points.

No migration background

Persons born in Switzerland with at least one parent born in Switzerland

First-generation migrants

Persons born abroad with both parents born abroad

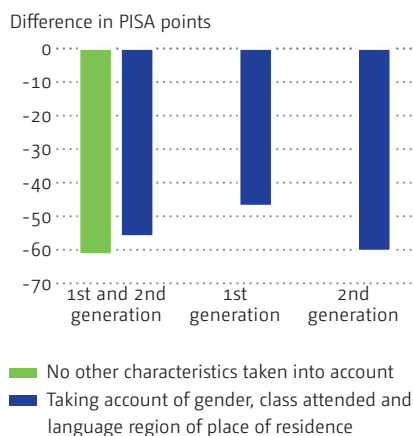
Second-generation migrants

Persons born in Switzerland with both parents born abroad

95 Attainment differences of first and second-generation migrants, PISA 2015

Deviation from attainment of young people with no migration background who speak the test language (focus: science)

Data: OECD; calculations: SCCRE



Heterogeneous results among the group of pupils with a migration background

If we compare the school attainment of young people with and without a migration background (→ *Text in the margin*) without taking into account any further characteristics, the PISA survey for 2015 (with its focus on science) reveals a difference of 61 PISA points, which equates to the knowledge acquired over almost eighteen months of schooling. Even if we assume that the young people will have the same characteristics in terms of their gender, the class that they attend and the linguistic region of their place of residence, the points difference only falls slightly, and is still 56 points (→ Figure 95). While young people with a migration background tend on average to record considerably lower school results at the end of compulsory education compared with young people without a migration background, breaking down the migration background further reveals that young people with this background form a very heterogeneous group. If we distinguish between first and second-generation migrants, we see that first-generation migrants achieve an average PISA score that is 47 points lower than young people without a migration background. With regard to second-generation migrants, the average points difference grows to 60 points.

If the group of young people with a migration background is broken down even further to consider the main language spoken at home and social origin, further differences emerge within the group (→ Figure 96). If, in addition to migration background, we consider whether the young people speak the test language at home (and/or the language of instruction), the attainment gap compared with young people who have no migration background is reduced by half. If young people with a migration background speak a different language at home, this alone explains half of the so-called «migrant effect». The attainment gap falls further if the influence of social origin (educational qualification, professional status and the number of books in the home as an approximation for cultural differences) is also taken into account. For

example, first-generation migrants from a privileged socio-economic background and who speak the test language at home record average scores that are still 16 PISA points lower than the average results recorded by a comparable young person with no migration background.

Breaking down the individual characteristics clearly shows that individual criteria do not describe the group of migrants in Switzerland sufficiently accurately. A detailed study based on differentiated characteristics is therefore crucial in order to assess attainment gaps and to evaluate the situation in terms of equal opportunities.

Social origin and attainment differences in PISA 2015

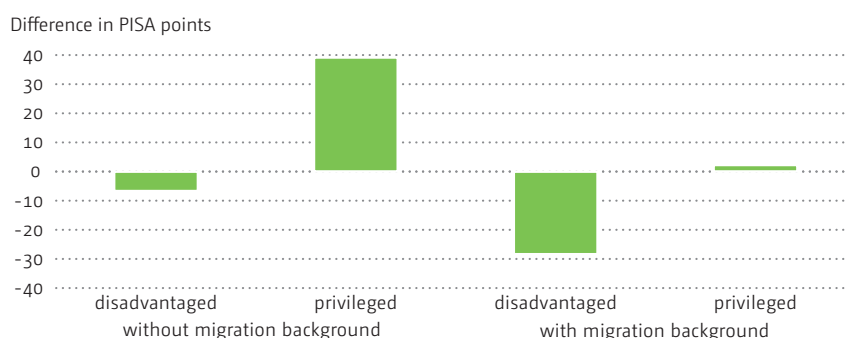
The strong link between young people's social origin and results has already been demonstrated in earlier PISA studies, and it has remained relatively stable throughout the studies. The results from PISA 2015 provide what is currently the only data for Switzerland that can be used for a review, covering the whole of the country, of this link at the end of compulsory education and across several areas of competence.

Having been able to show that, due to the interaction of various different socio-demographic and socio-economic characteristics, there are major differences in attainment within the migrant population, it can also be shown that the population of young people with no migration background is characterised by major differences in performance based on social origin (→ Figure 97). In the group of young people without a migration background, the attainment gap due to social origin between disadvantaged and privileged pupils is as high as 45 PISA points. This difference is smaller, at 30 points, in the case of young people with a migration background.

97 Attainment differences between young people with and without a migration background, by social origin, PISA 2015

Deviation from the average PISA scores of young people in Switzerland (focus: science)

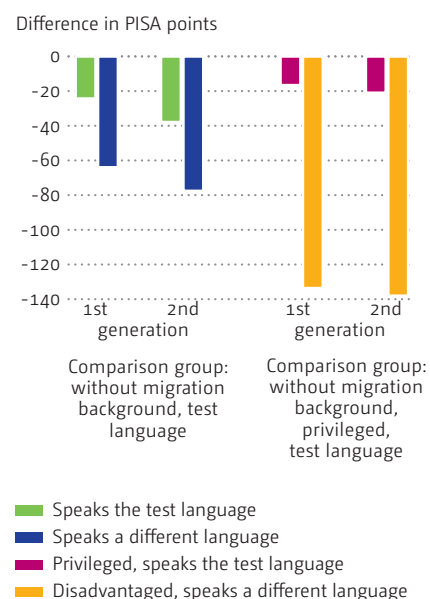
Data: OECD; calculations: SCCRE



96 Attainment differences of migrants by language and social origin, PISA 2015

Deviation from attainment of the comparison group (focus: science)

Data: OECD; calculations: SCCRE



Legend

Social origin is defined as disadvantaged for persons in the bottom quartile for social origin and as privileged for those persons in the top quartile. The social origin figure is based on the International Social and Economic Index of Occupational Status (ISEI), with regard to the parents. All four comparison groups relate to young people who speak the test language/language of instruction. The calculations take account of such characteristics as gender, class attended and linguistic region of place of residence.



Upper-secondary education

Issues affecting more than
one school type

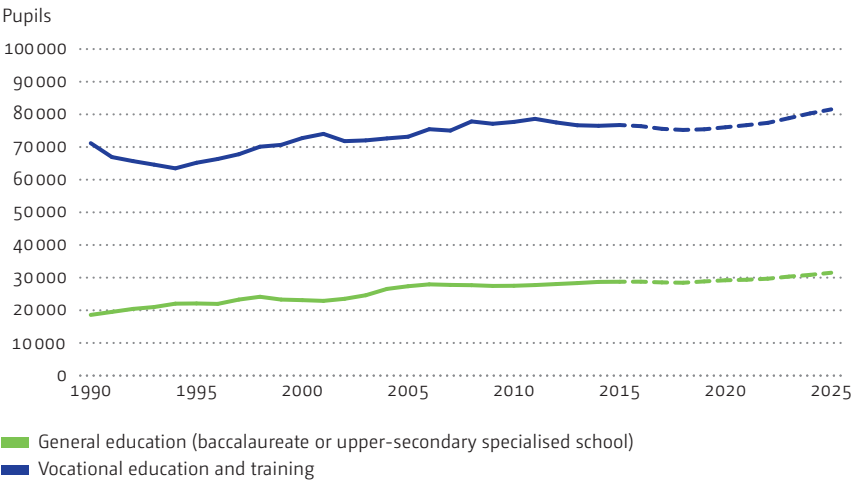
Upper-secondary education constitutes the first stage of post-compulsory education and applies to most young people at the age of around 15. Not all young people move on to this stage immediately after finishing their compulsory schooling, however (→ *Immediate transitions*, page 101 and *Interim solutions*, page 102), and the transition also involves selecting a type of school (vocational or general education), a decision influenced by academic ability, social background and the range of education options available in the particular canton. This chapter provides an overview of the different types of transition to upper-secondary education, the choice of school types available, the relative success rates applicable to pupils who go through upper-secondary education and the general success rate upon completion of post-compulsory education. An overview of the external evaluation of schools in the upper-secondary sector is also provided here. Issues specific to the different types of school are discussed in the individual sections on vocational education and training, baccalaureate schools and upper-secondary specialised schools.

Development of pupil numbers

With the corresponding nine-year time lag, the rise in the number of new pupils entering compulsory education as of the mid-2000s will also have a tangible impact on numbers at upper-secondary level. The current record for the number of pupils in the first post-compulsory year dates from 2011, at approximately 106 000 pupils. This is set to climb to a new all-time high of just over 113 000 pupils by 2025 (→ Figure 98). In terms of whether these pupils opt for vocational or general education courses, the Federal Statistical Office (FSO) expects the distribution to remain relatively stable in future. The proportion of pupils opting for general education courses, in other words attending a baccalaureate school or upper-secondary specialised school, will be just approaching 28% by the end of the forecast period.

98 Development of pupil numbers (1st years) in upper-secondary education, 1990–2025

Reference scenario from 2015 onwards
Data: FSO



Transitions to upper-secondary education

It is still the case that most young people move directly from compulsory education to a course leading to a certified qualification in upper-secondary level education. However the number of young people who either opt for an interim solution within the school system or temporarily drop out of education altogether has nearly doubled over recent decades.

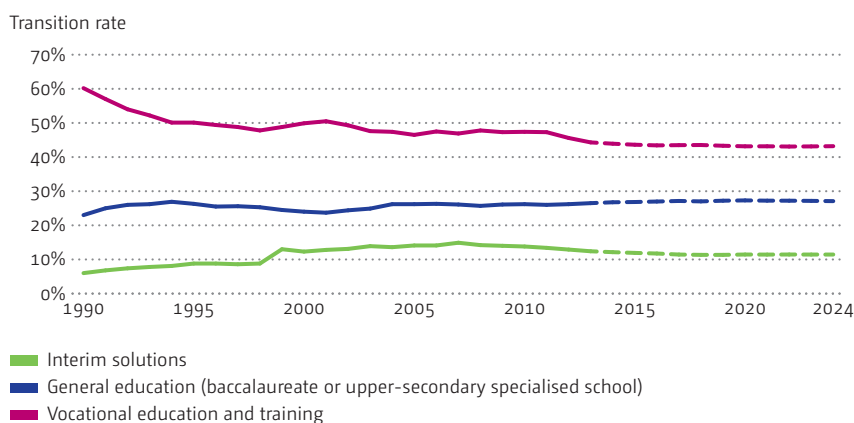
Immediate transitions

The number of immediate transitions following compulsory schooling, either to a general education school (baccalaureate school or upper-secondary specialised school) or to vocational education and training has fallen consistently since the start of the 1990s. Back in 1990 more than 83% of young people were still transferring to a course leading to a certified qualification at upper-secondary level. Ten years later, this figure had fallen by almost ten percentage points (74%), and there has been a further decline since to only just above the 70% mark. The FSO is basing its forecasts up to 2024 on a continuation of this trend (→ Figure 99). Even allowing for certain inaccuracies in the figures pre-1999, particularly in terms of the breakdown of school-based interim solutions, a slight increase in the percentage of young people who neither move immediately into upper-secondary education nor opt for an interim solution within the school system can nevertheless be seen for the period between 2000 and 2014. Given that delayed entry to general education schools accounts for less than 5% and almost exclusively applies to those cantons in which young people are able to repeat their 11th year of compulsory schooling, delayed entry to upper-secondary education is most noticeable in relation to vocational education and training.

99 Percentage of immediate transitions into upper-secondary education and interim solutions

Reference scenario from 2014 onwards

Data: FSO (Educational Prospects)



Interim solutions

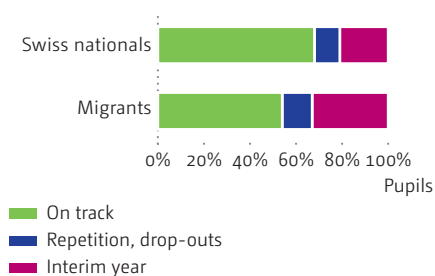
Not only has the number of school-based and non-school-based interim solutions risen overall but, as shown in earlier education reports, the figures also vary dramatically from canton to canton. It has already been suggested in this regard that the huge variations in the number of young people in interim solutions is possibly also a reaction to the large range of alternatives rather than being attributable, in full or in part, to a lack of training places. It should also be noted that, in many cantons, access to interim solutions, which were originally designed just to help a very narrowly defined group of young people with difficulties to make the transition to education after compulsory schooling, is being extended to further target groups and, in addition, interim solutions are in practice being incorporated into the standard education offering (*Landert & Eberli, 2015*). Recent research work points in this direction, although it appears that many young people now are already targeting interim solutions by the beginning of their 10th school year, in other words long before they have begun looking for an apprenticeship or education opportunity within general education (see *Jaik & Wolter, 2016*).

Furthermore, with regard to the PISA 2012 cohort, there is a marked difference between young Swiss nationals and those young people with a migration background as far as the taking up of interim solutions is concerned (*Wolter & Zumbühl, 2017a*). Analysis of young people in their second year after the end of their compulsory schooling (→ Figure 100) shows that young people with a migration background are considerably more likely to lag behind than those with no such background and that this difference can primarily be attributed to the greater use of interim solutions. While the minor difference in repetitions during the first year after compulsory schooling can be fully explained by differences in academic competencies upon entry into post-compulsory education, these differences only account for some of the imbalance in relation to interim solutions. In other words, young people with a migration background more frequently complete an interim solution even if they have equivalent school qualifications to native Swiss pupils. There are various explanations for the differing behaviour of Swiss nationals and young people with a migration background at the threshold to post-compulsory education. More in-depth analysis shows that it is mainly differing preferences, i.e. a preference for general education options rather than vocational training, that result in young people with a migration background tending to hold off from an immediate transition. These differences in preferences are also evident in the types of apprenticeship selected. When selecting an apprenticeship, young people with a migration background favour places for which their academic abilities are actually only just sufficient or not sufficient at all (→ Figure 121, *chapter Vocational education and training*).

While some of the young people are not successful in immediately transferring to a course leading to a certified qualification due to lack of academic abilities, a not insignificant proportion ultimately decide themselves to opt for an interim solution in cases where an immediate transition would be possible. This is because they hope, for example, to have a better chance of obtaining an apprenticeship place compared with opting for an immediate transition or because they want to use the interim solution to increase the likelihood of their training progressing smoothly (without their training contract being cancelled). If this works out for them, the decision to opt

100 Education situation of pupils in their second year after compulsory schooling, according to origin, 2014/15

Data: SEATS; calculations: Centre for Research in Economics of Education at the University of Berne



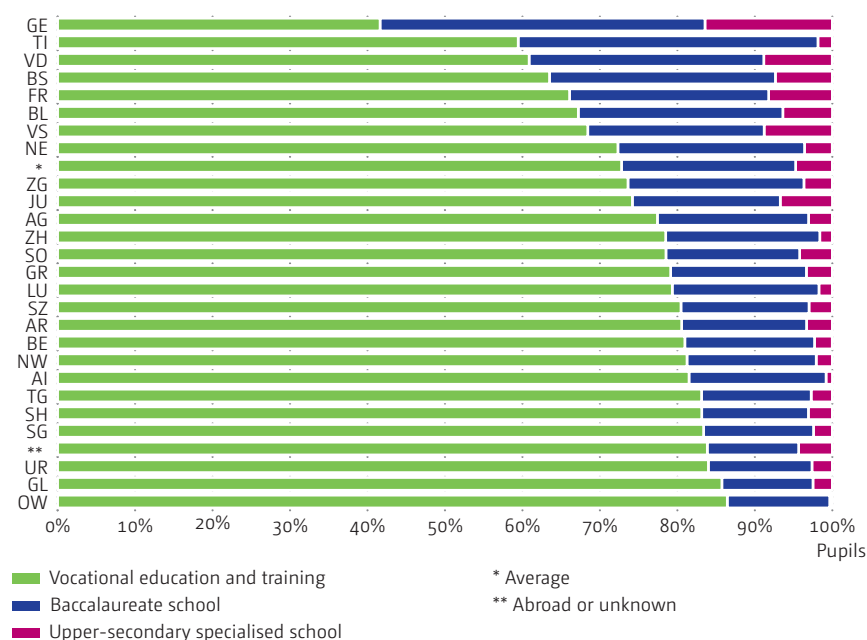
for an interim solution will indeed have paid off. Two independent studies have shown using the TREE data¹ (see Müller, 2016, and Sacchi & Meyer, 2016) that while young people who have completed school-based interim solutions in relation to their continuing education differ from those who do not enter any type of interim solution after compulsory schooling, there is no difference compared with comparable young people who opted for an immediate transition. This means that young people who chose interim solutions did not have «better» apprenticeships or better prospects of their education being successful.

Vocational and general education options

After their compulsory schooling, young people also have to choose a type of education, i.e. vocational education and training or general education. This decision is influenced by various different factors, including academic ability (→ Figure 103) and social background (see for example Glau- ser, 2015) (→ Figure 102, but also the range of options available in the canton (see for example Keller, 2014) (→ Figure 101, the figures shown here are not identical to the range of education options in all cantons as the chart shows the breakdown of pupils according to canton of residence). Although

101 Breakdown of pupils by type of education and canton of residence, 2015/16

Data: FSO



the vast majority of cantons do not apply an explicit *numerus clausus* for access to general education types (specifically baccalaureate schools), this arises implicitly as a result of the cantonal systems' high dependence on

Integration of recently migrated young people and young adults

In early 2017 the Confederation and cantons agreed on a common approach, known as the Integration Agenda Switzerland. The aim of this Agenda is to devise shared objectives in order to

- strengthen the promotion of integration as a process from entry to the country up to education/employment
- enable recently migrated young people and young adults to access education
- step up integration measures aimed at recognised refugees and provisionally accepted persons.

Analyses for 2013 show that recently migrated young people accounted for around 6.5% of their age category at that time, that only around 5% of these young people entered Switzerland via an asylum application and that about one half of them came from EU or EFTA states, with the majority entering Switzerland for the purposes of education or employment (Stutz, Jäggi, Bannwart et al., 2016). However, this type of figure can change quickly depending on how the number of asylum seekers devel-

Notes on figure: The percentages relate to pupils on a course leading to a certified qualification at upper-secondary level in the 2015/16 school year. Young people in interim solutions and those who are not in any training at all are therefore excluded. Different rates of repetition in the individual education types and cantons also influence the figures.

¹ TREE = Transitions from Education to Employment. The TREE data show the educational journeys of young people who sat the PISA test in Switzerland in 2000.

paths from a quantitative perspective: capacities at baccalaureate schools and upper-secondary specialised schools cannot be changed significantly in the short term. Furthermore, the demand for education in the vocational education and training segment comes up against the supply from industry, which is primarily based around economic criteria and less geared towards young people's preferences.

The strong pathway dependence of education decisions is clear even from the fact that the proportions of young people in general education and vocational courses in upper-secondary education differ greatly from one canton to another but remain quite stable over time within each canton (→ Figure 101).

Influencing factors with regard to selection of education type

Alongside the range of education options available in the particular canton, there are also individual factors that can influence whether pupils opt for vocational education and training or a general education. A review of the decisions made by pupils in their 9th year who sat the PISA test in 2012 (→ Figure 102) shows that girls from a migration background whose parents have a tertiary qualification and who are also younger than the average age of their peers at the end of the 9th year tend to opt for a general education. The different skills at the end of the compulsory education can explain around half of the influence of students' age and parental education on the probability to choose an academic education, but the different probability to choose general or vocational education can not be explained by different skills of men and women. Conversely, the probability of foreign-speaking young people with a migration background opting for a general education increases further when their skill levels are taken into account. Measured against their academic competencies, these young people opt even more frequently for a general education than native young people who do not speak a foreign language and who have the same skills.

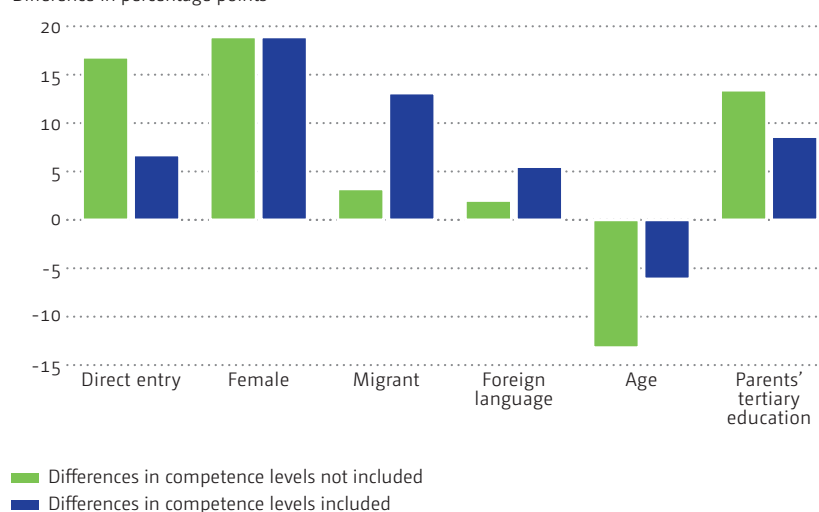
102 Difference in the likelihood of selecting a general education (as opposed to vocational training), 2012/13

Data: SEATS (see also Wolter & Zumbühl, 2017b)

Legend

The likelihood of young people selecting a general education is around 17 percentage points higher for those who opt for direct entry after compulsory education compared with those who delay their transition. However, this difference falls to approximately 7 percentage points when taking account of competencies, i.e. the different choices being made by those who move into the upper-secondary level directly and those who delay the transition can be attributed to the first group having better competencies at the end of their compulsory schooling.

Difference in percentage points

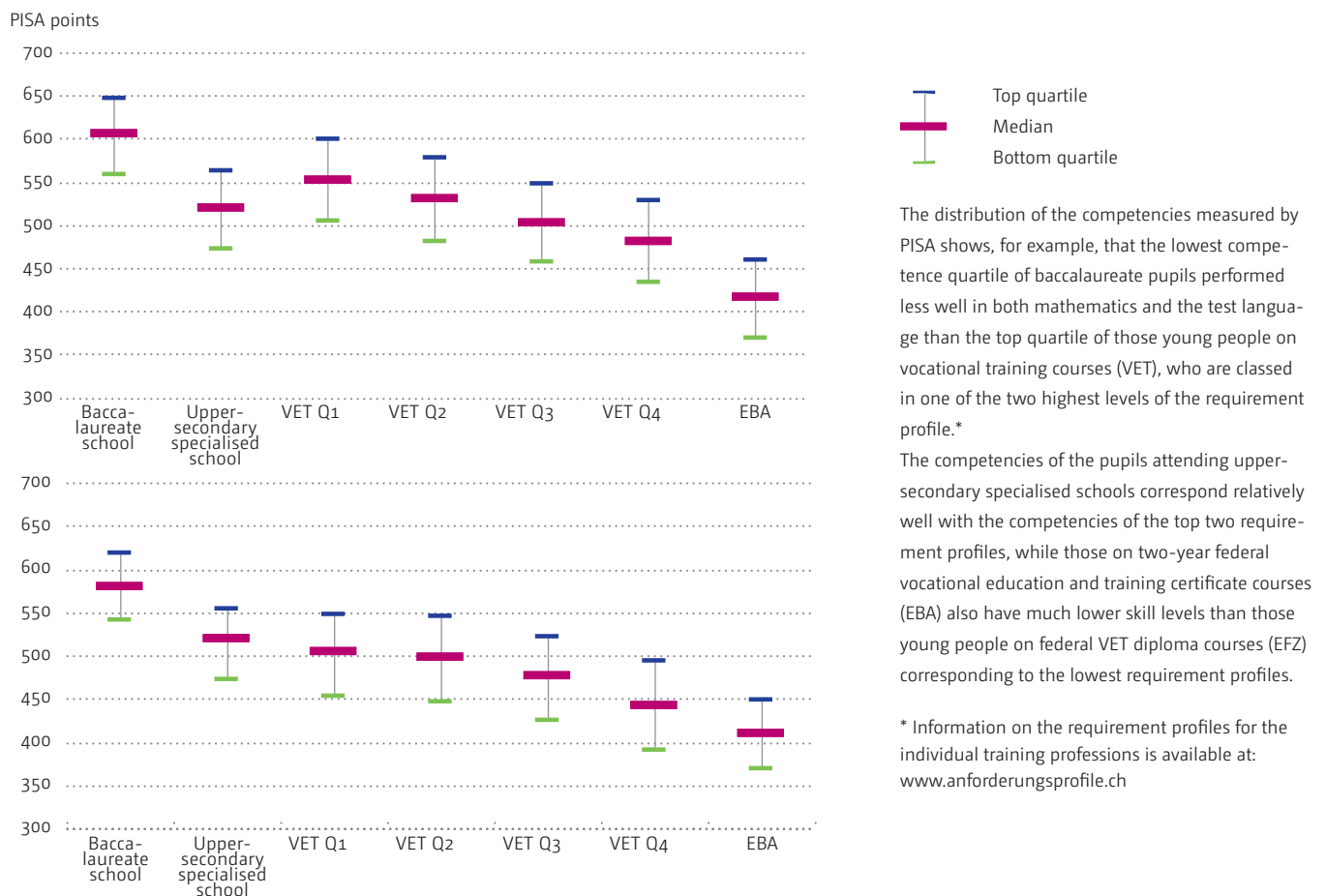


Academic competencies and selection of school type

If we look at the type of education being selected by pupils in conjunction with their competencies in mathematics and test language as assessed by the PISA test (2012 cohort), we observe that while there is on average a clear hierarchy of education types, there are nevertheless also major overlaps in competencies (→ Figure 103). This can be attributed to the fact that young people, despite having very good competencies, may opt for a type of education where the median pupils have lower competence levels. Conversely, some young people with low skill levels will succeed in acquiring places in education courses with higher median values. In addition to the decisions made by the young people themselves, these overlaps are, however, also due to specific circumstances in the different cantons with regard to the range of education options available. This means that young people with a certain level of competence may not be admitted to a baccalaureate school in one canton but would be granted a place if they applied in a different canton.

103 PISA points in mathematics (top graph) and test language (bottom graph) and first choice of education type after compulsory education, 2012/13

Data: SEATS, anforderungsprofile.ch; calculations: Centre for Research in Economics of Education at the University of Berne



Success rates at upper-secondary level

There are individual, social, competence-based and cantonal determinants of the transitions to the different types of education at upper-secondary level and the choice of education type; the likelihood of completing the course successfully and the timeframe of how the course progresses are specific to each type.

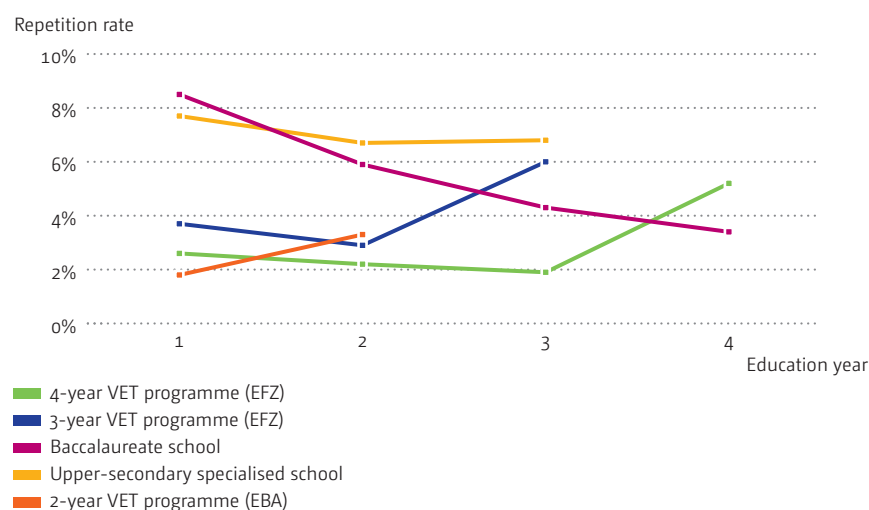
Repetition rates - particularly high in general education

Initial progression analysis by the FSO (FSO, 2015c) shows that the repetition rates are very high in the general education types in particular (baccalaureate schools and upper-secondary specialised schools) (→ Figure 104). While these rates consistently fall in baccalaureate schools as the course progresses, they remain persistently high in upper-secondary specialised schools. However, with regard to the latter, course switching by pupils (e.g. a switch to the second year at a baccalaureate school) makes it more difficult to interpret the data. As far as vocational education and training is concerned, the repetition rates are especially high in the last training year. In other words, it is mainly young people who have failed their final apprenticeship examination and therefore repeat their final year (around two thirds, see FSO, 2015c). While the repetition rates are low in the case of vocational education and training certificates (EBA), this is the education type affected by the highest (temporary) level of drop-outs (approx. 12% in each year) (→ chapter Vocational education and training, page 111).

Would **information on competencies** help to avoid pupils having to repeat a year or dropping out? The competencies measured in the PISA test are organised into competence levels, the definitions of which help to determine the minimum level that needs to be achieved to enter a baccalaureate school (→ chapter Baccalaureate schools, page 135). It is worth looking at how pupils fare during their first two years at a baccalaureate school. Among those pupils who meet the minimum requirements across all competence areas, 83% are able to progress to their third year without having to repeat a year. Meanwhile, in the group of pupils that did not meet any of the minimum requirements in the competencies measured by PISA, the equivalent figure is just 53% (see Wolter & Zumbühl, 2017b), which means that almost half dropped out early or were already having to repeat a year of their education.

104 Repetition rates by education type and year, 2013/14

Data: FSO (LABB) (Transitions in 2013/14)



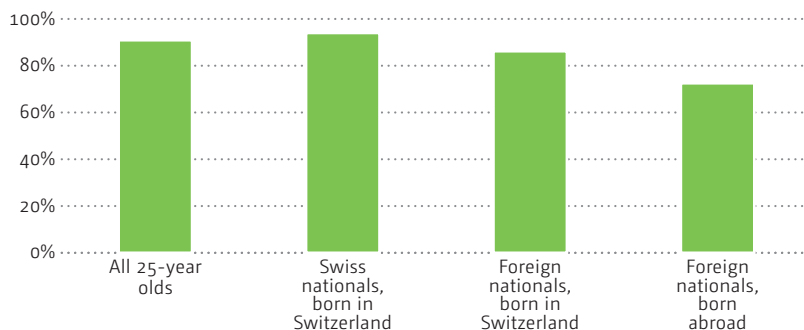
Completion rates: A need for action in relation to migrants

For the first time, the updating of the education statistics (FSO, 2018a) means that stable, differentiated completion rates can be calculated for the upper-secondary level. While young Swiss nationals who were born in Switzerland (→ Figure 105) achieve a completion rate of 94% (2015) and are

not far off the political target of 95%, the equivalent figure for migrants is some way off this target figure, regardless of whether the young people in question were born in Switzerland or abroad.

105 Completion rates at upper-secondary level at the age of 25 by origin, 2015

Data: FSO



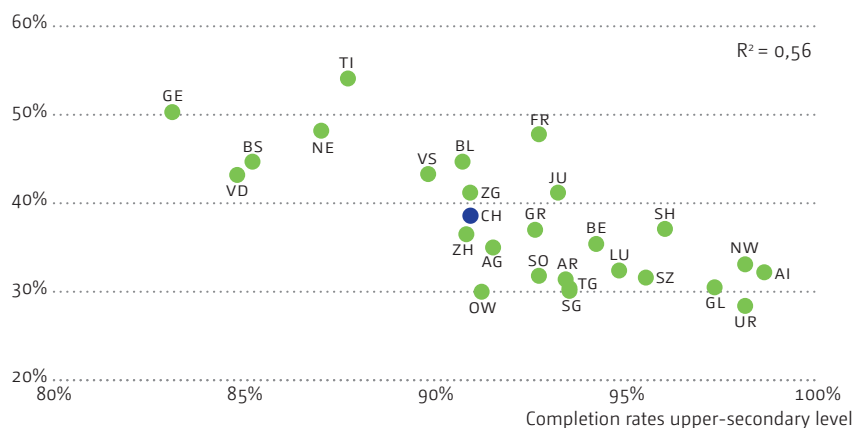
Alongside the marked differences due to the origin in success rates at upper-secondary level, the statistics also reveal clear differences from one canton to the next. The figures range from in excess of 98% in the cantons Appenzell Innerrhoden, Nidwalden and Uri, to below 85% in Geneva and Vaud. While various different factors, such as the proportion of migrants, the structure of the education system or of the labour market contribute to these discrepancies (interacting with each other in a complex manner that is still to be investigated), the figures for the various cantons appear to show a potential trade-off between baccalaureate rates and completion rates (→ Figure 106). The higher the baccalaureate rate in a particular canton, the lower the completion rate. While there may well be reasons for a causal relationship between the two rates, further research is needed to determine whether this is actually more than just a correlation and, if it is, to determine the vectors by means of which the two rates affect each other.

106 Completion rates in upper-secondary education and baccalaureate rates by canton, 2015

The baccalaureate rates encompass all types of baccalaureate (from a baccalaureate school or a federal vocational/specialised baccalaureate).

Data: FSO

Baccalaureate rates



External school evaluations

External school evaluations have also been carried out for all types of school at upper-secondary level for many years. Most cantons have rules in place in the form of laws or ordinances (→ Figure 107), but only very few cantons require external evaluations.

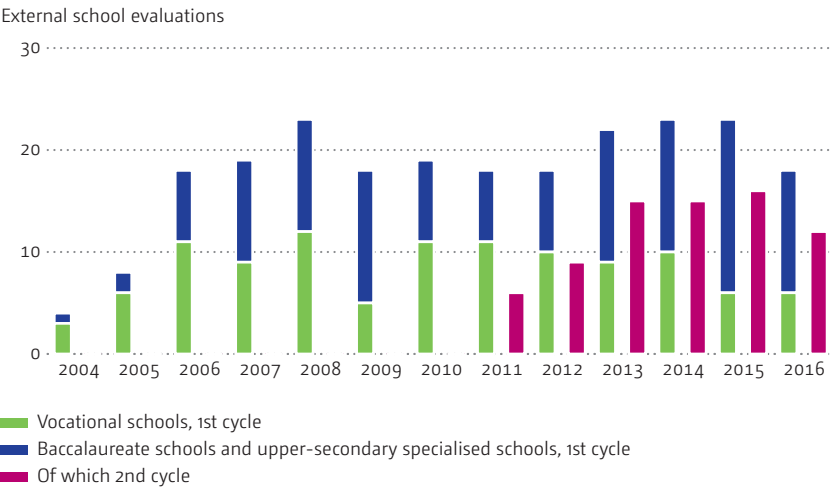
107 Legislative basis and obligations in the cantons in relation to external evaluations of baccalaureate schools and vocational schools, 2017

Source: IFES (evaluation for the purpose of the Education Report)

| | No. of cantons | |
|---|----------------|----|
| | Yes | No |
| Baccalaureate schools | | |
| Obligated to engage in quality development and quality assurance by law or ordinance | 20 | 6 |
| Basic rules in place at cantonal level regarding quality development or quality assurance or quality management or school development | 18 | 8 |
| Obligated to carry out external school evaluations by law or ordinance | 8 | 18 |
| Vocational schools | | |
| Obligated to engage in quality development and quality assurance by law or ordinance | 23 | 3 |
| Basic rules in place at cantonal level regarding quality development or quality assurance or quality management or school development | 23 | 3 |
| Obligated by law or ordinance to carry out external school evaluations | 2 | 24 |

108 Number of external school evaluations during 1st and 2nd cycle by IFES, from 2004/05 to 2016/17

Data: IFES



In fifteen primarily German-speaking cantons and in the Principality of Liechtenstein, these evaluations have previously been and continue to be carried out by the EDK specialist agency IFES (Institute for External School Evaluations at Upper-Secondary Level). Eight cantons have rules in place on the frequency of evaluations, with the same schools being assessed every six to eight years. This has led to a rising number of evaluations as part of the 2nd cycle, i.e. evaluations of schools that have been assessed externally by the IFES for the second time (→ Figure 108).



Vocational education and training

Context

Vocational education and training (VET), and company-based VET programmes in particular, are influenced by exogenous factors to a greater extent than general education. The availability of apprenticeships, as well as the type (professions) and quality of training, is not only dependent on the wishes and needs of the learners but also hinges on decisions made by industry. The latter is influenced, in turn, by structural change and the health of the economy, but also by the opportunities for procuring the skills it needs from other types of education. Young people and businesses interested in training also have a mutual influence on each other, with the result that the way in which VET develops is much more strongly influenced by the interplay between supply and demand than is the case in general education.

Globalisation

Vocational education and training according to the Swiss, German or Austrian model has grown strongly in international importance since the financial and fiscal crisis of 2007 to 2009. As well as being reflected in the rise in academic interest, this is also evident from the specific expressions of interest from foreign governments with regard to the Swiss vocational training system. Between 2012 and 2016, the State Secretariat for Education, Research and Innovation (SERI) welcomed 120 foreign delegations to Switzerland, signing declarations of intent with the USA, India, South Africa, South Korea, Mexico, Latvia and China with a view to engaging in more in-depth exchange on vocational training. The SERI has also organised three international vocational training congresses in Switzerland between 2014 and 2018, attended by delegates from more than 80 nations, and has worked with representatives from Denmark, Germany, Luxembourg and Austria to develop an online toolbox with advice on developing a dual vocational training system (www.apprenticeship-toolbox.eu). Keen international interest in dual-track vocational education and training programmes stems from the low levels of youth unemployment in countries with such a system and from the opportunity to have industry involved in funding training, thereby reducing the strain on the public purse (→ *Efficiency / costs*, page 128).

As far as the influence of dual based VET on youth unemployment is concerned, it appears that countries with a company-based vocational training programme do indeed have lower rates of youth unemployment. However, it has been difficult in the past to confirm a specific causal link between the two elements. This has partly been because jobless figures for young people are only one indicator (and not a particularly good one) of their integration into the labour market and because the countries in question differ in many other aspects that are difficult to take into account, such as the range of other education options available, the state of the economy, structural change, labour market regulations and social policy. The «KOF Youth Labour Market Index», which uses twelve different indicators to measure the quality of young people's integration into the labour market and compares data from 178 countries (→ Figure 109), is one index that can now be used for a more complex analysis of the situation.¹

¹ See also Pusterla (2017) for further information.

According to *Bolli, Egg & Rageth (2017)*, a higher proportion of company-based VET not only cuts the unemployment rate but also reduces the number of young people who are not in education, employment or training (the NEET rate). This type of vocational training also reduces the number of people working part-time out of necessity rather than choice, makes atypical working hours less common, and lowers the risk of living in poverty.

The fact that it is important to distinguish between company-based VET and vocational training organised within the school system when assessing the impact of vocational training is clearly illustrated by the fact that a higher proportion of vocational training with the school system (even if to the detriment of general education courses) actually pushes up the unemployment figures and the long-term jobless figures, and results more often in a skills mismatch on the labour market.

Structural change

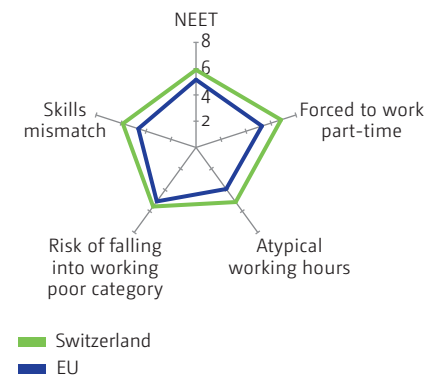
Ongoing structural change in the economy not only forces companies to keep adjusting to technological changes and shifts in the demand for goods and services. It also forces the training system to adjust to these same changes in terms of both content and quantity. Greater challenges arise for vocational training compared with general education in this regard, given that the former is looking to train people in skills that can be put to use on the labour market immediately while, at the same time, also imparting skills that can continue to be used profitably on the labour market for many years after the training itself. The speed with which the education system needs to react to changing requirements at regional and global level is also closely related to the economy's capacity to adapt: the more exposed an economy in a particular country is to structural change, and the quicker it is able to react, the higher the demands made of the company-based training system in terms of its ability to adjust and the speed at which it can change. Given the international interlinking of production (and the concept of global value chains; see *OECD, 2017c*), Switzerland is reliant on a training system that can react particularly quickly in order for its economy to remain competitive. The required ability to adapt affects three areas in particular. Firstly, there is the ability to create new job descriptions and thereby also secure the involvement of businesses that operate in new areas of activity in VET (see *SCCRE, 2014*), as this is the only way in which the loss, both real and potential, of apprenticeship places in shrinking sectors can be offset. Secondly, there is a need for training content to be adapted quickly in all professions that are exposed to foreseeable changes in the required skillset. Thirdly, the numbers in training have to be managed appropriately to ensure that future demand for trained professionals is met. Following the entry into force of the new Federal Vocational and Professional Education and Training Act, educational ordinances are now adjusted more frequently and as part of a shorter process (→ *Institutions, page 116*).

It is therefore difficult to assess how the process of technological and economic structural change will impact on vocational training as a whole. We can delve into this change more closely by simply considering the quantitative shifts in training numbers in the individual professions. Assuming that the competencies required for the individual professions have not changed over time, the aggregated values (→ Figure 110) paint a picture of the way in

109 Index values from the KOF Youth Labour Market Index (2014) for Switzerland and the EU 28

The higher the index value, the better the country/group of countries in question performs, i.e. the lower the prevalence of the risks shown in the chart.

Data: KOF Youth Labour Market Index



The **requirement profiles** define the basic requirements to enter a particular profession in terms of the level that needs to be achieved in school in maths, science, the language of instruction and foreign languages (www.anforderungsprofile.ch). Points on a scale of 1 to 100 are assigned to each of these four subjects for all occupations for which a requirement profile has been created. The project to define these requirement profiles was launched in 2011 at the initiative of the Swiss Trade Association and the Swiss Conference of Cantonal Ministers of Education (EDK), and was jointly funded by the SERI. The precise figures for all of the requirement profiles were provided by Dr. Walter Goetze (bfb Büro für Bildungsfragen AG).

Requirement profiles and PISA points

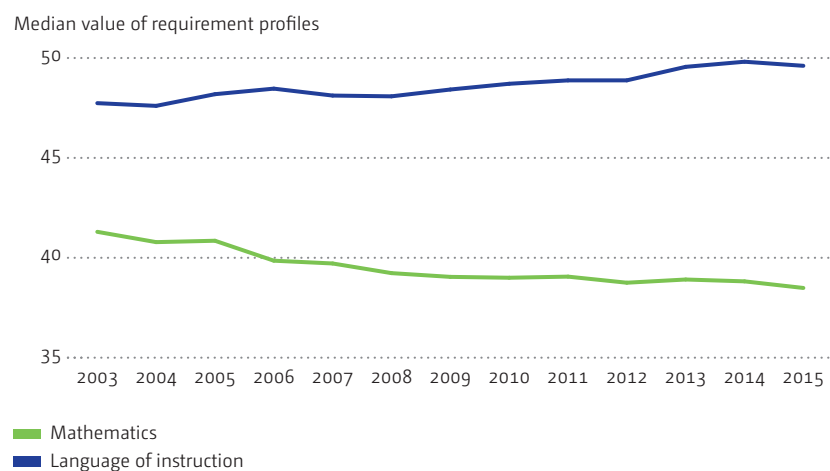
The classification of the occupations into the different requirement profiles in terms of the school-based requirements to start the training match up well with the competencies of the pupils who opt for the corresponding training positions. To take an example, young people in the bottom quartile for mathematics who began a three or four-year apprenticeship in 2012 ended with 47 points fewer in mathematics (which corresponds to a school year of knowledge) than those who began an apprenticeship in the upper quartile of the requirements (controlled for age, gender, origin and other factors in the PISA test). Similar differences are also observed in relation to skill levels in the sciences and in the language of instruction.

which the Swiss economy's demand for skills has changed (→ see text in left margin).

If we consider the changes in the basic requirements of schooling caused by the changes in the professions (→ Figure 110), with particular reference to mathematics and the language of instruction for the years 2003 to 2015, we see that the newly concluded apprenticeship contracts in 2015 have significantly lower mathematics requirements on average but significantly higher requirements statistically in relation to the language of instruction. Requirements in terms of science have remained relatively stable over time, with a positive trend in evidence as far as foreign language requirements are concerned. The negative trend in relation to the mathematical expertise required is also in evidence if vocational training certificates (EBA) are considered separately. However, here the trend was negative for all competencies.

110 Development in value included in requirement profiles (2003–2015) for mathematics and language of instruction, weighted with all apprenticeship ratios (EFZ only)

Data: anforderungsprofile.ch, FSO; calculations: SCCRE



Although the change in the requirement profiles for the individual professions over time cannot be taken into account, the changing composition of the occupations over time shows an increase in the requirements in terms of language skills and a decrease in the mathematics requirements. The latter is not necessarily what we would expect given how the economy is increasingly being penetrated by new technologies and digitalisation.

Economic fluctuations

As far as the supply of training places is concerned, company-based VET, unlike all other types of training, also reacts to fluctuations in the state of the economy. The number of new apprenticeship places is only very slightly, and statistically insignificantly, affected by fluctuations in economic growth yet, in contrast, is impacted by changing unemployment levels. In other words, industry tends to reduce the supply of apprenticeship places during those periods in which jobs held by existing workers are being shed. This shows that alternatives need to be in place, at least for such cyclical fluctuations, be it in the form of school-based vocational training options or general education courses. Overall, however, the economic impact on the supply of train-

ing places is relatively minor, which can be primarily explained by the fact that the company-based system of vocational training in Switzerland has a broad sectoral base. This means that economic shocks, which generally hit specific sectors particularly hard, can be cushioned by sectors that are less cyclical. This has happened during recent economic cycles (financial crisis and euro crisis) with regard to healthcare, for example, with the result that the total supply of training places has remained practically unchanged overall.

Demographics and the link to general education schools

The apprenticeships market is much more exposed to demographic than to cyclical influences. In years marked by sharp increases in the number of school leavers, the supply of apprenticeship places will not be able to keep pace with the growth in demand and there will be periods when there is a shortage of places; in years when the number of school leavers falls, the economy will not reduce its supply of places at the same rate, resulting in a surplus of apprenticeship places during such periods. Consequently, the fall in demand for apprenticeship places in evidence since the financial crisis (2008), mainly due to demographics, has manifested itself in a rising surplus of places (→ Figure 111). Through its Match-Prof project, the Confederation has therefore focused support on projects designed to achieve a better balance between supply and demand, not least in order to consistently reduce the number of young people in interim solutions (→ *chapter Upper-secondary education, page 99*). During periods with smaller cohorts of students, the competition posed by general education is also more noticeable. While both VET and general education courses react similarly to larger cohorts, the baccalaureate schools have succeeded over the past 25 years in maintaining their pupil numbers in absolute terms, even during periods of smaller cohorts (→ Figure 112). This means that all of the demographic decline has been absorbed by the VET sector, with the result that the surplus of apprenticeship places has consistently risen over recent years as the number of school leavers has fallen. According to the education scenarios prepared by the Federal

111 Number of young people interested in an apprenticeship and apprenticeship surplus as a percentage of places filled, 2008–2017

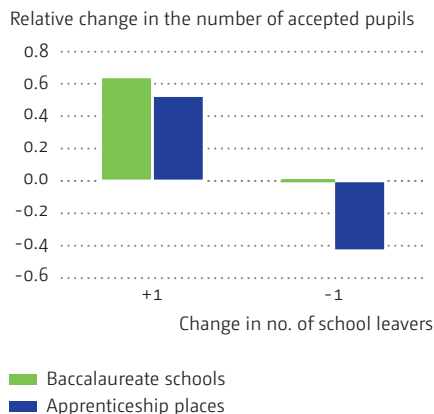
Data: SERI/LINK (Apprenticeship barometer, several year groups)



The **apprenticeship surplus** is calculated from the figures gathered in the August survey on vacant apprenticeship places and the number of places filled.

112 Relative reaction of the number of apprenticeships and the number of places in baccalaureate schools to changes in the number of school leavers, 1988–2013

Data: FSO; calculations: Centre for Research in Economics of Education at the University of Berne



Legend

The relative change in the number of apprenticeship places if the number of school leavers changes by one person is between 0.4 and 0.5 of a proportional reaction. Given that company-based vocational education and training accounts on average for some 60% of a year group, the number of apprenticeship places would have to increase by 0.6 for an increase of 1 in the number of school leavers if the reaction to changes in the number of pupils were perfectly proportional. In fact, the number of apprenticeship places only increases by about half of this figure. The figures are calculated using multiple regressions, incorporating all cantons ($N = 416$) and the impact of cyclical fluctuations.

Statistical Office (FSO) (FSO, 2017f), this situation will be reversed over the next few years. The increase in the number of school leavers due to demographic factors will, with effect from 2018, result in rising numbers of pupils in the upper-secondary level. By 2025 the number of students is expected to be up 7 percentage points on the 2015 figures.

Institutions

Vocational training in Switzerland is governed by the Confederation, the cantons and the professional organisations, which all cooperate with each other as partners. Central, national management by the Confederation takes account of the fact that vocational and professional education and training is intended to train young people who will then be mobile throughout the Swiss job market (and, wherever possible, beyond it) and who are therefore dependent on the greatest possible degree of standardisation in their qualifications. Cantonal implementation not only guarantees alignment to the regional job markets (sectors, occupations, etc.), but is also key for interaction with compulsory education and the other types of upper-secondary education.

Even in the absence of any major reform projects of a systemic nature over recent years on the scale of, for example, the introduction of the federal vocational baccalaureate or of the two-year training courses with a certificate, VET has been subject to reforms since the entry into force of the new Federal Vocational and Professional Education and Training Act that have tied up considerable resources. The overhauling of all vocational ordinances and the implementation of new processes, but also the creation of new job profiles, has demanded a lot of time and effort from all of the partners involved in training and education.

So as not to lose sight of the strategic challenges while dealing with the expanded operational activities, the Control Committee of the Swiss National Council called, inter alia, for a longer-term strategy for vocational training. This development process was launched in 2016 by the SERI together with its partners, resulting in the «Vocational Training 2030» vision one year later. This vision, which is to be implemented from 2018 onwards, covers a series of different elements designed to future-proof vocational training, equipping it for the economic and technological challenges that lie ahead.

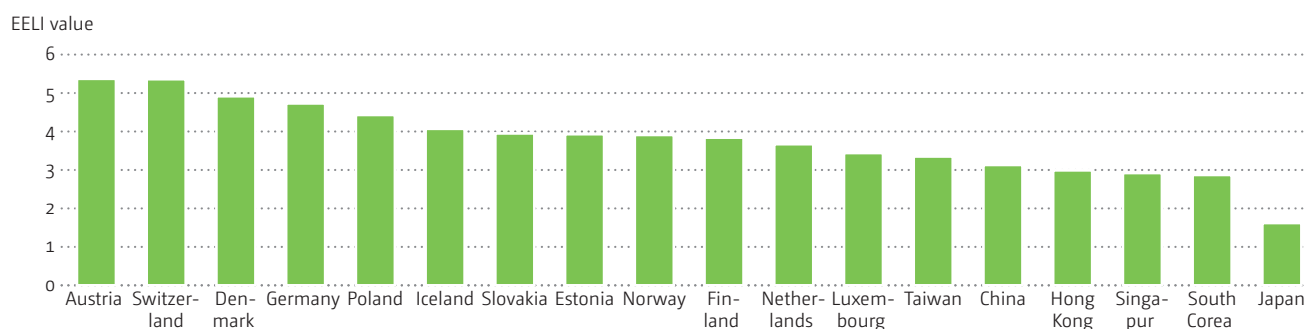
Interlocking of the labour market and education system

It is generally assumed that the company-based system of vocational training automatically means that the interests of the education system and those of employers are optimally aligned. This is not the case in all company-based vocational training systems. In certain countries, school logic prevails when it comes to designing the curriculum, setting examination standards or deciding on how much learning time should be spent in each teaching location. Meanwhile, in other countries, the logic of individual companies prevails. Achieving the best possible balance between educational and business interests, however, and ensuring the two worlds can dovetail, is the only way to

create a vocational training system in which students can acquire the skills they need, easily gain a foothold in the world of work, and enjoy mobility on the labour market. According to a pilot study conducted by KOF-ETHZ (see *Renold, Bolli, Caves et al., 2016*), Switzerland and Austria are ranked in top place for achieving a balance between education and the economy, while Asian countries perform relatively poorly in this regard (→ Figure 113). Switzerland's system with the different players working in partnership therefore appears to guarantee a close and balanced linkup between the education system and the labour market.

113 Country scores in the Education-Employment Linkage Index (KOF-EELI)

Source: *Renold, Bolli, Caves et al., 2016*

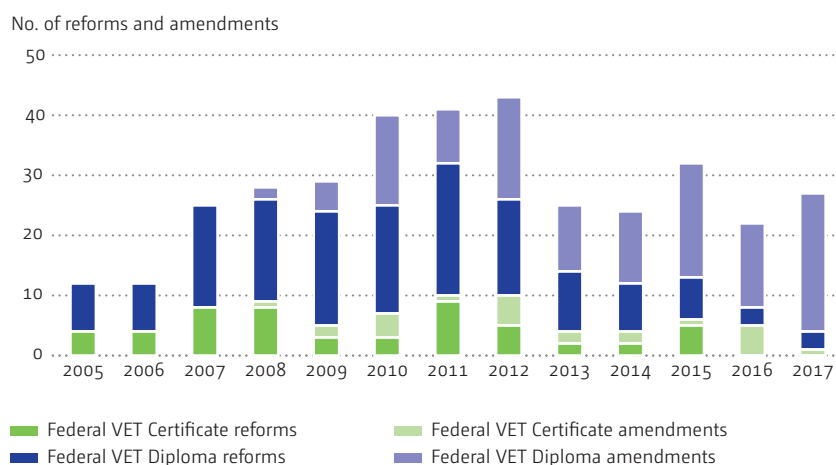


First cycle of reform completed

After the introduction of the new Vocational and Professional Education and Training Act, practically all of the regulations on training and examinations (236 professions; as at July 2017) had been reformed at least once by 2016 (→ Figure 114). Now that these reforms have been concluded, the focus lies on maintaining and further developing the professions (review of professions). To tackle these reviews professionally and with the involvement of all relevant partners, a committee responsible for professional development and quality was established for each profession composed of representative of the partners. Each committee deals with quality assurance and develop-

114 Breakdown of reforms and amendments since 2005

Data: SERI



ment, the optimisation and updating of the legal bases and enforcement documents, and the further development of the job profiles. The committee reviews the education ordinances and plans at least every five years in respect of economic, technological, ecological and didactic developments, proposing reforms where necessary.

Implementation of sustainable development strategy in vocational training

In 2016 the Swiss Federal Council adopted a «Sustainable development 2016–2019» strategy, which also encompasses education. On this basis, a new focus was defined in the area of vocational training, covering both vocational education and training (VET) and tertiary-level professional education (PE) (→ *chapter Professional education, page 265*) (Federal Council, 2016). The measures introduced as part of this strategy should enshrine skills to protect and make sustainable use of natural resources and energy sources in the education ordinances and plans relating to VET. The Federal Office for the Environment (FOEN) and the Federal Office of Energy (SFOE) help the bodies responsible (professional organisations) to develop the corresponding competencies and incorporate these into the training ordinances. During the period from 2013 to 2016, at least one skill relating to the sustainable use of resources and energy was developed further in more than 50 VET courses. In the food training sector, for example, new measures were put in place to improve energy efficiency and to avoid food waste.

Two-year federal vocational education and training certificate (EBA) continues to grow

The **replacement of basic apprenticeships** with the two-year VET courses has in some cases caused the fear that the stricter entrance requirements will make it even more problematic for pupils at special schools to complete a VET course. *Hofmann & Häfeli (2012, 2013)* conclude in their long-term analysis, however, that these learners assess their situation as positively as learners from mainstream classes. Following initial difficulties, the labour market situation after the apprenticeship has also stabilised with the result that the earning situation of former pupils of special schools (90% in permanent employment) three years following completion of the apprenticeship, is positive and comparable to the situation of those who were in mainstream classes.

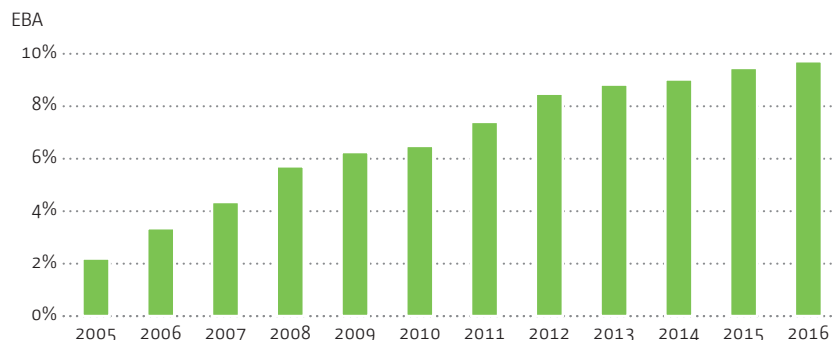
The two-year training courses resulting in the award of a training certificate (EBA) have replaced both basic apprenticeships and the previous two-year courses leading to a training diploma. These courses enable the trainees to enter the labour market at the end of their training or, instead, to transfer to a three or four-year apprenticeship with a diploma. Since the last education report was published, the number of apprenticeships that can be completed via a two-year training course has risen from 42 (February 2013) to 57 (as at July 2017). Yet there is an ever more dynamic movement underpinning this growth. As well as the creation of new and additional job profiles, there are also some existing profiles being withdrawn from the range of courses available, where for example changes on the labour market mean it is no longer possible to guarantee that those who complete the two-year training will have long-term employment prospects in that profession (see also *Kammermann, 2018*).

The number of young people starting a two-year VET certificate course has grown even more strongly than the number of training professions with EBA. As a proportion of all apprenticeship contracts, these contracts have more or less quadrupled since 2005 (→ Figure 115). Given the demographic development of the past, it can be assumed that a considerable portion of the growth in two-year courses can be attributed to a more effective tapping of the potential among those people who are keen to embark on training, which would in fact correspond to one of the aims of this type of training. It is not possible to be certain about the extent to which three and four-year

federal VET diploma (EFZ) courses are being replaced, not least because an increasing proportion of training contracts are being given to adult learners.

115 New EBA training contracts as a proportion of all new training contracts, 2005–2016

Data: FSO



The education progression statistics now also enable more meaningful conclusions to be drawn about learners' success during their apprenticeship and when transferring to EFZ courses (→ *Effectiveness*, page 122).

Federal vocational baccalaureate

The federal vocational baccalaureate may be acquired in parallel to a VET diploma course (EFZ) or take the form of a training course of at least one year after completion of VET or as a Swiss federal vocational baccalaureate examination, with access to the examination being permitted without previously having attended classes in a recognised training subject. It entitles students to continue on to a university of applied sciences without sitting an examination (except in cases where proficiency testing or an aptitude test is first required), or in some cases to universities of teacher education, or if an additional examination is taken («Federal vocational baccalaureate - university», also referred to as «Passerelle Dubs») to a university² (→ *chapter Tertiary-level education*, page 169).

While growth in the federal vocational baccalaureate rate flattened noticeably in the mid-2000s, the rate has risen markedly again since 2010 (→ Figure 116). With a growth rate of 15%, federal vocational baccalaureates make up 40% of all baccalaureate certificates (the figures for which also still include specialised baccalaureates). In relation to a cohort of learners, it is clear that around one quarter of all learners who currently conclude a VET certificate course also acquire a federal vocational baccalaureate.³ The latter

«The **promotion of the federal vocational baccalaureate** was defined as one of three top priorities at the national summit meeting on vocational training in 2014, with the aim of making vocational training as a whole more attractive. A steering group composed of the cooperation partners subsequently launched the project «Strengthening the federal vocational baccalaureate» with two sub-projects:

Sub-project 1 is focused around new ways of making the classroom-based federal vocational baccalaureate more flexible. Sub-project 2 is designed to optimise the information and communication about the federal vocational baccalaureate.»

Source: <https://www.sbf.admin.ch/sbf/de/home/bildung/maturitaet/berufsmaturitaet/foerderung-der-berufsmaturitaet.html>

² The ratio between the number (959 diplomas) of supplementary examinations («Passerelle Dubs») and all federal vocational baccalaureates was almost 7% and rising in 2016. By way of comparison, the equivalent figure in 2005 was only just above the 1% mark. The majority of people who take this form of additional examination go on to study at university in a field other than that in which they originally acquired their professional qualification (see *Ducrey, Hrizi & Mouad, 2017*, for detailed evaluations for the canton of Geneva).

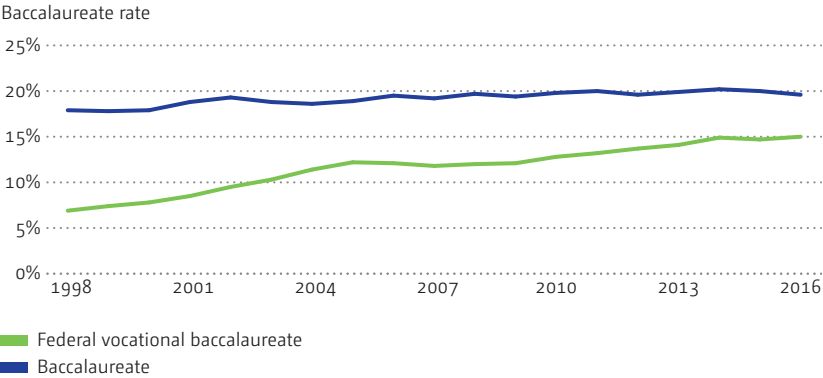
³ With regard to the number of EFZ courses, it should be noted that a (small) proportion of these are second courses being completed by people who already have an EFZ qualification.

The **baccalaureate rates** correspond to the number of baccalaureates gained in relation to 19-year-olds permanently resident in Switzerland.

has a socially balancing function in one sense, being primarily acquired by academically stronger young people from socially disadvantaged households (see *Jäpel, 2017*).

116 Proportion of baccalaureates at baccalaureate schools and federal vocational baccalaureate rate, 1998–2016

Data: FSO

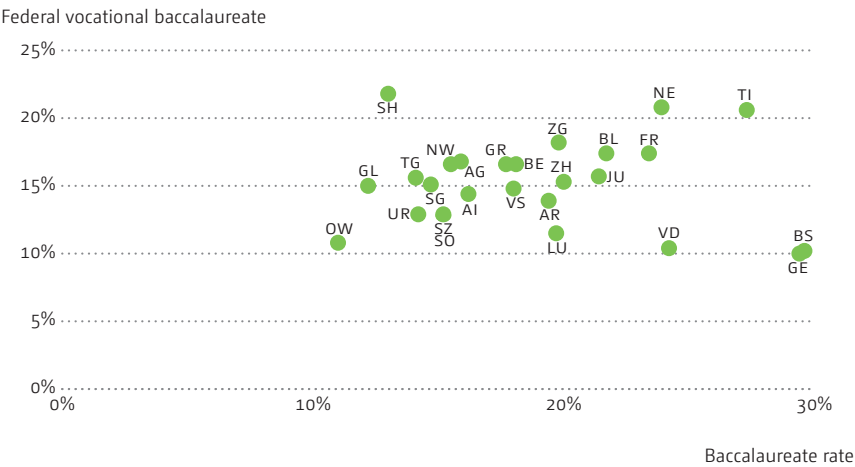


The federal vocational baccalaureate rates fluctuate similarly across the different regions, albeit somewhat less markedly than the baccalaureate rates. In the canton with the highest rate (Schaffhausen: 21.8%), the rate is more than twice as high as in the canton with the lowest rate (Geneva: 10.0%). However, the rates are not only high in those cantons where the number of young people opting for VET is high. The cantons of Neuchâtel and Ticino, which have a low proportion of young people in this category, also have high rates (in excess of 20%).

High federal vocational baccalaureate rates do not simply offset low baccalaureate rates (→ Figure 117). Leaving aside the two city cantons of Basel and Geneva, which have high rates for the baccalaureate and very low feder-

117 Rates for the baccalaureate and federal vocational baccalaureate by canton, 2016

Data: FSO



More precise estimates should be available for longer observation periods using the education progress data.

al vocational baccalaureate rates, and the canton of Schaffhausen with the highest federal vocational baccalaureate rate and an average rate for baccalaureates, there is a strong positive correlation between the two rates (0.48). As far as the remaining cantons are concerned, high rates in relation to the baccalaureate are therefore also associated with high rates for the federal vocational baccalaureate.

Vocational training for adults

One of the new focuses of vocational training policy is the provision of vocational training for adults. In response to a lack of skilled workers and the acceptance of the mass immigration initiative in 2014, the Confederation declared second-chance qualifications for adults as one of its priorities. At the same time, technological and economic structural change have led those with a low level of qualifications in Switzerland to find it increasingly difficult to integrate into the labour market at all.

To date, four ways for adults to acquire a professional qualification have become established (*Giger, 2016*). In addition to normal apprenticeships, these include a regular apprenticeship arrangement with recognition of past educational achievements, direct admission to a final apprenticeship examination subject to a minimum of five years' professional experience and, finally, the validation of past education achievements. While the final two of these routes can be pursued alongside work and do not require an apprenticeship contract, the first two options are only available if a company declares its willingness to enter into a normal apprenticeship contract with an adult apprentice. In 2015, 6061 adults aged 25 or older at the start of their training gained a vocational education and training qualification. This equates to around 8% of all those who completed a qualification process. Just over a quarter of these people had previously held a normal apprenticeship contract, two fifths were admitted directly to the examination, and the remainder completed a shortened apprenticeship or had previous achievements validated (*Schmid, Schmidlin & Hischier, 2017*).

From the companies' perspective, during a survey conducted as part of the apprenticeship barometer (*LINK, 2016*) 15% of businesses in German-speaking Switzerland and 27% of those in French-speaking Switzerland stated that they had entered into apprenticeship contracts with adults over the age of 20.⁴ Around one quarter of the businesses said that they would be willing to give older job seekers an opportunity. Surveys of businesses (see also *Tsander, Beeli, Aeschlimann et al., 2017*) reveal that, in addition to social reasons, it is mainly a shortage of specialist skills that encourages companies to commit to training adults. Generally, however, most businesses are training adults not on the basis of a specific training strategy but simply by chance.

4 These figures also include, however, apprentices who are completing a second apprenticeship directly after their first or following general education. Additionally, these are generally people who are only just above the age of 20 and, not least, apprentices who had problems transferring to and completing a course after their compulsory schooling.

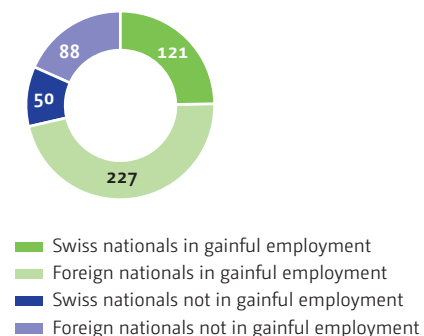
The potential group of people to be supported comprises four large-scale groups. Firstly, the group of almost 360 000 people in gainful employment who have no training qualification gained after compulsory schooling (→ Figure 118) and whose income from employment could be increased by completing a training course. Secondly, the group of around 125 000 unemployed people who have no training qualification gained after compulsory schooling and who would improve their chances of gaining a foothold in the labour market by completing a training course. Thirdly, the (difficult to count) group of people who have a training qualification gained after compulsory schooling but who have either changed profession and no longer rank among the skilled workforce in their new job or who lack an appropriate vocational qualification to work in a new activity with better prospects. And, fourthly, it should be considered that technological change is permanently impacting the value of qualifications held by formally trained people, creating a need for people to acquire new skills and certified qualifications.

118 People without training after compulsory education aged between 25 and 55, by form of employment and nationality, 2016

The proportion of foreign nationals in the group of employed/unemployed persons without training after compulsory education is slightly more than twice as high as the proportion of foreign nationals in the total number of 25 to 55-year-olds in Switzerland.

Data: FSO (SLFS); calculations: SCCRE

Figures in thousands



Effectiveness

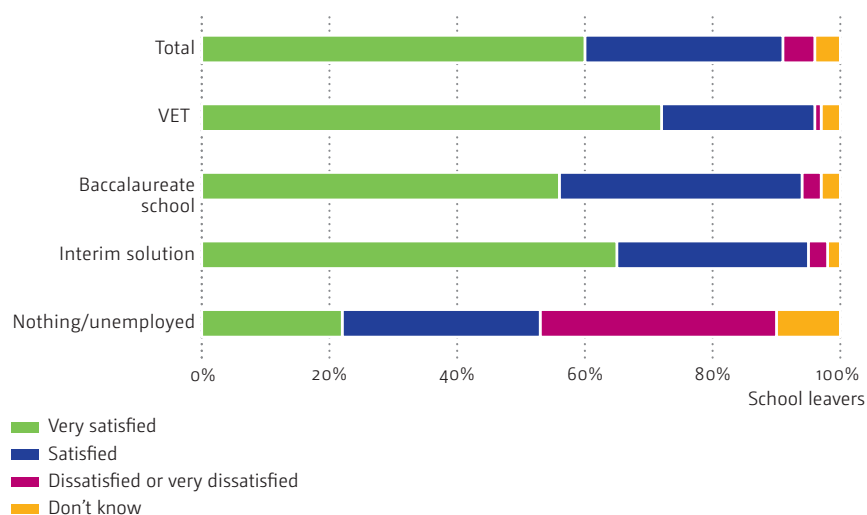
The effectiveness of vocational education and training may be considered at both a systemic and an individual level. The systemic approach has already been tackled in the section on context and partly corresponds to the aggregated assessment of effectiveness from an individual perspective. At an individual level, effectiveness may be considered from the perspective of either the learner or the business. The lack of any signs (→ *Context, page 112*) that entrepreneurs in Switzerland are pulling out of company-based vocational education and training would appear to indicate that they continue to view this type of training as an effective way of providing their employees of the future with the skills they need. From the learners' perspective, assessing the effectiveness of this type of training primarily involves the following aspects: firstly, satisfaction with this training opportunity, also in terms of professional self-fulfilment; secondly, whether this type of training can be successfully concluded; and thirdly, whether the vocational training offers good prospects on the labour market in terms of future career and professional development. All of these aspects are highly important not just from an individual perspective but also from a systemic perspective for assessing overall effectiveness.

Training continues to be well matched to apprentices

Despite the fact that pupils in Switzerland have to make far-reaching decisions about their education earlier than their peers in other countries, those young people who in selecting an apprenticeship were also selecting a career are shown to be very satisfied with the choice that they made about what to do immediately after compulsory education (→ Figure 119).

119 Satisfaction of young people between the ages of 14 and 20 about to make an education choice (upper-secondary education), based on the follow-up solution selected, 2016

Data: SERI/LINK (Apprenticeship barometer; August 2016)

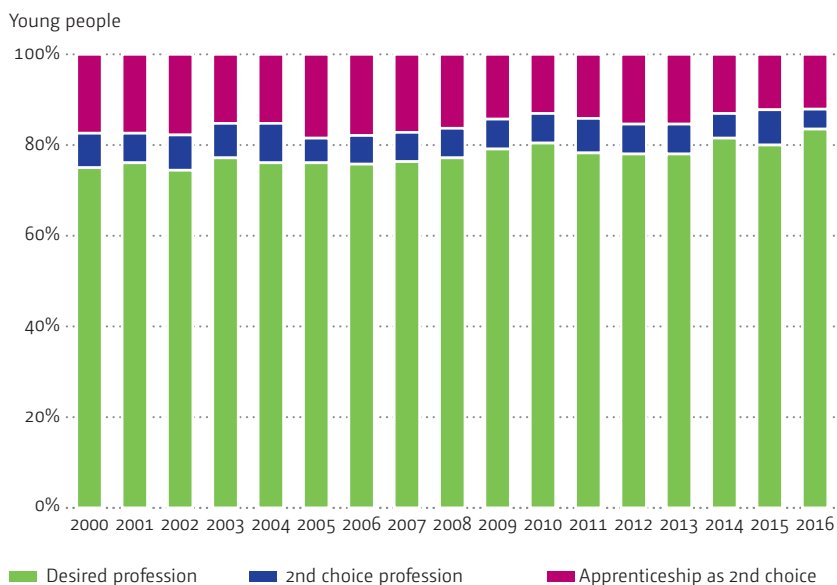


Individuals who are looking for an apprenticeship place will often have to go through many stages before finally obtaining their apprenticeship contract. This journey may involve considering one or more desired professions, taking careers advice at school and from external advisors, and attending taster courses and career fairs. Not everyone will be able to stick to their original plan. However, the figures show, with relatively little variation over time, (→ Figure 120) that about three quarters of those who find an apprenticeship place consider it to be their desired type of apprenticeship. The percentage of people completing an apprenticeship in a profession other than their first choice is very small, at less than 10%, while the remainder would have preferred to attend a general education school instead.

120 Satisfaction with the apprenticeship place obtained: Assessment by the young people

Data: SERI (Apprenticeship barometer, published on 31 August various years); LINK

The data has been extrapolated to 100% based on the 90% of respondents who gave an answer.

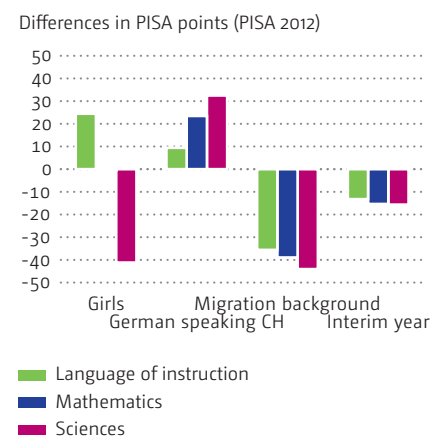


Major differences in prior knowledge

The apprenticeships on offer cover a broad range of requirements in relation to the prior knowledge that applicants are expected to have gained in school, not just in order to take up an apprenticeship place but also in order to complete it successfully (see www.anforderungsprofile.ch). If the training companies were always able to place the apprentices in those occupations for which they meet the expected profile, all learners would be successful in their apprenticeship almost regardless of how they had previously performed in school. Any differences in the success achieved during the apprenticeship could therefore only be explained by behaviour during the training, which could not have been predicted on the basis of differences in school achievements. The reality, however, is different from this optimum situation. Such factors come into play as regional differences in the range of available places or competition between vocational training and general education, not to mention differences in young people's preferences for individual professions, which also results in companies accepting young people who do not

121 Differences in PISA points (2012) by origin and processes for moving into apprenticeships with comparable requirements in terms of school competencies

Data: SEATS, anforderungsprofile.ch; calculations: Centre for Research in Economics of Education at the University of Berne



Generally, it appears that learners in German-speaking Switzerland do better in all three of the competencies tested by PISA than learners in French-speaking Switzerland and in Ticino who train in the same professions. Meanwhile, learners with a migration background are always at a disadvantage compared with those training in the same profession who do not have such a background. Learners with a migration background often appear to aspire to occupations for which the requirements exceed the school results that they can achieve by the end of their compulsory education. This also explains the high failure rate among learners with a migration background in their first training year (→ chapter Upper-secondary education, page 99).

have the ideal profile in terms of school achievements in some cases. Figure 121 shows the differences in the school results of different groups of learners in vocational education and training who take up apprenticeships with the same requirement profiles. In terms of gender, the graph shows that with regard to the same training professions, girls and boys bring the same level of mathematics skills. Girls compensate for their on average lower maths skills on leaving school by opting for professions that have lower requirements in relation to mathematics (→ *Equity*, page 130).

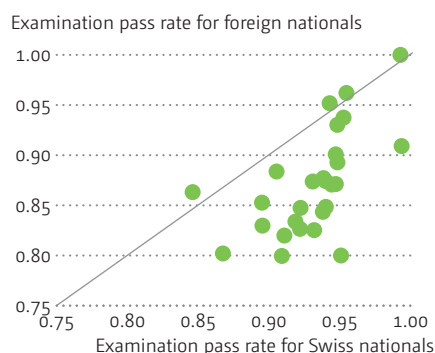
Premature termination of apprenticeship contracts

Analysis based on the SEATS data, which allows for the competencies of the students prior to taking up their apprenticeship place to be included as a control variable, shows that, for the 2012 cohort, interrupted training (the SEATS⁵ data only currently shows education progressions) is less common among women but more frequent in relation to students with a migration background and apprentices who do not start their apprenticeship immediately after compulsory education. While the effect of gender still applies after monitoring cognitive and non-cognitive abilities, the other two effects can, however, be explained by the fact that these learners began their apprenticeship with lower competencies (*Wolter & Zumbühl, 2017b*).

Yet in most cases the premature termination of the apprenticeship contract does not mean that the trainee gives up altogether on post-compulsory education.⁶ Longitudinal data analysis conducted in relation to trainees in the canton of Bern over a period of 10 years (see *Stalder & Schmid, 2016*) shows that the early termination of apprenticeships has less to do with poor careers advice and more to do with difficulties encountered during the training itself and in relation to the choice of host company. During the observation period, 84% of those who terminated their apprenticeship arrangement early went on to start a different certified training course, with around 90% of this group also going on to successfully complete that course. The most successful were those who remained in their chosen professional field. Less successful were, among other groups, young people with a migration background, young people with an irregular progression through training prior to starting the apprenticeship, and those who dropped out of their apprenticeship for personal reasons.

122 Examination success by nationality and canton, 2016

Data: FSO



Examination success in final apprenticeship examinations (EFZ) averaged approximately 92% in Switzerland for Swiss students and was some 7.5 percentage points lower for foreign nationals. The picture varies greatly from one canton to the next. There are four cantons in which foreign students match the examination success of Swiss nationals. At the same time, however, the examination success rate of Swiss nationals is more than 15 percentage points higher in one canton. The differences across the cantons cannot be explained by linguistic differences or by the degree of urbanity.

Successful completion of apprenticeships

The differences in school competencies observed at the start of apprenticeships between the linguistic regions can in some cases also be attributed to the fact that businesses in cantons or regions with high baccalaureate rates find it more difficult to recruit high-performing young people for professions with high requirements. If the companies concerned end up taking on applicants with lower achievements rather than leaving the place vacant,

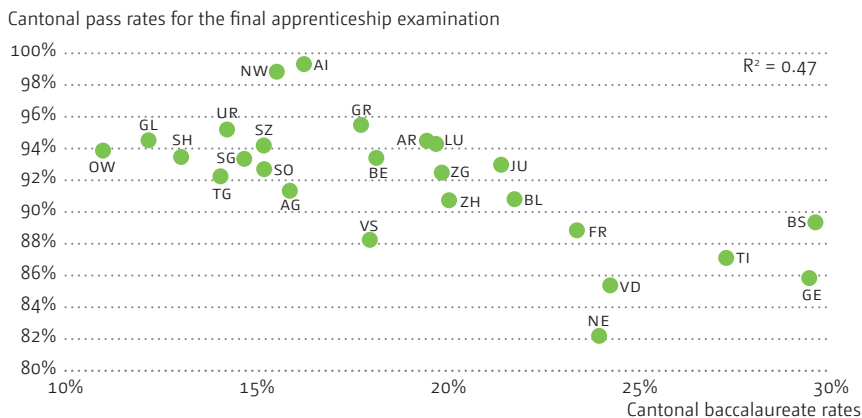
5 SEATS = Swiss Educational Attainment and Transition Study

6 For information on the causes and consequences of apprenticeship contracts being terminated prematurely, see for example *Kriesi, Neumann, Schurer et al., 2016*.

the problem of unsuitable applicants also impacts occupations with lower requirements as they lose their ideal candidates to companies with higher requirements. If these shortcomings in school achievements at the start of the apprenticeship are not fully offset by a greater effort during the training itself, or if trainees with insufficient skills do not drop out of their apprenticeship, this will ultimately be reflected in the success rate for the final apprenticeship examination.

123 Cantonal pass rates for the final apprenticeship examination and bacculaureate rates, 2016

Data: FSO



The strong correlation between the bacculaureate rates for the cantons and the average success rates for the final apprenticeship examinations can also be explained against this background. The bacculaureate rate can explain almost 50% of the variation in final apprenticeship examination pass rates.

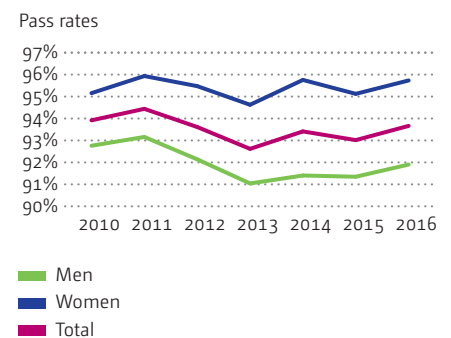
Success in final apprenticeship examinations, but many two-year courses terminated prematurely

The two-year federal vocational education and training certificate (EBA) is characterised, albeit with a marked gender mismatch, by a relatively high pass rate for the final examination (→ Figure 124). However, this high pass rate is largely due to the fact that this two-year VET course features considerably more drop-outs than the three and four-year courses (EFZ). A mere 74.1% of those who began a certificate course in 2012 successfully completed their training two years later (FSO, 2016c). It therefore appears that it is only those trainees with realistic prospects of success who take the final examination.

EBA courses also include trainees who initially began their training on an EFZ level course. Even if only 1% of EFZ trainees switch course type, more than 10% of EBA trainees still end up on the two-year course by this route (FSO, 2015c). As far as the training mobility of successful EBA trainees is concerned, the recorded figures for the 2012 and 2013 cohorts show that around one third of them began or even concluded an EFZ course in the same or following year. This confirms earlier cantonal studies that showed that most of those on EBA courses entered the labour market with their qualification from that course. In this regard, a review (Fitzli, 2018) confirmed that this type of training had a high level of target achievement, albeit with a need for optimisation.

124 Pass rates for the final apprenticeship examination (EBA) by gender, 2010–2016

Data: FSO

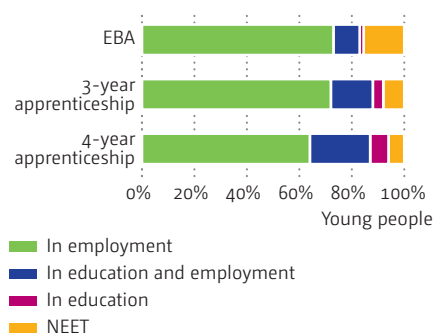


125 Education and employment situation three and a half years after completion of training

The chart shows the situation for the cohort of young people who sat their first leaving examination at upper-secondary level in 2012.

NEET = not in education, employment or training

Data: FSO (LABB)



Integration in the labour market after completion of an apprenticeship

After their apprenticeship, the vast majority of apprentices find a job and in a setting (→ *next section*) in which most apprentices leave their training company and (have to) look for a new employer.⁷ The number of apprentices who embark on another training course after completion of their upper-secondary education also increases over time, be it at tertiary level or on a smaller scale in upper-secondary education. Three and a half years after completing an apprenticeship, the proportion of those who are neither working nor in training (→ Figure 125) is below 10% for EFZ courses and just over the 10% mark for those with an EBA certificate. The situation of former EBA trainees improves over the first eighteen months after completion of their apprenticeship but subsequently remains at the same consistently unfavourable level (FSO, 2018a). The first data is available on the integration into the labour market of those who have completed a two-year vocational educational and training certificate (see also *Fitzli, Grütter, Fontana et al., 2016*) but little is known about how these apprentices would have fared if they had entered the labour market without any training after their compulsory schooling or if they had achieved a three or four-year qualification (EFZ) despite their, on average, lower school achievements. This is because it is difficult to define peer groups and also because long-term studies are rarely carried out. One exception, however, is the comparative study conducted by *Stalder and Kammermann (2017)*, which found there to be similar earnings prospects over the medium term for those with EBA qualifications compared with EFZ qualifications. *Kammermann, Balzer & Hättich (2018)* also show with regard to people working in retail and the hospitality industry that training guarantees the majority of people a stable entry into the labour market, but that a quarter to a third of this group are nevertheless in a precarious position on the labour market.

Professional mobility

The mobility of apprentices after the apprenticeship is highly interesting in many respects. Firstly, it influences companies in their training decisions (→ *Efficiency / costs, page 128*), and at the same time it shows the degree to which the skills acquired during the apprenticeship can also be put to profitable use in other companies or even in other professions. With regard to the time immediately following an apprenticeship, various surveys for Switzerland show that the apprentices are actually highly mobile. Around two thirds of apprentices leave their training company within the space of a year, although this proportion is lower for larger companies and higher for very small businesses (*Strupler Leiser & Wolter, 2012*). Most apprentices stay in the same profession but move company. Immediate changes of occupation are rare. Even if not all apprentices leave their training company voluntarily,

Trade-off between mobility and wage level

In analysis calculating the specific nature of professional skills, *Eggenberger, Rinawi and Backes-Gellner (2017)* and *Rinawi, Krapf and Backes-Gellner (2014)* show that people whose profession involves a very high proportion of competencies that are specific to that profession and thus difficult to transfer to other professions are, as expected, limited in terms of their mobility on the labour market and, if they become unemployed, require more time to find a new job. At the same time, however, this group can expect higher wages in these professions compared with other jobs with relatively non-specific skill requirements.

⁷ *Salvisberg & Sacchi (2014)* show by means of an analysis of job offers between 2001 and 2011 that the higher risk of unemployment when transferring from vocational education and training to the labour market is not in fact related to any potential mismatch of the skills acquired during VET and those required by the labour market, but can mainly be explained by the fact that employers are increasingly looking for candidates who already have work experience or who have even participated in continuing education and training as a prerequisite.

wage analysis shows that such moves are not associated with a loss of earnings. In other words, the professional skills gained with the training company can easily be transferred to a job with a different company, in accordance with the aims of vocational education and training. Those who switch profession immediately do, however, generally have to put up with a wage cut. As can be expected, this is because some of the skills acquired will have been specific to the training profession (→ *text in the left margin*) and therefore cannot be transferred to other occupations (Müller & Schweri, 2015).

While the fact that apprentices are highly mobile at short notice in terms of moving between companies corresponds to the aims of vocational training in Switzerland, there are critics of vocational training (see for example Hanushek, Schwerdt & Woessmann, 2017; → *text in the right margin*) who worry that the low professional mobility of people with an apprenticeship is a manifestation of the system's lack of ability to adapt to economic and technological change. A study by Eymann & Schweri (2016) using data from the Swiss Household Panel (1999–2012) shows, however, that around one half of people who have completed vocational education and training change professional field at least once in their working life, while the equivalent figure for tertiary A graduates is only 39%. The likelihood of changing profession therefore does not appear to be limited for those who have undertaken vocational education and training, and the switch is also not associated with any economic disadvantage for the vast majority of those who change occupation. Around 80% of those surveyed stated that they had the skills needed for their new profession. Based on current knowledge, vocational education and training is not associated with any disadvantages in terms of earning capacity compared with either general education at upper-secondary level or compared with a tertiary-level education. It can also be observed that, leaving aside non-formal continuing professional development activities (→ *chapter Continuing education and training, page 279*), an ever growing proportion of people with vocational education and training is going on to acquire a formal tertiary-level qualification, demonstrating that mobility also applies within the education system itself.

Advantages now but disadvantages later?

Using data from a review of the skills held by adults conducted in 1995 (IALS) Hanushek, Schwerdt, Woessmann et al. (2017) investigated whether there is a trade-off between a smooth entry to the labour market and subsequent problems, expressed as lower earning ability in the final stage of their working life, for those who complete vocational training compared with those who gain a general educational qualification. The authors find this type of trade-off in practically all of the countries investigated. While this trade-off, from a net perspective, appears to favour general education on average, the authors find that Switzerland is an exception. The net view shows higher lifetime earnings for those with vocational training.

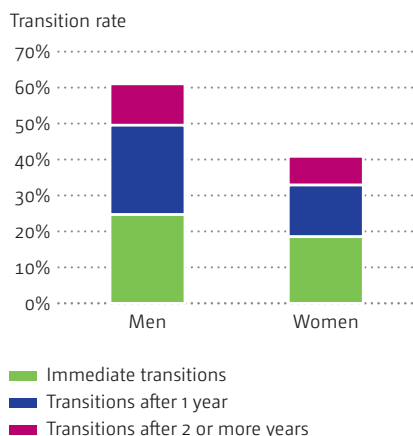
Transitions to higher education after the federal vocational baccalaureate; a slight downwards trend

The number of transitions to higher education by those who gain their federal vocational baccalaureate has remained practically unchanged during the current decade. The big difference between genders has remained stable (→ Figure 127) as about 50% more men make the transition. This is partly due to women moving on to tertiary-level professional education. For example, women in German-speaking Switzerland who want to train as a nurse would attend a PE college and therefore not be included in these statistics. The transition rate for men with a federal vocational baccalaureate to tertiary-level education is also slightly higher than the number men who go to university for the same reason. The rate for men is around one and a half times that of women.

Immediate transitions by men and those involving a delay of one year are sensitive to the state of the economy (→ Figure 126). From a bivariate perspective, around 60% of the fluctuations in the transition rates can be explained by fluctuations in economic growth.

127 Transitions to universities of applied sciences (including teacher education universities): Rates by time and gender, 2014

Data: FSO; calculations: SCCRE



The following comparison can be made to illustrate the quantitative impact of low transition rates for holders of the federal vocational baccalaureate. In 2014, 14 222 people gained their federal vocational baccalaureate, of whom 7231 then began a course at a university of applied sciences or a university of teacher education. There were 1973 more people gaining a federal vocational baccalaureate in 2014 than in 2010. Had those who gained their federal vocational baccalaureate in 2010 had the same transition rate as those with a baccalaureate, the transition rate for the 2010 cohort would have amounted to more than 11 000 people. This figure compared with actual transitions by the 2014 cohort would have been almost twice as high as the increase in diplomas between 2010 and 2014.

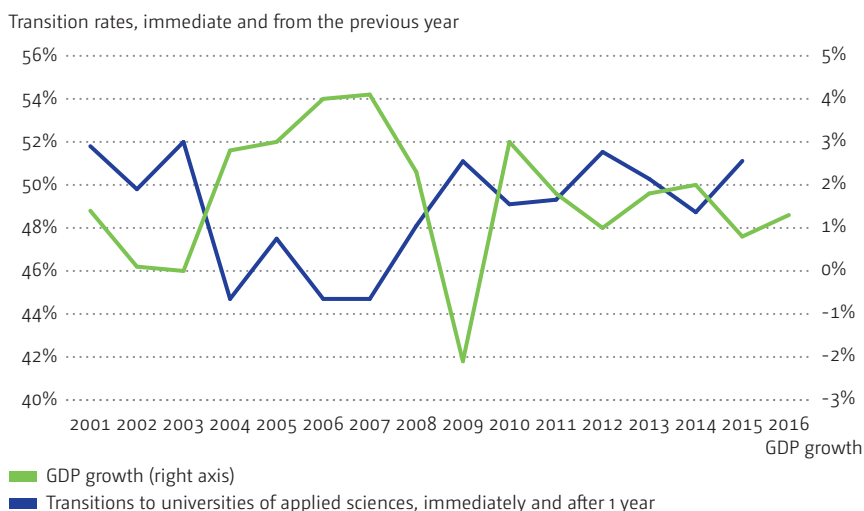
School-based training up slightly with cost implications.

Despite a surplus of apprenticeship places in the economy as a whole over the past few years (→ *Context*, page 112) and the efforts of some cantons to promote company-based forms of training, the proportion of school-based VET increased by slightly more than half a percentage point between 2011 and 2016 to 13.7%. While this may look like slight growth, it costs the state more than CHF 10 million in additional costs every year. This extra spending would only be justified if businesses were offering too few apprenticeships in the professions of the future and this was being compensated for by the state.

126 Transitions to universities of applied sciences and universities of teacher education by men with a federal vocational baccalaureate and GDP growth, 2001–2015

The transitions encompass both immediate transitions in the respective year and transitions delayed by one year on the part of graduates from the previous year.

Data: FSO (SHIS); calculations: FSO up to 2012, SCCRE subsequently



While economic growth may explain small cyclical fluctuations in the transition rates, it is not, however, the reason for the generally much lower rates for transitions to higher education compared with the transition rates for people with a baccalaureate. The main reason lies in the opportunity costs, which are higher for holders of federal vocational baccalaureates, as they can expect a higher wage upon completion of their training than baccalaureate school leavers who have to complete a trainee programme or training before entering a profession. Whatever the reasons for the low transition rates after a federal vocational baccalaureate, the shortage of specialist skills does not appear to result in strong enough wage signals for the potential pool of additional students to be sufficiently well exploited.

Efficiency / costs

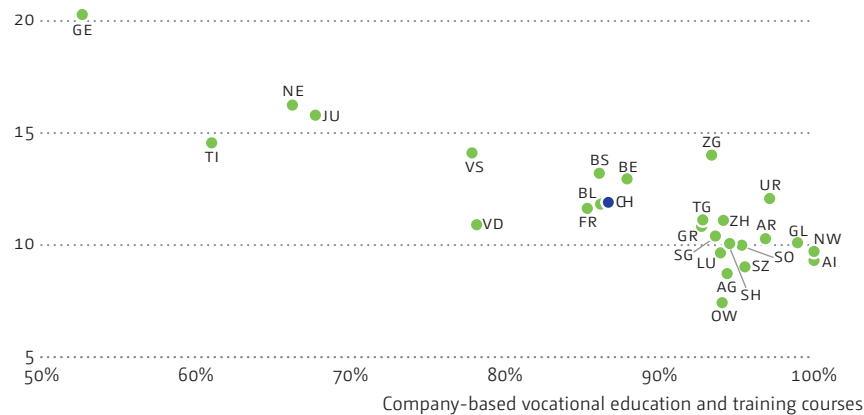
How efficiently resources are used can be assessed from the perspective of the learners or of the training companies, or from the public perspective. As in previous education reports, the lack of comparable measures for inputs and outputs makes it difficult to gauge the efficiency with which monetary and non-monetary inputs (such as the learners' time) are being used in relation to the outputs or outcomes achieved.

If it is assumed, however, that school-based and company-based training, which in formal terms generate identical qualifications, produce the same output in terms of competencies, it can be concluded that the way in which public money is used in school-based vocational training is considerably less efficient than in company-based training schemes. Almost three quarters of the differences in cantonal spending per learner in vocational education and training can be explained by the varying proportions of school-based and company-based training situations (→ Figure 128).

128 Public spending per learner on VET in relation to the share of school-based training programmes, by canton, 2016

Data: FSO, SERI; calculations: SCCRE

Average costs per training course in vocational education and training, in CHF 1000



Legend

In a canton where 50% of training places are school-based (Geneva), total spending on education falls by around one quarter of the costs for one trainee if there is one trainee fewer. If the number of trainees in a canton that does not have school-based training places (e.g. Nidwalden) falls by one person, the costs will fall by more than 45% of the expenditure for one learner.

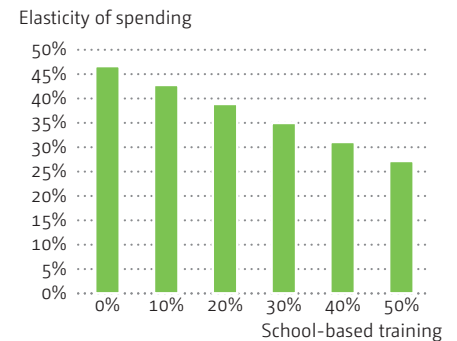
However, the proportion of school-based training places not only influences the absolute spending per training place but also impacts on how these costs change when the number of learners changes. While most businesses, particularly very small companies, mainly have variable training costs, enabling them to react entirely flexibly to a change in the training situation, the state is less able to adjust its spending on vocational skills in line with fluctuations in the number of pupils, as the school facilities and teaching staff need to be maintained even when faced with cyclical ups and downs. Empirical analysis (→ Figure 129) shows that the lower the elasticity with which spending reacts to fluctuating learner numbers, the higher the share of school-based vocational education and training programmes in a given canton.

Net benefits for training companies – but not without exception

According to the cost/benefit studies for companies from the years 2000, 2004 and 2009⁸ (Strupler & Wolter, 2012), the average business in Switzerland will enjoy a net benefit at the end of the training period. This is because the productive contribution of the apprentice in the form of his or her work on average exceeds the costs incurred for training, materials and an apprentice's wage. In a flexible labour market in which labour is highly mobile, this opportunity for businesses to have covered the costs of their investment in training by the end of the apprenticeship is especially important to small and micro companies as they cannot rely on being able to continue to recoup their training costs beyond the end of the apprenticeship. Generally, it is only large companies with access to an internal labour market that succeed

129 Elasticity of public spending upon changes in the number of learners based on proportion of school-based training in VET

Data: FSO; calculations: Centre for Research in Economics of Education at the University of Berne
Data basis: cantonal spending on VET between 1990 and 2014



Cost is not everything

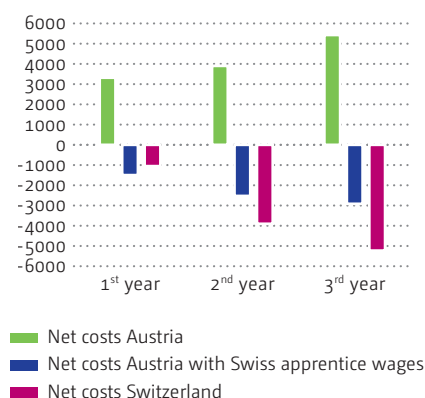
Several empirical analyses have been able to show in the past (e.g. Mühlemann & Wolter, 2011, or Mühlemann, Ryan & Wolter, 2013) that the expected net costs of training an apprentice have an influence on whether a business decides to become a training company or not. A new analysis with the cost/benefit data (see Kuhn, Schweri & Wolter, 2018) now shows that in addition to this commercial argument, social and political opinions also impact on this training decision. The more prevalent the accepted opinion in a local area that it is the state that should provide commodities and not private individuals, the lower the tendency on the part of companies in that community to commit to the dual vocational training system.

⁸ At the time of preparation of the 2018 Education Report, a fourth cost/benefit study by the Swiss Federal Institute for Vocational Education and Training (EHB) was in progress, the results of which will subsequently be incorporated into the 2022 Report.

130 Development of the net costs by teaching year for Austrian training companies and comparable Swiss training companies

Data: Centre for Research in Economics of Education at the University of Berne and öifb; calculations: Luca Moretti, Centre for Research in Economics of Education at the University of Berne

Net costs in euros



As the cost/benefit analysis in Austria was not representative, only the data for comparable Swiss training businesses (in terms of training profession and company size) was used in the comparison with Austrian businesses.

in holding on to their apprentices for a longer period of time, thereby saving on the costs involved in the hiring and induction of new skilled workers (Blatter, Mühlemann, Schenker et al., 2016). The fact that the average training company in Switzerland gains a net benefit does not mean, however, that every company in the country can automatically expect such a net benefit (Wolter, Mühlemann, Schweri, 2006) were it to become a training company. Nor does it mean that the average training company in a different country can necessarily expect the same net benefit at the end of the training period as that country may well have similar training models but could also have quite different labour market rules and government finance models. As far as Germany is concerned, the same cost/benefit studies in 2000 showed that an average business was confronted with high net costs by the end of the apprenticeship, but was better placed to offset these than a Swiss company thanks to the regulated nature of the German labour market (Mühlemann, Pfeifer, Walden et al., 2010). Moreover, more recent cost/benefit analysis for Germany has shown a move close to the Swiss model as the German labour market has been deregulated (Jansen, Strupler Leiser, Wenzelmann et al., 2015).

A survey relating to Austria, the third German-speaking country with a dual vocational training model (Schlögl & Mayerl, 2016), shows that the average training company there can also expect net costs, although these are partly offset by government subsidies. However, the main reason for the difference between Austria and Switzerland is not the high proportion of unproductive time spent by learners in the company, as is the case in Germany. Rather, it is the high level of wages paid to apprentices compared with the wages paid to skilled workers (see Moretti, Mayerl, Mühlemann et al., 2017). Figure 130 shows how the net costs for an Austrian training company would change if the learners were to be paid the same wage relative to trained workers as their Swiss counterparts.

Equity

Gender stereotypes in relation to career choices

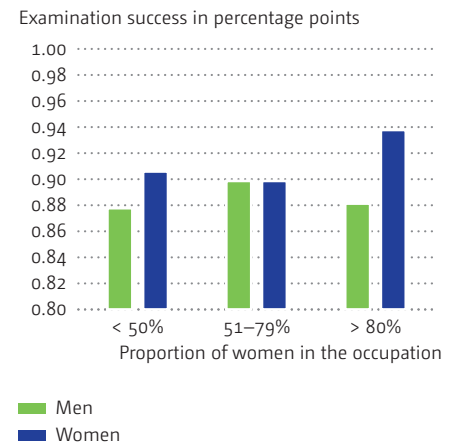
The imbalanced distribution of men and women across individual occupations has not been reduced despite the creation of new occupations. It appears to be particularly marked in those regions in which company-based vocational education and training is widespread (Imdorf, Sacchi, Wohlgemuth et al., 2014). Gender stereotypes are also particularly in evidence in the professions chosen in communities in which the electorate holds less progressive views on the respective roles of men and women. In-depth analysis shows, however, that this correlation stems from the fact that parents with stereotypical jobs for men and women tend to live in such communities and that the profession chosen by the young people can be explained by the parents' jobs and not by the prevailing political opinions on gender issue in that area (Kuhn & Wolter, 2018). Whether this stereotypical selection of a profession is caused by the education system itself, is passed on by parents to their children, or is created by young people's individual gender-specific preferences, the fact that women are concentrated in a few professions at least appears to offer the advantage that they enjoy higher success rates at the end

of their apprenticeship in these professions. Women generally record higher pass rates for their final apprenticeship examinations. However, both the success rate recorded by women and the differences in the success achieved by men and women are particularly marked in those particular professions in which the proportion of women is very high (→ Figure 131). Additionally, in male-dominated professions, women are more successful in their final apprenticeship examinations than men.

The question of the impact of stereotypical gender-based selection on the individuals' subsequent professional lives is difficult to answer. One possible indication of the potential consequences is provided by an analysis of the gender-specific selection of occupations based on the school competences required for that occupation. If the apprenticeships are ranked according to the requirement profiles for mathematics and foreign languages, it comes as no surprise to note that 65% of men selected an apprenticeship for which the demands made in terms of foreign language skills were in the lower half. In a symmetrical way, two thirds of women chose a training place with foreign language requirements in the upper half of the distribution (→ Figure 132, right-hand side). With regard to the requirements in mathematics, the situation is the exact reverse (→ Figure 132, left-hand side): almost 70% of women select a profession where the requirements in terms of mathematics level achieved at school are ranked in the bottom 50%. There is however a marked difference in the choices made by men and women in relation to the mathematics and foreign language requirements of occupations if the analysis focuses on those professions with the most demanding requirements. While less than 5% of women take up a place in one of the 20% most demanding apprenticeships in relation to mathematics⁹ (compared with 32% of men), close to 15% of men still manage to gain a place in the 20% most demanding apprenticeships in relation to foreign languages (compared with 28% of women).

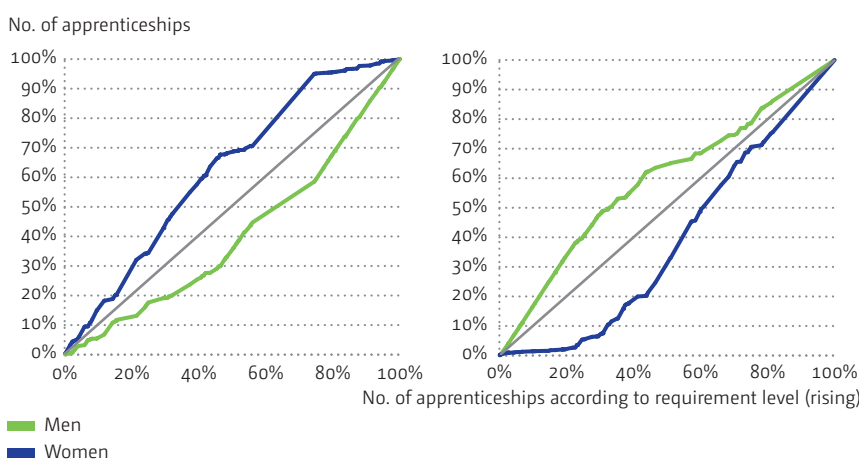
131 Examination success in the final apprenticeship examination by gender and proportion of women in the occupation, 2016

Data: FSO; calculations: SCCRE



132 Distribution of apprenticeship places by gender and requirement level in mathematics (left) and foreign languages (right), 2015

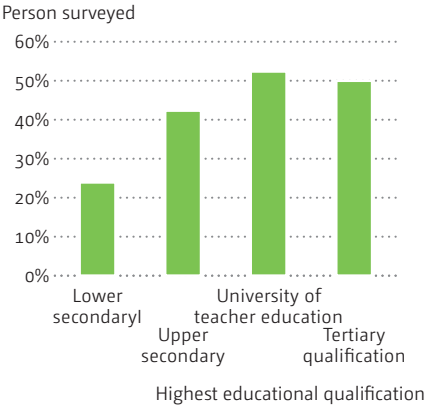
Data: anforderungsprofile.ch, FSO; calculations: SCCRE



⁹ Women are more likely to opt for an atypical profession in the areas of mathematics, physics and chemistry if they come from a household with a high socio-economic status and if their parents, from the young person's perspective, believe in the child's aptitude for science without burdening them with excessively high expectations of their achievements in these subjects, as shown by a survey of some 4500 baccalaureate school pupils and pupils sitting their federal vocational baccalaureate (see Ignaczewska, 2014).

133 **Proportion of those surveyed who regard vocational training as having a lower social status than general education; according to highest educational qualification, 2016**

Data: Centre for Research in Economics of Education at the University of Berne; calculations: SCCRE



With regard to the fact that women are almost completely absent from the most demanding occupations in relation to mathematics, it should be noted that empirical analysis shows a strong correlation only between mathematics (in terms of a profession's job profile) and the wages in this profession, but not between the other requirement profiles (language of instruction, foreign languages, sciences) and wages (*Buser, Peter & Wolter, 2017b*).

Social status: neither similar nor equivalent?

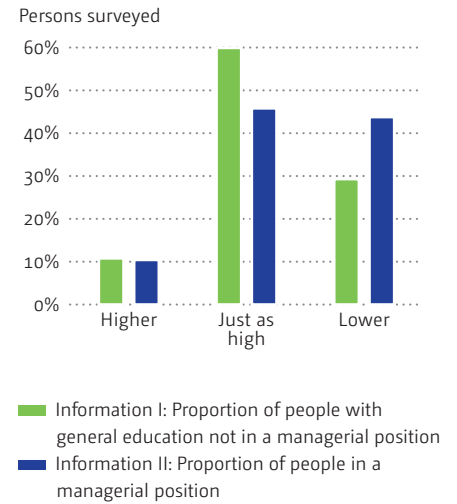
In terms of labour market success, vocational qualifications fare as well as general education qualifications (→ *chapter Cumulative effects, page 295*), and the public's views also point in this direction. However, if we consider the relative views of these qualifications' social status (see also *SCCRE, 2014*), around 40% of people living in Switzerland believe that vocational qualifications have a lower social status than qualifications gained in general education, while only 10% believe the opposite (*Cattaneo & Wolter, 2016*). This negative view of social status is not just in evidence among foreign nationals who have recently migrated to Switzerland and who are not sufficiently familiar with the value of vocational education in the country (see *Bolli & Ragoth, 2016*); it is a phenomenon that is also observed among Swiss nationals. The negative opinion is particularly marked among people with a tertiary qualification and among people who have a teaching qualification (→ *Figure 133*).

Although it is not possible to definitively assess why a large proportion of Swiss people regard vocational qualifications as having a lower social status than general education, part of this view can be explained by an inaccurate view of the relative career prospects.

A survey experiment (→ *Figure 134*) revealed the following: information on the very small number of people with vocational training or a general education who hold a senior managerial function had no impact on how the social status of the qualifications was assessed. Mentioning the high percentage (88%) of people who have a general education qualification (baccalaureate school or university) and do not hold a senior managerial position, however, led to a reduction by one third in the number of people who believe that vocational training has a lower social status. This outcome can be interpreted as showing that many Swiss nationals who accord a higher social status to those with general education qualifications are wrongly assuming that such a qualification automatically means a higher hierarchical function in business or public administration (*Cattaneo & Wolter, 2018*).

134 **Is a vocational training qualification (apprenticeship, tertiary-level professional education, university of applied sciences) held in the same esteem as a general education qualification (baccalaureate school, university)?**

Data: Centre for Research in Economics of Education at the University of Berne; calculations: SCCRE



Notes on the above figure

The Centre for Research in Economics of Education commissioned the polling institution LINK to carry out a survey of 6000 Swiss nationals on education issues in 2015. A randomly selected group of respondents answered the questions without any additional information, while other participants in the survey were given some statistical information (see also *Cattaneo & Wolter, 2016*). For the question regarding the social status of vocational training compared with a general educational qualification, a group of the survey participants were given the information that 5% of people with a vocational qualification work in a senior managerial position, compared with a figure of 12% for those with a general educational qualification. The other group of respondents were given the (same) information phrased differently, namely that 88% of people with a general educational qualification do not hold a senior managerial position.



Baccalaureate schools

Context

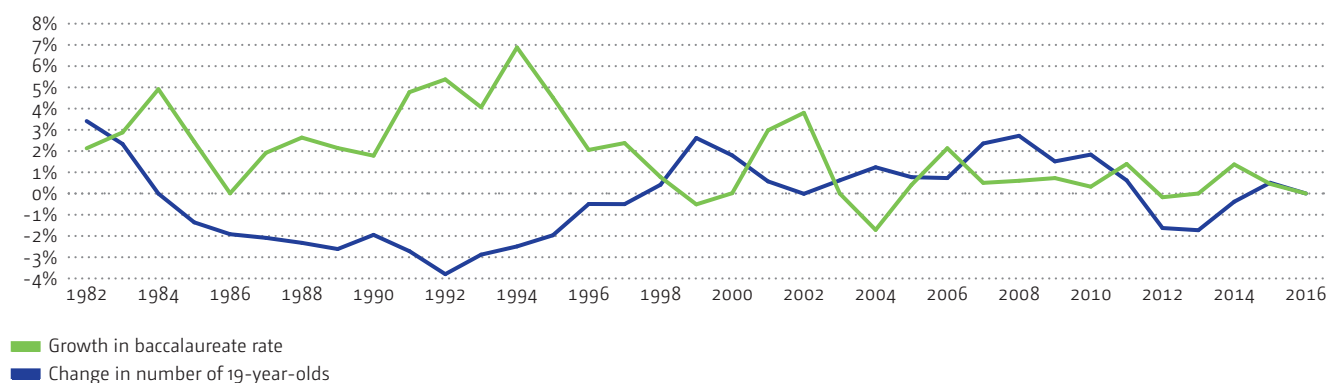
The **baccalaureate rate** corresponds to the number of baccalaureate certificates gained in relation to 19-year-olds permanently resident in Switzerland. In 2016, the baccalaureate rate dipped below 20% again for the first time, at 19.6%. In order to cushion statistical fluctuations between the different years, the figure shows smoothed averages for two years. Based on the FSO's reference scenario, the baccalaureate rate will settle at around the 22% mark from 2020 onwards.

The expansion of Switzerland's baccalaureate school system has progressed at a much weaker rate over recent years compared with the pace of change in the eighties and nineties. The greatest growth in recent times was recorded from 1991 to 1996. Efforts to expand baccalaureate schools represented education policymakers' response to technological progress and the growing demand for qualifications (*Criblez, 2001*). Then, growing educational ambition also helped drive up baccalaureate ¹rates. The expanded availability of baccalaureate education (new locations, infrastructure, teaching staff etc.) has been and remains a factor behind the steady rise in the baccalaureate rate, and this is reflected by the fact that the rate is always exceptionally high when the number of young people drops markedly for demographic reasons, in other words when the existing capacity needs to be fully exploited despite lower pupil numbers. Conversely, however, the baccalaureate rate has not fallen, but has rather remained stable, even when the number of young people has increased (→ Figure 135). The fact that the baccalaureate school system does not react sensitively to demographic changes in the school cohorts has consequences for vocational education and training (→ *chapter Vocational education and training, page 111*).

135 Link between baccalaureate rate and no. of 19-year-olds, 1981–2016

smoothed values as averages of two years

Data: FSO (SHIS); calculations: SCCRE



Women and baccalaureate schools

The biggest increase in baccalaureate rates was recorded in those years in which the rate for women began to move closer to the rate for men. What began as a catching-up process took on a new significance from 1993, when the female baccalaureate rate overtook the male rate for the first time. Today, the rate for women is considerably higher. In 2016, the baccalaureate rate for women was 23.7% compared with 15.7% for men.

¹ Use in this chapter of the term «baccalaureate» refers to a baccalaureate acquired at a baccalaureate school and granting the right to study at a university or a Federal Institute of Technology (ETH).

The rates for women do, however, differ markedly from one canton to another. No investigation has been carried out into the precise reasons for such differences. Regardless of this lack of information, it is clear that the cantonal baccalaureate rates are higher in those cantons with a high proportion of women in their baccalaureate schools (→ Figure 136). Given that no causal link can be derived from this, it is, however, also possible that it is mainly women who are benefiting from the improvement in the baccalaureate rate and favouring baccalaureate schools over vocational education and training.

136 Cantonal baccalaureate rates and the difference between the rates for women and men

Baccalaureate rate by canton: Average over 3 years (2014–2016)

Data: FSO

Difference in female and male baccalaureate rate



Differences between the cantons

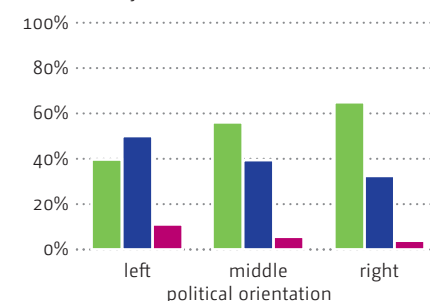
To date, there have been no empirically verified explanations for the persistently high differences in baccalaureate rates among cantons. These differences could be demand-driven (in that pupils or parents express a preference for baccalaureate schools), but they could also be supply-driven (political targets for the provision of places). One factor that should not be contributing directly to the sizeable gaps is the differing needs of the local (cantonal) labour market (→ Figure 138), since pupils at baccalaureate schools are expected to enter higher education and subsequently to become nationally and internationally mobile. In other words, even in the individual cantons, the baccalaureate rate should at least be geared to the needs of the labour market throughout Switzerland. At the same time, however, the local labour market might play an indirect role if demand for tertiary graduates is low and there is consequently not much political will to expand baccalaureate school capacity.

A representative survey of around 6000 Swiss nationals conducted in 2015 shows that opinions on whether there is the right number of baccalaureate students depends on a host of different factors. Leaving aside an individual's linguistic region and sociocultural factors, as well as personal educational background (Cattaneo & Wolter, 2016), preferences for a higher or lower baccalaureate rate are also related to political persuasion. The stronger an individual's leaning towards the right of the political spectrum,

137 Differences in the assessment of current number of baccalaureate students according to political orientation

Data: Representative survey (2015) of 6000 people by the Link Institute on behalf of Bern University (Cattaneo & Wolter, 2016)

Persons surveyed



There are too many.
The numbers are about right.
There are not enough.

40% of the Swiss population believe that the rate of baccalaureate students is too high, 48% think it is just right, and 12% think it is too low.

138 Baccalaureate rate by district

Data: BFS; map: Swisstopo



Baccalaureate rate:

< 10%
10–14.9%
15–19.9%
20–24.9%
25–29.9%
≥ 30%

the more likely it is that the current rate of baccalaureate students will be assessed as being too high (→ Figure 137); conversely, those with sympathies for the left are likely to share the opposite view regarding baccalaureate student numbers.

The baccalaureate rate, competition for baccalaureate schools and the resulting impact

The different baccalaureate rates in the cantons also influence how easy or difficult it is for pupils with the same attainment levels to gain a place at a baccalaureate school. Whereas very good pupils have almost no problems making the transition to a baccalaureate school in cantons where the rates are on the higher side, this transition may be uncertain even for good pupils in cantons with very low rates because there is greater competition for fewer places. One sign of these different starting points is, for example, the frequency with which very good pupils end up making use of paid private tutoring. Whereas in cantons with high baccalaureate rates good pupils (unlike very poor pupils) take almost no private tutoring (in mathematics) (*Hof & Wolter, 2014*), in cantons with low baccalaureate rates they make use of this option almost as often as pupils with a very poor attainment record in mathematics.

International comparability

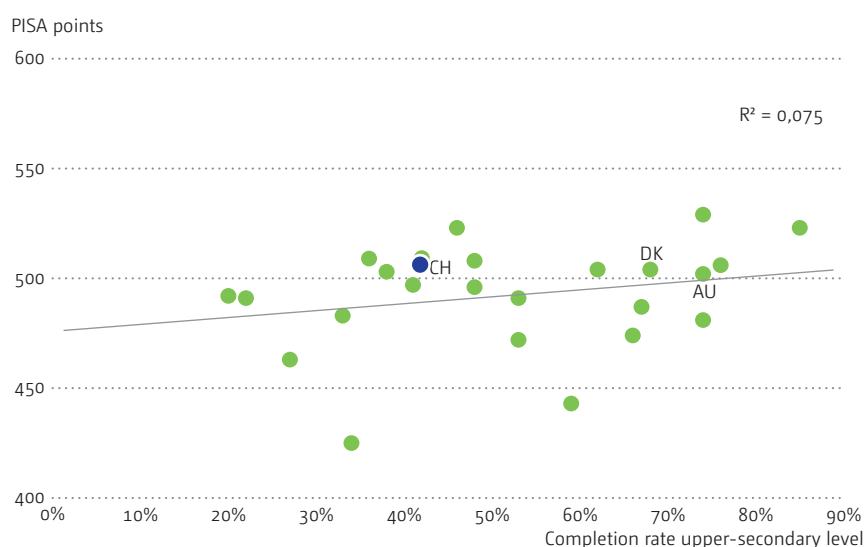
The national percentages of pupils in different countries who gain a general education qualification at upper-secondary level, (potentially)² entitling them to study at tertiary level, range from around 20% to 100%. These fluctuations can generally be explained by different education policy decisions, while only being due in very small measure to differing competence levels at the end of compulsory education (→ Figure 139). If we compare average PISA results at the end of compulsory education across the different OECD countries, this only explains around 7% of the difference in general education qualification rates in upper-secondary education. Countries such as Australia and Denmark, for example, have practically the same average PISA results as Switzerland, yet their qualification rates in general education are significantly higher.

² The national calculation methods also do not always make it entirely clear whether the general education qualification grants the right to a tertiary education generally or only under certain conditions.

139 Rate of young people completing upper-secondary education with a qualification and PISA points, by international comparison, 2015

The PISA points correspond to the average scores in mathematics, reading and natural sciences in the individual countries in 2015.

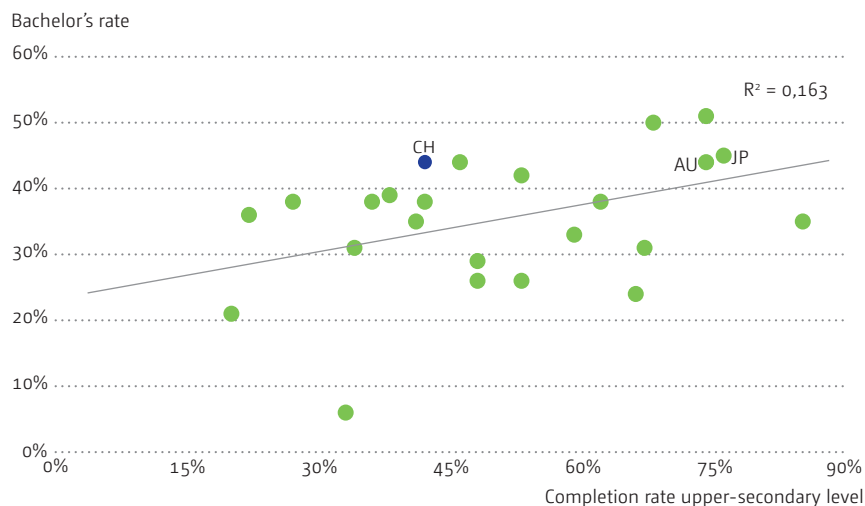
Data: OECD



Just as the international variance in the number of upper-secondary level qualifications cannot be explained by prior educational achievement levels, the former also does not explain the differences between the OECD countries in the number of first degrees in higher education (Bachelor's degrees). A mere 16% of the differences in the number of Bachelor's degrees from country to country can be explained by differences in the rate of students qualifying for university. In Switzerland, for example, the rate of Bachelor's and equivalent degrees (44%) is almost identical to the rate of general education qualifications at upper-secondary level (42%), while Australia and Japan have the same number of Bachelor's degrees as Switzerland but rates of more than 70% for the proportion of students gaining a general education qualification (→ Figure 140).

140 Rate of young people completing upper-secondary education and Bachelor's degrees, by international comparison, 2016

Data: OECD



The rate of students gaining entitlement to study at university as quoted in the Swiss Education Report for 2014 is not the same rate as shown here as the revision of the ISCED classification has also caused this international indicator to be changed. The success rate for upper-secondary education includes all final qualifications and not just first qualifications from general education courses. This means that all baccalaureates achieved via the second pathway, federal vocational baccalaureates and specialised baccalaureates are included in the figures. The rate is calculated as a net rate, i.e. the proportion of people with a qualification is calculated per age group. The rates are then totalled up. Using a cross-section, this means that the behaviour of a birth cohort can be simulated.

When drawing these international comparisons, it should be remembered that the nature of a qualification entitling the holder to enter higher education varies greatly from one country to another. In most countries with very high rates, the baccalaureate is not the only certificate awarded on completion of a general upper-secondary education, but frequently actually the only option available at upper-secondary level, as the vocational alternative is either not very widespread or not recognised as an educational qualification. As a result, by no means all students who gain their baccalaureate will be aiming to go on to higher education.

It should also be noted that, in other countries, a baccalaureate usually only grants theoretical entitlement to higher education, as universities are free to define additional admission requirements. This may result in a large percentage of those entitled to study not actually being granted a place.

It should also be noted that the odds of successfully completing a degree (→ *chapter Universities, page 197*) are not the same in all countries. In many countries, the Bachelor's degree is the most common university qualification and not the Master's, as is the case in Switzerland. The differences in graduation rates from higher education may be viewed as the product of cumulative factors, as a result of which most countries differ from Switzerland, such as additional selection processes for higher education, selection during higher education courses or even the voluntary decision not to embark on a course of study.

Institutions

With just a few exceptions (such as for courses in medicine and sport), the Swiss baccalaureate grants students the right to attend universities and universities of teacher education without any further entrance examination. There is no centralised baccalaureate examination, and the cantons, schools and/or teaching staff have a high degree of autonomy with regard to the education programme.

Long-term and short-term baccalaureate schools

By the time they sit their baccalaureate examination, Swiss pupils will have spent at least 12 years in education (excluding the first learning cycle as defined in the Intercantonal Agreement on Harmonisation of Compulsory Education (HarmoS)). The final four years are designed as a baccalaureate course, and the first of these four years may take the form of preparation for a baccalaureate school during the lower-secondary cycle (Article 6 of the 1995 Regulation on the Recognition of the Baccalaureate [MAR 95]). Structurally, a distinction is made between the long baccalaureate cycle (six years, two of which are at a preparatory school) and the short baccalaureate cycle (four years). Entry to the long cycle takes place immediately after primary school. The short cycle begins at lower-secondary level following the 8th or 9th school year. The long cycle is common in Zurich and cantons in Central and Eastern Switzerland (AI, GL, GR, LU, NW, OW, SG, UR, ZG, ZH). Three cantons (NW, OW, UR) only make provision for the long cycle.

In French and Italian-speaking Switzerland, by contrast, baccalaureate schools are organised around the short cycle.

Admission requirements

Requirements and entry procedures for admission to a baccalaureate school differ considerably from one canton to another (→ Figure 141). Basically all pupils from the type of feeder school with the most stringent requirements are eligible to take part in the entry procedure. The two Basel Cantons, for example, are an exception, as pupils from the type of school with the second highest attainment level are provisionally eligible if they achieve a high average grade. In simplified terms, cantons apply two types of entry procedure. Under Type 1, a leaving or entrance exam usually determines admission to a baccalaureate school. Type 2 characteristically does not entail a leaving or entrance exam but relies, for example, on previous attainment records instead. There are also major differences between the cantons in terms of the age of the pupils when they enter a baccalaureate school. In some cantons (such as Fribourg), pupils may repeat their 11th school year as a form of preparation for starting a baccalaureate school. 40% of young people who repeat their final year of compulsory education subsequently transfer to a baccalaureate school.

In addition to this, baccalaureate schools can confirm or rectify an admission decision after a probation period or periodic review period, the duration of which can vary. In the canton of Jura, for example, a one-year probation period can be applied if a candidate does not meet all of the entry requirements. The repetition rates during baccalaureate schooling also vary considerably according to canton.

No clear-cut link can be demonstrated between admission requirements and the baccalaureate rate, although the cantons in Western and Southern Switzerland, where the decision is made by the feeder school, often record higher baccalaureate rates than the German-speaking cantons, which tend to favour entrance examinations.

Tracking, accessibility of system, and success rates

As far as the admission procedures and entrance rates are concerned, it is often forgotten that the cantonal education systems also differ from each other in terms of how easy it is to reverse decisions at a later date. *Boes, Hangartner & Schmid. (2017)* investigated the medium and long-term impact of entrance examinations for baccalaureate schools in the cantons of Lucerne, Solothurn and St. Gallen in the 1970s and 1980s. They compared the subsequent success of pupils who had only just passed the entrance examination with those who had narrowly failed the examination. The results show (→ Figure 142) that, as far as horizontally accessible systems are concerned, this decision only had a minor impact on subsequent educational success as pupils were also able to switch to different levels at a later stage according to ability. Conversely, the decision-making process in a school system that lacks good accessibility causes long-term differences in educational outcomes. The selection process in this case lowers the likelihood of achieving a university degree by 17 percentage points. Overall, however, regardless of the horizontal accessibility of the systems, it is interesting to note that only half of those pupils who passed the entrance examination at their first attempt during the 1970s and 1980s went on to achieve a university degree, while between a third and almost a half of those who were not accepted into a baccalaureate school nevertheless went on to subsequently acquire a university

141 Simplified typology of admission to short-term baccalaureate schools

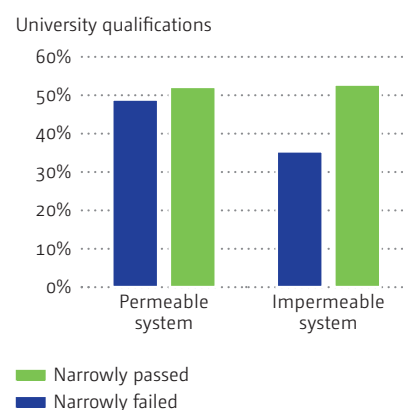
Data: BiGym, IDES (for further details see also Figure 163)

| Type 1: Typically requires a leaving or entrance exam | Type 2: Typically does not re- quire a leaving or ent- rance exam |
|--|--|
| AG | BE |
| AI | BL |
| AR | BS |
| GL | FR |
| GR | GE |
| SG | JU |
| SH | LU |
| SZ | NE |
| TG | NW |
| ZH | OW |
| | SO (2013) |
| | TI |
| | UR |
| | VD |
| | VS |
| | ZG |

142 Likelihood of a university degree in accessible and inaccessible school systems for those who only just passed the baccalaureate school entrance exam and for those who narrowly failed the exam

For the purposes of this report, the authors have classed the school systems in the cantons of Solothurn and St. Gallen as accessible systems during the relevant period and based on the relevant school regulations, while classing the school system in the canton of Lucerne as inaccessible. Other cantons have not been included in the analysis due to the low comparability of the examinations.

Source: *Boes, Hangartner & Schmid, 2017*



qualification. The extent to which these results also apply to the current situation is not clear, however.

Subjects and allocated time

Pupils choose between different subject specialisation profiles (1995 Regulation on the Recognition of the Baccalaureate (MAR 95)). Within each profile, the nine baccalaureate subjects include seven compulsory subjects based on the regular curriculum, plus another subject selected for specialisation and a second supplementary option. A baccalaureate essay must be submitted on a theme chosen by the pupil. For the regular components, 30–40% of time is allocated to languages, 25–35% to maths and natural sciences, 10–20% to the humanities and social sciences and 5–10% to arts (Art. 11, MAR 95 Regulation as amended in 2007). The special subject, second supplementary option and essay account for 15–25%.

Apart from the national languages featuring as regular or special subjects, a third Swiss language must be available as an option (Art. 12, MAR 95 Regulation). Pupils who do not choose English as one of their baccalaureate subjects must at least be offered a basic course in English (Art. 17, MAR 95 Regulation). With a view to securing scientific knowledge in the area of IT and an understanding of the background information needed for an information society, the Board of the Swiss Conference of Cantonal Ministers of Education (EDK) launched a consultation process with the Federal Department of Economic Affairs, Education and Research (EAER) on 26 January 2017. At the subsequent EDK annual meeting in October 2017, it was decided that IT should be made a compulsory subject.

Special subjects

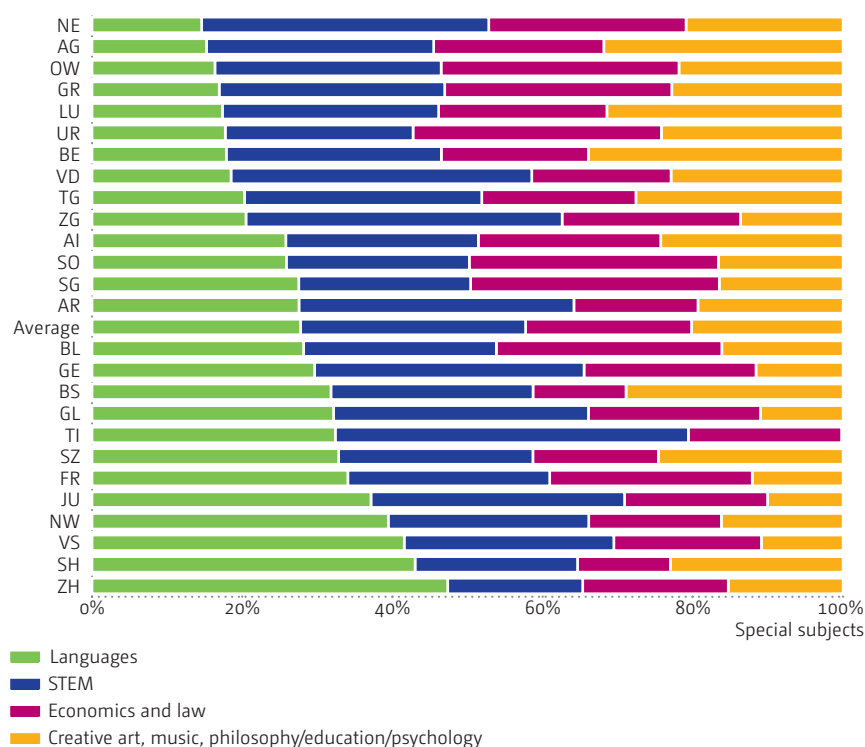
All pupils choose one of the following subjects or subject clusters (Art. 9, MAR 95) for specialisation: a) classical languages (Latin and/or Greek), b) one modern language (a third national language, English, Spanish or Russian), c) physics and applied mathematics, d) biology and chemistry, e) economics and law, f) philosophy/education/psychology, g) creative art, h) music.

The cantons determine which subjects are to be provided, and as a result there are relatively big differences in the pupil percentages for each specialisation depending on the canton (→ Figure 143) but little fluctuation within a given canton.

143 Cantonal shares of special subjects, 2015/16

Two-year average

Data: FSO



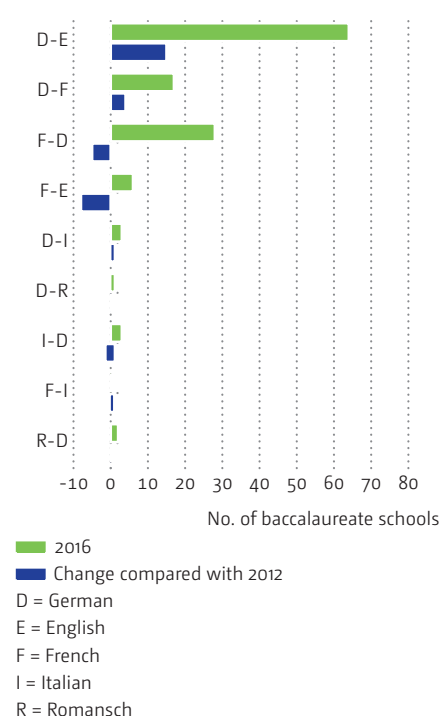
Bilingual baccalaureate

Article 18 of MAR 95 allows cantons to offer a bilingual baccalaureate (with a second official language of Switzerland or English). For this bilingual baccalaureate to be recognised, the requirement since 1 January 2013 has been that at least three subjects must be taught in the immersion language selected and that the overall number of hours taught must be at least 800 (Regulation adopted by the Swiss Baccalaureate Commission on the Recognition of Cantonal Bilingual Baccalaureates of 16 March 2012). There is a choice of two models. Model A with partial immersion teaching at the home school includes both the immersion teaching at the home school and an optional stay in the relevant language area. Model B is founded entirely on immersion teaching at a host school. Pupils must spend at least one academic year in the relevant language area. Immersion teaching is widespread and the most common language combination is German and English (→ Figure 144).

Based on several analysis studies, primarily from Germany, *Stebler (2010)* concludes from her evaluation of the research that the expectations regarding immersion teaching, namely better language skills coupled with subject skills of an at least equivalent level, were fulfilled. Nevertheless, she also warns that «in relation to the central assumptions and effects of immersive teaching there remain more outstanding questions than empirically confirmed findings» (*Stebler, 2010*).

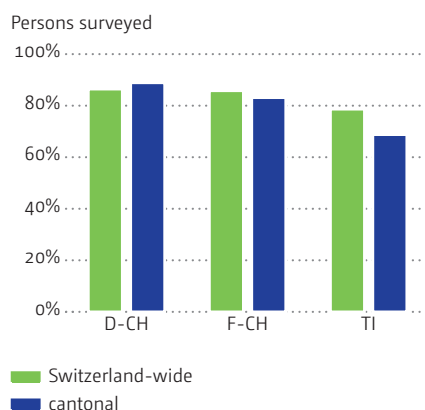
144 Number of baccalaureate schools in Switzerland with immersion classes in 2016 and change compared with 2012

Data: SFIB



145 Percentage of people in favour of a uniform exit exam for baccalaureate schools

Data: representative survey (2015) of 6000 people by the Link Institute on behalf of Bern University (Cattaneo & Wolter, 2016)



Joint testing

Holmeier, Maag Merki & Hirt (2017) documented this implementation, with examples, at four baccalaureate schools in German-speaking Switzerland, independently of the EDK recommendations. Their work shows that generally course content, requirements, assignments and marking schemes are agreed jointly at the baccalaureate schools but that there is no joint preparation and seldom any joint analysis or discussion of the results. Those involved stated that the joint testing had made it easier for them to compare assessments but only where there was a joint marking system in place (Holmeier, Maag Merki & Hirt, 2017).

Current projects to ensure exam-free access to universities

The Confederation and cantons, in their 2011 and 2015 joint declarations on education policy objectives (EAER & EDK, 2015), stipulated that exam-free access from baccalaureate schools to universities should be secured in the long term (→ *Institutions*, page 140). For the purposes of securing this long-term access without an examination, the EDK launched five projects (as resolved at its plenary meeting of 22 March 2012), adding recommendations on 17 March 2016.

Project 1 defines basic subject-related study skills in mathematics and first language, and has been integrated since the 2016/17 academic year in the annex to the framework curriculum for baccalaureate schools.

Project 2 describes support options for schools wishing to organise more joint testing. Project 3 seeks to build communication and cooperation between baccalaureate schools and universities, placing these aspects on a more permanent footing. Project 4 involves investigating the patterns of individual school careers and transitions to higher education so as to improve study and career advice at baccalaureate schools and reduce high drop-out rates and levels of course switching. Project 5, which was less of a priority and which was intended to tackle the nationwide harmonisation of the duration of education leading to the baccalaureate, was not implemented.

Based on these projects, the EDK issued the following recommendations on 17 March 2016:

1. The cantons should adopt framework specifications regarding the subject-related study skills in mathematics and first language stipulated in the framework curriculum.
2. Transparency and comparability in relation to examination procedures should be increased by having the cantons adopt framework specifications for harmonised baccalaureate examinations (→ Figure 145) and by supporting joint testing in schools. Joint testing adheres to the principle that teaching staff in a school work jointly to develop individual subject examinations and the corresponding assessment and marking indicators, which are the same for all pupils in the same year at the same school (→ *text in left margin*). A representative survey of the Swiss population showed that there would even be majority support across the country for a uniform baccalaureate examination for the whole of Switzerland.
3. Measures such as optimising study and career advice are planned to improve the transition to university. In its decision of 17 March 2016, the EDK recommends, with the Confederation's agreement, that the cantons should develop framework specifications on the development and implementation of concepts for selecting jobs, courses of study and careers while at a baccalaureate school.
4. The baccalaureate is to be reviewed again, on the basis of EVAMAR II.

Teachers

Teachers in a baccalaureate school must have successfully completed a Bachelor's and a Master's degree. Usually, teachers will study two subjects, which they will then go on to teach at a baccalaureate school. The EDK's Recognition Regulation does not contain explicit minimum requirements regarding

the specific content of studies or in terms of the level to be achieved. In its decision of 12 May 2016, the EDK fleshed out the details of the recognition process. Teacher training itself takes one year of full-time training and may be begun alongside a course of study or completed after graduation.

Effectiveness

According to Article 5 of the Regulation on the Recognition of the Baccalaureate adopted in 1995 (MAR 95), the tasks of baccalaureate schools are to guide pupils towards the level of personal maturity required for higher education and to prepare them for demanding functions in society. In other words, the purpose of pursuing a baccalaureate at a baccalaureate school is to obtain a «deeper social maturity» (Eberle, Gehrer, Jaggi et al., 2008) and, in particular, to gain the «ability to study».

While the first goal, deeper social maturity, is very difficult to evaluate empirically, it is at least possible to assess the extent to which students have acquired an ability to study, using competence measurements at the end of baccalaureate schooling, rates of transition to higher education and success rates in relation to courses of study. With regard to social maturity, there is only a recent study conducted by Bern University and commissioned by the SERI (Stadelmann-Steffen, Koller & Sulzer, 2015), which shows that the political education of pupils is enshrined as a goal in most teaching plans, albeit with very different implementation models in the respective cantons in terms of the specific subject content being taught.

Pupils' prior knowledge on transition to a baccalaureate school

When assessing how effective baccalaureate schools are in achieving their goals, the prior knowledge of the basis on which pupils are accepted into the school in the first place should also be taken into account, i.e. how difficult it is for the baccalaureate schools to achieve their goals.

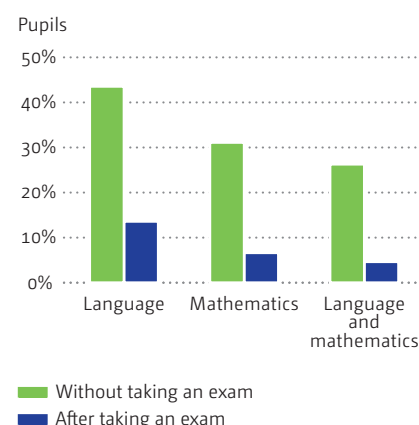
Based on the data on the education choices and progression of those pupils who sat the PISA test in 2012 (SEATS data), it is firstly clear that the average prior knowledge of the pupils entering a baccalaureate school or already attending such a school varies greatly between cantons with differing baccalaureate rates but also between cantons with differing admission procedures (→ *Institutions*, page 140).

Based on the competence definition for the PISA test, it can be assumed that those students about to go to a baccalaureate school would have to achieve at least competence level 4 in the PISA tests.

While less than 5% of pupils in cantons with a leaving or entrance examination (→ Figure 146) entered a baccalaureate school with a competence level of less than 4 in both reading and mathematics, this percentage is in excess of 25% in those cantons without an examination. What this means is that the cantons not only differ in terms of the likelihood of their pupils with the same competencies being able to enter a baccalaureate school but, in particular, in terms of the probability of being admitted to this type of school despite not having reached the required competence level.

146 Proportion of pupils with a PISA competence level below 4 attending a baccalaureate school after completion of compulsory education (2012/13), according to entrance method

Data: SEATS; calculations: SCCRE



In many cantons pupils transfer to baccalaureate school after their 8th year, i.e. they took the PISA test while attending the school but did not at that time achieve the competence levels that would actually be needed to attend a baccalaureate school.

Another Swiss study assessed the selection process used by baccalaureate schools on the basis of the pupils' IQ levels (*Stern & Hofer, 2014*). Given that the baccalaureate rate in German-speaking Switzerland is around 20% and assuming that the most intelligent 20% of pupils should be the pupils admitted to baccalaureate schools, the IQ of those starting such schools should in theory be 113 points. However, 30 to 50% of the baccalaureate students studied had an IQ of below 113 points.

This analysis is not directly comparable to the analysis of PISA competence levels of new baccalaureate students. While the analysis of IQ involves an evaluation based on the assumption that only the top 20% in terms of intelligence should enter a baccalaureate school, the evaluation of the rate of inappropriate allocations based on the PISA measurements assumes that a minimum of competencies are needed to enter a baccalaureate school but that the proportion of those who should attend such a school does not have to be stipulated. If, instead of the current average of 20% of young people attending baccalaureate schools, 30 or 40% of pupils reached the competence levels required for such a school, this would also be conceivable with much higher baccalaureate rates than currently apply without resulting in more students being allocated to the wrong school type.

There are of course compensatory processes that help to correct uneven admission decisions, in that varying numbers of baccalaureate students are allowed to repeat a school year or are taken out of the baccalaureate school system altogether (*Wolter & Zumbühl 2017b*). There must be some doubt as to whether all of the qualitative differences between the cantons in relation to accessing baccalaureate schools can be evened out in this way by the time of the baccalaureate examination, taking into consideration the negative correlation between competences at the end of baccalaureate school and cantonal baccalaureate rates (see EVAMAR II).

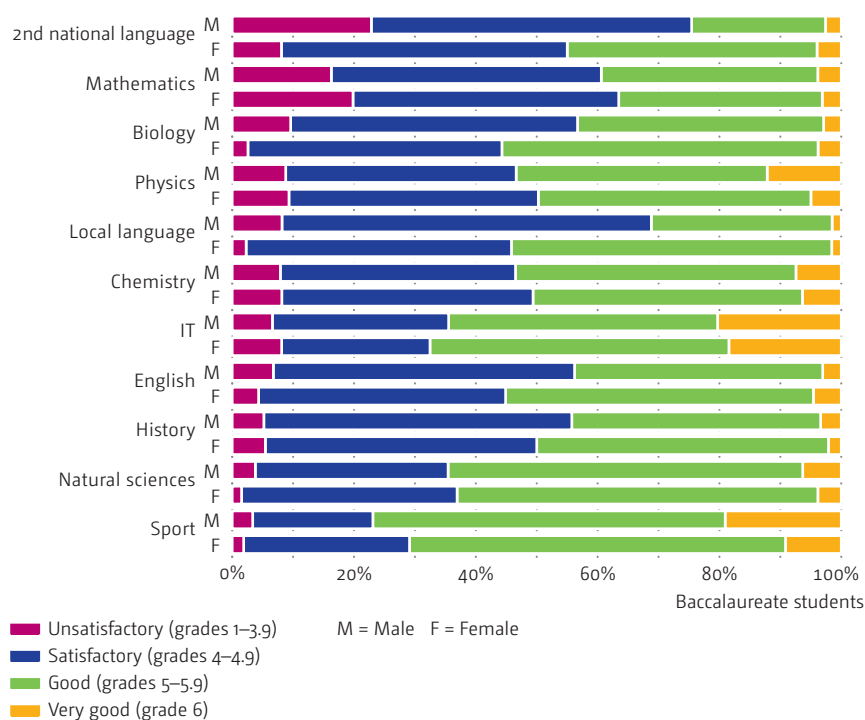
The baccalaureate and study success

The award of the baccalaureate attests students' general ability to study, as the baccalaureate certificate grants exam-free access to all courses of study (with a few restrictions) at universities and universities of teacher education in Switzerland. Nevertheless, it has already been demonstrated in EVAMAR II (*Eberle, Gehrler, Jaggi et al., 2008*) that not all successful holders of a baccalaureate certificate can be attested as having a general ability to study on the basis of the measured competencies.

The extent to which even successful baccalaureate students differ in their achievements is clear from the baccalaureate grades. A list of the insufficient achievements of baccalaureate students in the various relevant subjects was drawn up in 2012 (*Bührer, Egli, Hügli et al., 2014*). For example, around 20% of pupils achieved insufficient grades in mathematics (→ Figure 147). These findings more or less correspond to the EVAMAR II results from 2007.

147 Grades achieved by baccalaureate students in various subjects

Data: Swiss Academies of Arts and Sciences, 2014



This would in itself be relatively unproblematic if those people with a restricted ability to study selected those subjects for which their competence profile nevertheless indicates a good chance of success. Whether this happens is not easy to answer but the latest studies show that this course selection strategy only improves the chance of success to a limited extent.

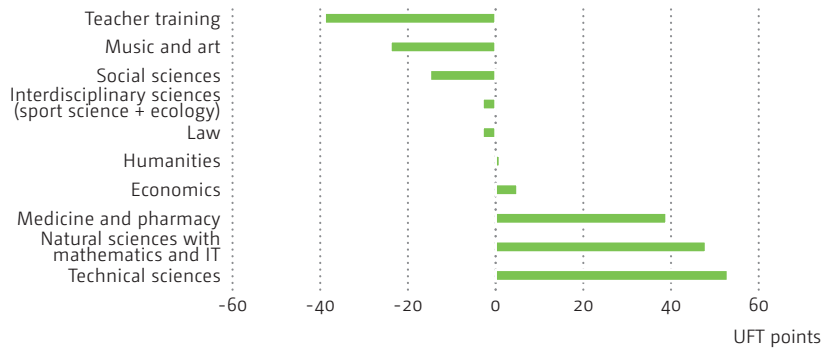
A follow-up study to EVAMAR II carried out for German-speaking Switzerland showed that the composition of students on individual courses varies a great deal in terms of prior knowledge. This study further investigated the link between the performance of the baccalaureate holders in the EVAMAR II measurement and their choice of studies (Eberle, 2016). The competencies of the baccalaureate students in general cognitive study skills (measured using the UFT, *see below*) differ markedly according to the course of study selected (→ Figure 148).

Legend

According to the **General Aptitude Test** students with a baccalaureate who opted to study in the field of technical sciences scored 50 points more in general cognitive study skills tests than those students who opted for an arts course.

148 **Deviation from the average in the EVAMAR II test of general cognitive skills³ and course choice**

Source: Eberle, 2016



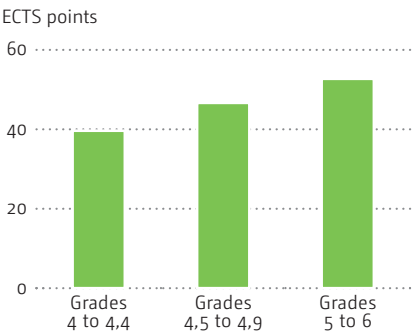
The general cognitive skills were measured for EVAMAR II using the General Aptitude Test (UFT). This test is based on the aptitude test for medicine degrees and covers general cognitive skills such as analytical and logical thinking, learning techniques and self-discipline (Bosse, Eberle & Schneider-Taylor, 2013). It is not yet possible to say whether this is because the students are aware of their general cognitive skills and any resulting restrictions in their ability to study, leading them to choose subjects in which they anticipate a higher likelihood of success.

What is clear, however, is that the decision to study a specific subject for which any competence shortfalls are less crucial does not protect students with poor baccalaureate grades from a higher failure rate during their studies. Even though baccalaureate grades are not awarded on the basis of standardised examinations, analysis of the Zurich data from EVAMAR II in any case shows that the average grade in the baccalaureate is one of the best predictors of a student's subsequent results during their studies. (Eberle & Oepke, 2014). Data for the 2014/15 entry cohort at Bern University further confirms this finding. Taking into account the degree subject chosen, the special subject studied for the baccalaureate, various personal qualities of the individual and qualitative assessments regarding the workload (e.g. if also working during studies) of the student, it is clear that those students who gained an average grade of between 5 and 6 in their baccalaureate examination gained almost a third more ECTS credits during their first year of study compared with those students whose average grade was between 4 and 4.5 (→ Figure 149). The ECTS credits achieved are again an important predictor of how the studies will progress in future (→ chapter Universities, page 197). It is not possible to say without experimental analysis whether the baccalaureate grade accurately portrays the competencies acquired at school or elsewhere that are crucial to study success or whether students who do well in their baccalaureate stand out from their peers in other ways too, so that they have a better chance of success during their studies. Nevertheless, it must be concluded that if students have rather poor results at the time of their baccalaureate, or even sufficient results, this indicates a restricted ability to study.

149 **Number of ECTS credits gained in first year of studies according to baccalaureate grade (average grade) for 2014/15 entry cohort at Bern University**

Only students resident in Switzerland prior to studies; students from medical faculty not included due to lack of data. Grades are from 1 to 6, 6 is the best grade.

Data: Bern University and SCCRE



3 As well as the UFT, the study also considered skills in German, mathematics and biology. These are not all shown here.

Special subject and choice of study

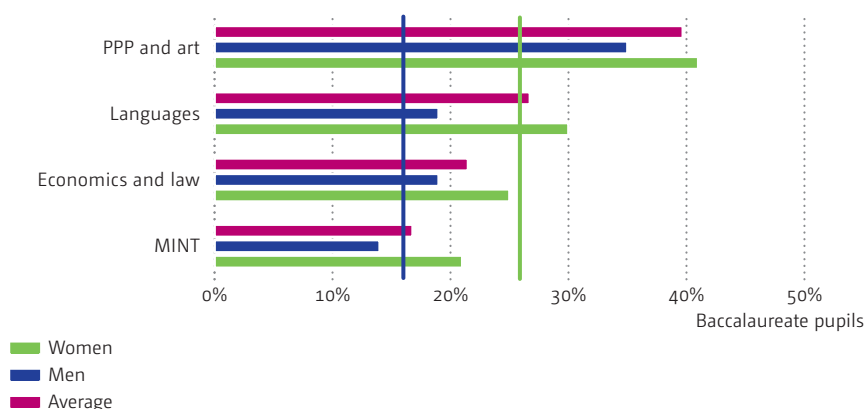
In addition to the finding that general ability to study can influence the degree course chosen, the link between the special subject chosen at baccalaureate school and the selected degree course is strong, as was already demonstrated in the 2014 Education Report. It is not yet possible to say precisely, however, whether this correlation is also an expression of preferences that were already reflected in the choice of special subject at school or whether the prospective student is forced to accept when picking a degree course that some special subjects provide a better basis for some subjects than others. The former will indeed apply in many cases but cannot be the only explanation for the strong correlation between the special subject chosen for the baccalaureate and the choice of degree subject, not least because it cannot be assumed that the individual preferences for subjects would differ between the individual cantons to the extent that choices of specialisation at baccalaureate schools do (→ Figure 143).

The latest available data on degree choices also show, however, that the special subject not only influences the choice of study but also, in particular, influences whether an individual even decides to take up a university course (→ Figure 150). This effect is independent of gender and can be partly explained by the fact that baccalaureate students who specialised in the arts or in philosophy, education & psychology tend to be much more likely to study at a university of teacher education or university of applied sciences. Due to the lack of individual data, an approximation was carried out for the calculation, linking the statistics on final qualifications (no. of baccalaureates gained) to the individual data from SHIS/LABB⁴. This has resulted in totals that deviate slightly from 100%.

150 Proportion of baccalaureate students in the 2014 cohort who had not started a university course by 2016, by special subject and gender

The special subjects «classical languages» and «one modern language» were combined to form «languages»; «physics & applied mathematics» were combined with «biology» and «chemistry» to form «STEM»; and «philosophy, education & psychology», «creative art» and «music» were merged to form «arts».

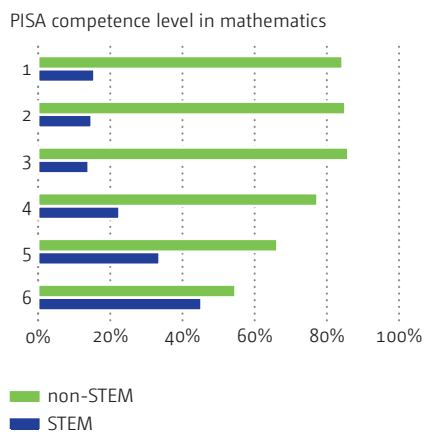
Data: FSO (SHIS, SBA); Calculations: SCCRE



⁴ SHIS = Swiss Higher Education Information System; LABB refers to the FSO project «Long-term analysis in the education sector».

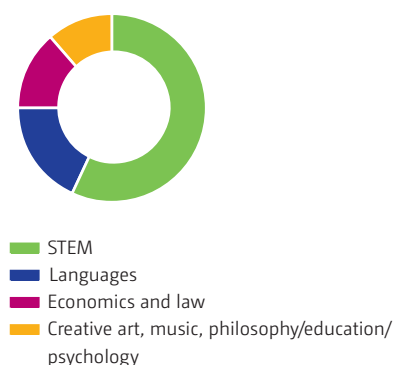
151 Correlation between competence level in mathematics at the end of compulsory education and the likelihood of selecting a STEM special subject at baccalaureate school

Data: SEATS; calculations: SCCRE



152 New university students in STEM subjects based on their special subject for their baccalaureate, 2016

Data: FSO (SHIS); calculations: SCCRE



STEM stands for science, technology, engineering and mathematics. Special subjects classed as **STEM specialisations** at baccalaureate schools are «physics and applied mathematics» and «biology and chemistry». A course of study is defined as a **STEM course** if a **STEM subject** is studied at a university or university of applied sciences. This includes IT, engineering (e.g. mechanical engineering), construction (e.g. architecture), natural sciences (e.g. chemistry or biology) and exact sciences (e.g. physics).

Shortage of skilled workers in STEM and healthcare sectors

In accordance with the 2015 joint declaration on education policy objectives of the Swiss Confederation and cantons, awakening an interest in STEM (→ *text in the margin*) and healthcare professions among children and young people is a priority.

The competencies gained by the end of compulsory education already have an impact on whether a STEM subject will be chosen as a special subject. In Figure 151, based on evaluations of the SEATS data, we can see that from a competence level for mathematics of 4 there is a practically linear correlation between the mathematics competencies measured in PISA and the likelihood of a STEM special subject being chosen. Obviously, the number of young people with mathematics results below competence level 4 who move on to a baccalaureate school is very small.

If we consider the origin of students studying a STEM subject at a university or Federal Institute of Technology (ETH), we see that around 60% had already opted to study a STEM special subject at their baccalaureate school (→ Figure 152). Current international research also demonstrates that providing more lessons in natural sciences in baccalaureate schools can help to increase the number of students registering for STEM subjects (*De Philippis, 2017*). This shows that choosing a STEM course is not just a question of individual preferences but can also be influenced by the intensity of education in STEM subjects.

Multivariate analysis confirms the descriptive correlations, i.e. the selection of a STEM special subject at baccalaureate school is a good predictor of a STEM course subsequently being selected at university. Additionally, regardless of special subject, a good grade for mathematics also has a positive impact on the selection of STEM courses. The fact that preferences for STEM subjects do not match up with the cantonal proportions for STEM special subjects at baccalaureate level is also reflected in the fact that, in cantons with a low proportion of STEM special subjects, it tends to be young people from other special subjects who opt for a STEM course compared with cantons that have a high proportion of pupils opting for STEM special subjects. A distance effect is also in evidence to the extent that students from the cantons of Zurich and Vaud, i.e. students who live close to an ETH, are more likely to opt for a STEM subject. In the case of Vaud, this choice could still be explained by the high proportion of STEM special subjects at baccalaureate level, but this does not apply to Zurich, which has one of the lowest shares of STEM special subjects in its baccalaureate schools. Whether students who have not previously done STEM subjects as their special subject have equally good or poorer prospects of success on a STEM degree course cannot yet be determined from the current data.

The transition from baccalaureate school to higher education

Transition rates must be treated with caution as measures of baccalaureate school effectiveness, because in Switzerland everyone who leaves a baccalaureate school with a baccalaureate certificate is entitled to a place in higher education.

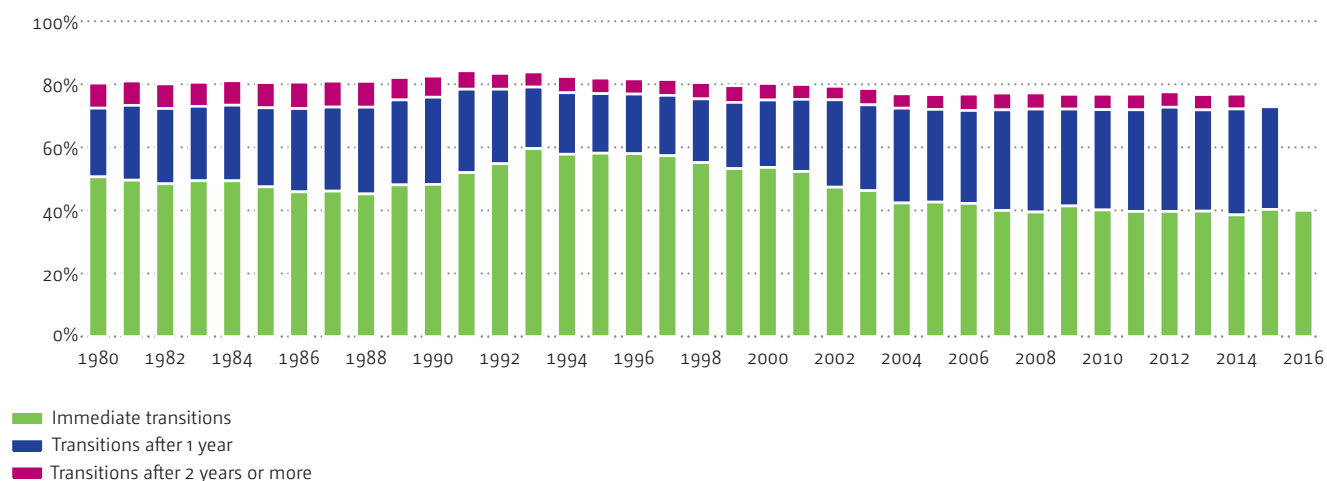
Three quarters of those who gain their baccalaureate go on to university, with 40% doing so the same year and a good 30% starting at university the following year. After that university transition rates fall to single-digit percentages. Compared with a rate that almost hit 60% in the early 1990s, the rate of immediate transitions has dropped considerably over the last ten years, while the percentage of baccalaureate holders who wait a year has increased by an almost identical proportion (→ Figure 153). This delay in commencing studies has cancelled out the effect of shortening the baccalaureate cycle in many cantons, which had lowered the average age of students.

Women transfer from a baccalaureate school to a university at a much lower rate than men. That is because women opt more frequently for tertiary education outside of universities, notably with a view to working as teachers or in the health sector. If this tertiarised training is factored in, the transition rate to higher education is virtually the same for men and women.

153 Transitions to universities

Data: FSO

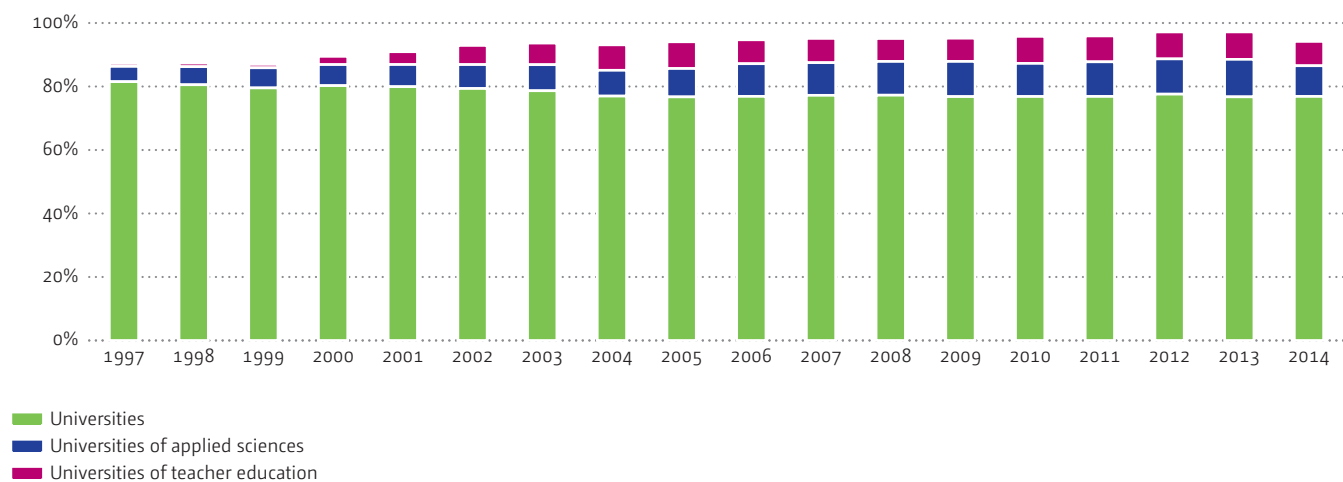
Students



154 Transitions to an institution of higher education

Data: FSO

Students



Efficiency / costs

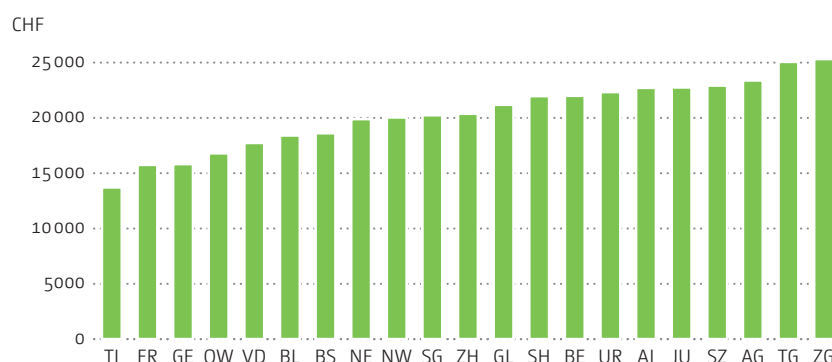
As with any education cycle, it is difficult to assess the efficiency of baccalaureate school education. Three problems arise when measuring efficiency, all of which are exacerbated in the case of baccalaureate schools. Firstly, we have no nationwide, standardised measurements of attainment at baccalaureate schools that might serve as output values. Secondly, it is relatively difficult to control the effects of self-selection and external selection, which is also why it is not possible to demonstrate the contribution made by the baccalaureate school to the formation of skills. Thirdly, as in the case of other educational levels, the inputs are relatively difficult to compare across cantons, in terms of both the real and the monetary inputs. This prevents the forming of conclusions at the current time about the efficient or inefficient use of inputs.

Annual expenditure for pupils in general education schools at upper-secondary level

The figures for annual expenditure per pupil fluctuate so markedly over time for some cantons that it can only be assumed that the data cannot be correct. This even applies if only the expenditure on staff salaries is considered (such as the salaries for teaching staff) that should be least influenced by different cost accounting methods. Even if we exclude those cantons from the intercantonal comparison that do not display any striking patterns over time, the differences between the cantons remain very high (→ Figure 155). It is not possible to assess whether these are purely due to real factors, such as differences in staff/student ratios or the rates of teachers' pay, or whether there continue to be differences in accounting or expense allocation.

155 Public expenditure for staff salaries per pupil in general education upper-secondary schools

Salaries for teaching staff and other members of staff such as management team and administrators
Averages for 2013 and 2014, including Pro-baccalaureate classes
Data: FSO, EFV



Note on Figure 155

The Federal Statistical Office has determined that it is not possible to distinguish between teaching staff and administrative staff for accounting purposes in many cantons. The data on the salaries paid to all staff is therefore used.

General education schools are baccalaureate schools, upper-secondary specialised schools and other forms of general education school. According to the Federal Statistical Office, upper-secondary specialised schools are integrated into the baccalaureate schools in some cantons, with teaching staff shared across the two streams in some cases. It is not possible to break down the salary figures by education type.

Year repetitions and premature exit from baccalaureate schooling

Premature exits from a baccalaureate school suggest an inadequate match between the pupil and the school, which is rectified by the pupil's departure. However, that does not necessarily mean that baccalaureate schools with

low drop-out rates have no problems with matching. This apart, drop-outs signify an efficiency loss for the individual concerned (more time spent in education) and for society (higher education costs) which might be avoided if the probability of drop-out could be reduced by improving selection at entry to the baccalaureate school.

Following the modernisation of education statistics, repeated years and premature departures from baccalaureate schools can be measured accurately for Switzerland as a whole. It is not yet possible, however, to break down the repetition figures for the individual cantons.

Around one fifth of baccalaureate students take longer than the minimum time required to complete their schooling (→ *chapter Upper-secondary education, page 99*), repeating at least one year. With regard to the efficiency of the system as a whole, it is crucial to establish whether these repetitions are distributed more or less equally across all baccalaureate schools or if they are concentrated on certain schools. If the former applies, the cost impact of students repeating a year will be low, as having an extra student in a class or losing one student from a class does not have any cost implications. If, however, repetitions are concentrated in certain schools resulting in some classes losing pupils and continuing their schooling as a smaller group while additional classes are needed for those who are having to repeat a year, the cost of repetitions could be high at a systemic level.

Even if repetitions do not adversely affect efficiency at a systemic level, they invariably impact individual efficiency. If around one fifth of baccalaureate students need one year longer than originally planned to achieve their goals, the individual return on education will also be considerably lower.

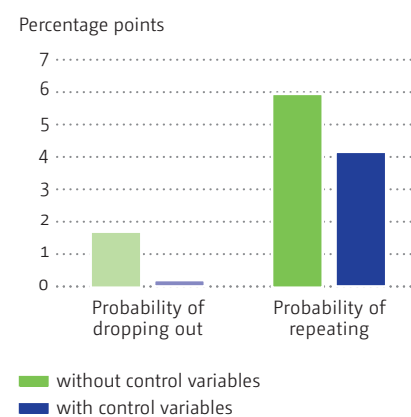
Even if qualitative surveys on drop-outs from baccalaureate schools focus on motivational factors (*Stamm, 2010; Pfulg, Meylan, Gyger Gaspoz et al., 2014* and *Cecchini, 2016*), the data from the PISA 2012 cohort (SEATS) can at least be used to establish that a significant proportion of repetitions and drop-outs during the first year of baccalaureate school could have been avoided if information similar to that used to measure PISA competencies had been taken into account when making the decision to grant a place at a baccalaureate school (*Wolter & Zumbühl, 2017b*).

In addition to those cases where there are indications that the pupil is unlikely to succeed at baccalaureate school based on their academic performance when ready to join the school, there are instances where the school results at that juncture should actually be sufficient but were «only» achieved with the help of private tutoring.⁵ If we compare the academic progress of those baccalaureate students who made use of private tuition before starting baccalaureate school with those who did not (→ Figure 156), we see that the probability of the former having to repeat their first year is statistically significantly higher. The higher probability of dropping out of baccalaureate schooling is not statistically significant. A comparison of baccalaureate students with identical results in the 2012 PISA test according to whether or not they had private tutoring before starting baccalaureate study, shows that the higher likelihood of them dropping out can be entirely explained by the different competencies when starting the baccalaureate school but that

⁵ The question of whether the PISA results were in fact improved by private tutoring or whether the pupils would have scored the same results without tutoring is not considered here in any more detail. The data on the use of private tuition are taken from the additional PISA study on the 2012 survey (*Hof & Wolter, 2014*).

156 Difference in drop-out/repetition rate during the first year of baccalaureate school after compulsory education between pupils who did and pupils who did not receive private tutoring during lower-secondary education*

Data: OECD (PISA, 2012), SEATS; calculations: Centre for Research in Economics of Education at Bern University



Matt colours indicate statistically insignificant effects.

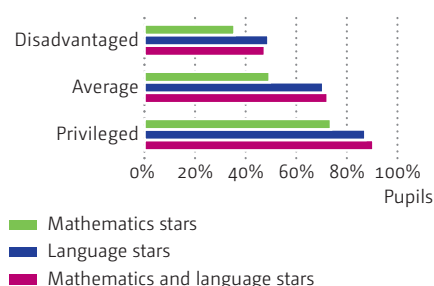
* On average 9.5% of baccalaureate students in this random sample repeat their first year and a further 6.1% drop out. The calculations here also still partly include those students who received private tutoring during the first year of baccalaureate school due to their attending the baccalaureate school before reaching the end of their compulsory education, i.e. due to their having attended the long-term baccalaureate school or switching to it after 10th year (HarmoS).

the higher probability of having to repeat a year still applies. With regard to the causes of a higher likelihood of having to repeat among those who have received private tutoring but who otherwise have the same competency levels, it is currently only possible to speculate. It is possible that those young people who have received tutoring differ from those who have not in other aspects that are not obvious but that affect success at baccalaureate school level. It is also possible that they might have adopted learning strategies during their private tutoring (Hof, 2014) that are not suited to a baccalaureate school or it could be that they did not have the same potential to progress successfully through baccalaureate schooling despite demonstrating the same competences prior to attending.

As with those young people who enter a baccalaureate school with insufficient prior knowledge, young people who have been tutored also face a considerably greater risk of dropping out early or having to repeat years. We do not know if parents or pupils have decided in favour of attending a baccalaureate school while fully aware of this risk simply because this education route was more important to them than a safer alternative.

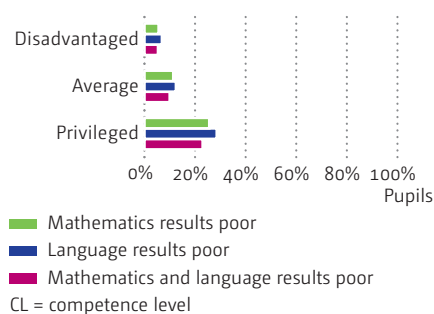
157 Socio-economic origin of pupils with very good results who wish to move to a baccalaureate school after their 11th school year

Data: SEATS; calculations: SCCRE



158 Socio-economic origin of pupils with poorer results (below CL 4) who attend a baccalaureate school in their 11th school year

Data: SEATS; calculations: SCCRE



Equity

Equity can be examined at entry to a baccalaureate school, within the baccalaureate cycle or at entry to tertiary education.

At entry to baccalaureate schooling, the primary and secondary effects of educational disparity are relevant. The primary effects include the socio-economic and cultural origins of pupils, which have a direct impact on attainment. This means that young people from a socio-economically disadvantaged background only achieve poorer school results due to their origin and it is only because of this origin that they are less likely to attend a baccalaureate school. The secondary effect of educational disparity emerges where privileged groups or a gender are over or under-represented even with comparable attainment. Such inequality is particularly disturbing where potentially less able pupils from privileged families are given places in baccalaureate schooling over potentially more able pupils from less privileged households. Yet such competition is difficult to prove as a decision for or against baccalaureate education may also depend on the individual educational preferences⁶ of the parents or the pupils themselves. Moreover, this type of competition will only be virulent in those cantons where the supply of places is considerably lower than the demand and where objective or objectifiable school results are not adequately taken into account when allocating places. Regardless of whether, in the case of sufficient and similarly good attainment, a varying level of probability of getting a place in a bacca-

6 Differing educational preferences would be problematic from an equity perspective if they were the result of a lack of opportunity for all, if for example the lack of inclination to send children to a baccalaureate school were related to a fear on the parents' part that they would face financial commitments as a result that they would struggle to afford due to their lower household income. In such a case people express a preference for a different education type but only because they lack the financial freedom to make a free choice from all of the available options.

laureate school is due to discrimination or different preferences, questions arise at a systemic level as to the effectiveness and efficiency of the system if potentially less able pupils are being given a baccalaureate school place solely on the basis of their origin.

More recent data confirm the findings contained in earlier education reports that the likelihood of attending a baccalaureate school is strongly influenced by socio-economic background, which manifests itself in two ways. Firstly, very talented young people from disadvantaged socio-economic backgrounds are only about half as likely as comparably gifted young people from socio-economically privileged families to attend a baccalaureate school (→ Figure 157).

Secondly, the figures show that, conversely, (→ Figure 158) young people who attend a baccalaureate school without fulfilling the necessary competence requirements come almost exclusively from socio-economically privileged families. Put bluntly, the gap left when very good young people from disadvantaged families do not go to a baccalaureate school is being filled by young people from privileged families who in reality do not have the competencies required to attend such a school.

Gender and STEM

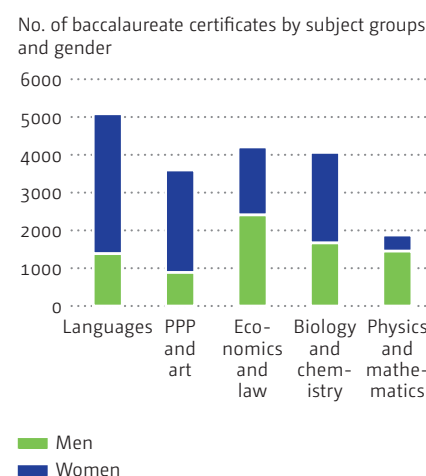
Alongside the question of who decides for or against a baccalaureate school education, the question of the special subject chosen is increasingly becoming a priority. This is because the EVAMAR II evaluation of competencies at the end of a baccalaureate school education has shown that these vary greatly from one specialisation to another, and because the choice of special subject subsequently influences the choice of degree course, regardless of the competencies acquired from taking that special subject in school. The marked gender-based differences in subject choice are striking (→ Figure 159), resulting in different selections being made by both genders to the same extent.

There is, however, no obvious general under-representation of women if we consider the two special subjects to which the STEM subjects can generally be allocated, as the proportion of women opting for natural sciences is considerably higher than the proportion of men. It is only in the case of exact sciences, physics and applied mathematics in particular, that women are significantly under-represented. This difference may have a negative impact on women's careers in their later working lives, as the latest studies show that there is a positive correlation between the requirement level for a career in the area of mathematics and the salary paid, but no such correlation in the area of natural sciences or languages.

The reasons for women being under-represented specifically in the exact sciences are diverse (see *Kahn & Ginter, 2017*, for an overview on gender and STEM). The latest findings from Switzerland show the influence of teaching staff and, at the same time, the influence of so-called non-cognitive competencies as potential explanatory factors for girls being less likely to choose maths or physics as their special subject. While *Han, Elsässer, Lang et al. (2017)* and *Terrier (2015)* claim that teachers generally give girls better marks for the same level of work, a Swiss study of physics grades (*Hofer, 2015*) demonstrated that teachers in lower-secondary education who had been teaching for less than ten years, gave girls significantly worse marks than boys for the same standard of work. This is the type of thing that can

159 Choice of special subject and gender, 2016

Data: FSO



impact the choice of special subject, as other studies show that girls who benefit from better marks in mathematics are more likely to choose a special subject for their baccalaureate from the natural or exact sciences. With regard to the influence of non-cognitive competencies, it is firstly clear that even very intelligent girls reject physics (and maths) due to their own self-image and level of interest (*Hofer & Stern, 2016*), but also due to a lack of competitive inclination. *Buser, Peter & Wolter (2017a)* showed using the selection of special subjects by baccalaureate students in Bern that it is mainly those young people who are highly willing to compete with others who opt for physics and mathematics. The fact that this competitive spirit features strongly among talented men, but not among women, explains a certain element of the gender-based difference in the selection of physics and applied mathematics as a special subject for the baccalaureate.

Compensating for disadvantages

People with disabilities can find it more difficult to gain a place at a baccalaureate school and to progress through that school. They have a legal entitlement to compensation for disadvantages (*Glockengiesser, 2015*). This relates to proportionate adjustments to the teaching or examinations so as to ensure that the disadvantages suffered by pupils as a result of a disability are compensated. With regard to post-compulsory schooling, the central aim of the education is used as the basis for determining the scope of the adjustment measures (*Glockengiesser, 2015*). Any compensation for disadvantages may, however, only be provided in the form of adjustments to examination procedures and not in the form of changes to the learning objectives (*Hungerbühler & Schwaller, 2015*).

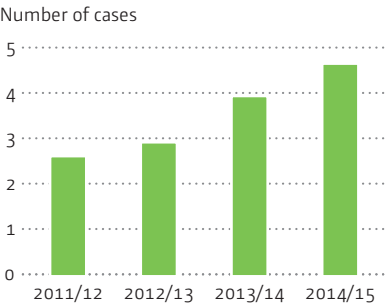
Adjustments made for pupils with a disability are not handled uniformly across Switzerland but differ from one canton to another and even from one school to another (*Leuenberger, 2015*). This results in a heterogeneous mix of processes, criteria and compensatory measures (*Hungerbühler & Schwaller 2015*). Although there is no representative data available for Switzerland, a study carried out by the University of Applied Sciences of Special Needs Education reveals that the average number of cases per baccalaureate school has risen over recent years from just under 3 to almost 5 (→ Figure 160). The most frequent measures relate to dyslexia, in other words helping to tackle problems with reading and writing. Almost half of the measures concern time modifications (e.g. granting additional time to complete an examination). Adjustments may also be made to the type of assignment or examination (e.g. oral instead of written), the assessment criteria can be changed (e.g. grammatical errors not taken into account) and pupils might be permitted to use technical aids (*Schellenberg, Hofmann & Georgi, 2016*).

Whether and to what extent the measures introduced to compensate for disadvantages help to enable people with disabilities to pass their baccalaureate is difficult to evaluate on the basis of the available data⁷ and given the lack of observation.

7 There are no known studies from Switzerland comparing people with disabilities and their experiences of the baccalaureate school system with and without measures to compensate for disadvantages.

160 Compensation for disadvantage at baccalaureate schools: Number of cases per school

Non-representative random sample
Source: *Schellenberg, Hofmann & Georgi 2016*





Strandkrabbe
Carinus menckeni

Upper-secondary
specialised schools

Upper-secondary specialised schools (FMS) are like baccalaureate schools, i.e. part of the general education system at upper-secondary level. They provide a significant proportion of general, post-compulsory school education, while offering more in-depth vocational studies at the same time. As a result, they provide a basis for tertiary-level professional education and training in specific vocational areas at professional colleges or for a course of study at a university of teacher education or university of applied sciences.

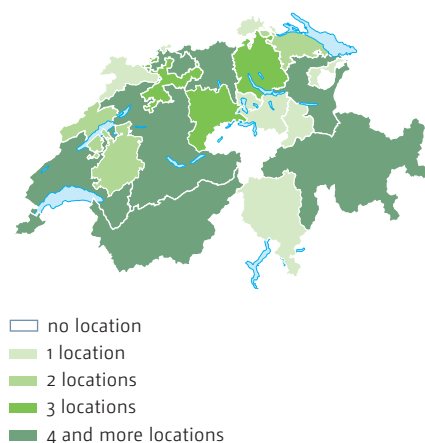
Institutional development of upper-secondary specialised schools

Upper-secondary specialised schools emerged in connection with the advent of universities of applied sciences in the 1990s and were preceded by the *Diplommittelschulen* (DMS). The name was changed as a result of the Federal Vocational and Professional Education and Training Act of 2002, which stipulates that only tertiary-level qualifications can be called diplomas. The assumption of responsibility for vocational training in the fields of health, social work and the arts (GSA) by the Confederation and the widespread allocation of GSA occupations to the tertiary sector, in conjunction with access to GSA occupations being provided via an apprenticeship, also called for a rethink of the old DMS approach.

The current diversified range of subjects offered at upper-secondary specialised schools is designed to ensure access to the corresponding tertiary-level professional education, on attaining the specialised school leaving certificate following completion of a three-year full-time course of study. On finishing the specialised school leaving certificate, it is possible to study for another eight to twelve months for the specialised baccalaureate. This qualification enables access to a university of applied sciences to study the applicable area of specialisation. The specialised baccalaureate in the field of education is the entry requirement to a teacher-training course for the first learning cycle and primary level in most universities of teacher education. Since 2017, holders of a specialised baccalaureate have also been able to go on to university, subject to passing an additional examination. This education offer only used to apply to holders of a Federal Vocational Baccalaureate (EDK, 2016c).

161 Geographical distribution of FMSs

Data: www.fms-ecg.ch; Map: Swisstopo



Upper-secondary specialised schools and their offering

22 cantons in Switzerland have upper-secondary specialised schools (→ Figure 161). They are mainly attached to baccalaureate schools. There are seven specialisations on offer, plus combinations of specialisations (e.g. health/social work or health/education). Most cantons offer a choice of two to four areas of specialisation. Although not all cantons initially offered the specialised baccalaureate through upper-secondary specialised schools, that has changed significantly in recent years. Now all of the 22 cantons offer the specialised baccalaureate.

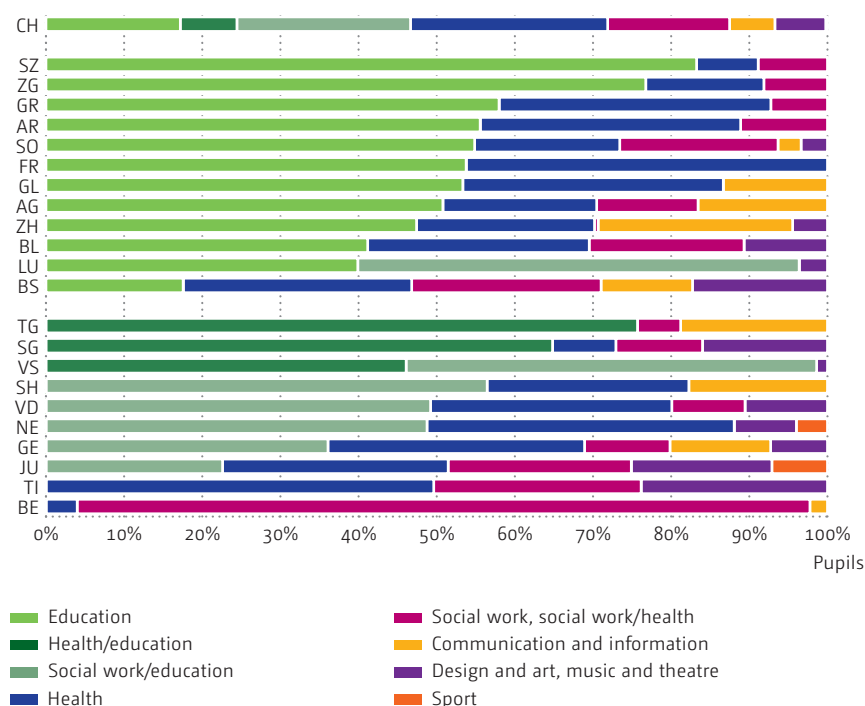
The distribution of the pupils among different areas of specialisation means that upper-secondary specialised schools still mainly serve as feeder schools for non-university tertiary training in the field of education, paramedicine and social work (→ Figure 162). In most cantons, over 80% of pupils at upper-secondary specialised schools complete courses in education,

health or social work (70% in the cantons of Basel-Stadt and Zurich). These specialisations are offered in all the cantons, whether as a sole specialisation or in varying combinations.

162 Distribution of pupils at upper-secondary specialised schools by specialisation and canton, 2015/16

Excluding pupils in the base year and those preparing a specialist baccalaureate

Data: FSO; calculations: SCCRE



Admission requirements and entrance skills

The conditions for admission to an upper-secondary level school or baccalaureate school differ not only among cantons but also within the cantons and between the two education types. In spite of the significant differences, the cantonal acceptance procedures can be divided into three broad categories for the sake of simplicity (→ Figure 163).

Generally speaking, however, the admission requirements for baccalaureate schools are stricter than for upper-secondary specialised schools (*EDK-IDES, 2017*). As a result, the competencies of pupils starting upper-secondary education, as measured by PISA, are higher on average among baccalaureate school pupils than for those attending upper-secondary specialised schools. The average skills of pupils attending upper-secondary specialised schools are more or less similar to those of students in vocational education and training in higher-level apprenticeships (→ *chapter Upper-secondary education, page 99*).

Composition of the FMS pupil population

Following the replacement of the Diplommittelschulen by the upper-secondary specialised schools and the corresponding conversion and expan-

163 Simplified overview of cantonal admissions procedures for baccalaureate schools and upper-secondary specialised schools

Data: EDK-IDES, as at September 2017

| | FMS | Baccalaureate school |
|---|--|------------------------------------|
| As a rule no entrance exam | GE, JU | GE, JU, LU, NE, TI |
| Entrance exam, if the conditions for not having to sit an examination are not met | AG, BE, BL, BS, FR, NE, SO, TI, VD, VS, ZG | AG, BE, BL, BS, FR, SO, VD, VS, ZG |
| As a rule an entrance exam | AR, GL, GR, LU, SG, SH, SZ, TG, ZH | AR, GL, GR, SG, SH, SZ, TG, ZH |

The admission conditions differ for all three categories: Sometimes participation in the expanded requirement profile at lower-secondary level is a condition. The requirements in terms of the grades and their minimal level also differ.

sion phase in the cantons about ten years ago, the proportion of all pupils in upper-secondary level education attending an upper-secondary specialised school has settled at about 5% (→ Figure 164). This ratio is considerably higher (10%) in the French-speaking cantons and it has continued to rise in recent years. The preference for general education at upper-secondary level in French-speaking Switzerland is not only demonstrated through pupil numbers in school-based initial vocational training courses and baccalaureate schools, but also in upper-secondary specialised schools (→ *chapter Upper-secondary education, page 99; chapter Vocational education and training, page 111*).

Three-quarters of FMS pupils are female. In total, almost 7% of all women in upper-secondary level education attend an upper-secondary specialised school. The corresponding percentage for men meanwhile has increased ever so slightly over the past decade and is now at 2%. Foreigners in upper-secondary specialised schools are slightly overrepresented relative to their presence in general upper-secondary level education.

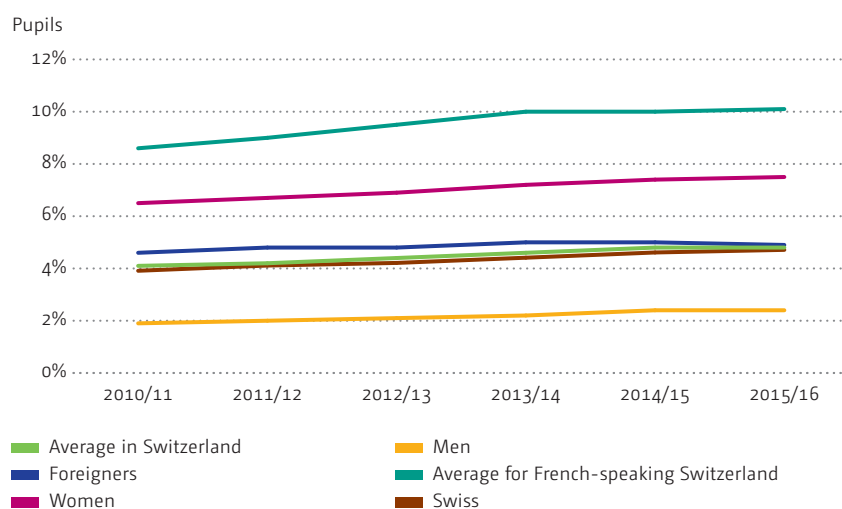
164 Share of pupils in upper-secondary level education at an upper-secondary specialised school 2011–2016

Including FMS pupils and those preparing a specialised baccalaureate

Data: FSO; calculations: SCCRE

Legend

In the 2010/11 school year, 6.5% of all women in upper-secondary level education attended an upper-secondary specialised school. In the same school year, 2% of all men in upper-secondary level education attended an upper-secondary specialised school.



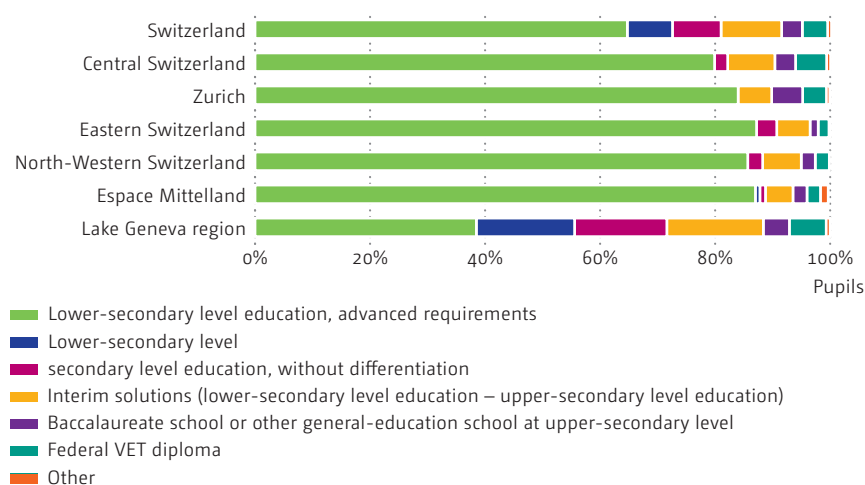
Most young people entering upper-secondary specialised schools come from a lower-secondary class with advanced requirements (→ Figure 165). This is partly because some cantons stipulate that as a minimum entrance requirement.

The modernisation of the education statistics enables an analysis of the entire Swiss upper-secondary specialised school population by social background (parent's educational level). On the whole, the distribution of upper-secondary specialised school pupils based on the parent's level of educational attainment hardly differs from that of the general distribution at upper-secondary level (40% have at least one parent with an upper-secondary level education and 40% at least one parent with a tertiary-level education). A comparison between Swiss and foreign pupils (→ Figure 166), shows that the proportion of Swiss pupils with a parent educated to tertiary level is slightly higher than among the foreign pupils. In both groups the proportion of FMS pupils with at least one parent educated to tertiary level is higher than for the total foreign pupil population at upper-secondary level.

165 Educational background of FMS entry cohorts by FSO-major region, 2014

Canton Ticino cannot be included due to its smaller figures.

Data: FSO



Central Switzerland: LU, NW, OW, SZ, UR, ZG

Zurich: ZH

Eastern Switzerland: AI, AR, GL, GR, SG, SH, TG

Northwestern Switzerland: AG, BL, BS

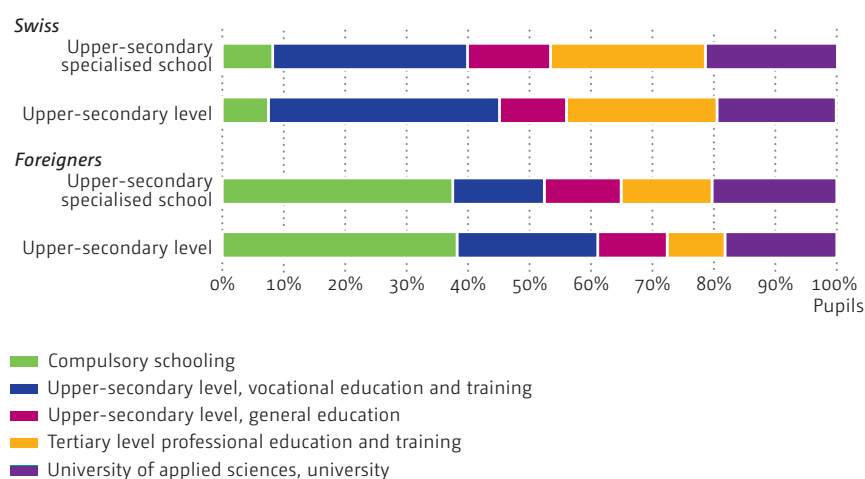
Espace Mittelland: BE, FR, JU, NE, SO

Lake Geneva region: GE, VD, VS

166 Distribution of pupils at upper-secondary specialised schools by nationality and parent's level of education, 2013

excluding those preparing a specialised baccalaureate

Data: FSO; calculations: Chair of Sociology of Education PH FHNW, SNF project FMS



Taking account of school performance and gender, the probability continuing education at an upper-secondary specialised school after compulsory education is the highest for young people with a migration background whose parents are not tertiary educated (6%) (→ Figure 167). The probability is higher for young people without a migration background if the parents have a tertiary-level education (4%).

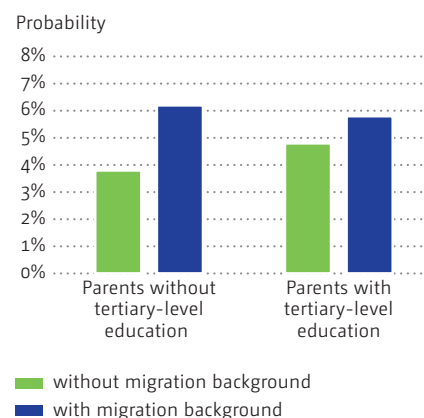
Added value or compensation through general education

As with the baccalaureate rates, the cantonal upper-secondary specialised school ratios show major differences of up to 1:3. The specialised baccalaureates vary between 2% (in cantons Glarus, St. Gallen and Thurgau) and 6% (Basel-Landschaft, Basel-Stadt, Fribourg, Geneva). These differences can result from disparities in demand, in that pupils or their parents pre-

167 Probability of attending an upper-secondary specialised school, by migration background and social background

Taking account of performance and gender. The random sample comprises all pupils, tested in 2012 under PISA and who successfully completed a baccalaureate, upper-secondary specialised school or a VET diploma the following year.

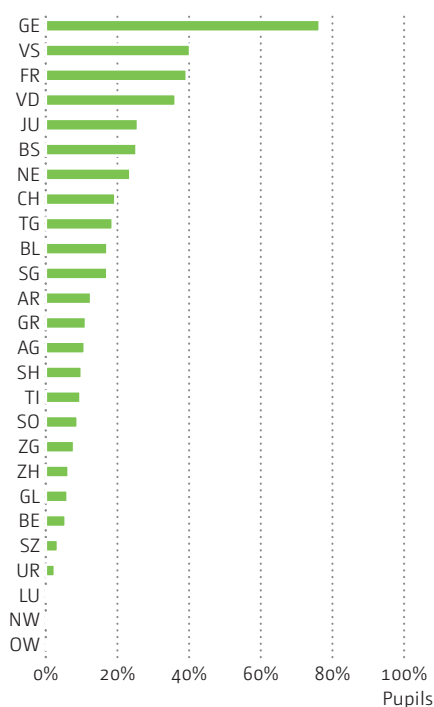
Data: SEATS; calculations: SCCRE



169 Specialising in health at upper-secondary specialised school, by canton, 2015/16

Pupils who complete a course specialising in healthcare at an FMS, by canton of residence (AI is missing due to smaller figures)

Data: FSO; calculations: SCCRE



100% are all pupils and apprentices attending a course specialising in health at an FMS or a VET diploma (FMS without base year and those who prepare for of a specialised baccalaureate, VET without 1st year of education).

FMS: all specialisations related to healthcare (including health/education etc.) are taken into account

VET areas: chemistry and process engineering, dental medicine, nursing and midwifery, medical diagnostics and treatment technology, interdisciplinary programmes and qualifications in healthcare and social welfare

Legend

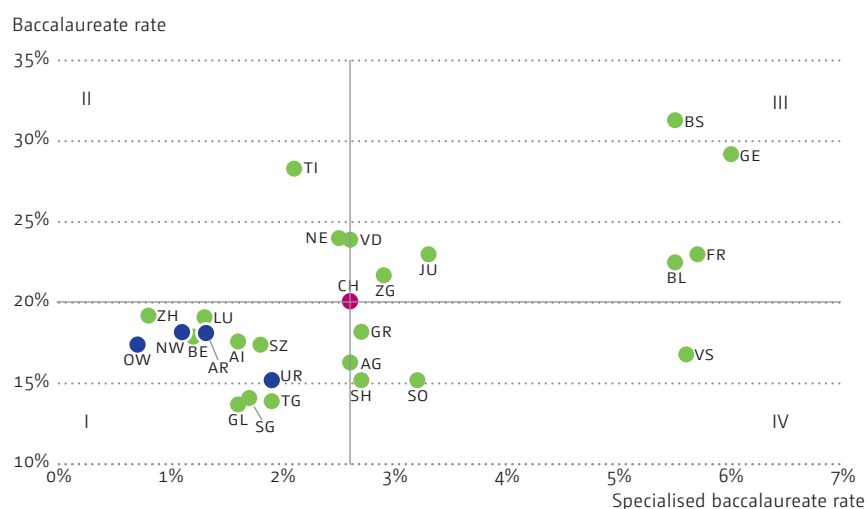
In Canton Geneva, 76% of those in upper-secondary level education specialise in healthcare at an upper-secondary specialised school, the remainder (24%) complete a vocational education and training course (VET).

for a general education, and from differences in the courses offered by the canton (traditional or politically-justified number of places offered at upper-secondary specialised schools, baccalaureate schools and for vocational education and training). This leads to a number of patterns emerging (→ Figure 168). In quadrant I are those cantons, where the baccalaureate and specialised baccalaureate rate is lower than the average for Switzerland. The cantons in quadrant III, on the other hand, display higher baccalaureate rates in both areas. Canton Ticino displays an above-average baccalaureate rate, while the specialised baccalaureate is below the average for Switzerland (quadrant II). Meanwhile the reverse applies to Canton Valais (quadrant IV).

168 Cantonal specialised baccalaureate rates and baccalaureate rates

Average value for 2014 and 2015; cantons in blue don't have FMSs.

Data: FSO



Healthcare education options

It has been possible for about 15 years (transfer of vocational education and training in health, social work and the arts to the Confederation and the scope of the Vocational and Professional Education and Training Act of 2002) to complete vocational education and training at the upper-secondary level or a specialised school leaving certificate in healthcare at an upper-secondary specialised school.

The distribution of persons studying healthcare at upper-secondary level (at an upper-secondary specialised school or a VET course) shows that most people in the French-speaking cantons prefer the upper-secondary specialised school (→ Figure 169). The percentage is much lower in German-speaking Switzerland. One contributory factor is that non-university tertiary level health education in French-speaking Switzerland is only available at universities of applied sciences. In addition, exam-free access to these courses is contingent on having a Federal Vocational Baccalaureate or specialised baccalaureate. In German-speaking Switzerland, on the other hand, tertiary-level training for nurses is mainly provided by professional education colleges where a baccalaureate is not a precondition for enrolment. Although a baccalaureate certificate may be achieved through both courses, more young people study health at upper-secondary specialised schools in French-speaking Switzerland. These differences can stem from demand (students) and

from the offering available in the different cantons. Generally speaking, cantons with high levels of baccalaureate rates (e.g. Basel-Stadt, Geneva, Vaud) also have a higher ratio of persons selecting a general education in health and social work than in cantons with a low level of baccalaureate rates. The breakdown in cantons with a high proportion of general education courses and cantons with a high proportion of vocational education and training courses is also apparent in the health sector.

Education paths of the FMS pupil population

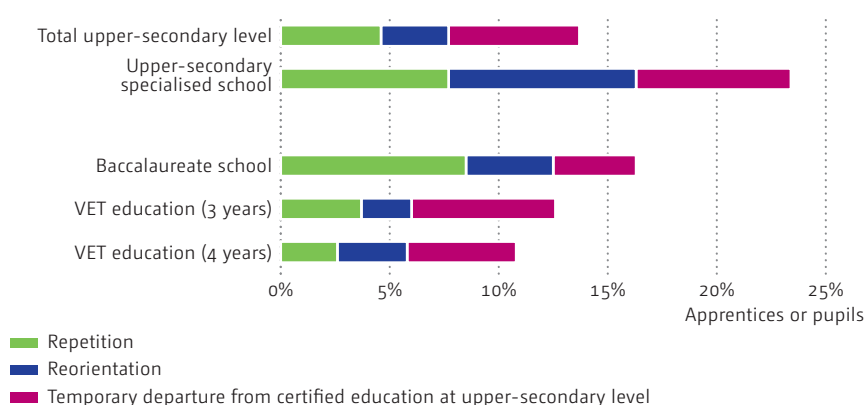
Since the modernisation of education statistics, individual longitudinal data has also become available for pupils at upper-secondary specialised schools (FSO, 2015c) as more detailed data is now available on completion, repetition and reorientation rates.

In 2013/14, only 76% of first-year upper-secondary specialised school pupils advanced to the next year. This is considerably lower than in the other upper-secondary level education pathways. The quarter that fails to seamlessly advance is composed of three more or less similarly sized groups (→ Figure 170): About 8% of the upper-secondary specialised school pupil population repeat the first year. A further 9% change course and repeat the first year as a result, with most pupils transferring to vocational education and training. The remaining 7% temporarily leave certified upper-secondary level education. The return rate for upper-secondary level education one year after a temporary departure is just under 50% for the upper-secondary specialised school entry cohort in 2012. About a fifth of them went back to an upper-secondary specialised school. The majority of other returnees completed a vocational and educational training programme (FSO, 2015c).

170 Repetitions and conversion

Pupils in the first year, transferrals 2013–2014

Data: FSO



Diplomas and transfers

Most qualifications from upper-secondary specialised schools are in health and education (→ Figure 171). This is partly because the specialised school leaving certificate and specialised baccalaureate in health offers access to the next level of nursing training in the non-university tertiary sector. In the

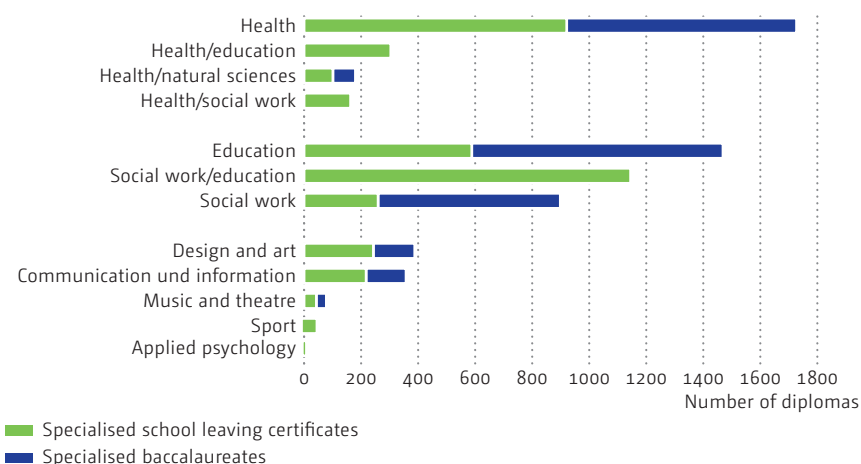
field of education, the specialised baccalaureate is also the entry condition for universities of teacher education in some regions (→ *chapter Universities of teacher education*, page 241). Corresponding to these access opportunities, these specialisations, unlike the other specialisations, are also offered throughout Switzerland.

171 Number of specialised school leaving certificates and specialised baccalaureates by specialisation, 2016

Data: FSO

Explanation of chart

The specialised school leaving certificates for social work/communication and information and the specialised baccalaureate certificates for social work/education are each divided in half for the specific specialisations. Specialised baccalaureates in natural sciences are included under health/natural sciences.



The examination pass rates at upper-secondary specialised schools varied significantly in 2016 from canton to canton: between 72% (Geneva) and 100% (Appenzell Ausserrhoden, Glarus, Zurich) for specialised school leaving certificates and between 74% (Geneva) and 100% (Graubünden) for specialised baccalaureate certificates. As neither the selection to the upper-secondary specialised schools nor the qualifications are standardised, the high success rates of individual cantons are not necessarily an indication of a more effective system.¹

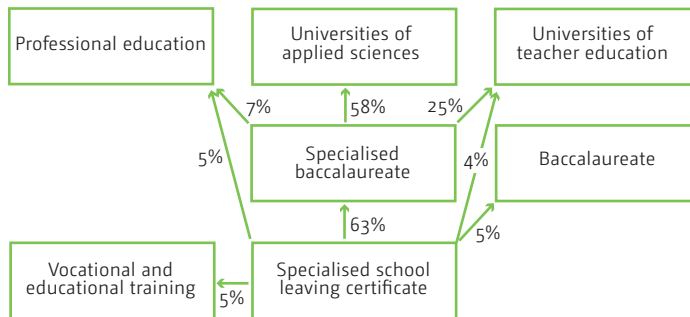
After gaining the specialised school leaving certificate, the majority of pupils pursue their education at an upper-secondary specialised school to work towards the specialised baccalaureate. 63% of the 2012 graduation cohort went on to complete their specialised baccalaureate 42 months later. A further 10% completed another upper-secondary level diploma (→ Figure 172). After completing the specialised baccalaureate, the vast majority (about 90%) went on to tertiary education. 58% of the upper-secondary specialised school leaving cohort in 2012 continued their education at a university of applied sciences, 25% at a university of teacher education and about 7% went on to tertiary level professional education. There are major interregional disparities in the ratio of students going on to tertiary education. This is partially due to non-university tertiary healthcare education almost exclusively being offered in universities of applied sciences in French-

¹ Analyses of outcomes, for example labour market success are very hard to perform for upper-secondary specialised schools due to the relatively low pupil volumes. Analyses of outcomes based on random samples (such as the Swiss Labour Force Survey) don't include a sufficient number of FMS school leavers. Moreover, as there are currently no figures available on the costs of an upper-secondary specialised school education, the efficiency of these institutions cannot be measured either.

speaking Switzerland and the entry conditions to individual universities of teacher education (→ *chapter Universities of teacher education, page 241*).

172 Transfers after the specialised school leaving certificate and after the specialised baccalaureate, graduation cohorts 2012

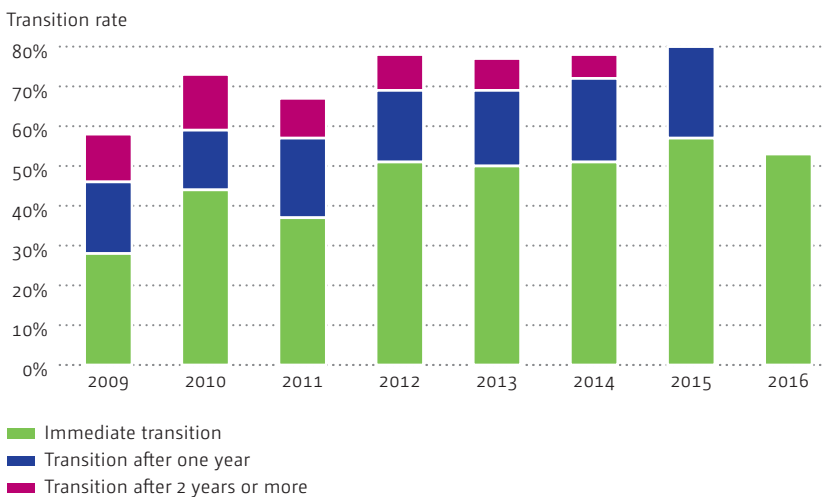
Data: FSO



The entire quota of transfers to a university of applied sciences following the specialised baccalaureate has increased slightly since 2009. Between 2012 and 2015, about 80% of the specialised baccalaureate cohort went on to a university of applied sciences. About 50% transferred directly from an upper-secondary specialised school and a further 20% the following year (→ Figure 173).

173 Transfers to universities of applied sciences and universities of teacher education, 2009–2016

Data: FSO (SHIS); calculations: SCCRE





Tertiary-level education

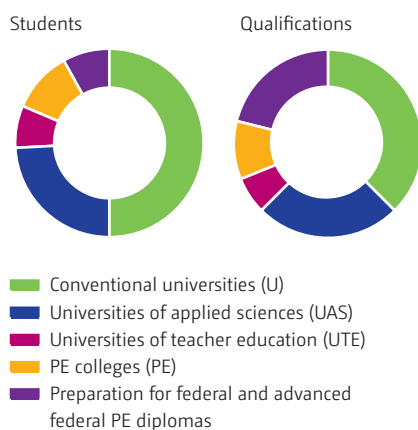
Cross-cutting themes

174 Education to tertiary level

| ISCED level | Description | Swiss education pathways |
|-------------|---------------------------------------|---|
| 5 | Short tertiary educational programmes | Non BBG (Federal and Vocational Professional and Training Act)-regulated tertiary level professional education |
| 6 | Bachelor's or equivalent | Bachelor's courses at universities; qualifications at PE colleges; Federal PE Diplomas (with certificate); MAS Certificates (Master of Advanced Studies); Completion of post-diploma courses (university-based continuing education and training) |
| 7 | Master's or equivalent | Master's courses at universities; Advanced Federal PE Diploma (Federal Diploma or Master's examination) |
| 8 | Doctorate or equivalent | Doctorates; Habilitation (post-doc thesis) at German-speaking universities |

175 Students and qualifications 2016

All students and qualifications excluding CET
Data: FSO; calculations: SCCRE



The Swiss tertiary system comprises the entire university sector, including the conventional universities (i.e. the cantonal universities and the federal institutes of technology; ETH), the universities of applied sciences (UAS) and the universities of teacher education (UTE), as well as institutions providing tertiary level professional education (PE). Tertiary level professional education includes the PE colleges and a range of federal PE diplomas and advanced federal PE diplomas.

In accordance with the revised International Standard Classification of Education (ISCED 2011), the tertiary system covers ISCED levels 5 to 8. In Switzerland, university Bachelor's degrees and federal PE Diplomas correspond to ISCED level 6, while Master's programmes at universities and advanced Federal PE Diplomas slot in at level 7. Doctorates and post-doctoral theses (*Habilitation*) are awarded at level 8 (FSO, 2015a). The new version of the ISCED no longer distinguishes between tertiary sector levels A and B. Any different orientation (general education or professional education) can be identified using a second figure in the designation. However, the assignment of national programmes of education to the ISCED is not applied uniformly across countries, hindering international comparisons. For example, tertiary level professional education programmes throughout the three German-speaking countries slot into very different parts of the international standard scale. While the advanced federal PE diploma in Switzerland is classified at ISCED level 7, the corresponding course in Germany is at either level 5 or 6, depending on its duration.

Even though the new classification no longer reflects the differentiation of the higher education sectors as well as before, the distinction between a university sector comprising different types of university and a vocational or professional education sector comprising tertiary level professional education remains a core part of the Swiss higher education system.

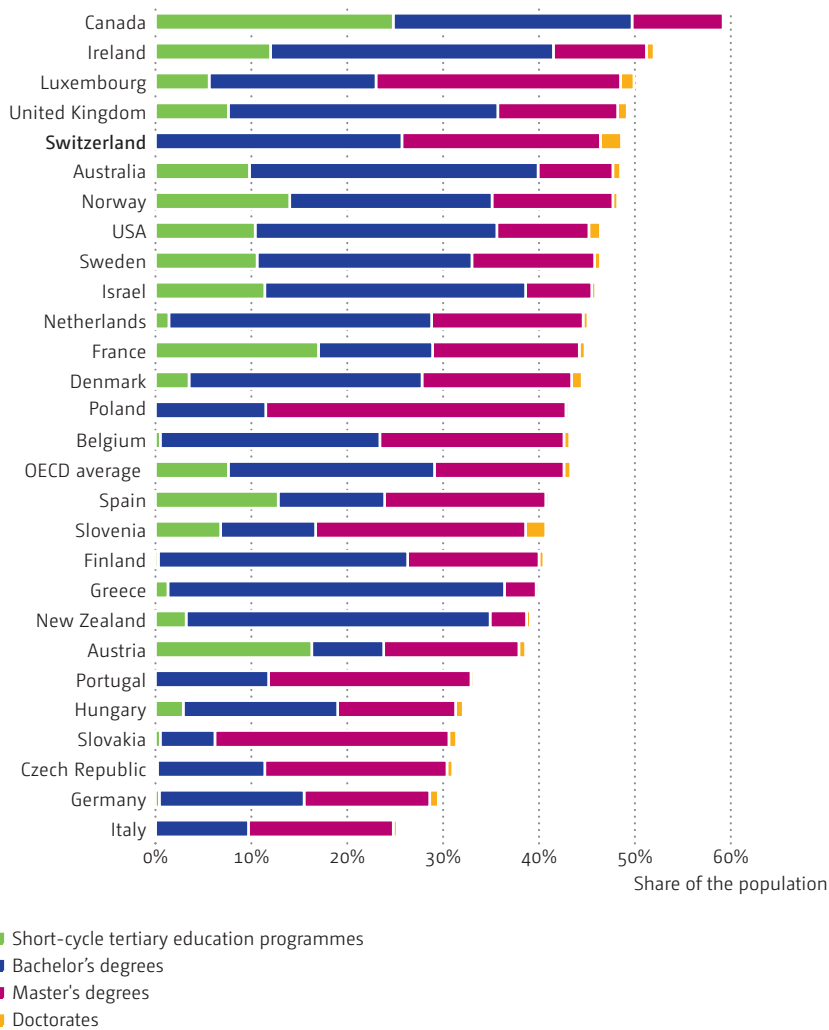
The following sections contain statements that relate to the tertiary sector as a whole; comparisons are also made between the types of university. Data on the university sector is available in much greater quantity than on the tertiary level professional education sector, allowing the former to be described in greater detail. It should be said first that, in terms of the distinction of university types, teacher training provided by UAS has been counted under UTE in the information below. Purely in terms of numbers, the university sector dominates tertiary-level education, with four-fifths of all students. This can be explained in part by the longer length of studies, especially at conventional universities. Nevertheless, when considering the number of qualifications awarded, tertiary level professional education ranks highly. The sector, which has mainly been under private control and funding, contributes around one third of all tertiary-level qualifications.

Education status of the population by international comparison

The spread of tertiarisation is reflected in the fact that the tertiary education rate of young people is rising. The proportion of 25 to 34-year olds who have a university education has more than doubled in the last 20 years. In Switzerland today, almost one in three people in this age-group has a university qualification. In addition a solid 15% hold a tertiary level professional qualification. This pronounced growth can be explained in part by the reform of the university system, and the creation of UAS and UTE.

176 International comparison of education status of 25 to 34-year olds, 2015

Data: OECD



The international comparison reveals that Switzerland's young generation has an above-average rate of tertiary education (→ Figure 176). It should be remembered that the value of 49% for Switzerland is taken from survey data (SLFS) and includes both university and tertiary level professional qualifications according to the revised ISCED classification, which no longer differentiates between tertiary-level A and B sectors. Around two thirds of these people hold a university qualification, while the remaining third have a tertiary level professional qualification. The university qualification rate is also based on estimates, stating the total number of qualifications as a percentage of the estimated number of people in the population of the same age. For 2015, the FSO reports a higher-education rate of 28.7%¹ in total (comprising 14% from conventional universities and 16.1% from UAS/UTE).

¹ The total figure only includes first qualifications; therefore the rate does not correspond to the sum of the rates at the conventional universities, UAS and UTEs.

177 Completed education of 30 to 34-year olds, 2007 and 2016

Data: FSO

| | 2007 | 2016 |
|--|-------|-------|
| University qualification | 18.1% | 36.1% |
| Tertiary level professional education | 15.6% | 12.8% |
| Tertiary level professional education and university qualification | 2.8% | 2.7% |
| No tertiary qualification | 63.5% | 48.4% |

Making comparisons of different university systems is difficult, as many types of education are allocated to different levels of the scale and to different types of institution in different countries. For example, a qualification in tertiary level professional education awarded by a corresponding tertiary institution in Switzerland may be offered as a short-cycle qualification at a university in a different country, or as a vocational course at a university of applied sciences in another. The overall tertiary rate, which includes both university and tertiary level professional education, therefore reflects a more adequate image of the population's education status.

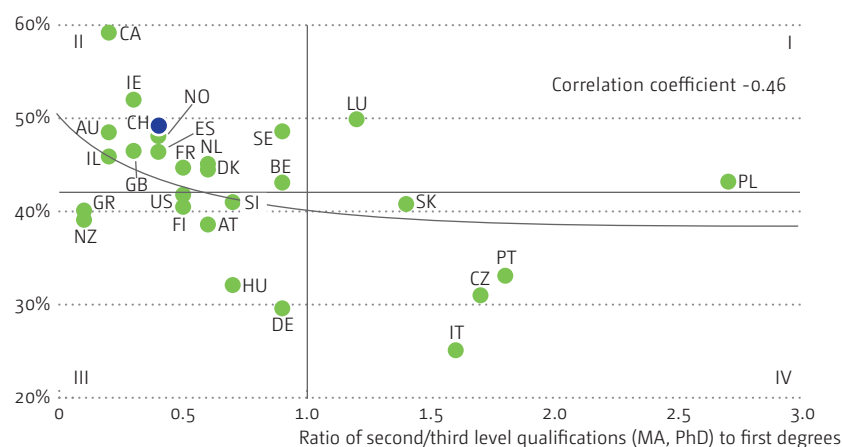
In respect of the mean level of qualification of a population, however, the level of the highest qualification is key. There are marked differences between countries in that regard. While in Canada, despite a very high rate of tertiary education, only one fifth of graduates go on to obtain a post-graduate qualification (Master's or Doctorate), the same group in Germany, a country with a very low tertiary rate, makes up almost half the total number. When comparing university systems, therefore, it is imperative to take account of the proportion, in terms of the total population with a tertiary education, of those who have successfully completed more advanced academic education (at post-graduate level, i.e. resulting in the award of a Master's or Doctorate). In Switzerland this proportion is just under 50%.

The figure below shows the proportion of post-graduate qualifications (MA and PhD), measured in terms of first qualifications (*short cycles* and BA), compared with the total tertiary rate. In the majority of countries with an above-average tertiary rate, the proportion of people with a post-graduate qualification is smaller than that with the first qualification (upper-left quadrant). As the distribution of countries in the right-hand half of the diagram shows, the overall rate exhibits a falling trend as the proportion of post-graduate qualifications increases. The fact that these countries also do not offer short-cycle programmes indicates that they have shifted many types of course to secondary-level education, where in other countries these remain under the auspices of the tertiary sector. A generally low tertiary rate is frequently connected with more socially selective mechanisms governing entry to the tertiary phase. In contrast, in those systems that produce a higher rate of tertiary education, social selection occurs within the tertiary phase, i.e. between types of higher education institutions (HEIs) or at the transition from Bachelor's to Master's.

178 Ratio of first degree to second/third level qualifications, 25 to 34-year olds, 2015

Data: OECD; calculations: SCCRE

Overall tertiary rate; intersection with x-axis: OECD mean: 41.8



Legal basis for higher education institutions

Based on the constitutional requirement for cooperation in higher education (Article 63a para. 3 FC), the Confederation and the cantons have established a new legislative basis for higher education; they are now jointly responsible for the coordination and quality assurance of the higher education sector. On the part of the Confederation, this has resulted in the enactment of the Higher Education Funding and Coordination Act (HEdA) with effect from 1 January 2015, while the cantons have adopted the Higher Education Concordat with effect from the same date. An agreement between the Confederation and the cantons on cooperation on higher education then sets the scope for the two elements of the legislative framework, declares the aims of the HEdA as joint objectives of the Confederation and the cantons and creates the basis for the joint organs (the Swiss University Conference SHK, the Rectors' Conference and the Accreditation Council). As Switzerland's highest organ of higher education policymaking, the SHK is responsible for coordinating the activities of the Confederation and the cantons in the higher education sector. The Rectors' Conference of the Swiss HEIs brings together the rectors of the universities, UAS and UTEs. It is responsible for coordination and cooperation among HEIs. The Accreditation Council is an independent expert body with representatives from higher education and employers. It reaches decisions on accreditation at institutional and programme levels, which are then enforced by the Accreditation Agency. Institutional accreditation is a prerequisite for protection under the naming law (i.e. the law that permits an institution to call itself a «university», «university of applied sciences» or «university of teacher education»). It is also necessary for payment of federal funding (Article 28, para. 2 HEdA) (→ *Funding of HEIs and tertiary education expenditure*, page 175). Accreditation of programmes (Bachelor's and Master's courses) is voluntary. The HEdA thus provides the UAS with greater autonomy in creating and organising their course offering.

Responsibilities

The cantons are responsible for the cantonal universities, universities of applied sciences and the universities of teacher education.

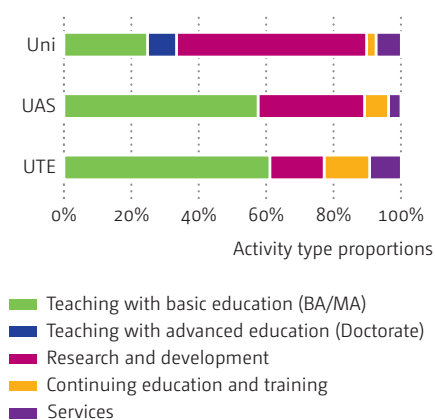
The ETH and other federal institutions of higher education are managed by the Confederation.

Funding of higher education: → page 175

179 Proportion of activity types by type of institution, 2016

In FTE of academic personnel

Data: FSO



Activity types according to FSO

Teaching

All activities primarily devoted to teaching students (Bachelor's, Master's, Diplom and doctoral) and related tasks. A distinction is drawn between regular teaching (Bachelor's and Master's cycles) and more advanced teaching (doctoral students).

Research and development (R&D)

Systematic, creative work to expand knowledge and draw on it to identify new applications and/or contribute to a restructuring of knowledge.

Continuing education and training

All activities involved in the provision of continuous education and training for students wishing to follow up their initial diplomas.

Services

All academic and non-academic activities of a predominantly routine nature which are related to neither research and development nor teaching and which primarily target an audience outside HEIs.

Profile

The diversity of the tertiary sector, comprising conventional universities, UAS, UTEs and professional education colleges has developed for historical reasons and is a continuation of the distinction at upper-secondary level between an academic and a vocational sector (Weber, Tremel & Balthasar, 2010). Maintaining this diversity of the different tertiary education options, each with its own profile, has been declared to be a joint education policy objective of the Confederation and the cantons (EAER/EDK, 2015) and is also explicitly mentioned in the the HEdA (Article 3c HEdA).

The diverse profile of HEI types, which is also taken into account in funding (→ *Funding of HEIs and tertiary education expenditure*, page 175) is also reflected in the distribution of different areas of work done by staff (→ Figure 179). While the focus for staff at conventional universities is on research, more than 60% of the staff resource at UAS and UTEs is employed in teaching and continuing education and training (→ Figure 179). In line with the statutory framework and conditions, UAS and UTEs are characterised by a practical, teaching-based orientation. The UTEs also carry out a substantial amount of continuing education and training (CET). A primary reason for this is that frequently they are the only providers of CET for teachers and usually organise the mandatory CET on behalf of the cantonal authorities.

In relation to the deployment of staff, teaching at conventional universities is more frequently done by assistants and research staff, while at UAS and UTEs most teaching is delivered by lecturers (→ Figure 180). The substantially lower use of assistants in the teaching at UAS and UTEs is associated with significantly higher teaching costs. Lecturers with management functions represent the highest category of staff at UAS and UTEs, similar to the professors with a chair at universities. Lecturers at non-university HEIs also occasionally hold the title «professor». However, this is not normally associated with the same function as that carried out by university professors. In addition, lecturers with management responsibilities at UAS and UTEs are less engaged in research than professors at conventional universities.

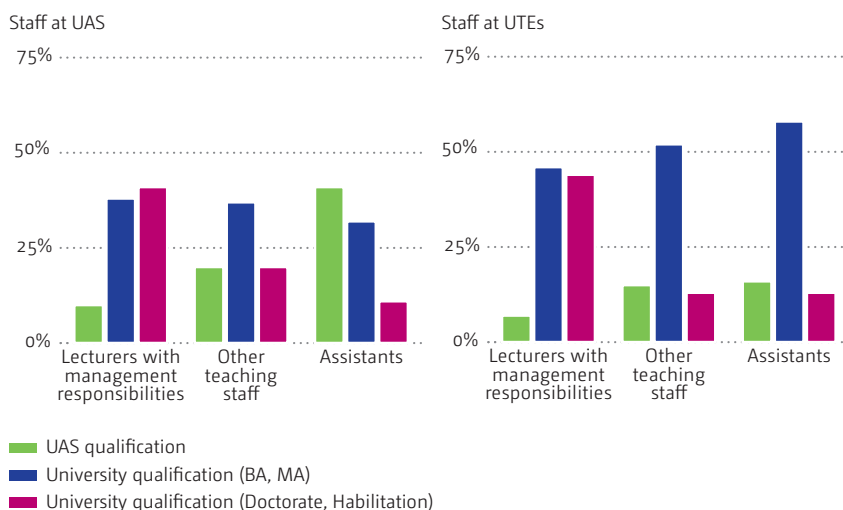
The types of HEI differ not only in terms of the function and responsibilities of their staff, but also in terms of these people's qualification, degree of employment and origin. For example, lecturers with management functions at non-university HEIs are more frequently engaged in part-time posts with smaller numbers of hours than professors at conventional universities. There is no data that allows comparisons to be made for conventional universities in relation to the qualifications of academic staff (→ Figure 181). For this reason the comparison is limited to the UAS and UTEs. However, figures based on experience at conventional universities are used as a reference. After all, against the backdrop of an academic career, the qualification requirements for professors at universities should be mostly identical. Professors usually hold a doctorate, and also a post-doctoral qualification (*Habilitation*), or are able to demonstrate published post-doctoral research. The first of these criteria also applies for other lecturers.

At the UAS, around one third of managers hold a university qualification below the level of doctorate (Bachelor's and/or Master's), while a further third hold a PhD. There is a similar situation at the UTEs. Nevertheless, it can be seen that the proportion of lecturers with management responsibilities who also have a doctorate has grown considerably in the past four years. Universities of applied sciences frequently recruit assistants from among

their own pool of graduates. This is a lot less common at the UTEs, since they normally recruit university graduates to work as assistants (→ Figure 181).

181 Qualification of academic staff, 2015

Data: FSO



In general it must be recognised that while non-university HEIs are able to hire assistants and research staff, these staff cannot study for a doctorate at their own institution. As a result, cooperation is required with universities in Switzerland and abroad. This is a strategy now adopted by many UAS and UTEs. Such cooperation models give rise to questions about supervision of doctoral students, the integration of candidates into the international research network of peers in the discipline, and ultimately quality assurance of the work being undertaken. It must also be ensured that the scope and scale of the research activities carried out at the UTEs and UAS in the corresponding areas are actually sufficiently large to qualify these HEIs to offer to supervise dissertations.

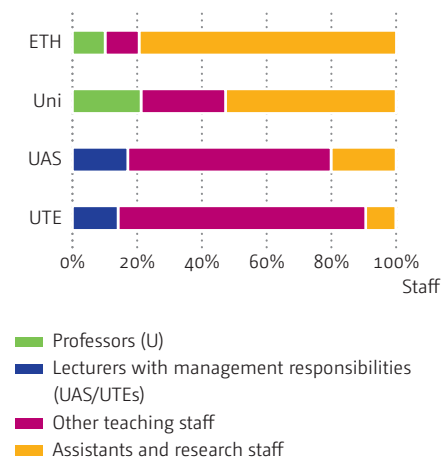
A high proportion of foreign academic staff is generally considered to be an indicator of an institution's attractiveness as a place to do research. Therefore, international rankings also account for international mobility, as well as the proportion of foreign teachers and students. The different proportions according to HEI type reflect the different research orientation and focus of the institutions. In addition, the proportion of foreign teaching staff is linked to the discipline focus of the field of instruction. In conventional universities, one in every two professor is now a foreign national (→ Figure 182).

Funding of HEIs and tertiary education expenditure

The basic funding of cantonal universities and UAS comprises the funding by the responsible bodies, intercantonal contributions to higher education, and the federal government's basic contributions. Thus, the Confederation assists in meeting the HEIs' operating expenses. The payment framework for these basic contributions for a four-year period is presented by the Federal Council for the approval of parliament. Performance-based assessment criteria are used to distribute the allocated funds, taking into account the different institution profiles. This means that the performance of an HEI

180 Academic staff (FTEs) in regular teaching by type of institution, 2016

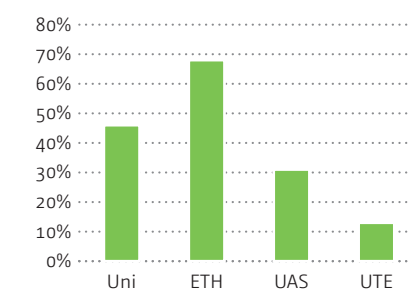
Data: FSO; calculations: SCCRE



182 Proportion of foreign staff among professors and lecturers with management responsibilities, 2016

Data: FSO

Foreign nationals



The HEdA provides for **three forms** of contribution:

- Basic contributions
- Project-specific contributions
- Construction investment contributions

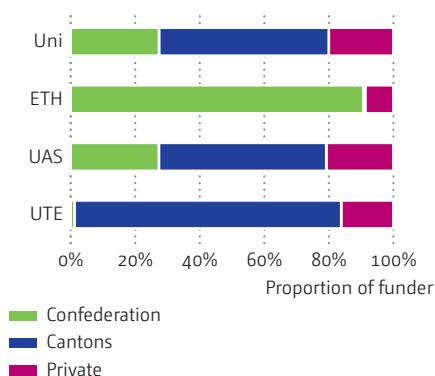
The federal institutes of technology (ETHs) and UTEs receive no federal funding in the form of basic and construction investment contributions. Nevertheless, they are able to obtain federal funding through project-specific contributions.

The ETH is funded by lump-sum contributions from the Confederation in accordance with ETH law. The UTEs are funded in accordance with cantonal requirements.

The two research funding organisations, the Swiss National Science Foundation (SNSF) and the Commission for Technology and Innovation (CTI) also provide funds to all types of higher education institution.

183 Funding of HEIs by source, 2015

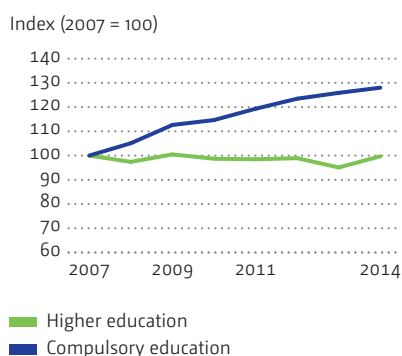
Data: FSO; calculations: SCCRE



184 Spending per person in education, 2007–2014

Public and privately-subsidised institutions

Data: FSO; calculations: SCCRE



within its own category is measured against that of all other institutions to create a competitive structure. Assessment of funding according to performance in teaching uses data such as the number of students and number of qualifications awarded.

The overall funding allocated to the basic contributions is split between a teaching element and a research element, the proportions of which differ according to the type of institution. For example, funding for conventional universities is granted according to criteria that are weighted 70% in favour of teaching and 30% in favour of research. At the UAS these proportions are 85% in favour of teaching and 15% in favour of research (Article 7 of the HEdA Ordinance). Moreover, the federal government provides funding by means of construction investment grants and project-specific grants. The project grants are used to support nationally important projects relating to inter-institutional cooperation among HEIs.

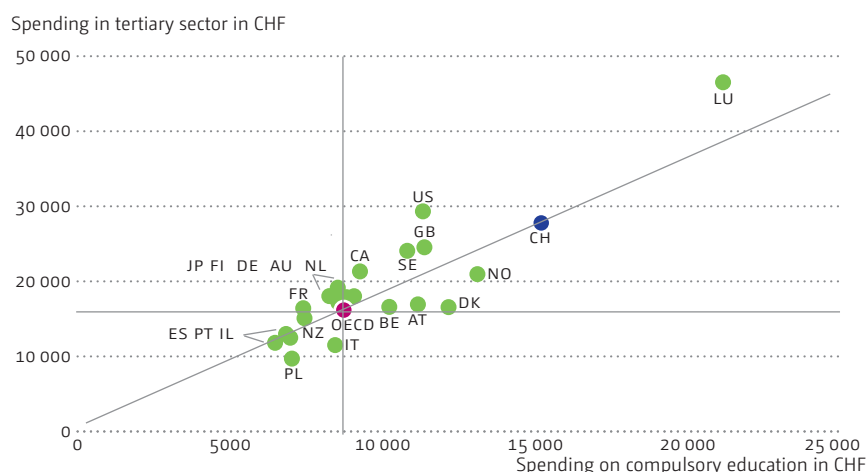
The higher education sector (including research) takes around one third of the public spending on education. Of the almost CHF 11 billion expenditure on higher education in 2015, the Confederation and cantons contributed around 40% each. The remainder comes from private sources (tuition fees, private research commissions, grants from foundations and sponsoring). A good half of the contribution from the Confederation goes directly to the two federal institutes of technology (→ Figure 183).

Recent decades have witnessed strong growth in education spending. A comparison of per capita spending in each phase of the education system shows whether the increase in spending on the higher education sector has come at the expense of the other phases. Figure 184 demonstrates that this is not true. Per capita spending at compulsory education in particular has risen rapidly in the last 20 years, while growth in the tertiary sector has been more modest. The increase in spending in higher education is primarily attributed to the dynamic growth in student numbers (→ Figure 184).

Alongside the development of costs within the tertiary level, the relationship of costs between the tertiary level and compulsory education provides pointers to the importance of these phases within the national education system. The OECD average per capita costs at tertiary level are around countries such as the USA or United Kingdom in which the proportion is

185 Comparable per capita spending in primary and tertiary education, 2013

Data: OECD; calculations: SCCRE



twice as high as in compulsory education (quotient of 1.9). There are some countries such as the USA or United Kingdom in which the proportion invested in the tertiary sector is greater (quotient of 2.5), and others like Poland and Italy where the investment in the tertiary sector compared with compulsory education is below average. Switzerland's spending per capita on the tertiary sector is at relatively similar levels to that of the USA, the United Kingdom, Sweden and Canada. However, Switzerland also spends an above-average amount on compulsory education. In other words, the importance attached to compulsory education in Switzerland is high even in comparison to higher education (→ Figure 185).

One of the reasons for the relatively high level of education expenditure in Switzerland compared with other countries is the above-average added value of education in the country. Looking at tertiary education spending relative to per capita GDP, Switzerland's spending is above the OECD average, but comparable to other OECD countries (→ Figure 186). A further factor that is forcing current tertiary education spending upwards is the high level of research activity being undertaken at Swiss HEIs. This is enhancing the attractiveness of the country as a place to do research and therefore also favourably affects its ability to gain the best talent and achieve economic growth. When taking account of expenditure on teaching alone, however, spending in Switzerland is below average compared with OECD countries.

Grants

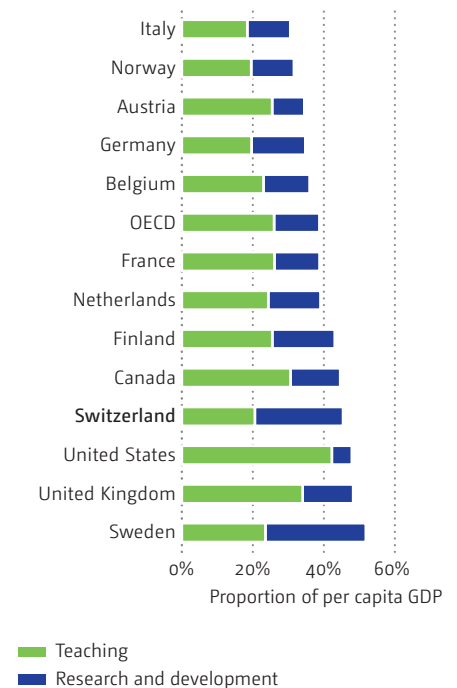
HEIs in Switzerland are nearly all funded by the public purse. Nevertheless, students incur high personal outlay during their studies. As a result, financially less well off people may opt not to take a course (*Hurwitz, 2012*) or must take on a job while studying, extending the length of their studies and increasing the risk of not completing the qualification (*Kolland, 2002*). Financial assistance for students can improve their performance, shorten the amount of time taken to complete their studies and reduce the risk of not completing the qualification (*Cappelli & Won, 2016; Sneyers, Agasisti, De Witte et al., 2016; Bettinger, 2015; Glocker, 2011*). There has been no research to date on the impact of grants on education in Switzerland. However, the findings of surveys show that students who have comparably low levels of financial support from parents, partners and relatives are more frequently engaged in work and work longer hours (*FSO, 2017c*). It also appears that grant recipients are less likely to be working and work for fewer hours, giving them more time for their studies.

In 2016, the average grant for students in tertiary education was CHF 8600 per year. There are, however, large variations among the cantons (*FSO, 2017a*). An increase in financial assistance for students has been recorded since 2009, reflecting a moderate increase in the average grant per recipient after allowing for inflation (→ Figure 187). In contrast, the grant rate – given a rising number of students and a relatively constant number of recipients – has continued to fall since 2004, from an initial 15% to 10% in 2016.

An intercantonal agreement on grants entered into force in March 2013, with the aim of harmonising cantonal grant legislation on the basis of a set of minimum standards. As of December 2017, 18 cantons had signed this agreement.

186 Spending per student in tertiary education relative to per capita GDP, 2014

Data: OECD



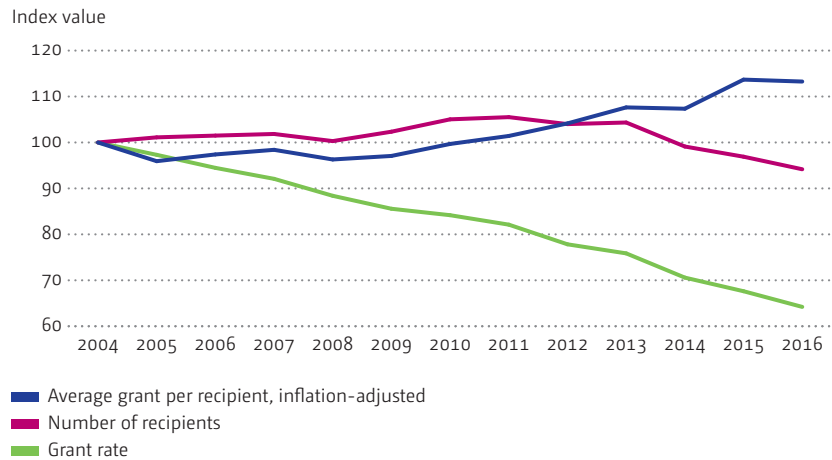
Cantons are responsible for awarding **grants**. They decide who is eligible for grant support on the basis of their grant legislation. The Confederation pays lump-sum contributions under the Education Contribution Act to cantons that meet key criteria of the Grants Agreement. The Confederation's share of the education assistance varies from canton to canton in a band between around 7% and 33% (*FSO, 2017a*).

Grant rate

Grant recipients as a proportion of all students (excluding foreign students)

187 Indexed value of grants (inflation-adjusted) and number of recipients in higher education, 2004–2016

Data: FSO



Education progression depending on competencies

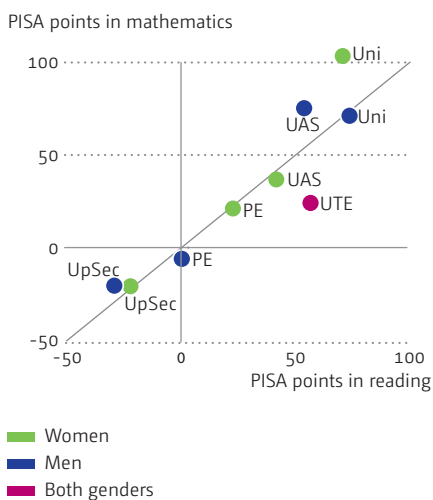
It is to be assumed that the probability of achieving a higher education qualification in a specific type of tertiary education is affected by an individual's competencies. However, there are no standardised competence assessments at the end of upper-secondary education that would permit such factors to be investigated. Looking instead at reading skills at the end of compulsory education, it can be seen that these are predictive of later education (→ Figure 188; → *chapter Cumulative effects, page 295*). People with above-average competencies are more likely to obtain a tertiary level qualification, especially a conventional university qualification, than those with low competencies. In addition, there are interesting gender-related differences. Among females, the difference in competencies between graduates of conventional universities and UAS is significantly higher than between graduates of UAS and those who have completed tertiary level professional education. The situation among males is very different; the PISA competencies of conventional university and UAS graduates differ only slightly, while those who have completed tertiary level professional education had between 50 and 80 fewer points on the PISA scale.

The reading and mathematics skills of females with a tertiary level professional education diploma (measured relative to the gender-specific average) are also higher than those of males, in contrast to the UAS graduates who show the opposite. In addition, female conventional university graduates' results in mathematics were further ahead of their gender-specific average than was the case for males; they also achieved more PISA points than men in absolute terms. One possible explanation for the gender variation may be that women and men select different fields of education, which are represented differently among the various types of education. The competencies of women and men whose highest qualification was gained in upper-secondary education are some 20 to 30 PISA points below the average for their gender.

Looking at reading skills at the end of the compulsory education phase in more detail by type of first tertiary qualification (→ Figure 189), a large

188 Variation of the reading and mathematics PISA points from the (gender-specific) average by qualification

Data: TREE (9th wave), PISA 2000 (national sample); calculations: SCCRE



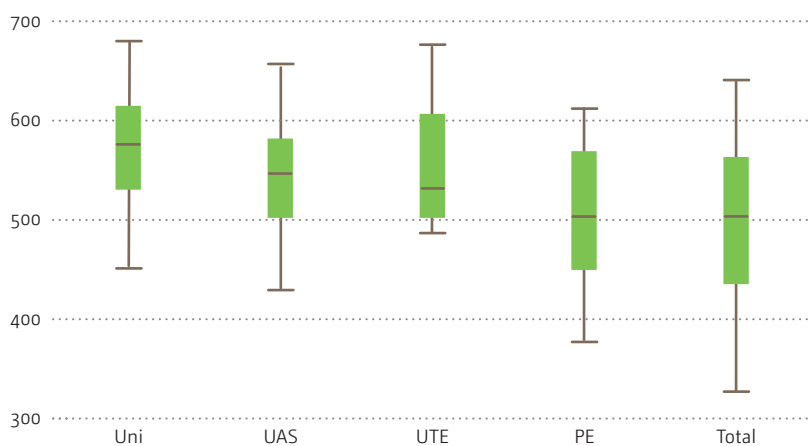
The points indicate the difference between the PISA points and the gender-specific average (according to the PISA-2000 national sample). For women these are 509 points in reading and 521 in mathematics, while for men they are 487 in reading and 540 in mathematics. No gender-specific indication has been given for UTE students owing to the small sample size.

overlap can be seen between the types of HEI. Graduates from conventional universities on average have somewhat higher skills than those from a UAS, however. An analysis of the UTEs reveals barely anyone with low reading skills. The distribution of reading skills of people with a tertiary level professional qualification largely matches that of the average population. Their competencies are therefore slightly lower on average than those of people who have a university qualification. Among holders of tertiary level professional education diplomas, the reading skills of people who completed education at a PE college are better than those of people who hold a federal PE Diploma, but lower than those of UAS graduates.

189 Reading skills by type of (first) tertiary qualification, and total

Data: TREE (9th wave), PISA 2000 (national sample); calculations: SCCRE

PISA points in reading



Explanation of figure:



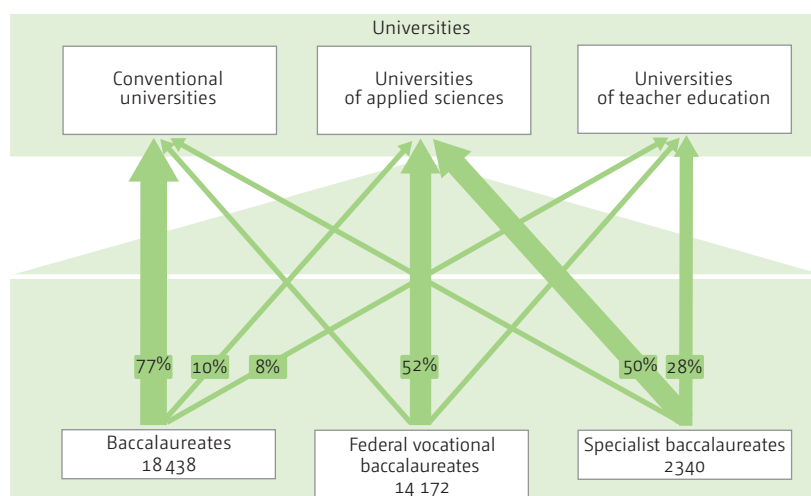
Transition to higher education

The pathways to HEIs differ according to the type and function of the preparatory school type (→ Figure 190). The general baccalaureate schools act primarily as a conveyor belt for conventional universities and UTEs, while federal vocational baccalaureate schools feed UAS and the specialised baccalaureate schools feed the UAS and UTEs. Additional activities also allow transition to other types of HEI, ensuring accessibility between the types of education. Entry to a UAS for holders of a baccalaureate generally requires one year's experience in the workplace (*Swissuniversities, 2015*). Admission to a conventional university with a federal vocational baccalaureate or specialised baccalaureate normally requires the candidate to pass an additional «federal vocational baccalaureate – conventional university» or «specialised baccalaureate – conventional university» exam, which entails a one-year preparatory course.

190 Transitions to higher education, 2014 cohort

Transitions up to 2016, i.e. up to two years after completion of baccalaureate

Data: FSO (SHIS); calculations: SCCRE



General baccalaureate holders have the highest transition rates (95% within two years of obtaining their baccalaureate). The vast majority (77%) transition to a conventional university, 10% go to a UAS and 8% to a UTE (→ *chapter Baccalaureate schools, page 135*). The transition rate is at its lowest (up to two years after obtaining a baccalaureate) among those with a federal vocational baccalaureate. However, these people frequently commence studies after a longer break. Those who take a course of higher education generally elect to study at a UAS. Transitions to a conventional university or university of teacher education are rare among this group. The total transition rate within two years of completion of a federal vocational baccalaureate is less than 60%; this increases to 63% up to three-and-a-half years after completion of the baccalaureate (FSO, 2018b). Half of people with a specialised baccalaureate gain admission to a UAS within two years of completing their baccalaureate, and slightly more than a quarter transition to a UTE. The transition rates for holders of a general baccalaureate are very stable over time (→ *chapter Baccalaureate schools, page 135*). The past ten years have witnessed a slight increase in the transition rates of those with a federal vocational baccalaureate (→ *chapter Vocational education and training, page 111*).

The **Bologna system** structures higher education into three cycles:

- 1st cycle: Bachelor's
- 2nd cycle: Master's
- 3rd cycle: Doctorate (PhD).

The former university qualifications at *Lizenziat* and *Diplom* levels correspond to the second cycle. Doctorates can only be obtained from conventional universities. However, there is cooperation between UAS/UTEs and the conventional universities (for the purpose of jointly managed doctorate programmes) (→ *chapter Universities of applied sciences, page 221*).

Transition and accessibility between types of HEI

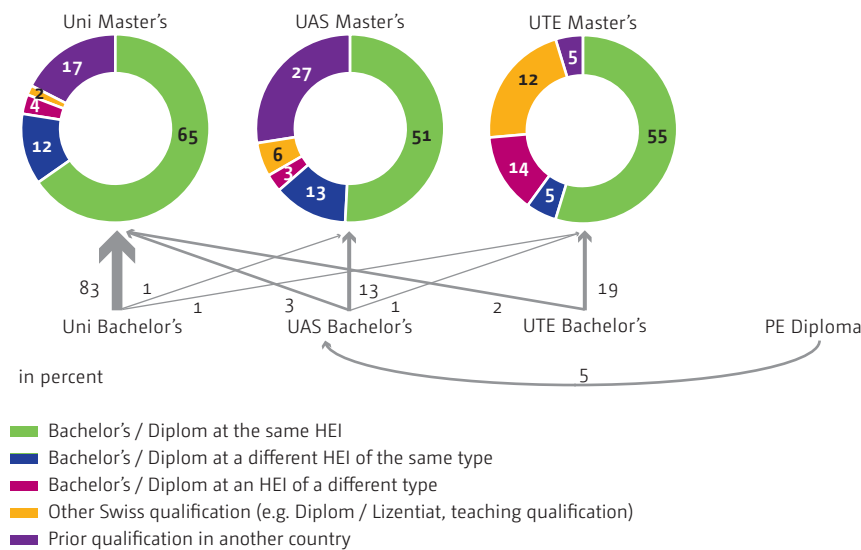
The modularisation of courses in accordance with the Bologna system was intended to make it easier to switch between HEIs and HEI types. An agreement adopted by the former Higher Education Rectors' Conferences (CRUS, KFH, COHEP, 2010, 2007) govern the conditions on accessibility within the Swiss higher education system. This agreement allows graduates with a Bachelor's to move to a different HEI type for a Master's as long as they can achieve the required additional credits amounting to up to 60 ECTS points. If the knowledge and capability deficit amounts to a difference in excess of 60 ECTS points, a relevant Bachelor's course must be completed at the corresponding HEI type before admission is granted to the Master's course.

The proportion of Bachelor's graduates who go on to study for a Master's at a different type of HEI is low, however (→ Figure 191). Only 1% of graduates of a conventional university Bachelor's course commence studies for a Master's at a UAS or UTE. Of UTE Bachelor's graduates (for whom the general Master's transition rate is 21%), only 2% switch to a conventional university. The corresponding figure for UAS Bachelor's graduates (with a general Master's transition rate of 17%) is 3% (→ *chapter Universities of applied sciences*, page 221).

191 Accessibility between HEIs in transition to Master's

Proportions of entries to Master's courses up to 2015 for the 2013 Bachelor's cohort

Data: FSO



Transition to Master's from a UTE Bachelor's

Some subjects (such as training of teachers for lower-secondary education) require a Master's to be completed for entry to the profession, while a Bachelor's is sufficient for other subjects. Where education to Master's level is required, this is generally obtained at the same type of institution.

The composition of the student population on Master's courses shows that only moderate use is made of the opportunity to switch to a different HEI of the same type. Among Master's students at conventional universities and UAS, one in eight obtained their Bachelor's qualification at a different institution of the same type, while for Master's students at UTEs the figure was one in twenty. Two thirds of conventional university Master's students and slightly more than half of UAS/UTE students obtained their Bachelor's degree at the same HEI. The large proportion of foreign certificates among UAS Master's students can be ascribed to the field of arts. At the UTEs, and especially among specialist courses for therapeutic and special needs education, there is a large proportion of students with the older teaching qualification.

International mobility

International cooperation, particularly in research, is vital to a small country such as Switzerland. The agreements with the European Union in particular are important scene-setters for Switzerland as a research location. From 2017, full membership of the Horizon 2020 framework programme provides the country's researchers with the possibility of once again participating in the EU's research programmes without restriction, and therefore cementing their place in international networks.

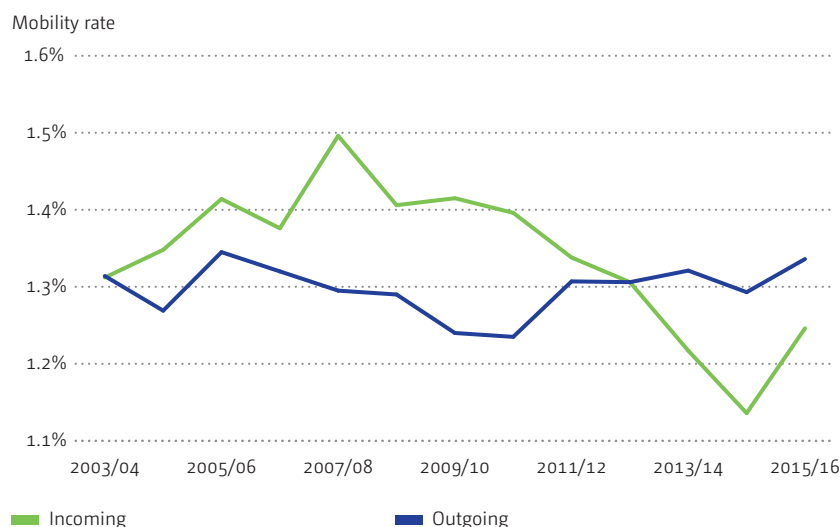
Erasmus+ is a further EU education programme that is of special importance to students. Switzerland lost its full membership of the current pro-

Proportion of outgoing: Percentage of students who complete an Erasmus semester (including SEMP but excluding those on an internship student mobility programme) out of all students at Swiss universities.

Proportion of incoming: Percentage of foreign students who complete a semester at a Swiss university as part of Erasmus (or SEMP), out of all students at Swiss universities.

192 Erasmus mobility rates, 2003–2015

Data: movetia, FSO



grammes in February 2014. As part of a transition solution SEMP («Swiss Implementation of Erasmus+») study mobility is still being supported by the direct funding of outgoing and incoming mobility at tertiary level. However, in contrast to the situation under full membership the strategic partnerships and cooperation projects, as well as the political collaboration options are vastly reduced or impaired. Furthermore, Swiss HEIs now have to manage a large administrative effort since bilateral agreements must be negotiated with each individual foreign university. It is not always possible to reach agreement. An analysis of outgoing mobility over time shows that the loss of full membership has not caused a drop in numbers of exchanges; and the downwards trend in incoming mobility had already started before the loss of the full membership (→ Figure 192). The extent to which students have had to switch to other universities that they find less attractive cannot be determined from the available data. However, full membership will not be reviewed by the Confederation again until the successor programme, which is due to start in 2021.

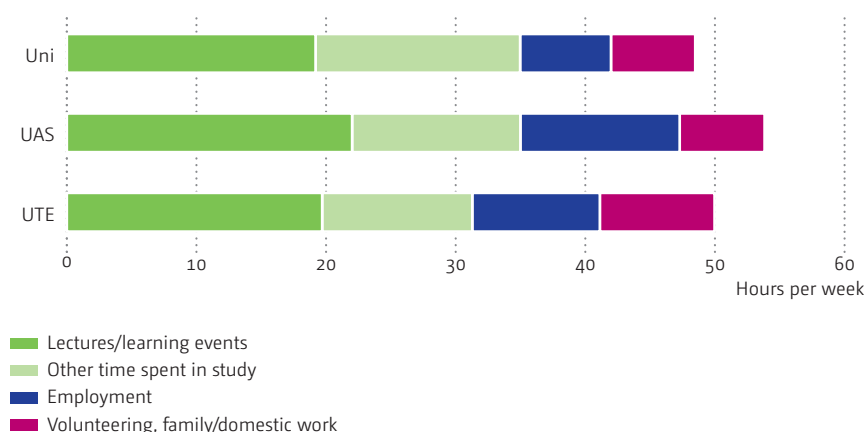
Students' time

An average student spends around 35 hours per week at lectures and other study-related activities during term time, and 9 hours in employment (→ Figure 193). There is a negative correlation between the time spent in study and time spent in employment (FSO, 2017c). Older students and students on Master's courses spend slightly more time in employment and dedicate correspondingly less time to study than younger students and students on Bachelor's courses. Participation in employment also depends on the students' resources, as well as on their discipline of study and type of HEI they attend (FSO, 2017c). To some extent, the fact that UAS students are subject to the greatest time stresses can partly be explained by extra-occupational studies offered.

The finding that many students are dedicating less time to study (FSO, 2017d) and are taking up employment (FSO, 2017c), whether for economic or professional reasons, indicates a need to enable courses to be attended on a part-time basis, or at least according to a more flexible schedule. New tech

193 Time dedicated to study, employment and volunteering/family and domestic work, 2013

Data: FSO (Social and Economic Conditions of Student Life); calculations: SCCRE



nologies offer the opportunity to implement learning activities that are not-bound to a specific time and place. However, online courses may also have a negative impact on learning (marks) and increase the likelihood of not completing courses of study, in particular among lower performing students (Bettinger, Fox, Loeb et al., 2017).

Graduation rates

Not all people who commence a course of study successfully complete it with a qualification at their first choice of institution (→ *chapter Universities*, page 197 and *chapter Universities of applied sciences*, page 221). Some of them change to a different type of institution, while others leave the higher education system entirely. Of the students at Bachelor's level at conventional university, 9% switch to a UAS or UTE (Diem, 2016a). The average completion rate (with a Bachelor's degree) for all students who commence a course at all three types of university is 78% within six years. Thus the graduation rate is in the upper range by international comparison (→ Figure 194).

In particular in those countries where higher education is funded largely from the public purse, there is an interest in ensuring that students complete their studies successfully. This is especially true in Switzerland, where the tertiary education entry rate is relatively low owing to the high degree of selection at upper-secondary level and where there are also indicators of a lack of qualified specialists (→ *Skills shortage*, page 192).

Assuming that study requirements in different countries are comparable and the most capable young people commence a course of study in each place, it would be expected that the graduation rate is higher when the entry rate is lower. However, this negative correlation cannot be shown empirically (→ Figure 194), which indicates that the quality of the educational programmes varies. Switzerland has a similar entry rate to Bachelor's courses as the United Kingdom, but a lower graduation rate. Moreover, other countries with comparable graduation rates to Switzerland (Denmark and Norway) have higher entry rates to Bachelor's courses.

Bachelor's entry rate

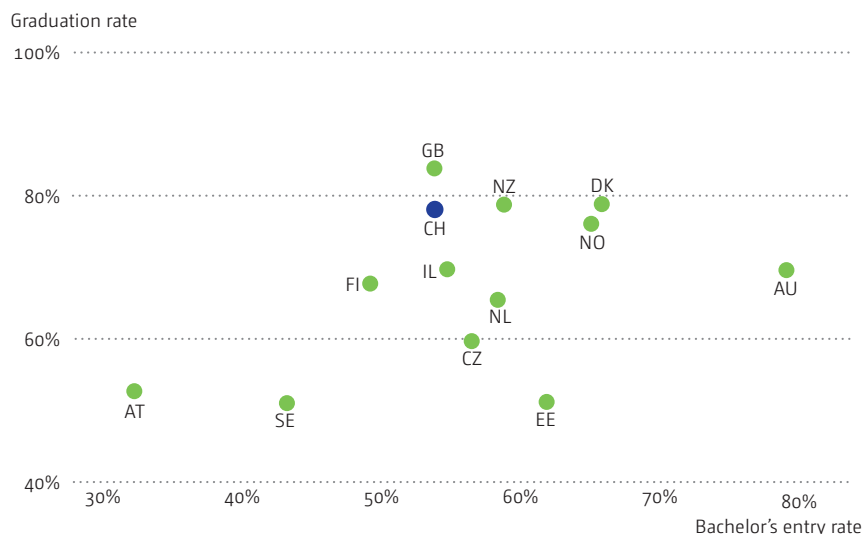
Entry to Bachelor's or equivalent level (ISCED 2011 level 6).

Graduation rate

Students qualified within the regular study period + 3 years. For Switzerland: Proportion of people who entered a Bachelor's course in 2009 and had obtained the qualification by 2015. The data point for Switzerland assumes that the graduation rate for Bachelor's courses does not differ from that for «equivalent level».

194 International comparison of entry rates to Bachelor's courses and graduation rates, 2014

Data: OECD, FSO (LABB); calculations: SCCRE



Definitions according to the ILO and FSO

People in employment

People who did at least one hour's paid work during the reference week

Unemployed according to ILO

People who were not in employment during the reference week and who were actively looking for work in the four preceding weeks

Labour force

Total of people in employment and unemployed

Unemployment rate according to ILO

Proportion of unemployed from the total labour force, in percent

Employment rate

Proportion of people in employment from the total number of graduates, in percent

Selection of **part-time employment** is often a personal decision and is not in most cases due to the fact that no full-time job could be found (according to data from graduate survey). The emphasis is therefore placed on employment income extrapolated to full-time equivalent.

Employment opportunities

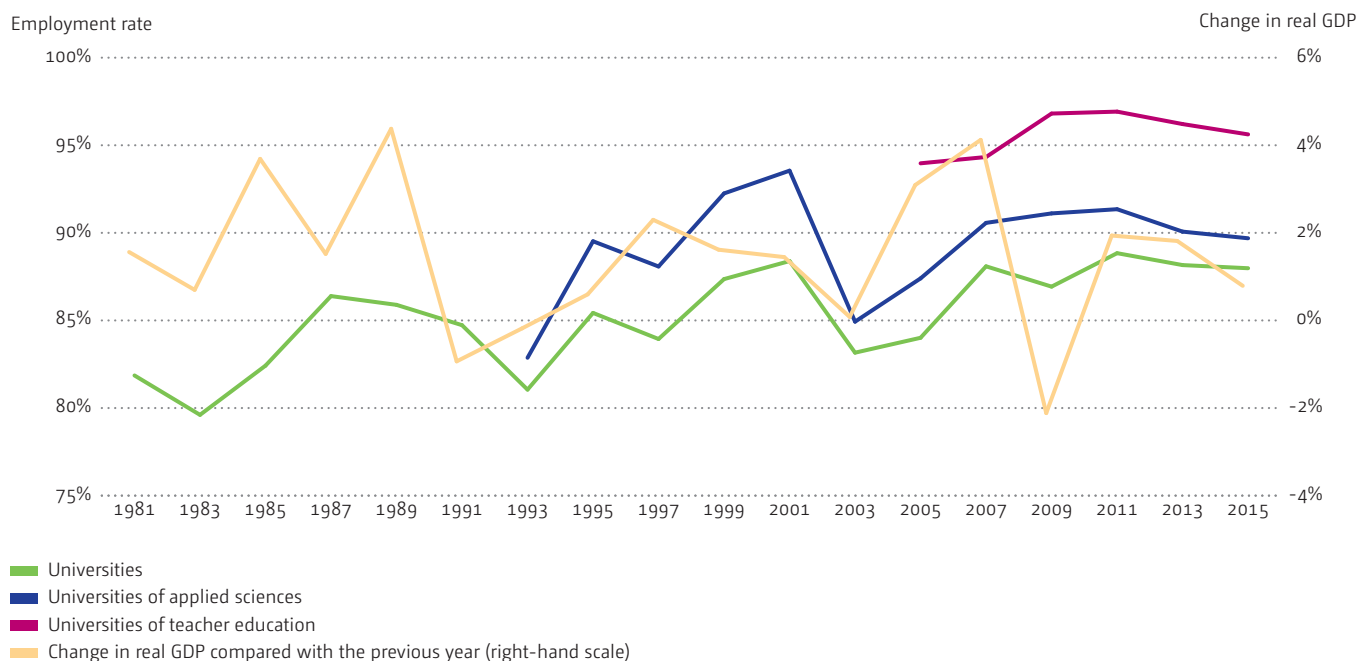
In the past ten years, the employment rate for university graduates one year after completion of their course has been between 87% and 97% depending on HEI type and the state of the economy (→ Figure 195). Graduates from UTEs have the highest levels of employment, while those from conventional universities have the lowest. The probability of finding employment varying by type of institution is also reflected in the unemployment rates assessed by the International Labour Organization (ILO) (FSO, 2017h). The fact that the unemployment rate among graduates of UAS tends to be lower than among conventional university graduates may be explained by the fact that many conventional university courses do not prepare their students for a specific job. At the same time, graduates of conventional universities have on average less work experience than their counterparts from UAS, making it more difficult for them to enter the labour market. Nevertheless, analysis of the likelihood that students will obtain employment that is suitable for their level of education paints a different picture (FSO, 2017h). Graduates of conventional universities are more frequently engaged in a job that requires a university degree than their counterparts who graduated from UAS. Once again, the highest proportion can be found among graduates from UTEs. In general it appears that differences observed according to type of institution for employment, unemployment rates and the proportion of graduates in suitable employment remain five years after graduation.

Employment incomes vary greatly by discipline, irrespective of whether looking at effective incomes or incomes extrapolated to full-time employment. One year after completion of studies, average graduate annual incomes range from some CHF 55 000 (design) to CHF 85 000 (medicine and business studies) extrapolated to full-time employment. In the subsequent four years, the mean incomes rise to around CHF 70 000 to CHF 110 000.

195 Employment rate of university graduates one year after completion of studies, 1981–2015

Conventional universities: 2nd cycle graduates (Lizenziat, Diplom, Master). UAS/UTES: 1st cycle graduates (Bachelor's, diploma), provided they have not started a Master's at the time of being surveyed, and 2nd cycle graduates

Data: FSO (Graduate Survey), SECO; calculations: SCCRE



Graduates in business achieve particularly high incomes, especially five years after completion of their studies, irrespective of the type of institution at which they gained their degree (→ Figure 197). Consistently above-average incomes can also be observed among graduates of teaching courses, although variation is also found within the discipline (→ *chapter Universities of teacher education, page 241*). In particular, incomes in medicine and pharmacy stand out one year after graduation. The greatest increase in income is observed in the area of law, where entry salaries are relatively low owing to the mandatory internships for prospective lawyers; four years later these people achieve above-average incomes. The lowest incomes are earned by those working in design and the arts, both one year and five years after completion of studies. The health and chemistry/life sciences disciplines, in which below-average entry salaries can also be observed, show the greatest relative income disadvantages.

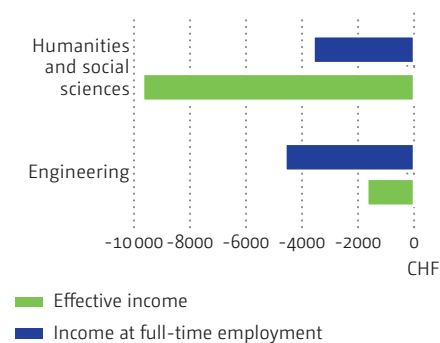
The median incomes of graduates in humanities and social sciences are practically at the same level as those of graduates in engineering and are slightly below the average at both observation time points. Looking at effective incomes (→ Figure 196) rather than salaries extrapolated to full-time employment, it is apparent that the actual incomes of graduates in the humanities and social sciences are significantly lower owing to more frequent part-time employment, however.

196 Variation of gross income from the median, 2015

Men only, five years after graduation

from a conventional university

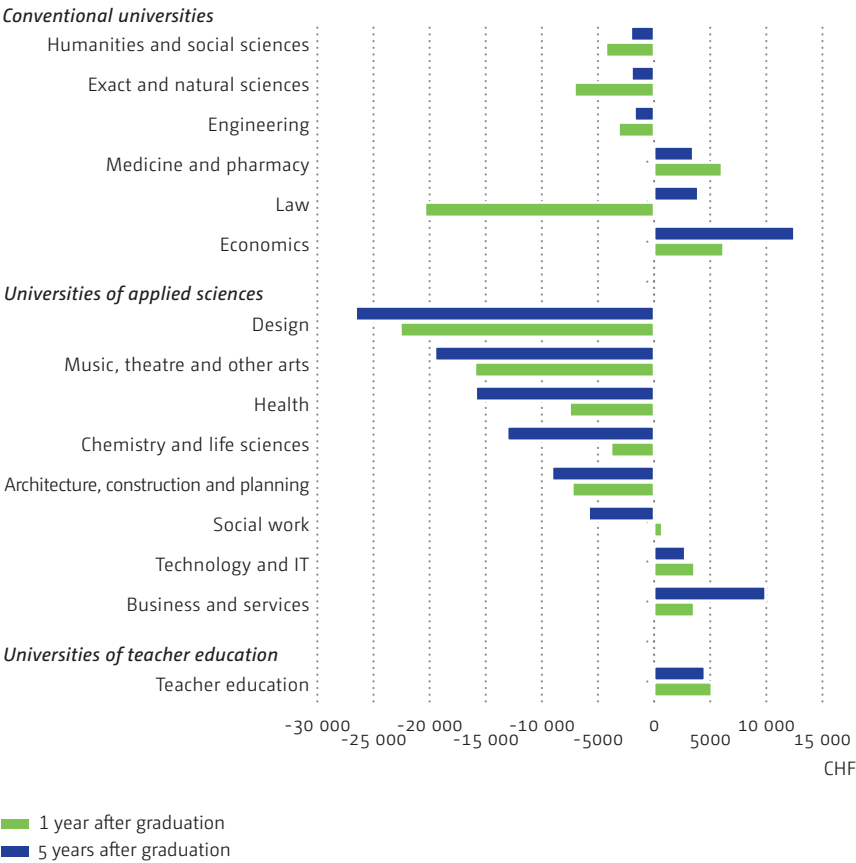
Data: FSO (Graduate Survey); calculations: SCCRE



The **median income** is CHF 77 000 one year after graduation and CHF 97 000 five years after graduation.

197 **Variation in gross incomes by discipline and HEI type from the median of all graduates, 2010 graduation cohort**

Median employment incomes for full-time employment estimated by quantile regression (controlled for age); conventional universities: only Master's. UAS/UTES: Bachelor's qualifications among those who have not started a Master's, and Master's qualifications
Data: FSO (Graduate Survey); calculations: SCCRE



System efficiency

It is worth considering what level of quality is achieved in education with the funds spent in the system, and how efficiently the resources are used. To estimate the system efficiency it is necessary to have a suitable output measurement (in order to assess effectiveness). International comparisons at university level can be made using university rankings as an indicator. While the use of these as a measure of quality may be open to criticism, in particular as they do not pay sufficient heed to different academic cultures and weight research activity a lot more highly than teaching outcomes, the fact that university rankings are broadly cited and the universities publish their rankings on their websites should provide sufficient evidence of their acceptance as a quality characteristic.

An assessment of the position between countries looks at the proportion of students who attend a top university in their country according to the university rankings. Only the Bachelor's level (i.e. ISCED level 6) is considered, in order to allow for different structures of the tertiary education sector. Looking at the Shanghai Ranking for 2016, for example, it is apparent that 26% of Swiss Bachelor's students attend one of the 200 highest-ranked

In Switzerland, only conventional universities will be able to rank among the top 200 universities owing to the evaluation criteria employed by the current **university rankings**. Looking at the three most popular rankings – Shanghai Jiao Tong (Academic Ranking of World Universities), Times World University Ranking and QS World University Ranking – six or seven universities in Switzerland have regularly placed in the top 200 universities for a number of years.

universities. With the exception of Sweden, no other country has a comparably high proportion (→ Figure 198).²

The performance of a country according to this measure, however, depends not only on the quality or output of its tertiary education system, but also on what institution types offer what types of education. For example, if teacher training in Switzerland were to be offered by conventional universities, the percentage of students attending a top university would rise. Therefore, the proportion of students at top universities only partially reflects the effectiveness of the tertiary education system. Nevertheless, in the absence of better alternatives, this indicator can be used to produce a rough assessment of effectiveness. By comparing education expenditure with the proportion of students at a top university, it can be seen that Switzerland has a medium cost-benefit relationship, i.e. average efficiency (→ Figure 199).

199 Bachelor's students attending top universities and annual expenditure per student, 2014/2016

The curve shown in the figure stands for the hypothetical efficiency limit, i.e. the maximum proportion of students at a top university that can be achieved at the given level of spending.

Data: OECD, Eurostat, SCCRE web research; calculations: SCCRE

Proportion of students at top 200 universities (Shanghai Ranking 2016)

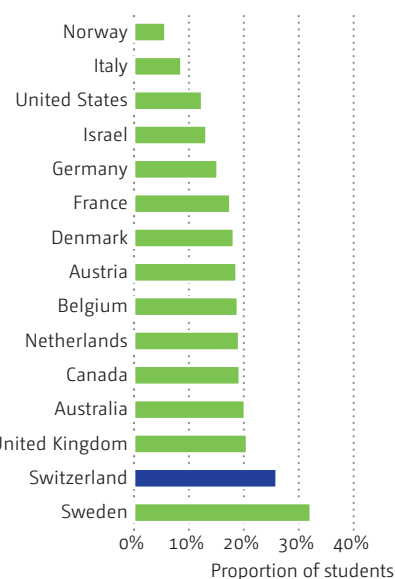


Social disparities

Social background continues to affect access and transition to higher education, and successful completion of a tertiary education (*Maaz, Watermann & Daniel, 2013; Becker, 2012*). Children from academic families have a greater chance of obtaining a university qualification. This link can also be observed in Switzerland (→ Figure 200). Access to tertiary education is less dependent on parents' education in Switzerland than in other countries, however, with an odds ratio of 1.2. This means that the proportion of students with fathers

198 Proportion of students attending a top university, 2016

Data: OECD, Eurostat, SCCRE web research; calculations: SCCRE

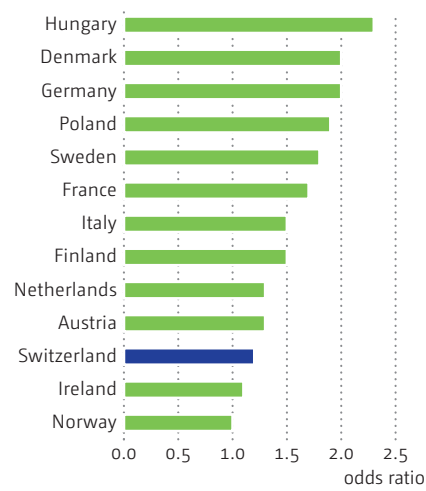


The proportions reflect the percentage of students who study at a top-200 university (according to the Shanghai Jiao Tong university ranking 2016). The indicator only includes students at Bachelor's or equivalent level to make comparison easier. If only including students attending conventional universities in the calculation, it is apparent that in Switzerland two-thirds of students are taught at one of the 200 «best» universities in the world. The percentage indicated in the figure is much lower, however, owing to the fact that the percentage of students who do not study at a conventional university is substantial (owing in part to the new ISCED classification).

² When using the Times Higher Education Ranking 2017 as the basis for calculating the proportion of students attending one of the top 200 universities, the rating for Switzerland is 27%. This is the third highest value (after Sweden and the United Kingdom).

200
Social disparity at universities

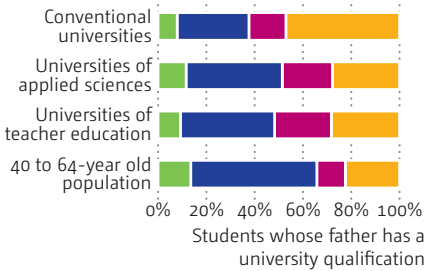
Data: OECD; calculations: SCCRE



Social disparity is the relationship between the proportion of students with fathers educated to tertiary level and the proportion of the 40 to 60-year old male resident population with a tertiary qualification.

201
Education background by HEI type, 2013

Data: FSO (SAKE, Social and Economic Conditions of Student Life); calculations: SCCRE



- Compulsory education
- Upper-secondary education
- (Tertiary level) professional education
- Uni/UAS/UTE

- Agri: Agriculture and forestry
- Arch: Architecture
- Art: Music, theatre and other arts
- Bus: Business and services
- Chem: Chemistry and life sciences
- Des: Design
- Econ: Economics
- Eng: Engineering (technical sciences)
- Hea: Health
- Hum: Humanities and social sciences
- Law: Law
- Ling: Applied linguistics
- Med: Medicine and pharmacy
- Psy: Applied psychology
- Sci: Exact and natural sciences
- Soc: Social work
- Spo: Sports
- Teach: Teacher training
- Tech: Technology and IT

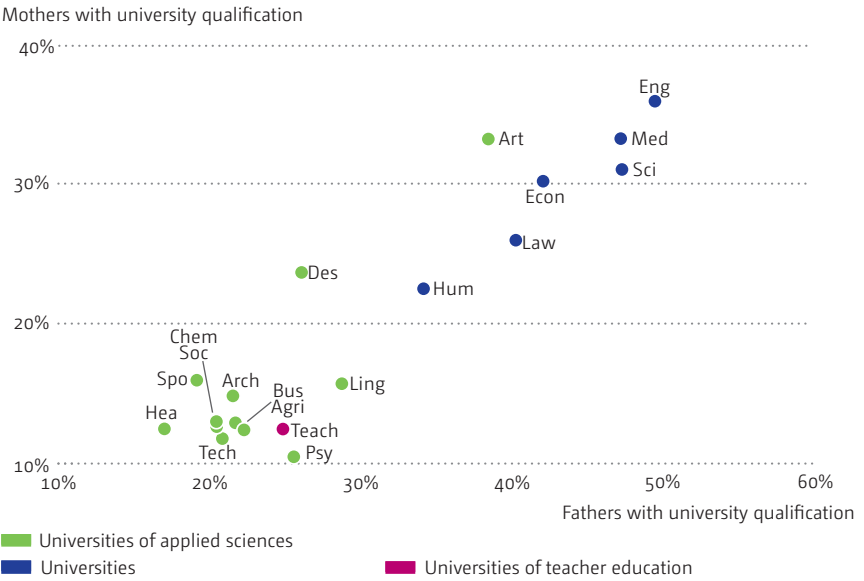
who have received a tertiary education (completion of a university or tertiary level professional education course) is only slightly higher for those attending university than for the comparable population. In Germany and Denmark, in contrast, children of academic families are twice as likely to go on to study in higher education. Nevertheless, in Switzerland the types of HEI attended vary strongly according to the students' social background. While the proportion of UAS and UTE students with academic fathers corresponds largely to the proportion of academics in the corresponding age group of the population, students at conventional universities are significantly more likely to have been born into an academic educated home (→ Figure 201). When taking account of students' fathers' education, there are twice as many students registered at universities with fathers who are academics as there are young people with fathers who have an academic education.

The considerably wider social disparity at conventional universities is down in part to the already socially selective access to baccalaureate schools (Scharenberg, Wohlgemuth & Hupka-Brunner, 2017; Buchmann, Kriesi, Maarten et al., 2016; Felouzis, 2014; Hupka-Brunner & Wohlgemuth, 2014), which are the most important source of admissions to conventional universities. At the same time, research shows that the choice of discipline and type of institution also varies in line with the degree of parental education (Denzler, 2011; Buchmann, Sacchi, Lamprecht et al., 2007).

When investigating the individual disciplines by social background of students, the same picture emerges as in the analysis by type of institution, with just a couple of exceptions. All subjects that are taught at conventional universities or the federal institutes of technology (ETH) are located in the upper right quadrant. These are the subjects studied more frequently by students whose parents have an academic education. The only exception is art, which is taught at universities of applied sciences but has a similar student body to the conventional universities. Humanities and social sciences at universities and the UAS specialising in design occupy the middle ground, while other UAS subjects and UTE teacher training all have lower proportions of students from academic families (→ Figure 202).

202
Education backgrounds of university students by discipline, 2013

Data: FSO (Social and Economic Conditions of Student Life); calculations: SCCRE



Migration background

The proportion of students at Swiss HEIs who have a migration background is rather small. While many foreign nationals come to Switzerland specifically to study («foreign students»), especially at the conventional universities, people with a migration background (i.e. Swiss students with both parents having been born abroad, or foreign nationals who obtained their university admission qualification in Switzerland) make up only 10% of the student body. One factor in this regard is the high social barrier to entry for baccalaureate schools; which applies also to migrants (*Beck, Becker, & Jäpel, 2013; Becker, 2011; Becker, Jäpel, & Beck, 2011*). In addition, migrants have been found to make different choices in their selection of what and where to study (*Bergann & Kroth, 2013*).

Barrier-free access

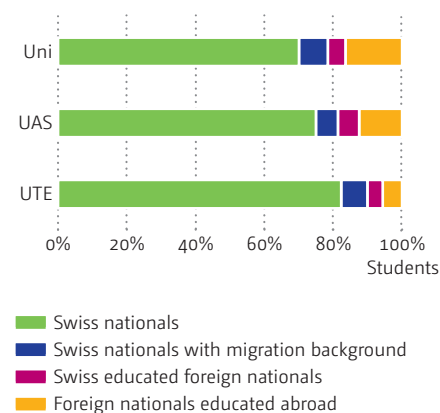
Access to higher education for people with disabilities and their right to participate equally in student activities are enshrined in Swiss law.³ Nevertheless, a great deal of work is still to be done to implement barrier-free access in a way that enables disabled people to study on an equal, self-sufficient footing, encompassing measures such as accessible construction, accessible websites, institutional procedures for overcoming disadvantage, etc. (*Meier-Popa, 2012; Kobi & Pärli, 2010*). In respect of access to buildings, a recent survey of the corresponding building facilities at the Zurich University of Applied Sciences (*Tomczak-Plewka, 2016*) shows that while the majority of buildings are accessible to wheelchair users (83%), only 17% have provision for users with a hearing impairment and only 6% for users with a visual impairment.

The currently available figures do not allow conclusions to be drawn as to whether or to what extent the existing barriers cause people with disabilities to be disadvantaged when it comes to access to higher education. In the population as a whole, the level of education of people with disabilities is lower on average than that of people who do not have a disability. However, this may also be attributed to the fact that people with a lower level of education are more at risk of acquiring a disability in adult life. When comparing only people who were born with a disability with those who were not (→ Figure 204), it transpires that the tertiary qualification rate is around 4 percentage points lower among the former group. However, owing to the small number of cases this difference is statistically uncertain, so no disadvantage can be proven.

The likelihood of obtaining a place in higher education can vary according to type of disability (impaired mobility, visual disability, impaired hearing, mental disability, learning difficulties, etc.). A comparison of the percentage of people with functional disabilities in the student population with those in the general population aged 15 to 39 (→ Figure 205) indicates that people with impaired sight or hearing tend to be under-represented in the student population – especially those with more severe impairments – in contrast to people with mobility impairments. Again, the small number of cases means that no definite conclusions can be drawn.

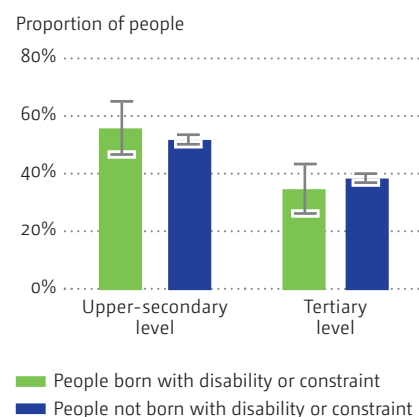
203 Background and migration status of students, 2013

Data: FSO (Social and Economic Conditions of Student Life); calculations: SCCRE



204 Education level of people born with and without disability, 2014

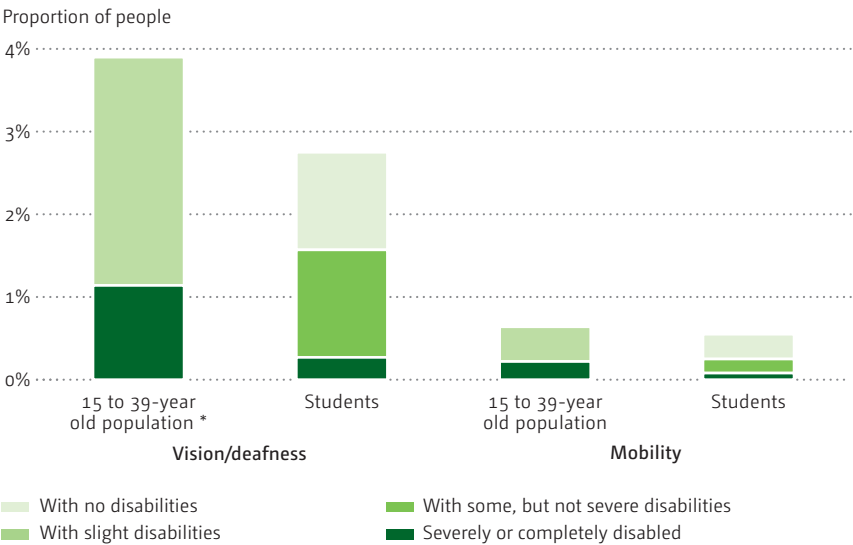
Data: FSO (SILC)



³ Federal Constitution (Article 8), Disability Equality Act (Articles 1 & 2) and Agreement on the Rights of People with Disabilities (0.109).

205 Proportion of people with functional disabilities among students and the population of 15 to 39-year-olds, 2012 and 2013

The restrictions for students relate to study-related activities. * Double-counting possible
Data: FSO (Swiss Health Survey, Social and Economic Conditions of Student Life); calculations: SCCRE



Nevertheless, even if there are no significant differences in participation in education, it is to be anticipated that people with disabilities will experience greater cost for studying, and this will only be possible with limited autonomy. The support offered by HEIs varies. According to the data on the social and economic conditions of student life, three quarters of students who receive assistance and have a chronic health problem are quite or very satisfied with the support available to them.

Demand for tertiary education

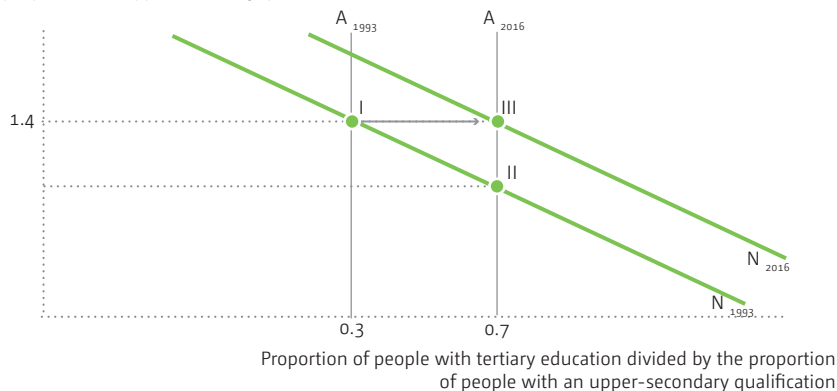
The observation that the impressive expansion of education in developed countries has not led to a reduction in the return on education is explained in theory by the fact that technological change relies on education and generally leads to increased demand for a more educated workforce (*Acemoglu, 2002; Freeman, 1986; Tinbergen, 1974*). In other words, the increase in the number of people with a tertiary education as a result of the expansion in education was largely in response to a corresponding growth in demand (*Freeman, 1986; Tinbergen, 1974*).

The Figure 206 below shows the correlation between supply and demand for tertiary-educated people in Switzerland. In the last twenty years, the proportion of people with a tertiary education relative to people with a post-compulsory education has more than doubled (from 0.3 to 0.7). If demand were to remain stable, this expansion in supply would have resulted in a decrease in the wage advantage for those with a tertiary education (see equilibrium II). However, given the relative incomes of tertiary-educated people have remained more or less stable, it must be that demand has expanded accordingly (from equilibrium I to equilibrium III).

206 (Relative) supply and demand for tertiary-educated people (1993, 2016)

Data: FSO (SLFS); calculations: SCCRE

Salary of people with tertiary education divided by the salary of people with an upper-secondary qualification



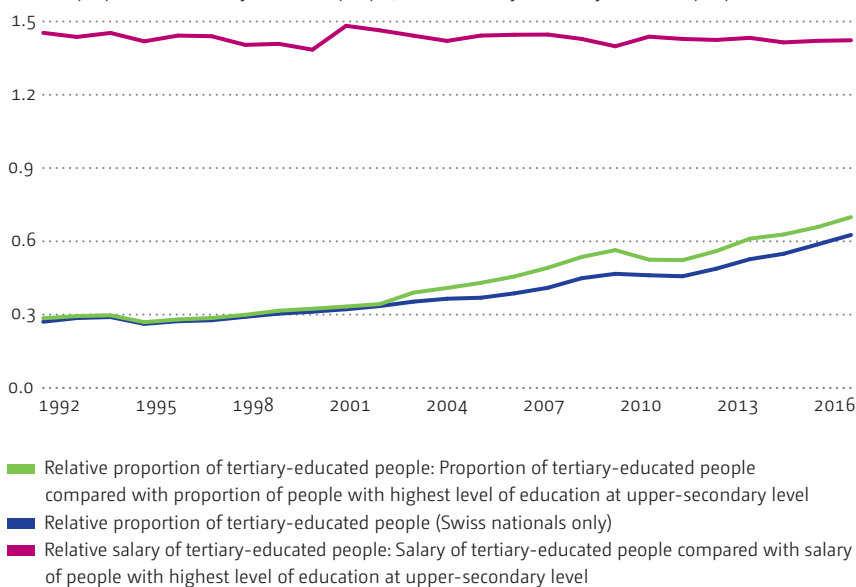
The education expansion described above cannot only be attributed to the flow of foreign labour into the Swiss labour market, however. The expansion of relative supply can also be observed among Swiss nationals (→ Figure 207). Nevertheless, the relationship of the relative supply and relative salaries also leads to the conclusion that the inbound migration of highly qualified people has met a domestic demand, since it has not caused the relative salaries of higher qualified people to fall.

207 Supply and demand for tertiary-educated workers, 1992–2016

Working population (25 to 64-year olds)

Data: FSO (SLFS); calculations: SCCRE

Relative proportion of tertiary-educated people/ relative salary of tertiary-educated people

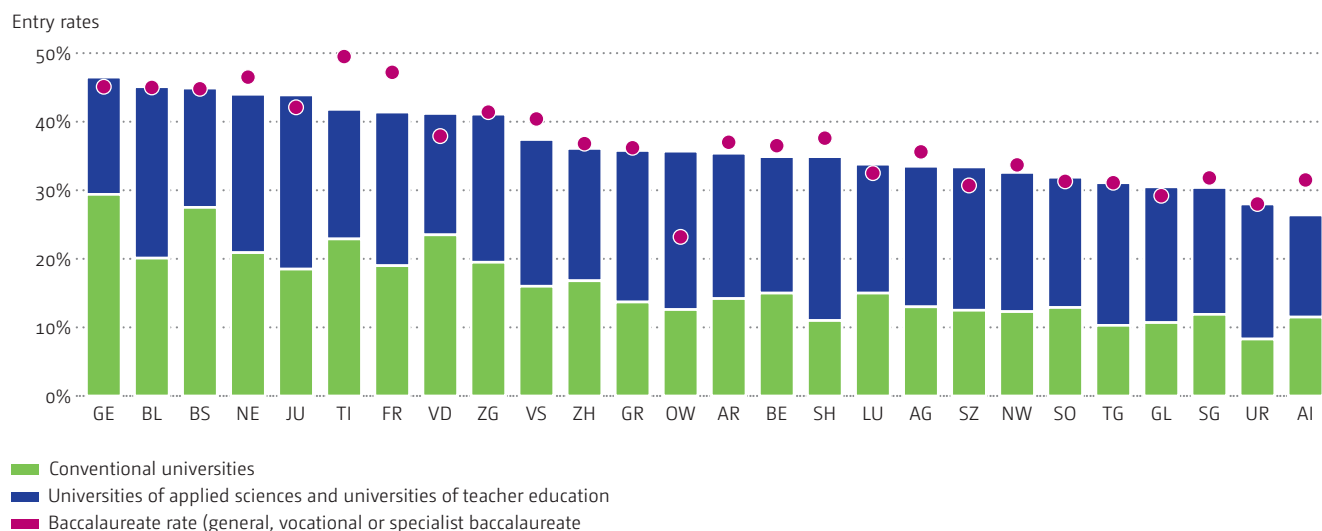


Regional distinctions in demand for higher education

Demand for higher education differs along regional lines. It correlates relatively strongly with the corresponding baccalaureate rate. Cultural differences in respect of general versus vocational education would be reflected here.

208 University entry rates by canton and HEI type, 2016

Data: FSO



These then continue into the tertiary phase in terms of the different relationship between the university sector and professional education. Ultimately, the different higher education offering should also impact demand. Thus there is lower demand for higher education in rural cantons that do not have a university.

Skills shortage

The fact that expansion of tertiary education roughly matches expansion in demand for tertiary-educated people does not automatically mean that supply and demand are in equilibrium across all disciplines. In addition, the lack of specialists bemoaned in many locations is not limited to professions requiring a higher education; there are other fields of work that have lower educational requirements for which there are signs of a lack of workers (*SECO*, 2016; *Zurich, Volkswirtschaftsdirektion*, 2016). Looking only at professions that require a tertiary education, it is apparent that there are not only very different tensions in labour markets between different professional fields, but also in some cases within specific professional fields. For example, *SECO* (2016) has, in the natural science professions, established a lack of chemists, mathematicians and statisticians, but sufficient numbers of biologists, geographers and meteorologists.

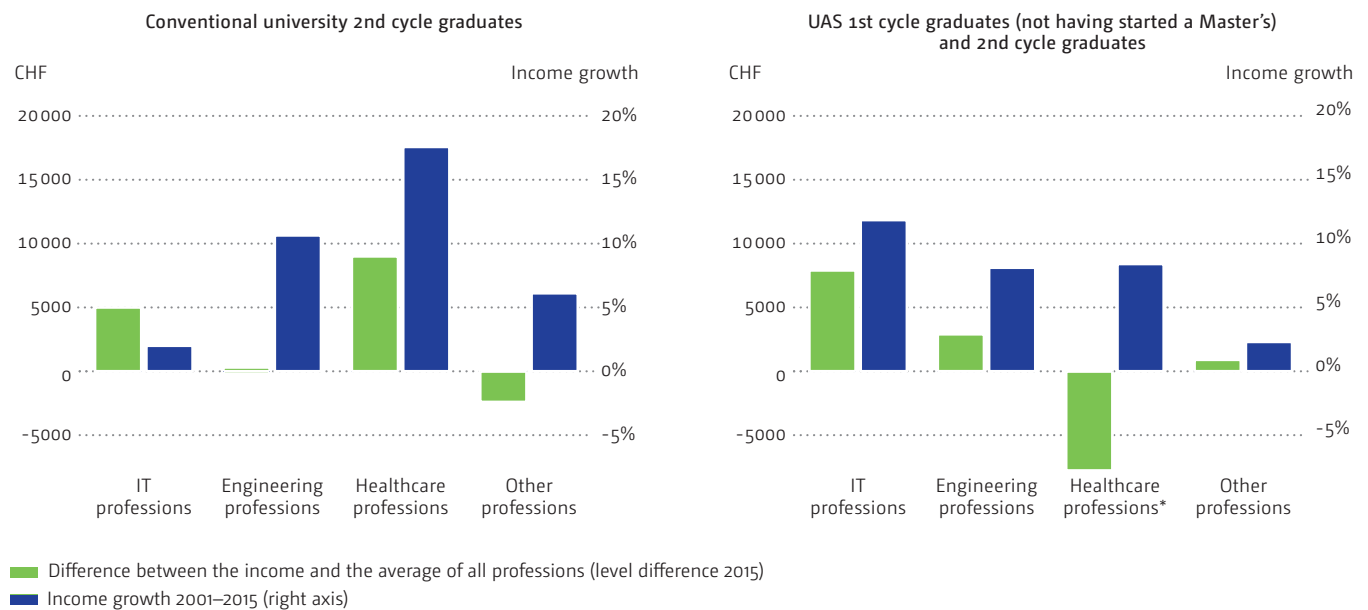
Economics would suggest that a shortage of supply in a given profession would result in higher salaries. A comparison of the entry salaries for university graduates in a range of professions confirms this assumption at least in part. Professions in the field of information technology achieve above-average salaries in line with expectations, however the increase in salaries over the last 15 years is only above average for UAS graduates (→ Figure 209). In engineering professions, salaries are at an average level, but above-average salary increases have been recorded. Healthcare professions exhibit major differences between conventional university and UAS qualifications. While doctors' salaries remain at above-average levels and have increased strongly in recent years, UAS-graduate healthcare professionals' incomes are below average.

209 Income from employment in under-supplied professions in comparison with average of all professions, 2015

Median values gross income of university graduates one year after graduation, at full-time employment. Occupational classes according to Swiss Standard

Classification of Occupations (SSCO) 2000. * The growth in income relates only to the years 2007–2015.

Data: FSO (Graduate Survey); calculations: SCCRE

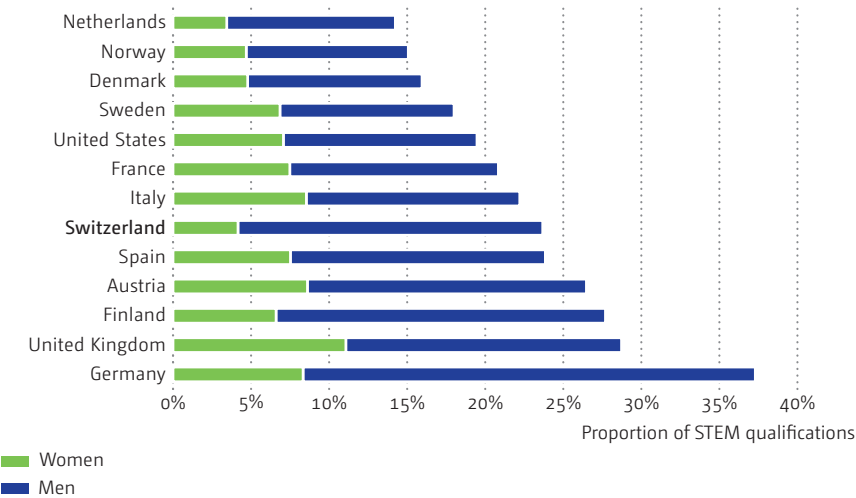


The recent development in qualifications in STEM subjects and healthcare could exacerbate the lack of supply in the corresponding professions if the corresponding demand does not also increase. The number of qualifications in STEM subjects has risen since 2010 and forecasts indicate that this trend will be sustained in the coming years (FSO, 2017e). The FSO also anticipates that student numbers in STEM subjects at conventional universities will increase relative to other subjects, but not at universities of applied sciences. A higher number of university degrees is expected to be awarded in the healthcare sector too (→ *chapter Universities*, page 197).

Switzerland's proportion of students studying STEM subjects is average by comparison with other countries (→ Figure 210). However, it is apparent that women in this country are particularly unlikely to start or complete studies in a STEM subject, which indicates a significant gender gap (→ *chapter Universities*, page 197, → *chapter Universities of applied sciences*, page 221).

An American study (Hunt, 2016) shows that the under-representation of women in STEM subjects is worsened by the fact that women are also more likely to leave STEM professions compared to men, i.e. either temporarily or permanently give up employment or switch profession. The higher the proportion of men studying a given subject, so show the American findings, the higher the rate of women leaving the profession. This has been particularly marked in the engineering profession in the USA.

210 STEM qualifications as a proportion of all qualifications (ISCED 6), 2015
Data: OECD

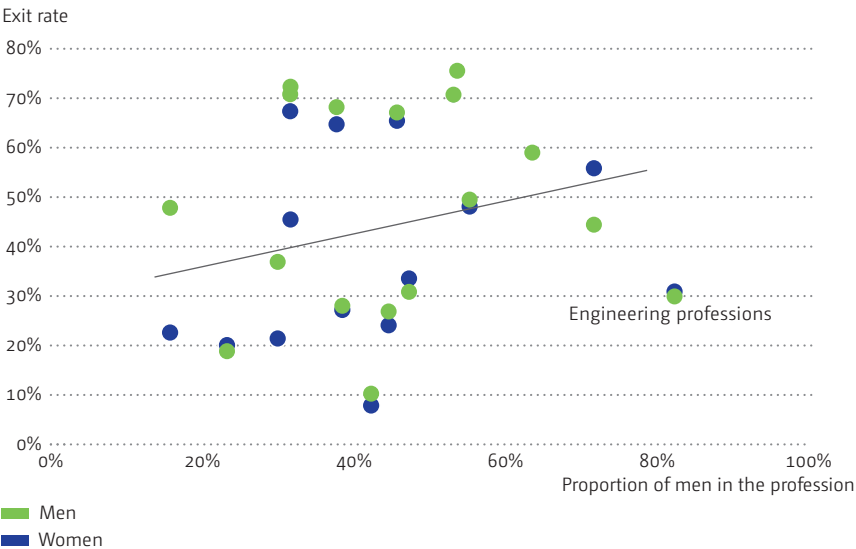


In Switzerland, data from the Graduate Survey also show that the exit rate (five years after graduation) for women who were originally in work related to their qualification (one year after graduation) is generally higher the greater the percentage of men working in the profession (→ Figure 211). In engineering sciences, however, the female exit rate is comparably low despite the very high proportion of men. Gender proportions are generally less important in explaining exit rates from the profession or from employment for men than they are for women.

Refined analysis shows further that the proportion of men is important for switching profession but less so for leaving employment entirely. In addition, in-depth analysis reveals that the results vary considerably according to type of institution.

211 Proportion of men in the profession and exit rates

Only includes data points with at least 100 observations. The trend line relates to the data points for females.
Data: FSO (Graduate Survey); calculations: SCCRE



Proportion of men in the profession

Proportion of men in the occupational group (according to Swiss Standard Classification of Occupations 2000) among university graduates one year after graduation (surveys 2007 to 2015).

Exit rate

Proportion of university graduates who were in a relevant job one year after graduation but were no longer in the same profession four years later (owing to change of profession or exit from employment).



Universities

Context

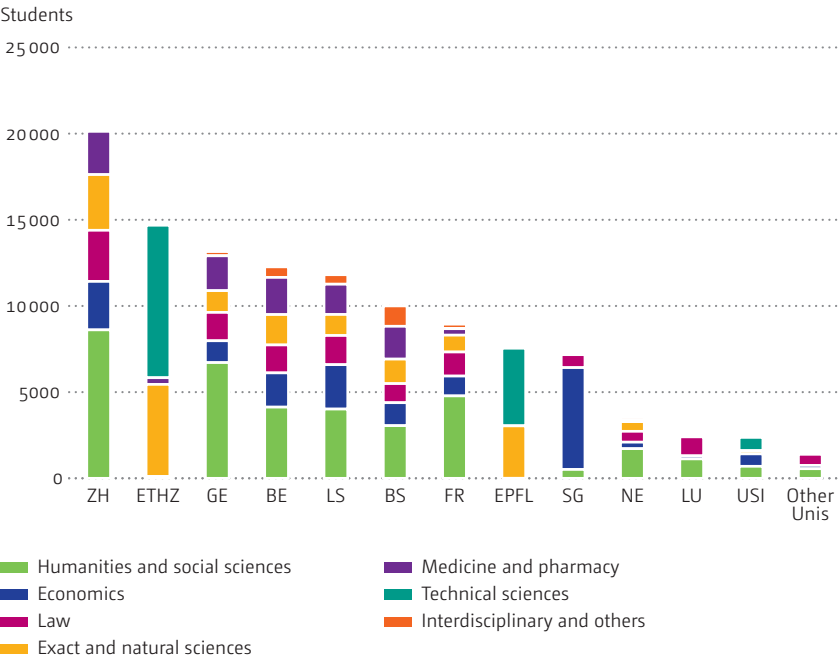
Unless specified otherwise, the term **student** as used in this chapter includes all students on Bachelor's, Master's, Lizenziat and Diplom courses, but not students at doctorate level or students taking part in continuing education and training.

In accordance with the Swiss Act on Funding and Coordination of the Higher Education Sector (HFKG), universities in Switzerland encompass the ten cantonal universities and the two federal institutes of technology (FIT). This chapter also deals with other university institutions approved under the funding legislation.¹ In 2016 there were a total of 116 000 people studying for Bachelor's or Master's degrees or for the older Lizenziat or Diplom (→ Figure 212). By far the largest university is the University of Zurich with approximately 20 000 students. Among the smallest universities with fewer than 5000 students are those in Neuchâtel, Italian-speaking Switzerland and Lucerne. The humanities and social sciences account for a good quarter of all students starting their Bachelor's degree. In all other subject fields (with the exception of interdisciplinary sciences for which the figure is lower), this proportion lies between 10 and 19% (→ Figure 213).

212 Student numbers by university, 2016

Data: FSO

- ZH University of Zurich
- ETHZ Swiss Federal Institute of Technology Zurich
- GE University of Geneva University
- BE Bern University
- LS Lausanne University
- BS Basel University
- FR Fribourg University
- EPFL Swiss Federal Institute of Technology Lausanne
- SG: University of St. Gallen
- NE University of Neuchâtel
- LU University of Lucerne
- USI University of Italian-speaking Switzerland



Students who have gained their Swiss university admission qualification are free to choose what they want to study and which university they want to attend. The only exceptions are medicine and sport science, for which there are admission requirements in the universities in German-speaking

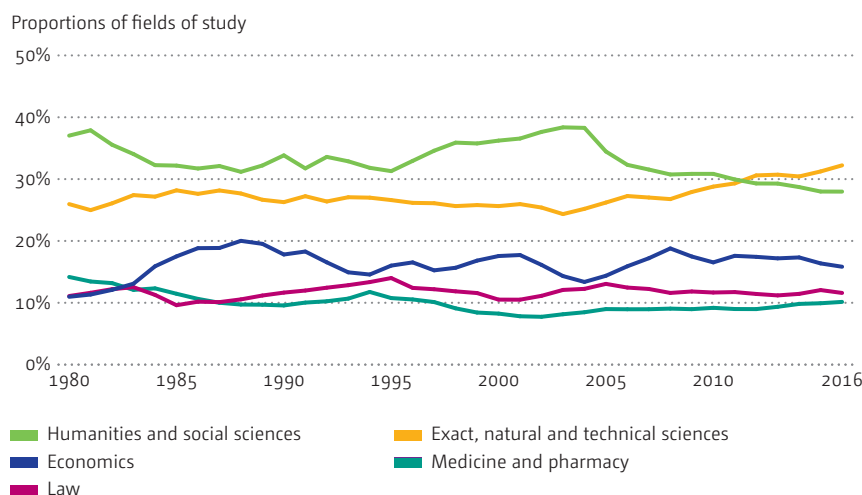
¹ The higher education institutions recognised in the funding legislation include the Universitäre Fernstudien Schweiz (for distance-learning), and the Graduate Institute of International and Development Studies (IHEID). For the purposes of the FSO statistics, the former is included in the «Other universities» category and the latter under Geneva University. Until the mid-2010s, the Kurt Bösch University Institute and the Swiss Graduate School of Public Administration (IDHEAP), both of which are integrated into universities, and the former Schweizerische Zentralstelle für die Weiterbildung der Mittelschullehrpersonen (WBZ, now the Swiss Centre for Secondary Schools, ZEM/CES), were also classed as institutions of higher education.

Switzerland. The predominantly demand-oriented nature of the system is reflected in the composition of the subject fields (→ Figure 213). Since the middle of the 2000s, student numbers in the humanities and social sciences have been falling consistently (from 38% in 2004 to 28% in 2016), while the number of new students has increased in the fields of exact, natural and technical sciences, for both men and women.

213 Relative share of student intake by field of study, 1980–2016

New Bachelor's or Lizenziat/Diplom students

Data: FSO



With regard to medicine, student demand far exceeds the limited supply of places, while there is also a shortage of medics with specialist skills (→ *chapter Tertiary-level education, page 169*). In response to this problem, the Confederation and cantons have launched a special programme that aims to increase the number of graduates in human medicine over the long term from just under 900 per year (in 2016) to 1350 by 2025, thereby reducing Switzerland's reliance on foreign doctors. This project was launched using project funding from the Swiss University Conference (SHK). However this special programme is not sufficient for sustainable funding. Consequently, the programme's long-term success will hinge on financing at cantonal level. In cooperation with the existing faculties of medicine, parts of the human medicine training are now also being offered at universities that have not previously offered any such courses.

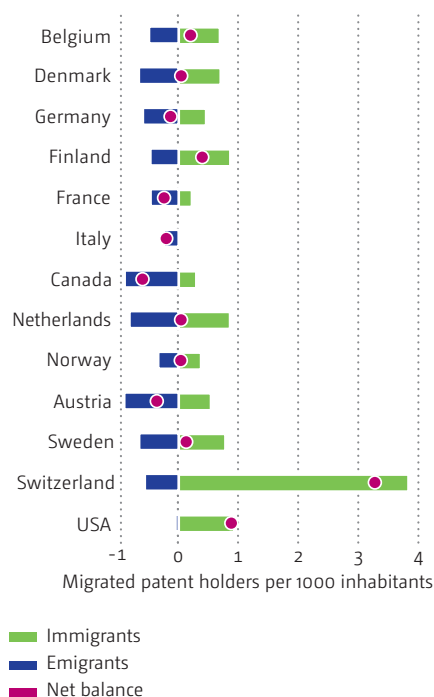
Forecasts for student numbers

The development of student numbers essentially depends on the number of school pupils achieving their baccalaureate and on the transition rate from the baccalaureate to university. According to the Federal Statistical Office's (FSO) reference scenario, the number of baccalaureates will only rise to a small extent, if at all, between now and 2025, with the transition rate remaining stable (FSO, 2017f). Constant trends can also be expected in relation to new students with a foreign admission qualification. In contrast, the number of new entrants with other qualifications (e.g. supplementary examinations federal vocational baccalaureate/specialised baccalaureate – university or qualifications from a university of applied sciences/university of teacher

215 Number of migrated patent holders, 2001–2010

Per 1000 inhabitants of working age

Source: Miguélez & Fink, 2013; data: WIPO, OECD; presentation: SCCRE



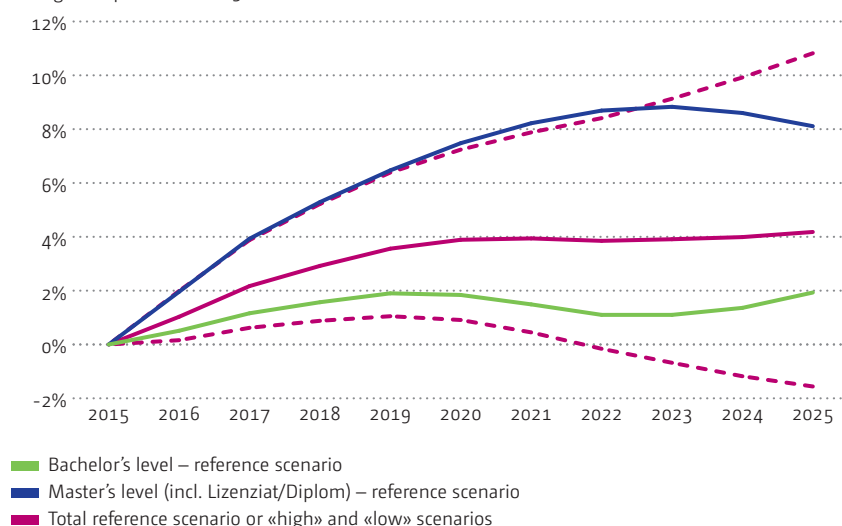
The migrated patent holder indicator is based on data relating to patents filled with the international patent system (PCT) of the World Intellectual Property Organization (WIPO). The chart shows the number of patent applicants, the nationality of whom does not correspond to the country of residence, per 1000 inhabitants of working age (15 to 64-year-olds, as at 2010).

education) is likely to increase. Overall, weak growth in student numbers is the most that is expected by 2025 (+1.9% for Bachelor's and +10% for Master's degrees between 2015 and 2025) (→ Figure 214). It is, however, difficult to produce reliable forecasts given the uncertainty surrounding certain factors such as the development of the number of students with a foreign entrance qualification. Depending on the scenario, growth in the number of students between now and 2025 could amount to 11% («high» scenario) or there could be a fall of 2% («low» scenario). In absolute terms, this equates to a difference between the two scenarios of more than 14 000 students by 2025, underlining the uncertainties associated with forecasts. If the «high» scenario were to occur, the student-teacher ratio (assuming constant staff levels) would rise from 16.7 students per full-time equivalent academic staff member to 18.5. The creation of an additional 740 full-time positions would be required in order to maintain the same student-teacher ratio.

214 Development of student numbers, 2015–2025

Data: FSO

Change compared with 2015



Developments specific to a field of study are particularly difficult to forecast. Reasonably reliable predictions can only be made in relation to the area of medicine, for which the number of study places is controlled. Rising demand for STEM subjects over recent years, as well as the trends in the key subjects of biology, chemistry/physics and applied mathematics do, however, appear to indicate growth in STEM student numbers (FSO 2017f).

Globalised labour market for academics

The labour market for academics is highly globalised (Kerr, Kerr, Ozden et al., 2016). International competition for the best talent from around the world is particularly intense. This means, on the one hand, that skilled workers who have been educated in Switzerland will not necessarily stay on the Swiss labour market, with some moving abroad. On the other hand, it also means that Switzerland can benefit from highly qualified foreign staff. With regard to acquiring these foreign workers, the basic institutional parameters governing immigration, including international cooperation agreements, are

crucially important. Additionally, the attractiveness of the local working environment and the working conditions are a key factor in competition for the best talent. Switzerland benefits greatly from the internationalisation of the labour market for academic personnel (→ *chapter Tertiary-level education, page 169*), as also highlighted by comparing the *brain drain* and the *brain gain* using the indicator of migrated patent holders (*Miguélez & Fink, 2013*) (→ Figure 215).

Evaluations of graduate survey data on the mobility of university graduates in the first five years after completing their studies show that only a small proportion leave Switzerland. One year after graduating, 3.5% of those in employment who hold a Swiss university admission qualification are working abroad, a figure that rises to 5% five years after graduating. Graduates who acquired their university admission qualification abroad (foreign students) do however tend to return abroad more frequently. Based on estimated figures, between 60 and 74% of this group are working on the Swiss labour market one year after graduating (→ Figure 216). The lower figure in this range is somewhat lower still four years later. The proportion of people from third states who remain in Switzerland is barely any different from the proportion of EU/EFTA nationals, despite the restrictions on their rights of establishment and working rights. It is not known whether this is related to different subject choices.

Institutions

Universities in Switzerland have a diverse remit to fulfil, encompassing 1st and 2nd cycle degree studies (Bachelor's and Master's) and advanced studies (doctorates); research and development; continuing education and training, and services. While continuing education and training has to be offered in such a way that the institutions' costs are covered, expenses for teaching and research are largely funded by the Confederation and cantons.

The level of funding provided by the Confederation is governed by the Act on Funding and Coordination of the Higher Education Sector (HFKG) and/or in the FIT Act (→ *chapter Tertiary-level education, page 169*). This covers some three quarters of the costs of Swiss institutes of technology (global budget) and 12% of the costs of cantonal universities (basic contributions). Cantonal contributions cover around one half of cantonal universities' expenses. The vast majority of these come from the canton in which the institution is based. Meanwhile, the amounts transferred by the cantons on the basis of the Intercantonal Agreement between the Universities (IUV), under which the cantons undertake to pay contributions for students from their territory to the cantons responsible for the academic institutes these students attend, cover between 5 and 23% of costs, depending on university.

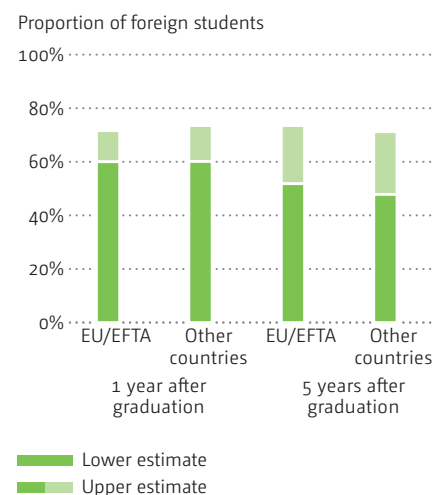
Intercantonal migration flows of university graduates

Analysis of the migration flows of university graduates shows that more than 80% of those who studied in their home canton were still living in their home canton five years after completing their studies (→ Figure 217). In contrast, with regard to those people from non-university cantons, one in two remained in the canton of residence

216 Proportion of foreign students on Swiss labour market, 1 and 5 years after graduation, 2015

Graduates of 2nd cycle only

Data: FSO (Graduate Survey); calculations: SCCRE



The upper estimate corresponds to the figure reported in the graduate data. When calculating the lower estimate, the fact is taken into account that the response rate for foreign students is lower than for Swiss nationals and Swiss-educated foreign nationals. It is therefore assumed that the difference in responses corresponds to a place of residence abroad (and thus work abroad).

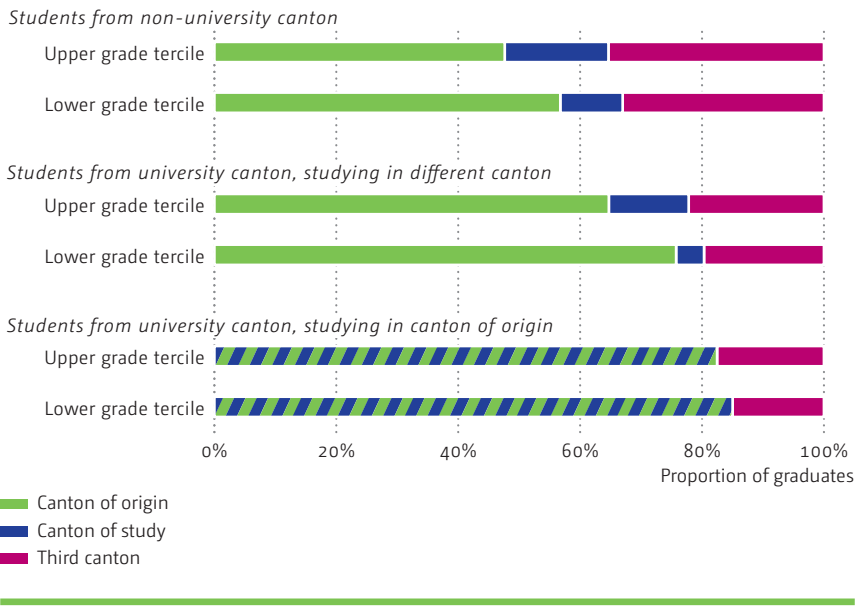
The **Intercantonal Agreement between the Universities (IUV)** is currently being revised. Its basic function – free movement of students and sharing of the burden among the cantons – will still be guaranteed in the new version (IUV II). However, future fees are to be based on effective operating costs (with deductions for research and location advantage of university cantons). The migration discounts, previously applied to six cantons, are also to be abolished, as most cantons record migration losses (*EDK, 2017b*). The new fees under IUV II are likely to cover a good three quarters of operating costs and will not differ to any large extent from the current rates (*ibid*).

and/or returned to that canton. The figures for students from university cantons who did not study in their own canton are somewhere in the middle (at around two thirds).

However, it is not just from a quantitative perspective that the non-university cantons are losing out. They are also losing out qualitatively. Out of the group of graduates who did not study in their canton of origin, those with better degree results are less likely to live in their canton of origin five years after graduating compared with those students who gained below-average results. University cantons are the winners. In-depth analysis of the factors influencing mobility (*Oggenfuss & Wolter, 2018*) indicates that high taxes inhibit a return to the canton of origin.

217 **Place of residence of graduates 5 years after graduating by origin and final grade, 2015**

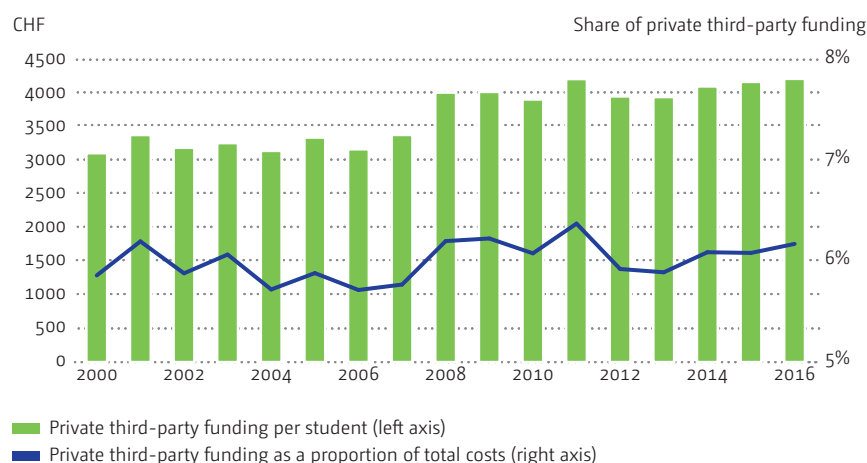
Data: FSO (Graduate Survey); calculations: SCCRE



Around one fifth of the costs are covered by competitively acquired third-party funds, mainly from public funding institutions such as the Swiss National Science Foundation (SNSF) and the Commission for Technology and Innovation (KTI), or from EU research programmes. The allocation of funding by competitive means is generally associated with the expectation that the productivity of the university will improve as a result and that funds will be deployed more efficiently. However, research findings indicate that competitively granted (international) third-party funding only improves productivity (measured in terms of number of publications and number of students) at universities with a lower level of productivity, i.e. with a relatively low number of publications and/or students to start with (*Bolli, Olivares, Bonaccorsi et al., 2016*). As far as the most productive universities are concerned, there is actually a negative effect, which is explained by the fact that the administrative time and effort needed to procure competitive funding is considerable, leaving less time for productive work. Private third-party funding, acquired in the form of private research assignments and from foundations, accounts for around 6% of costs (→ Figure 218). In absolute terms, this type of funding has increased compared with the early 2000s, while the relative share of the total budget has remained largely stable. To minimise the risk of sponsors influencing research (results), the universities have adopted guidelines on the acceptance of private money.

218 Private third-party funding and its share of total costs, 2000–2016

Data: FSO



Through their tuition fees, students only cover a small portion (2%) of the total costs. The fees at most universities are between CHF 1000 and 1700 per year. It is only the University of Italian-speaking Switzerland that charges considerably more, with fees of CHF 4000 (→ Figure 219). In the case of students who are resident abroad when they acquire their admission qualification, higher fees will be charged by some institutions, as is the case at the two universities with the highest proportion of foreign students (USI and SG). The reasons given for these additional fees, ranging from CHF 300 to 4000, are higher administrative costs (review of application upon admission, communication/website in English) and the financial shortfalls that the university cantons are required to make up due to a lack of IUV contributions.

Tuition fees are identical for all fields of study within the university. Since there are substantial cost differences between the various courses, however (→ *Efficiency / costs*, page 212), the percentage of study costs covered by each student varies considerably. An economics student at the University of Geneva, for example, personally assumes 15% of his or her annual costs for the 1st and 2nd cycles (excluding research), while a natural sciences student at the same university will only contribute around 3%.

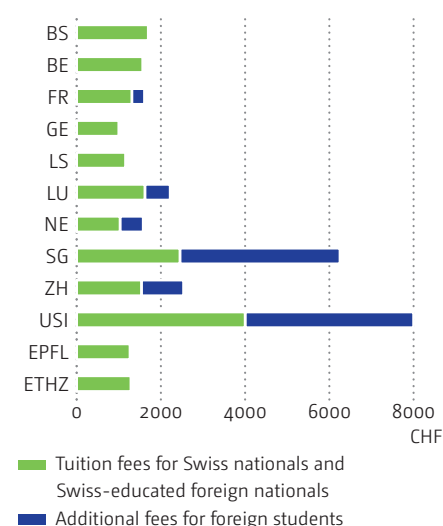
Studying in the Bologna system

Studies at Swiss universities follow the three cycles of the Bologna system, with a Bachelor's degree (1st cycle), Master's degree (2nd cycle, usually following straight on from the Bachelor's) and doctorate (3rd cycle). At Bachelor's and Master's level, the introductory phase lasting one to two semesters, as well as being used to transfer specialised knowledge, is designed to achieve a uniform level of knowledge and to select students (CRUS, 2014). Generally, a Bachelor's degree will take three years of full-time study (180 ECTS credits) and a Master's degree from one and a half years to two years (90–120 ECTS credits). The actual duration of studies is, however, just under four years for a Bachelor's course and 2.4 years for a Master's. This extra time can partly be explained by the fact that the average study intensity does not correspond to a full-time course (Bachelor's: 86%, Master's: 77%) (FSO, 2017d). Additionally, repeating examinations and study achievements that cannot be credited towards a student's final qualification, due for example

219 Annual tuition fees at universities, 2017/18

At Bachelor's level

Data: swissuniversities



to switching subject (→ *Change of subject and length of course*, page 214), result in courses taking longer to complete.

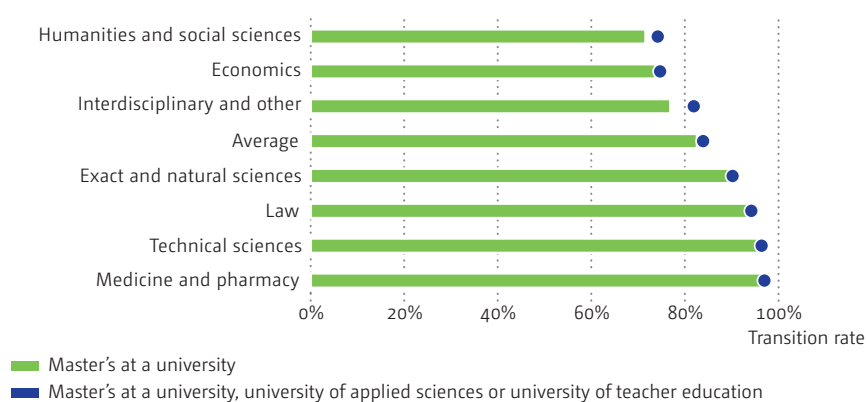
Upon the conclusion of a Bachelor's degree, students already have the opportunity to enter the labour market with a higher education qualification gained after three years of study. However, the most common final qualification from Swiss universities is the Master's, which has replaced the *Lizentiat* or *Diplom* under the old system. It is clear that only a minority of those who gain a Bachelor's degree leave higher education immediately. On average, 84% of Bachelor's graduates continue with their studies, either immediately or after a gap of one to two years (→ Figure 220). Yet in humanities, social sciences and economics, the transition rate is considerably lower with one quarter of Bachelor's graduates not tackling a Master's course in the two years following their graduation. In medicine and pharmacy, and in the technical sciences, however, nearly all Bachelor's graduates go on to study for their Master's (97% and 96% respectively).

Analysis of the data from the graduate survey shows that students who perform at the lower end tend to be less likely to start a Master's course of study (without a relatively long break). Similarly, older students have a lower likelihood of transition. It is not known whether the decision to proceed with a Master's also depends on structural factors such as the state of the economy or the situation on the labour market at the time.

220 Bachelor's to Master's transition rate

in the two years following completion of the Bachelor's degree 2013

Data: FSO



With the introduction of the Bologna structure came the expectation that the interface at the transition from Bachelor's to Master's level would promote physical and thematic mobility. However, little use is being made of the possibility of switching subject when progressing to a Master's course. Only 5% of entrants to Master's courses embark on a different field of study compared with their Bachelor's degree (FSO, 2015d). One of the reasons for this lack of mobility across different subject areas may well be that switching subject generally involves the need for additional achievements. Geographical mobility is somewhat more common. 16% of students choose a different university for their Master's course. Infrequent use is made of the option of acquiring individual ECTS credits at a different university. Every year 3% of students at Bachelor's level and 6% at Master's level study at a host university in Switzerland (2015/16 academic year).

Academic staff and junior career pathways

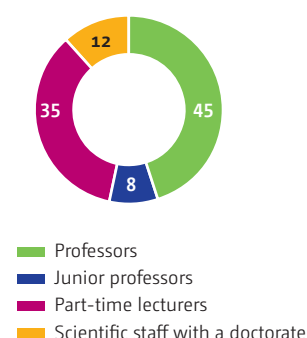
In terms of full-time equivalents, around three quarters of the academic staff at universities are assistants and scientific collaborators. Unlike professors and other lecturers, these staff are generally employed on a fixed-term basis. On average, the proportion of academic personnel on permanent contracts is 28% (SERI, 2014). This mainly applies to full and associate professors (45%) and to part-time lecturers (35%) (→ Figure 221). There are few positions for junior professors and other permanent positions for researchers with a doctorate.

Individuals with a doctorate generally have very good prospects on the labour market (→ *Labour market success*, page 209). Academic careers, however, are generally associated with uncertain employment conditions and rather low prospects. The average contract term for post-doctoral jobs is two years, with half of contracts being limited to one year or less (SERI, 2014). Moreover, the incomes in academia are lower than those paid outside of universities (→ Figure 222) with wage differences also not changing significantly over the past few years. The number of professorships is limited. Compared with approximately 200 professor vacancies per year and 150 positions for junior professors, there are around 2000 doctoral theses being completed (only counting those persons who were resident in Switzerland before starting their studies). If we also take into account the fact that, given the global nature of the labour market (→ *Context*, page 198) and fierce nature of the competition, around every second professorship is filled by a candidate who is a foreign national (→ *chapter Tertiary-level education*, page 169), this means that only one out of every twenty or so post-docs obtains a (junior) professorship at a university in Switzerland.

The uncertain, precarious nature of this career path raises the question of whether young academics are being sufficiently supported. Based on such concerns, the Confederation produced a report (SERI, 2014) setting out potential measures to promote young candidates in research and teaching. To make the process of transferring from post-doc to professor simpler and smoother, various funding positions (fixed-term junior professorships, tenure track positions) and funding tools (SNSF grants) have been put in place.

221 Composition of permanent academic staff (FTE)

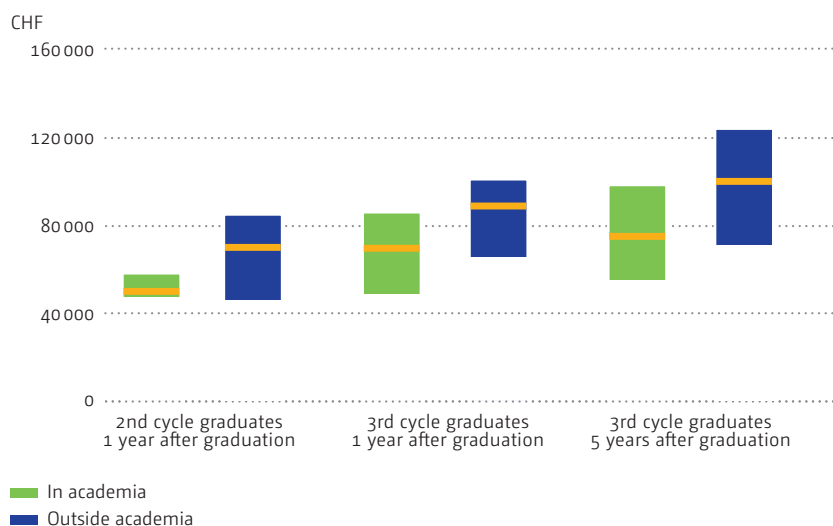
Data: SERI (Staff survey 2014 SERI/CRUS)



222 Income earned by academics within and outside academia, 2015

Gross wages, latest findings from first and second survey in each case (2015). Medicine not included.

Data: FSO (Graduate Survey); calculations: SCCRE



Legend

The box describes the area in which the middle 50% of incomes are located. The horizontal line shows the median income level.

Effectiveness

The **qualification framework** for the Swiss university area includes the targeted skills that the students are to achieve by the end of the relevant study cycle, in the following five categories: «Knowledge and understanding», «Application of knowledge and understanding», «Judgement», «Communication skills» and «Self-directed learning».

A primary aim of university education is to prepare the students for professional activities that require academic knowledge. The competences that the students should have acquired as a minimum by the end of their studies are stipulated in the qualification framework for Swiss higher education (nqf.ch-HS) (CRUS, KFH & COHEP, 2011). While efforts are being made to define learning outcomes at the level of individual study programmes, modules and learning units, there are neither national nor international tests to review the target competence levels in Switzerland. Instead, in order to have some indication of the effectiveness of university education, labour market integration indicators are used, providing indirect information on learning outcomes. The drop-out rate is also used as an indicator of the education system's effectiveness. Analyses of the return on education are presented in *chapter Cumulative effects*, page 295, and international comparisons of higher education systems provided in *chapter Tertiary-level education*, page 169.

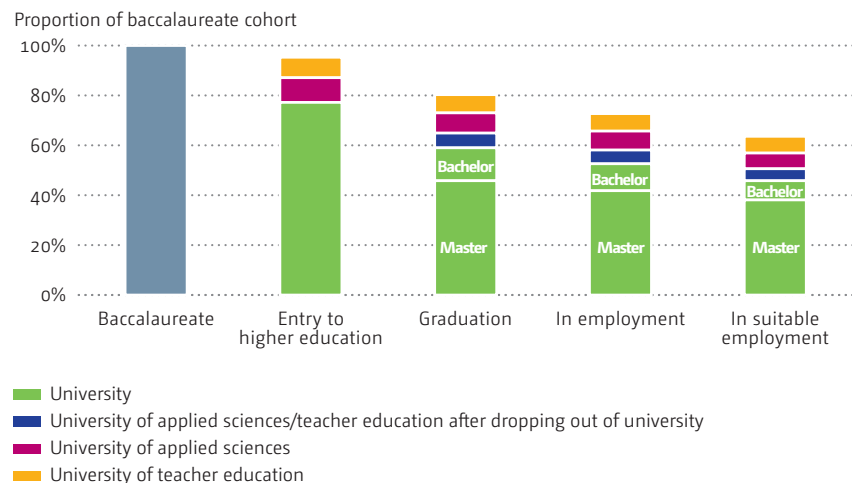
Departures after the baccalaureate towards a highly-qualified job

Access to Swiss universities is very restricted given the selective access to baccalaureate schools (→ *chapter Baccalaureate schools*, page 135). The presumption therefore tends to be that those students who achieve their baccalaureate will generally tend to work in a job that requires a high level of qualifications. The cascading progression from baccalaureate to working life, charted using a notional baccalaureate cohort taking account of the most recent transition and success rates based on cross-sectional data, indicates substantial departures however (→ Figure 223). Around 95% of a cohort of successful baccalaureate students transfer to higher education. Some will drop out of their course, some will not end up in employment and, out of those who do go on to work, not all will be in a job that is commensurate with their level of education. The result of all of these departures is that, five years after graduating, only two thirds or so of the original cohort are performing an activity that requires a higher education qualification or that is appropriate in light of the

223 Transition and success rates after baccalaureate

Data: FSO (Graduate Survey, SHIS); calculations: SCCRE

The figure is also based on the latest available data on transition and success rates and not on the progression data of a selected baccalaureate cohort. The bars therefore reflect the progression of a notional cohort. The values of the final two bars are based on data from graduate studies (second survey 2015) and relate to the point in time five years after graduation.



skills gained during the course of study. The extent to which the remaining third realise successful career progressions is not known.

Successful completion of studies and drop-outs

Assuming that successful completion of studies reflects the acquisition of the respective skills (and thus the quality of the education), the graduation rate may be used as an indicator of the effectiveness of a course or university. Yet the graduation rate also depends on the quality standards applied by a university. In other words, a high graduation rate may be an expression of lower quality requirements. Furthermore, the composition of the student population may differ according to subject field and university, making it more difficult to draw valid comparisons.

With regard to Bachelor's courses, on average 76% of students graduate within eight years of starting their course, of whom between 4 and 13% do so in a subject field other than the subject originally chosen (→ Figure 224). If graduations from universities of teacher education and applied sciences are added to these figures, the graduation rate rises to an average of 84%. There are however differences in graduation rates between the various subject areas. A low university Bachelor's graduation rate does not necessarily coincide with a lower Bachelors' graduation rate overall, as highlighted by the area of technical sciences. This is consistent with the observation that students on technical science courses switch to a university of applied sciences particularly frequently (*Diem, 2016a*).

Graduation at Master's level

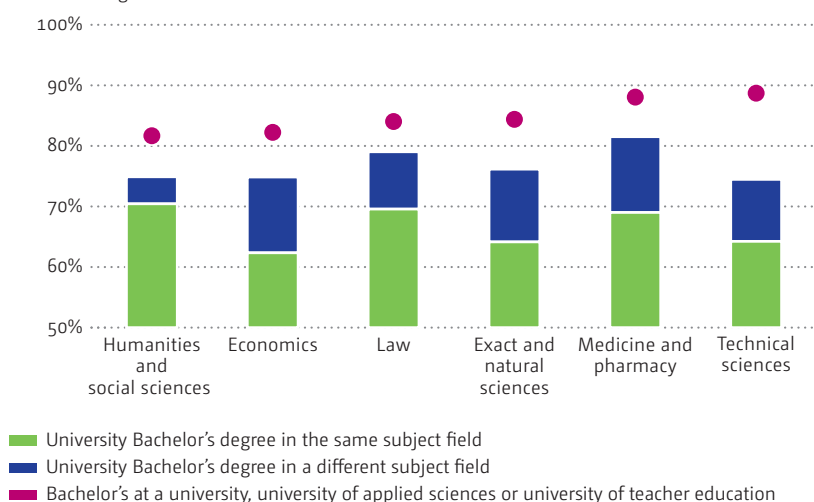
At Master's level, the success rate at universities is 94%. Combined with a Bachelor's success rate of 76% and the rate of transitions to Master's courses (83%), this results in a Master's graduation rate of around 60%.

If we also include Master's degrees from other types of higher education institution, the proportion with a second cycle qualification increases to around two thirds.

224 Graduation rates by subject

Bachelor's degree within 8 years of start of studies for 2007 entrants previously resident in Switzerland
Data: FSO

Bachelor's degree ratio



Based on the finding that a substantial proportion of university students do not gain a university qualification, the Confederation and cantons formulated the aim of using appropriate measures to reduce the number of drop-outs (Aim 5) in their 2015 declaration on common educational goals for the Swiss Education Area. The central question is what can be done to ensure that as many students as possible gain a qualification without any reduction in quality. It is not yet possible for this question to be answered conclusively.

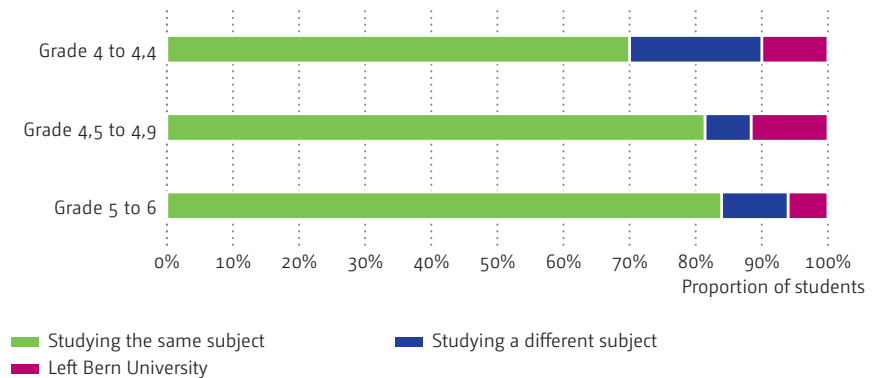
It is known from the literature that factors such as school background, previous school performance or willingness to learn have a key impact on whether students drop out or not (Larsen, Sommersel & Larsen, 2013). In Switzerland too, students with good baccalaureate grades are more likely to stick with their (first) subject choice compared with students with poorer grades (→ Figure 225).

The strong correlation is significant given the non-standardised character of baccalaureate examinations and the free choice available to students, enabling all prospective students to pick the subject that best corresponds to their competences and interests. Based on the data currently available, it is not possible to answer the question of how much the influence of baccalaureate grade can be attributed to different cognitive abilities and specialist skills or to non-cognitive competences such as learning techniques or willingness to learn.

225 Student status in 3rd semester by baccalaureate grade (average mark)

Only persons resident in Switzerland prior to starting the course. Medical students are not included due to a lack of data

Data: University of Bern, SCCRE (Bern entry cohort 2014); calculations: SCCRE



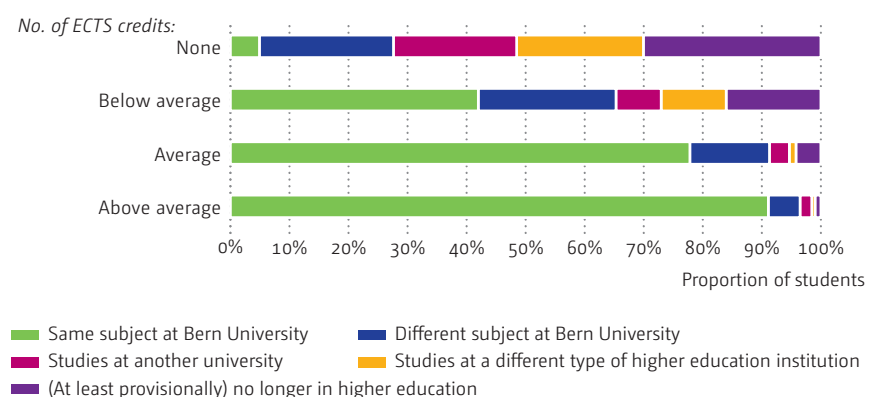
The **Bern entry cohort 2014 data set** is based on survey data from first semester students in the 2014 autumn semester at Bern University, as well as on additional administrative data from Bern University (with information on study performance and study progression). The administrative data is also linked to further data from the FSO, enabling study progressions outside of Bern University to be monitored too (→ Figure 226).

The data shows, however, that the correlation between baccalaureate grade and study progression can be partly explained by academic performance. Students with better baccalaureate grades achieve more ECTS credits (→ *chapter Baccalaureate schools, page 135*), and students who acquire a comparatively high number of ECTS credits are less likely to switch subject or to move to a different type of higher education institution. They are also less likely to leave higher education altogether (→ Figure 226).

226 Study status in the 5th semester by number of ECTS credits gained in the first study year

ECTS credits relative to average no. of ECTS credits in selected subject

Data: University of Bern, FSO (LABB); calculations: SCCRE



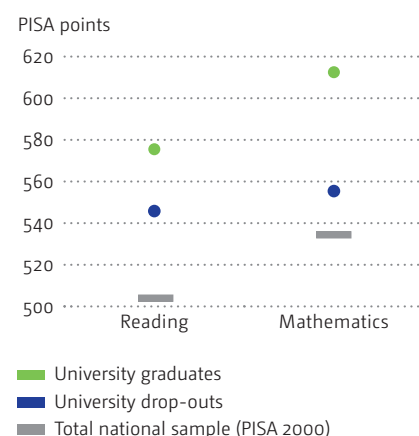
The percentage of students who gained no ECTS credits during the first year of their studies is 9%.

Research findings additionally show that weaker achievements in the form of examination marks also jeopardise the chances of the student remaining at university and continuing to study on their originally selected course (Tinsner-Fuchs, 2014). Results from the study progressions at St. Gallen University (Pfister, Tafreschi & Thiemann, 2015) show that failing the first year of a course (assessment year) considerably reduces the likelihood of subsequently entering the second year. For those students who repeat their first year, the repetition has a positive and lasting impact on their grades in subsequent semesters.

Analysis of the TREE data supports the assumption that cognitive competences at the end of compulsory education can be used to predict how studies will progress (→ Figure 227). Students who drop out of their university course already had lower competences in reading and mathematics at the end of compulsory education compared with those people who successfully complete their studies. Whether these differences can be explained by other characteristics (such as subject choice for example) or whether they are independent of other factors requires further investigation.

227 PISA results of successful and unsuccessful university students (median values)

Data: TREE (9th wave), PISA 2000 (national sample); calculations: SCCRE



Labour market success

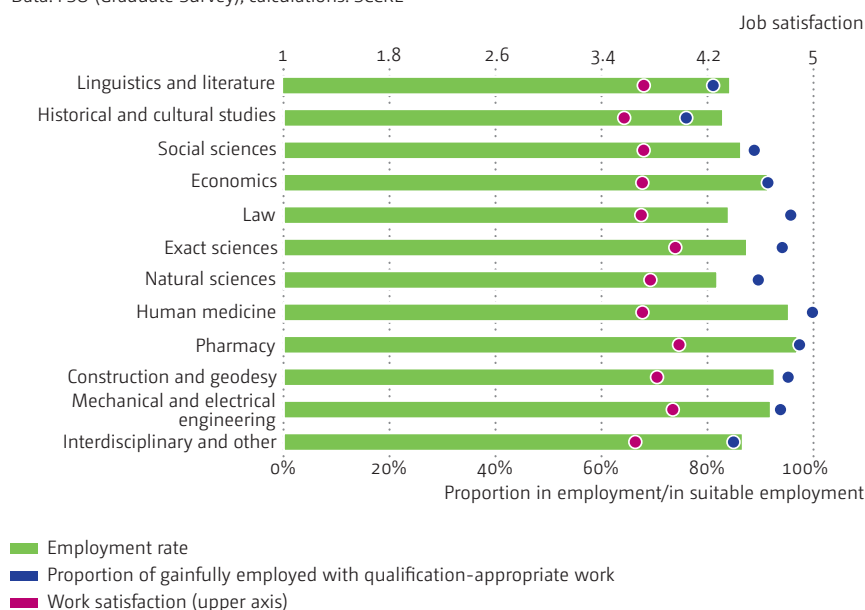
Successful integration into the labour market is a central criterion for the evaluation of higher education, providing information on the extent to which courses of study equip students with relevant skills for the labour market. It should be noted, however, that some of these relevant skills will already have been acquired before entering university, that universities can only provide a portion of the skills demanded by the labour market themselves, and that universities have no major impact on the state of the regional labour market into which most of their graduates will transfer.

According to the 2015 graduate survey, 88% of university graduates with a 2nd cycle qualification are in employment one year after graduating, while

228 Labour market situation 1 year after graduation, 2015

Graduates of 2nd cycle only

Data: FSO (Graduate Survey); calculations: SCCRE



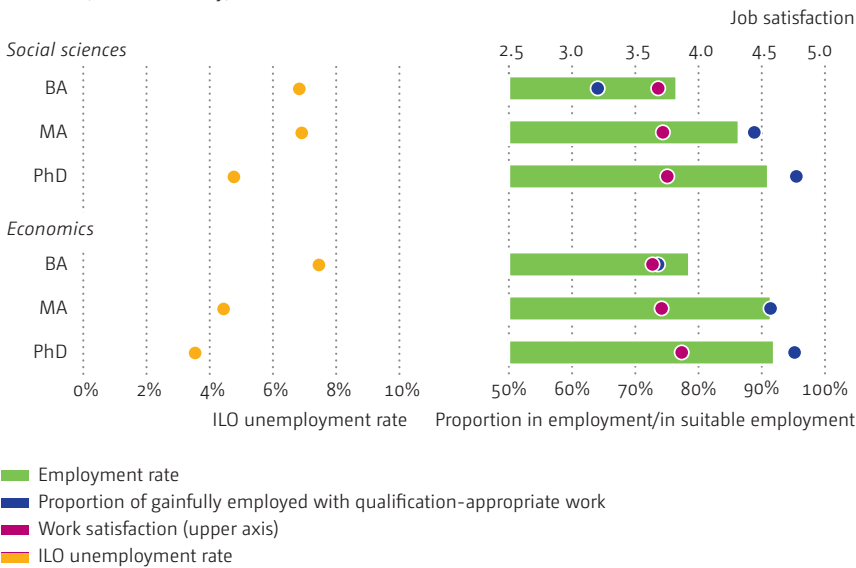
5% are unemployed as defined by the ILO (see definitions, → *chapter Tertiary-level education*, page 169). With regard to economic inactivity, this is only partly an entry phenomenon. The jobless figure five years after graduation is approximately 9%. The ILO unemployment rate (2.5%) is, however, considerably lower than the Swiss average. Of those university graduates who are in employment one year after graduating, the vast majority (91%) are in suitable employment based on their education, in other words a type of job that requires a higher education qualification or is at least appropriate given the specialist skills acquired during the course of study.

There are clear differences between the subject fields with regard to entering the labour market, both in terms of participation and quality of occupation (→ Figure 228). Job satisfaction varies somewhat less dramatically. In the humanities, which are less career-specific, and in interdisciplinary studies, entering the job market is associated with relatively large difficulties, as reflected in a higher proportion of jobless graduates and graduates working in jobs that do not match their skills. Comparatively low employment rates are also observed in the natural sciences and in law.

229 Labour market situation one year after graduation, by education cycle, 2015

For 1st cycle graduates, only those who did not begin a Master's are included.

Data: FSO (Graduate Survey); calculations: SCCRE

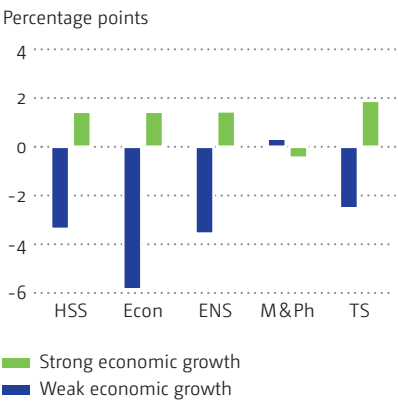


The ease with which graduates are able to enter the job market differs according to education cycle (→ Figure 229). Bachelor's graduates record a higher rate of economic inactivity and a higher ILO unemployment rate one year after graduating than those who have completed a Master's course. Moreover, the proportion of people with a job for which a higher education qualification is required or that is appropriate for them given the skills acquired during their studies is much lower in the case of Bachelor's graduates. The group that find entering the job market the easiest is graduates with a doctorate. The differing labour market prospects according to education cycle are also in evidence five years after graduation.

Meanwhile, graduates' labour market prospects are also influenced by the state of the economy when they complete their studies. Wages tend to be lower when the labour market is faring less well, and the likelihood of graduates finding work falls, as does the probability of finding full-time employ-

230 Impact of the economic cycle on the employment rate, 1982–2015

Data: FSO (Graduate Survey; calculations: SCCRE)
Impact of disproportionately high/low GDP growth on the employment rate 1 year after graduation.
Male graduates from 2nd cycle only



HSS Humanities and social sciences
Econ Economics
ENS Exact and natural sciences
M&Ph Medicine and pharmacy
TS Technical sciences

Economic growth is classed as strong or weak if the GDP growth in the graduation year deviates from the average growth in the observed period by more than one percentage point.

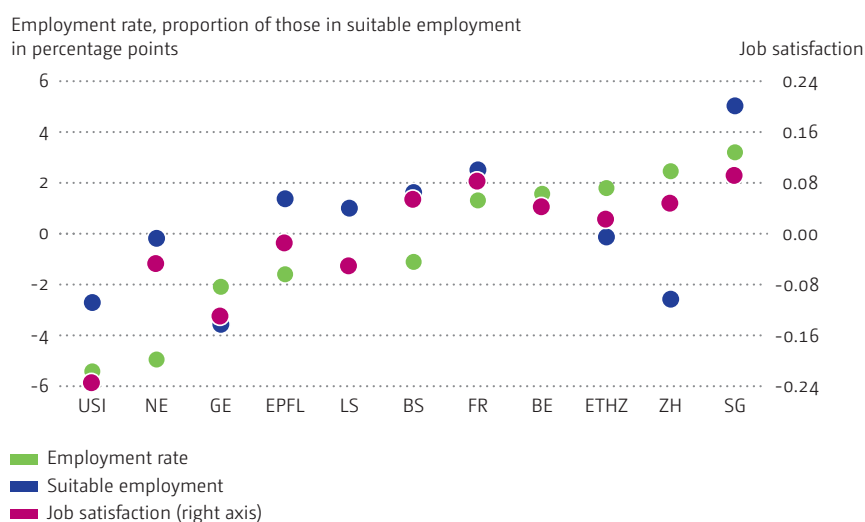
ment (Altonji, Kahn & Speer, 2016). Depending on subject studied, graduates also react with varying degrees of sensitivity to the economic situation. A correlation between economic situation and the employment rate is also in evidence in Switzerland, and this similarly applies to the subject-specific effects of below-average economic growth (→ Figure 230). Economic downturns have the biggest impact on the employment rate for economics graduates. In contrast, male medicine and pharmacy graduates are resistant to economic cycles.

The question regarding the extent to which universities can influence the successful integration of their graduates into the labour market, for example, by designing their courses in the right way or providing the right kind of teaching is one that still needs to be answered. What is clear, however, is that the employment prospects of graduates one year after completing their degree vary considerably between the different universities (→ Figure 231), regardless of the subject fields offered. The ranking of universities differs, however, according to the indicator used and is also subject to certain fluctuations over time (Diem & Wolter, 2012). It would be good to know the reasons for the major difference between the highest and lowest employment rate (9% adjusted for subject and unemployment rates) and between the biggest and lowest proportion of those graduates in qualification-appropriate employment (9% adjusted for subjects). The differences between universities, however, disappear at least in part five years after graduation (Diem & Wolter, 2012).

231 Differences in the labour market success of graduates by university, 2015

Deviations from the average in the employment rate, the proportion of those in appropriate employment and job satisfaction; 2nd cycle graduates one year after graduation

Data: FSO (Graduate Survey), SECO; calculations: SCCRE



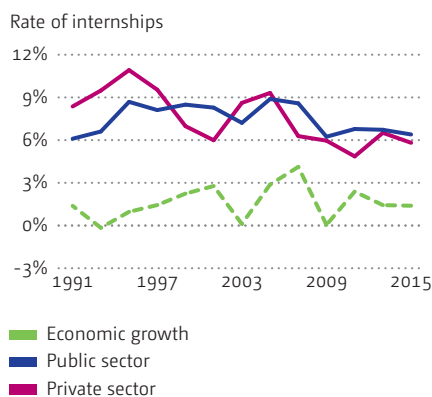
The **labour market indices** show the extent to which the employment rate, the proportion of appropriately employed graduates, and job satisfaction deviate from the average for each university, taking account of the subjects offered. The deviations from the average for that subject across Switzerland as a whole have been calculated for each subject and university, and added up for each institution, taking account of the relative share of the subject areas per university. The values for the employment rate index have been corrected to reflect the difference between the cantonal unemployment rate and the average rate (see also Diem & Wolter, 2012). Given the limited comparability of universities in relation to the labour market integration of law and interdisciplinary science graduates, these subject areas have not been incorporated into the analysis. Consequently, Lucerne University had to be excluded from the comparison due to its excessively low number of cases.

No increase in internships

Findings on the numbers of university graduates being taken on for internships clearly contradict any references to «internship generation» (→ Figures 232 and 233). There has been a slight decline in the number of those on traineeship between 1991 and 2015, while the employment rate has risen (→ Chapter Tertiary-level education, page 169). In 2015 the internship rate one year after graduation averaged around 6.5%, although this percentage varies according to subject area (→ Figure 233). Humanities and social

232 Rate of internships in private and public sector, 1991–2015

1 year after graduation; only 2nd cycle university graduates in employment; excluding law
Data: FSO (Graduate Survey), SECO; calculations: SCCRE

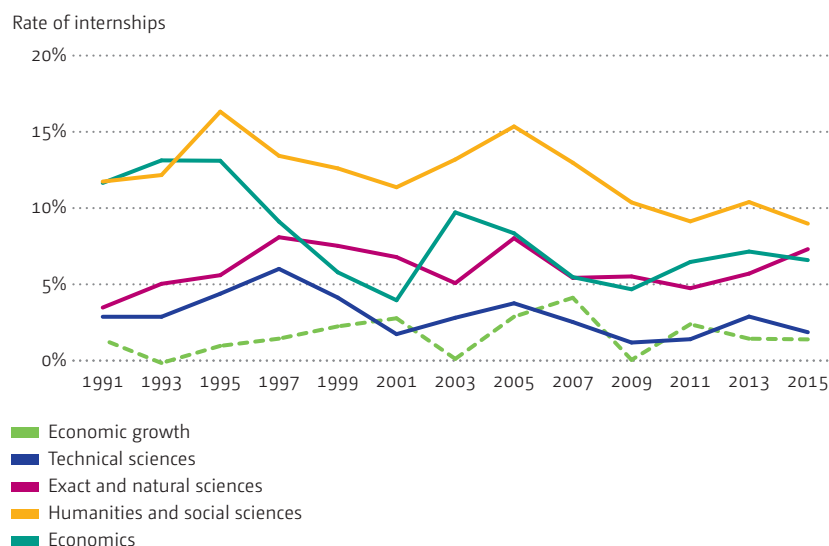


sciences graduates are most frequently involved in internship placements, which may well be to do with the lack of job-specific training in this field. The proportion of graduates doing traineeships has however fallen strongly since 2004. With regard to women, this rate no longer differed in 2015 from the equivalent rate for economics graduates or for graduates in exact and natural sciences. Regardless of their subject area, women also tend to be involved in internships more frequently than men.

There is barely any difference between the public and private sectors in terms of the proportion of internships (→ Figure 232), although there are some different economic fluctuations over time. In the private sector, an anti-cyclical pattern can be observed, in other words higher rates of internships during years when the economic cycle is weak. The public sector is less sensitive to the state of the economy, with a slight trend towards a procyclical pattern.

233 Rate of internships according to subject field, 1991–2015

1 year after graduation; only 2nd cycle university graduates in employment
Data: FSO (Graduate Survey), SECO; calculations: SCCRE



Efficiency / costs

In order to adequately assess the efficiency of university education, in other words the relationship between the use of resources (input) and the achievement of targets (output), comparative data on inputs is required, along with a suitable measure of output (i.e. effectiveness). Currently, however, neither of these conditions is adequately fulfilled. Regarding costs, while the accounting models used by universities have been broadly harmonised, the problem remains that there are no figures available on student numbers expressed in full-time equivalents (FTE). Data on study intensity is available (based on the number of evaluated ECTS credits), but it is not suitable for calculating the costs per student full-time equivalent due to methodological reasons. On the output side, an index for labour market success may be used as a measure of effectiveness for lack of a better alternative (→ *Labour market success*, page 209). Given these difficulties in measuring efficiency, the following sections will focus on comparing the costs incurred by universities

and on possible explanations for the differences. International comparisons are provided in *chapter Tertiary-level education, page 169*.

Costs according to subject and university

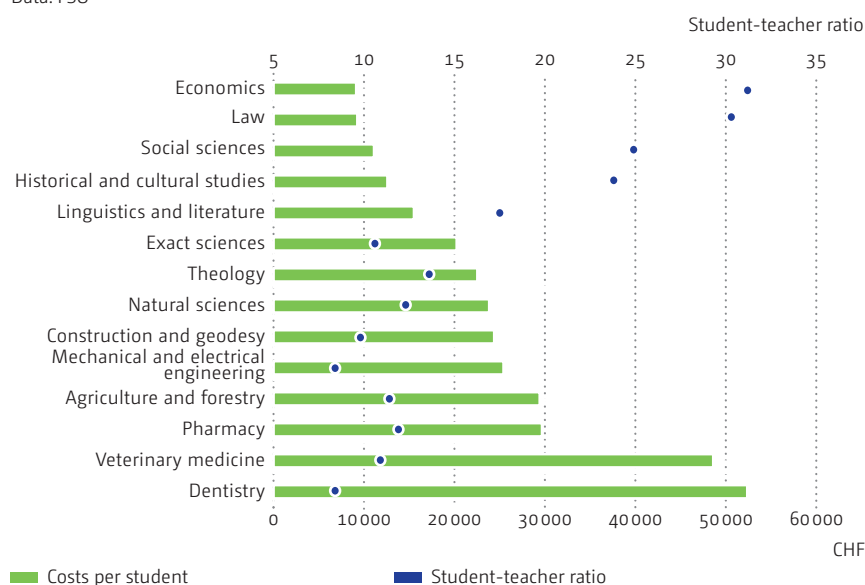
Annual teaching costs per student differ greatly from one subject to another, with spending ranging from approximately CHF 10 000 (economics, law, social sciences) to CHF 50 000 (veterinary medicine and dentistry) (→ Figure 234). The cost differences between the fields of study are due to a large extent to the different student-teacher ratios. What is not known, however, is what the optimal ratio would be for individual subjects and how far individual subjects and universities are from this optimal ratio. Consequently, the question remains of whether the same results could be achieved with less intensive teaching or whether the student/teacher ratio in some areas should actually be stepped up in order to facilitate effective education.

Taking account of research costs in addition to teaching costs, the annual expenditure per student is between CHF 17 000 (law) and CHF 129 000 (veterinary medicine).

234 Costs by field of study, 2015

No information on costs is available for human medicine due to a lack of any differentiated cost information of a sufficiently high quality for clinical training at university clinics.

Data: FSO



Costs per student: Annual costs for teaching (basic education and training) per student

Student-teacher ratio: Number of students per full-time equivalent in the academic teaching staff (basic education and training)

The costs for the same subject differ from one university to another. These differences can potentially be explained by differences in the range of subjects being offered within the same field of study, material costs, infrastructure costs, the number of ECTS credits gained per student and year, and staffing costs. The latter depend in turn on the composition and salary levels of the academic staff, as well as on student-teacher ratios.

If, in order to assess the efficiency with which resources are deployed, the average costs of universities and the labour market prospects of graduates are considered in relation to each other, it is clear that the costs differ greatly from one university to another. According to Figure 235 it is the universities of Lausanne and St. Gallen that operate at the closest to optimal efficiency. It should be noted, however, that the quality of this efficiency measure underpins the possible restrictions of the effectiveness indicator (labour market integration) and the differences in expenditure (e.g. price level).

Labour market integration index: Average value from the employment rate index (adjusted for the unemployment rate) and adequate employment index.

Expenditure per student: weighted deviations from the average spend per student, multiplied by duration of studies until Master's degree.

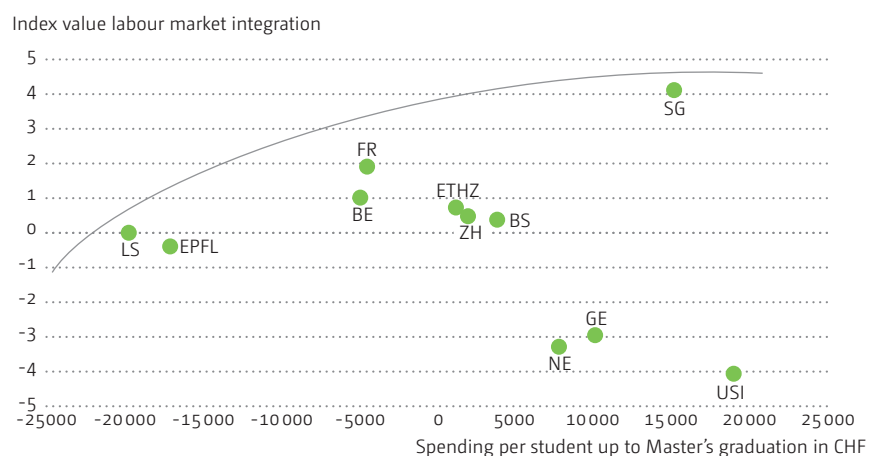
The figures show how each university's spending deviates from the average taking account of the subjects offered. The deviations from the average for that specialisation across Switzerland as a whole have been calculated for each specialisation and university and added up for each institution, taking account of the relative share of the specialised areas per university.

Only those specialised areas are included for which information is available on both spending and labour market integration.

235 Spending per student and labour market integration

Weighted deviations from the average (index values); Spending: average value for 2013 and 2014; Labour market integration: 1 year after graduation, 2015. The curve in the graph symbolises the hypothetical efficiency limit, i.e. the maximum labour market integration that can be achieved with the respective spending.

Data: FSO (Graduate Survey), LABB; calculations: SCCRE



Change of subject and length of course

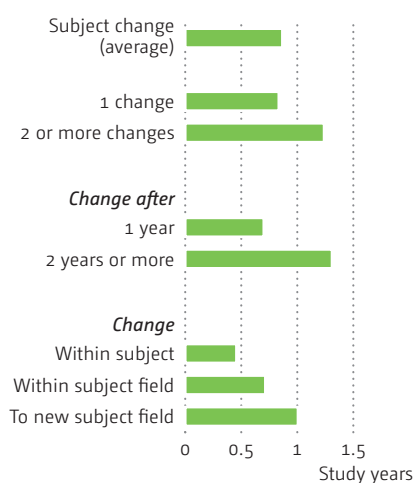
Changes of subject may increase the costs of university education if the achievements recorded in the first subject cannot be credited to the new course. Analysis of the correlation between changing subject and length of studies (Diem, 2016b) show that switching to a new specialisation means adding on an average 0.8 study years to the total study time (→ Figure 236). The extra time added is also considerably greater if students switch subject two or more times and in the case of changes made after two study years or even later. Similarly, changes that go beyond the subject field have a greater impact on study duration than those within the same field. This indicates that transferring previous achievements is only possible to a very small extent when switching to a new, unrelated area of study.

Students change subjects relatively frequently. During Bachelor's courses, on average every fifth student will change subject (at least) once. This figure differs greatly according to subject area, however (→ Figure 237). There are also differences between individual universities within the same subject area (Diem, 2016b). The decision to switch subject is influenced by a range of factors. Students whose main subject for their baccalaureate is not particularly related to the subject they go on to study and students from a canton with a high baccalaureate rate tend to have a higher switch rate (*ibid.*). It is also clear that poorer baccalaureate grades are associated with a higher likelihood of a subject switch (→ *Effectiveness*, page 206).

236 Increase in duration of Bachelor's studies upon change of subject compared with students who do not change

The average duration of study with no change of subject is 3.8 years.

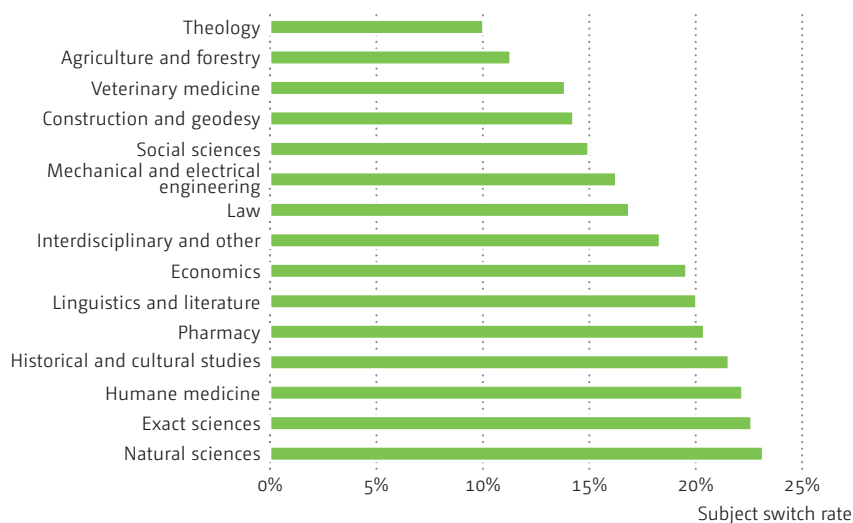
Source: Diem 2016b; own presentation



237 Subject switch rate by subject area

Dental medicine is not shown due to changed study conditions in relation to switching options.

Source: *Diem 2016b*

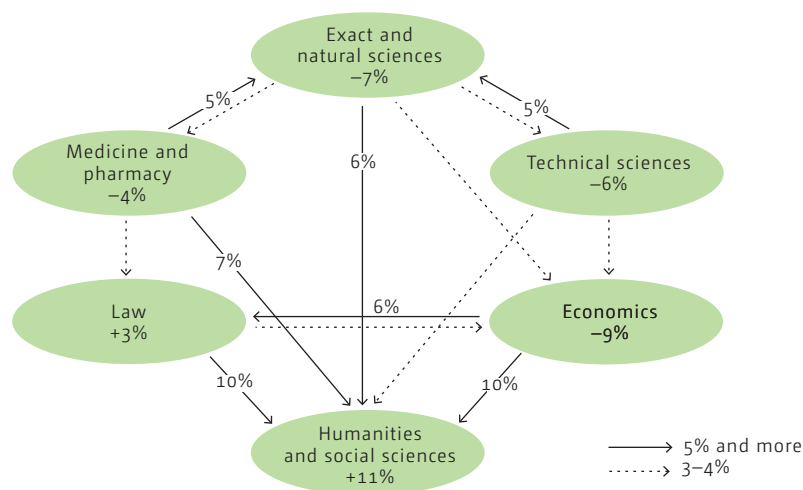


When choosing a new subject, the majority of students opt for a subject that is related to their first choice (→ Figure 238). The direction of the switch also follows gender-typical patterns, reinforcing gender segregation (→ *Equity*, page 216). Regarding the question of the extent to which switches of subject are related to the universities' quality assurance efforts or rather (also) the result of students being insufficiently prepared when they made their first choice, further investigation is needed.

238 Direction of subject switching flows and net balance rates

Flows of 2% and less are not shown.

Source: *Diem 2016b*; own presentation



Legend

Of those students who began a Bachelor's course in economics, 10% switched to humanities and social sciences, with 6% moving to law. The total number of students studying economics fell by 9% compared with the initial intake (net balance). Humanities and social sciences experienced the biggest intake of new students. However, given that these areas also lost students to other fields, and in view of the large numbers from the outset, the net increase in student numbers in humanities and social sciences was «only» 11%.

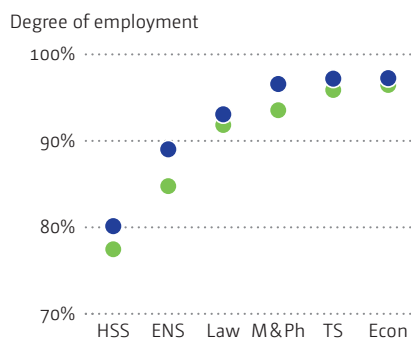
Education investment and income

One of the arguments that can be used to justify the predominantly public financing of university education is that society will subsequently benefit from above-average tax revenue. However, the profitability of a course essentially depends on whether graduates from that course are in work af-

239 Average degree of employment one year after graduation, by subject field, 2015

Arithmetical average; only 2nd cycle graduates in employment; excluding assistants who are preparing for a doctorate

Data: FSO (Graduate Survey); calculations: SCCRE



Women
Men

HSS Humanities and social sciences
ENS Exact and natural sciences
M&Ph Medicine and pharmacy
TS Technical sciences
Econ Economics

ter completing their training and on the degree of employment (→ *chapter Cumulative effects*, page 295). The lower the degree of employment, the lower the monetary income will be (and it may even be negative). From the individual's perspective, a loss of earnings due to working part-time or not being in employment is only associated with a reduction in the benefit of education if the employment situation is not the individual's choice. From a fiscal perspective, in contrast, unemployment or part-time work will always result in a monetary loss compared with full-time employment, although this loss is less marked in the case of part-time work than if the graduate is unemployed.

Evaluations of graduates' degree of employment show that 30% of graduates in employment are not in a full-time position one year after graduation and that around 40% are not working full-time five years after graduation. The average number of working hours differs considerably according to subject area (→ Figure 239). Of those who were working at a rate of less than 90% one year after graduating, almost one in three had been unable to find a full-time position. A good third of the group surveyed stated that they were working part-time in order to have sufficient time for personal interests. Five years after graduation, the proportion of graduates working part-time who have not found a full-time job is only 10%.

Equity

Equal opportunities in university education are considered below using access to and participation in education as the relevant criteria. It considers disparities between men and women and differences between people with and without a migration background. Aspects of social heritage and (physical) disabilities are addressed in → *chapter Tertiary-level education*, page 169.

Horizontal segregation

Uneven gender distribution in choice of subjects

Vertical segregation

Uneven gender distribution at the individual career levels

Gender-based differences

Measured in terms of the total number of students at universities, gender distribution is very balanced. In the 2016/17 academic year, the proportion of female students was 51%. Yet the process of selecting a subject to study is very gender-specific. Women are particularly under-represented in the exact and engineering sciences, while men are under-represented in languages, literature and social sciences, as well as in veterinary medicine and pharmacy. Overall, a substantial degree of horizontal segregation is in evidence. Around one quarter of students choose a subject for which the proportion of students of their gender is in excess of 70% (→ Figure 240). Only 4% of women and 8% of men choose an atypical subject for their gender (i.e. a subject for which the proportion of their gender is less than 30%). However, this gender segregation is less marked at universities than it is at universities of applied sciences (→ *chapter Universities of applied sciences*, page 221). This can be partly explained by the fact that major subjects such as law or human medicine that appeal to both women and men cannot be studied at universities of applied sciences.

Gender-specific study preferences prove to be relatively stable over time. Since 2008 the proportion of women in subjects dominated by women has fallen by around 6 percentage points (→ Figure 241), although over the same period the proportion of men in male-dominated subject areas has risen.

Taking into account the heterogeneous nature of subjects, the probability of a Bachelor's degree being followed by a Master's degree is comparable for men and women (FSO, 2015d). However, gender-specific imbalances begin to emerge after Master's degree, leading to vertical segregation (Dubach, Legler, Morger et al., 2017). Women move on to a doctorate course less frequently than men (16% compared with 22%), with the most marked differences in strongly feminised subject areas (humanities and social sciences, law). Women also less frequently complete their doctorate. Over time, the proportion of women completing their doctorate has in fact consistently increased. However, this rise can generally be attributed to the fact that the proportion of women in 2nd cycle courses has increased and also to the fact that the number of doctorates being completed by men over the past few years has fallen. Out of those persons who are working in academia five years after their doctorate, men are more likely to hold a permanent position and more frequently hold a professorship than women.

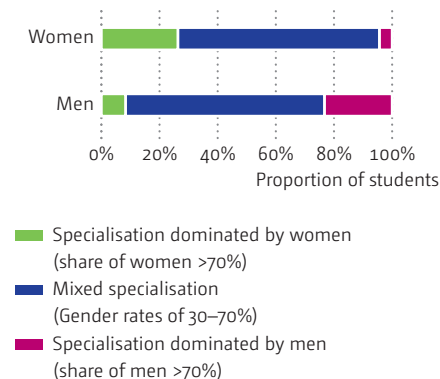
The lower transition and success prospects at the various levels mean that the participation of women decreases as academic careers progress (*leaky pipeline*): from 52% in relation to graduations from the 2nd cycle to 42% in the case of doctorates, 31% in relation to other lecturers and finally 22% in the case of professors (as at 2016). Within the professor category, the proportion of women among full and associate professors (Category I), at 19%, is far lower than the proportion of women (30%) in Category II which encompasses (often fixed-term) assistant professors.

This leads to the assumption that there is a significant gender-specific selection towards the end of the post-doctoral phase (Dubach, Legler, Morger et al., 2017). With the help of federal programmes, greater emphasis has been placed on increasing the proportion of women in professor positions ever since 2000. Thanks to funding tools put in place specifically for women, it has already been possible to achieve a proportion of 40% women in applications for individual funding, which almost corresponds to the proportion of women among newly qualified doctors (Dubach, Legler, Morger et al., 2017). The success rate (proportion of approved applications) are also similarly high for both men and women. With regard to professorships, the proportion of women has consistently risen over the past 15 years (→ Figure 242) – albeit not as strongly as originally targeted. Even with regard to new appointments, the proportion of women in category I is lower than in category II. The *leaky pipeline* therefore continues at the transition from fixed-term professorships with low resources to permanent positions. Studies on Switzerland (Bataille, Le Feuvre & Kradolfer, 2017) indicate that the difficulties associated with reconciling family commitments (typically based on a traditional family model with the man as the main breadwinner) and career expectations (high level of dedication, high productivity and geographical mobility) are a key reason for women dropping out of academic careers. There are also signs that, in addition to motherhood, institutional barriers contribute to lower levels of career success among women too (González Ramos, Cortés & Moreno, 2015). Having said that, it is also clear that women put themselves forward for promotion less frequently (Bosquet, Combes & García-Peñalosa, 2018).

240 Gender segregation at student intake, 2016

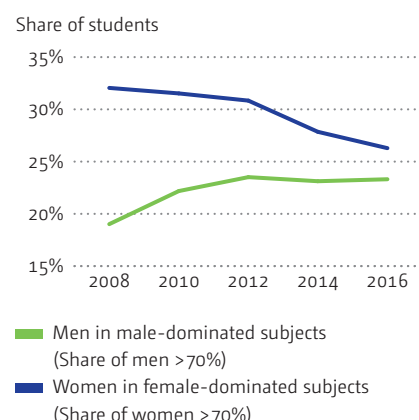
Share of students in specialised areas dominated by women, mixed and dominated by men

Data: FSO; calculations: SCCRE



241 Share of students in gender-typical subjects at student intake, 2008–2016

Data: FSO



Category I

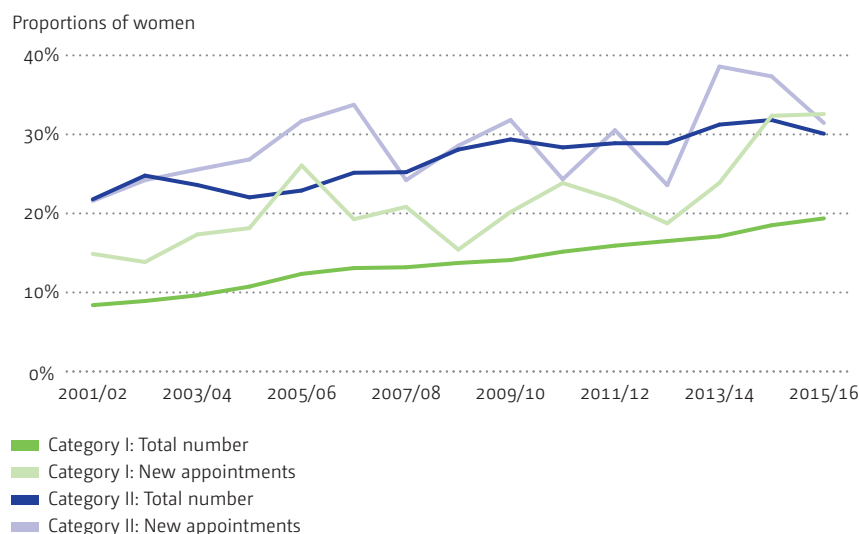
Full and associate (permanent) professorships with an employment rate of at least 50%.

Category II

Assistant and/or associate (temporary) professorships.

242 Proportions of women in professorships, 2001–2016

Data: Swissuniversities

**Migration background**

Until recently, only data on nationality was available for analysing the composition of the student population in terms of migration background. Given that the nationality of those completing upper-secondary education is not recorded, and because naturalisations of young adults who have grown up in Switzerland are common, the statistics have not provided any conclusive findings to date regarding the prospects of accessing university. However, data is now available on the country of birth of the students and their parents, enabling a comparison of the proportion of students with a migration background against the corresponding proportion of the population and thus the identification of any differences of opportunity.

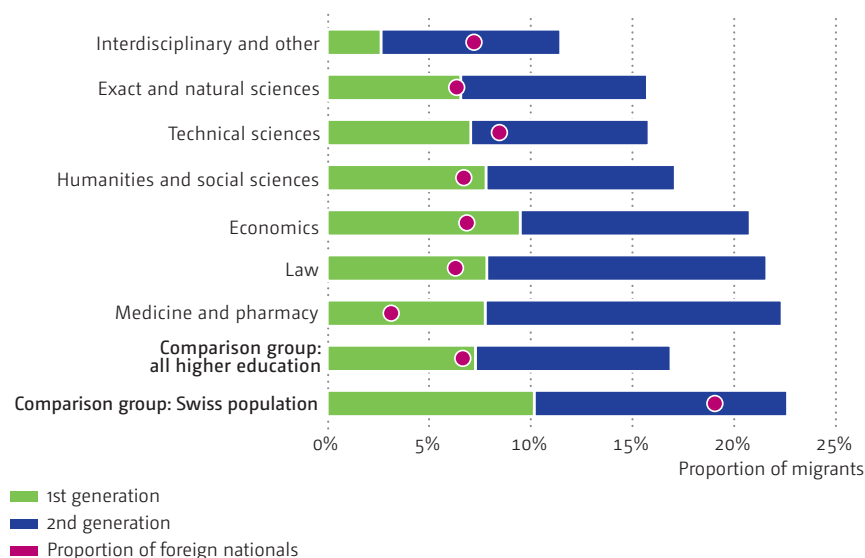
The data indicates that people with a migration background are slightly under-represented on average at universities, but less markedly so than elsewhere in higher education (→ Figure 243). Some 8% of university students are first-generation migrants, and around 11% are second-generation migrants. The percentages are therefore almost 3 respectively 2 percentage points below the figure that would be expected based on the breakdown of the Swiss population. The fact that the proportion of students who are foreign nationals is much lower than the proportion of foreign nationals in the population as a whole indicates that many people in this age group become naturalised.

The proportion of students with a migration background differs greatly according to subject (→ Figure 243). They are most strongly under-represented in the interdisciplinary sciences, followed by exact and natural sciences and by technical sciences. In the fields of law and medicine/pharmacy, second-generation migrants are over-represented.

243 **Proportion of students with a migration background by subject, 2013**

Bachelor's students with a Swiss university admission qualification.

Data: FSO (Social and Economic Conditions of Student Life, PISA 2006, SLFS 2006); calculations: SCCRE

**Comparison with the overall population**

As the composition of the group of persons with a migration background has changed in recent years and many young adults are taking up residence in Switzerland for a university education, the comparison is not based on current data but on data from 2006. The PISA data reflects the migration quotas from the ninth class of that year, the SAKE data represents the proportion of foreigners in the 15–18 age group. Persons in this age group were of typical student age in 2013.

The lower prospects overall of young people with a migration background going to university can be partly explained by their lower achievements at an earlier stage in their education (*Picot & Hou, 2016*). As shown by research results, assuming the same individual characteristics and same achievements at lower-secondary level, it is at most first-generation migrants, but not second-generation migrants, who have lower prospects of achieving a higher education qualification (*Scharenberg, Rudin, Müller et al., 2014*). Among students with the same characteristics, individual migration groups tend to switch to a university more frequently than students without a migration background (*Griga, 2014; Kost, 2013*).



Universities of
applied sciences

Context

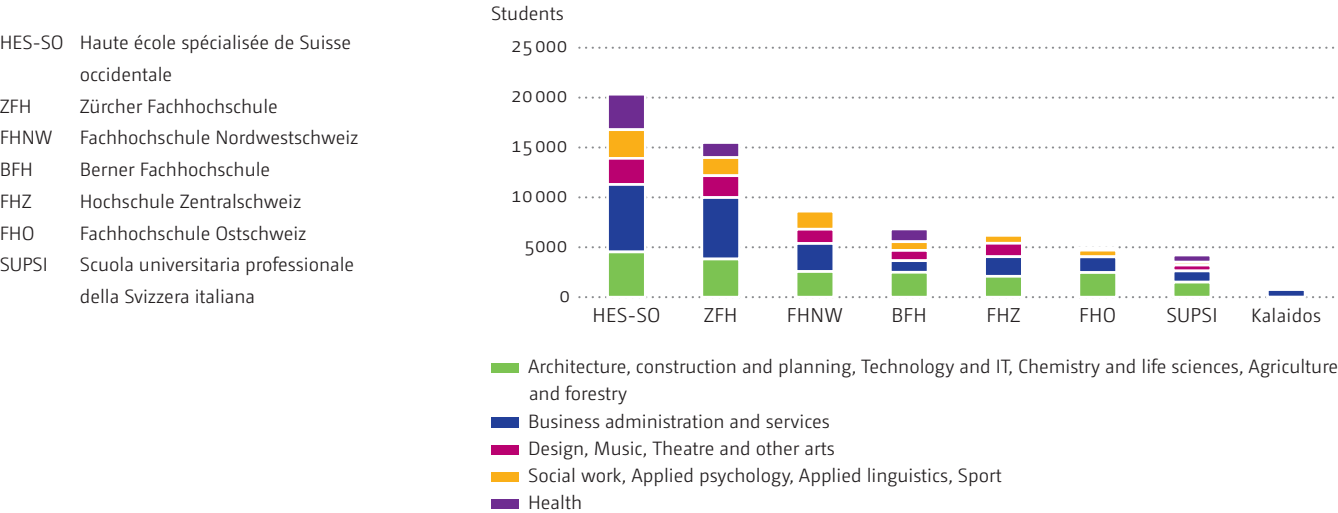
The facts and figures in this chapter are for universities of applied sciences excluding the integrated universities of teacher education. The latter are addressed in *chapter Universities of teacher education*, page 241. Continued education and training is addressed in *chapter Continuing education and training*, page 279.

According to the Federal Act on Funding and Coordination of the Higher Education Sector (HFKG), universities of applied sciences (UAS) comprise seven public and one private institution (Kalaidos).¹ The individual universities of applied sciences consist of several sites in different locations with each one normally having its own management and administration. However, not all the universities of applied sciences meet the institutional accreditation criteria (→ *chapter Tertiary-level education*, page 169) in their current form, which is the requirement to guarantee federal funding and the right to be called a university (of applied sciences). Structural reforms are therefore likely in some of these institutions, which may result in further sub-units emerging.

In 2016, a total of about 67 600 persons studied at Bachelor's or Master's level at universities of applied sciences. The universities of applied sciences vary considerably in terms of size (→ Figure 244). The private university Kalaidos is by far the smallest with a 1% share of students. The Haute école spécialisée de Suisse occidentale (HES-SO) is the biggest, followed by the Zürcher Fachhochschule (ZFH). The size disparity between the two universities stems mainly from the fields of health and social work. This reflects the fact that those two fields are also offered at professional education (PE) colleges in German-speaking Switzerland (→ *chapter Professional education*, page 265), but not in the French-speaking region.

244 Student numbers at Bachelor's and Master's level, 2016

Data: FSO



The three biggest specialist areas, business administration/services (33%), technology/IT (18%) and social work (11%) and the specialisation architecture/construction and planning (6%) are offered by all the public universities of applied sciences, all the other specialisations, however, are only offered at certain universities of applied sciences, with agriculture and forestry,

1 The private university of applied sciences Les Roches-Gruyère will cease operations by the end of 2018 at the latest.

sport, applied linguistics and applied psychology only being offered at one or two institutions. The range of specialisations on offer thus differs markedly among the universities. The relative proportions of students per specialised area have been extremely stable over time. Health has seen the biggest change, as the ratio of Bachelor's level entrants increased from 11% to 13% between 2008 and 2016.

Forecasts for student numbers

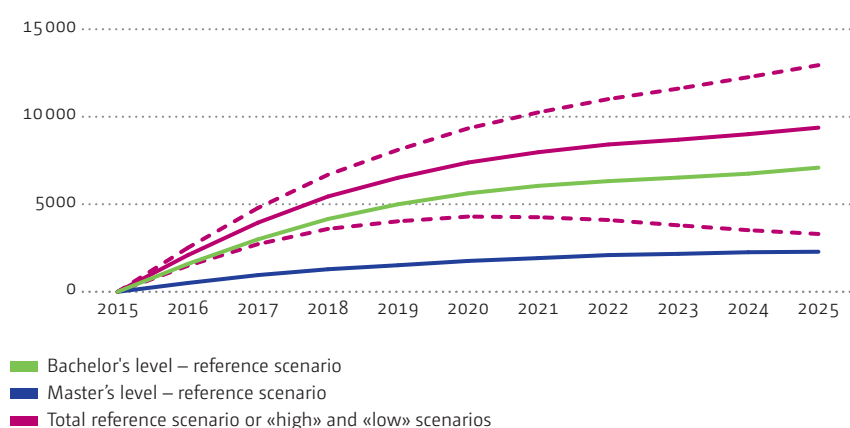
Universities of applied sciences have grown significantly since they were first established in 1998, partially as a result of the integration of new fields of study as well as the growing number of people obtaining a federal vocational baccalaureate (→ *chapter Vocational education and training, page 111*). The introduction of a Master's degree (from 2008) also increased student numbers.

This upward trend is set to continue over the next few years (→ Figure 245). At Bachelor level in particular, the positive trend in the number of federal vocational baccalaureates is set to lead to more entrants at universities of applied sciences and the Federal Statistical Office (FSO) (FSO, 2017f) anticipates higher transferral ratios from the federal vocational baccalaureate to further study. Moreover, the number of entrants with other Swiss qualifications (such as baccalaureate or specialised baccalaureate) or an admission qualification from another country is also likely to increase student numbers. At Master's level, the FSO anticipates a constant ratio of transferrals from Bachelor's to Master's degrees. The expected increase in the number of Bachelor's degrees is likely to filter through to Master's level. Another contributory factor will be the rise in entrants at Master's level with a foreign admission qualification. At the same time, these forecasts are far from certain as reflected in the big difference between the individual FSO scenarios (→ Figure 245).

245 Change in forecast for student numbers from 2016–2025 relative to the 2015 reference year

Data: FSO

Students



In the reference year 2015, student numbers came to about 57 000 at Bachelor level and 8200 at Master's level (total: 65 200 students).

According to the FSO reference scenario, the total increase in student numbers at universities of applied sciences will exceed 9000 (over 14%) between 2015 and 2025. The lower growth threshold is estimated at 5% («low» scenario) and the upper one at 20% (+13 000 students, «high» scenario).

If the «high» scenario occurs, the student-teacher ratio (assuming constant staff levels) will go up from 13.0 students per full-time equivalent academic staff member to 15.6. To keep the student-teacher ratio unchanged would require the addition of 1000 full-time positions at universities of applied sciences.

Institutions

Universities of applied sciences differ from conventional universities through their higher practical and labour market orientation, acceptance of people with a federal vocational or specialised baccalaureate and by offering a Bachelor's as the standard qualification. The key differentiators relative to tertiary-level professional education (PE) are the baccalaureate entry requirement and the added emphasis on academic work. The specific characteristics of universities of applied sciences must be maintained and their profile raised (EAER & EDK, 2015).

Admittance to universities of applied sciences

The Federal Act on Funding and Coordination of the Higher Education Sector (HFKG) basically envisages three channels for starting a Bachelor's course at a university of applied sciences (Art. 25 para. 1). The first one is for holders of a federal vocational baccalaureate in combination with a vocational education and training (VET) course in a vocation related to the chosen specialisation, known as the «Königsweg» which translates as royal road. A second way is by completing a baccalaureate combined with at least one year of work experience. The third way is a specialised baccalaureate oriented towards the relevant specialisation. There are also other entrance possibilities (Art. 25 para. 2; *Swissuniversities*, 2015). For example, students with a federal vocational or specialised baccalaureate unrelated to the relevant specialisation can gain admittance, if they have at least one year of work experience in a relevant field. Completion of tertiary level professional education is another option. In some areas (applied psychology, design, health, social work, music/theatre or other arts, applied linguistics, sport) the institutes conduct additional aptitude² tests.

Universities of applied sciences thus recruit from a highly heterogeneous pool of students (→ Figure 246). However, the federal vocational baccalaureate remains by far the most significant source, accounting for just under 60% of Swiss admission qualifications.

Practice-integrated STEM-degree

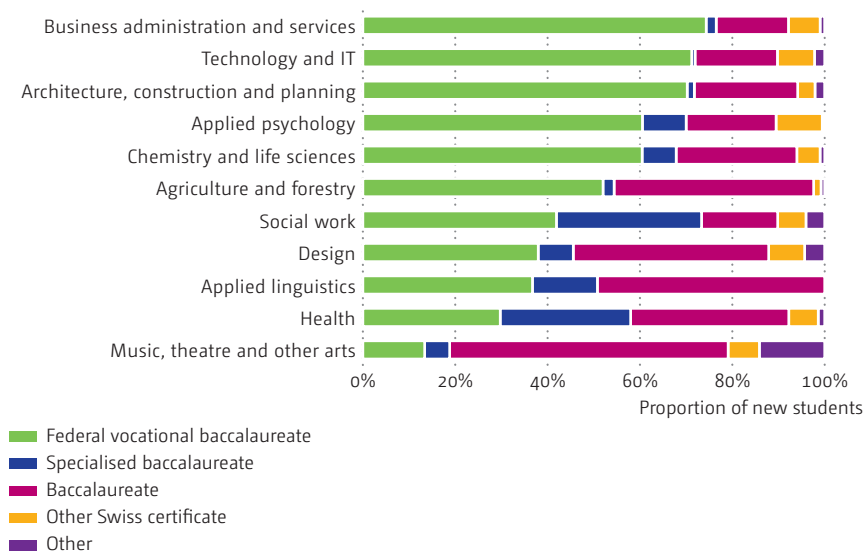
As part of the package of measures designed to alleviate the STEM (science, technology, engineering and mathematics) skills shortage, universities of applied sciences were able to offer four-year STEM courses (from 2015 to 2017) for persons with a baccalaureate in place of a year's work experience. SERI will evaluate this admission criterion in 2019.

2 In art and applied linguistics, these tests replace the requirement to prove at least one year of relevant work experience.

246 Enrolments for a Bachelor's degree by admission qualification, 2016

without foreign admission qualifications

Data: FSO (SHIS)



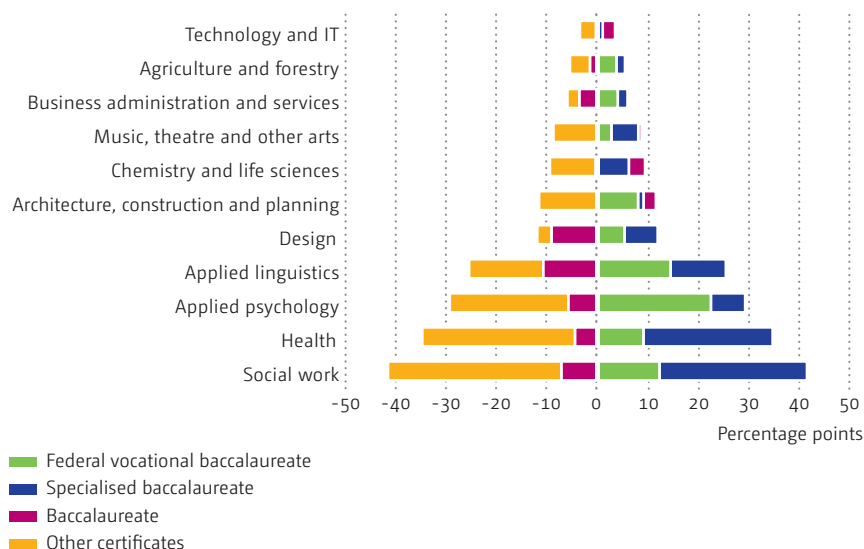
Two of five students with the baccalaureate transfer to a university of applied sciences via a conventional university (→ Figure 247). The proportion of students in those subjects also offered at conventional universities is particularly high, i.e. technology/IT (64%) and chemistry/life sciences (50%). This suggests that courses offered at universities of applied sciences are sometimes seen as a second choice by students who drop out of their conventional university courses.

Otherwise, the current trend in the composition of admission qualifications does not really change the classic UAS profile, in other words there is no increase in baccalaureate holders as entrants (→ Figure 248).

248 Change in admission qualifications between 2008/09 and 2015/16

Change in the composition of the admission qualifications for starting a Bachelor's course in percentage points. Only persons resident in Switzerland prior to starting the course

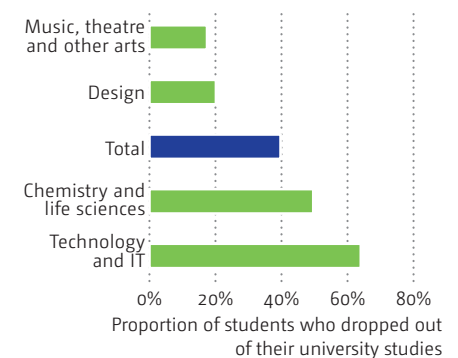
Data: FSO (SHIS); calculations: SCCRE



247 Proportion of students with a baccalaureate who initially began their degree at a conventional university but did not finish the course

Measured by all students with a baccalaureate on entering a university of applied sciences in 2015, only selected specialisations are shown

Data: FSO (LABB); calculations: SCCRE



Explanation of figure, left: The category «other certificates» comprises the sub-categories «other Swiss certificate», «foreign qualification» and «other» whereby the first sub-category is by far the biggest.

On the contrary, the evidence shows that the relative proportions of federal vocational and specialised baccalaureates increased from 2008 to 2016 (by about 5 and 8 percentage points on average), while the proportion of students with a baccalaureate trended downwards (–2 percentage points). The main changes are more in terms of other certificates (*Diplommittelschule* [DMS] certificates, teacher training diplomas etc.) being replaced by the federal vocational and specialised baccalaureate.

Origin of the students

Foreign students are persons with foreign citizenship, who lived outside Switzerland when they gained their university admission qualification.

A large international student population can be an indicator of the quality and attractiveness of a university. At Bachelor level, the proportion of foreign students at universities of applied sciences averages 9%. However, there are major differences among the individual specialist areas. Music, theatre and other arts is by far the most international specialisation (one third are foreign students), followed by design (18% foreign students). Above average proportions of foreign students also study architecture, construction and planning.

Some universities of applied sciences have more foreign students than others. Looking solely at the specialised areas offered at all the public universities of applied sciences, both universities in the French and Italian-speaking cantons (HES-SO and SUPSI) have the largest proportions of foreign students (relative to the number of students from the region they lived in prior to studying) (→ Figure 249).

Proportion of foreign students

Proportion of foreign students relative to number of students from the region they lived in prior to studying

Proportion of IN-coming

Proportion of students who lived (in Switzerland) outside the region in which they are studying prior to the course relative to the number of students from the same region they lived in prior to studying

Proportion of OUT-going

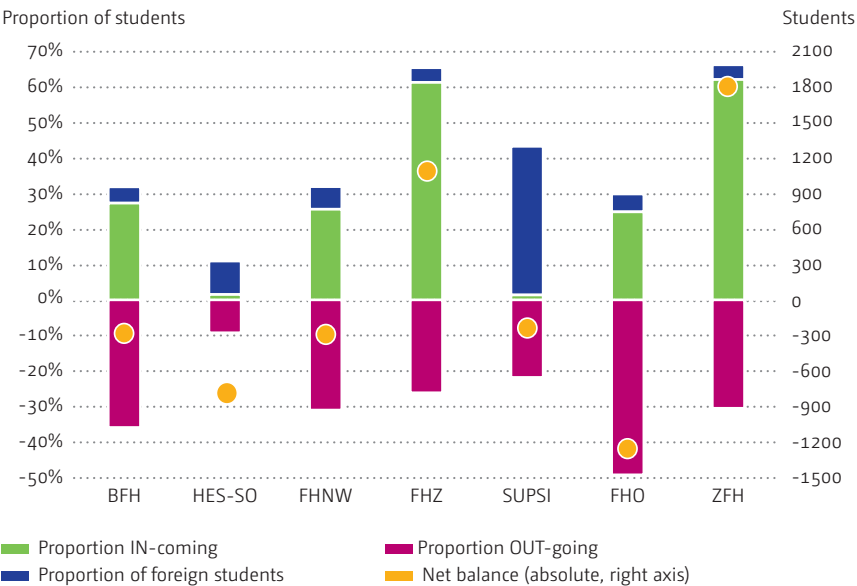
Proportion of students from the region they lived in prior to the course, studying outside the region in question, relative to the number of students from the region they lived in prior to studying

Net balance

Number of students who lived (in Switzerland) outside the region in which they are studying minus the number of students studying outside the region they lived in prior to studying

249 Proportion of Bachelor’s students studying outside the region they lived in prior to studying, by UAS, 2016

Data: FSO (SHIS); calculations: SCCRE



Only those specialisations offered at all universities of applied sciences are taken into account. Private institutes and departments financed by foundations (e.g. the Swiss Distance University of Applied Sciences, which is part of SUPSI) are not taken into account. In the case of the cantons that are responsible for two universities of applied sciences (Bern and Schwyz), the persons studying outside the region they lived in prior to studying were proportionately charged to the two universities of applied sciences as OUT-going students (according to the distribution of the indigenous students among the two universities of applied sciences).

If the foreign students had not been living in Switzerland for at least two uninterrupted years, the universities of applied sciences do not receive any contributions under the *Fachhochschulvereinbarung (FHV)* (an intercantonal agreement on UAS). As a result, the universities or their financing agencies may experience financing shortfalls. The contribution shortfall for SUPSI is, at least partially, compensated through higher fees. There are also differences between universities of applied sciences or their catchment areas regarding the number of students resident in Switzerland but from outside the catchment area.

Education at Bachelor's, Master's and doctoral level

At the basic education and training level, the main mandate of the universities of applied sciences is to provide professionals with an academic education at Bachelor level, who can quickly make a productive contribution in the labour market (*CRUS, KFH, COHEP, 2011*). The courses should therefore be practical and oriented to labour market requirements and the Bachelor's degree should be equivalent to the corresponding professional-level skills (except for music, where the Master's degree is the standard qualification).

The HFKG has enabled universities of applied sciences to gain autonomy in terms of their course content, as the institutional accreditation negates the need for further acceptance procedures. Moreover, universities of applied sciences can now offer Master's degrees without any additional approval procedures. As the distribution formula for the basic federal contributions at Master's level only account for the number of students and not, as at Bachelor's level, also the number of qualifications (with the exception of music), the incentives to expand the offering of Master's courses are restricted. However, whether and the extent to which the HFKG actually impacts the supply of Master's courses, will become apparent in the next few years.

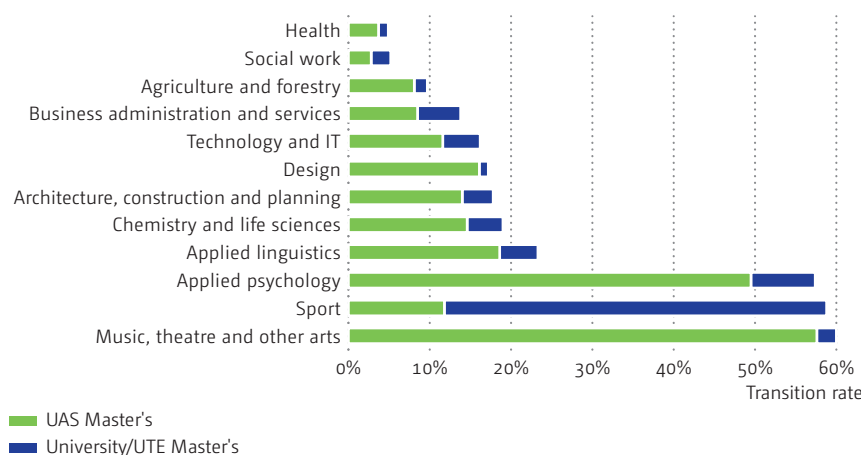
The current ratio of students going on to do a Master's degree (two years following completion of the Bachelor's course) averages at 17% (2013 leaving cohort), with another 3% likely to take a Master's course in the following years (*FSO, 2015d*).

The courses must also integrate education for sustainable development as per the «sustainable development strategy 2016–2019» (*Federal Council, 2016*). A study on the establishment of sustainable development in university strategy plus the presence of sustainable development in the teaching of business administration (*Kägi, Zimmermann, Roggo et al., 2017*) shows that sustainable development is firmly established, at least to some extent, and features in the lectures. The Swiss University Conference (SHK) is contributing to the promotion of sustainable development by financing student sustainable development projects from 2017–2020.

250 Ratio of transfers to a Master's degree

in the two years following completion of the Bachelor's degree 2013

Data: FSO



251 **Probability of pursuing education as a function of Bachelor's degree result, 2015**

Progress to a Master's degree until the survey just one year following completion of the Bachelor's degree; only persons living in Switzerland prior to starting the degree course in Switzerland, with a Swiss admission qualification and a Bachelor's degree from a public university of applied sciences
Data: FSO (Graduate Survey); calculations: SCCRE



By far the highest transition rates (about 60%) are in art, sport and applied psychology (→ Figure 250). In all the other disciplines, the transition rate is about 20% or less. In the arts, most transitions to a Master's degree are in music. In applied psychology, a Master's is required the title «psychologist», and a Master's in sport enables the holder to teach at lower-secondary level.

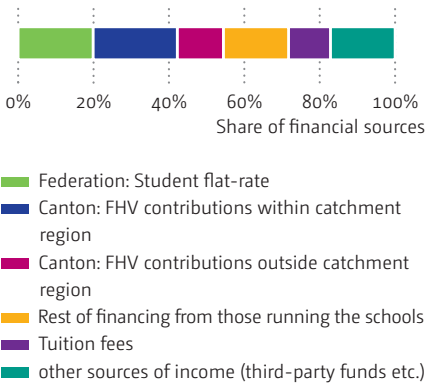
Regardless of the selected specialisation, students taking a full-time course are more likely to go on to Master's level than part-time students (FSO, 2015d).³ Students living abroad prior to the course are about 50% more likely to proceed to a Master's degree than students already in Switzerland. The data from the graduate surveys also indicate that the probability of going on to a Master's depends on the person's performance at Bachelor level (→ Figure 251). In those areas with a low to moderate transition ratio, the probability of taking a Master's gradually increases the higher the Bachelor's degree result. By contrast, in those areas with a high transfer rate the probability of transfer is similar for middle and upper grades.

Only conventional universities are entitled to award the highest academic achievement, i.e. a doctorate. However, universities of applied sciences can provide doctoral courses in cooperation with a conventional university. These joint projects enable universities of applied sciences to contribute to the education of their own scientific staff – and thus ensure a practical and applied research orientation – while the conventional university ensures the requisite academic standard. To promote these forms of cooperation, the Swiss University Conference (SHK) is supporting doctorate courses from 2017–2020 through project-related contributions based on cooperation between a university of applied sciences and a conventional university. Cooperation is possible with a Swiss or a foreign conventional university (in areas where Swiss universities are not well established). Moreover, the SHK promotes pilot programmes to strengthen the double competence profile to ensure continuity at universities of applied sciences, which should help them to have an adequate number of suitably qualified employees (→ chapter Tertiary-level education, page 169) and further its distinctive profile at the interface of academia and practice.

Funding sources of universities of applied sciences

252 **Composition of financial sources, 2015**

Data: FSO



The universities of applied sciences are half-financed by the cantons, with the Confederation and the private sector covering over a quarter and one fifth respectively (→ chapter Tertiary-level education, page 169). A detailed assessment of the financial sources by origin of the funds (→ Figure 252) shows that the contributions made by the cantons for their students at a university of applied sciences outside the canton under the intercantonal UAS agreement (FHV) to the canton where the university of applied sciences is based, accounts for two thirds of average cantonal contributions. The basic contributions from the Confederation cover approximately 20% of expenditure.

Student fees contribute over 10% of total costs. These fees are between 500 and 1000 francs per semester at public universities of applied sciences (→ Figure 253). Some places charge higher fees to foreign students.

3 This connection applies irrespective of age, gender, residence of the students prior to starting the course (Switzerland or abroad) and university of applied sciences.

The fees are standard for all specialist areas within the individual universities of applied sciences (exception: art at FHNW). As the education costs vary significantly by specialist area (→ *Costs by field of study*, page 233), the share of costs covered by the students also varies considerably. A full-time business studies student at the university of applied sciences in Bern, for example, contributes 8% of their annual costs for a basic education (no research), whereas a student in chemistry and life sciences at the same institute pays only 3%.

Effectiveness

The primary aim of the teaching at universities of applied sciences is to turn out students who are qualified for the labour market, which requires the application of academic knowledge and methods as well as design and artistic skills (see HFKG). The minimum skill level students should have on completing the course is defined in the qualification framework for Swiss universities (nqf.ch-HS; CRUS, KFH & COHEP, 2011). However, there are no national or international tests for Switzerland to benchmark the stipulated competencies. Labour market integration is used instead to gain an indication of the effectiveness of a UAS education. Furthermore, the effectiveness is measured using the «graduation rate» indicator. Analyses of the return on education are presented in *chapter Cumulative effects*, page 295.

Graduation rates

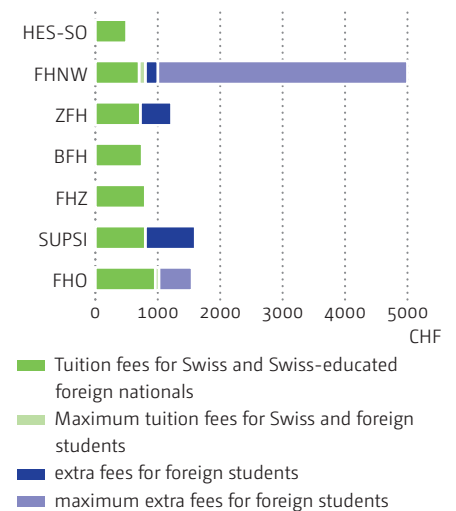
The indicator of graduation rates could – assuming that the graduation includes certification of the requisite skills (and thus the quality of training) – serve as an indication of the effectiveness of the education provided by universities of applied sciences. In any case, the graduation rate also depends on the selection strategy and/or quality standards applied by a university. A low graduation rate can therefore also point to high quality standards and a high rate, by the same token, may mean more modest demands on students. Universities must not keep the ratio «artificially» high or set lower qualification requirements than the labour market would demand if the graduation rate is to maintain credibility as an indicator of a course's effectiveness. The high employment rates overall of UAS graduates, however, suggest that isn't the case. Granted, there are major and not so major differences between individual universities and specialist areas. The permanently high proportion of people in jobs that do not reflect their university qualifications (→ *Labour market success of graduates*, page 231) should be kept an eye on.

The graduation rate is not only determined by the requirements of the universities and the quality of their courses but also by the composition of the student population. As opposed to the conventional universities, the universities of applied sciences have the option of setting their own entrance exams and that is what they do in some fields (→ *Institutions*, page 224). It is thus to be expected that, as a result, fewer students will drop out of their course. The available data unsurprisingly show that the graduation rate of between 74 and 100% depending on the field (→ Figure 254) is higher on average for those areas that have entrance examinations.

253 Tuition fees per semester, 2017

only public schools

Data: Swissuniversities



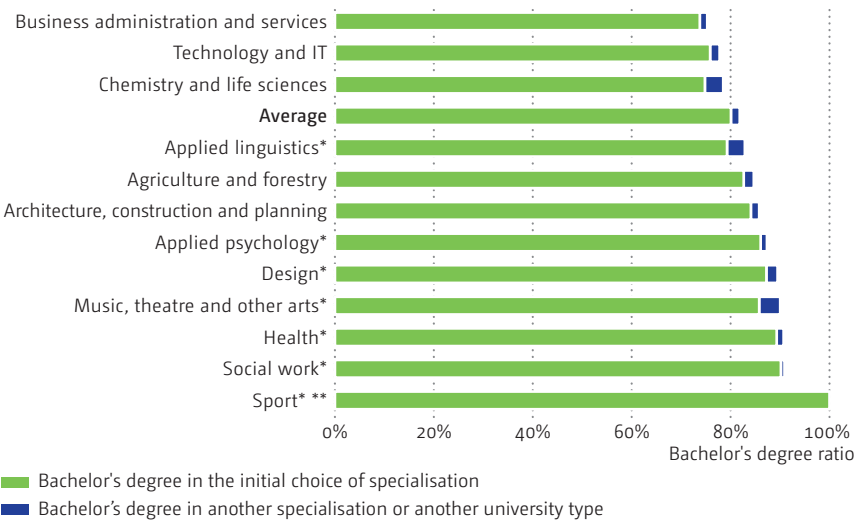
Tuition fees only partially raised are in muted colour. The extra fees for foreign students only apply at the HTW of the FHO and at the FHNW only for persons based outside Switzerland and the EU.

The **qualification framework** for the Swiss university area includes the targeted skills, which the students are to achieve by the end of the relevant study cycle, in the following five categories: «knowledge and understanding», «application of knowledge and understanding», «judgement», «communication skills» and «self-directed learning».

254 Graduation rate up to eight years following start of Bachelor's degree

for the 2007 entrance year of students living in Switzerland before beginning the course, by specialisation at the start of the Bachelor's degree.

* Specialisation with evaluation of suitability, ** The values in sport are based on student numbers of < 50.
Data: FSO



Federal vocational baccalaureate 1 is completed in parallel with vocational and educational training, **federal vocational baccalaureate 2** is after completing vocational and educational training.

Furthermore, the probability of achieving a degree also depends on the educational path taken and individual characteristics. Students with a baccalaureate are on average at a lower risk of failing to finish their studies than those with a federal vocational baccalaureate, whereas persons with another Swiss certificate are more likely not to complete their studies (→ Figure 255). Statistically, there are no major differences between holders of federal vocational baccalaureate 1 and federal vocational baccalaureate 2. On the other hand, persons with a baccalaureate who initially started a course at a conventional university or university of teacher education, pose a higher likelihood of dropping out than those who proceeded directly to a university of applied sciences. The correlation between admission qualification and drop out rate varies depending on the area of study.

255 Probability of dropping out by university admission qualification

Data: FSO (LABB); calculations: SCCRE

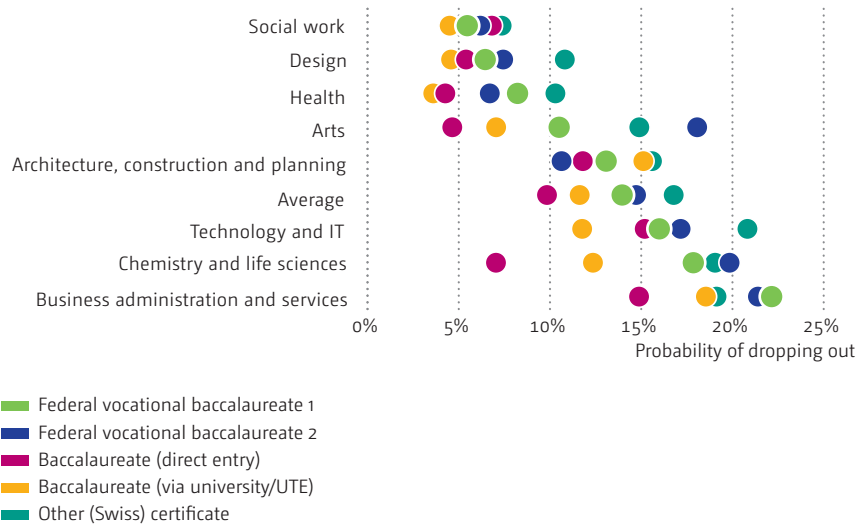


Figure 255 gives the student dropout probability and figure 256 the difference between the probability of student dropout by each one of the comparison groups assuming everything else remains identical (same specialist area, same gender, same age etc.), calculated using statistical regression analysis. Student dropouts are departures from the university system without a degree occurring within the first six years of study following entry to a tertiary education institution. The data is based on students who joined a public university of applied sciences between 2006–2009 and who lived in Switzerland prior to starting their studies (excluding persons with foreign admission qualifications).

The probability of dropping out increases with age on entry (→ Figure 256). There is also a counter effect for delays prior to attending university (gap years between gaining university admission qualification and actually starting the university course), but the age effect comes to bear when the gap exceeds two years. Part-time students are at higher risk of dropping out than full-time students, probably due to the double burden of studies and work plus the higher opportunity costs. There are no marked differences between men and women if all other criteria are equal. On the other hand, foreign students are less likely to graduate than their Swiss counterparts.

The results of a qualitative survey of social work students (Kita, 2016) suggest that normally a combination of factors, as opposed to just one reason, lie behind the decision to drop out of a degree course. This is consistent with international literature on the subject (see Larsen, Sommersel & Larsen, 2013, for an overview). The people who drop out cite mainly personal reasons (e.g. multiple stresses), as well as having the wrong idea about what the course involved. The key criterion named for the successful completion of a university course is a good level of social integration, i.e. good contacts among fellow students (Kita, 2016).

Labour market success of graduates

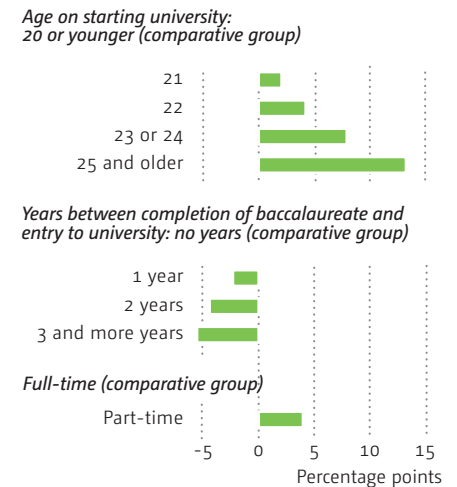
Successful integration into the labour market is the key criterion in assessing the value of a UAS education, as it is designed as a practical degree and oriented to labour market requirements. Besides the pure employment rate, the extent to which the education leads to qualification-appropriate employment is also important.

According to the 2015 graduate survey, UAS graduates integrate relatively easily into the labour market. One year following graduation, an average of 90% are in employment with only 4% unemployed (as per ILO definition) (see definitions in → *chapter Tertiary-level education, page 169*). Five years following graduation, the unemployment rate (for the 2010 graduation cohort) was just 2% – with a relatively high employment rate of 93%.

However, the high level of employment market participation gives no indication as to whether the graduates are working at a level commensurate with their qualifications. The survey shows that four of every five UAS graduates (81%) in work one year after leaving university are in a job appropriate to their education, i.e. an occupation requiring a degree or at least the acquired professional qualifications. Even five years after graduation, the proportion of graduates working at a level commensurate with their qualifications is only slightly higher than one year after graduation (83% for the 2010 graduation cohort), suggesting that it is not solely a labour market entry problem. One explanation for the substantial proportion of graduates in non qualification-appropriate employment could be that some positions are equally suitable for graduates of tertiary level professional education (e.g. PE colleges) or persons with continuing education and training certificates (MAS etc.). This hypothesis is backed by the situation in the field of health (see Diem, 2014), where tertiary-level health training is basically only available in universities of applied sciences in the French-speaking area of Switzerland, while in the German-speaking part health training is also provided at PE colleges. It can be seen here that the differences between the regions (French and German-speaking) are reflected in the institutional structure

256 Difference in student dropout probability between the different groups

Data: FSO (LABB); calculations: SCCRE



of job requirements. This poses the question of whether the education type profiles are sufficiently differentiated at tertiary level.

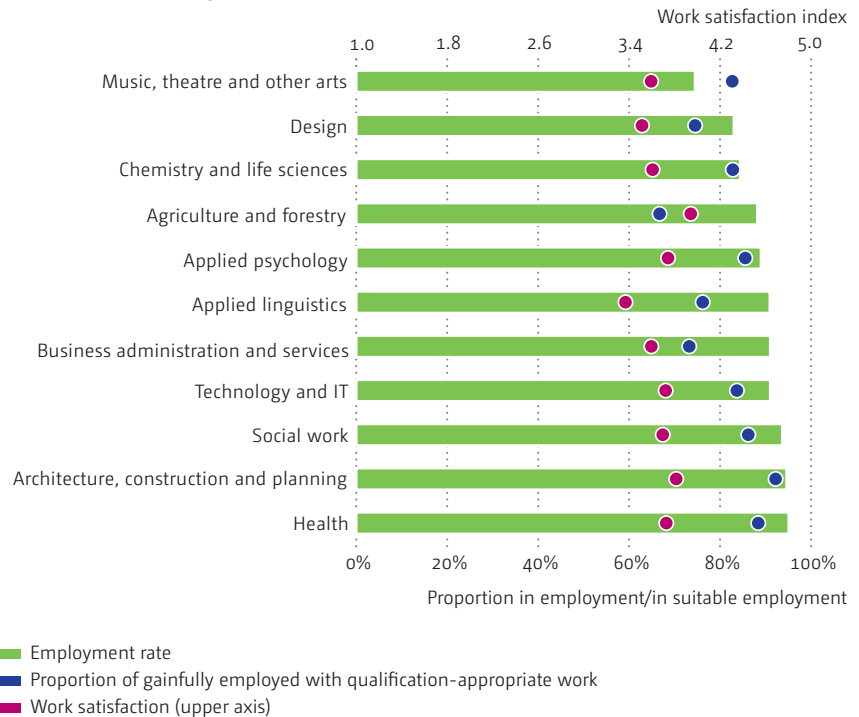
257 Labour market situation 1 year after graduation, 2015

1st cycle graduates (Bachelor's, diploma), provided they have not started a Master's at the time of being surveyed, and 2nd cycle graduates

Data: FSO (Graduate Survey); calculations: SCCRE

A person is defined as **appropriately employed** if the job the person is doing requires a higher education degree or displays a clear match with professional skills acquired during higher education (scores of 4 and 5 on a scale from 1 «not at all appropriate» to 5 «highly appropriate»).

Job satisfaction is a summative index comprising 14 aspects of job satisfaction. The range lies between (minimum) and 5 (maximum).



There are differences between the specialisations when getting started in the labour market, both in terms of participation and quality of occupation (→ Figure 257). The highest employment ratios and proportions of people in qualification-appropriate work are shown for the areas of health, architecture/construction/planning and social work. The employment rate is lowest for art, design and chemistry/life sciences. The proportion of persons in qualification-appropriate work is clearly below average, for example, in business administration/services. There are also differences in terms of work satisfaction.

Moreover, the question regarding the extent to which universities of applied sciences can influence the successful integration of their graduates into the labour market, for example, by designing their courses in the right way or providing the right kind of teaching is not easily answered. Nonetheless, the data show that the employment prospects of graduates one year after completing their degree vary considerably between the different universities of applied sciences (→ Figure 258), regardless of the specialisation. For example, the Fachhochschule Zentralschweiz (FHZ) has a markedly higher employment rate for the same proportion of adequately-employed graduates than the Haute école spécialisée de Suisse occidentale (HES-SO). Fachhochschule Ostschweiz (FHO) has the lowest qualification-appropriate employment ratio at six percentage points below Fachhochschule Nordwestschweiz (FHNW). The differences between the universities of applied sciences may be partly due to differences in the local labour markets. However, the varying unemployment levels by major region can be excluded as an explanation as can the different course offerings (→ *margin text*).

258 Differences in labour market success of graduates by UAS, 2013, 2015

Deviations from the average in the employment rate and share of appropriately employed; 1st cycle graduates (Bachelor's, diploma), provided they have not started a Master's at the time of being surveyed, and 2nd cycle graduates one year after completing their studies

Data: FSO (Graduate Survey), SECO (amstat); calculations: SCCRE



The **labour market indices** show the extent to which the employment rate and the proportion of appropriately employed graduates taking account of the specialisations offered deviate from the average for each university of applied sciences. The deviations from the Swiss UAS average were calculated for each specialisation and university of applied sciences and added up for each institution, taking account of the relative share of the specialised areas per university of applied sciences. The values for the employment rate index were corrected to reflect the difference in the regional unemployment rate from the average (see also *Diem & Wolter, 2012*). The specialisations of agriculture and forestry, sport and applied linguistics were not included in the analyses as the numbers are too low.

Efficiency / costs

An assessment of the efficiency of the investment made in teaching in universities of applied sciences requires comparable data on costs (input) and an adequate measurement for output (effectiveness). Such data is available, at least on the cost side, for the individual universities, and the output (effectiveness) can be measured by means of different criteria. In the following analyses, by way of example, the indices for labour market success under the Effectiveness section are used to measure output.

Costs by field of study

The costs per student for teaching vary significantly between the different fields of study, with annual expenditure of about 20 000 francs (applied psychology, business administration and services) to over 50 000 francs (music, theatre and other arts, chemistry and life sciences; → Figure 259). The differences between the fields of study are due to a large extent to the different student-teacher ratios. While some subjects, such as the labour-intensive life sciences or subjects involving individual tuition, for example music or theatre, understandably need smaller classes or higher student-teacher ratios, the efficiency of costly student-teacher ratios due to lower student numbers in a specific subject must be called into question.

Taking account of applied research and development in addition to teaching costs, the annual expenditure per student is between 27 000 francs (business administration and services) and 91 000 francs (chemistry and life sciences).

Costs per student

Annual full costs for teaching (basic education and training) per student-full-time equivalent

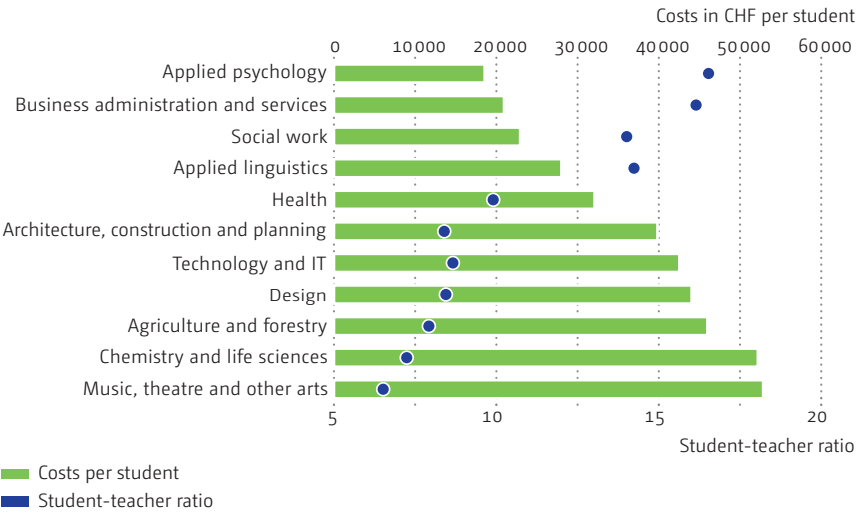
Student-teacher ratio

Number of student-full-time equivalents per full-time equivalent in the academic teaching staff (basic education and training)

A calculation of the student-full-time equivalents is based on the number of ECTS points for which students have registered, whereby 60 ECTS points correspond to a full-time course.

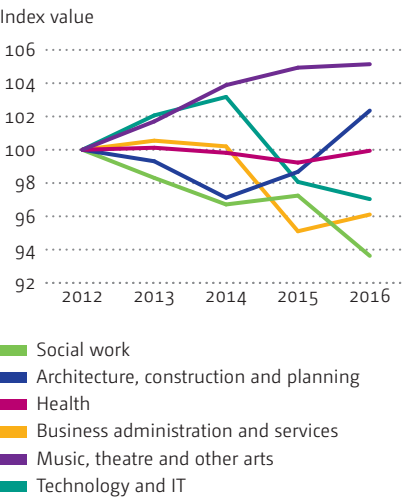
259 Student-teacher ratio and costs per student-full-time equivalent, 2016

Data: FSO, SERI



260 Change in costs per student-FTE, 2012–2016

only specialisations with a student share of at least 5%
Data: FSO, SERI



Expenditure per student has remained constant on the whole over the past few years and even fallen (→ Figure 260). Higher costs are only evident in the arts and architecture, construction and planning. However, the question remains as to whether the cost reductions reflect efficiency gains or whether perhaps more money should be spent to achieve a more effective educational offering.

Costs by university of applied sciences

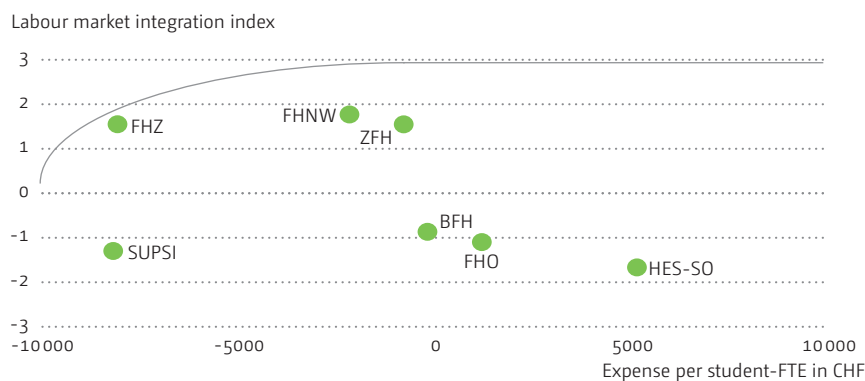
The costs for the same specialisation differ between the universities of applied sciences. That may be due to differences in material and staff costs, whereby the latter also depends on the composition of the academic staff, salary level and student-teacher ratio. Additional reasons could also be differences in subject offering within the same subject area and differences in the size of the specialisation or university.

If the deviations in terms of expenses from the total for that field of study in Switzerland are aggregated to an index for each universities of applied sciences (taking account of the relative weighting per subject), it becomes apparent that the cost differences are significant independently of the subject offering (→ Figure 261). The cost difference between the cheapest and most expensive universities of applied sciences amounts to in the region of 13 000 francs per student and year, which comes to about 40 000 francs per student for a Bachelor's degree. Comparisons with the cost index from 2011 (SCCRE, 2014) also show that the UAS hierarchy is very constant in this respect. To gain indications about the efficiency of deploying resources, the cost deviations among the universities of applied sciences are correlated to the labour market prospects of graduates. The figure shows Fachhochschule Zentralschweiz (FHZ) is closest to the optimum efficiency level (→ Figure 261). It must be borne in mind that the quality of this efficiency measure underpins the possible restrictions of the effectiveness indicator (labour market integration) and the differences in expenditure (e.g. price level).

261 Expenditure per student-FTE and labour market integration one year following graduation

weighted deviations from the average (index values), without agriculture and forestry, sport and applied linguistics; data on expenditure: Average of values from 2013 and 2014; Data on labour market integration from 2015

Data: FSO (Graduate Survey), SERI; calculations: SCCRE



Equity

Using access and participation as criteria, this section rates equal opportunities at the universities of applied sciences. It considers disparities between men and women and differences between people with and without a migration background. Aspects of social heritage and (physical) disabilities are addressed in *chapter Tertiary-level education, page 169*.

Gender-based differences

Based on the total number of Bachelor's students, the gender distribution at universities of applied sciences is more or less balanced with women representing 48% (as at 2016). However, marked gender-specific differences are apparent in the subjects selected, leading to significant horizontal segregation. Men are mainly overrepresented in technology/IT, architecture/construction/planning and sport, women have a big majority in health, applied linguistics, applied psychology and social work. About 45% of students in total are registered in a course where over 70% of students are of the same gender (→ Figure 262). Only 6% of women or 9% of men select a gender atypical subject (with below 30% of students of the same gender).

Gender segregation is more pronounced in universities of applied sciences than in conventional universities (→ *chapter Universities, page 197*). One explanation could be the different range of subjects offered. Universities of applied sciences offer fewer (major) study areas than universities that are of equal interest to men and women. Another possible explanation is that the gender composition makes the difference at an earlier stage of education, so these differences are sustained at upper-secondary level and into university. Examples of this practice include IT and architecture, where the proportion of women with the admission qualifications for universities of applied sciences is much lower than for conventional universities, leading to a lower proportion of women at universities of applied sciences (→ Figure 263).

Expense per student-FTE

Weighted deviations in average expenditure per student-FTE and year

Labour market integration index

Average value from the employment rate index (adjusted for the unemployment rate) and adequate employment for the index

Horizontal segregation

Uneven gender distribution in choice of subjects

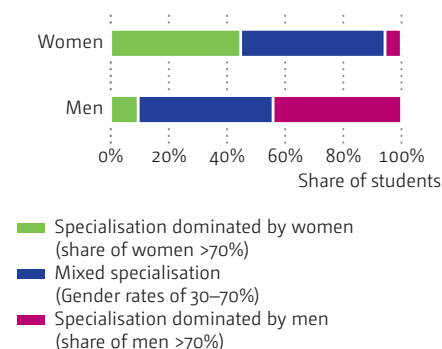
Vertical segregation

Uneven gender distribution at the individual career levels

262 Gender segregation by student intake, 2016

Share of students in specialised areas dominated by women, mixed and dominated by men

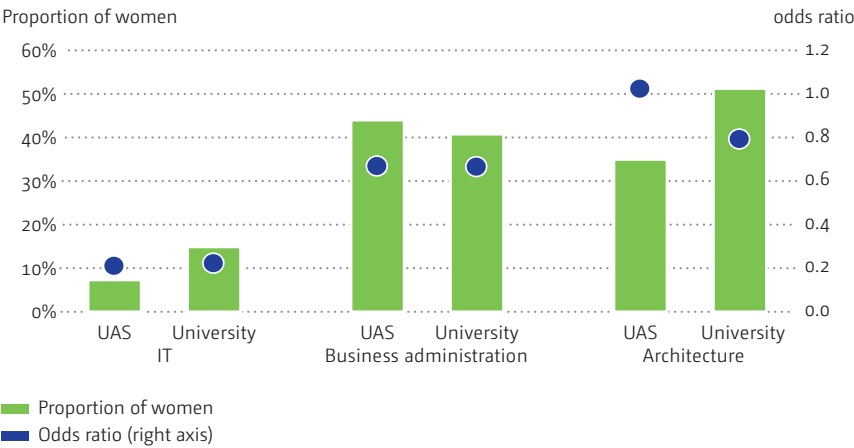
Data: FSO; calculations: SCCRE



The **odds ratio** is the gender ratio (women to men) by student intake relative to the gender ratio in the admission qualifications (weighted by the relevant subject quotas). A value of 1 means that the odds ratio is the same. Values of < 1 mean the women-men ratio in the student intake is smaller than the expected ratio based on the admission qualifications.

263 Proportion of women and odds ratio in selected subjects, 2016

only Bachelor's entrants with a federal vocational baccalaureate, specialised baccalaureate or baccalaureate (if details on the special subjects are available)
Data: FSO (SHIS)



However, allowing for the probability of studying a specific course at university, taking account of the gender distribution as reflected in the admission qualifications (odds ratio), women are not represented any less at universities of applied sciences than in conventional universities for those subjects. The relative probability of women studying architecture at a university of applied sciences is even greater than for a conventional university.

As regards vertical segregation, women (all other things being equal) are less likely than men to start a Master's degree after their Bachelor's degree (FSO, 2015d). Gender-specific inequalities are also apparent among academic staff, which become more pronounced along the career path. Women represent 39% of the category assistants and academic staff, 38% of other lecturers (without managerial responsibility) and just 26% of lecturers with managerial responsibility (as at 2016). The proportion of women in most specialist areas at the highest hierarchical level is about half that of the proportion of women students (Dubach, Legler, Morger et al., 2017). The area of health is a major exception in this regard as three quarters of lecturers with managerial responsibility are women. Generally speaking, vertical segregation is less pronounced overall at universities of applied sciences than at conventional universities.

Migration background

Until a few years ago, only data on nationality was available for analysing the composition of the student population in terms of migration background. As details on the nationality of pupils at upper-secondary level was only available for people in the system but not in terms of qualifications gained and as many people become naturalised at a young age, it has not yet been possible to draw any firm conclusions in terms of entrance opportunities to universities of applied sciences. However, data is now available on the country of birth of the students and their parents, enabling a comparison of the proportion of students with a migration background against the corresponding proportion of the population and thus the identification of potential differences of opportunity.

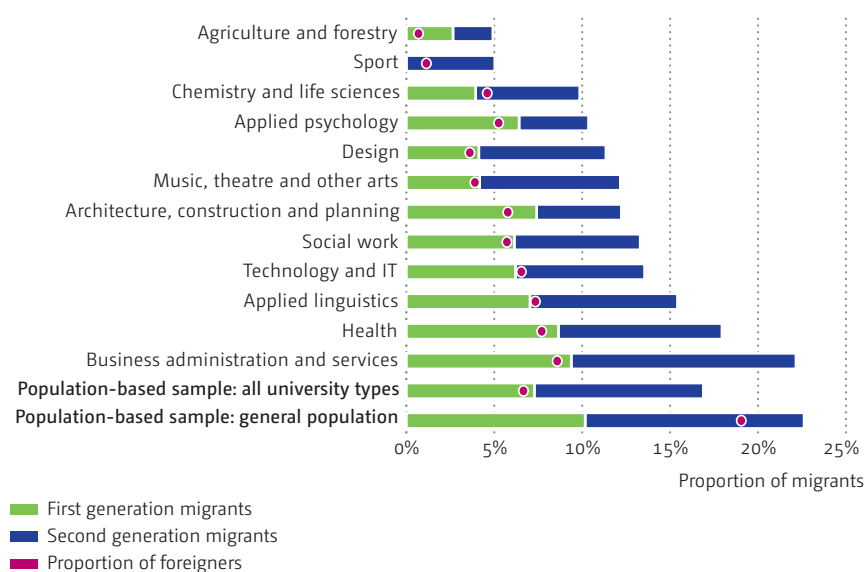
Statistically, persons from a migration background are clearly under represented in universities of applied sciences (→ Figure 264). This applies to both

first and second generation migrants. A total of 17% of students at universities of applied sciences with a Swiss tertiary education admission qualification are from a migration background. However, a ratio of 23% would be expected for a similar distribution among the non-migration population. Moreover, migrants tend to be less well represented at universities of applied sciences than at conventional universities (→ *chapter Universities, page 197*) although they are much less in evidence at universities of teacher education. However, this tells us nothing about migration-specific barriers, as migrants may simply not have the same interest in universities of applied sciences as non-migrants.

264 Proportion of students with a migration background by specialisation, 2013

Bachelor's students with a Swiss university admission qualification.

Data: FSO (Social and Economic Conditions of Student Life, PISA 2006, SLFS 2006); calculations: SCCRE



There are marked differences between the different specialisations as regards the proportion of students with a migration background (→ Figure 264). Only business administration and services is representative of the population. Migrants are also only slightly under-represented in health. In all other areas, migrants are very much in the minority.

The greater under-representation of migrants at universities of applied sciences relative to universities is partly due to differences in the nature of entrance diplomas. For example, the proportion of foreign students in schools offering the federal vocational baccalaureate is lower than in a baccalaureate school (9% vs. 13%). Furthermore, research suggests that migrants with a baccalaureate are less likely to attend a university of applied sciences and more likely to attend a conventional university than non-migrants (*Griga, 2014*). As a result, the proportion of foreigners with a baccalaureate studying at a university of applied sciences is lower than the proportion of foreign students at university (→ Figure 265). With some origin groups, the holders of a federal vocational baccalaureate are less likely to pursue a university education (all other things being equal) than persons from a non-migratory background (*Murdoch, Guénard, Griga et al., 2016*).⁴

4 On the other hand, migrants with a baccalaureate are generally more likely to go on to tertiary education.

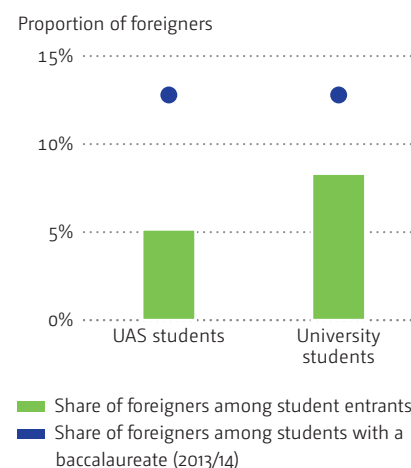
Comparisons with the overall population

As the composition of the group of persons with a migration background has changed in recent years and many young adults are taking up residence in Switzerland for a university education, the comparison is not based on current data but on data from 2006. The PISA data reflect the migration quotas from the ninth class of that year, the SLFS data represent the proportion of foreigners in the 15-18 age group. Persons in this age group were of normal student age in 2013.

265 Share of foreigners among students with a baccalaureate, 2016

Bachelor's degree entrants in 2016 with a Swiss baccalaureate (obtained from 2014–2016)

Data: FSO (SHIS); calculations: SCCRE



An evaluation of migration background by nationality instead of country of birth reveals a still lower level of representation among migrants. The detailed data on migration background, however, supports the assumption that this under-representation is overestimated due to naturalisations.



Universities of teacher education

Context

The details and statistics provided in this chapter relate primarily to the **universities of teacher education as a distinct category of university** at tertiary level. As this Education Report is structured by type and level of education rather than by topic, teacher training is only discussed in this chapter where it is provided by universities of teacher education. This is therefore not a comprehensive overview of the training of all categories of teacher.

Universities of teacher education (UTE) comprise a third category of university in Switzerland, alongside universities of applied sciences (UAS) and universities. They are smaller institutions that are specialised in the training of teachers. Designed along similar lines as UAS, with which they are partially integrated, universities of teacher education are funded solely by the cantons (*Ambühl & Stadelmann, 2013; CRUS, KFH & COHEP, 2009*). This is an indicator of the importance that the cantons attach to teacher education.

Demand for teachers

The core activity for the UTEs is to ensure a supply of a sufficient number of appropriately trained teachers to meet the needs of schools. They therefore carry out an essential function for the education system. Their fulfilment of this function is dependent on a range of factors over which UTEs have no influence, such as demographic change, education reforms and their implementation. The cantons are able to use admission requirements and training specifications to influence the UTEs' selection procedures and therefore shape the student population. Cantons have three main levers with which they can exert a decisive influence on the work of the UTEs. Firstly they are the universities' source of funding; secondly they determine the curricula and teaching hours in individual subjects and therefore the training content; and thirdly they are also able to influence the UTEs through the funding of schools and therefore their role as future employers of most of the graduates of these institutions.

Even though they are unable to affect the developments in pupil numbers, the cantons do have a range of options for influencing the labour market for teachers. They can adjust a number of institutional frameworks that have a direct impact on the recruitment of teachers. In addition to the admission criteria that are relevant to the potential supply (including new study options for existing professionals and people crossing over from another career, (→ *Institutions, page 248*) the cantons have at their disposal the means to control demand for teachers by policy directives on pupil-teacher ratios (rules on class size).

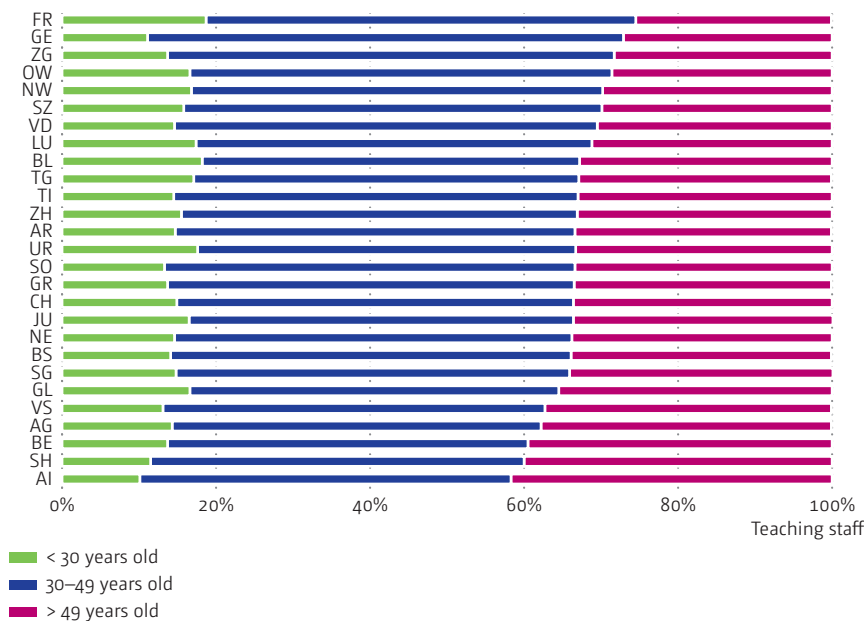
Fluctuations in pupil numbers can be overcome to a certain extent by flexible pupil-teacher ratios. Therefore, the demand for additional teachers does not change directly in proportion to a change in the number of pupils. Empirical studies show that on average, demand is inelastic to changes in pupil numbers (→ *chapter Primary school level, page 51*). For example, an increase of 10% in the number of pupils normally entails demand for about half as many extra teachers. The pupil-teacher ratios deteriorate as a result. At the same time, teachers are not immediately made redundant when a fall in pupil numbers is registered. This improves the pupil-teacher ratios (→ *Figure 64*).

Pupil numbers and pupil-teacher ratios aside, the demand for new teacher recruits also depends on the fluctuation rate in the pool of teachers. Departures of teachers with permanent contracts are around 7% per annum (*FSO, 2014*). However, given the proportion of teachers over the age of 49 is high, there has been an increased need to recruit new teachers for some time. The pressure on the different cantons varies greatly, but the proportion still ranges from 25% to 42% (→ *Figure 266*).

266 Teaching staff age bands, 2015/16

Teaching staff in compulsory education (primary level 1–8 and lower-secondary level) excluding special curriculum, state schools) by age bands and cantons

Data: FSO; calculations: SCCRE



The FSO's forecasts indicate that the effect of an ageing teacher population on exit rates due to retirement has now peaked (FSO, 2017g), but will be maintained at this level until 2022.

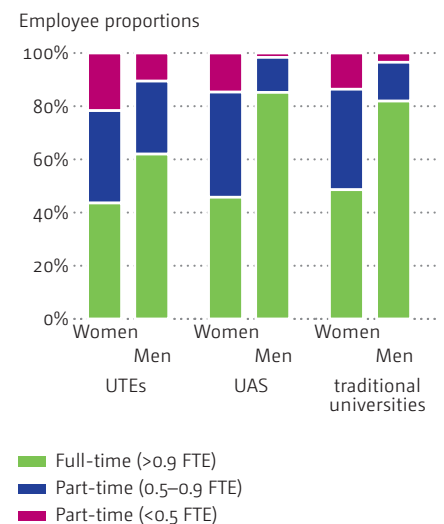
Full and part-time teaching

Whether teachers are in full-time or part-time employment plays a key role in the supply of teachers. Part-time employment is particularly widespread in the teaching profession, including in comparison with other professions that have a high proportion of women. While the employment level for new recruits is high at 0.85 FTE for both genders, full-time posts for teachers are significantly less widespread in comparison with positions for other university graduates. According to the Graduate Survey, at least 40% of UTE graduates working in compulsory education report having sought a higher number of hours per week than they were able to secure one year after graduating. This indicates that the observed higher levels of part-time work are not always by choice. However, in the later parts of their careers both male and female teachers experience substantial reductions in working hours. Employees who were trained at a UTE have the lowest rate of full-time employment in comparison with other academics and the highest rate of part-time employment with a low number of hours. This also applies in the case of male employees (→ Figure 267).

The reasons for the low average number of working hours in the teaching profession are cultural as well as structural and institutional. Both women and men select teaching as a profession precisely because of its compatibility with family life (Hof & Strupler Leiser, 2014; Denzler & Wolter, 2009). Furthermore, school structures in rural areas with low population densities or complex set-ups with a high number of specialist teachers make the organi-

267 Degree of employment, employed people (ages 25–64) by type of university, 2016

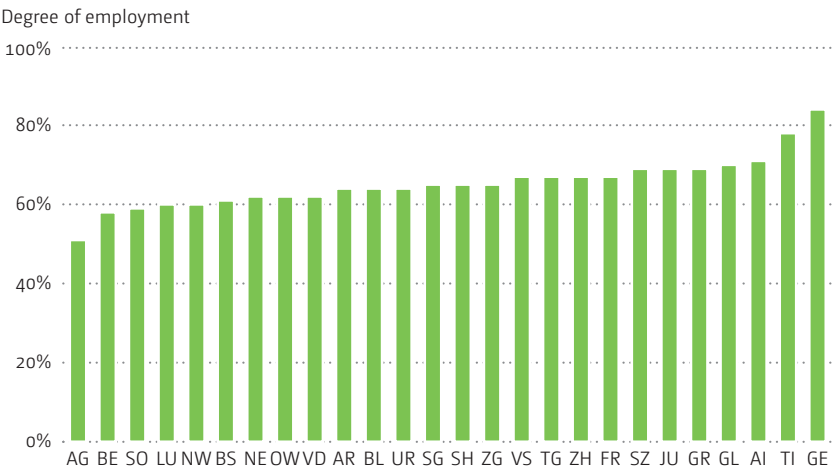
Data: FSO (SLFS)



sation and optimum deployment of available resources a difficult task. The figure below, however, shows that the low number of working hours applies in cantons with rural and urban characteristics alike; school structures cannot, therefore, be the sole explanation for the phenomenon. It is equally clear that the average number of working hours has also fallen in recent years in cantons in which the number of pupils has increased again more strongly. The low number of working hours cannot, therefore, be explained by a lack of employment opportunities.

268
Average degree of employment of teachers at primary level (1–8 HarmoS), 2015/16

Data: FSO; calculations: SCCRE

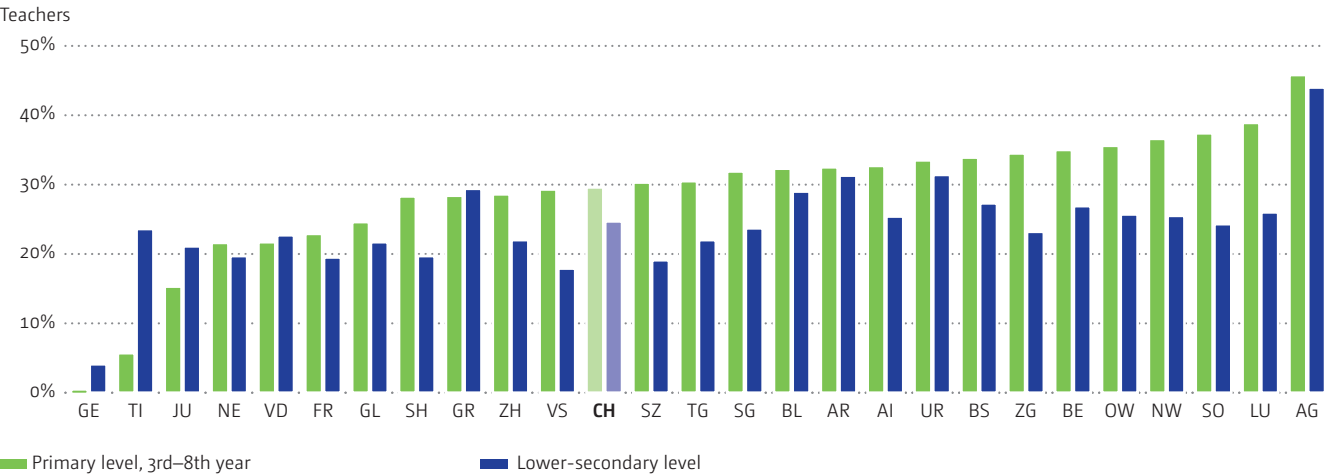


The proportion of people in small part-time positions is also telling (→ Figure 269). Major differences between individual cantons are indicative of the fact that the reasons for the average degree of employment are not primarily organisational and structural, and that institutional and cultural factors are far more important. For example, there are considerably lower levels of 50% or less part-time work in Western Switzerland than in German-speaking Switzerland.

269
Part-time teaching staff with low working hours, 2015/16

Proportion of teachers employed for less than 0.5 FTE, state schools

Data: FSO; calculations: SCCRE



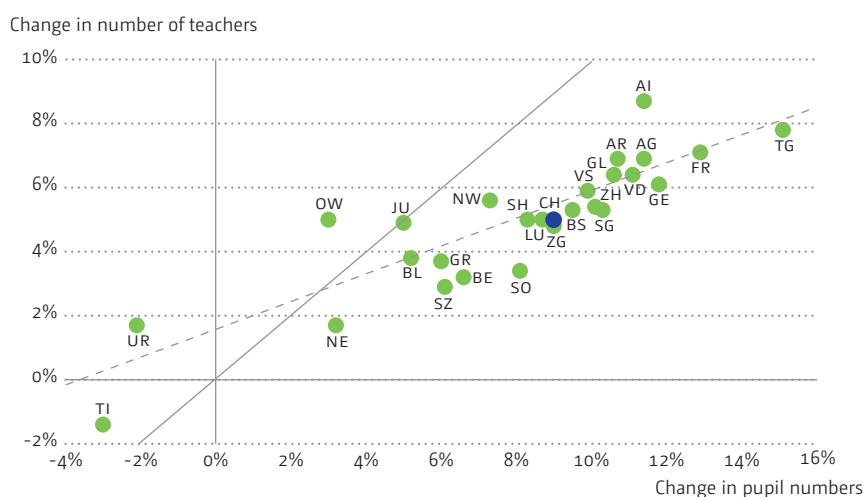
Forecast demand for teachers

The future demand for newly qualified teachers is primarily a product of the development in pupil numbers. It is anticipated that this population will continue to grow throughout the compulsory education segment. The FSO forecasts an increase of some 15% within a decade for the primary level, for example (FSO, 2017f). Nevertheless, the demand for new teachers is not expected to achieve this level. The simulation below illustrates the effect on demand for additional teachers that can be created by only small changes to the degree of employment (proportion of FTE) and pupil-teacher ratio. Given the forecast growth in pupil numbers, increasing the average pupil-teacher ratio by just one pupil would reduce the demand for additional teachers generated by the increase in pupil numbers from some 7000 to around half that figure.

At the same time, the forecast growth in the school population could be met while maintaining the current pupil-teacher ratio if teachers were to increase their average degree of employment by just 10 percentage points (proportion of FTE). The same target could be achieved by a combination of both approaches, increasing the pupil-teacher ratio by 0.5 of a pupil and adding 0.05 to the proportion of FTE. It can be seen from the FSO's calculation of such mechanisms that for many cantons (→ Figure 270) in which growth of pupil numbers is expected to be low, forecasts are that there will be falling demand for teachers. The opportunities for cantons that expect high demand for new teachers to cover their requirements will depend also on the mobility of teachers between cantons.

270 Development of teaching staff and pupil numbers at primary level, HarmoS school years 1–8, 2018–2025

Data: FSO; calculations: SCCRE



Explanations of Figure 270

The forecasts of the development in the teaching pool are calculated on the basis of pupil forecasts and after taking account of fluctuation rates and average degree of employment (proportion of FTE) (FSO, 2017g).

According to the FSO's forecasts, the number of teachers at primary level will not increase in proportion to pupil numbers; growth in teachers at this level will be around half that of pupils (cf. dashed trend line).

However, the further a canton is located from the diagonal (proportionate relationship) the more, according to the FSO, the increase in pupil numbers will be managed by larger class sizes or increased degrees of employment of the teachers (for example in the cantons of Thurgau and Geneva). A disproportionate increase in teaching staff (cf. the canton of Obwalden) may, in contrast, be explained by smaller class sizes, increase in the teaching hours for pupils or a decrease in the average degree of employment of the teachers.

Development of numbers studying at universities of teacher education

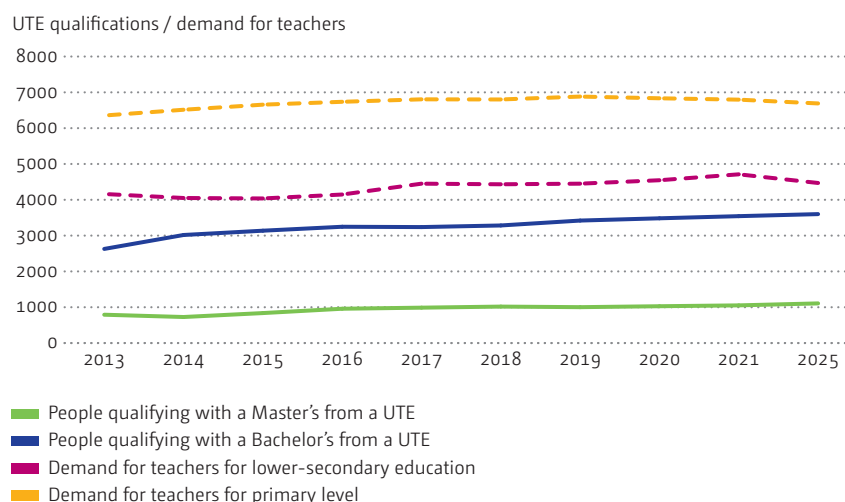
The strategic importance of UTEs for the education system is evidenced by the fact that the forecast additional requirement for teachers can only be covered domestically if more people commence studies at a UTE and qualify. The UTEs have undergone a period of strong expansion in the past ten years, as the total number of students has risen from 11 000 in 2006 to over

20 000 in 2016. The FSO's reference scenario for the number of students at UTEs anticipates that these figures will continue to rise (→ Figure 271). However, the FSO forecasts students on courses relating to the lower-secondary education level to increase only slightly (FSO, 2017f).

271 Demand for teachers and number of students at UTEs, forecasts 2016–2025

UTE qualifications taking account of the average transition rates and average degree of employment of graduates from UTEs

Data: FSO; calculations: SCCRE



The labour supply illustration above takes account of the fact that only some 85% of each qualifying cohort actually enters the profession, and that their average degree of employment is just 0.85 FTE. On average, only half of the forecast annual additional demand for teaching staff will be met by newly qualified teachers. The remaining gaps must be plugged by teachers coming back to the profession after a period away or by teachers who have qualified abroad.

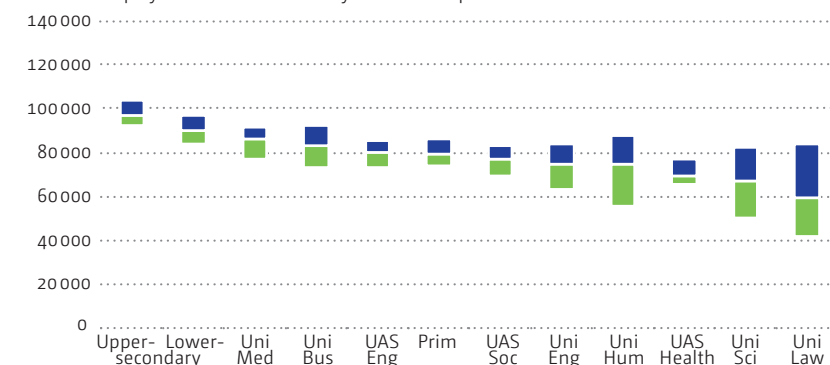
Teaching salaries

The motivation for a person to train at a UTE and for a qualified teacher to stay in the profession depends on the attractiveness of teaching as a job; this includes the salary opportunities in the teaching profession compared with other professions with similar educational requirements. A comparison of the incomes of new teachers with those of graduates in other disciplines from all types of university in Switzerland has shown that the salary prospects in the teaching profession, especially at entry level and during the following first five years, are currently very good.

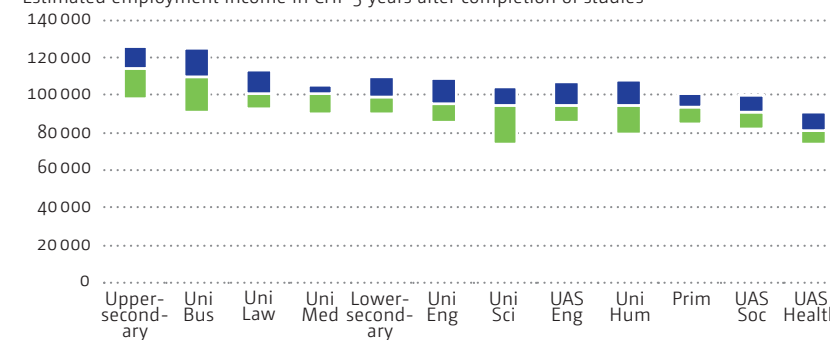
272 Employment income of graduates, 1 year and 5 years after completion of studies, 2015

Annual gross incomes estimated using quantile regression (standardised to 100%), controlled for age
Data: FSO (Graduate Survey); calculations: SCCRE

Estimated employment income in CHF 1 year after completion of studies



Estimated employment income in CHF 5 years after completion of studies



2nd quartile

3rd quartile

One year after completing their studies, teachers at middle school and lower-secondary level are among the best paid compared with other academic professions. Secondary school teachers earn higher median salaries than even doctors or economists when they start working. The median salary of just under CHF 80 000 earned by primary teachers places them in the upper middle band, ahead of university engineering, natural science or humanities graduates. (→ Figure 272).

Five years after completion of their studies, middle school teachers remain in top position. Their CHF 110 000 median salary is similar to that earned by economists. The median salary of teachers in lower-secondary education five years after completing their studies is almost CHF 100 000, which is on a par with doctors and lawyers. On a lower level, we find primary teachers together with graduates in STEM subjects and in humanities (→ Figure 272).

The income comparison must also take account of the fact that, five years after completing their studies, primary school teachers, with their three-year Bachelor's course at a UTE, continue to earn at the same level as university graduates with Master's in a range of disciplines; any relative drops in salary in the later phase of their careers should also be viewed as compensating for shorter training periods.

While salary levels do vary between the cantons, the distribution found indicates that the variance among teachers is lower than among university graduates in humanities or natural sciences. In other words, graduates of these individual university disciplines incur a greater risk of earning a more markedly below-average income after graduating.

Explanations for Figure 272: salary estimates based on quantile regressions

Traditional universities (U): Graduates of 2nd cycle only (Lizenziat, Diplom, Master's)

Universities of applied sciences (UAS): Only graduates of the 1st cycle (Bachelor's, Diplom) who had not started a Master's course at the time of the survey

Universities of teacher education (UTE), primary level: Only graduates of the 1st cycle (Bachelor's, Diplom) who had not started a Master's course at the time of the survey and who teach at the primary level

Universities of teacher education (UTE), lower-secondary education: Only graduates with Master's or final examination, working in lower-secondary education

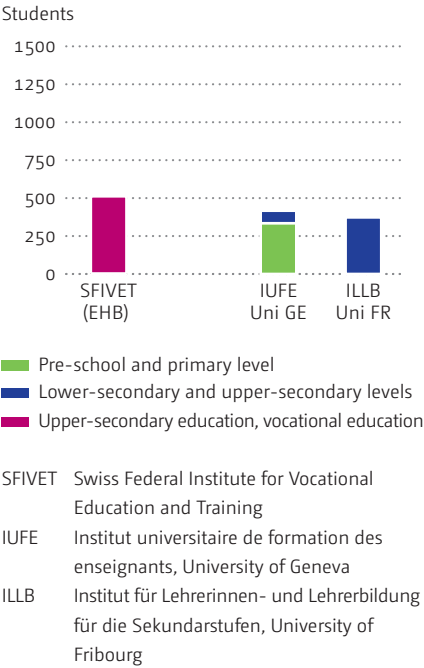
Universities of teacher education (UTE), upper-secondary education: Graduates working in a middle school

Explanation of the chart: The bars represent the middle 50% of the distribution (2nd and 3rd quartiles); the median is located in between.

| | |
|------|--------------------------------|
| Uni | traditional university |
| UAS | university of applied sciences |
| Med | medecine |
| Bus | business |
| Eng | engineering |
| Prim | primary school education |
| Soc | social work |
| Hum | humanities |
| Sci | natural sciences |

273 Students of other university types or specialised institutions for teacher training, 2016

Only university types that offer teaching diplomas recognised by the EDK or Confederation, that are members of the UTE Chamber of the Rectors' Conference and whose students are registered in the SHIS are listed.
Data: FSO



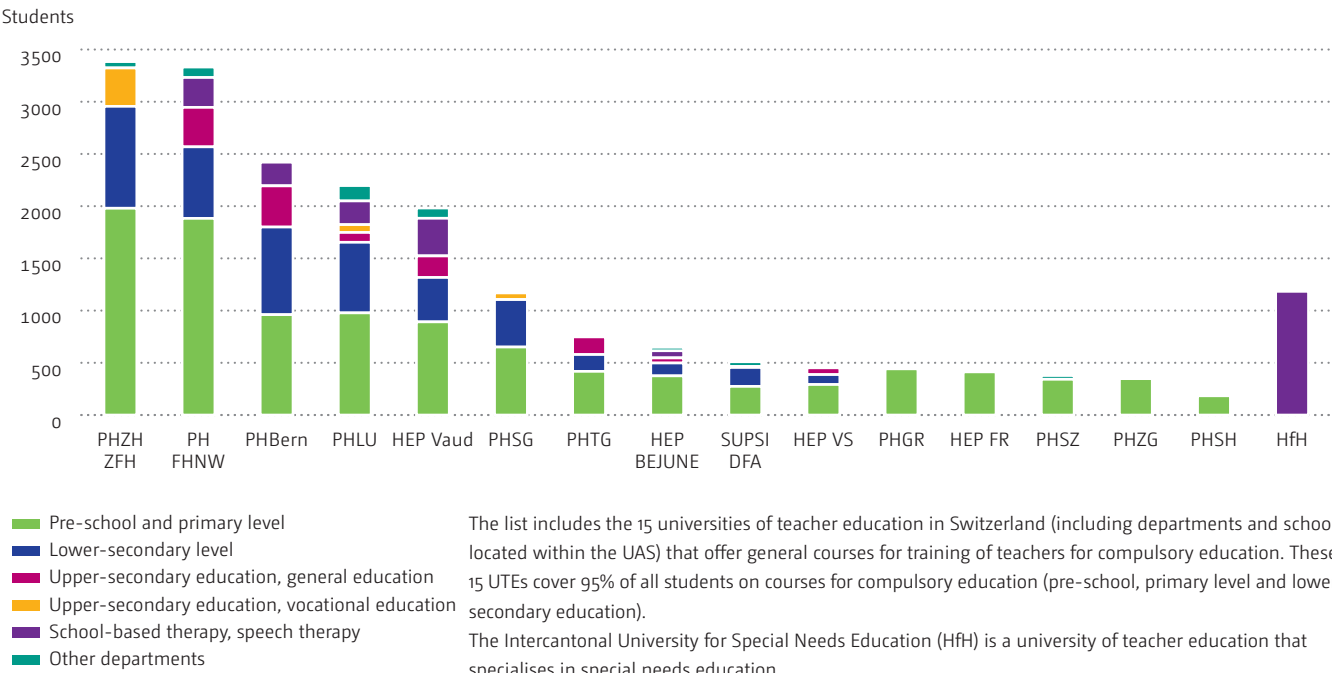
Institutions

In contrast to other areas of tertiary-level professional education (PE), teacher training has never come under the auspices of the Confederation, and has remained an exclusively cantonal matter for both funding and regulation. This institutional characteristic is a distinguishing feature between the UTEs and universities of applied sciences (UAS).

The Swiss Conference of Cantonal Ministers of Education has issued national recognition regulations (*Diplomanerkennungsrecht*) for the various teaching profession qualifications, in order to ensure freedom of entry to the profession throughout the country and international recognition of teaching qualifications despite their cantonal origin. The regulations have established standards in core areas such as the structure of courses, admission requirements and the qualification of lecturers, which must be met to ensure mutual recognition (*EDK, 1999a, 1999b*). The EDK's assessment following its most recent evaluation of the progress made by the recognition regulations is positive. It maintains that the EDK's practice of recognising courses guarantees professional mobility of teachers and the minimum level of quality for teacher training (*EDK, 2016b*). Institutional accreditation of the universities themselves is done by the Swiss Accreditation Council on the basis of the new Higher Education Funding and Coordination Act (HEFCA) at national level and the Higher Education Concordat at cantonal level (→ *chapter Tertiary-level education, page 169*).

274 Students at universities of teacher education, 2016

Data: FSO



The list includes the 15 universities of teacher education in Switzerland (including departments and schools located within the UAS) that offer general courses for training of teachers for compulsory education. These 15 UTEs cover 95% of all students on courses for compulsory education (pre-school, primary level and lower-secondary education).
The Intercantonal University for Special Needs Education (HfH) is a university of teacher education that specialises in special needs education.

The EDK's recognition regulations require all teacher training to be provided at tertiary (university) level but do not prescribe a specific form of institution. While almost 90% of the 21 000 students attending teacher training courses today are at UTEs (→ Figure 274), other institutions also offer teacher education (→ Figure 273).

Neither do the recognition regulations contain detailed specifications for the content of the courses. Each UTE generally builds its course content around the cantonal curricula for the individual school phases. The Rectors' Conference issues national recommendations for certain cross-cutting topics. For example, in 2012 the Conference published its recommendations on integrating education for sustainable development (ESD) into teacher training (*COHEP, 2012*). The latest survey reports mixed success of this initiative. While ESD has now been included in the UTEs' courses, full integration as originally recommended is still very far from being realised. The survey's authors refer to the cantonal implementations of the linguistic region curricula, as a consequence of which the implementation of ESD in teacher training must become more consistent (*Swissuniversities, 2017*). The Rectors' Conference UTE Chamber is currently monitoring the implementation of the ESD recommendations.

Mobility

Despite the intercantonal freedom of movement, the great majority of UTE students attend a course of education at the institution in their home canton. The reasons for this are twofold: first, many students tend to select the nearest university to pursue their studies (*Denzler & Wolter, 2009, 2010*), and second, it is a consequence of the very localised school systems, which may differ greatly from one canton to the next and around which the local UTEs have adapted their offering.

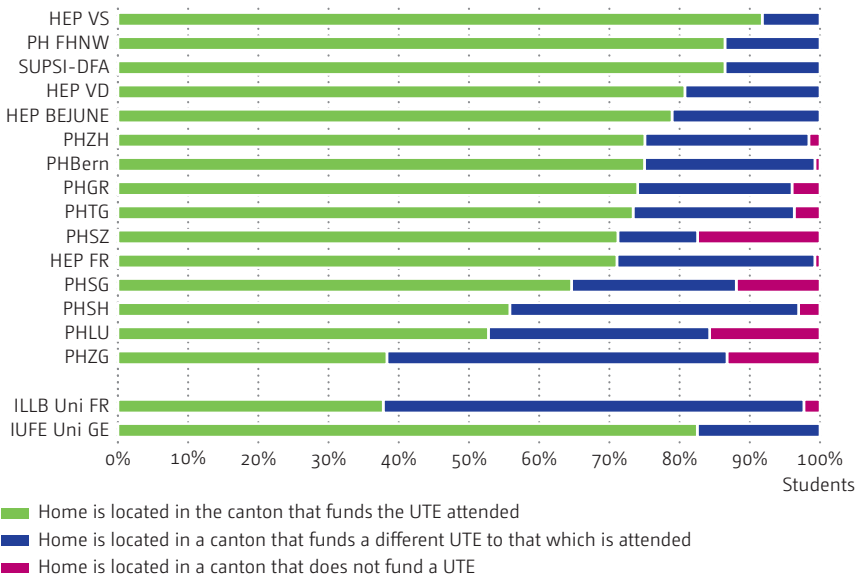
Almost two thirds of all trainee teachers come from the canton that funds their UTE. This means they have applied for admission to university in the canton that funds their training institution, or that at least contributes to funding as part of a larger consortium. A good third complete their training in a different canton, 15% of these people doing so through no choice of their own since their home canton does not have a teacher training institution (→ Figure 275). It generally appears that UTEs with a large catchment area and those located on the periphery (such as in Ticino and Valais) attract the largest proportion of students from the funding region. The canton of Geneva doesn't have a UTE and Fribourg doesn't offer training at a UTE for all teaching qualifications. However, corresponding university-based courses exist to provide an alternative, which is also open to students from other cantons.

When it comes to choosing where to work, teachers are considerably less mobile than members of other professions. A large majority return to their home canton after completing their training. Even very rural cantons, to which around 80% of university graduates do not return, record a proportion of some 50% of newly trained teachers either returning to their home canton or remaining in their canton of origin if this was the same as their place of study (→ Figure 276).

275 Origin of students at UTEs, 2008–2014

Home canton of students before commencing their studies, only courses pertaining to compulsory education levels

Data: FSO (Graduate Survey); calculations: SCCRE

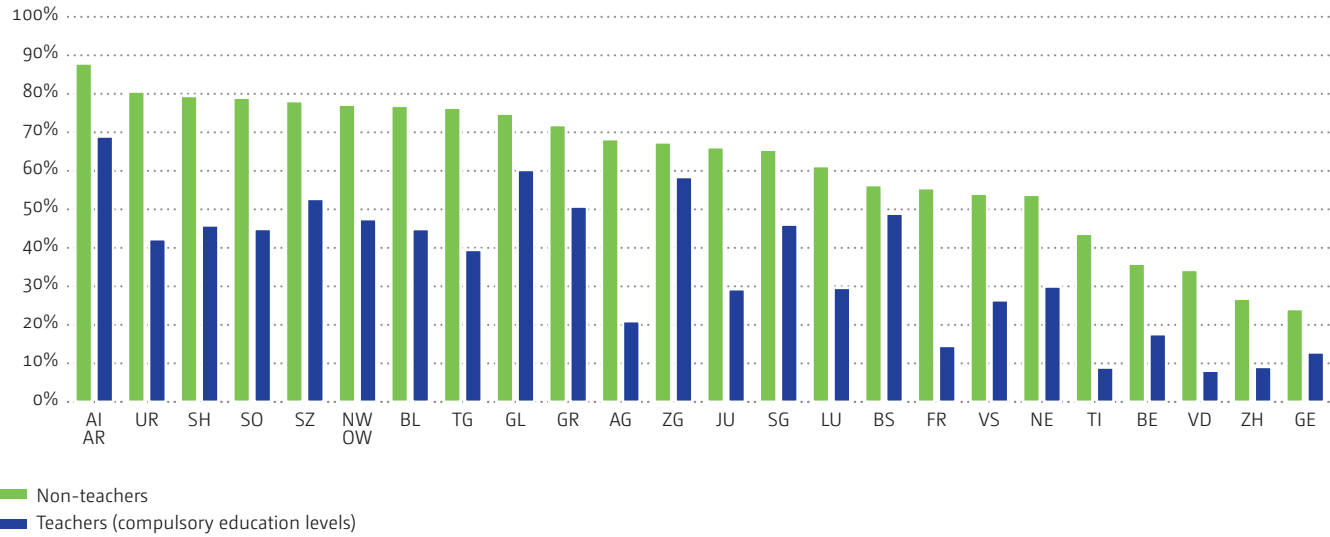


276 Mobility of university graduates, 2008–2014

Place of work is not the same as residence before commencing studies

Data: FSO (Graduate Survey); calculations: SCCRE

University graduates



Nevertheless, no pattern has emerged to indicate that cantons that do not have their own UTE record a smaller proportion of returnees. In general, the migration rates, whether pre or post-completion of studies, appear to have nothing to do with the institutional offering of universities, but rather with factors such as the size of the canton or particular nature of the cantonal school system (→ Figure 277). Another revealing finding is that, in fact, cantons without their own UTE do not ultimately lose more young teachers who fail to return after training in another canton than cantons with a small UTE such as Zug, Schwyz, Graubünden or Schaffhausen. Despite offering their own training courses, the latter group lose around half of their potential

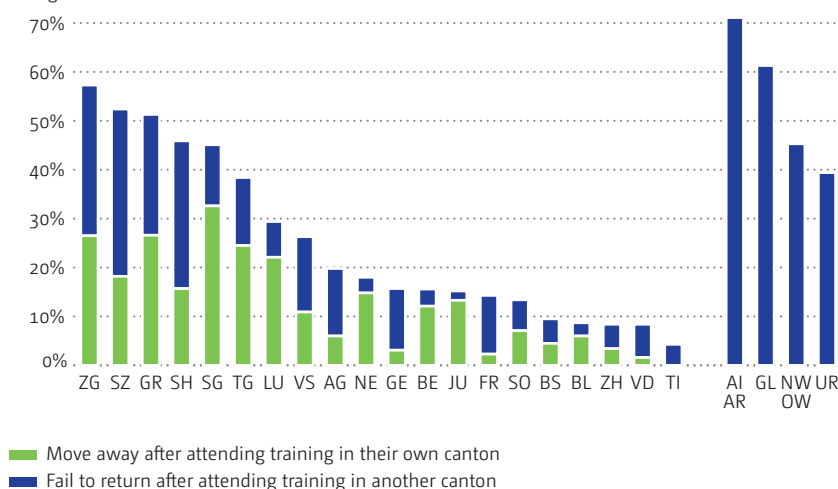
teacher pool, whether this is due to students training in a different canton and not returning afterwards or students being trained within the canton but moving away after completing their studies.

277 UTE graduates who do not teach in their canton of origin, by canton of origin, 2008–2014

Only includes teachers at compulsory education levels

Data: FSO (Graduate Survey); calculations: SCCRE

UTE graduates



For UTEs with intercantonal owner, these cantons are considered as a single region.

Canton of Geneva: incl. IUFE, University of Geneva

Canton of Fribourg: incl. ZELF, University of Fribourg

Training

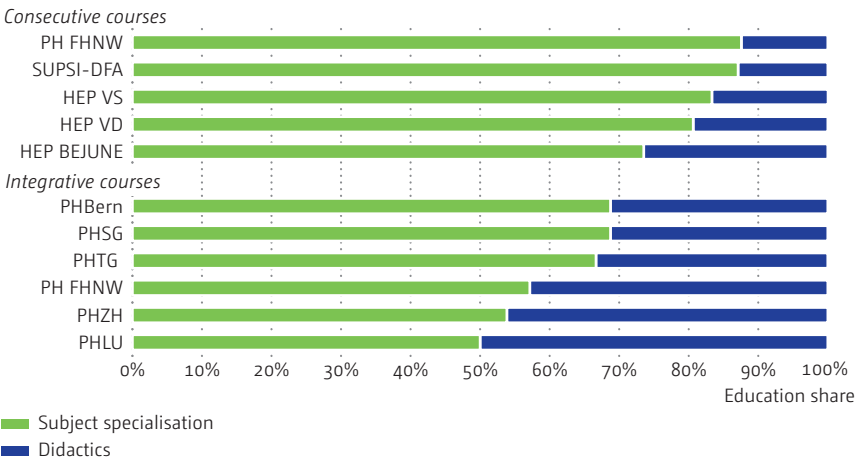
Teacher training courses for lower-secondary education require education in the specific disciplines in which the teachers wish to specialise. In the consecutive model that is widespread in Western Switzerland in particular, the specialist subject education takes place before studies at the UTE, where a Bachelor's qualification from a university is an admission requirement to study at the UTE. In contrast, in the integrative model that applies in German-speaking Switzerland, the subject education takes place primarily at the UTE itself. Academic research (→ *text in margin, right*) shows that subject related didactics (pedagogical content knowledge) as well as subject matter content knowledge are core components of a teacher's professional knowledge and have a strong effect on pupils' learning (Kunter, Baumert, Blum et al., 2011; Baumert, Kunter, Blum et al., 2010; Kunter, Klusmann, Dubberke et al., 2007; Hill, Rowan & Ball, 2005).

Evaluations of a situation analysis of the structure of courses among Swiss UTEs reveal a diverse landscape with major differences in the relationship between subject based education and didactic training. When counting up the proportions of subject based education and didactic training, a similar picture emerges overall for both models, although the importance attached to each varies considerably. In the integrative model, training in didactics receives much more attention compared with subject based education (at a ratio of 2:3) than in the consecutive model (where the ratio is around 1:4). This ratio also applies to the absolute values. However, the boundaries between subject matter content knowledge and a didactics are not always clear, particularly when elements of subject education are delivered in lectures focusing on didactics (→ Figure 278).

While international studies indicate that teachers' **subject-related didactic knowledge** has a stronger impact on pupils' learning and quality of teaching than is the case for subject matter content (content knowledge), content knowledge has a key role in the acquisition of didactic competencies (Baumert, Kunter, Blum et al., 2010; Kleickmann, Richter, Kunter et al., 2013).

278
Subject-based education, lower-secondary education discipline, 2017

Proportions of specialist subject and didactic education, measured in terms of ECTS points
 Data: SCCRE

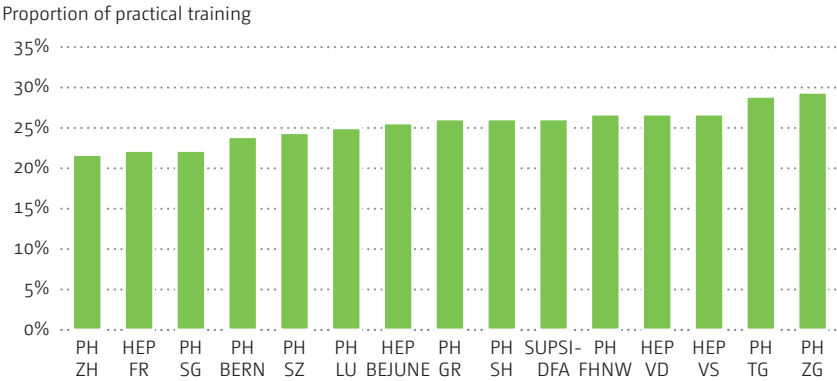


A lack of appropriate research means nothing can be said about the impact of the different structures of training on the teachers’ skill acquisition and subsequent effectiveness in the classroom.

Since their introduction, UTEs have been criticised for reputedly not being close enough to the practice of teaching and attaching too little importance to professional practice in their training. In reality, however, teacher training is characterised by a high proportion of practical work in comparison with other disciplines at tertiary level. Teacher training is not merely a practical education, but also practical training, during which those studying to become teachers come under close supervision of the UTEs’ lecturers and practitioners in the field (*Oser, Biedermann, Brühwiler et al., 2010; Fraefel & Seel, 2017*).

279
Practical training as a proportion of the entire course, primary school level, 2017

ECTS points by area of study: Primary level (minimum number of ECTS points)
 Data: SCCRE



In terms of ECTS points, practical professional training contributes to 25% of trainee primary school teachers’ education on average. This meets the specifications of the EDK recognition regulations that stipulate that between 20–30% of the course for pre-school and primary level teachers should be dedicated to practical training (*EDK, 1999b*). A recent survey of the UTEs has found that the proportion of training offered is within this specified band. The differences between the UTEs indicated in Figure 279 reflect different

emphasis in the course structure. However, some of these differences are simply the result of different attributions of training modules.

Admission requirements and self-selection for the teaching profession

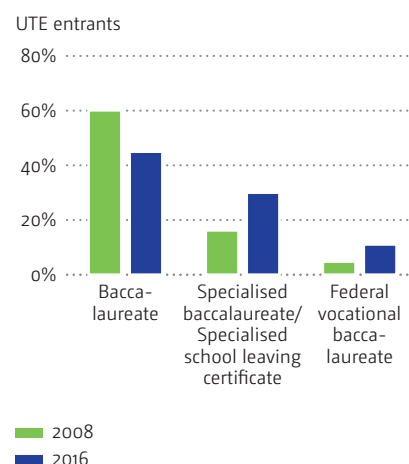
The self-selection of potential students for UTEs is affected by factors including institutional rules on admissions. Opening up access to specific courses for people with an upper-secondary specialised school qualification, federal vocational baccalaureate or specialised baccalaureate has resulted in changes to the composition of the student population on pre-school and primary level courses. Recently, the number of candidates holding an upper-secondary specialised school leaving certificate, specialised baccalaureate or federal vocational baccalaureate has increased at the expense of those with a general baccalaureate (→ Figure 280). The admission of people with a federal vocational baccalaureate or other qualification has the potential to attract a higher proportion of men to study at UTEs (→ Figure 281).

Changes in the composition of the student population may also impact the average competencies of new teachers, although it is not clear how this will be manifested as nothing is known about the individual competencies of the new arrivals. Among students with a baccalaureate arriving at UTEs, however, there is a strong preponderance of people with musical or humanities specialisations at baccalaureate school (→ Figure 283). These subjects are those in which the students at the time of obtaining their baccalaureate display lower skill levels than baccalaureate holders in other specialisations (Eberle, 2016; Eberle, Gehrer, Jaggi *et al.*, 2008).

The composition of the student population by admission criterion varies strongly from one UTE to the next (→ Figure 282). These differences may be

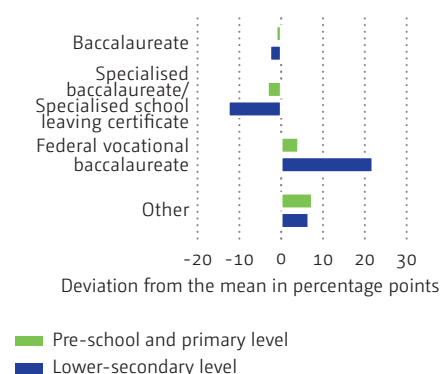
280 UTE entrants to pre-school and primary level courses, by admissions criterion, 2008 and 2016

Data: FSO (SHIS); calculations: SCCRE



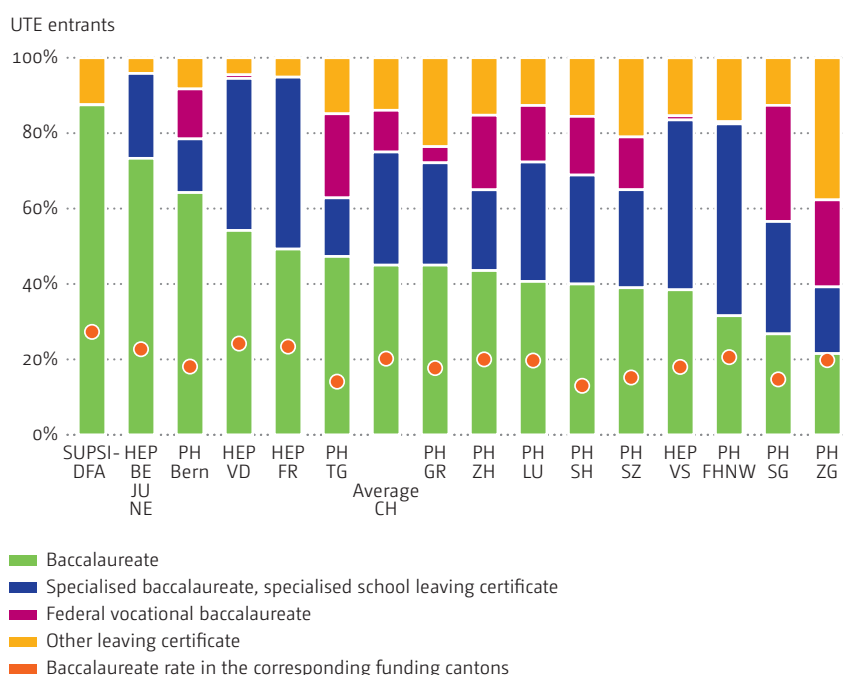
281 Proportion of male UTE entrants (Bachelor's level) by course of study and admissions criterion, 2014–2016

Data: FSO; calculations: SCCRE



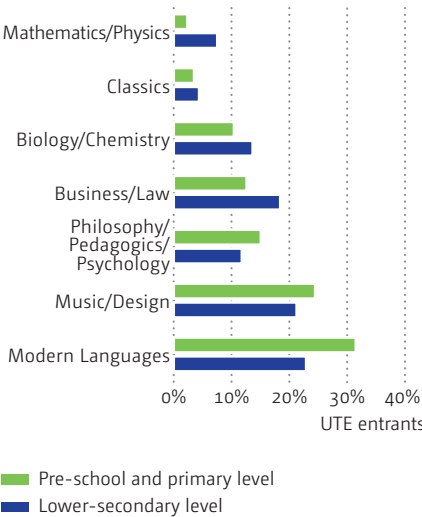
282 UTE entrants to pre-school and primary level courses, by university and admissions criterion, 2016

Data: FSO (SHIS); calculations: SCCRE



283
UTE entrants by course and baccalaureate school subject specialisation, 2014–2016

Entrants at Bachelor's level, persons with baccalaureate
 Data: FSO (SHIS); calculations: SCCRE

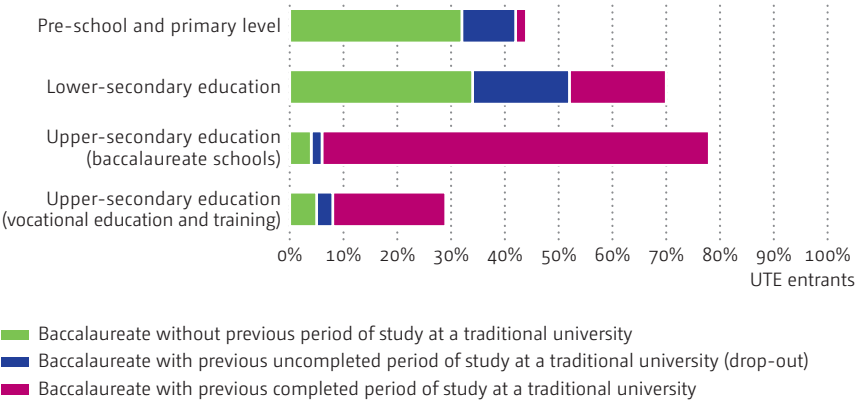


explained by different regional traditions in respect of access to teacher training, but also by different baccalaureate rates at cantonal level. The correlation between the cantonal baccalaureate rate and the proportion of students attending a UTE with a general baccalaureate explains around one third of the variance of these proportions among the individual UTEs.

A previously largely neglected aspect of the qualifications required for admission to a UTE is the fact that a sizeable proportion of new students arrive at the UTE having already interrupted a university course. Longitudinal analysis of university data shows that students with this background primarily undertake the course for lower-secondary education, where they make up around one quarter of new students who have been admitted on the basis of a baccalaureate (→ Figure 284).

284
UTE entrants: Proportion of students with baccalaureate and previous education at a traditional university, 2015

Data: FSO (LABB); calculations: SCCRE



Joining the teaching profession from other fields

Shorter UTE courses have been developed in a number of cantons as part of measures to counter the teacher deficit. The purpose of these has been to attract people from other professions to consider a career in teaching. In its 2012 revision of the recognition regulations, the EDK created a binding framework for the organisation of such training variants and for their recognition across the country. Candidates must be aged 30 or older and already have a number of years' professional experience. Their suitability is generally verified by special assessment procedures; in some cases examinations are also held. The length of the training may be shortened in recognition of skills and competencies that the candidates have acquired through previous formal or informal measures. In addition, some UTEs offer training in parallel to a part-time teaching position. This teaching position, which takes the form of part-time employment at the desired level of the education system, can be taken up after successful completion of 60 ECTS points (EDK Recognition Regulations).

Most UTEs now have provision for career changers (*Bauer, 2017; Puderbach, Stein & Gehrmann, 2016*). There has been no systematic attempt to gather figures, however. The information available indicates that the number of entrants from other professions is subject to relatively high levels of fluctuation. In 2015 and 2016, they amounted to only around 5% of all student entrants, on average.

Initial empirical studies from Switzerland, which nevertheless rely only on self-assessments, provide no indications of any major differences between career changers and regular students (*Bauer, 2017; Bauer, Aksoy, Troesch et al., 2017; Loretz, Schär, Keck Frei et al., 2017; Keller-Schneider, Arslan & Hericks, 2016; Engelage & Diesbergen, 2013*). For policy reasons, some aspects of career changers' professional competencies have had to be prioritised, however, where formal admission criteria have been dropped to accommodate career changers, in particular to attract people from non-academic target groups to the teaching profession. This has been done without empirical evidence in respect of the impact on the technical skills of the new teachers or their effectiveness in the classroom (*Puderbach, Stein & Gehrmann, 2016*).

Effectiveness

It must be possible to measure the effectiveness of teacher education according to how well the universities have inculcated future teachers with the skills and competencies that by extension (in a causal relationship) improve the competencies of the pupils taught by these teachers. In order to assess the relative effectiveness of individual universities in this respect, therefore, it would be necessary to take account of both the different personal, cognitive and motivational endowments on the students and the potential different demands on the young people whom they teach.

Selection into the teaching profession and the associated competencies of teachers also play a role in determining effectiveness in the context of international comparisons. The effectiveness of the national education system depends on the relative average competencies of the population as a whole as well as on the range of competence distribution of the people who are successfully recruited to become teachers within the system (→ *text in margin, right*).

The school pupils who participated in the PISA study in 2006 were asked about their intended profession. This information allows researchers to track how future teachers previously performed on a national scale, at least on the assumption that young people in all countries who wished to be teachers actually more frequently went on to do this job than other pupils.¹ If this assumption holds to be true, the Swiss pupils who expressed a desire to be teachers represent a positive selection of the population as a whole.

Analysis of PIAAC (Programme for the International Assessment of Adult Competencies) data shows that the competencies of teachers vary widely, along national lines in comparison with other university graduates and internationally in comparison with other teachers. For example, teachers in the lowest ranking countries (such as Italy) have comparable competencies as persons who do not have a tertiary education in Canada. In contrast, Finnish and Japanese teachers have higher competencies than persons with a Master's or Doctorate in Canada (*Hanushek, 2011*). When this information is combined with the PISA pupil performance data, differences in international pupil performance can be explained in part by differences in the specialist competencies of the teachers (*Hanushek, 2011; Piopiunik, Hanushek & Wiederhold, 2014*).

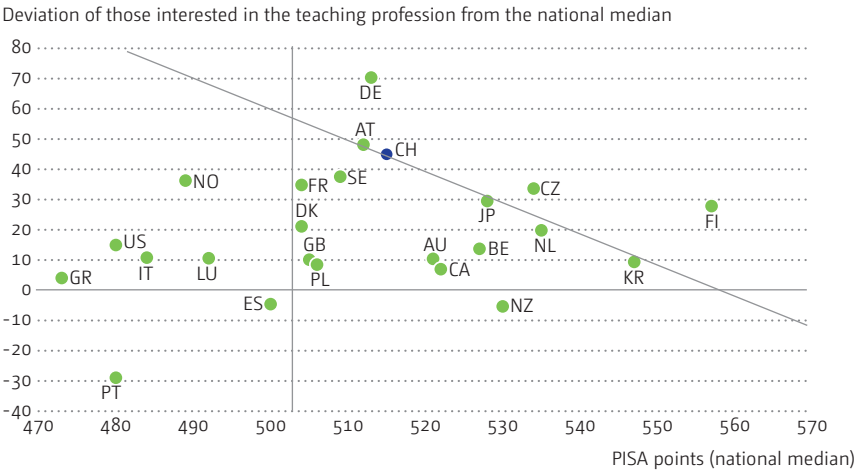
¹ The study by *Piopiunik, Hanushek and Wiederhold (2014)* produced findings that were consistent with the assumption that there were very marked between-country differences in terms of the competencies of people selected for the teaching profession.

Explanations of Figure 285

The median of pupils who are interested in becoming teachers is 45 points higher in Switzerland than the national pupil median. This means that the median of the «future» teachers in Switzerland is 560 PISA points. Young Koreans achieve significantly better results according to PISA on average than their Swiss counterparts; however, as those who wish to become teachers are only slightly above the median, the «future» teachers in Switzerland record equally high numbers of PISA points as «future» teachers in Korea. Finns, on the other hand, not only achieved the best PISA performance overall in 2006, their young people expressing a desire to become teachers were also above the national median, so that people with this intended profession achieved among the highest PISA points. The results of young Germans who wished to become teachers were similarly high, and represented the highest positive deviation from the national median.

285 PISA points of 15-year-olds indicating a wish to become teachers in comparison with the population as a whole, 2006

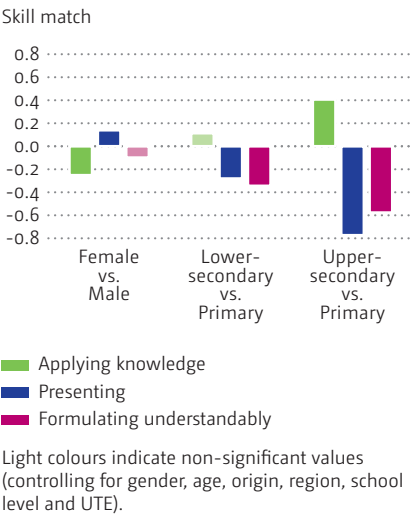
Median values of 15-year-olds who expect to be working as teachers at the age of 30
Data: PISA 2006; overall score (average of reading, mathematics and natural sciences)



With the exception of Portugal, where the findings point to a negative selection for the teaching profession, future teachers in most countries show average or better performance than the average national population. However, the varying selection effects combined with major differences between national median values result in very marked international differences in the average qualifications of a teacher (→ Figure 285).

286 Skill match, 2007–2015

Data: FSO (Graduate Survey); calculations: SCCRE



Acquisition of skills

Swiss studies into the effectiveness of teacher education are limited mainly to surveys of the competencies achieved at the end of the training period or on entry to the profession. The data is generally collected by means of self-assessments by the students, observation of lessons and surveys of pupils, as well as in some cases by performance testing (Affolter, Hollenstein & Brühwiler, 2016; Brühwiler, Ramseier & Steinmann, 2015; Larcher, Smit, 2013; Müller, Baer et al., 2010). Nevertheless, there are practically no findings borne out by empirical evidence in Switzerland by means of which the performance measured at the end of teacher training can also explain increased pupil performance.²

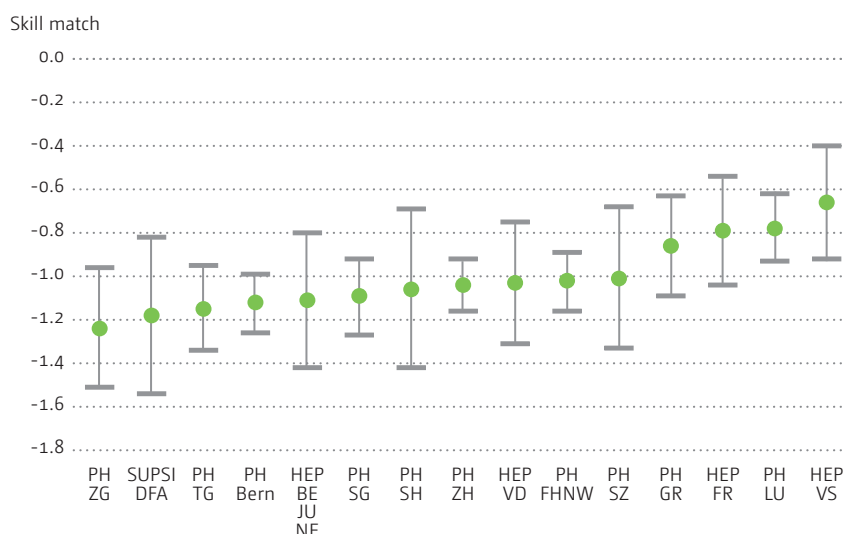
Analysis of graduate data is able to determine the subjective perceived overlap (skill-match) between the competencies acquired during teacher training and those needed by budding professionals.

2 One exception is a study of new teachers from four UTEs from three different countries (N = 73) that was concerned with the links between teacher competencies and pupil performance. The authors substantiate effects of teaching competencies on pupils' achievement and perception of instruction (Smit, Helfenstein & Guldemann, 2013).

287 Skill match «Applying knowledge» by university of teacher education, 2007–2015

Difference between the extent to which the competence «Applying knowledge to new problems» was acquired through study and the extent to which it is required through professional activity.

Data: FSO (Graduate Survey)



As can be seen in Figure 287, the individual UTEs do not differ significantly with regard to the skill-match assessed by the students; the differences between students of the same UTE are bigger. Gender or the teaching level have a stronger effect on the assessment of how well the competences acquired and the competences required match. Thus, for instance, women are less likely than men to apply themselves in the area of «applying knowledge», while at the same time estimating the professional requirements more important. Secondary school teachers, on the other hand, value each other in the areas of «presenting» or «formulate intelligibly» less competently than primary school teachers, which is also connected with the fact that they rate the professional requirements higher (→ Figure 286).

Entry to the profession and retention

The prevailing majority of UTE graduates take up a teaching post within a year of completing their studies. However, a significant proportion of secondary teachers are not able to find a position at the appropriate level of the education system immediately. One fifth of secondary school teachers and a good third of middle school teachers are teaching at a lower level of school (→ Figure 288). People who have a qualification for general upper-secondary education are most frequently employed in other fields outside the teaching profession. The data does not reveal whether those engaged in teaching activity at a different level to their training do so by choice or as a consequence of a lack of available positions. The proportion of lower-secondary school teachers employed at a different level of the education system five years after completing their training falls only slightly, although there is a ten-percentage-point decrease among those who qualified as upper-secondary school teachers.

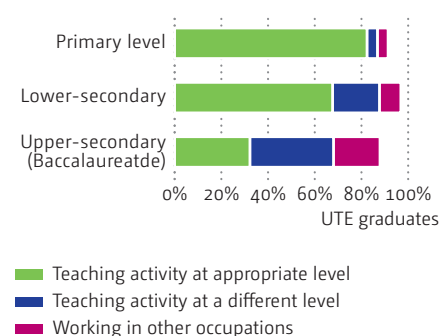
Of course, education policy is not merely concerned with entrants to the profession. It also needs to ensure long-term retention of teachers. Where young teachers quickly exit the profession, quite apart from individual reasons this may be the consequence of the profession's low relative attractiveness as well as inade-

Legend

Figure 287 shows the results (marginal effects and 95% confidence interval) of a linear regression of the skill match in the competence «Applying knowledge to new problems» for the individual UTEs, allowing for age, gender, social origin, course of study and linguistic region. «Zero» means a complete skill match (competencies gained through study = competencies required for professional activity). All universities display negative values. That means this competence – in the eyes of the graduates – is demanded to a greater extent in the world of work than it is acquired through education. The differences among the individual universities are not significant.

288 Employment situation of working UTE graduates one year after qualifying, 2014

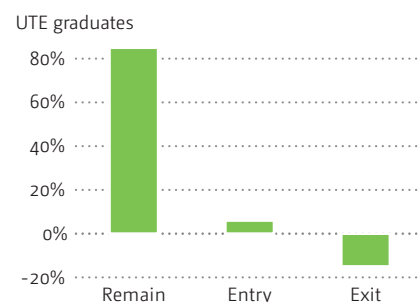
Data: FSO (Graduate Survey); calculations: SCCRE



289 Retention of UTE graduates in the profession, 5 years after qualifying, 2014

Employment of UTE graduates 5 years after qualifying (second survey) in comparison with employment 1 year after qualifying (first survey)

Data: FSO (Graduate Survey); calculations: SCCRE



quate preparation for the profession by the UTE. Nevertheless, the retention rate of teachers in compulsory education is greater than 80% (→ Figure 289).

Efficiency / costs

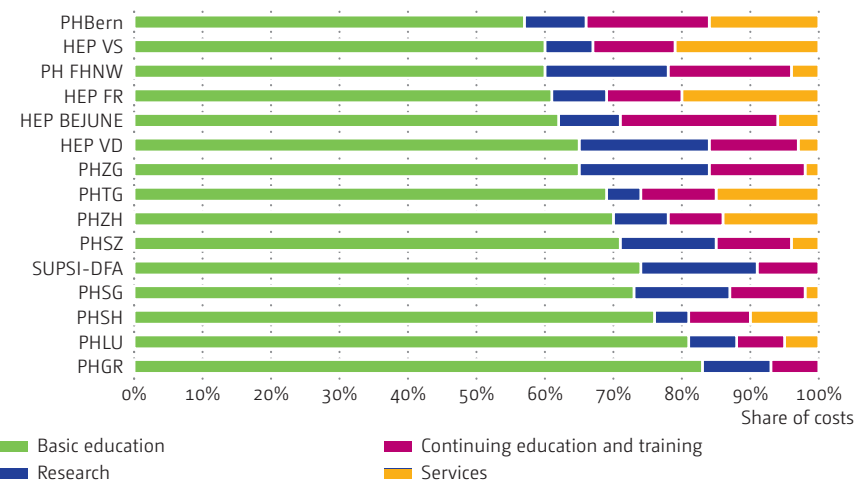
Statements about the efficiency of resources used in UTEs demand comparable data on the various inputs (real and monetary) as well as suitable output measurements. In terms of teacher training, however, there is no general output measurement capable of adequately reflecting the effectiveness of the education. Even at a theoretical level there is no consensus on what such output could be used. Moreover, the gathering of data in respect of effectiveness of teaching is extremely complex. For this reason, the sections below are restricted to a comparison of costs.

Costs

A comparison of staff costs for the various activities by university shows that individual UTEs' investment in different activities varies markedly. Smaller universities tend to invest proportionately more in education and correspondingly smaller shares for research and development or for continuing education and training. There are exceptions to this, however. The UTEs of the cantons of Vaud, Zug and Ticino are relatively strong in research, along with the FHNW university of teacher education (→ Figure 290).

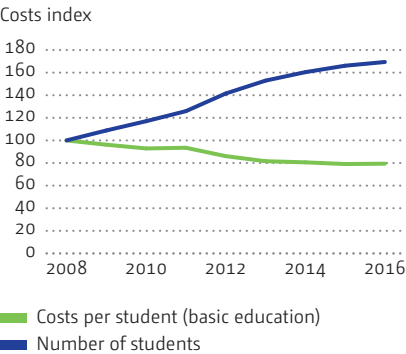
290 Operating costs (only staff costs) by activity type and UTE, 2015

Data: FSO; calculations: SCCRE



291 Development of costs and student numbers, 2008–2016

Educational staff costs per capita; UTE students (excluding CET); indexed (100 = 2008)
Data: FSO; calculations: SCCRE



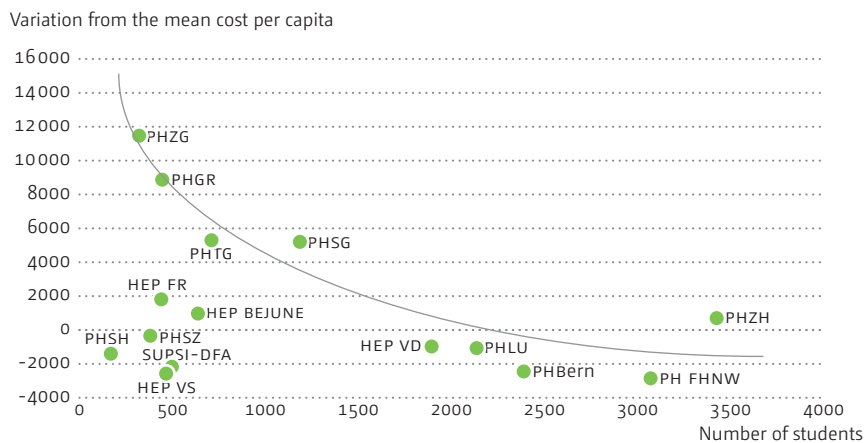
Teaching courses are generally cost-intensive compared with other tertiary education courses, since the students in many instances are under very close supervision. This is accentuated by the relatively small-scale delivery methods, which further contribute to low student-lecturer ratios.

The development of the UTEs in recent years led to an ongoing reduction in the cost per teacher thanks to increasing numbers of students (→

Figure 291). This indicates that efficiency gains could be made from higher student numbers, as long as the increase did not compromise the quality of education. Figure 292 shows that this analysis also applies in part to the size of an individual UTE, on the assumption of uniform education quality at individual universities. Per-capita costs for basic training vary greatly from one university to the next, ranging from CHF 17 000 to CHF 30 000 per year.³ The differences can largely be attributed to different student-lecturer ratios. Additional factors include differing salaries and differences in staffing structures.

292 Education costs per capita (only staff) and students by UTE, 2015

Data: FSO



Legend

The points on the curve in Figure 292 represent universities that report a cost structure as expected for their size. Moving to the right along the curve allows theoretical efficiency gains to be made by increased numbers of students. The comparison shows that a UTE with 1500 students or more no longer reports any difference in costs per capita, while one or two very small universities are able to operate at similar costs as the very large universities.

Equity

Equality of opportunity at the UTEs is discussed in this chapter, in addition to the analysis of the university system as a whole (→ *chapter Tertiary-level education, page 169*), mainly from the perspective of access to training. Disparities between different social groups, genders and Swiss and foreign students are highlighted.

Social background

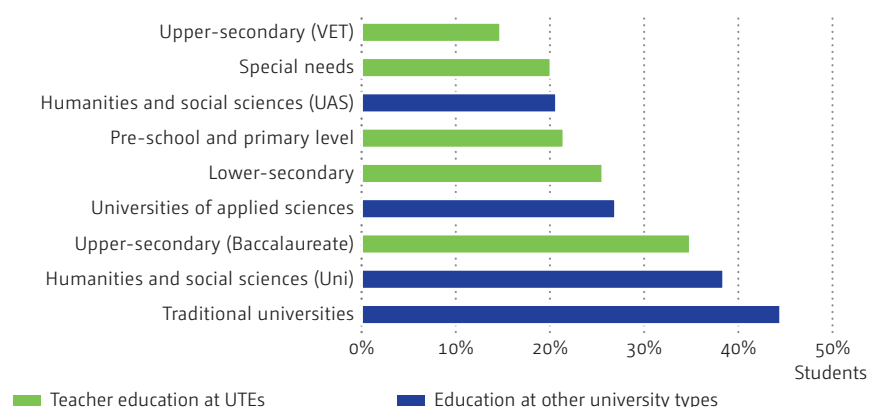
The disparity of social background in access to universities of teacher education is not problematic in the sense that barriers to entry are higher for students from non-academic homes. The disparity is actually expressed more as a marked lack of representation of higher status groups (→ Figure 293). An exception to this is found among prospective middle school teachers. The reason for the exception, however, is that this training requires previous study of a specialisation at university level.

The **socially diverse selection** for teacher training is comprehensively documented in the literature (cf. Kühne, 2006; Denzler & Wolter, 2009; Enzelberger, 2001; Neugebauer, 2013; Rothland, 2011).

³ This comparison must take account of the fact that the standardised costs survey has only recently been introduced to UTEs and there are probably still certain limitations to the comparability of data.

293 Proportion of students from an academic household by course, 2012–2014

Data: FSO (Graduate Survey); calculations: SCCRE



Alternative access pathways and different course orientations allow UAS and UTEs to help improve equality of opportunity when it comes to access to university education in Switzerland. Nevertheless, status-dependent self-selection for the various university types cements the social disparity between traditional universities and the UAS/UTEs. This consequently impacts the status of the university types (Denzler, 2011).

Feminisation of schools

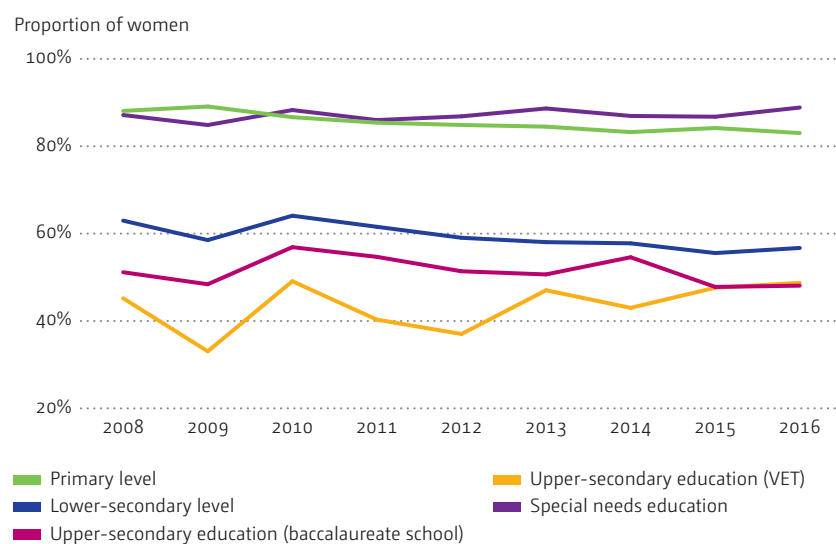
Given the high proportion of women among teachers, the topic of feminisation of schools recurs frequently, with the question of whether female and male teachers teach differently, whether this creates different and unfavourable learning environments for boys, and whether the feminisation of the profession is therefore responsible for the tendency of boys to fare worse in school testing (Stamm, 2008). There is, however, no empirical evidence for these hypotheses; any alleged worse performance by boys cannot be explained as resulting from a disadvantage related to female teaching staff. Neither boys nor girls gain any advantage from being taught by a person of the same gender (Martin & Marsh, 2005; Neugebauer, Helbig & Landmann, 2011; Neugebauer, 2011).

Gender distribution

The high proportion of women among the students at UTEs has remained practically unchanged for many years. It ranges from over 80% on courses at pre-school and primary level, as well as special needs education, and decreases to around 50% as the school levels increase (→ Figure 294). As long as the characteristic «Gender of teacher» does not correlate with other relevant aspects of instruction effectiveness, the over-representation of women in the teaching profession by itself does not demand any action in terms of education policy (→ text in the margin, left).

294 Development of female proportion of UTE entrants by course, 2008–2016

Data: FSO (SHIS); calculations: SCCRE



When courses were created for professionals wishing to change to a career in teaching, one associated hope was that a new target group could be acquired to bring more men into the profession. The first data available for both the 2013 and 2015 qualifying cohorts indicates, however, that the career-change programmes have attracted only small additional numbers of men to teaching (→ Figure 295).

Migration status

Similar to the topic of gender mix in the teacher population, the representation of people with migration backgrounds among teachers is discussed on the assumption that it could be advantageous for pupils with migration backgrounds to be taught by a person with similar cultural experiences. Teachers with a migration background are attributed particular potential in dealing with cultural diversity. They could, it is hoped, act as cultural intermediaries and role models for the integration of pupils with migration backgrounds (Akbaba, Bräu & Zimmer, 2013; Edelmann, 2013; Mantel & Leutwyler, 2013; Rotter, 2012; Strasser & Steber, 2010). Hitherto there has been little in the way of empirical evidence that can support these expectations, however.

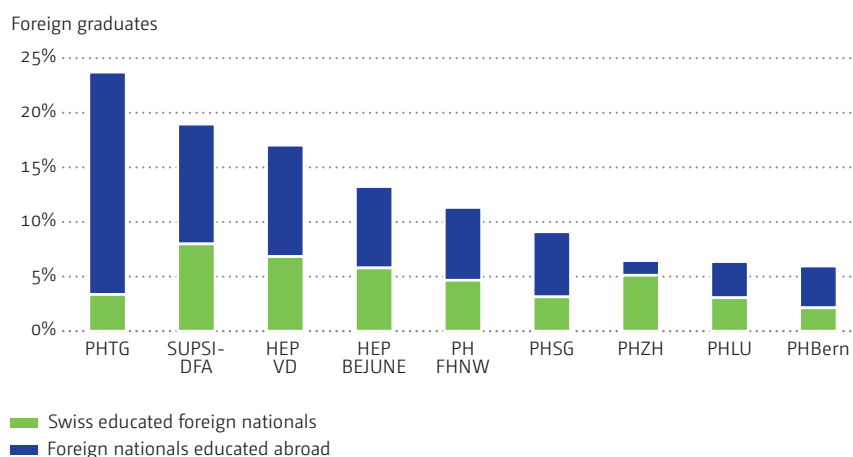
In total, around 13% of graduates from all types of university who have obtained their qualification to study at university in Switzerland (Swiss-educated) hold foreign nationality. There is a slightly higher proportion at universities of applied sciences, but the differences are minor. The major differences between university type exist for people who arrived in Switzerland to study (foreign students). Among these people the traditional universities attract significantly more, while UTEs are the least attractive to them (→ chapter *Tertiary-level education*, page 169).

From the perspective of equity the only problem would arise if it transpired that students with a migration background were prevented from training as teachers as a result of their origin. There are no indications of this in Switzerland, however. An evaluation of graduate data by nationality shows that different groups of foreign nationals are represented among the population of future teachers in roughly the same proportions as within the population as a whole (→ Figure 296).

297 Foreign graduates by UTE, 2007–2015

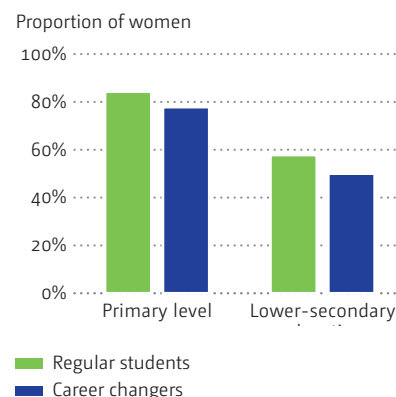
Only larger UTEs with at least 50 foreign students are included.

Data: FSO (Graduate Survey); calculations: SCCRE



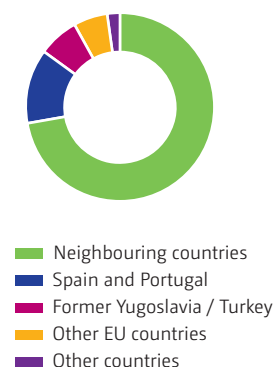
295 Proportion of female career changers by course, 2013, 2015

Data: FSO (Graduate Survey); calculations: SCCRE

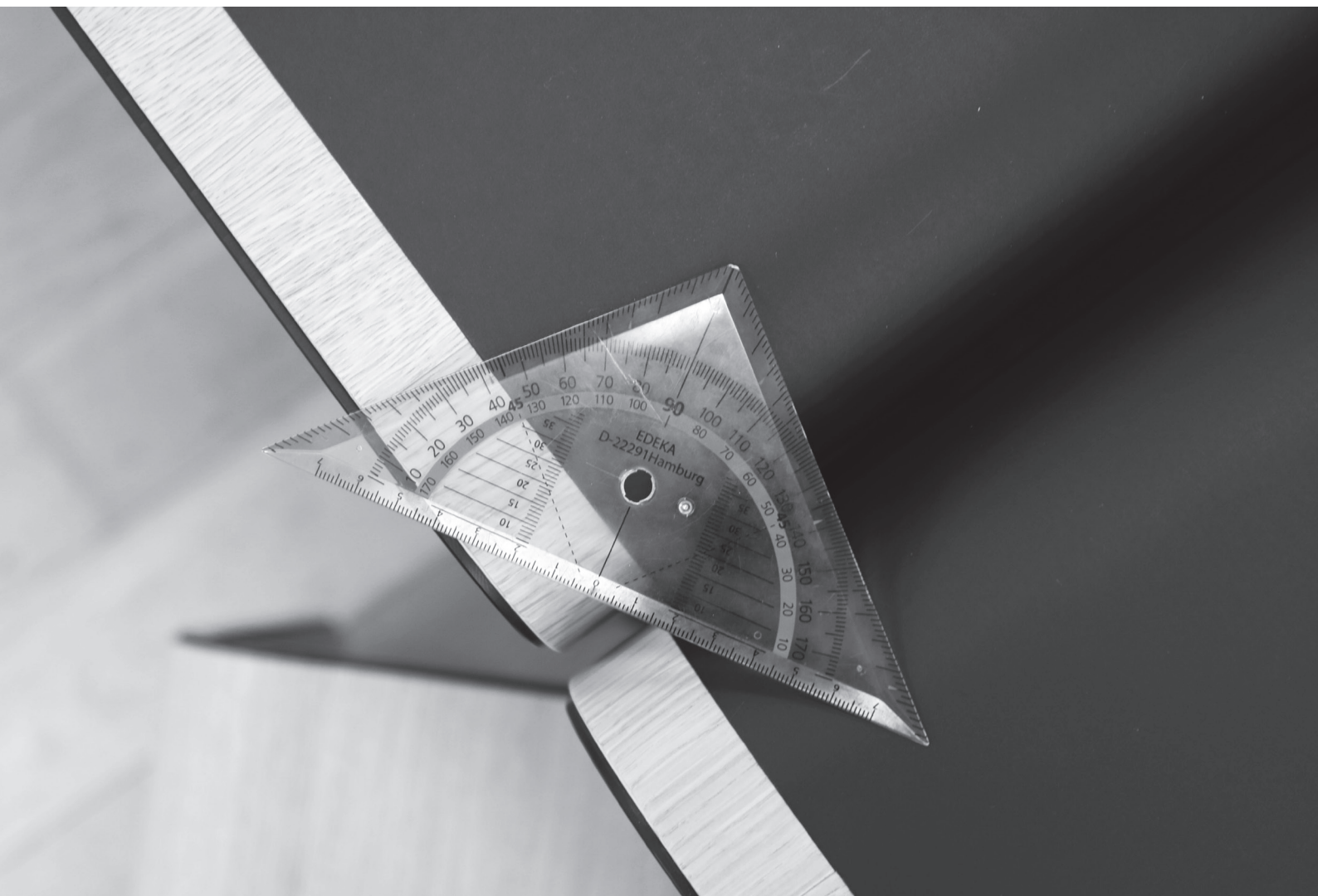


296 Foreign UTE graduates (compulsory education) by nationality, 2007–2015

Data: FSO (Graduate Survey); calculations: SCCRE



Differences between the universities in respect of the proportion of foreign students (→ Figure 297) point to a different catchment area, different patterns of selection for the courses and different profiles and offerings that foreign students find attractive. Locations close to national borders such as Kreuzlingen (PH Thurgau), Delémont (PH BEJUNE) and Basel (FHNW) are attractive to foreign students. The largest proportion of foreign-educated students can be found in courses for upper-secondary education (middle school). The consecutive nature of these courses (UTE study following study of a specialist subject at a traditional university) makes them the most compatible with foreign education systems. There are also special forms of cooperation, such as the course for upper-secondary education at PH Thurgau, which is offered in conjunction with the University of Konstanz and is also recognised in the German state of Baden-Württemberg (*Pädagogische Hochschule Thurgau*, 2013).



Professional education

Context

Professional education (PE), alongside the cantonal universities, the Federal Institutes of Technology, the universities of applied sciences and the universities of teacher education, is enshrined in Swiss law as tertiary-level education. In this way, the diversity found in general education and vocational education forms is also maintained at tertiary level. Professional education is also highly significant from a quantitative perspective, accounting for around 44%¹ per year (2016) of all tertiary first qualifications (up to and including Bachelor's level at universities, universities of applied sciences and universities of teacher education).

The Swiss Federal Council approved a package of measures designed to strengthen professional education in 2014. These include the classification of the qualifications in the National Qualifications Framework for Vocational Training (NQF Vocational Education), the generally improved positioning of professional education – both nationally compared to other tertiary qualifications and by international comparison – and improved accessibility. Furthermore, measures have been adopted to reduce the financial burden on those sitting federal examinations (→ *Costs and funding*, page 273), and arrangements put in place to move away from a model of funding school and examination providers to funding examination candidates in specific subjects.

Changes in education statistics

In contrast to the previous approach in which professional education was classified as (non-university) tertiary-level B education (ISCED 5B), under UNESCO's new ISCED 2011 classification professional qualifications are no longer listed separately from the other tertiary qualifications. Instead they are now classified at all of the new available levels from 5 to 8, which cover short courses at tertiary level and university degrees from Bachelor's to Master's and doctorate. This takes account of the diversity of professional qualification in the education statistics, and provides for equivalence with other academic qualifications. In Swiss education statistics, all professional qualifications that are not regulated by the Confederation, of which there are ever fewer in existence, are classified at level 5. Federal Diplomas and qualifications offered by PE colleges are classified at level 6 (Bachelor or equivalent), while the Advanced Federal Diplomas of Higher Education are classified at level 7 (Master or equivalent). A similar picture is found in the classification of the first qualifications in the NQF Vocational Education (→ Figure 298). A corresponding ordinance on qualifications in vocational education entered into force on 1 October 2014. The NQF Vocational Education also has eight levels, at which all of the qualifications defined as formal edu-

¹ The number of qualifications may result, however, in an overestimate of the quantitative importance of professional education. This is because many people undertake several qualifications at this level over the course of their career. In addition, some people with other tertiary qualifications also obtain PE qualifications. Leaving aside those people who have obtained a PE qualification alongside university education, the proportion of the Swiss population for whom this represents their highest level of qualification is slightly higher than 14%.

cation by the Federal Vocational and Professional Education and Training Act are classified according to their requirements. The primary purpose of the NQF Vocational Education is to allow Swiss qualifications to be compared to qualifications of other countries using the European Union's European Qualifications Framework. In contrast to the ISCED classification, the NQF Vocational Education also differentiates among Federal and Advanced Federal Diplomas of Higher Education.

298 Classifications of vocational qualifications in the NQF Vocational Education (last updated 1 January 2018) by qualification type and level

Legend: VETC = Two-year vocational education and training certificate; VETD = Three or four-year vocational education and training diploma; FDHE = Federal Diploma of Higher Education; PEC = PE college; aFDHE = Advanced Federal Diploma of Higher Education; Number of final examinations passed at each level

Data: SERI

| Level | VETC | VETD | FDHE | PEC | aFDHE | Level |
|-------|------|------|------|-----|-------|-------|
| 8 | | | | | 1 | 8 |
| 7 | | | | | 15 | 7 |
| 6 | | | 7 | 24 | 46 | 6 |
| 5 | | 3 | 103 | | | 5 |
| 4 | | 98 | | | | 4 |
| 3 | 37 | | | | | 3 |
| 2 | | | | | | 2 |
| 1 | | | | | | 1 |

Titles in English

Statistical classifications only tell part of the story when it comes to a high degree of transparency for educational qualifications and fulfilling the prerequisites for establishing equivalence with other qualifications. It is equally important that the names of the qualifications can be understood in an international context. In Switzerland this entails a need to develop names of PE qualifications that could be understood in English, so that people with these qualifications can maximise their mobility on the labour market (Walker, Bachmann & Büchler, 2013). As part of the PE strategic project, the State Secretariat for Education, Research and Innovation (SERI) and its partners in PE carried out a broad-based process to develop meaningful English titles. The English-language names for the qualifications in PE were adopted in November 2015. The basis for the adoption of these titles is Article 38 para. 1 of the Vocational and Professional Education and Training Ordinance (VPETO).

After proposals made in the Federal parliament to use the common university designations Bachelor's and Master's in the titles were rejected, it was decided to avoid using these designations in the English translations (→ *text in the right-hand margin*). The English titles refer instead to the vocational character of the training and to the standardised nature of the vocational skills, in terms of both the requirements and the assessment. This is in contrast to the individual university-defined competencies examined in the case of other qualifications. PE qualifications are identified in English using the expression «higher education».

English translations of PE qualifications

The English names of all of the qualifications can be prefixed by the words «certified», «registered» or «licensed» in order to ensure protection of title. In such instances, the qualifications arising from federal PE examinations are known as «Federal Diploma of Higher Education» and qualifications from PE colleges and advanced federal PE examinations are known as «Advanced Federal Diploma of Higher Education» (see www.sbf.admin.ch). For example, successful completion of professional training and examination as a master dental technician permits use of the English title «Master Dental Technician, Advanced Federal Diploma of Higher Education» while a podiatrist who has qualified from a PE college holds the title «Registered Podiatrist, Advanced Federal Diploma of Higher Education».

From a ratio of 5:1 to 1.5:1

Within less than fifteen years, the number of PE qualifications has fallen from being five times the number of diplomas and Bachelor's awarded by universities of applied sciences (UAS) and universities of teacher education (UTE) (→ Figure 300) to being one and a half times as high. This decrease is solely attributable to the rise in qualifications awarded by the UAS and UTE; the number of PE qualifications awarded has remained constant. Therefore, there has not been a shift in qualifications away from PE to universities. Rather, it appears that PE has not been able to benefit from the boom in higher education to the same extent as the universities.

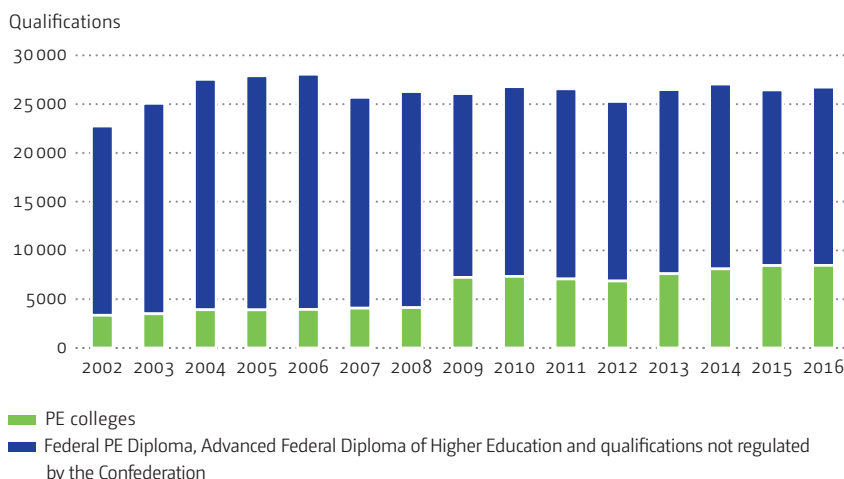
Professional education struggles to compete with other qualifications

Despite PE's continuing quantitative importance for the Swiss tertiary education sector, it is losing relevance against a backdrop of generally increasing levels of higher education among the Swiss population. The number of people qualifying from PE colleges and passing Federal and Advanced Federal Diploma of Higher Education has been more or less stagnating for around 15 years (→ Figure 299). This trend is in part an expression of the increasing competition from first qualifications at universities of applied sciences. In addition, it is exacerbated by the ever greater number of young people with a federal vocational baccalaureate (→ *chapter Vocational education and training, page 111*) and the ensuing higher number of candidates who can seek direct entry to a university of applied sciences.

299 Development of the number of PE qualifications awarded, 2002–2016

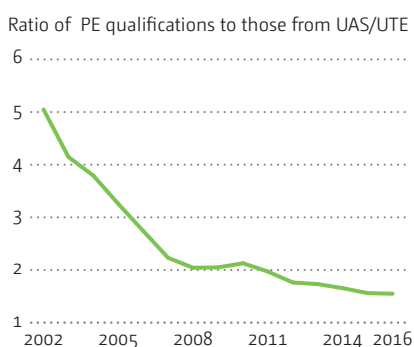
In 2009, a large number of qualifications that had previously not been regulated by the Confederation were converted into PE college qualifications.

Data: Federal Statistical Office (FSO)



300 Ratio of qualifications awarded by PE to qualifications (diplomas and Bachelor's) awarded by universities of applied sciences and universities of teacher education (2002–2016)

Data: FSO



Another matter for consideration alongside the competition from tertiary-level first qualifications awarded by universities is the fact that courses resulting in the award of Federal and especially Advanced Federal Diplomas of Higher Education tend to constitute continuing education and training measures. Vocational continuing education and training faces competition not only from first qualifications but also from a growing range of continuing education and training courses (MAS, DAS, CAS) offered by universities. It is difficult to make generalisations about the strength and extent of the competition for consumers of education in the same segment, or whether the different forces affecting trends among qualifications simply reflect different developments in the areas of education covered by PE and the universities. These effects can largely only be assessed on a case-by-case basis, if at all.

The objective of PE is to «enable the transfer and acquisition of competencies needed to carry out the complex tasks and decision-making associated with a given profession» (Article 26 para. 1 VPETA). Federal and Advanced Federal Diplomas of Higher Education confirm the ability of the candidates to carry out (technical or managerial) activities at a level that is more demanding than that required to successfully conclude vocational education

and training to the level of the Federal VET diploma. The Advanced Federal Diploma of Higher Education assesses the candidates' ability to manage an SME independently or to act as an expert in their specialist field.

301 Overview of Switzerland's PE sector

Data: SCCRE

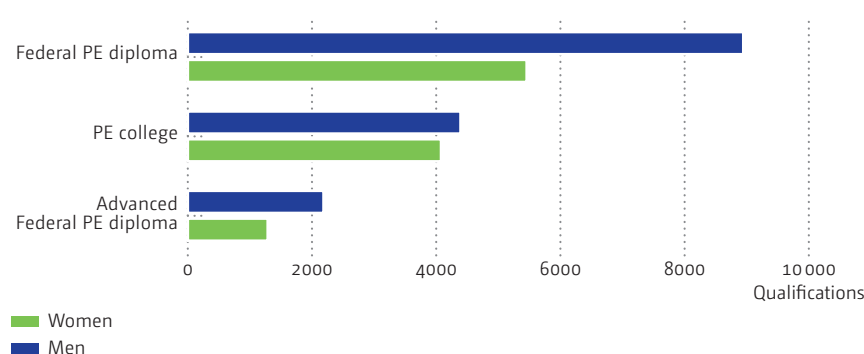
| | Admission requirements | Duration | Provider | Full/part-time | Qualification |
|--|--|--|--|------------------------|---|
| PE colleges | Upper-secondary qualification and work experience in some cases | 2–3 years | Private and public schools | Full-time or part-time | Professional college degree, Example: Professional College Degree in Nursing |
| Federal Diploma of Higher Education | Upper-secondary qualification and a certain number of years' work experience in the relevant field | Unspecified since attendance of preparatory courses is voluntary | Trade associations; voluntary attendance of preparatory courses offered by education institutions and professional organisations as well as public and private schools | Part-time | Example: Federal Diploma of Higher Education in Construction Site Management |
| Advanced Federal Diploma of Higher Education (also Master examination) | Federal PE diploma qualification and a certain number of years' work experience in relevant field | Unspecified since attendance of preparatory courses is voluntary | Trade associations; voluntary attendance of preparatory courses offered by education institutions and professional organisations as well as public and private schools | Part-time | Example: Advanced Federal Diploma of Higher Education in Cabinetmaking, Advanced Federal Diploma of Higher Education in Finance |

Some two thirds of all PE qualifications awarded each year are granted at the level of the federal and the advanced federal diploma of higher education; the remaining third are awarded by PE colleges.

302 PE qualifications by education type, and gender, 2016

Excluding post-diplomas and qualifications not regulated by the Confederation

Data: FSO



In 2016 there were still slightly in excess of 400 qualifications (including post-diplomas) in PE courses not regulated by the Confederation. 3849 diplomas were awarded in unregulated courses in 2011.

Professional education colleges

The Ordinance of the Federal Department of Economic Affairs, Education and Research on the Minimum Requirements for Recognition of PE College Degree Programmes and Continuing Education and Training Courses was fully

Lack of presence in Western Switzerland

The lower number of students in vocational education in Western Switzerland and Ticino may be one reason for the lower number of students attending courses at PE colleges in the region, but it is not the only one. In 2016, just under 18% of diplomas were awarded by PE colleges in Western Switzerland and Ticino, even though five years previously the proportion of students in vocational education and training, as a potential pool of future students, had been almost 27%. The other part of the explanation lies in the extent of differentiation with other forms of education, especially universities of applied sciences, which varies according to (linguistic) regional lines. In some training pathways, the blurring of the lines between courses offered by PE colleges and those offered by universities of applied science is very evident. For example, care professions in Western Switzerland are generally supported by courses at universities of applied sciences, while in German-speaking Switzerland most of the teaching in this field is done at a PE college. As a result, the PE college qualifications awarded for nursing in Western Switzerland only make up 1.3% of the total number of these qualifications.

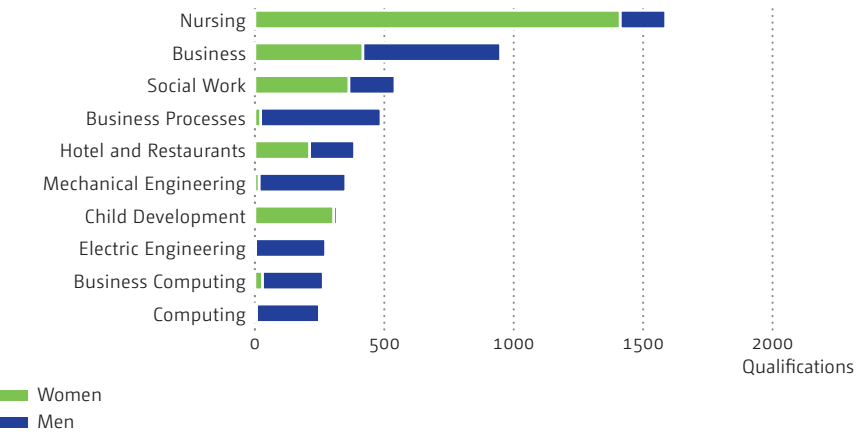
revised with effect from 1 November 2017. Pursuant to the new Ordinance, the education and training offered should be more attuned to the needs of the labour market and should have a stronger profile. Moreover, the revision is intended to improve quality assurance and simplify administrative procedures.

An upper-secondary education qualification aside (VET diploma gained after a three or four-year apprenticeship, completion of three years at upper-secondary specialised school, baccalaureate), candidates wishing to enrol in a degree programme or continuing education and training course at a PE college may be required to demonstrate a certain amount of professional experience and undergo an aptitude test, the precise contents of which are set by the PE providers. The admission requirements vary for the different degree programmes.

The PE college degree programmes are based on national core curricula developed and issued by the PE colleges themselves in cooperation with professional organisations; the State Secretariat for Education, Research and Innovation (SERI) approves these core curricula at the request of the Federal Commission for PE colleges (see also *Feller-Länzlinger, Hanimann, Schwenkel et al., 2016*). The SERI has proposed a transition phase for the current national core curricula in view of the complete revision of the Ordinance. All national core curricula that were developed on the basis of the 2005 version of the minimum requirements for PE colleges must be reapproved within no more than five years.

Almost 64% of the qualifications obtained in 2016 were in the ten most frequently studied diplomas (→ Figure 303). Apart from a few areas of education and training, the disciplines studied are split strongly along gender lines.

303 Ten most frequently obtained PE college qualifications by subject and gender, 2016
Data: FSO; Diplomas in which fewer than 20 awards were made are not shown.



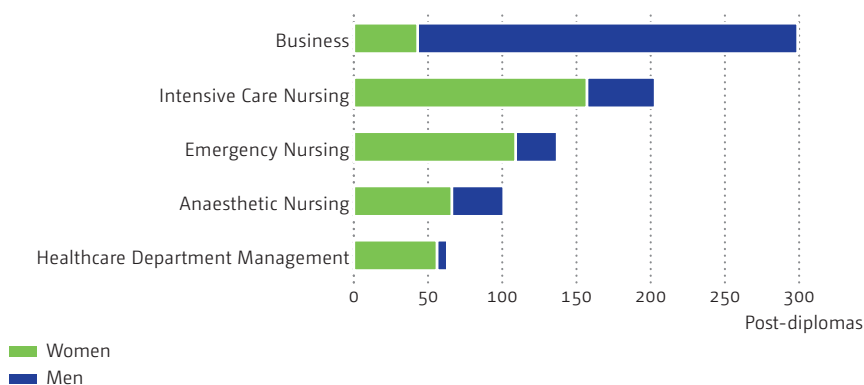
A regional analysis of PE colleges shows a very strong focus on specific cantons and German-speaking Switzerland. In 2016, nearly 59% of all qualifications awarded were obtained by students from the five cantons with the most qualifications at PE colleges (excluding post-diplomas): the cantons of Zurich, Bern, Aargau, St. Gallen and Lucerne.

PE colleges also award post-diplomas that are also regulated by the Confederation and provide candidates with a route to specialist professions in their chosen sector, such as emergency or intensive care. Post-diplomas are particularly widespread in the area of healthcare, with specialisations very common in business management (→ Figure 304). After qualifying, the successful students hold the same title as those with a PE diploma, but with the

additional letters NDS (*Nachdiplomstudium* – post-diploma study). Of the slightly fewer than 1400 post-diplomas awarded in 2016, 59% were obtained by students in one of the five most popular courses.

304 Five post-diplomas most frequently obtained from PE colleges by gender, 2016

Data: FSO; excluding qualifications governed by old regulations.



Federal and Advanced Federal Diplomas of Higher Education

The advanced federal diploma of higher education examination (also referred to as the *Meisterprüfung* in commercial and industrial contexts) was governed as early as 1933 by the first Federal Vocational and Professional Education and Training Act. The federal diploma of higher education was then included in this same Act when it was revised in 1963.

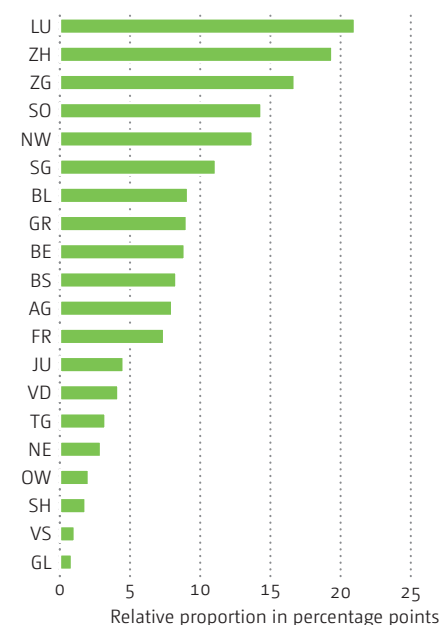
Contrary to the case for the PE colleges, where the whole course is recognised by the Confederation, the recognition of the federal and advanced federal diploma of higher education relates solely to the implementation and content of the examination. The initiative to create a new federal or advanced federal diploma of higher education always comes from a professional organisation. This organisation determines the content while the Confederation assumes responsibility for supervising the examinations and for approving the examination regulations. The SERI authorises only one federal diploma and one advanced federal diploma of higher education for a particular specialisation within a given sector. The advanced federal diploma of higher education generally differs from the federal PE diploma through its more demanding requirements. This is the reason why the majority of people who take a federal diploma examination have a VET qualification as their highest educational qualification, while those taking advanced federal diploma of higher education generally already have a professional education qualification (such as a federal PE diploma) or a different tertiary qualification.

The individual professional associations organise the annual or biannual examinations. There are no regulations governing the preparations for the examinations; the candidates are free to choose how they prepare themselves. They can study by themselves or attend one of the courses offered by the associations in privately-run or public colleges. No new data on the spread of preparatory courses across the whole of Switzerland have been collected

305 Apprentices in PE (federal and advanced federal diploma of higher education), 2015/16, relative to apprentices in VET (2010/11), by canton (location of college)

The figures for number of students are incomplete as preparations for federal diploma of higher education are not formally regulated. These frequently take the form of modular training courses that are only captured if the individual module lasts for at least one semester (full time). Cantons that have no college or apprentices in PE are excluded.

Data: FSO



Sustainable development

Recent years have witnessed the creation of new job profiles in PE that make a particular contribution to resource conservation and energy efficiency. These include the processing of secondary raw materials (Raw materials processor, Federal Diploma of Higher Education), environmental technologies (Energy and Environment Technologist, Advanced Federal Diploma of Higher Education) and renewables (Solar installation project manager, Federal Diploma of Higher Education; Energy and Efficiency Advisor, Advanced Federal Diploma of Higher Education). This gives professionals in the construction industry and the energy and technology sectors the opportunity to obtain advanced qualifications in sustainable use of energy and resources.

since 2011. According to the most recent statistics, between 80 and 90% of candidates for the federal diploma attended a preparatory course (*Neukomm, Rageth & Bösch, 2011*), generally while still working. Around 90% of candidates for the federal and the advanced federal diploma of higher education were in 0.9 or more full time equivalent (FTE) posts prior to the exam (*ibid.*).

Federal and advanced federal diplomas of higher education show even greater regional differences than PE colleges. This uneven distribution does not reflect the different spread of VET, and is instead the result of a heavy concentration of providers (colleges and associations) in specific cantons (→ Figure 305). The chart therefore does not show the different levels of participation in professional education by the population living in the canton, but rather indicates the concentration of providers in a handful of cantons.

Despite the large number of possible qualifications that can be obtained through the federal diploma of higher education (247 in July 2017), most diplomas are obtained in just a small number of fields. Hence, of the 14 402 diplomas obtained in 2016, 39% were awarded in the top ten fields (→ Figure 306). Many of the qualifications are not examined annually; in 2016, for example, there were no diplomas awarded at all in more than 50 fields. Fewer than ten awards were made in almost 50 further federal diploma of higher education examinations.

306 Ten most frequently made awards for federal PE diploma examinations by gender, 2016

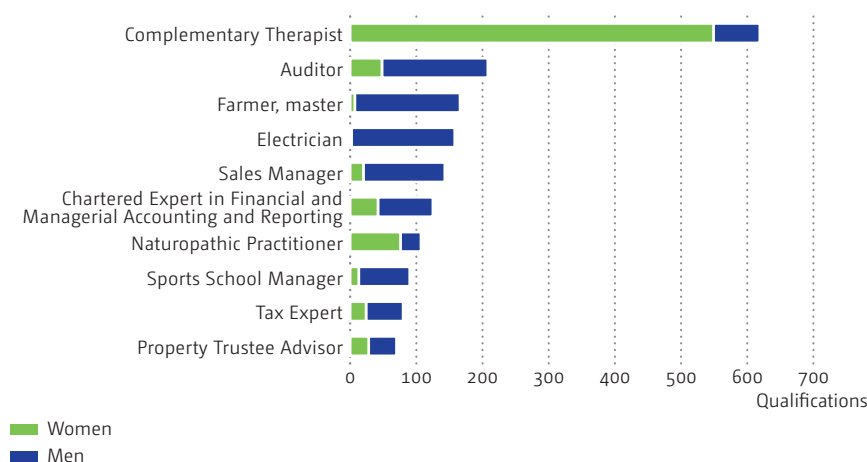
Data: FSO



The concentration is even more dramatic for advanced federal diplomas of higher education. The ten most frequently awarded (→ Figure 307) account for almost 51% of all diplomas obtained. As in previous years, new diplomas always race quickly to the top of the rankings. This is because they frequently attract a large number of candidates in professions in which there were previously no qualifications available. These candidates either wish to benefit from the creation of a new vocational examination, or are required implicitly or explicitly to obtain the diploma in order to practise their profession. For example, the advanced federal diploma with complementary therapy was first awarded in 2015. However, it requires a minimum of two years' professional experience prior to sitting the examination. Given some of these awards include post-diplomas, the number of qualifications awarded will probably drop off quickly again over the next few years.

307 Ten most frequently made awards for advanced federal diplomas of higher education by gender, 2016

Data: FSO; Diplomas in which < 20 awards were made are not shown.



Costs and funding

Calculating the overall cost of PE is not possible without surveying the consumers of training, since most of the costs associated with the federal and advanced federal diploma of higher education are borne by the candidates themselves or their employers. The most recent survey of these costs was conducted in 2010 (*Neukomm, Rageth & Bösch, 2011*). The costs incurred by the taxpayer must be differentiated according to those allocated to the funding of PE colleges and those for federal and advanced federal diplomas of higher education. Somewhat more than 70% of a total CHF 460 million (2015) was spent on PE colleges, with the rest dedicated to vocational continuing education and training and preparation for federal examinations (→ Figure 308).

Implementation of intercantonal agreement on PE college funding

Around 80% of the costs of PE colleges are covered by the public purse (according to an older survey). In 2015, the public contribution was CHF 325 million, which means that providers incurred costs of around CHF 410 million.

The very uneven geographical distribution of the 200 or so PE colleges in Switzerland means that a large number of students do not study in the canton in which they live. This could mean that students attending courses outside their cantons of residence face higher tuition fees. Since the 2015/16 academic year, the «Intercantonal Agreement on Contributions to Educational Courses at PE colleges» (HFSV), which all cantons have signed, has guaranteed equal access to all students on all PE college courses eligible for funding, at equal fees. It will not be possible to investigate the impact of the agreement on students' mobility until later, since up to the end of 2018 the cantons will still be entitled to demand that attendance at a PE college outside the canton be approved (for example, if the same course is offered within the home canton).

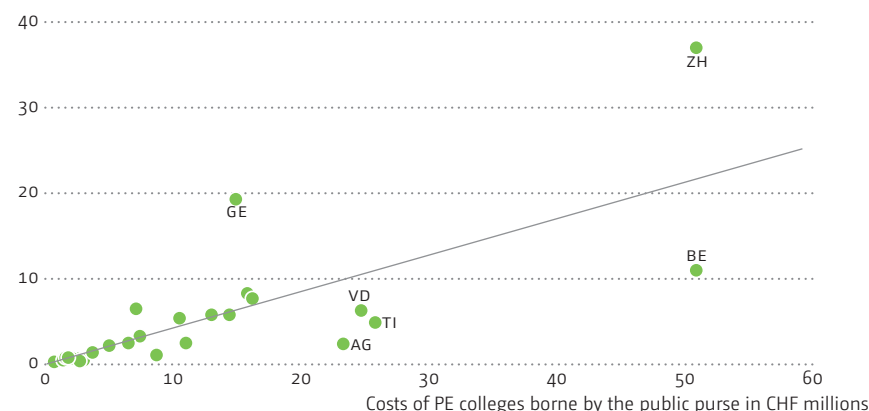
Legend

The state spends around 2.4 times more on PE colleges than on vocational continuing education and training and preparation for federal examinations. This ratio applies in most cantons (correlation of the two budget lines: 0.75). Variations in particular exist for the cantons of Aargau, Bern, Vaud and Ticino, which spent a lot more on PE colleges than on vocational continuing education and training and preparation for federal examinations compared with Switzerland as a whole, and for the cantons of Geneva and Zurich where exactly the reverse is true.

308 Public spending on costs of PE colleges, vocational continuing education and training and preparation for federal examinations, by canton, 2015

Data: SERI

Spending on examination preparation, in CHF millions



Change in funding of federal examinations

Public funding for the preparation of federal and advanced federal diplomas of higher education amounted to CHF 138.3 million in 2015. The extent to which the subject-oriented funding adopted by the Federal Council for incorporation into the ERI Dispatch 2017–2020 will change the level of public contributions to PE will not become apparent for a few years (see also *Kuhn & Schweri, 2014*). The new subject-oriented funding model was introduced on 1 January 2018. Funds that were previously contributed by the cantons to providers of preparatory courses for federal examinations (supply-side funding) are now paid directly to the candidates in the form of federal contributions. The cantons are still able to fund specific offerings for reasons of regional policy or to ensure supply.

Profiles of candidates and students

Around one quarter of people with vocational education and training will go on to complete a PE qualification during their career. The sociodemographic profile of people whose highest educational qualification is at PE corresponds most closely to those whose highest qualification is at upper-secondary level. However, the figures for PE qualifications include a somewhat greater number of Swiss nationals and more men compared with other comparable qualifications in relation to the region of residence and economic sector (→ Figure 309). In respect of age, this group is a little older than the group of people who do not have a post-compulsory education qualification and people with an upper-secondary qualification, because they obtain their PE qualification at a median age of over 30. People who have a university qualification obtain this at an earlier stage; in addition, for the youngest cohorts in particular there appears to be a more exaggerated growth rate than among

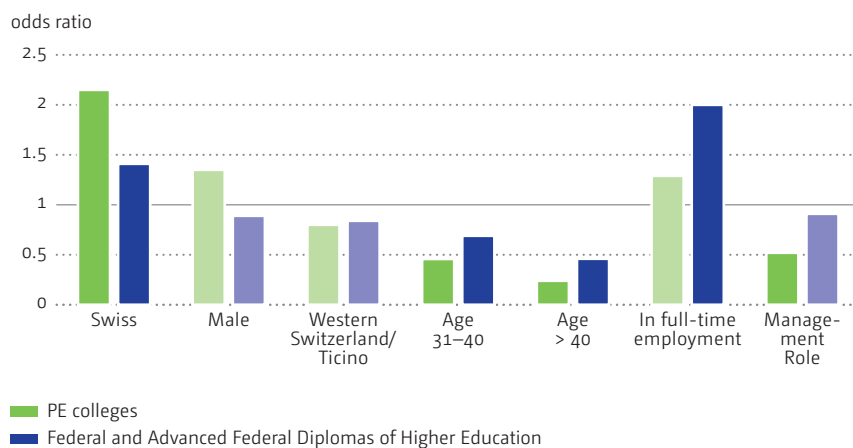
those with PE qualifications (→ Figure 299). For this reason, the average age of people who have a university qualification in the population as a whole is somewhat lower.

Considering the relationship between sociodemographic and socioeconomic factors and the probability of obtaining a PE qualification (→ Figure 310), similar and only slightly different patterns can be seen with regard to qualifications from PE colleges compared with federal and advanced federal diplomas of higher education. Among the latter, the link to nationality is more marked, as is the fact that candidates tend to be in full-time employment before taking the qualification. In addition, people who undertook a federal or advanced federal diploma of higher education were no less often in a management position before sitting the examination than the average person in employment, in contrast to PE college graduates. In terms of age on graduation, the probability of obtaining a qualification of either type is highest for those between 20–29 years old. However, the probability of obtaining a qualification unsurprisingly decreases at a slower rate with age for federal and advanced federal diplomas of higher education than for students at PE colleges. The fact such qualifications are not achieved statistically significantly more frequently by men can be explained in part by the fact that these figures only take account of people in employment.

310 Personal characteristics that correlate with the probability of achieving a PE qualification within the next 18 months

Odds ratios of a multivariate regression with economic sectors as additional control variables. The reference population comprises all people in employment in Switzerland. Matt colours indicate statistically insignificant values.

Data: FSO (SFLS 2010–16); calculations: SCCRE



Benefits

It is still very difficult to determine the benefit of PE as a consequence of a range of problems that arise when attempting such a calculation. These include the lack of statistical information on various educational pathways²,

² The statistical coverage of students in PE should improve considerably in the future, as the

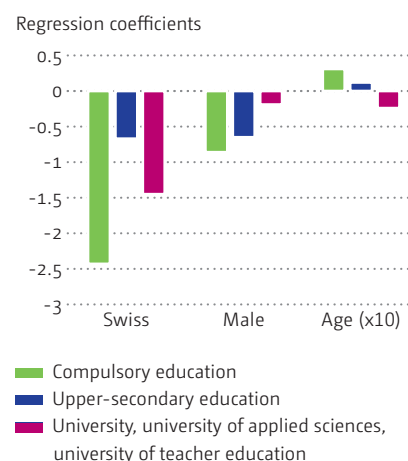
Subject-oriented funding key data

The state pays up to 50% of the attributable tuition fees, up to a limit of CHF 19 000 for federal diplomas in higher education and CHF 21 000 for the advanced federal diploma in higher education. Payment of these grants is linked to sitting the federal examination (irrespective of success). This ensures the distinction with funding of vocational continuing education and training, which to some extent is also delivered through the preparatory courses. Federal grants are paid in arrears, i.e. after the examination has been sat. In exceptional situations where the course participant is unable to meet upfront costs before receiving the grant payment and no support is provided by the employer, industry associations, cantons or third parties, the Confederation is able to pay a partial grant before completion of the examination.

309 Comparison of characteristics of people with different educational qualifications and characteristics of people whose highest qualification is at PE, 2016

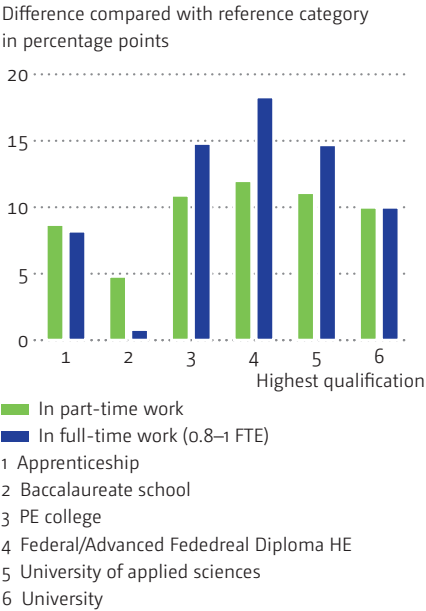
Multinomial logit regression with major regions and employment sectors as additional control variables; reference population: people in work aged between 25 and 60

Data: FSO (SLFS); calculations: SCCRE



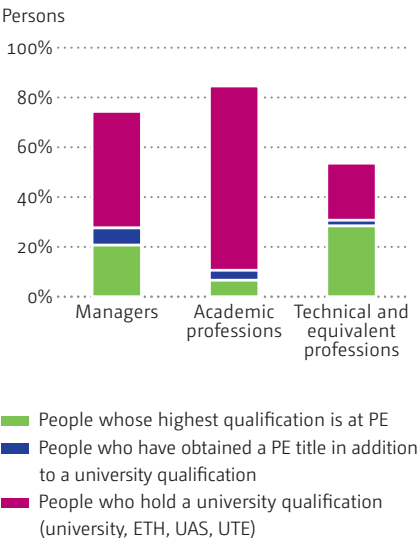
311 **Employment rates by highest educational qualification relative to people without a post-compulsory education qualification, 2016**

Marginal effects in percentage points; monitored for gender, age, nationality and civil status
Data: FSO (SLFS); calculations: SCCRE



312 **Proportion of people with PE and a university qualification in the top three professional categories (ISCO categories 1-3), 2016**

The International Standard Classification of Occupations (ISCO) classifies all jobs at one of nine levels. The top three categories in this classification can be understood to contain professions for which a tertiary qualification is typically required.
Data: FSO (SLFS)



the marked diversity of qualifications, the occasionally very low number of diplomas awarded in an individual field and the rather specific selection of people pursuing this course of training. The screening process is controlled more or less directly by those employers who actually allow candidates to do most of the preparation for federal and advanced federal diplomas of higher education during their working hours and frequently also provide direct assistance in the way of funding. This support mechanism means that the candidates sitting these examinations already represent a very specific selection of people who have been assessed by the employers as particularly motivated and talented and therefore worthy of support. If the figures reveal that candidates with a PE qualification are particularly successful in the labour market, it is not always clear to what extent their success is a product of the training or the selection process. There are limited methods for weighting these two explanations appropriately. However, it appears (Cattaneo, 2011) that even taking into account the fact that students at PE tend to be more successful and therefore higher earners before undertaking the training, the rewards for those with PE are very high in comparison with other tertiary qualifications (→ chapter Cumulative effects, page 295).

The comparably high benefit of PE qualifications is not only evident in the salaries of people in employment, but also from the fact that people who have come through this pathway are generally very well integrated in the labour market. When comparing employment rates, even accounting for the fact that people holding PE qualifications tend to be Swiss men living more frequently in German-speaking Switzerland (i.e. are more likely to be people in a higher level of work), the employment rates of people with PE qualifications are very high in comparison with other qualifications. They are comparable to those of people holding qualifications from universities of applied sciences and are actually slightly higher than those of university graduates (→ Figure 311). When considering only people who work full time (0.8-1 FTE), the group holding a PE qualification actually comes out on top. Indeed, the employment rate of people with a federal or advanced federal diploma of higher education is some 8 percentage points higher than that of university graduates. Nevertheless, when drawing conclusions from these statistical findings it must be emphasised that it is unknown whether this is a consequence of this training being particularly sought after in the labour market, or rather the result of the people who opt for a PE qualification being primarily those who are highly motivated for work³.

People with a PE qualification are not only more frequently in full-time employment; in line with the objectives of their training, they are also main-

FSO is conducting surveys of people who have completed studies at this level on behalf of the SERI. In addition, the ability to trace people through the education system using a personalised identifier will generate new information within a few years.

3 The high employment rate can also be attributed in part to the fact that private individuals' investment in training can only be repaid through participation in employment. For example, students in PE must very often sign a continuing education and training agreement to remain with their employer and therefore remain in employment. A survey conducted among those with a qualification in a commercial discipline (Gisiger, Kraft & Meier, 2014) shows that almost 85% of those interviewed had concluded such an agreement with their employer. Since such obligations are subject to a time limit, however, these arguments alone do not explain the large difference in employment levels of people who have completed PE compared with those who have graduated from university.

ly engaged in the professional categories for which a tertiary qualification is normally a prerequisite. Among the 30 to 34 year age group in employment (→ Figure 312) who fulfil a management role, more than one third have completed PE; the majority of these do not hold a university qualification. In the category of technician and equivalent professions, the group holding PE qualifications makes up more than half of those in employment.

BRAINSTORMING

TEAMENTWICKLUNG

Wen
Möling

Offenheit

① KOMMUNI-
KATION

LOB

Respekt

②

③ KRITIK
(Freiheit)

Verständnis

Bottom
up

Zuhören

Freund-
lichkeit

POSITIVER
DIALOG

VER-
TRAUEN

gemein-
sam

Continuing education and training

Context

Continuing education and training (in addition to formal education) is of fundamental importance given the technological changes afoot in the economy and society. This non-formal learning enables individuals to catch up on any skills shortages while maintaining and improving their current skill set and expanding it to encompass new activities.

Continuing education and training (CET) is a necessity for three main reasons. Firstly: it allows persons without a post-compulsory education to make up for any education deficits. This also applies to persons who immigrate to Switzerland at an age by which the formal education process is normally over. The proportion of persons without a post-compulsory education is particularly high among foreign workers, including refugees, who only immigrated to Europe after reaching adulthood (Wößmann, 2016). Their formal education deficits must be addressed to promote their lasting integration to the labour market.

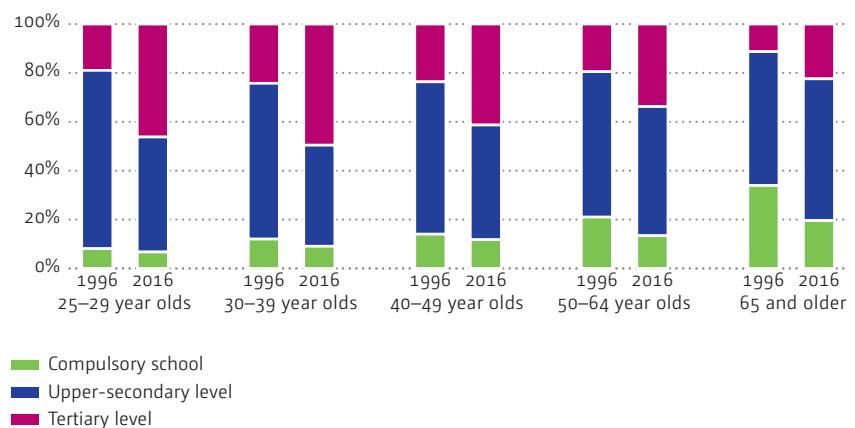
The new Federal Act on continuing education and training of 2014 (→ *Institutions*, page 283) is designed to advance lifelong learning. The aim of increasing the participation of persons without post-compulsory education in continuing education and training is explicitly set out in the legislative planning for 2011–2015 (*Federal Council*, 2012). That is the main area for improvement from a social and economic perspective. The main issue with gaining qualifications later is that low-skilled people normally fail to reach the level of a post-compulsory qualification through non-formal learning even if they have completed several years of employment. Moreover, people in work with a post-compulsory education also keep learning, and on average actually undergo more training than persons with fewer qualifications. As a result, the gap between those with less formal education and those with more does not close but, on the contrary, actually widens (→ *Equity*, page 291).

The proportion of low-skilled people (i.e. persons without a post-compulsory qualification) in the working population of Switzerland has fortunately gone down in recent decades. In 2016, it came to about 10% among the older cohorts (40–64), and just under 5% for the youngest cohorts (25–29)

313 Education level of the population by age group, 1996 and 2016

Data: FSO (SLFS); calculations: SCCRE

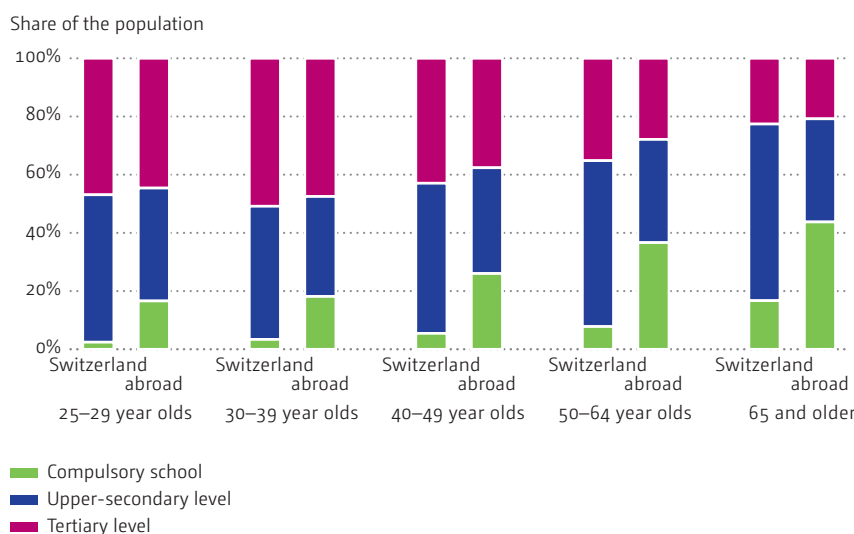
Share of the population



(→ Figure 313). The decline in the share of persons without a post-compulsory education over the age groups results from the expansion of education in the formal system and a shift in the qualification structure for migrants. In spite of changes in their qualification structure, gainfully employed foreigners without a post-compulsory education are still heavily overrepresented (→ Figure 314). For persons between 40 and 64, one in every three to four people does not have a post-compulsory education and this figure is higher for women of foreign nationality.

314 Highest educational level achieved by age group and national origin, 2016

Data: FSO (SLFS); calculations: SCCRE



Looking at the qualification structure of the population in gainful employment, the low-skilled phenomenon is underestimated as they work less than persons with better qualifications: about two-thirds of people with low skills are in gainful employment compared to 80% for people with post-compulsory qualifications. Not working reduces a person's chances of gaining a professional qualification or participating in continuing education and training, not least due to the lack of employer support. Taking into account a number of individual and structural features, the SLFS data show that not having a federal vocational baccalaureate reduces the probability of participating in further education by 44% relative to holders of a post-compulsory qualification.

In addition, a lack of formal education often entails a low level of basic competence in mathematics and reading (see Programme for the International Assessment of Adult Competencies [PIAAC] results for Germany, *Rammstedt, Martin & Massing, 2013*), which again reduces the likelihood of participating in further education and training. It is therefore essential to establish a basic competency level to integrate persons without a post-compulsory education into continuing education and training.

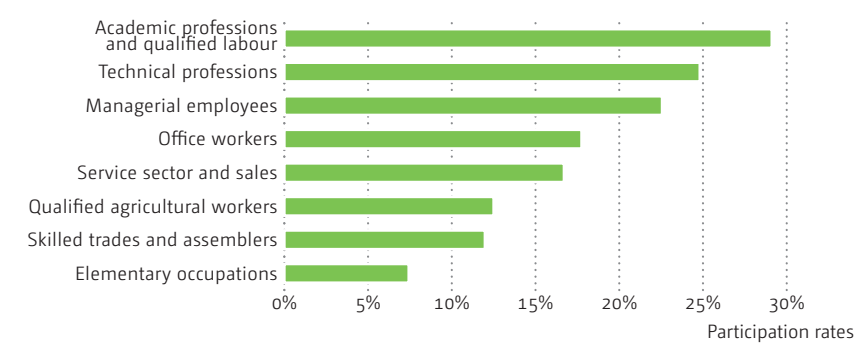
A second argument in favour of continuing education and training is the devaluation of skills. The maintenance and development of skills and knowledge are particularly important for people who are educated to a high level, as their level of competency also diminishes over time. There are also signs of a decline in general basic skills among adults, for example numeracy and literacy. Data evaluations by PIAAC show that the skill level of per-

sons with the same formal education decreases with age in all the countries surveyed (OECD, 2016c; Rammstedt, Martin & Massing, 2013; Rammstedt, Perry & Maehler, 2015).

People in jobs requiring a relatively long formal education are more likely to undergo further training (→ Figure 315). That may be due to necessity, i.e. the best educated people having no alternative but to invest significantly in training if they are to keep their skills up to date. It may also result from the dynamic accumulation process of skills and competencies equating to a virtuous circle, whereby current skills form a basis for the efficient assimilation of new knowledge (Cunha, Heckman & Lochner, 2006). The better educated derive much greater benefit from further training than people with a low skill level. That is because they are more efficient at learning and, as a result, can become more productive from the same investment in education and training. Whatever the explanation for the function of education in further training, the higher level of participation among persons with a good formal education contributes to a growing gap between the well qualified and not so well qualified.

315
Participation in CET by occupational group, 2016

Participation in CET, last 4 weeks, 25-to-64 age group in gainful employment
 Data: FSO (SLFS); calculations: SCCRE



A third argument in favour of CET is technological and economic changes, which affect everyone regardless of their formal education. Disruptive innovation is a recurring feature of technological progress. For example, parts of the production process may become superfluous or more technologically advanced and require a better-qualified operator. Digitalisation basically makes routine activities redundant, i.e. the type of jobs normally filled by people with a low level of formal education. However, digitalisation can also extend to the type of work associated with a medium or high level of education, if the work in question involves a lot of routine. If these routine jobs disappear, the people affected will have to find something else to do. This normally means retraining once it becomes evident which activities are in demand and are a realistic prospect.

Technological advances can also occur in a given profession and create demand for entirely new skills, even if the original position remains relevant; this could involve the rapid acquisition of new skills and thus go beyond a gradual update of the current skill set.

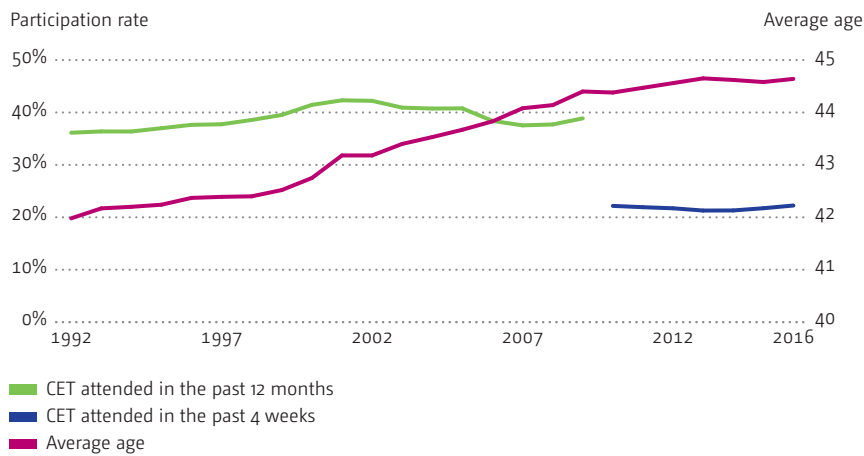
Although technological change is nothing new and demographic change has increased markedly over the past twenty years as reflected in the average age of the working population, there are no signs that these processes have led to an increase in CET participation in Switzerland (→ Figure 316).

316 Development of participation in CET and average age of the Swiss working population, 1992–2016

Only working Swiss from 25 to 64 years of age; smoothed curves (three-year average)

Reference period Participation 1992–2009: past 12 months; 2010–2016: last 4 weeks

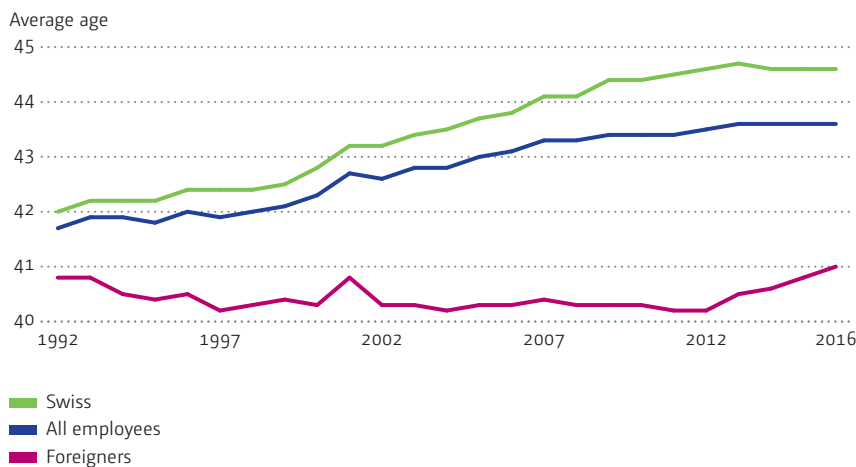
Data: FSO (SLFS); calculations: SCCRE



As HR managers and line managers are normally responsible for motivating employees to participate in continuing education and training (*Kaufmann & Widany, 2013*), Figure 316 suggests that employers have not seen the need to respond to the developments outlined above by investing more in CET for their employees over the past twenty years.

317 Development in average age of working population by nationality, 1992–2016

Data: FSO (SLFS); calculations: SCCRE



The pattern in Figure 316 may be because the possibility of recruiting younger people from abroad mitigated the ageing of the workforce and thus reduced the onus on employers to organise further training for their staff (→ Figure 317).

Institutions

Legal framework conditions

The Federal Act on CET of 20 June 2014 and corresponding ordinance came into force on 1 January 2017. The Act defines general principles, which must be complied with when setting special laws on continuing education and training in the Confederation and the Cantons. This will lead to greater co-

herence in state governance. State support for CET will, in particular, provide new standard criteria (public interest, quality assurance, equality of opportunity, competition). The ordinance increases the regulation of those areas for which continuing education and training requires financing. This will benefit training organisations and other projects based on the acquisition and maintenance of basic skills among adults. People who lack basic skills in reading, writing, numeracy and the application of ICT will be encouraged to better themselves through publicly financed training. The Act enables the Confederation to pay Cantons contributions towards financing corresponding measures.

It also provides for the Confederation to monitor the CET market and participation in the continuing education and training offered and to gather data for that purpose (Art. 18 and 19 WeBiG). Besides the Swiss Labour Force Survey (SLFS), which gives a general participation rate (participation in continuing education and training in the past 4 weeks), the main relevant source is the the Microcensus on Education and Training (MET). However, the participation rate in the MET is based on a 12-month reference period meaning that the SLFS and MET ratios are not directly comparable. The two surveys also differ in other ways. The SLFS conducts a labour market situation survey involving a sample of over 100 000 people several times a year, while the MET is conducted every five years and is based on a sample of 10 000 people.

The corporate perspective is examined through a separate survey on corporate CET programmes (SBW). This survey is held every five years and covers about 8000 secondary and tertiary sector companies with a minimum of ten staff, focusing on the internal and external CET programmes supported by the companies. One drawback of this survey is that the minimum size of ten employees excludes about 90% of companies in Switzerland or at least a quarter of the working population.

Concepts and statistical consequences

CET is part of lifelong learning as it allows for education and training at any stage in life and enables the substitution and expansion of formal education, e.g. the classical educational path or university education, through non-formal and informal learning activities (*OECD, 2003*). The term continuing education and training has established itself on an international level as being synonymous with a comprehensive approach to education (*European Commission, 2010*).

It covers non-formal learning activities and organised learning occurring outside the formal education system. Non-formal learning happens within an organised and structured framework, whether within or outside the workplace in the form of courses, seminars, workshops or private lessons. Non-formal learning complements the formal side but does not lead to formal qualifications. Even if certificates are awarded for certain CET activities, they do not count as formal qualifications within the government-regulated education system. That applies to preparatory courses for (advanced) PE diploma that are not a compulsory part of the qualification. This training activity is therefore not formal, even if the qualification itself leads to a diploma. CET courses at universities do not count either within the formal education system, as the corresponding qualifications and certificates (Master of Advanced

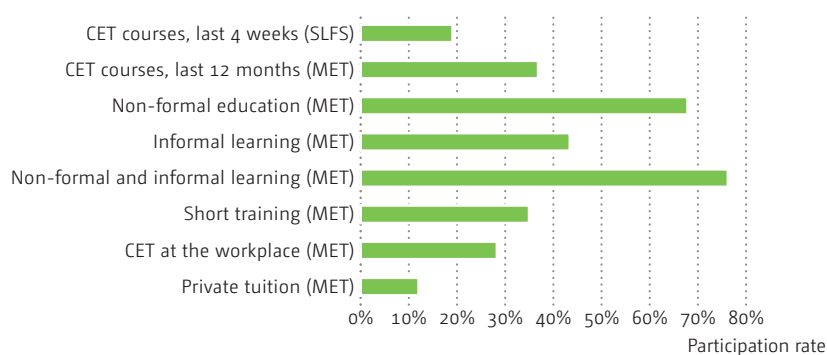
Studies, MAS, or Certificate of Advanced Studies, CAS) are not formal university degrees, even if they were acquired at a university.

Different activities are counted and statistically compiled as CET depending on the conceptual understanding of the term. That means the recorded participation rates differ greatly depending on how the indicators are defined. Participation rates are therefore usually lower when only CET courses are recorded than when non-formal learning is counted, covering seminars, conferences and other organised forms of CET. It also needs to be borne in mind when interpreting statistics how the data is collated and over what period (four weeks or twelve months) the CET relates to (→ Figure 318).

318 Participation in CET activities: Different concepts and surveys, 2016

Data: FSO (MET, SLFS); calculations: SCCRE

Age 25 to 64, resident population. Reference period: The information in the Microcensus on education and training (MET) is based on the past 12 months, that of the Swiss Labour Force Survey (SLFS) on the past 4 weeks.



In-company continuing education and training

Continuing training mainly takes place within a work context. Companies promote and support their employees with further training. Over 80% of all Swiss companies (small companies of up to nine employees are not considered) support continued education and training activities. Every third company supports its employees with training courses to prepare for Federal PE Diploma and Advanced Federal PE Diploma examinations. However, very few companies actively promote proficiency in basic skills. According to the SBW survey, companies involved in the provision of continuing education and training spent just under 700 francs on average per employee in 2015. Measured against persons who took part in CET, it's just under 1500 francs. About 0.8% of labour costs on average are spent on corporate investment in CET. However, companies often support their employees with a combination of contributions to CET costs and working time; the value of the latter is not included in the figure of 1500 francs.

The decision to participate in CET is not normally taken by the participants themselves but by their line managers, the company management or designated CET or HR managers (Abraham, Höglinger, & Liechti, 2016). This is in effect a selection process based on a person's qualifications, professional status, function and perceived development potential. People with little formal education are usually overlooked for further training as a result (→ Figure 319). Nonetheless, there are no marked differences in terms of employer support regarding the CET participants' educational background (→ Figure 320).

CET courses

CET offers occurring in a series and for a specific area

Non-formal learning

Organised learning activities outside the formal, institutional education system without formal qualifications (courses and short training programmes)

Informal learning

Activities oriented to a learning objective but which take place outside an organised learning setting.

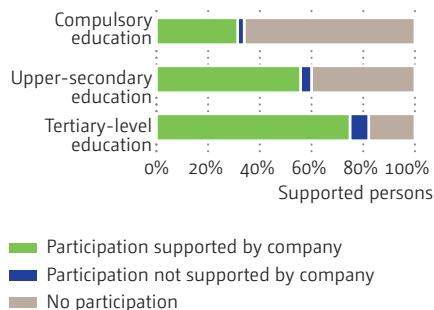
Short training

targeted, irregular CET activities (e.g. seminars, lectures, congresses etc.)

319 Employer support for job-oriented training by highest educational qualification, 2016

Time commitment and/or financial support for job-related non-formal learning

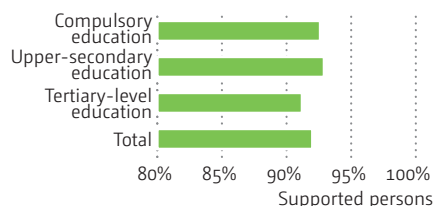
Data: FSO (MET)



320 Proportion of employer support for job-oriented training by highest educational qualification, 2016

Time and/or financial support for job-related non-formal learning (only CET participants)

Data: FSO (MET)

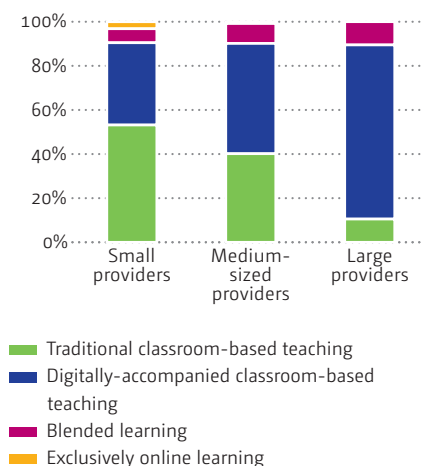


321 Digital technology applications, 2017

Survey of CET providers on dominant instruction method

Source: *Scgier, Haberseth & Schüepp, 2018*

Nominations



The finding that 90% of all gainfully employed participants in CET are supported by their employer reflects the extent of responsibility borne by companies in updating staff skills; it also shows how rare it is for gainfully employed persons to pursue further training without support from their employer.

Institutions of continuous education and training

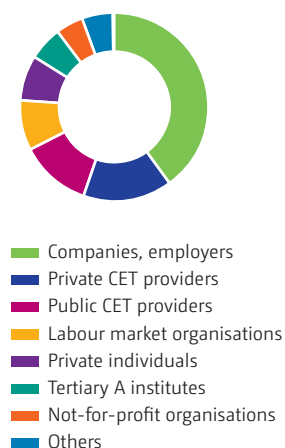
The Swiss CET market is mainly organised along private sector principles. The majority of non-formal learning providers are therefore private organisations. First of all there are the companies themselves, which offer most of the corporate and professionally-oriented CET. Private CET providers and professional associations, employer organisations and unions are also active in the CET market (→ Figure 322).

Digital technologies have also made their mark in the field of continuing education and training, although small and medium-sized companies still mainly use traditional classroom-based learning, which is not so dependent on digital aids (→ Figure 321). The larger and classical instruction methods, which are supported and expanded by digital learning, such as learning platforms, social media, computer-based training (learning programmes on data carriers) or web-based training (online learning units and programmes) are widespread (→ Figure 331).

The dominance of labour market relevant education is apparent in the preferred subjects. Subjects relevant to the field or job concerned, such as science and technology or IT account for over half of the education activities undertaken.

322 Providers of non-formal learning, 2016

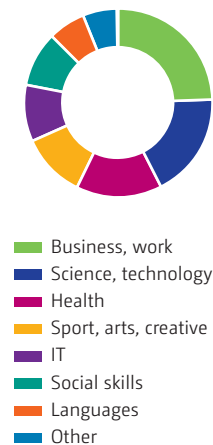
Data: FSO (MET)



323 Subject-matter, 2016

Non-formal learning by the most common themes

Data: FSO (MET)



Effectiveness

The effectiveness of CET work should be reflected in the resulting direct output, i.e. the improvement of those competencies targeted through the training. However, the aims of CET activities are as varied as the participants and the pronounced heterogeneity in terms of content, extent and intensity complicate a uniform definition of goal achievement. In non-formal learning there are, unlike in the field of formal education, hardly any explicit education-policy criteria with learning goals, which could be used as a proxy indicator.

The output of CET can be measured to a limited extent by asking the participants how happy they are with it. However, this method primarily measures the subjectively-measured benefit derived by the participants, in terms of acquisition of competencies, applicability and transfer into everyday working life. Apart from the fact that these assessments are subjective, the survey instruments are not used uniformly and thus do not provide a basis for an overall assessment of the benefit derived from CET.

Ultimately, the outcomes of CET must be recorded, as must the effect of the competencies acquired through CET on employment status or other target values. However, empirical proof of the effects of CET is also difficult, if not impossible, to measure due to selective participation (*Wolter & Schiener, 2009; Becker & Hecken, 2005*).

As a result, it is normally a political task to promote participation in life-long learning and improve equality of opportunity in accessing CET. One of the Federal Council's legislative goals from 2011–2015 was to demonstrably increase CET among the low-skilled. The main thrust of this section will therefore be to assess participation rates according to different criteria and comparisons will be drawn between countries and groups of people (→ Figure 324).

Participation in continuing education and training

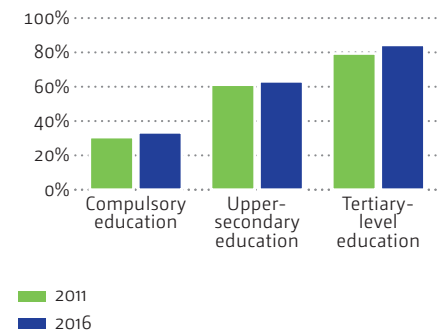
It is precisely because different indicators and measurables deliver such different results in CET, that an international comparison is so useful, as it enables a relative assessment of Swiss CET participation rates.

Switzerland has had high participation rates for years by international comparison (→ Figure 325), both among the general population and especially among those educated to tertiary level. The participation rate among the low-skilled (those without a post-compulsory education) is low in Switzerland both in absolute terms and relative to the other population groups, but not relative to other countries: only Sweden and Denmark have a higher participation rate.

However, the low proportion of people in continuing education and training without a post-compulsory education combined with the very high proportion of people with a tertiary level qualification in continuing education and training in Switzerland means there is a relatively large disparity between the two groups, including by international comparison (→ *Equity, page 291*). This effect is mitigated by the fact that the proportion of low-skilled people in Switzerland is small by international comparison.

324 Participation in non-formal learning by educational level, 2011, 2016

Data: FSO (MET)

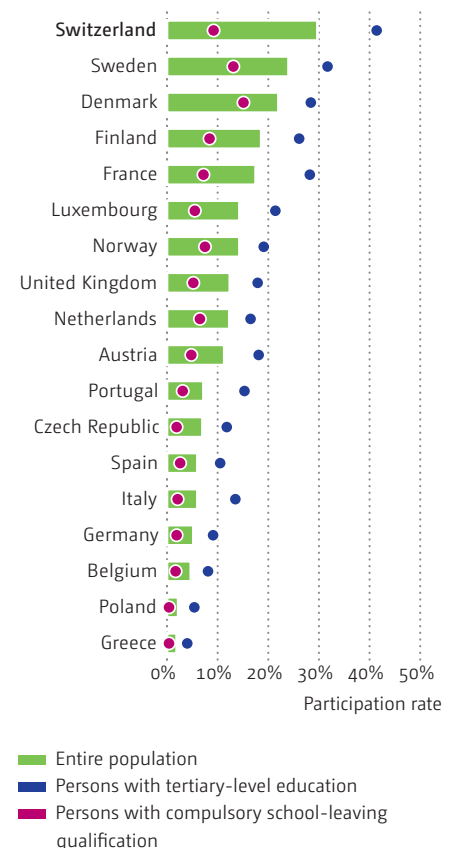


A comparison between the participation rates in non-formal learning measured in 2011 and 2016 shows that the ratios remained relatively constant for all educational levels. The small changes are within the statistical error range of $\pm 5\%$ and therefore not significant.

325 Participation rates in non-formal learning, by educational level, 2016

Continuing education and training during the past 4 weeks, 25–64 age group

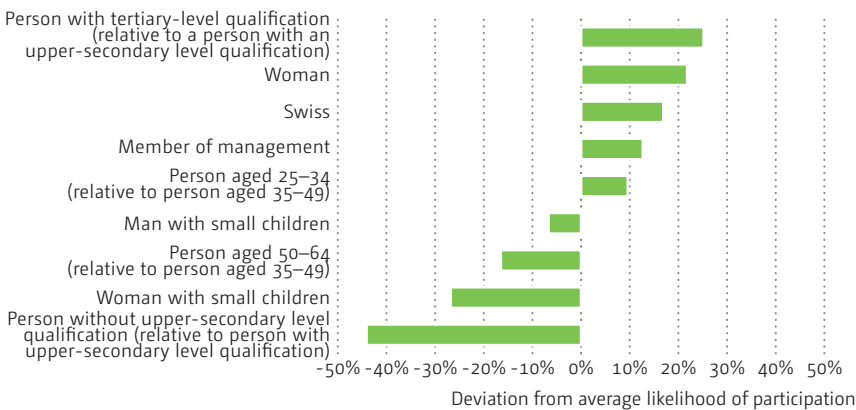
Data: Eurostat



Multivariate analyses based on SLFS data reveal several factors, which demonstrate a significant statistical correlation with individual probability of participation. A higher level of education, higher career position, being female or Swiss are associated with a higher probability of participation in CET (→ Figure 326). Taking account of personal, structural and business factors, people with a tertiary education are 25% more likely to pursue CET courses than people with a vocational education and training background, rising to over 40% for the low-skilled. Having children below school age also reduces the likelihood of taking part in continuing education and training. The over-50 age group in employment is also under represented in CET.

326 Factors influencing CET, 2010–2016

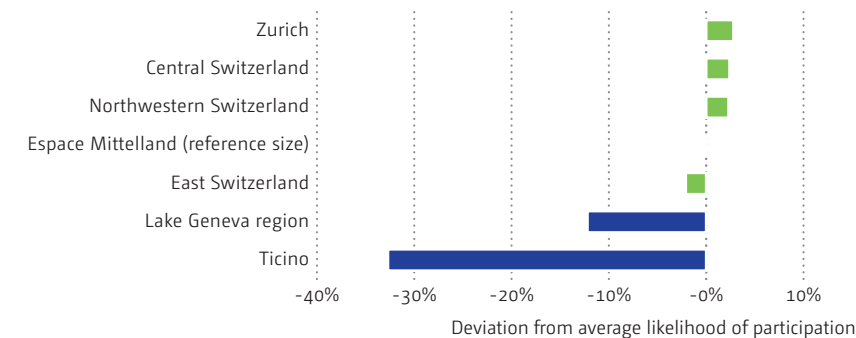
Deviation from average probability of participation, significant factors
Data: FSO (SLFS); calculations: SCCRE



CET pathways also vary by region. Taking account of the economic structure and staffing factors, the Lake Geneva region (Cantons Vaud and Geneva) and Ticino have a significantly lower probability of engagement in CET (→ Figure 327).

327 Participation in CET by major region, 2010–2016

Deviation from average participation probability in Espace Mittelland, significant effects in blue
Data: FSO (SLFS); calculations: SCCRE



Legend
The participation rate of a person from Ticino is one third below the rate for a comparable person from Espace Mittelland.

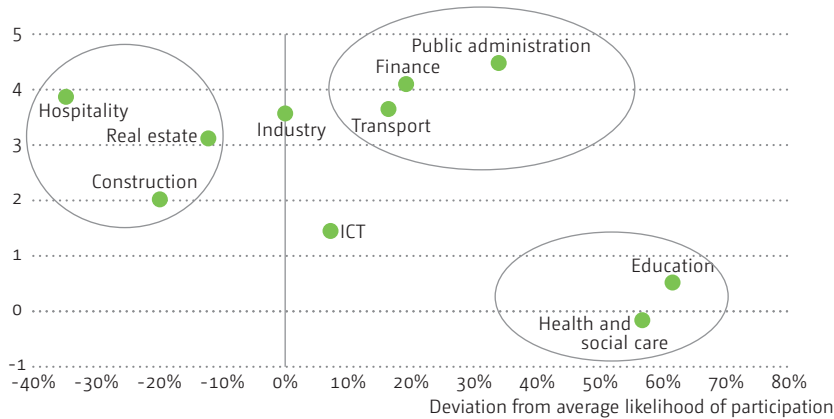
There is also a considerable degree of variation in terms of CET activities by business sector. The sectors do not just show disparities in terms of CET activity, they also vary demographically. In Figure 328 the probability of pursuing CET is shown by sector, taking account of personal and labour market factors and participation differences among age groups.

328 Probability of participation by age and sector, 2010–2016

Difference in probability of participation in CET between younger (25–49) and older (50–64) persons and deviation from average probability of participation in industry

Data: FSO (SLFS); calculations: SCCRE

Difference between participation rate of younger and older employed persons, in percentage points



There are three different patterns of CET participation by business sector: First are the sectors where CET is to the fore, such as health and social welfare or education, which also display a balanced relationship between the participation rates of the younger and older employees. They are the main sectors in which job-specific compulsory CET is commonplace. Secondly there are sectors with above-average CET participation rates, such as public administration or finance, which stand out because younger employees are considerably more likely to pursue CET than their older counterparts. Thirdly, there are sectors where employed people have a lower than average overall probability of engaging in CET and where participation rates are lower still for older employees relative to younger ones.

Duration of CET

Simple participation rates for each form of CET recording all the CET pathways equally, are not sufficient for a precise evaluation. There are also differences regarding the timespan of the continuing education and training.

The non-formal learning activities recorded by the MET account for 36 hours (per year) on average and also vary significantly in terms of the education level (→ Figure 329). According to SLFS, employed persons pursuing CET courses spent an average of about eight hours on those courses over the past four weeks. The estimated average duration of CET activities is higher for men and persons with a tertiary-level education. Only language courses have a longer average duration, amounting to an average of just under 50 hours a year (→ Figure 330). That corresponds approximately to two hours a week for half a year.

Benefit of CET activity

Surveys on the benefit dimensions of employer-financed CET (→ Figure 332) show that employed persons engaging in CET see the benefit less in short-term, bottom-line categories and much more in operational criteria, such as

Legend

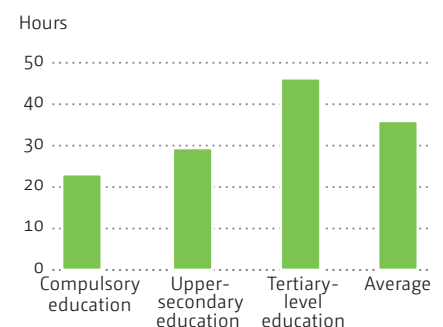
People working in hospitality are just under 40% less likely to engage in CET than people working in industry. At the same time older hospitality employees have a CET participation ratio of just under 4 percentage points lower than younger workers.

The **lower level of CET activity among** construction and hospitality **employees** cannot be explained solely by the lower average qualification level, as the CET ratios shown are based on regression analyses where a series of influencing factors, including education, are kept constant. That means that a construction worker is 20% less likely to participate in CET than an employee with the same educational level working in industry.

329 Duration of non-formal learning per person, by education level, 2016

Age 25 to 64, resident population

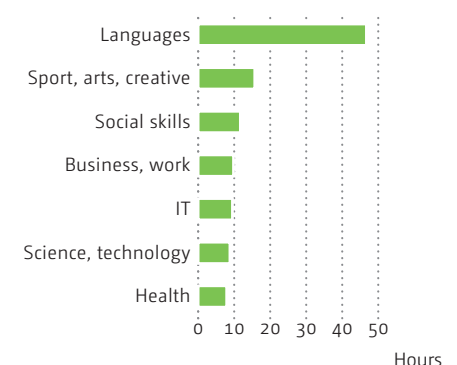
Data: FSO (MET)



330 Duration of a non-formal learning by subject, 2016

25–64 resident population; average values by number of hours for an education activity

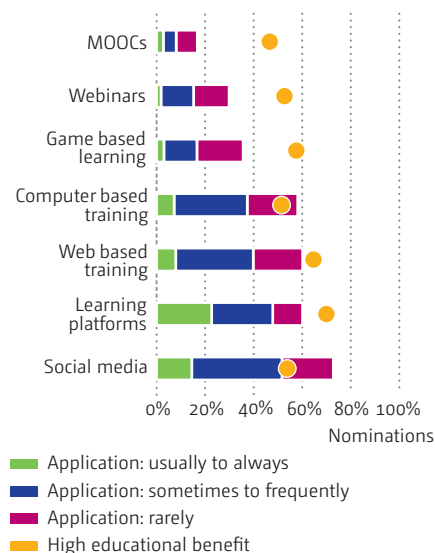
Data: FSO (MET)



331 Application and benefit evaluation of digital technologies, 2017

Survey of CET providers per frequency of application of digital technologies/benefit derived from these technologies

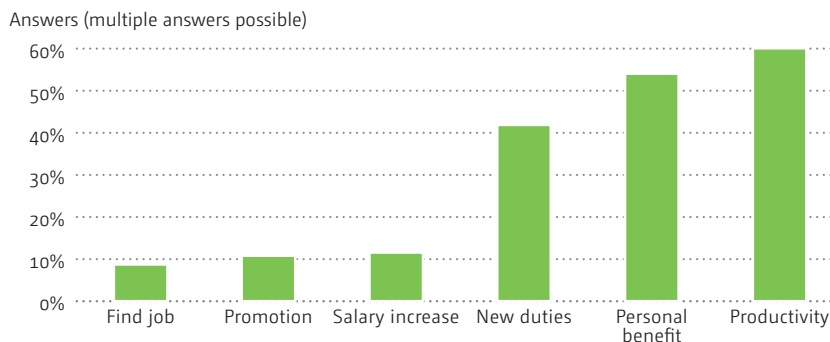
Source: *Sgier, Haberzeth & Schüepp, 2018*



productivity or area of responsibility. The assessment of the benefit categories is similar for CET activities not financed by companies.

332 Subjective benefit estimate of CET when the employer makes a financial commitment, 2016

Data: FSO (MET)

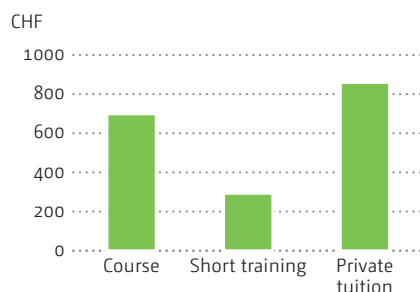


CET providers have varying views on the usefulness of the different types of digital technology used in CET. The majority of providers consider learning platforms and web-based learning as extremely useful. Mass online courses (MOOCs) are seen as a less useful educational tool (→ Figure 331). This verdict is confirmed by the latest research results on success in learning. University students who do online courses are not as successful as their peers who attend classroom-based courses, in terms of academic performance and pass rate (*Bettinger, Fox, Loeb et al., 2017*). Online education does have the potential to reach more people and thus enable more people to study, however it appears to lose effectiveness in doing so. Moreover, according to the provider survey, fully digitalised continuing education and training, of the type used in MOOCs or webinars for example, is currently the least commonly-used format (*Haberzeth, Sgier & Schüepp, 2018*).

333 CET expenditure of participants, 2016

25–64 age group; median values

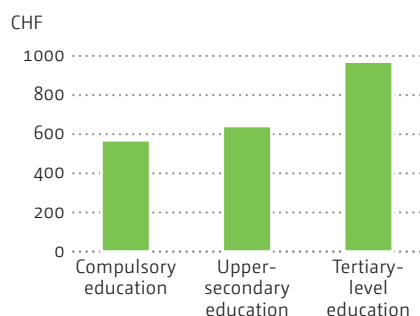
Data: FSO (MET)



334 CET expenditure by participants, by educational qualification, 2016

25–64 age group; median values

Data: FSO (MET)



Efficiency / costs

Due to the difficulties outlined in assessing the effectiveness of CET, it is not possible to draw any conclusions on its effectiveness, even with information on costs and time invested. This section therefore focuses on costs without analysing the cost/benefit aspect. This complicates the analysis to the extent that high costs do not necessarily entail high benefit, just as low costs do not equate with high efficiency.

CET costs comprise direct costs, e.g. entry fees, course fees, devices for working, documents, expenses etc. and indirect costs. Indirect costs are opportunity costs, i.e. income foregone due to CET. Loss of free time and non-fulfilment of family duties are also opportunity costs. Moreover, cognitive exertion and psychological stress induced by learning can be seen as costs and taken into account when deciding whether to pursue CET. Opportunity costs in the form of lost earnings are the main hurdle for employees who are not supported by their employer and therefore cannot use working time to study either.

People spend just under 700 francs of their own money on CET on average per annum in the form of direct costs (→ Figure 333). Costs for private instruction are higher, whereas costs for courses are a lot lower. The median for CET courses is 21 francs per hour. Persons with a tertiary education spend a lot more on CET at just under 1000 francs on average, while persons with low qualifications only spend about half that amount (→ Figure 334).

Equity

Participation rates show that the low-skilled are the least involved group in CET. They face significantly higher entry barriers, meaning that persons who already have a high level of formal education are also more likely to benefit from non-formal learning. The outcome is a growing gap between the skilled and the unskilled. Therein lies the central problem of CET in terms of equity.

On the whole, CET does not reduce inequality from formal education. On the contrary, it adds to inequality over a person's working life (→ Figure 335).

Figure 336 shows the educational advantage for people educated to tertiary level relative to people without post-compulsory education (green columns) and relative to people with an upper-secondary level qualification (blue columns). The chart shows that, solely for formal education, a person educated to tertiary level has about twice as much education as someone with only compulsory schooling. Comparing the CET that a person is likely to accumulate on the basis of their educational qualifications, the difference in education on entering the workforce is actually doubled: people educated to tertiary level do four times more continuing education and training over their working life than people without post-compulsory education (→ Figure 336).

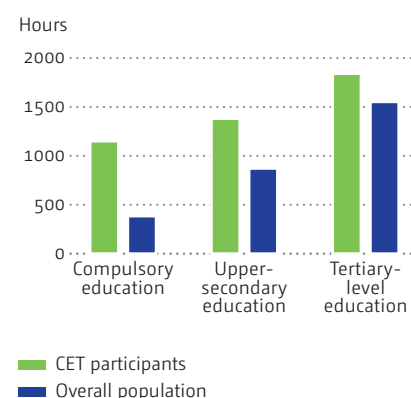
It must also be taken into account in this connection that CET only comprises a very small part relative to formal education; 7% for a tertiary education and 4% for people without post-compulsory education. Continuing education and training is therefore not a suitable means of reducing educational disparities. Someone without a post-compulsory education cannot compensate for the education deficit vis-à-vis the better educated over a correspondingly longer working life.¹

International comparison of educational disparities

By international comparison, Switzerland is in the middle of the field as regards educational disparity, with over four times as many people educated to tertiary level relative to low-skilled people (→ Figure 337). The Nordic countries and the Netherlands display a much lower disparity. However, the picture changes when looking at the difference between people with a tertiary education and an upper-secondary level qualification. Switzerland has

335 Non-formal learning over a full working life by highest educational qualification

Data: FSO (MET); calculations: SCCRE

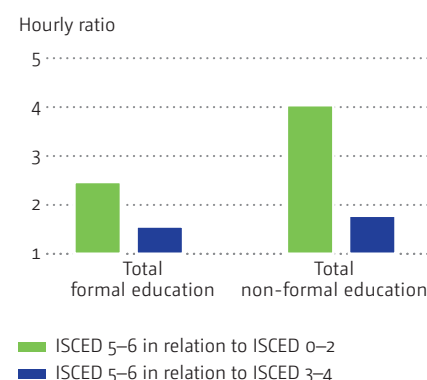


The calculation is based on the MET 2016 average number of CET hours per year for the different educational levels extrapolated to average years in employment (green columns in above chart). The blue columns also include the probability of participating in CET based on formal educational level.

336 Educational disparity between formal and non-formal learning

Advantage of tertiary-level qualification holders relative to exclusively compulsory or post-compulsory educational certificate holders, accumulated throughout the person's life

Data: FSO (MET); calculations: SCCRE



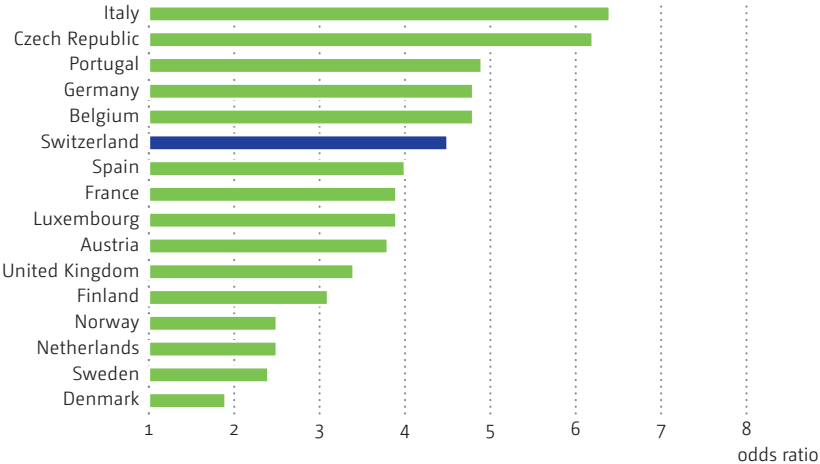
¹ A person without a post-compulsory qualification would have to undergo three additional weeks of CET every year of their working life to catch up with a person holding an upper-secondary level qualification.

caught up with the Nordic countries as it has a markedly lower educational imbalance with an odds ratio of less than 2 (→ Figure 338).

337 Educational disparity between tertiary level and persons without a post-compulsory education, 2016

Participation in non-formal learning
Data: Eurostat; calculations: SCCRE

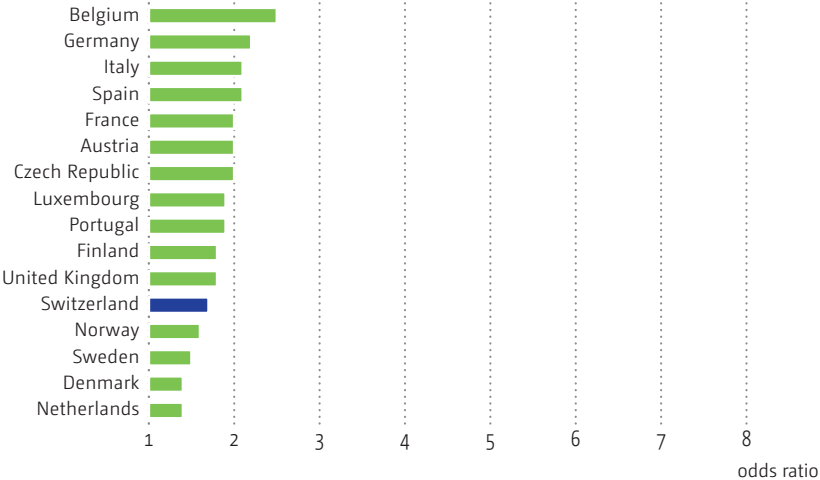
Legend:
The columns give the ratio of people educated to tertiary level engaging in CET relative to the ratio of persons without post-compulsory education who engage in CET.
The longer the column, the more uneven the CET participation among the different educational levels.



338 Educational disparity between tertiary level and persons with an upper-secondary level qualification, 2016

Participation in non-formal learning
Data: Eurostat; calculations: SCCRE

Legend:
The columns give the ratio of people educated to tertiary level engaging in CET relative to the ratio of persons educated to upper-secondary level who engage in CET.
The longer the column, the more uneven the CET participation between the different educational levels.



Gender

Regression analyses with data from the Swiss Labour Force Survey (SLFS) show that women engage in more continuous education and training than men (→ Figure 326), in spite of part-time work having a negative effect on participation in CET and more women being in part-time work. This can be explained by women in general being more interested in further training and because part-time work, in contrast to men, has a markedly lower effect on the likelihood of women taking part in further education (Backes-Gellner, Oswald & Tuor Sartore, 2014). There are also higher proportions of women than men in job related CET. The support they receive from their employer

is comparable to men according to the latest data (Microcensus on education and training 2016). There are no differences between genders, or degrees of employment (→ Figure 339). The statistically striking lower support from employers for women, which was still evident in 2011 (SCCRE, 2014), was thus no longer apparent in 2016. Companies offer equal opportunities between men and women in terms of CET provision.

People with disabilities

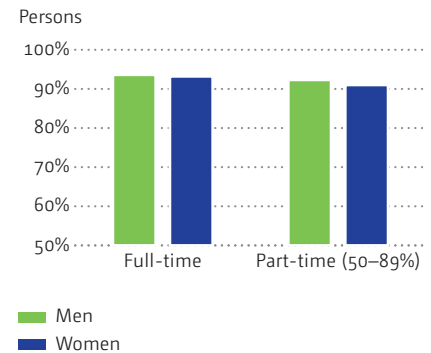
Under equality of treatment for persons with disabilities, CET offers must be fully available to the disabled. Even if this legal entitlement is harder to enforce with private providers than state institutions, private CET providers are not immune from the fundamental requirement for equality for the disabled in terms of access to CET.

A contemporary study on professional equality for the visually impaired shows that they tend to be under represented in CET. There is very little research into the reasons for that. Access to CET, on the other hand, is not considered problematic. The overwhelming majority of the disabled thus consider themselves as receiving equal treatment. In addition, CET is accessible to most people, including the visually impaired according to this study (Johner-Kobi, Riedi, Nef et al., 2015).

339 Employer support for non-formal learning, by gender and degree of employment, 2016

25–64 age group, only job related CET

Data: FSO (MET)





Cumulative effects

Introduction

This chapter builds on the results presented in the 2010 and 2014 Education Reports regarding the cumulative effects of education by adding more recent findings and further considerations on the subject. Some definitions and explanations have been taken over from the previous reports and supplemented by more recent bibliographical references. The new findings are included in the chapter's empirical sections.

As in the previous reports, the concept of «cumulative» in the title of this chapter is to be understood in several different ways. First of all, the investment made in education and the acquisition of education is viewed in cumulative terms. In this case, «cumulative» is used in the sense of time (i.e. over the full length of an education path) as well as in the sense of not just referring to the acquisition of education during formal (school) education, but also to the acquisition of education outside school.

Apart from observing the cumulative acquisition of skills, this chapter addresses the cumulative effects, i.e. returns provided by education. At an individual level, these include both monetary (earnings) and non-monetary returns (well-being and health) and, at the level of society, fiscal income and non-monetary effects, such as a functioning democracy. In so doing, this chapter does not aim to provide a comprehensive overview of the national and international literature on the subject. The focus is rather on the most recent available academic studies and findings.

An example of the cumulative effects of acquired skills is shown in → Figure 340, which shows the importance of assessing specific educational paths from a longitudinal perspective. Otherwise only a small part of the benefits brought by education is recorded. The TREE cohort data, i.e. every student who underwent PISA testing in 2000, show that those who achieved a competence level of 4 or above, had slightly better prospects of starting a course leading to a certified qualification in upper-secondary level education than those who achieved a competence level of 2 or 3. The advantage in favour of the more competent pupils then increases markedly when it comes to completing a post-compulsory course of education. Although the difference is initially just under 10 percentage points, it increases to over 30 percentage points for the number of students who subsequently started tertiary education. This is of course also, but not exclusively, related to the type of education selected at upper-secondary level. The relevance of the type of tertiary-level education is ultimately reflected in the fact that the gap between the two groups is reduced again when analysing who has gained a tertiary-level qualification at the age of 29. The longitudinal data thus clearly shows that skills differences at a given point in education have differing effects when transferred to higher levels of education and, on the whole, also exercise long-term effects.

The acquisition of non-cognitive and cognitive abilities and the correlation between them

The acquisition of cognitive and non-cognitive abilities and characteristics is simultaneously facilitated and hindered by a number of factors: family, social environment and – the most relevant to this report – school.

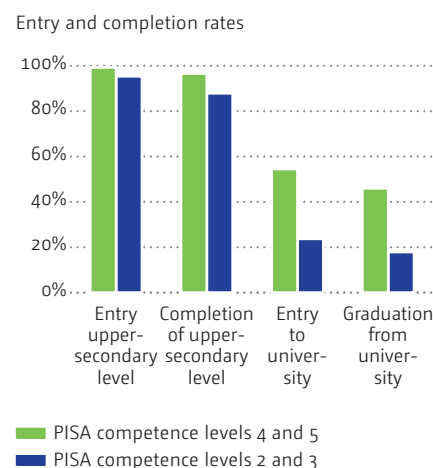
There is normally a close correlation between cognitive and non-cognitive abilities, however, they are not congruent. The correlation does not always reveal the extent to which it results from just one or more than one determining factor. For example, a good family setting can promote both motivation as an important non-cognitive trait and reading ability as a cognitive trait. As motivation invariably also influences reading ability, it is reasonable to assume that some of the correlation between motivation and reading ability indicates a causal relationship. It also works the other way, i.e. a good level of literacy can also be a motivating factor. As a result, it is not always clear where the causality between cognitive and non-cognitive abilities actually originates (see, for example, *Fletcher & Wolfe, 2016*, for an up-to-date overview of the academic literature). At the same time, all non-cognitive abilities also require cognition and a significant proportion of performance in cognitive tests stems from non-cognitive abilities (*Martins, 2017*).

While cognitive and non-cognitive abilities have been empirically proven to positively influence monetary and non-monetary outcomes, the extent to which the inverse applies to non-cognitive traits is not always clear, i.e. whether subsequent outcomes also change subsequent non-cognitive characteristics. This potentially reverse causality relativises the validity of the correlations identified in cross-sectional studies and supports the need for panel or cohort studies.

The individual chapters of this education report focus mainly on the influence of educational institutions on the production and acquisition of cognitive abilities. In other words, we assess the development of cognitive abilities from when a child starts school. Cognitive abilities, including those skills required for school, develop naturally from birth, i.e. a long time before starting school. The same applies for non-cognitive skills. The question therefore arises, for both cognitive and non-cognitive skills, as to the ideal juncture for interventions, whether at home or with outside support, to maximise the effectiveness and efficiency of the investment in these abilities (*Elango, Garcia, Heckman et al., 2016; Currie, 2011; Chou, Liu, Grossman et al., 2010*). There is consensus in academic literature that investments in supporting and developing skills during early childhood have a positive impact on a child's development. Research-based findings have advanced significantly in recent years, as some countries (particularly in northern Europe) can access longitudinal data tracking the development of children from birth until well into adulthood (e.g. *Havnes & Mogstad, 2011*). In spite of the generally positive and long-term effects of early childhood development on subsequent academic success, it cannot be easily measured for all interventions (see, for example, *Datta Gupta & Simonsen, 2010*, for Denmark or *Kühnle & Oberfichtner, 2017*, for Germany). On the other hand, there is broad agreement on the socially stabilising effect of working with children at an early age: that access to qualitatively high-level funding and support programmes can reduce the influence of social background on educational achievement and pathways (*Del Boca, Piazzalunga, Pronzato, 2017; Felfe & Lalive, 2014; Apps, Mendolia & Walker, 2013*). That makes it all the more important for children from all social backgrounds to have the same access to high-level support programmes and to avail themselves of it to the same extent, which is not always the case (see, for example, *Burger, 2013*, for Switzerland).

340 Progression of educational careers by PISA competence level

Data: TREE (9th wave). Entry and completion rates by PISA competence level in reading



Non-cognitive abilities are hard to define. Neither in theory nor in empirical analysis are there any standardised concepts that can be applied to achieve a precise distinction between cognitive and non-cognitive abilities. The term non-cognitive abilities is generally used to denote things like personality or character traits, while the term cognitive abilities is used to denote intelligence and, in particular, educationally defined and imparted skills, such as reading or arithmetical skills (see, for example, *Duckworth & Yeager, 2015*).

To examine the effects of school education on subsequent outcomes without addressing the non-cognitive abilities would be incorrect. For example, it has been known since the 1960s that characteristics such as self-discipline or the ability to forego immediate consumption or remuneration (time preference) do not just have a positive impact on educational success, but can also (independently of education) be key to further personal and professional success. Persons who, as children, were able to delay gratification in the marshmallow test (*Mischel, Ayduk, Berman et al., 2011*) went on to earn more, and to have a higher level of self-contentment, more successful marriages and better health. The significance of patience for subsequent success in life is also confirmed by more recent research (see *Dohmen, Falk, Huffman et al., 2015*, or *Sutter, 2015*). These important abilities are very much personally developed; they are encouraged in different ways by parents and can also be practised. The most recent studies show that these personal characteristics, which are so important for success in education and in life, also depend very much on cultural background (*Figlio, Giuliano, Özek et al., 2016*).

The benefit of education

Investments in education do not entail benefits alone, but also costs. That's why the net benefit is key when evaluating an investment in education; the cost aspect is just as important as the benefit when assessing the success of an individual or state-sponsored investment in education.

Costs to the individual are especially high in post-compulsory education. They comprise direct education costs, for example, study fees or the cost of teaching material, and opportunity costs, i.e. income foregone while studying. Society also carries a significant share of education costs as well as the persons pursuing an education. The societal costs mainly comprise costs borne directly by the state. In addition, society bears the opportunity costs of the foregone income tax revenue, which students would have paid had they not been in education. Investments made in the acquisition of skills in the form of time and money, whether inside or outside the formal education process and whether paid for privately or publicly, are made because both the person pursuing the education and society expect to gain a benefit greater than the concomitant costs. This benefit can be gained both by the person pursuing the education and by society – in both monetary and non-monetary form.

The problem inherent in the empirical determination of causal relationships

The biggest problem encountered in measuring the benefit obtained from investments in education is that the benefit is not generally just the difference in outcome (whether this be wages, health, contentment or something else) between people with a certain number of years of education (or skills) and people with fewer years of education (or skills). This is generally a distorted comparison, since the decision whether to remain in education is a selective process, and individuals do not opt for more or less education by chance. Hence, healthier people can decide to pursue more education, since they are better able to cope with the requirements of additional years of education. If it is subsequently established that those who have a longer educational path are healthier, that is not necessarily the consequence of more education. It could also result from healthier people with a potentially better genetic make-up staying in education for longer. Attempts to account for these causality issues are made using statistical methods (for a more recent overview of conventional methods and relevant literature, (see *Athey & Imbens, 2016*), or via what are known as «natural experiments» such as an increase in the number of years of compulsory schooling. For certain types of intervention in the education system, it is also possible to conduct randomised field experiments (see, for example, *Bouguen & Gurgand, 2012*, or *Athey & Imbens, 2017*), where the interventions are only conducted for a randomly selected group of persons while everyone else serves as a control group. Finally, reference must be made to the challenge posed by certain educational effects only emerging over the long term, in dynamic form. This calls for either cohort studies or a solid basis of administrative data, which make it possible to track the education and job market profiles of representative groups over an extended period.

The monetary benefit of education

When it comes to the monetary benefit of education, this relates, at the level of the individual, to how the acquired skills will impact the person's well-being in the form of a greater likelihood of being employed and, in addition, of obtaining a job with good remuneration. At the level of society, it relates – at the macro level – to the influence of the collective acquisition of skills on competitiveness and hence on the growth of a country's economy. At the micro level, the state/societal perspective is that people with a better and more extensive education will earn more and thus generate more tax income (fiscal return on education), thus, justifying public-sector investment in education.

Employment

The influence of education on the likelihood of a person actively participating in the labour market acts via three factors, which are not mutually exclusive. First of all, people may voluntarily forgo taking up employment. The likelihood of not working can – depending on the social system and family status – be higher among people with a low level of education, as such a person will only find a low-paying position with relatively poor working conditions. It also works the other way, for example if a better education leads to a level of remuneration that allows more free time at the expense of time spent working. The latter depends once again on how the education is financed. If a longer time spent in education entails high private cost, the likelihood of the person subsequently working is higher, as the investment would otherwise not be worth it or because the person is forced to work to pay back the student loan. Secondly, the level of education affects the probability of finding a job in the first place. This probability also depends to a large extent, but by no means solely, on the economic situation. Thirdly, skills lose their value over time, and hence the risk of unemployment can depend on how rapidly the acquired skills lose value. The devaluation of skills depends on a number of factors. For a start, it is closely related to the nature of the skill (type of profession). It also depends on the speed of technological change affecting the profession, as well as the scope for individual development as a means of making up for the devaluation.

Empirical literature works on the assumption that more education also increases the likelihood of finding employment (→ *chapter Professional education*, page 265). However, the individual effects can differ depending on the type of education. Most of the current literature concludes that professional training has a positive influence when finding employment relative to a general education, although this advantage turns into a disadvantage further down the career path, as this knowledge is liable to devalue more quickly (Golsteyn & Stenberg, 2017; Hanushek, Schwerdt, Wößmann et al., 2017; Hampf & Wößmann, 2016). However, that is only a supposition: empirical studies cannot include further training following completion of formal education and almost all statistical surveys show that people with a general education are more active in non-formal training (→ *chapter Continuing education and training*, page 279).

On the risk of unemployment due to the progress of digitalisation (Brynjolfsson & McAfee, 2014), it emerges that it is less a factor of level or type of

education than of the number of routine activities involved in a job (→ *chapter General context of the Swiss education system, page 13*). Such routine activities are present in intellectual professions requiring tertiary-level education and in manual work where tertiary education is not a requirement.

Wages

Differences in type and level of education not only affect the likelihood of working, but also the wage that can be obtained by working. Education-dependent wage differentials are due, in part, to the difference in productivity between people with a dissimilar education and hence different levels of competence and, in part, to the fact that more productive jobs (such as those involving the use of technical equipment) tend to be given to highly qualified individuals.

The wage differentials resulting from a different number of years in formal education are denoted as private returns on education. The value of returns on education is easily calculated, but the returns themselves are hard to generalise, i.e. it is not clear whether people who are not educated, would have achieved the same returns if they had been educated. That is because only the actual wages of people are observed. However, educational attainment is not a random choice. If motivated and talented people undergo more demanding and longer courses of education, their higher wages may not result from education, but from comparing the wages of better educated people with those of less educated people, who are anyway not as motivated or talented as the former group, regardless of the difference in education. As a result, returns on education calculated for research purposes for formal education tend to be overestimated, as educated people would have earned more even if they weren't educated, whereas those with a lower level of education would have had to expect a lower wage increase even if they had education (see *Bhuller, Mogstad & Salvanes, 2017*, and *Card, 2001* for a detailed analysis).

Returns on education are not just of interest to researchers as a guide to the effectiveness of education. They also influence individual educational decisions. People have their own ideas of what they will earn through completing their education, implicitly of the return from their education (*Wolter & Weber, 2003*) and of the wage distribution and compensation for wage risks (→ *Figure 341*) involved with an educational decision (*Schweri, Hartog & Wolter, 2011*). These subjective perceptions of the wage effect of educational decisions then impact the individual's choice of education (*Schweri & Hartog, 2018*).

Discounting this overrating of returns from education, the wage benefits in Switzerland of studying for an extra year have fluctuated between about 7 and 8.5% over the past 20 years (→ *Figure 341*). This estimated educational return has been subject to cyclic fluctuations over the past two decades and is showing a slight but consistent upwards trend. A return of 7% indicates that someone who has completed a five-year Master's degree can expect to earn an average of 35% more per year than a person who entered employment after the baccalaureate.

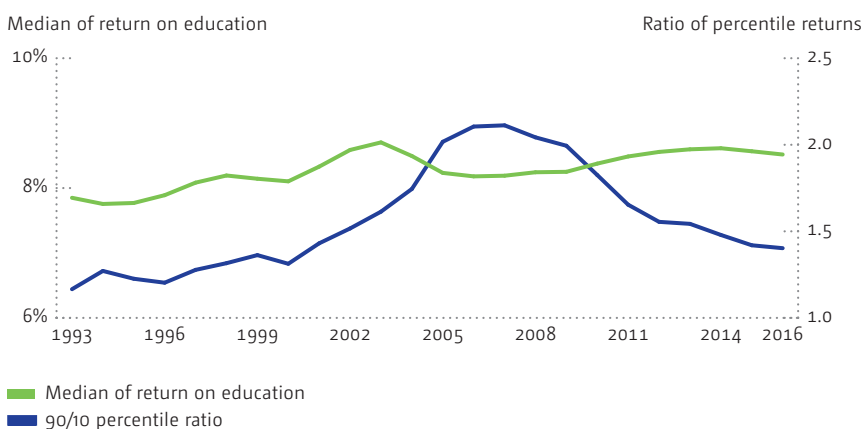
The increase in the return on education over the past twenty years (→ *chapter Tertiary-level education, page 169*) indicates that the growth of education, i.e. the more extensive educational offering is occurring in tandem with rising demand on the labour market. The rise in returns on education applies equally to upper-secondary level and tertiary-level qualifications.

Not everyone will achieve the same wage increase by staying in education for longer and the difference between the lowest and highest wages among people with the same number of years in education increases with the duration of the education. An analysis of the proportion of returns from education achieved by people in the highest income decile relative to those in the lowest decile reveals that the former category achieved approximately 40% more return from education in 2016. This difference in educational returns over the past twenty years follows a puzzling course. In the 1990s it increased steadily and peaked at the last financial and economic crisis when those in the ninth income decile had a return more than twice as high as those in the first income decile. In the interim, it has returned to its level at the start of the 2000s. The economic boom at the start of the last decade may explain the growth in this disparity, as wages for those with the highest level of education tend to rise sharply and spread when the economy is expanding, while the wages of those with a lower level of education are considerably less sensitive to fluctuations in the economy. In any case, recent years at least show that there has been no structural increase in the educational return risk in Switzerland.

Although the educational returns of those who are always in the highest income decile are higher relative to the returns of those who are always in the lowest income decile, this does not automatically mean that the former also derive more benefit from education, as people who always earn more than others regardless of their educational status are able to differentiate themselves through unobservable capabilities. As a result, their higher earning power might not be due to their education but to their intangible abilities. At least that is the conclusion of an analysis of the situation in Switzerland (see *Balestra & Backes-Gellner, 2017*). According to this study, the role of education in wage growth for people in the lower income distribution quantiles are higher than in the highest quantiles. In other words, people in the lowest quantiles will not earn much more if they spend longer in education, although income growth is a function of education.

341 Returns for an extra year of education, median and relationship between returns on education for the first and ninth wage distribution deciles, 1993–2016

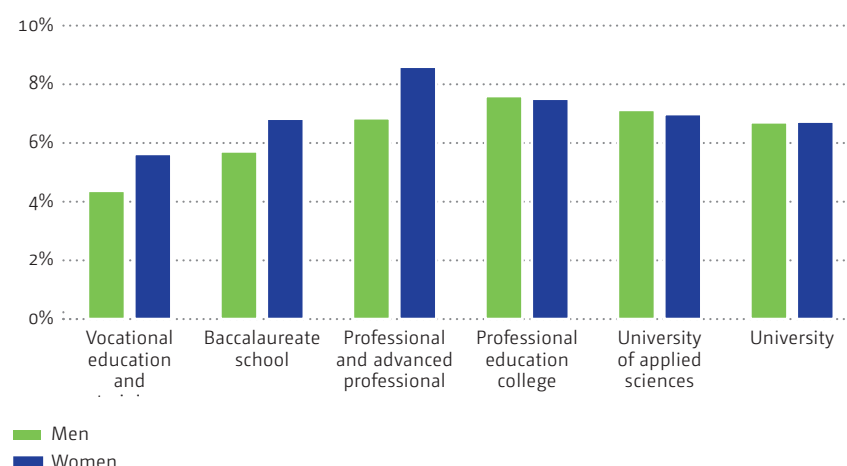
Data: FSO (SLFS); calculations: SCCRE (average over two years)



An analysis of returns on education broken down by type of education (→ Figure 342) does not reveal any major differences in the return from one year of education.

342 Returns on education in 2016 per year and type of education¹

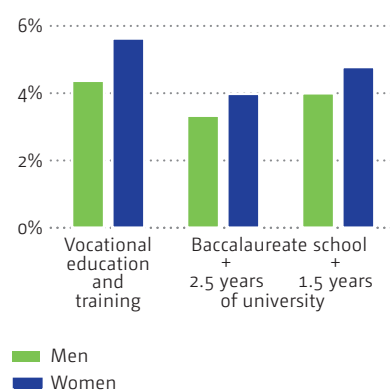
Data: FSO (SLFS); calculations: SCCRE



The only striking feature is that the returns for one year of apprenticeship seem to be a lot lower than for one year of baccalaureate school. However, the latter are hard to interpret for a number of reasons. These returns are skewed upwards and thus overrated, as over half of the people surveyed with a baccalaureate as their highest formal qualification have spent an average of two-and-a-half years at a tertiary education institution (even if they didn't complete the course). That means additional non-earning years would have to be taken into account when calculating the return from education. The educational return for these people would be lower, assuming they subsequently earn a similar average wage to someone who finished their formal education with a baccalaureate, at 4% (women) and just under 3% (men) (→ Figure 343). The anticipated value for the entire group of persons having concluded their education with a baccalaureate is an extra 1.5 years of formal education without completing their studies. Allowing for this aspect, the educational returns in this instance are similar to the return for vocational education and training.

343 Returns on education per year 2016 for persons with a baccalaureate school qualification, corrected for the duration of the university course

Data: FSO (SLFS); calculations: SCCRE



Another explanation for the heterogeneity of individual returns on education can also stem from social background. A study from the USA shows that wage growth for people with a tertiary-level education from low-income families tends to be lower than for people from high-income families (Bartik & Hershbein, 2016). There are different possible explanations for this disparity but they are not covered in this study. It is possible that persons from higher socioeconomic strata choose other, more lucrative courses or have access to better education providers or are simply preferred as candidates, even if they have the same level of qualifications (see, for example, Hupka-Brunner, Scharenberg, Meyer et al., 2015), for example by being first in line for promotion.

A reproduction of this study with data from the Swiss Household Panel, plus information about the father's level of education as proxy information

¹ The returns on education for Figure 342 are calculated in relation to the average income of people without a post-compulsory education. Those in Figure 341 were calculated at the median wage of persons without post-compulsory education. The average wage is above the median, mainly due to the relatively higher wages of foreign men without a post-compulsory education. Therefore all returns from education in Figure 342 are slightly lower than the returns in Figure 341.

for the parent's socioeconomic status, reveals that tertiary education in Switzerland has an advantageous effect on income for persons from the socio-economically better-positioned families (→ Figure 344).² The difference in income between persons from families at the lower end of the income scale and persons from families with a relatively high socioeconomic status are less pronounced in Switzerland than in the USA. It is interesting to note that there is no difference in terms of lifetime income in Switzerland among the different levels of socio-economic origin for persons who complete upper-secondary level education.

Only formal qualifications have been included as a contributory factor to earning higher income in this analysis of returns on education. Studies, particularly from the USA, also show higher earnings for people with good social skills (*Deming, 2017*). Labour market returns are thus especially rewarding for persons who have a high level of cognitive and non-cognitive competency.

A Swedish study (*Edin, Frederiksson, Nybom et al., 2017*) shows rising earnings for non-cognitive abilities to be most prominent in the private sector and among higher earners. The authors show that people with strong non-cognitive abilities tend to work in professions that also require a high level of cognitive ability and in areas with more abstract, social, non-routine and non-automated activities where the relative increase in earnings for non-cognitive abilities also tends to be higher. Non-cognitive abilities also play a role in gaining promotion to management positions.

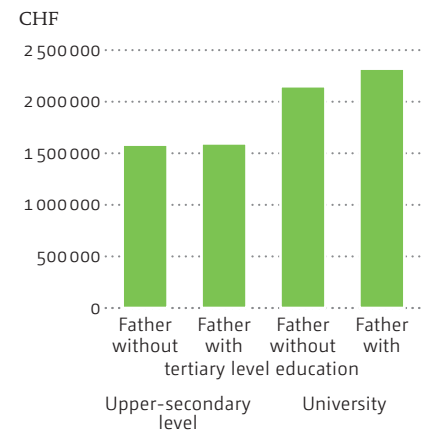
Externalities and fiscal returns

Besides the benefit of education for the person pursuing it, education also has a monetary benefit for society as a whole, which is manifested in the form of higher economic growth and higher tax revenues. The fiscal benefit does not derive solely from the fact that people with a higher level of education earn more, but also from progressive taxation. Moreover, a better education also normally produces a fiscal benefit as better educated people receive fewer social benefits and transfers from the state. The fiscal return on education can thus be viewed as a combination of higher tax revenues, lower government transfers and state expenditure on education. As with the individual return on education, the causal interpretation of the connection between education and fiscal revenue must be approached with caution. More capable people stay longer in education, meaning that the returns tend to be overestimated.

Individual returns on education are normally calculated under the assumption that the people will go on to full employment. This assumption is made on the basis that someone working part-time will assign at least as much importance to leisure time as to the foregone income. The vulnerability of this argument lies in the assumption that part-time work is always a matter of choice. Nonetheless, when calculating fiscal returns it is irrelevant whether the part-time work is voluntary. From the state's perspective, any

344 Lifetime earnings by qualification (tertiary or secondary) and the father's level of education (with or without university qualification)

Data: FORS (SHP 1999–2015); calculations: SCCRE
Lifetime earnings were calculated as the cumulated income from 25 to 62.

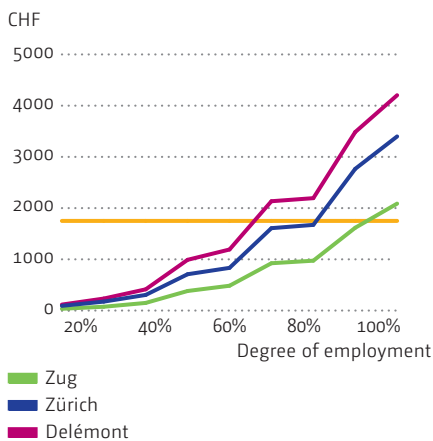


² The data indicate that the difference can be traced back to persons whose parents have no academic background, studying other subjects and selecting relatively low-paying professions.

345 Differences in terms of tax income between persons with a tertiary education and persons with up to an upper-secondary level education depending on degree of employment

Data: FSO (SLFS 2015); calculations: SCCRE

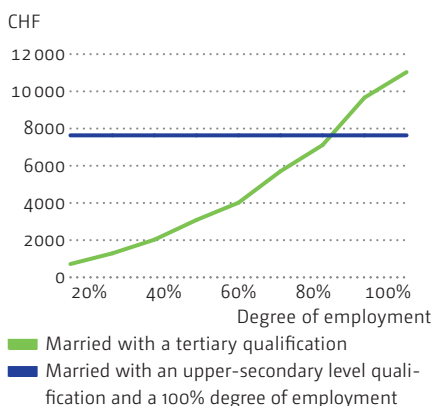
The tax burden was calculated on the basis of the tax calculator for the Federal Tax Administration. The calculation assumes a median income by education level and number of working hours for married people with two children, with a 100% degree of employment and the Swiss average wage for the spouse. Tax deductions and any inter-municipal differences are not considered.



346 Tax income from persons with a tertiary level education by degree of employment compared to tax income from persons with an upper-secondary level qualification with a 100% degree of employment in the town of Zurich

Data: FSO (SLFS 2015); calculations: SCCRE

The tax burden was calculated on the basis of the tax calculator for the Federal Tax Administration. The calculation assumes a median income by education level and number of working hours for married people with two children, with a 100% degree of employment and the Swiss average wage for the spouse.



reduction in working hours entails a reduction in the fiscal return on education, as the costs incurred by the state are not contingent on whether a person goes on to work. While the progressive tax rate means the fiscal returns tend to increase, the longer the duration of the education, it works the other way when working hours are reduced. When people reduce their working hours and income, the fiscal return on education falls disproportionately. To illustrate this effect, Figure 345 shows the impact on the relative tax income for a person with a tertiary-level education compared to a person with an upper-secondary level qualification if both people reduce their working hours. This effect depends on the level of the taxation as well as the progression, three different cantonal capitals were selected to illustrate this point.

Working on the basis of public education costs averaging about 120 000 Swiss francs for a tertiary education and 50 000 francs for vocational education and training³ and distributing the difference of these costs over each year spent working until retirement, financing a person's studies would only pay off for Zurich in fiscal terms, if the person worked a minimum of 80% on average. In Zug, where taxes are lower (but study costs are identical), a 90% position would be the minimum requirement, and in Delémont, which has a high tax rate, a 65% (average) position would be fiscally viable.⁴

The calculations in Figure 345 are based on the tax revenue from persons with different education levels but the same degree of employment. A similar picture emerges for a person with an upper-secondary level qualification working full-time. A person in Zurich with a tertiary education would have to work almost 80% to pay the same taxes as someone with a lower level of education. Only from that point would more taxes be paid and the state could only anticipate a fiscal return on education from a 90% degree of employment.⁵

The social return from education can be more than the sum of the individual advantages and fiscal returns, as education can also create positive externalities. Positive externalities from education arise when the education does not just have a positive impact on the students but also on people who have not pursued an education. These positive externalities can be seen on the labour market if the uneducated persons' productivity increases when they start to work with better-educated persons (see *Winters, 2016*, for an overview or *Nix, 2015*, or *de Grip & Sauermann, 2012*). However, these positive externalities are not restricted to the micro level. The same effects also explain the observation that the macroeconomic growth effects from education are higher than the individual wage advantages resulting from education (see, for example, *Hanushek & Wößmann, 2012*).

3 Education expenditure per apprentice/student by level of education, 2014 Sources: FSO – public education expenditure (PPE), Pupils (PPL), Students and university qualifications; FFA – Financial Statistics (FS).

4 This estimate is consistent with a study by the OECD (2017a), which estimates the net fiscal return for a tertiary education in Switzerland. The study gives a negative return for women averaging –9000 USD, and +64 000 USD for men. These figures do not have to be identically high or low in all countries. Pfeiffer and Stichnoth (2015) calculated fiscal returns for Germany for university studies (relative to vocational training) and vocational training (relative to compulsory school), which are a lot higher, also because they account for savings on social transfers.

5 The situation that many persons, particularly those in a double-income household, do not work full-time and thus contribute to low or even negative fiscal returns, is again partially due to the tax and social transfer system. Morger (2016) finds, for example, that women and mothers often work part-time to reduce taxes and childcare costs

The non-monetary benefit of education

Education and skills also generally influence many different dimensions and aspects of life outside the workplace. Better education is expected to have positive effects on health, on life expectancy, on personal satisfaction, on people living together harmoniously, on political participation and on other outcomes (see, for example, *Oreopoulos & Salvanes, 2011; Grossman, 2005*). These effects are of a non-monetary nature, since they are not directly measurable in monetary values. They nonetheless normally generate monetary benefits, or benefits to which a monetary value can be attached at the level of both the individual and society as a whole. The following sections highlight the most important non-monetary outcomes on which education exerts a positive influence.

Health

The influence of education on health is interesting in several respects. For a start, it is hoped that education will have a positive direct and indirect influence on the health of the persons pursuing an education. The education system is designed to exercise a positive direct impact on health-related behaviour, for example, by promoting types of behaviour which are likely to prevent the emergence of unhealthy conduct. It also acts indirectly, as well-educated people earn more, can afford better health services and thereby increase the opportunity cost of unhealthy behaviour. Secondly, a positive correlation between education and health is also of interest to society, as the costs of unhealthy behaviour are socialised for the most part (i.e. borne by everyone). This means there is a risk of incurring negative externalities through not pursuing an education.

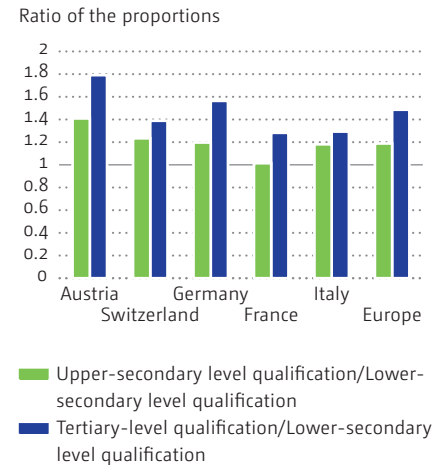
As with all links between education and all types of monetary and non-monetary outcomes, the causality is not always a given, even if there are strong statistical correlations. That is because other factors can also have a positive influence on health, so the correlation between education and health could actually be of a spurious nature. Besides, the causal effect can also work in reverse, i.e. people with health impairments tend to be less disposed to pursue an education or to attain the same level of education (*Bhalotra, Karlsson, Nilsson et al., 2016; Grossman, 2015; Oreopoulos & Salvanes, 2011*). As a result, there are also attempts to promote health directly through education, by offering healthy fare in school canteens, for example (*Anderson, Gallagher & Ritchie*).

Meanwhile, however, many empirical studies have been able to isolate the causal relationship between education and health. These studies show that education reduces unhealthy behaviour, such as smoking, drug abuse and alcohol consumption, while promoting physical exercise and thereby reducing the obesity risk (*Brunello, Fort, Schneeweis et al., 2016; Gagné, Frohlich & Abel, 2015; Nordahl, Lange, Osler et al., 2014; Abel, Hofmann & Schori, 2013*). The same applies for the effect of education on health brought about by a higher income (*Grossman, 2015; James, 2015*).

Education also has a lasting effect on health. A number of studies (e.g. *Campbell, Conti, Heckman et al., 2014; Schneeweis, Skirbekk & Winter-Ebmer, 2012; Clouston, Kuh, Herd et al., 2012*) substantiate the lasting effect of education on health, i.e. education acquired in childhood and during adolescence still has a positive effect on health in adulthood, which endures into old age.

347 Proportion of persons with good subjective health by educational qualification (relative to persons without a post-compulsory education and regression adjusted)

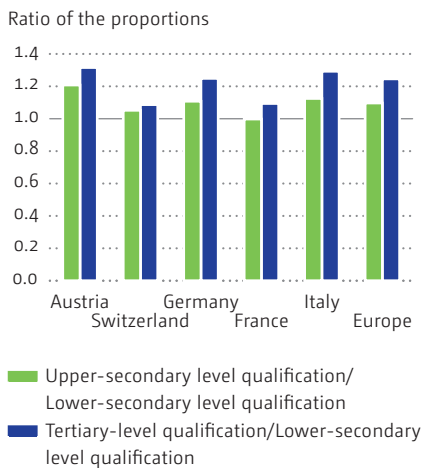
Data: Eurostat (Statistics on Income and Living Conditions [SILC], 2014); calculations: SCCRE



The values show the proportion of persons with good subjective health and an upper-secondary level or tertiary qualification relative to the proportion of persons with good subjective health and a compulsory schooling qualification. For example, the value of about 1.2 per upper-secondary level/lower-secondary level in Switzerland shows that the proportion of persons with upper-secondary level education and good subjective health is higher by a factor of 1.2 (or 20 percentage points) than for those with a lower-secondary level qualification. The estimates of the proportions are based on linear probability models by country for an indicator for good subjective health with qualifications serving as explanatory variables and control variables for age, gender, marital status and income.

348 Proportion of persons with high post-qualification life satisfaction (relative to persons without a post-compulsory education and regression adjusted)

Data: Eurostat (Statistics on Income and Living Conditions [SILC], 2013); calculations: SCCRE



The values show the proportion of persons with high life satisfaction and an upper-secondary level or tertiary-level qualification relative to the proportion of persons with high contentment and a lower-secondary level qualification. For example, the value of about 1.1 per tertiary/lower-secondary level in Switzerland shows that the proportion of persons with high contentment and a tertiary-level qualification is higher by a factor of 1.1 than for those with a lower-secondary level qualification. The estimates of the proportions are based on linear probability models by country for an indicator for high contentment with qualifications serving as explanatory variables and control variables for age, gender, marital status and income.

Although the extent of causation in the education-health correlation cannot be precisely determined in this case, Figure 347 shows (as expected) a positive connection between a person's education and subjective health in all countries reviewed. The added subjective benefit, especially for persons with tertiary-level education relative to persons with upper-secondary level education, tends to be lower in Switzerland than in neighbouring countries, with the exception of Italy. This indicates that the people surveyed in Switzerland are generally and independently of their level of education, satisfied with their health, which may be due to healthy behaviour being encouraged during compulsory schooling or through other measures unrelated to education.

Well-being and happiness

As with the effects on health, there are potentially a number of direct and indirect mechanisms through which education can influence well-being. First of all, the knowledge acquired through education can be viewed as a benefit in itself, thus enhancing self-contentment. Secondly, education can improve our ability to reflect on our own situation and that of other people, thus increasing our capacity to cope with life in general or with twists and turns of fate, which in turn boosts happiness. The attainment of a certain level of education and the associated education-based identification with a certain group can also have a beneficial psychological effect and thereby increase contentment (*Kuppens, Easterbrook, Spears et al., 2015*). On the other hand, a higher level of education can also lead to higher expectations of self, others or of life in general. These expectations are harder to meet and failure to do so can have a negative impact on self-contentment (*Stewart-Brown, Samaraweera, Taggart et al., 2015*).

Apart from the direct influences of education on life satisfaction, there are indirect influences that must be borne in mind. Education can generate greater contentment through the income obtained or the profession exercised, as well as through the fact of being in work and enjoying good health. The many conceivable direct and indirect influences and the possibility that education can negatively impact contentment, make it difficult to precisely empirically identify these channels. As a result, the effects of education on happiness have a smaller empirical basis and are not as clearly demonstrated as the effects of education on health. Moreover, contentment is harder to measure than health, which is objectively quantifiable (*Blanchflower & Oswald, 2011*). As with the statistical correlation between level of education and subjective health, there is also such a positive interrelation between education and the subjective well-being (→ Figure 348). The differences between the different levels of education in Switzerland are also relatively small in this instance, both relative to neighbouring countries and by comparison with Europe as a whole.

Crime

One of the positive effects of education is also that it reduces criminal or other socially harmful behaviour (*Hjalmarsson, Holmlund & Lindquist, 2015; Machin, Marie & Vujic, 2011*). Here again, education can exert its influence via a whole series of direct and indirect channels, some of which have

been empirically proven. Education can directly nurture cognitive and non-cognitive traits and skills, such as patience or risk aversion, which reduce the likelihood of anti-social and criminal behaviour. One direct and empirically proven correlation between education and crime stems from the fact that young people who spend more time in school have less opportunity to commit crimes. A number of studies support this finding through changes in the duration of obligatory schooling (Bell, Costa & Machin, 2016; Landersø, Nielsen & Simonsen, 2016; McAdams, 2016; Anderson, 2013).

One particular way in which education can affect crime indirectly is through the income and career opportunities that it opens up. These markedly increase the opportunity costs of socially undesirable behaviour and, at the same time, reduce the incentive to acquire income and recognition by illegal methods (see, for example, Machin, Marie & Vujic, 2011, or Entorf, 2009). Since potential income from criminal behaviour is highly uncertain and involves a great deal of risk compared with the relatively certain income from investments in education, it can be assumed that more risk averse people will dispense with behaviour of this type (Mocan & Unel, 2011). The significance of opportunity costs, which increase in tandem with education, is however relativised if the earnings opportunities from criminal activities increase very sharply, while, at the same time, a certain level of education opens up opportunities to partake in certain profitable criminal ventures. This is demonstrated by the positive correlation between level of education and probability of committing white-collar crime (Lochner, 2004).

Finally, here again, attention must be drawn to the possibility of an inverse cause and effect relationship. Education can do more than just influence the probability of engaging in criminality. It also works the other way, in that criminal acts – especially when committed at a young age – reduce the likelihood of the offender starting and completing a longer or better course of education.

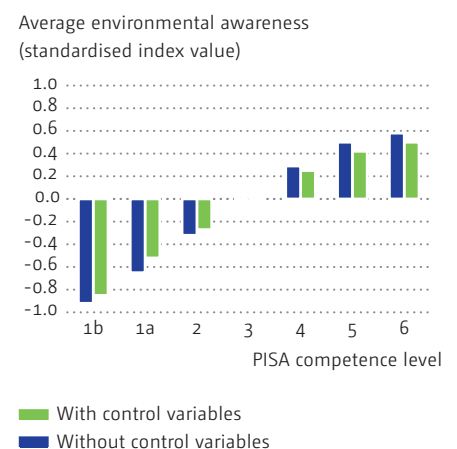
Environmental knowledge and behaviour

Education can have an added positive effect if it raises awareness of the environment and prompts environmentally-conscious behaviour. The most direct link comes from having environment and ecology taught as subjects at school (Meyer, 2015).

An analysis of PISA tests relating to the environmental awareness of pupils in Switzerland (→ Figure 349) also shows that, after including a broad range of control variables, there is a strong connection between the school competencies and environmental awareness. This correlation does not, however, indicate a causal relationship. Such a relationship cannot be proved through this cross-sectional analysis. Another approach would be to spread the comparison to the variation in environmental awareness among pupils from different countries that take the PISA tests. This comparison shows no correlation between the national averages in terms of environmental awareness and the national averages for PISA points. The main differences internationally in terms of environmental awareness must therefore stem from other non-school-related factors.

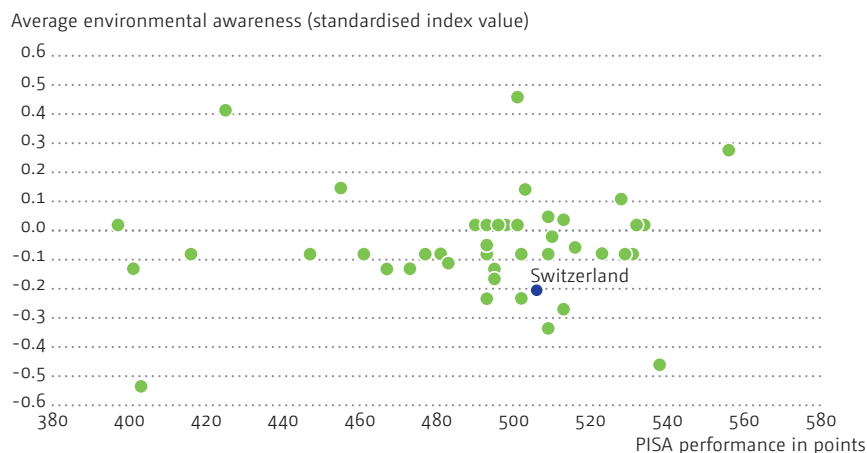
349 Correlation between environmental awareness and PISA results in Switzerland

Data: OECD (PISA 2015); calculations: SCCRE
PISA competence level 3 is the reference category.
The control variables include age, gender, class, migration status, parent's education and socio-economic status.



350 Correlation between environmental awareness and PISA results by international comparison

Data: OECD (PISA 2015); calculations: SCCRE



Even if formal education raises awareness of the environment, there is still no guarantee that this actually translates into environmentally friendly conduct. Several studies show a positive correlation between level of education and greenhouse gas emissions (see, for example, *Büchs & Schnepf, 2013*). This correlation, however, is only high for mobility-related emissions, and very low to negative for emissions from energy consumption in the home (*Büchs & Schnepf, 2013; Poortinga, Steg, & Vlek, 2004*).

Moreover, the effects of education on environmental awareness and behaviour are not only direct, but also indirect, through the relationship between education and income. A high income can positively influence behaviour because environmental quality is viewed as a (positive) asset that people (or societies) with a higher income are better able to afford, and, indeed, wish to be able to afford, for example, through organic products or more expensive, energy-efficient devices. At the same time, however, a higher income increases the probability of environmentally-harmful behaviour. *Bruderer Enzler & Diekmann, 2015*, demonstrate that an additional year of education entails 5% more mobility emissions and 1% more residential emissions), as people on low incomes simply can't afford to buy certain goods (e.g. a large house) or to indulge in certain behaviour.

Political participation

The expected influence of education on civic knowledge and behaviour is ultimately the most important element for peaceful coexistence within a society and for a functioning democracy.

As with environmental knowledge, an attempt is made to steer this behaviour directly via the education provided at school. This gives rise to two fundamental questions. Firstly: can knowledge and interest in political participation be influenced by school? Secondly: does more knowledge really bring a higher level of political participation?

The Swiss education system assigns considerable weight to civic knowledge as it is firmly and prominently positioned in the individual curricula (see, for example, *Stadelmann-Steffen, Koller & Sulzer, 2015*, for upper-secondary level education).

However, research is divided regarding the anticipated positive association between a person's level of education and their political activity. Some analyses support the existence of such associations, while some even show that the difference in political participation between those of low and high education has increased in the past few decades (*Armingeon & Schädel, 2015*). Other studies show a positive correlation between education and political participation, even allowing for all types of personal characteristics, for example *Dinesen, Dawes, Johannesson et al. (2016)* in a twin study analysing the connection between education and political participation in the USA, Denmark and Sweden. They find a positive educational effect even when controlling for genetic factors and family background, at least for the USA and Denmark (but not for Sweden). However, other studies consistently call the postulated causal effect of education into question. For example, *Persson, Lindgren & Oskarsson (2016)* demonstrated via quasi-experimental variations of the level of education that it cannot actually be used to explain any differences in political participation.

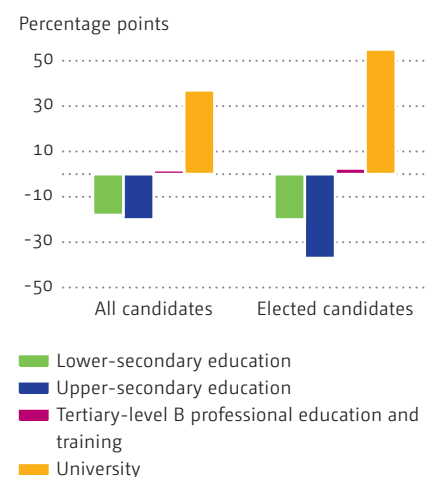
However, education does not just influence whether a person is politically active. It can also influence political preferences (see, for example, *Meyer, 2017*). Most empirical studies identify a positive relationship between education and a liberal ideology or between education and political viewpoints tending to the left (see, for example, *Weakliem, 2002*). Finally, other studies show that an inverse relationship can arise, i.e. political positions influencing educational preferences. However, most studies simply identify correlations but no causal relationships in this regard.⁶

While most studies in this area address the question of whether a longer education or course content with a direct connection to political behaviour promotes political activities, such as party membership, interest in political issues or participation in votes and ballots, there is also more recent theoretical and empirical literature approaching the issue of whether better educated people are also more likely to assume a political role or to be elected to such a role.⁷ It is also hard to judge in this instance whether people with certain character traits, which cannot be observed by researchers, also pursue education for longer and are more predisposed to show interest in a political career and, due to these character traits, are more likely to be elected by the voters, or whether it is due to their education, i.e. it is actually education that has a causal influence on whether people tend to show interest in political office, or also on whether they are more likely to attract votes.⁸

Without providing a conclusive answer to this question, a positive correlation in two aspects is evident in Swiss politics between a person's level of education and the probability of assuming a mandate in the national parliament. The data in the 2015 Selects study shows (→ Figure 351) that politicians having completed a tertiary education were, for a start, more promi-

351 Difference in proportions of candidates and elected members of parliament at the Federal elections in 2015 relative to corresponding sections of the population by highest educational qualification, in percentage points

Data: Selects Candidate Survey, 2015; distributed by FORS, Lausanne, 2016; calculations: SCCRE
Positive (negative) values show by how many percentage points the proportion of persons with the assigned qualification is higher (lower) among the circle of politicians than in the Swiss population.



⁶ As an example of a non-causal correlation, *Denzler and Wolter (2017)* demonstrate a significant statistical correlation between political preferences and choice of subject in the course selection at Swiss universities, but the correlation disappears once sociodemographic factors and personal characteristics are factored in.

⁷ For the theory see *Galasso & Nannicini (2011)* and *Caselli & Morelli (2004)*.

⁸ A study using Swedish data (*Dal Bó, Finan, Folke et al., 2017*), shows that nominated and elected politicians have a higher level of education and stronger leadership qualities as a rule and score higher results in cognitive tests than the rest of the population, and that this result is not solely due to social background.

nent among the candidates for such an office, and were also more likely to be elected to office than people of lower educational achievement. On the other hand, persons having completed a tertiary level B professional education and training were also represented to the same extent among the candidates and elected politicians as among the general population.

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Annex

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