OECD Economic Surveys
SWITZERLAND

NOVEMBER 2017

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OECD Economic Surveys: Switzerland 2017

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Please cite this publication as:
OECD (2017), *OECD Economic Surveys: Switzerland 2017*, OECD Publishing, Paris.
http://dx.doi.org/10.1787/eco_surveys-che-2017-en

ISBN 978-92-64-28302-2 (print)
ISBN 978-92-64-28303-9 (PDF)
ISBN 978-92-64-28305-3 (epub)

Series: OECD Economic Surveys
ISSN 0376-6438 (print)
ISSN 1609-7513 (online)

OECD Economic Surveys: Switzerland
ISSN 1995-3402 (print)
ISSN 1999-0464 (online)

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Table of contents

Basic statistics of Switzerland, 2016 8
Executive summary 9

Assessment and recommendations 13
Switzerland is doing well by most measures of economic and social well-being . . . 14
The recovery has been difficult to sustain 17
Assessing the large current account surplus 22
Preserving price and financial stability 25
Balancing fiscal priorities in the short and medium term 29
Boosting productivity for long-term growth and living standards 35
Ensuring dynamic skills training and life-long learning 44
Enhancing environmental sustainability 50
Bibliography 53

Annex. **Progress in structural reform** 57

Thematic chapters

Chapter 1. **Boosting productivity in Switzerland** 63
Productivity growth has under performed recently, but its level remains elevated 65
Understanding the drivers and determinants of productivity 72
Recommendations to boost Swiss productivity 100
Bibliography 101
Annex 1.A1. Firm database 106

Chapter 2. **Ensuring a dynamic skills-training and life-long learning system** 111
Demand for skills and skills mismatch 116
The impact of digitalisation on work 121
Overview of the Swiss education system 123
The supply of VET 129
The post-secondary education mix 132
Life-long learning 133
Equity in skills and education 136
Recommendations to make education and skills training more responsive 141
Bibliography 142

Boxes

1. Estimating the cyclical component of the current account surplus 23
2. Reforming corporate taxation to meet international obligations 30
3. The importance of immigration in Switzerland 33
1.1. Role of measurement issues 66
1.2. Environmental productivity 66
1.3. The effects of immigration on productivity outcomes 70
1.4. Availability of Swiss firm-level data 74
2.1. Strengths of the Swiss vocational education and training system 113
2.2. The 2003 OECD Adult Literacy and Life Skills Survey 119
2.3. Forecasting skills needs 130

Tables

1. Macroeconomic indicators and projections 18
2. Possible shocks and their economic impact 22
3. Switzerland's net international investment position 24
4. Past recommendations relating to financial-sector regulation 28
5. Fiscal indicators 30
6. Past recommendations related to ageing 35
7. Comparison of the regime for resolving insolvency 41
8. Past recommendations on addressing environmental sustainability 52
1.1. Comparison of the regime for resolving insolvency 84
A1.1. R&D rate of return 108
A1.2. Type of competition 109
A1.3. Correlations with productivity growth 109
2.1. Sources of working-age population growth 120
2.2. Responsibilities for non-compulsory education 124
2.3. PISA scores and gender differences across selected countries 126

Figures

1. Well-being and trust in government 15
2. Sources of real income differences across OECD countries, 2015 16
3. Average annual rate of trend labour productivity growth 17
4. Drivers of growth dynamics 19
5. The current account surplus has remained large despite the appreciation of the franc 20
6. Exports of goods by market and type, 2016 20
7. Labour market developments 21
8. Inflation has become positive 21
9. Developments in macro-financial vulnerabilities since 2007 22
10. Components of the current account surplus 23
11. The savings-investment balance 24
12. Monetary policy has remained very accommodative 25
13. Banks are recouping some costs on mortgages 26
14. The financial sector is adjusting to the post-crisis environment 27
15. Housing prices and household debt 28
16. Government spending and debt are comparatively low 31

17. The federal debt brake . . . 32
18. Long-term projections for age-related spending . . . 33
19. The role of net immigration in past and projected population growth . . . 34
20. Comparison of hourly productivity levels across several European economies . . 36
21. Decomposition of the growth rate of Swiss potential output per capita . . . 36
22. Firm performance has diverged since the crisis . . . 37
23. Network sectors are highly regulated . . . 38
24. Regulation of trade in services is relatively restrictive . . . 40
25. Innovation performance is high . . . 42
26. Parts of the population are underutilised in the labour market . . . 43
27. Most of Switzerland's job growth has been in high-skill jobs . . . 45
28. Job vacancy rates by sector . . . 45
29. Tertiary qualifications in OECD countries, 2015 . . . 47
30. Participation in life-long learning across Europe . . . 48
31. Difference in PISA science score levels between students in schools with high and low concentrations of students with an immigrant background, 2015 . . . 49
32. Students in vocational education and training . . . 50
33. Environmental indicators . . . 51
1.1. Growth of output per hour worked . . . 65
1.2. CO_2 productivity . . . 67
1.3. Decomposition of GDP per capita amongst OECD countries . . . 67
1.4. Decomposition of growth of potential output per capita . . . 68
1.5. Labour productivity trends by major regions . . . 71
1.6. Contribution to productivity growth by sector . . . 73
1.7. Labour reallocation . . . 73
1.8. Allocation of labour input across firms and labour productivity . . . 75
1.9. Employment protection legislation strictness . . . 76
1.10. Wage differences between leading and other firms . . . 77
1.11. Employment rate differences between native- and foreign-born population . . . 78
1.12. Share of small enterprises by main sector . . . 80
1.13. Importance of bank and non-bank financing . . . 82
1.14. Backward and forward participation in global value chains . . . 85
1.15. PMRs in international comparison, 2013 . . . 86
1.16. International comparison of PMRs by sector, 2013 . . . 86
1.17. Price level comparison for household final consumption expenditure . . . 88
1.18. Services trade restrictiveness index, 2016 . . . 89
1.19. FDI Regulatory Restrictiveness Index, 2016 . . . 90
1.20. Share of Swiss firms that are highly productive . . . 91
1.21. Importance of the most productive firms . . . 92
1.22. Labour productivity of the most productive firms versus the rest . . . 92
1.23. Gross domestic expenditure on R&D . . . 94
1.24. Quality of academic publications . . . 94
1.25. Innovation performance remains high . . . 95
1.26. Patents covering inventions made abroad . . . 96
1.27. Business R&D expenditure in the pharmaceuticals industry . . . 97
1.28. Total government support to business R&D . . . 98

2.1. Youth labour market outcomes, 2016 113
2.2. Expected average years of schooling of the adult population 114
2.3. Public expenditure on educational institutions by level of education 115
2.4. Most of Switzerland's job growth has been in high-skill jobs 117
2.5. Job vacancy rates by sector in Switzerland and in the ICT sector across Europe. . 117
2.6. Types of mismatch in Europe 118
2.7. Adult Literacy and Life Skills Survey (ALL) scores, 2003 120
2.8. Employment in the ICT sector and its sub-sectors 122
2.9. Labour productivity in the ICT sector is high 122
2.10. PISA outcomes versus expenditure per student 125
2.11. Percentage of 25-64 year-olds whose highest level of education is upper-secondary or post-secondary non-tertiary, by programme orientation (2016) 127
2.12. The post-compulsory education system 127
2.13. Average years of tertiary schooling for the total population, 1950 to 2010 128
2.14. Tertiary qualifications in OECD countries, 2015 133
2.15. Participation in life-long learning across Europe by educational attainment . . . 134
2.16. Students in vocational education and training 137
2.17. Difference in PISA science score levels between students in schools with high and low concentrations of students with an immigrant background, 2015 139

This Survey *is published on the responsibility of the Economic and Development Review Committee of the OECD, which is charged with the examination of the economic situation of member countries.*

The economic situation and policies of Switzerland were reviewed by the Committee on 5 October 2017. The draft report was then revised in the light of the discussions and given final approval as the agreed report of the whole Committee on 19 October 2017.

The Secretariat's draft report was prepared for the Committee by Christine Lewis, Patrice Ollivaud and Petar Vujanovic under the supervision of Peter Jarrett. The survey also benefited from contributions from Christian Hepenstrick, seconded from the Swiss National Bank. Research assistance was provided by Klaus Pedersen and Anne Legendre. Editorial assistance was provided by Elisabetta Pilati.

The previous Survey of Switzerland *was issued in December 2015.*

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BASIC STATISTICS OF SWITZERLAND, 2016

(Numbers in parenthesis refer to the OECD average)*

LAND, PEOPLE AND ELECTORAL CYCLE

Population (million)	8.4		Population density per km^2	198.1	(35.3)
Under 15 (%)	14.8	(18.0)	Life expectancy (years, 2015)	83.0	(80.7)
Over 65 (%)	18.0	(16.5)	Men	80.8	(78.1)
Foreign-born (%, 2015)	29.0		Women	85.1	(83.3)
Latest 5-year average growth (%)	1.2	(0.6)	Latest general election	October 2015	

ECONOMY

Gross domestic product (GDP)			Value added shares (%)		
In current prices (billion USD)	669.2		Primary sector	0.7	(2.5)
In current prices (billion CHF)	659.2		Industry including construction	26.0	(26.6)
Latest 5-year average real growth (%)	1.7	(1.9)	Services	73.2	(70.4)
Per capita (000 USD PPP)	64.1	(42.1)			

GENERAL GOVERNMENT

Per cent of GDP

Expenditure	34.3	(41.5)	Gross financial debt (2015)	44.8	(108.4)
Revenue	34.6	(38.6)	Net financial debt (2015)	5.9	(69.9)

EXTERNAL ACCOUNTS

Exchange rate (CHF per USD)	0.985		Main exports (% of total merchandise exports)		
PPP exchange rate (USA = 1)	1.221		Chemicals and related products, n.e.s.	31.5	
In per cent of GDP			Commodities and transactions, n.e.s.	28.1	
Exports of goods and services	65.8	(53.5)	Miscellaneous manufactured articles	17.9	
Imports of goods and services	50.6	(49.4)	Main imports (% of total merchandise imports)		
Current account balance	9.8	(0.2)	Commodities and transactions, n.e.s.	31.7	
Net international investment position	125.4		Machinery and transport equipment	18.7	
			Chemicals and related products, n.e.s.	17.2	

LABOUR MARKET, SKILLS AND INNOVATION

Employment rate for 15-64 year-olds (%)	79.6	(66.9)	Unemployment rate, Labour Force Survey (age 15 and over, %)	4.9	(6.3)
Men	83.7	(74.7)	Youth (age 15-24, %)	8.6	(13.0)
Women	75.4	(59.2)	Long-term unemployed (1 year and over, %)	1.9	(2.0)
Participation rate for 15-64 year-olds (%)	83.9	(71.7)	Tertiary educational attainment 25-64 year-olds (%)	41.2	(36.7)
Average hours worked per year (2015)	1 590	(1 766)	Gross domestic expenditure on R&D (% of GDP, 2015)	3.4	(2.3)

ENVIRONMENT

Total primary energy supply per capita (toe, 2015)	3.0	(4.1)	CO_2 emissions from fuel combustion per capita (tonnes, 2014)	4.7	(9.4)
Renewables (%, 2015)	22.4	(9.6)	Water abstractions per capita (1 000 m^3, 2012)	0.3	
Exposure to air pollution (more than 10 µg/m^3 of $PM_{2.5}$, % of population, 2015)	87.1	(75.2)	Municipal waste per capita (tonnes, 2015[a])	0.7	(0.5)

SOCIETY

Income inequality (Gini coefficient, 2014)	0.297	(0.311)	Education outcomes (PISA score, 2015)		
Relative poverty rate (%, 2014)	9.9	(11.1)	Reading	492	(493)
Median equivalised household income (000 USD PPP, 2014)	36.5	(23.1)	Mathematics	521	(490)
Public and private spending (% of GDP)			Science	506	(493)
Health care, current expenditure	12.4	(9.1)	Share of women in parliament (%, July 2017)	32.0	(28.7)
Pensions (2013)	11.5	(9.1)	Net official development assistance (% of GNI)	0.54	(0.39)
Education (primary, secondary, post sec. non tertiary, public, 2014)	3.4	(3.4)			

Better life index: *www.oecdbetterlifeindex.org*

a) 2014 for the OECD average.

* Where the OECD aggregate is not provided in the source database, a simple OECD average of latest available data is calculated where data exist for at least 29 member countries.

Source: Calculations based on data extracted from the databases of the following organisations: OECD, International Energy Agency, World Bank, International Monetary Fund and Inter-Parliamentary Union.

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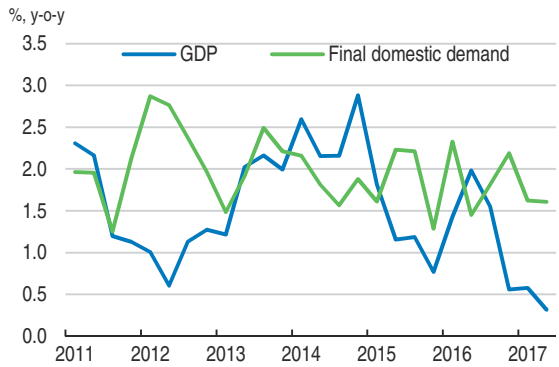
Executive summary

- *The economy is growing slowly*
- *Faster productivity growth is needed to raise incomes*
- *The demand for skilled workers has been strong*

The economy is growing slowly

Growth in output and domestic demand are modest



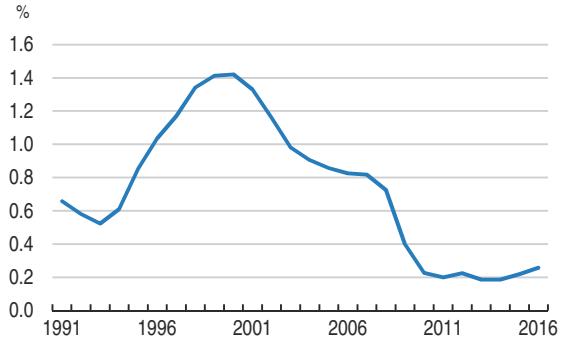
Source: SECO.

StatLink http://dx.doi.org/10.1787/888933620417

Switzerland continues to provide its citizens with a high standard of living. The economy has shown considerable resilience, most recently to the exchange rate appreciation in 2015. Nevertheless, growth has been too slow to absorb spare capacity or raise income per capita meaningfully. Unconventional monetary policies have helped return inflation to positive territory, but pose other risks. The current account surplus remains large. Fiscal policy is sound, and the federal fiscal rule has helped lower public indebtedness but it implies that spending priorities must be funded from other areas. Ensuring the sustainability of the pension system and implementing effective policies for extending healthy working lives are becoming increasingly urgent.

Faster productivity growth is needed to raise incomes

Trend labour productivity growth has stalled



Source: OECD Economic Outlook database.

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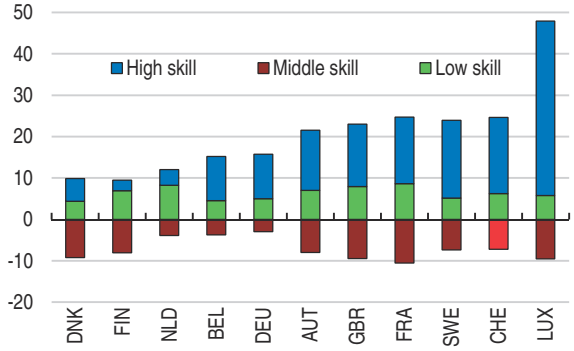
Swiss labour productivity growth has been falling since the late-1990s to be one-third of the OECD average rate in the past decade. Swiss R&D and innovation are top-ranked but need to be more widespread across firms and sectors. Boosting entry by innovative start-ups could reverse the recent divergence between frontier firms and the rest. Improving competition, raising trade in services and investment and lowering administrative burdens could boost the creation of innovative start-ups and revive growth. Higher education institutions can play a role by enhancing entrepreneurship through incubators. And the nation could make more use of its women and immigrants, neither of whom are achieving their potential.

The demand for skilled workers has been strong

Employment growth has been skill-intensive

% change, 2000-16



Source: Eurostat.

StatLink http://dx.doi.org/10.1787/888933620455

The Swiss education and training system is well regarded and has contributed to high employment rates. Demand for skilled workers has been strong and is likely to continue so. This, together with far-reaching changes such as digitalisation and the risk of declining immigration, will challenge the education and training system. The supply of tertiary-educated workers will need to be expanded further. Access to lifelong-learning opportunities should be broadened to those outside the labour force and the less well-educated and take-up by older workers encouraged. Tracking in the school system has been reduced but still limits the achievement of those from disadvantaged socio-economic backgrounds.

MAIN FINDINGS	KEY RECOMMENDATIONS
Entrenching the expansion and sustaining high living standards	
Monetary policy is supporting growth and the return to price stability. There is limited scope for further monetary accommodation, and financial stability risks are rising. The fiscal position is sound.	Avoid persistent budget underspending through better co-ordinating procedures at federal and sub-national levels. Reduce agricultural subsidies and pursue efficiency gains in public spending to free up funds for measures that enhance growth and inclusiveness.
House price growth has slowed, but imbalances remain. Parts of the banking system are highly exposed to housing. Guarantees provided by cantons to their public banks are a fiscal risk and distort competition. Bank lending standards may be declining.	Eliminate remaining explicit cantonal government guarantees to their public banks. Establish a formal framework for setting mortgage lending limits that takes affordability into account and is enforced on a comply-or-explain basis.
Ageing-related spending represents a fiscal burden that may crowd out other expenditure. Workers face increased uncertainty about their retirement incomes and working lives. Precautionary household saving resulting from uncertainty about the future and the need to finance costly housing purchases may be contributing to the large current account surplus.	Fix the retirement age at 65 for both sexes, and thereafter link it to life expectancy. Increase financial incentives to work longer before retirement. Promote programmes to lengthen healthy working lives, including preventative health programmes. Promote lifelong training, career planning and tailored job-search assistance to enhance workers' resilience to change.
Boosting productivity for long-term growth	
Government involvement in sectors such as energy, telecommunications and transport is significant and competition weak. The competition authority's board includes representatives of economic associations, harming its perceived independence. Market access between cantons is difficult for several occupations.	Increase private ownership and remove barriers to entry, including restrictions on the number of competitors, in energy, telecommunications and transport. Remove representatives of economic associations from the board of the competition authority.
Restrictions on services trade and agricultural imports are substantial, especially regarding the movement of persons. New free-trade agreements provide an opportunity to increase market size, achieve scale economies and boost productivity.	Lower restrictions on trade in both goods and services, notably in highly protected agricultural products. Complete the negotiations for free-trade agreements that are underway with Asian nations and MERCOSUR.
The entrepreneurship rate is low for younger age groups. The administrative burden is high. Fragmented delivery reduces the effectiveness of government support.	Finalise the virtual one-stop shop for administrative affairs. Establish cantonal physical contact points to improve delivery of advisory services and public financing programmes.
Parts of the population, notably women, are not achieving their potential. Child-rearing responsibilities fall disproportionately on mothers, and the tax system discourages second earners. Slowing immigration may worsen skill shortages.	Increase childcare affordability. Shift income taxation to individual rather than household incomes, or implement equivalent measures. Facilitate high-skilled immigration from non-EU countries to meet labour market needs.
Ensuring a dynamic skills-training and life-long learning system	
Jobs requiring tertiary education are expanding, and vacancy rates in skilled sectors are high. Separating students into vocational and general streams after lower secondary school weakens intergenerational mobility.	Collect more detailed data on skills to facilitate adjustments to education in response to changing labour market needs. Increase the effectiveness of pathways between vocational and general streams by increasing the academic component of the vocational curriculum and vice-versa.
The vocational system relies on apprenticeships, but small firms tend not to participate. The system has generally been responsive to changes in labour market conditions, but the school-based model is less connected to firms.	Encourage small firms to participate more in apprenticeships by promoting sharing of apprenticeship places between firms and training centres that undertake part of the training. Strengthen linkages between the vocational education and training system and employer associations in school-based vocational training.
Participation in continuing education and training is high but not broad-based. Public spending is low and the framework complex.	Use subsidies to encourage participation in continuing education and training for groups with low participation rates.

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Assessment and recommendations

- *Switzerland is doing well by most measures of economic and social well-being*
- *The recovery has been difficult to sustain*
- *Assessing the large current account surplus*
- *Preserving price and financial stability*
- *Balancing fiscal priorities in the short and medium term*
- *Boosting productivity for long-term growth and living standards*
- *Ensuring dynamic skills training and life-long learning*
- *Enhancing environmental sustainability*

Switzerland is doing well by most measures of economic and social well-being

The Swiss economy has shown remarkable resilience in recent years in the face of the 2009 financial crisis and significant currency appreciation in 2015. But the upward momentum in the recovery has been difficult to maintain and GDP per capita has plateaued since 2008. Inflation has recently returned to positive territory, supported by unconventional monetary policy tools. The current account surplus is the largest among OECD countries relative to GDP.

In aggregate, the population enjoys a high standard of living, as measured by GDP per capita and by broader measures of well-being (Figure 1, Panel A). In particular, jobs and earnings, personal security and subjective well-being are especially high. Confidence in government has increased since 2007 and is the highest in the OECD (OECD, 2017a; Figure 1, Panel B). Income inequality before taxes and transfers is one of the lowest in the OECD, partly reflecting the high employment rate (Panel C). The Gini coefficient after taxes and transfers is around the OECD average. Yet, the share of income and wealth held by the top 1% has increased in the past two decades, as in many countries (Atkinson et al., 2017). The gap between the highest and lowest socio-economic groups is around or above the average across OECD countries in some other measures of well-being, such as the employment rate, student skills and self-reported health, reflecting the particularly impressive outcomes for the highest socio-economic groups.

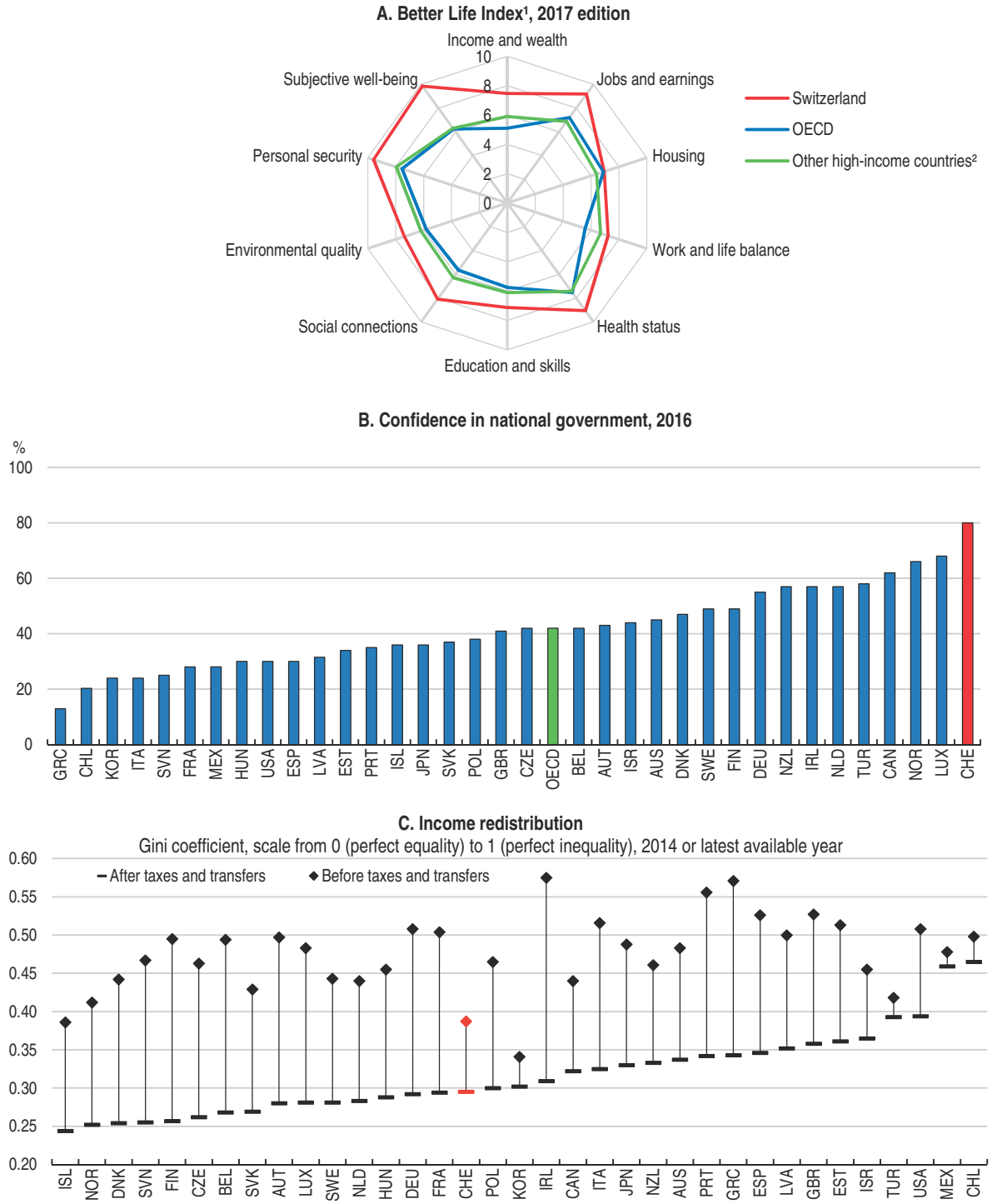
The economy consistently ranks highly in international comparisons. For example, Switzerland came second in the 2017 IMD World Competitiveness Ranking. GDP per capita is the third-highest in the OECD, due to high levels of employment and labour productivity (Figure 2). Maintaining Switzerland's enviable well-being is the paramount challenge facing policymakers. Trend annual labour productivity growth has slowed over the past two decades to 0.3%, one-third of the average rate across OECD countries (Figure 3). Weak competition, especially in some key domestic sectors, generates high prices and weighs on productivity outcomes. The high employment rate masks a sharp difference in hours worked between men and women: Switzerland has one of the highest rates of female part-time employment, reflecting a lack of affordable childcare and tax disincentives for second-income earners, as well as personal preferences. These factors hinder women's career prospects and lower their well-being (OECD, 2015a; OECD, 2013; Dutu, 2014).

A skilled workforce, reflecting in part Switzerland's renowned vocational education and training system, and high (albeit declining) capital intensity, have delivered high labour productivity, wages and job quality (OECD, 2017b). At the same time, increasing demand for high-skilled workers has been met in part by immigration, facilitated by agreements with the European Union. But as digitalisation and globalisation increase demand for such workers and if immigration continues to slow, shortages are likely to intensify.

Against this background, the key messages of this *Survey* are:

- Monetary policy is supporting growth and the return to price stability, but the scope for further monetary accommodation is limited, and financial stability risks are rising. The

Figure 1. **Well-being and trust in government**



1. Each dimension is measured by one to four indicators from the OECD Better Life Index (BLI) set. Normalised indicators are averaged with equal weights. Indicators are normalised to range between 10 (best) and 0 according to the following formula: (indicator value – minimum value)/(maximum value – minimum value) × 10. The OECD aggregate is weighted by population. Please note that the OECD does not officially rank countries in terms of their BLI performance. The civic engagement component has been omitted, as direct democracy in Switzerland means that there are a disproportionately large number of national polls, with relatively low average turnout.
2. Based on income per capita; unweighted average of Ireland, Luxembourg, Netherlands, Norway, United States.

Source: OECD, *Better Life Index*; OECD, *Income Distribution Database*; Gallup World Poll.

StatLink http://dx.doi.org/10.1787/888933620474

Figure 2. **Sources of real income differences across OECD countries, 2015**

1. The OECD GDP per capita is a population-weighted average of nominal GDP converted using 2015 purchasing power parities (PPPs). Note that the population of Luxembourg is augmented by cross-border workers and Norway GDP refers to the mainland.
2. Labour utilisation is measured as total number of hours worked per capita.
3. Labour productivity is measured as GDP per hour worked.

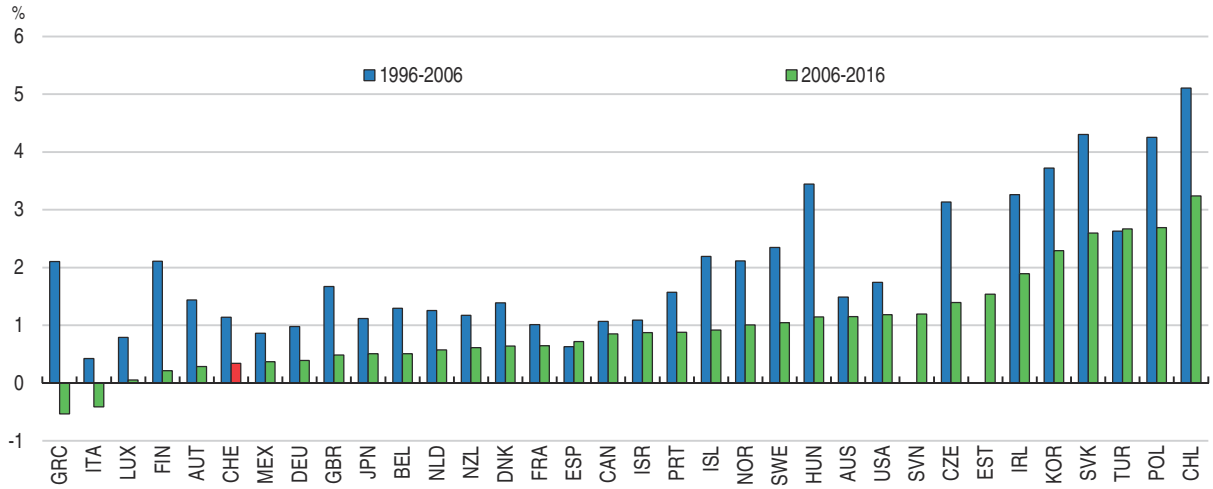
Source: OECD (2017), *Economic Policy Reforms: Going for Growth 2017*.

StatLink http://dx.doi.org/10.1787/888933620493

fiscal position is sound. Population ageing will require further reforms to pension systems and policies supporting longer working lives.

- High labour productivity sustains Switzerland's high living standards, but productivity growth has been slow for many years. Maintaining and increasing living standards will require policies to restore productivity growth, enhance competition by lowering import barriers and government involvement in key network sectors, and encourage greater use of women's and immigrants' skills.
- The well-regarded education and training system has contributed to strong Swiss labour market outcomes. But it is being increasingly challenged by the ever-growing demand for high-skilled workers along with the changing nature of work, calling for a nimble and inclusive lifelong learning system.

Figure 3. **Average annual rate of trend labour productivity growth**



Source: OECD, *OECD Economic Outlook 102 database*, preliminary version.

StatLink http://dx.doi.org/10.1787/888933620512

The recovery has been difficult to sustain

The Swiss economy lost momentum throughout 2016 with little pick-up in the first half of 2017. While GDP growth edged up to 1.4% in 2016, supported by domestic demand as well as exports, growth in several components has slowed (Table 1; Figure 4, Panels A and B). Improvements in confidence have supported private domestic demand (Panel C). But services sectors have been surprisingly weak. Retail activity has been modest, even though the strong franc boosted households' purchasing power. One possible explanation is that households lifted precautionary saving. More recently wage growth appears soft. Business investment has been subdued, reflecting past export sluggishness and spare capacity, particularly in the manufacturing sector (Panels B and D). But stronger prospects for growth and exports, improving profit margins and continued negative interest rates are supporting investment. In all, a number of leading indicators point to a firming of activity in the second half of 2017.

The current account surplus was 9.8% of GDP in 2016 – the highest in the OECD (Figure 5, Panels A and B). It represents mainly a positive balance on goods and services. Low inflation has mitigated the effect of the 2015 nominal exchange rate appreciation on export competitiveness, and export performance had improved until recently (Panels C and D). The diversity of Swiss export destinations also helped (Figure 6, Panel A). Pharmaceuticals exports and merchanting activity (associated with trade in commodities) are significant, contributing 11% to GDP in 2016, and are less price sensitive than other exports (Panel B; Yeung et al., 2016; SNB, 2012). The high degree of integration of some manufactured products in global value chains (for example, in pharmaceuticals) also reduces sensitivity to exchange rate movements (Ollivaud et al., 2015). But other exports, such as machinery, tourism and financial services, have been weak. Specialisation in relatively specific products allows exporters to achieve scale and international competitiveness, but also raises vulnerability to changes in regulations or consumer preferences, for example.

The employment rate has reached 80%, the second-highest in the OECD, surpassing its pre-crisis peak (Figure 7, Panel A). The unemployment rate has been edging down since

Table 1. **Macroeconomic indicators and projections**

	2013	2014	2015	2016	2017	2018	2019
	Current prices (CHE billion)	Percentage changes, volume (2010 prices)					
Gross domestic product (GDP)[1]	**638**	**2.5**	**1.2**	**1.4**	**0.8**	**1.7**	**1.8**
Private consumption	341	1.3	1.8	1.5	1.3	1.4	1.6
Government consumption	76	2.2	1.2	1.6	1.4	1.1	1.2
Gross fixed capital formation	151	2.9	2.3	3.0	2.1	2.4	2.6
Housing	20	2.3	3.8	4.2	2.8	2.9	2.8
Final domestic demand	568	1.8	1.8	1.9	1.5	1.6	1.8
Stockbuilding[2]	-7	0.6	0.5	-1.4	-1.3	-0.3	0.0
Total domestic demand	561	2.7	2.4	0.2	0.1	1.3	1.9
Exports of goods and services	459	-6.1	2.2	6.5	0.5	5.3	4.0
Imports of goods and services	382	-7.7	4.5	6.0	-0.7	5.5	4.6
Net exports[2]	77	0.2	-0.9	1.0	0.7	0.5	0.1
Other indicators (growth rates, unless specified)							
Potential GDP	..	1.8	1.7	1.6	1.5	1.4	1.4
Output gap[3]	..	-1.1	-1.6	-1.8	-2.5	-2.3	-1.9
Employment	..	1.7	1.5	1.5	1.0	1.3	1.4
Unemployment rate[4]	..	4.8	4.8	4.9	4.8	4.5	4.4
GDP deflator	..	-0.6	-0.6	-0.5	0.4	0.7	0.8
Consumer price index	..	0.0	-1.1	-0.4	0.5	0.5	0.6
Core consumer prices	..	0.1	-0.5	-0.3	0.3	0.5	0.6
Terms of trade	..	0.0	2.5	-2.2	-1.0	0.1	0.0
Household saving ratio, net[5]	..	18.9	17.6	18.8	19.1	19.1	18.9
Trade balance[3]	..	11.8	11.5	11.3	11.4	11.9	11.9
Current account balance[3]	..	8.6	11.2	9.8	10.2	10.7	10.9
General government fiscal balance[3]	..	-0.2	0.6	0.3	0.3	0.4	0.4
Three-month money market rate, average	..	0.0	-0.8	-0.7	-0.7	-0.7	-0.5
Ten-year government bond yield, average	..	0.7	-0.1	-0.4	-0.1	0.2	0.8

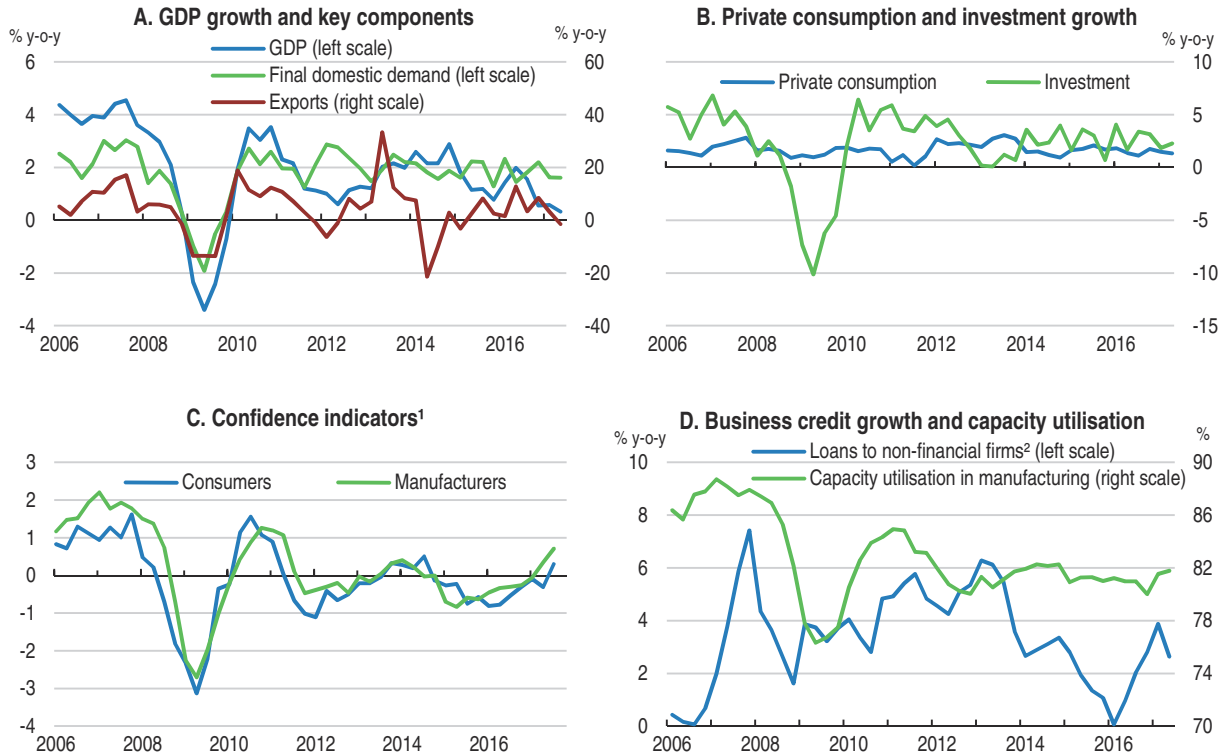
1. Based on seasonally and working-day adjusted quarterly data.
2. Contributions to changes in real GDP, actual amount in the first column.
3. As a percentage of GDP.
4. As a percentage of the labour force.
5. As a percentage of household disposable income.

Source: OECD, *OECD Economic Outlook 102 database*, preliminary version.

early 2016, to just under 5% (ILO definition). Labour market flexibility and large migratory inflows and outflows helped stabilise employment. However, the long-term unemployment rate and the number of unemployed who are not registered for benefits appear high relative to history, although not compared to other countries (Panel B). Real wages have increased faster than productivity since the crisis, squeezing firms' profits. This trend, together with a declining rate of self-employment, has driven labour's income share to historically high levels (Panel C), whereas it has fallen in other OECD countries. This points to the dependence of future real wage growth on firms' ability to raise total factor productivity, particularly given the difficult environment for investment.

Inflation has averaged only 0.1% per year since 2007, and import prices have fallen, reflecting the strength of the franc and low trading-partner inflation (Figure 8, Panel A). But domestic price pressures have also been weak until recently. Measures of underlying inflation have finally turned positive (Panel B). Survey data suggest that the share of consumers expecting further price falls has declined. The risk of deflation – i.e. persistent price reductions – is still present but seems to have receded.

Figure 4. **Drivers of growth dynamics**



1. Deviation from 20-year average in standard deviations.
2. The data are adjusted for a break in coverage in September 2006 when the banking statistics covered all Raiffeisen banks. Previously the statistics covered only the larger Raiffeisen banks.

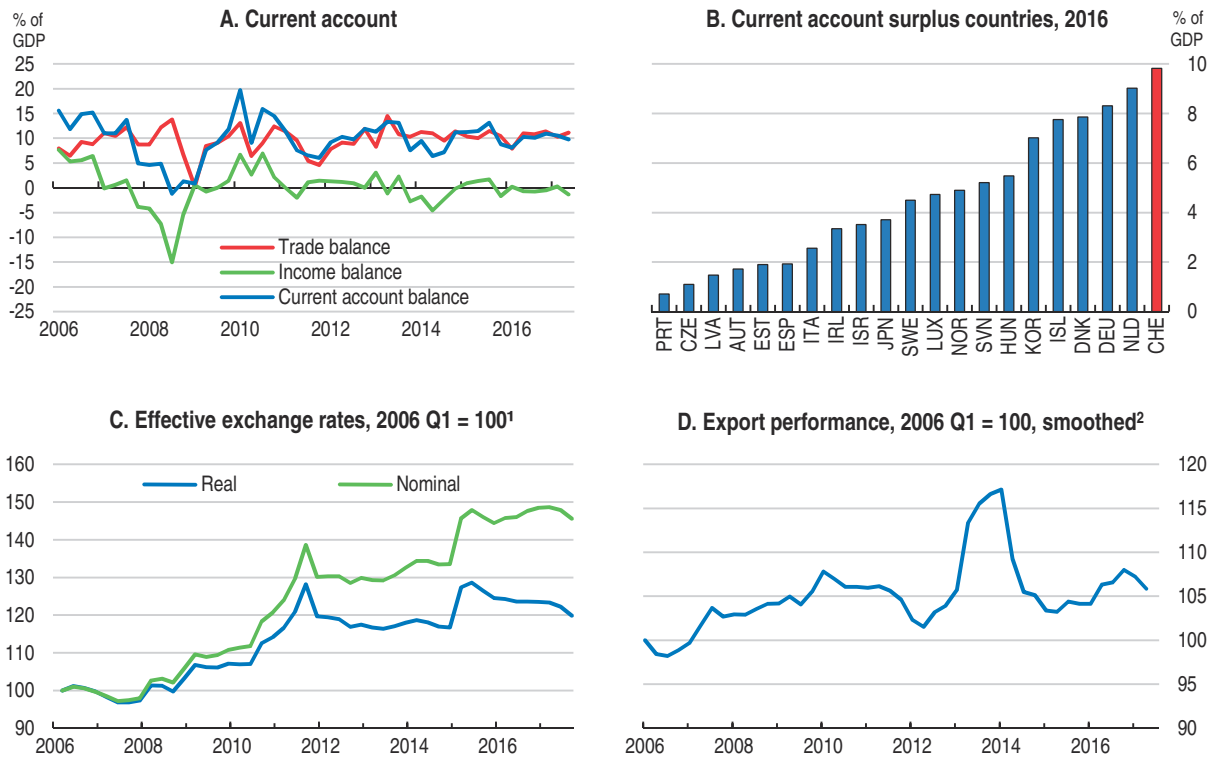
Source: SECO; OECD, *Main Economic Indicators database*; Swiss National Bank; Thomson Reuters Datastream.

StatLink *http://dx.doi.org/10.1787/888933620531*

GDP growth is projected to pick up to 1.8% by 2019 as the recovery resumes (Table 1). This is sufficient to expand employment and slowly reduce the unemployment rate. The improved labour market will support household incomes and consumption. Strengthening growth globally, and particularly in Europe, will raise capacity utilisation and boost confidence, encouraging business investment, given favourable financial conditions. In this context, and assuming the exchange rate remains at current levels, inflation is projected to edge up. The current account surplus will remain large due to the inelasticity of some exports to the exchange rate, and rising investment income as the global economy strengthens.

External risks dominate the projections due to the economy's considerable openness. The euro area recovery could prove stronger than assumed, boosting exports and confidence more than projected. But renewed turbulence in the euro area, a disorderly exit of the United Kingdom from the European Union or increased global protectionism would weigh on activity. Indicators of macro-financial vulnerabilities point to small increases in some imbalances, including the external sector where competitiveness deteriorated due to the currency appreciation (Figure 9). Other dimensions have improved. Large adverse external shocks could also be transmitted to the Swiss economy (Table 2). These could include geopolitical tensions or a sudden worsening of the European banking situation. The high level of house prices and the financial sector's exposure through mortgage lending and direct housing ownership mean that a negative shock could trigger a correction with knock-on effects to the financial sector and wider economy.

Figure 5. **The current account surplus has remained large despite the appreciation of the franc**



1. Nominal effective exchange rate uses chain-linked trade weights; real effective exchange rate uses constant trade weights.
2. Four-quarter moving average. Export performance is measured by the ratio of exports of goods and services to the trade-weighted average of trading partners' imports in volumes.

Source: OECD, *OECD Economic Outlook 102 database*, preliminary version.

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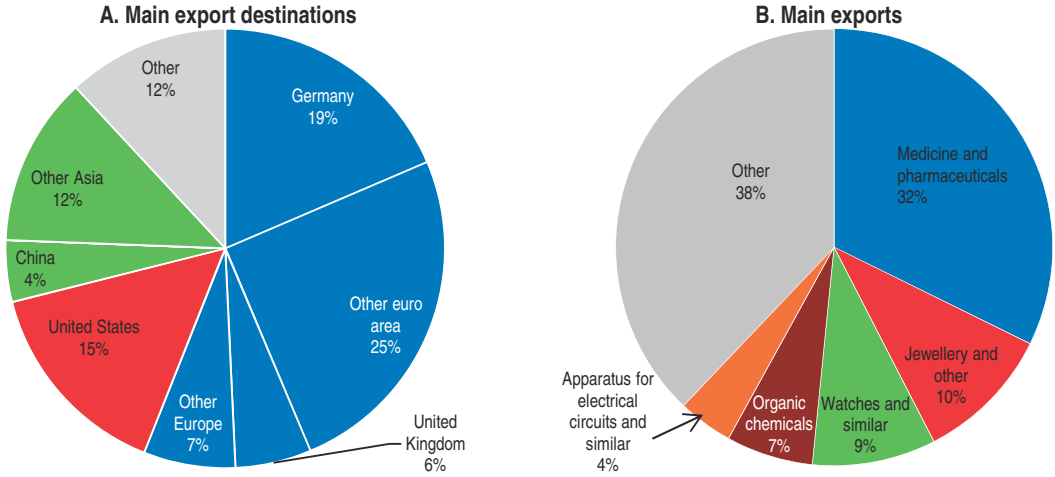
Figure 6. **Exports of goods by market and type[1], 2016**



1. Excludes exports of non-monetary gold, which accounts for 27% of the value of gross exports but are a net import.

Source: OECD, *International Trade Commodity Statistics database.*

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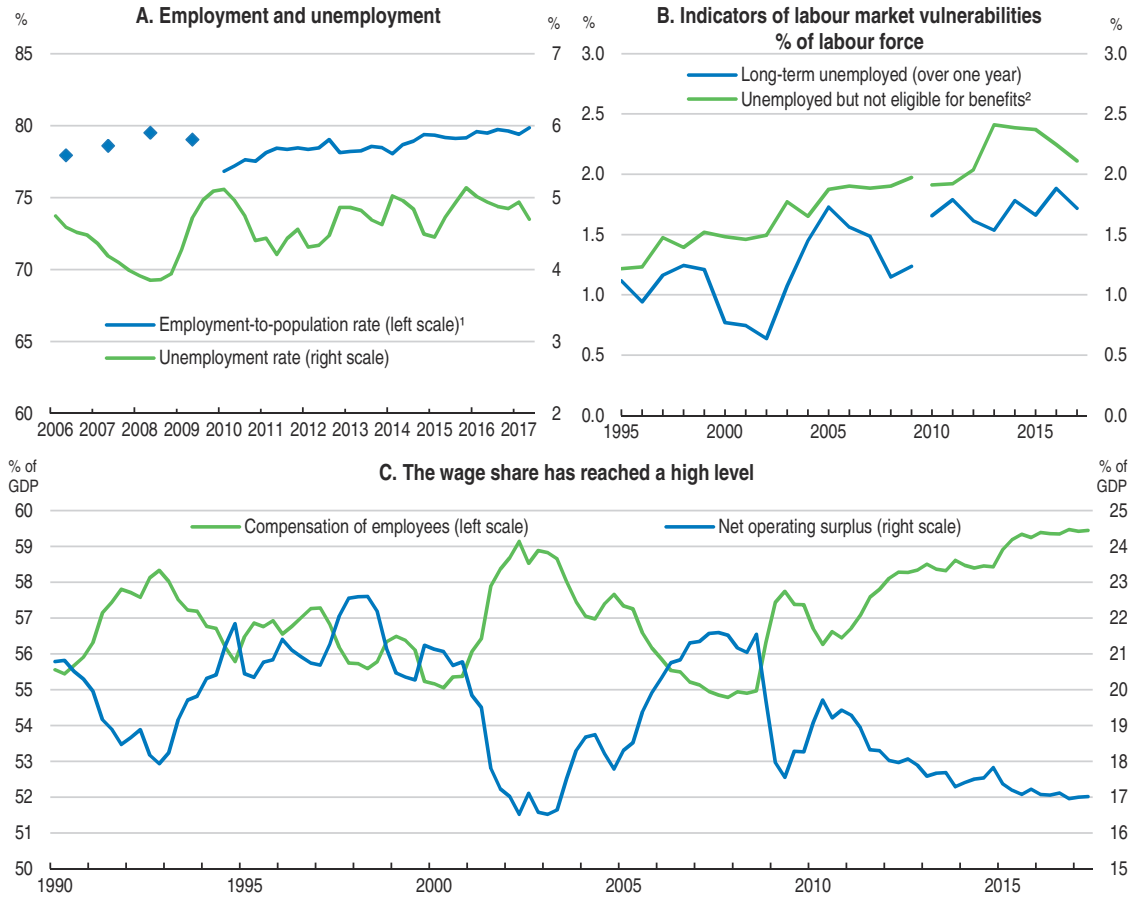
Figure 7. **Labour market developments**



1. There is a break in the methodology for labour force statistics in 2010. In addition, data prior to 2010 are available only for the second quarter of each year.
2. Unemployed workers not registered at a regional employment centre.

Source: OECD, *OECD Economic Outlook 102 database*, preliminary version; OECD, *Labour Force Statistics database*; Federal Statistical Office.

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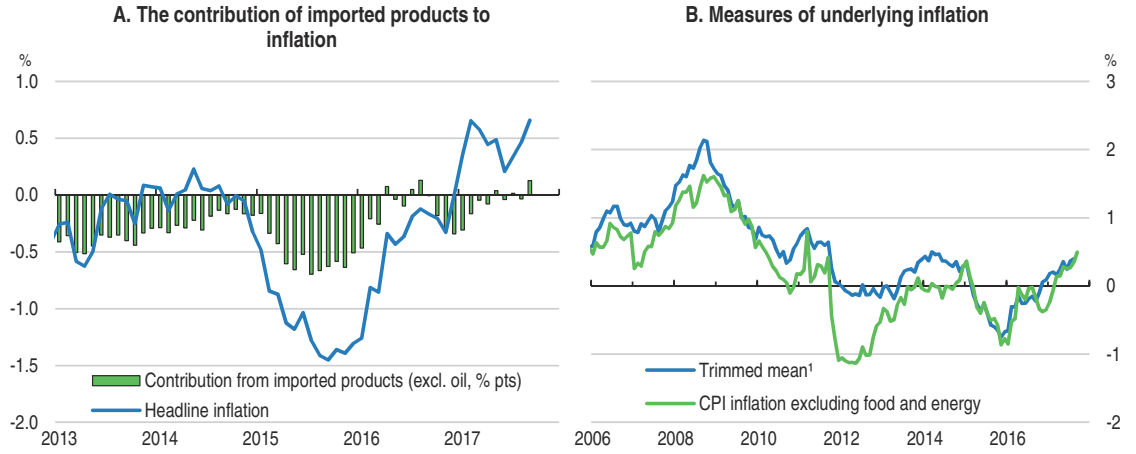
Figure 8. **Inflation has become positive**



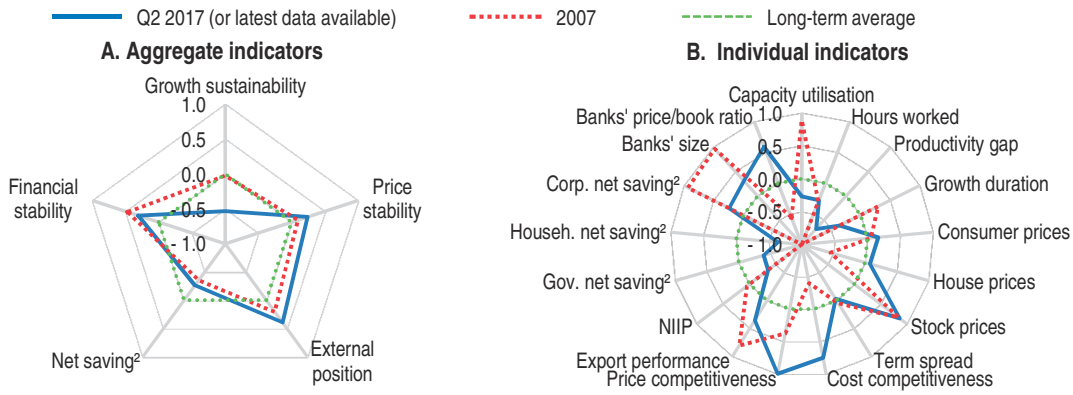
1. The trimmed mean measure of inflation excludes the top and bottom 15% of price changes.

Source: Swiss National Bank; OECD, *Main Economic Indicators database*; OECD calculations.

StatLink http://dx.doi.org/10.1787/888933620607

Figure 9. **Developments in macro-financial vulnerabilities since 2007**[1]

Deviations of indicators from their real time long-term averages (0), with the highest deviations representing the greatest potential vulnerability (+1), and the lowest deviations representing the smallest potential vulnerability (-1)[1]



1. Each aggregate macro-financial vulnerability indicator is calculated by aggregating (simple average) normalised individual indicators. Growth sustainability includes: capacity utilisation of the manufacturing sector, total hours worked as a proportion of the working-age population (hours worked), difference between GDP growth and productivity growth (productivity gap), and an indicator combining the length and strength of expansion from the previous trough (growth duration). Price stability includes: headline and core inflation (consumer prices), the average of the house prices-to-rent ratio and the house prices-to-income ratio (house prices), stock market index adjusted by nominal GDP (stock prices), and the difference between long-term and short-term government bond interest rates (term spread). External position includes: the average of unit labour cost based real effective exchange rate (REER), and consumer price based REER (cost competitiveness), relative prices of exported goods and services (price competitiveness), ratio of exports to export markets (export performance), and net international investment position (NIIP) as a percentage of GDP. Net saving includes: government, household and corporate net saving, all expressed as a percentage of GDP. Financial stability includes: banks' size as a percentage of GDP (banks' size) and the ratio of price to book value for publicly listed banks (banks' price/book ratio).
2. Annual data.

Source: OECD calculations based on *OECD Economic Outlook database*; Swiss National Bank; Thomson Reuters Datastream.

StatLink *http://dx.doi.org/10.1787/888933620626*

Table 2. **Possible shocks and their economic impact**

Shock	Possible outcome
Rising geopolitical tensions	Safe-haven flows could push up the exchange rate substantially, slowing growth and increasing deflationary pressures in the economy.
Banking crisis in Europe	Funding costs could rise due to concerns about capital adequacy and contagion effects. It may also generate safe-haven inflows. Together these effects would have a major contractionary impact.
Major house price correction	A large correction in housing prices coinciding with a contraction in GDP could expose vulnerabilities in the financial system, causing a domestic banking crisis with feedback to the real economy.

Assessing the large current account surplus

The current account surplus has tallied around 10% of GDP since the late 1990s. It has persisted while the real effective exchange rate has appreciated by around 1% per year on average, without denting the goods and services balance. Likewise, cyclical developments appear to have played little role, lowering the surplus only at the margin, except in 2008 (Box 1).

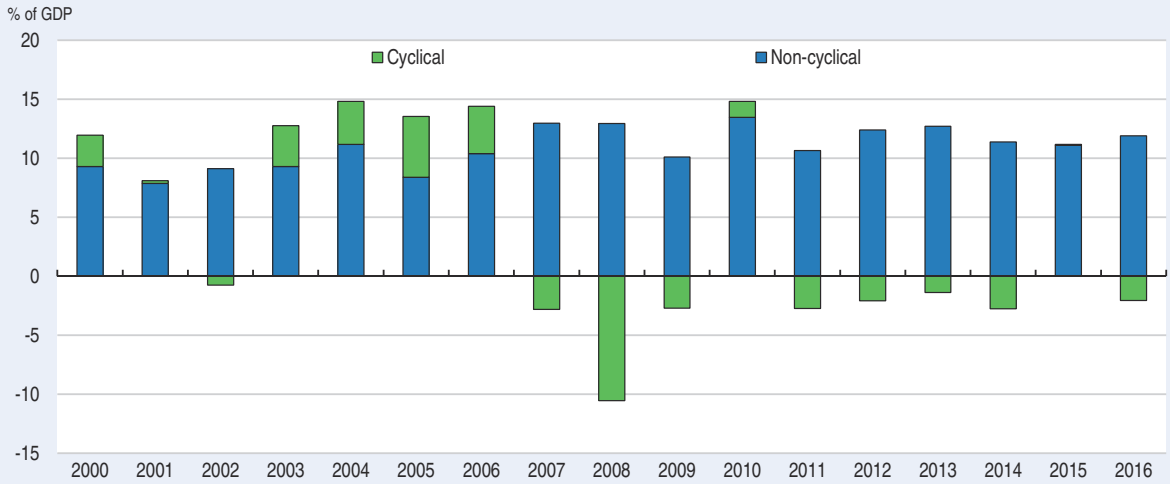
One explanation for the sticky surplus is the rising share of price-insensitive exports, discussed above, which may be more sensitive to the tax and regulatory regime (including intellectual property rights for pharmaceutical products) than exchange rate developments. To the extent that location decisions by merchanting companies have been influenced by past tax policies (Beusch et al., 2014), upcoming tax changes to meet international commitments may shrink the surplus stemming from these companies.

Box 1. **Estimating the cyclical component of the current account surplus**

The current account balance can be decomposed into structural and cyclical components, following Ollivaud and Schwellnus (2013). In this framework the cyclical components are extracted from separate models for the trade and investment income balances; the former is a function of the relative output gap (the domestic output gap minus partners' trade-weighted gaps) and the latter of the global neutral interest rate and differential with other countries. Due to the trend increase in pharmaceuticals exports, this component is first extracted from the trade balance.

This exercise reveals that the cyclical component is currently in deficit, as its biggest driver is interest rates (on net foreign assets), which are lower than neutral (Figure 10).

Figure 10. **Components of the current account surplus**[1]



1. The cyclical component is computed as the sum of estimated cyclical components in oil, non-oil non-pharmaceutical goods and services, and investment income balances; while the remaining part is the residual.

Source: UN, *Comtrade database*; IMF, *Balance of Payments database*; OECD, *OECD Economic Outlook 102 database*, preliminary version; OECD calculations based on Ollivaud and Schwellnus (2013).

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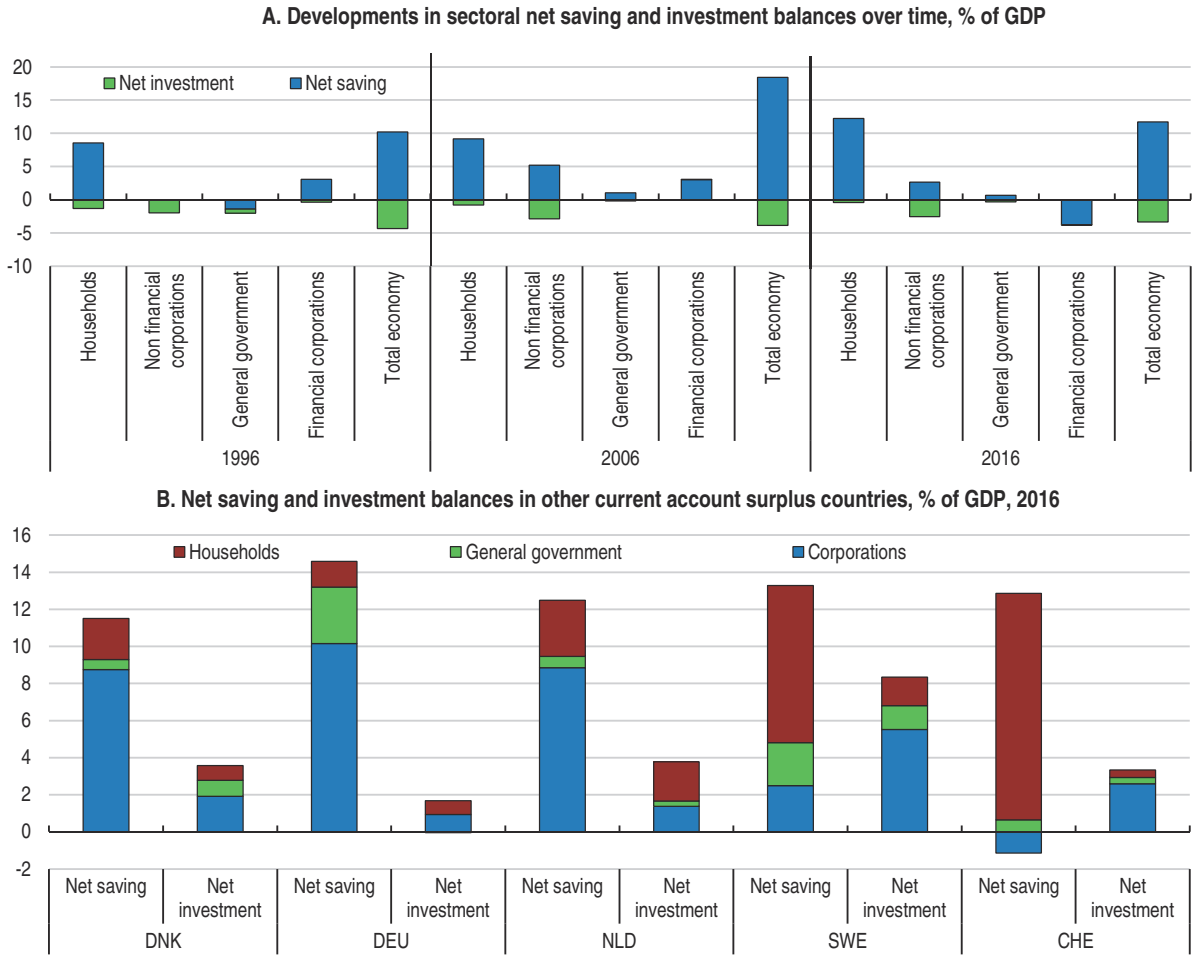
The surplus also reflects a growing excess of household saving – the highest rate in the OECD in 2016 – over investment (Figure 11, Panel A). This contrasts with many other surplus countries, where corporate savings drive the surplus, but is similar to Sweden's situation (Panel B). High household saving appears partly linked to the rapidly rising share of Swiss approaching retirement and their retirement savings and to the need to save for costly owner-occupied housing. Households also appear less willing to spend than in the past: consumption fell by 4 percentage points of GDP in the mid-2000s and remains low relative to the mid-1990s; and household investment is 0.9 percentage points lower. Persistent price gaps relative to neighbouring countries induce cross-border shopping, which is, however, difficult to measure. Government saving has increased, while its investment has fallen a little. Although business-sector investment exceeds saving in aggregate, this masks heterogeneity between types of firms, including measurement issues associated with profits of foreign-owned multinationals (Jarrett and Letrémy, 2008) and the abovementioned contributions of pharmaceuticals and merchanting that boost the surplus.

Although large surpluses are less concerning than deficits, they generate large exposures to credit, currency and interest-rate risk. In particular, currency appreciation leads

Figure 11. **The savings-investment balance**



Source: Federal Statistical Office; OECD, *OECD Economic Outlook 102 database*, preliminary version, and *Annual National Accounts database*; OECD calculations.

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Table 3. **Switzerland's net international investment position**

Per cent of GDP

	Assets		Liabilities		Net assets	
	2000	2016	2000	2016	2000	2016
Private non-financial sector	297	462	215	400	82	63
Banks	165	101	155	127	9	-26
Swiss National Bank	20	113	1	18	19	94
Public sector	2	4	2	5	0	-2
Total	484	680	373	550	110	130

Source: Swiss National Bank; OECD, *OECD Economic Outlook 102 database*, preliminary version.

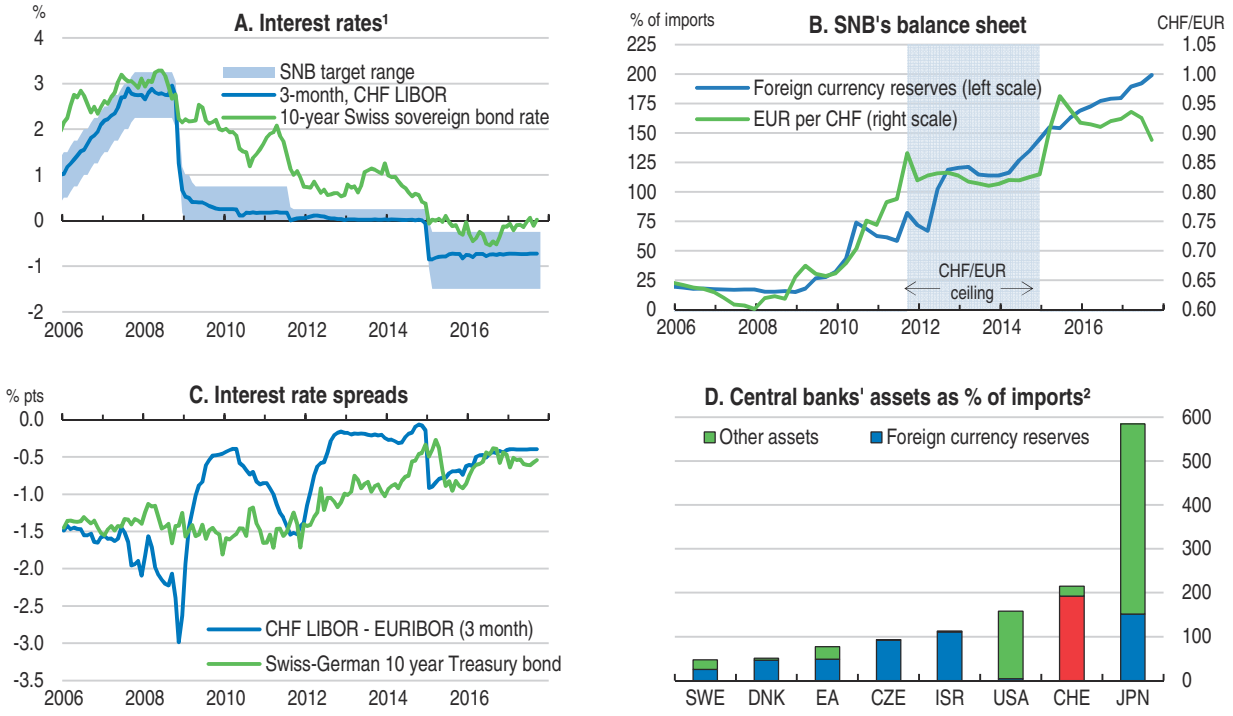
to valuation losses. This may mean that households do not correctly anticipate the returns on their investments. In 2016 Swiss net international assets were the world's fifth-largest and 130% of GDP. This is relatively little changed since 2000, but the gross exposure of the private non-financial sector has increased substantially as has the Swiss National Bank's exposure (Table 3). The implied return on Switzerland's assets has tended to be a little lower

than that on its liabilities, but in 2007-08 the differential was much larger. If the imbalance is driven by concerns about retirement incomes stemming from rising but uncertain longevity and lower investment returns, policymakers have a potential role. Reforms could encourage longer working lives, reduce income uncertainty pursuant to job loss by extending unemployment insurance coverage, and increase certainty around the pension system, discussed below. As the population ages and older households dissave, the surplus of saving over investment should fall, reducing the current account surplus (Peters and Winkler, 2016).

Preserving price and financial stability

Monetary policy has been fighting against disinflation, including the effects of safe-haven inflows, since the onset of the global financial crisis. After conventional monetary policy tools were exhausted, an exchange rate ceiling against the euro was imposed (Figure 12, Panels A and B). Since the ceiling was removed in January 2015 the Swiss National Bank (SNB) has used a two-pronged approach including a negative policy interest rate of -0.75% – partly restoring the traditional negative interest rate differential with the euro area – and periodic foreign exchange intervention to prevent excessive appreciation. However, interest rate differentials with the euro area have narrowed again (Panel C). And the SNB's assets reached 113% of GDP in 2016, with foreign reserves equivalent to 192% of imports in June 2017 – the highest of any OECD central bank (Panels B and D).

Figure 12. **Monetary policy has remained very accommodative**



1. The SNB implements its monetary policy by fixing a target range for the three-month Swiss franc Libor. The Libor is a reference interest rate in the interbank market for unsecured loans. It is a trimmed mean of the rates charged by 11 leading banks and is published daily by the ICE Benchmark Administration.
2. As at June 2017.

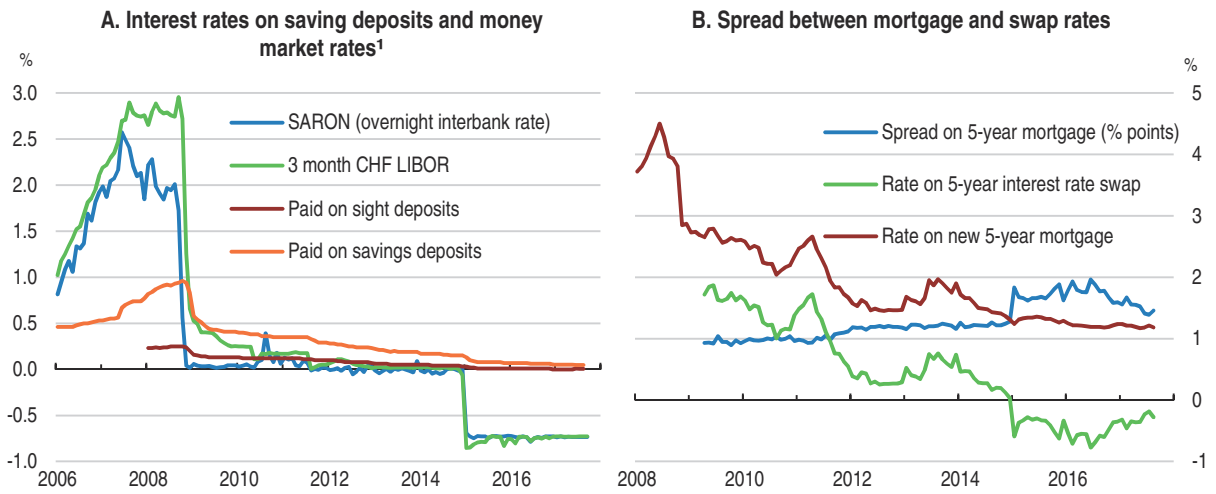
Source: Swiss National Bank; OECD, *OECD Economic Outlook 102 database*, preliminary version; Thomson Reuters Datastream.

StatLink http://dx.doi.org/10.1787/888933620683

While the two-pronged approach has been successful in warding off deflation, it also raises current and future challenges. First, as the SNB's balance sheet grows, so does the potential for greater debate around its investments. Assets are mostly held in foreign government bonds, although around 20% are invested in foreign equities according to prescribed rules for diversification (in Denmark, Japan and the Czech Republic around 10% of reserves are likewise allocated to equities). The balance-sheet risks to the SNB will be present for many years, both from appreciation and from the underlying asset prices. Second, if and when the SNB will start reducing the size of its balance sheet, appropriate early communication will be key to reduce the risk of large market reactions.

As inflation moves more comfortably away from zero and the risks of deflation fade, the SNB will be able to consider beginning interest rate normalisation. This is unlikely to be appropriate before the euro area policy rate begins to increase (so that the interest rate differential with the euro area does not shrink, putting upward pressure on the franc) unless the Swiss economy is expanding sufficiently robustly for inflation pressures to mount or financial stability concerns intensify. Interest rate normalisation will reduce some negative side-effects from negative interest rates, including their burden on commercial banks' profitability, even though the SNB exempts them from the negative rate on a large part of their reserves. As elsewhere, Swiss banks have been reluctant to charge negative rates on retail deposits, but they increased their margins on new mortgages (Figure 13). Mortgage income, and in turn bank profitability, is vulnerable to increasing competition, including from life insurers and pension funds, which have different funding structures and are searching for returns. Indeed, interest margins have fallen since the crisis and appear to have fallen further recently (SNB, 2017; Panel B). Domestically focussed banks have taken on more interest rate risk to boost income from maturity transformation, increasing their exposure to a sharp steepening (SNB, 2017).

Figure 13. **Banks are recouping some costs on mortgages**

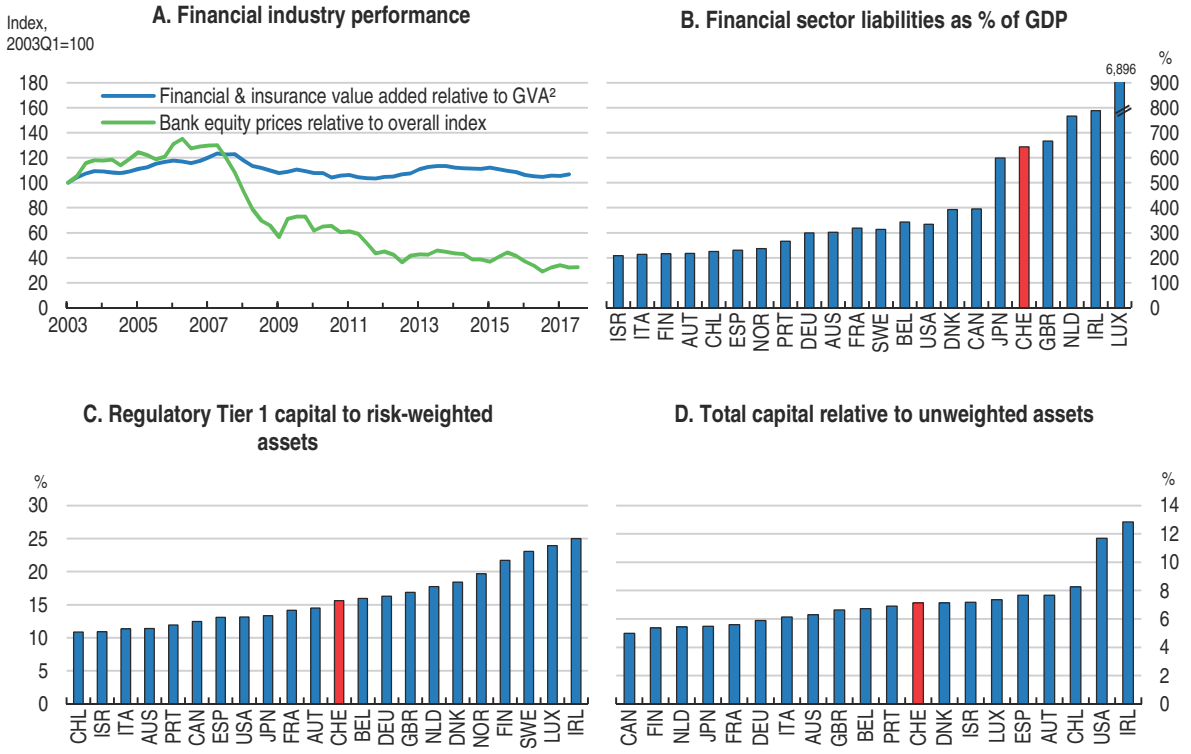


1. Reserves exempted from the negative rate are 20 times required reserves or CHF 10 million for banks without required reserves.
Source: Swiss National Bank; Thomson Reuters Datastream.

StatLink http://dx.doi.org/10.1787/888933620702

Overall, banks have underperformed the rest of the economy since the crisis due to low interest rates as well as litigation, higher capital requirements and an increasing likelihood that bank secrecy would be curtailed (Figure 14, Panel A). Returns on equity fell

Figure 14. **The financial sector is adjusting to the post-crisis environment**[1]



1. Panels B to D are for all banks and for 2016 or latest available year.
2. GVA is gross value added; both series are volumes.

Source: Thomson Reuters Datastream; OECD, *National Accounts database*; IMF, *Financial Soundness Indicators*; OECD, *Vulnerability Indicators database*.

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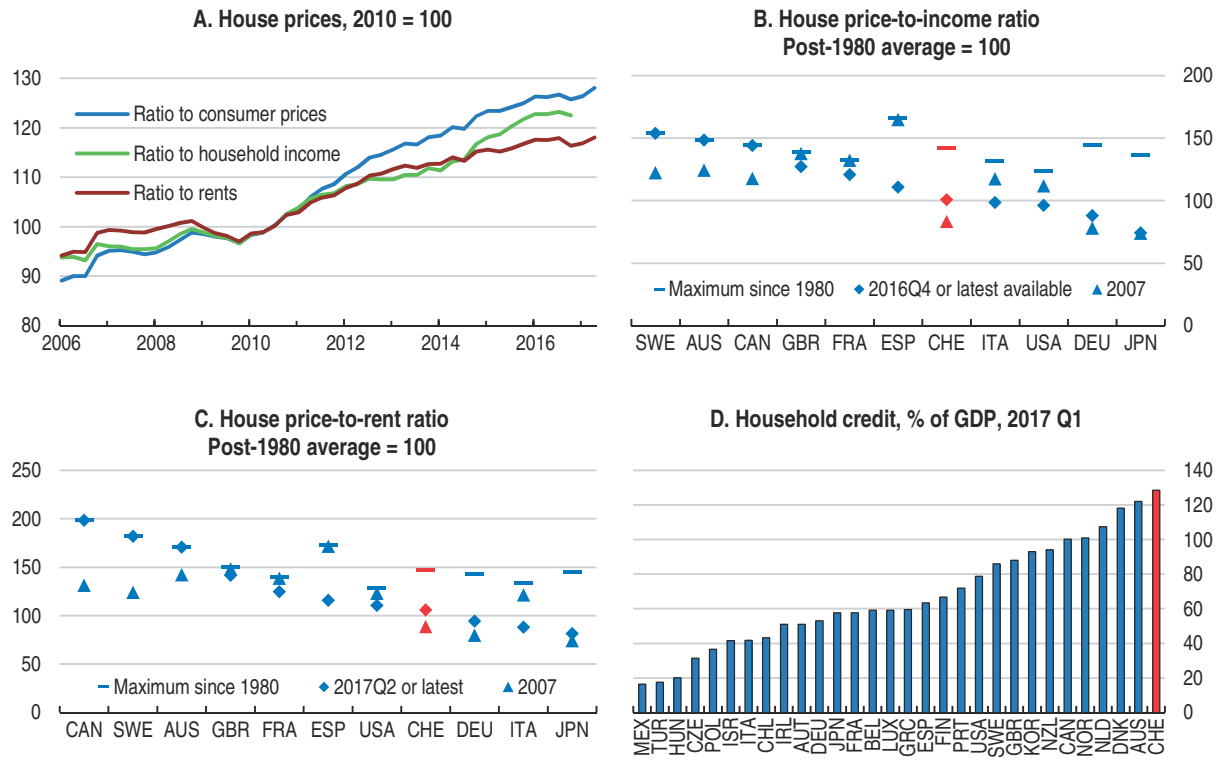
from 10% to 5% between mid-2015 and mid-2016. Reflecting the significance of the financial sector, capital requirements have been raised since the financial crisis, and capital ratios are now, on average, around the median of OECD countries (Panels B to D). As elsewhere, a key concern for regulators has been that near-zero interest rates raise the risk of excessive mortgage borrowing and a house price bubble. Accordingly, prudential regulation, including self-regulation, was tightened over 2012-14. After cooling in 2016, prices are rising again (Figure 15, Panel A). Non-performing loans were just 0.8% of gross loans in mid-2016.

Nonetheless, risks from housing market imbalances remain (SNB, 2017). House price increases substantially outpaced incomes and rents over the past decade and made home ownership less affordable (Figure 15; OECD, 2015b). In a longer context, the gains have been less dramatic than in other some OECD countries (Panels B and C). Households' mortgage debt is high and accounts for over 90% of household credit, which itself is the highest in the OECD relative to GDP (Panel D). At least on an aggregate level this is offset by financial assets; however, financial information at the individual household level is not available. The exposure of cantonal banks has increased since the 2015 *Survey*, with mortgages representing around 60% of their total assets. Raiffeisen and regional banks have exposures of 70% and 80%, respectively. Overall, these banks are considered to have sufficient capital to withstand the SNB's current stress test scenarios (SNB, 2017). Because most cantonal banks are guaranteed by their cantons, a house price correction could generate a public finance problem in a crisis.

Figure 15. **Housing prices and household debt**



Source: OECD, *House Price database*; Swiss National Bank; OECD, *Vulnerability Indicators database*.

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Cantonal banks also benefit from cheaper funding costs relative to their competitors. Thus, remaining explicit guarantees should be removed, as previously recommended (Table 4).

Another growing risk posed by the high and rising level of mortgage debt combined with low interest rates is that banks (and other mortgage issuers) may lower their lending standards to chase returns. An indication of this behaviour is the rising share of loans with

Table 4. **Past recommendations relating to financial-sector regulation**

Recommendation	Action taken since the November 2015 *Survey*
Eliminate explicit cantonal government guarantees to their cantonal banks.	The guarantee for the Banque Cantonale de Genève was phased out in 2016.
Establish a framework for explicitly addressing affordability risk, to be used if needed to contain financial stability risks related to imbalances in the housing and mortgage markets.	No action taken.
Consider periodic rotation of the outside auditors responsible for particular financial institutions, and widen the range of authorised external auditors.	While lead auditors do periodically rotate, the regulator (FINMA) believes that periodic rotation of audit firms would not be helpful, given the limited number of large audit firms. FINMA is currently considering possibilities to widen the range of authorised external auditors by re-evaluating the requirements for lead auditors.
Complement the accounting triggers for the contingent convertible bonds (CoCos) by market indicators. FINMA could, for example, be required to request an independent audit of a bank's book value when market indicators drop below predefined values. A higher trigger of 7% of common equity relative to risk-weighted assets should be introduced for all CoCos.	No action taken.
Develop resolution plans for the large Swiss insurers.	Light resolution plans were implemented by 2015 for the three largest Swiss insurance groups.

an implied debt-servicing ratio exceeding one-third of income, based on imputed costs that assume an interest rate of 5% and 2% for other costs and gross wage, pension or rental income. In 2016 46% of new owner-occupier mortgages exceeded this affordability ratio (SNB, 2017). In practice banks' internal definitions differ, but the 7% rate is usually applied. To contain the risks from a downturn or (eventually) rising interest rates, a proper framework for setting lending limits, taking affordability into account, should be formalised and enforced on a comply-or-explain basis.

The supervisor, FINMA, has been increasing its supervisory visits (IMF, 2016). However, still it relies heavily on outsourcing. It should reduce the associated risks of outsourcing or raise the extra resources to carry out such tasks itself (Table 4; IMF, 2016; OECD, 2015b). Close supervision of life insurers and pension funds also remains important given their need to generate sufficient investment income to meet the returns which they have guaranteed. Recent decisions by insurance companies to offer products without any guarantees or with guarantees from banks are welcome.

Improvements to the crisis management framework are ongoing. The revised too-big-to-fail regulations require systemically important banks to implement emergency plans, starting at end-2019 for the two globally systemically important banks. Depositor protection is being revised after two reviews highlighted severe inadequacies (IMF, 2014; Brunetti, 2014). In particular, the period for paying out on protected deposits will be shortened (from 20 working days) to improve the scheme's effectiveness. Earlier reviews highlighted that the scheme was unfunded and that there is no explicit back-up support if available funds are insufficient (IMF, 2014; OECD, 2009). The reform does improve the funding by requiring half of the banks' commitments to be secured by collateral (with regulatory requirements to hold liquid assets reduced commensurately). Public awareness of the scheme should be increased to preserve depositors' incentives to take precautions and ensure the scheme's effectiveness.

Swiss banks are also adjusting to the progressive end of bank secrecy, at least on the international level. Switzerland has, together with 100 other jurisdictions, committed to implement the OECD/G-20 Standard for Automatic Exchange of Financial Account Information in Tax Matters (Common Reporting Standard). The Common Reporting Standard sets out the types of financial accounts and non-resident taxpayers covered and the information to be automatically exchanged with other tax authorities. Swiss financial institutions must annually collect and report financial account information on non-resident account holders as from January 2017, with the first exchanges to take place with EU members and nine other jurisdictions in 2018.

Balancing fiscal priorities in the short and medium term

Public debt is low and the fiscal position sound. The general government budget has been in surplus since 2015. Small surpluses are also likely in 2017-19 (Table 5). After this, there is some uncertainty around corporate tax reforms, which were initially rejected by referendum but are necessary to align Switzerland's tax system with its international commitments (Box 2). Cantons are expected to lower their corporate income tax rates in keeping with the model of competitive federalism. To alleviate policy uncertainty, the federal government should work with cantons to pre-announce their corporate income tax cuts and how they will cover the consequent revenue shortfalls. Although it is too early to assess the final reform package, Switzerland's efforts to meet its international commitments are welcome.

Table 5. **Fiscal indicators**

Per cent of GDP

	2014	2015	2016	2017	2018	2019
Spending and revenue						
Total revenue	33.6	34.7	34.6	34.8	34.6	34.3
Total expenditure	33.8	34.0	34.3	34.5	34.2	33.9
Net interest payments	0.6	0.5	0.5	0.5	0.4	0.4
Fiscal balances						
General government fiscal balance	-0.2	0.6	0.3	0.3	0.4	0.4
Underlying government primary fiscal balance[1]	0.3	1.3	1.3	1.5	1.5	1.3
Public debt						
General government gross debt (SNA definition)	45.3	44.8	44.4	44.1	43.6	43.1
General government net debt	1.9	5.9	5.5	5.1	4.6	4.1

1. Per cent of potential GDP.

Source: OECD, *OECD Economic Outlook 102 database*, preliminary version.

Box 2. **Reforming corporate taxation to meet international obligations**

Swiss tax regimes have existed for many years that have provided lower tax rates for companies that are mainly active abroad. These have been subject to discussion both at the OECD and at the European Union since 2005. In 2016 the Swiss Parliament passed a reform package ("corporate tax reform III") designed to address this criticism and meet Switzerland's commitments relating to the OECD/G-20 Base Erosion and Profit Shifting (BEPS) project and its mutual understanding on business taxation signed with the European Union. However, 59.1% of Swiss voters rejected it in a referendum in February 2017 due to concerns about who bears the cost of the expected revenue shortfall.

A revised reform – "tax proposal 17" – was released by the Federal Council for consultation in September 2017, following widespread stakeholder consultation. It includes the following key measures:

- Abolishing special cantonal tax regimes, increasing taxation of dividends and providing equal tax treatment of all resident companies. Companies transitioning from special regimes would benefit from a five-year transition period for releasing "hidden reserves".
- A patent box that is in accordance with the international standard, which would be mandatory for all Cantons due to the federal harmonisation law.
- Cantons may introduce a super-deduction for R&D expenditure.
- Increasing family allowances and cantons' share of direct federal tax revenue to 20.5% (from 17%).

In addition, cantons are likely to cut their corporate tax rates.

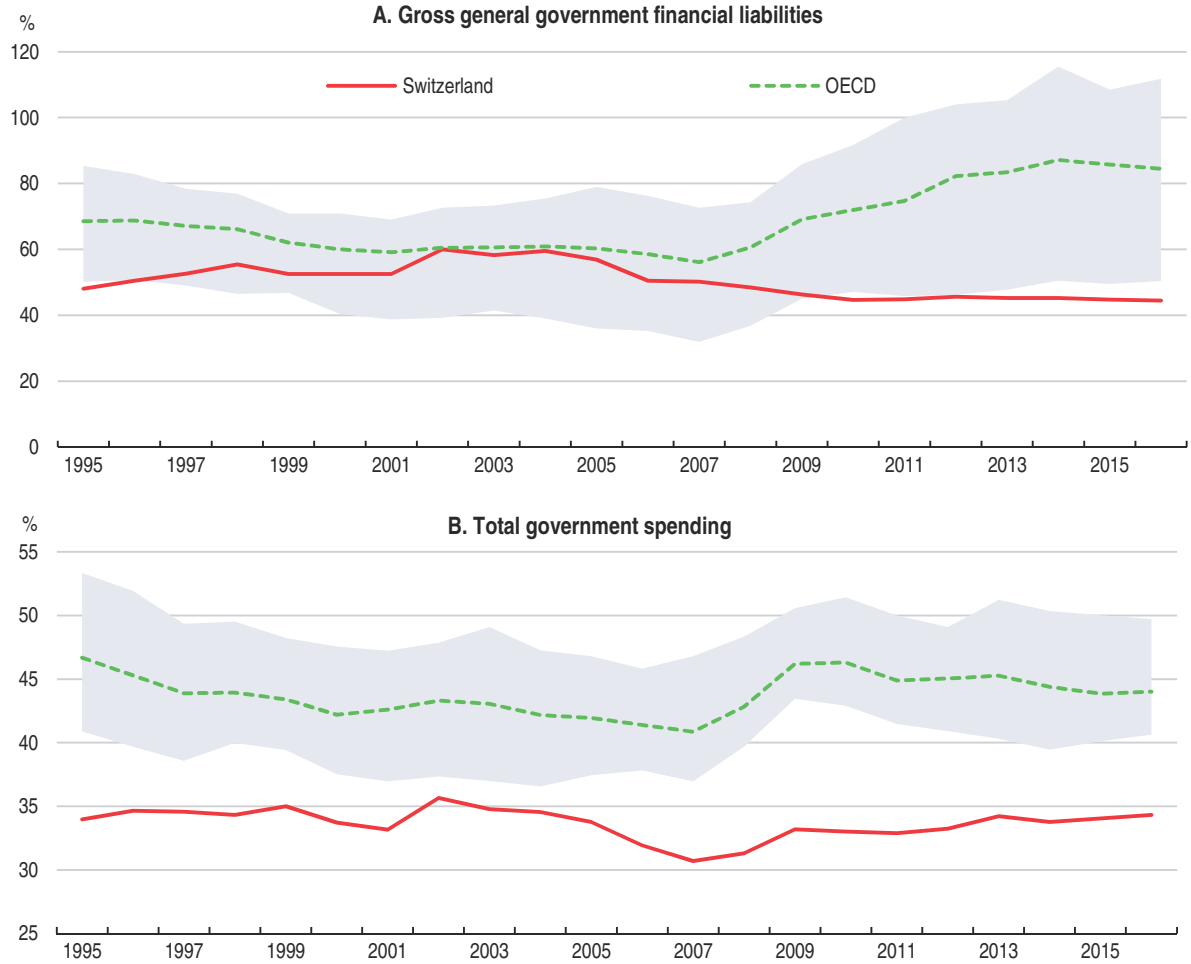
The consultation period ends in December 2017. Subject to the Swiss parliamentary/constitutional approval process, the intention is for the new Federal legislation to become effective by 1 January 2021.

The total budgetary impact is difficult to gauge because of the complexity of the tax system and uncertainty around the cantonal response. In 2011 7% of all taxable corporate entities were under a special tax regime (FC, 2015). Together these entities paid about half of federal corporate taxes (7% of revenue) and 20% of cantonal corporate tax (6% of revenue) (FC, 2017a; FDF, 2016a). Federal government revenue is estimated to be CHF 755 million lower in 2021, or 1% of projected revenue (FDF, 2017). Previously, some cantons had announced plans to reduce their corporate income tax rates by 3-10 percentage points.

General government debt has been declining relative to GDP in part thanks to the introduction of a federal fiscal rule ("debt brake") in 2003 (Figure 16). The rule aims to balance the budget over the cycle but includes an asymmetry that means that structural deficits have to be offset in future budgets but surpluses are used to pay down debt. The federal rule has been matched by fiscal rules in almost all cantons (Marti Locher et al., 2015). Accordingly, Switzerland now has one of the OECD's lowest government debt ratios (less than 45% in gross terms).

Figure 16. **Government spending and debt are comparatively low**[1]

As a percentage of GDP



1. Data represent general government accounts (i.e. including sub-national government accounts). The shaded area denotes the 25th to 75th percentile range of available data for OECD countries. OECD is an unweighted average of data for available countries.

Source: OECD, *OECD Economic Outlook 102 database*, preliminary version.

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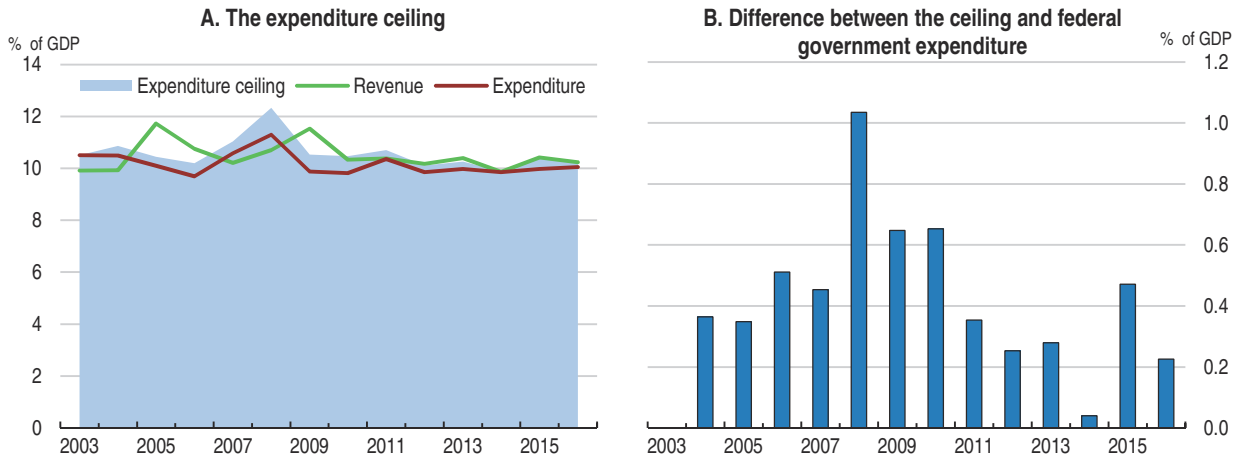
There is more scope for fiscal policy to support near-term growth

Fiscal policy is expected to be broadly neutral in 2017-19, with a continuing general government surplus. Given the remaining slack in the economy and the constraints on monetary policy it would be appropriate to avoid any persistent underspending through better co-ordinating procedures at federal and sub-national levels. Although debt is low and negative interest rates mean that fewer years are needed to repay debt-financed deficits

(Botev et al., 2016), this fiscal space is not all accessible under federal and cantonal fiscal rules. At the federal level government spending has consistently been below the ceiling by an average of 0.3% of GDP in recent years (Figure 17). However, recent improvements imply that such underspending should be modest, perhaps only 0.1% of GDP. A recent study of the debt brake commissioned by the Federal Council recommended against changing the debt brake itself (Sturm et al., 2017). At the cantonal level, sub-national government autonomy has helped ensure that spending is more effective and needs-based. The constitution requires all governments to take the economic situation into account, but not all cantons do so (Marti Locher et al., 2015). For instance, in 2015 and 2016, despite the widening output gap, cantons reduced their aggregate deficit by 0.2% of GDP (excluding extraordinary items). In addition to further co-ordination between the levels of government, all levels of government could use the scope for additional spending given their fiscal rules. The extra spending should be devoted to high-quality measures that raise output or well-being. Earlier *Surveys* and *Going for Growth* publications have called for funding the expansion of early childhood education and childcare, increasing financial support for youngsters from disadvantaged socio-economic backgrounds to undertake pre-primary and tertiary education, and investing in older workers, as discussed below.

Figure 17. **The federal debt brake**[1]



1. The expenditure ceiling is set equal to forecast revenues adjusted by the output gap.
Source: Federal Department of Finance; OECD, *OECD Economic Outlook 102 database*, preliminary version.

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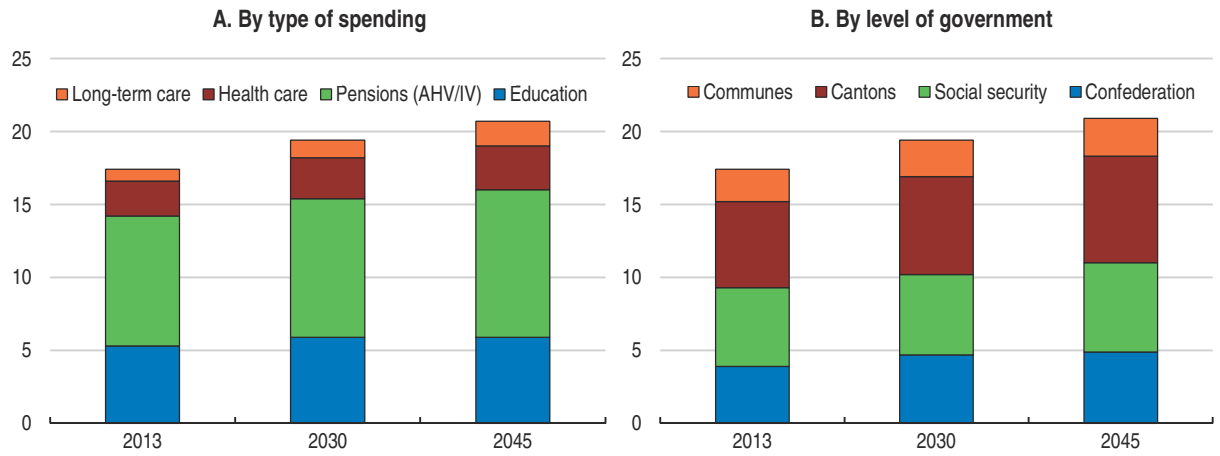
Fiscal policy can also support near-term growth by finding ways to speed up planned investment of infrastructure funds and shifting away from inefficient spending. Agricultural subsidies represent 1% of GDP, the highest in the OECD relative to sectoral value added, but are largely fixed by existing legislation until 2021; thereafter they should be lowered further (OECD, 2017c). Efficiency gains, for instance in procurement and health, should be pursued to create room for other spending or reductions of distortionary taxes (OECD, 2015b).

Looking further ahead, demographic change will increase the old-age dependency ratio and drive up public spending on old-age pensions, health and long-term care, as in many countries. UN population projections imply that the old-age dependency ratio will rise by 21 percentage points, which is a similar-sized increase to some other Western European countries, though more than in the United States or France. A 2016 government report showed that ageing-related spending could absorb 3.5% more of GDP by 2045 than in 2013

(Figure 18, Panel A; FDF, 2016b). The increase is likely greater because a planned pension reform was rejected in a recent referendum. The extra costs will fall mainly on cantons (Panel B). The rapid increase in the dependency ratio will create an additional strain on revenues, given the importance of personal income tax in overall tax receipts (31%, compared to the OECD average of 24%). Given immigrants' more favourable age structure, continued strength in immigration could help defer the problem (Box 3). Indeed, a less steep fall in net immigration (with around 25% more immigrants) could almost halve the projected increase in the debt-to-GDP ratio over 2013-45 (FDF, 2016b).

Figure 18. **Long-term projections for age-related spending**[1]

Per cent of GDP



1. These projections assume current policy settings and the passing of the Federal Council's initial 2020 retirement provision reform proposal; as no reform is currently legislated pension spending will increase by more than shown.

Source: Federal Department of Finance (2016), *Report on the Long-term Sustainability of Public Finances in Switzerland*.

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Box 3. **The importance of immigration in Switzerland**

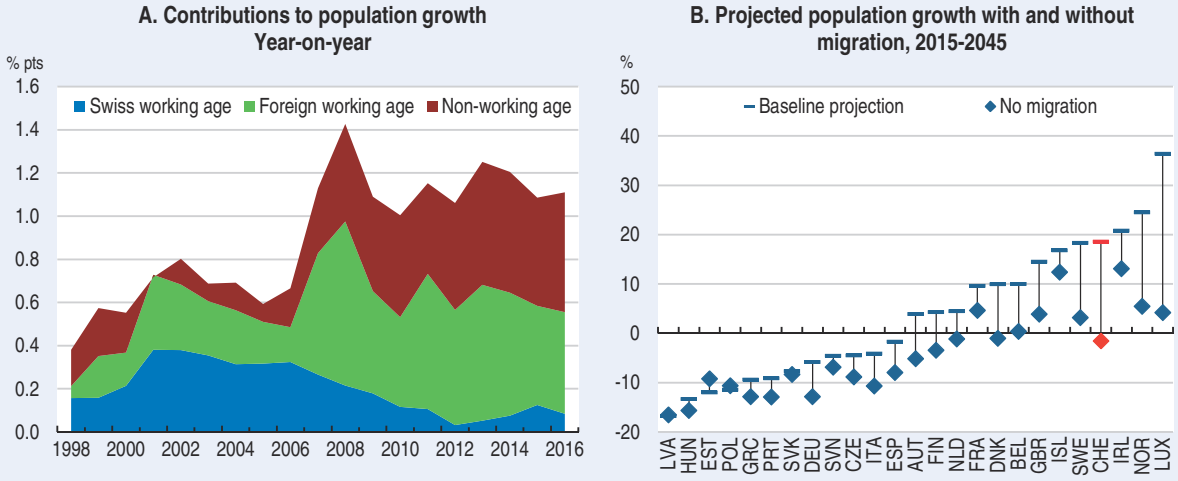
Migration is a key determinant of the size and evolution of the Swiss resident population. The share of foreign-born residents in the total population was 28% in 2013, the second-highest in the OECD. The 2002 agreement with the European Union on the free movement of persons led to sizeable inflows of European workers, driving working-age population growth that complemented the Swiss labour force (Figure 19, Panel A; Swiss Confederation, 2017). At the same time, the Swiss population has been ageing, pushing up the dependency ratio. Net inflows are likely to decline over time if the propensity of previous immigrants to leave Switzerland remains constant while inflows remain roughly stable. Nonetheless, UN projections imply that all of Switzerland's population growth to 2045 will be through net migration (Panel B).

In 2014 a vote on a popular initiative aiming to limit immigration (the "Mass Immigration Initiative") passed by a narrow margin. However under the EU Agreement, EU nationals may migrate to Switzerland if they have a valid employment contract, are self-employed or are otherwise financially independent. In December 2016 the Swiss Parliament adopted an amendment to the Federal Act on Foreign Nationals implementing the new constitutional articles. It adopted measures that aim to tackle unemployment and make better use of the workforce potential in Switzerland. On 28 June 2017 the Federal Council presented its draft ordinance and opened the public consultation. That consultation expired on 6 September 2017. The government will decide on the ordinances in the beginning of 2018. The new legislation is considered to be compatible with Switzerland's EU obligations.

Box 3. **The importance of immigration in Switzerland** *(cont.)*

Nonetheless, immigration policy remains topical. In May 2017 the authorities activated a clause in the agreement on free movement allowing them to reintroduce quotas for permanent residency applications from Romania and Bulgaria, and more votes on immigration are possible.

Figure 19. **The role of net immigration in past and projected population growth**



Source: Federal Statistical Office; United Nations, Department of Economic and Social Affairs, Population Division (2017), *World Population Prospects: The 2017 Revision – Special Aggregates*; OECD calculations.

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Efforts to reform the old-age pension system suffered a setback when the Swiss people rejected a planned reform in September 2017. A reform of the pension system remains urgent, as no substantial changes have been made in the past 20 years and the shortfall between the public fund's revenues and its expenses is widening. Raising the pension age is an effective way of containing spending increases (Keuschnigg et al., 2011). Life expectancy at age 60 is higher than in many other OECD countries, at 25 years according to UN estimates, and is expected to rise in coming decades. Yet Switzerland is one of a few countries not considering raising the retirement age to 67 in 2050 or linking it to life expectancy, as recommended in previous *Surveys* (Table 6). The retirement age for women is 64 years, compared to 65 years for men; these should be harmonised. The retirement age should be linked to life expectancy thereafter. While 62% of 60-64 year-olds participated in the labour force in 2016 (one of the highest rates in the OECD), this rate plummets to 23% among 65-69 year-olds. Pension payouts should be adjusted (in all parts of the system) to enhance the incentives to continue working, thereby increasing the supply of older workers. Another possibility to reduce the future fiscal burden is to introduce an automatic stabilisation rule, whereby corrective measures would be automatic if the public pension fund's financial position reaches critical thresholds. For instance, the value-added tax could be increased. Harmonisation between the public and private schemes of incentives for timing retirement would also be welcome, alongside reforms to ensure the financial sustainability of the second pension pillar (Table 6).

There is scope to reduce pressure on health and long-term care expenditure by improving its efficiency, as highlighted in the previous *Survey* (OECD, 2015b). For example, competition should be increased and more benchmarking of hospital costs undertaken.

Table 6. **Past recommendations related to ageing**

Recommendation	Action taken since the November 2015 Survey
Fix the retirement age at 65 for both sexes, and thereafter link it to life expectancy. To cut early retirement, reduce existing incentives, and pay a larger pension premium for those who choose to work longer. Deal with lack of sustainability through adjustments to contribution rates, benefits and required years of contributions.	No action taken. A comprehensive pension reform (Prévoyance Vieillesse 2020) was passed by Parliament in March 2017 but rejected by the Swiss people in September 2017.
Allow pension funds to set the conversion rate.	No action taken.
Reassess the generosity of tax incentives for the occupational pension schemes.	No action taken.

The country-wide strategic framework – Health2020 – should be used to set priorities and facilitate national health policies.

Measures to encourage longer working lives and improve job quality for older workers would ease future spending pressures and may lower the high saving rate and current account surplus. Although the participation rate of 55-64 year-old workers is high relative to other countries, employment rates are 20 percentage points lower for those without upper-secondary education than with tertiary education and lower for women at each education level. Digitalisation also poses risks for older workers since they are less likely to have skills needed in technology-rich environments (OECD, 2017d). The government's Skilled Workers Initiative includes measures to increase the engagement and productivity of older workers. Increasing take-up of targeted training, including in innovative technologies, and expanding preventative health programmes would help to maintain productivity and well-being. More flexible work arrangements and job mobility combined with career planning would help ensure that older workers remain well matched with their jobs. Working with social partners to link pay scales more closely to relevant experience rather than tenure would facilitate mobility (OECD, 2014). Efforts to increase awareness about discrimination against seniors should continue.

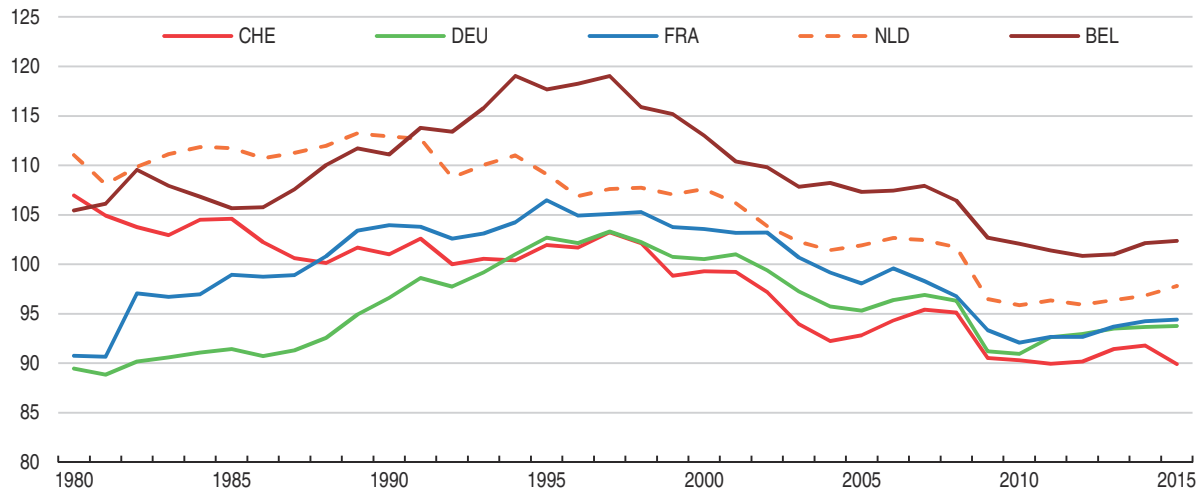
Growth-enhancing tax reforms discussed in earlier *Surveys* could help to finance ageing-related spending (OECD, 2011). However, these reforms are typically complex and can be unpopular, which makes them likely to be subjected to a referendum, as for corporate tax in 2017. Ahead of a referendum, the government must provide a booklet of arguments for and against the proposition. A small independent fiscal institution may be able to provide improved communication on complex fiscal issues by providing independent analysis of the potential budgetary effects, as in some other OECD countries such as Australia, Canada, the Netherlands and the United States (Von Trapp and Nicol, 2017).

Boosting productivity for long-term growth and living standards

Swiss labour productivity developments have been disappointing for some time. While the country was in an enviable position almost 40 years ago, it has steadily lost ground in terms of productivity levels (Figure 20). Even though its productivity growth has remained weak, trend GDP per capita accelerated noticeably during the five years before the global crisis (Figure 21), partly thanks to immigrants, who have been disproportionately of working age and have high employment rates (Box 3). Increased employment weighs on labour productivity by lowering capital intensity, but it could raise multi-factor productivity (MFP) by complementing capital and reducing skills mismatches. However, MFP has slowed since the early 2000s and contributed to lower labour productivity growth, as in most OECD countries (OECD, 2015c). At the same time, its advanced ICT sector and developed infrastructure makes

Figure 20. **Comparison of hourly productivity levels across several European economies**

USA = 100, constant prices, 2010 PPPs



Source: OECD, *Productivity database*.

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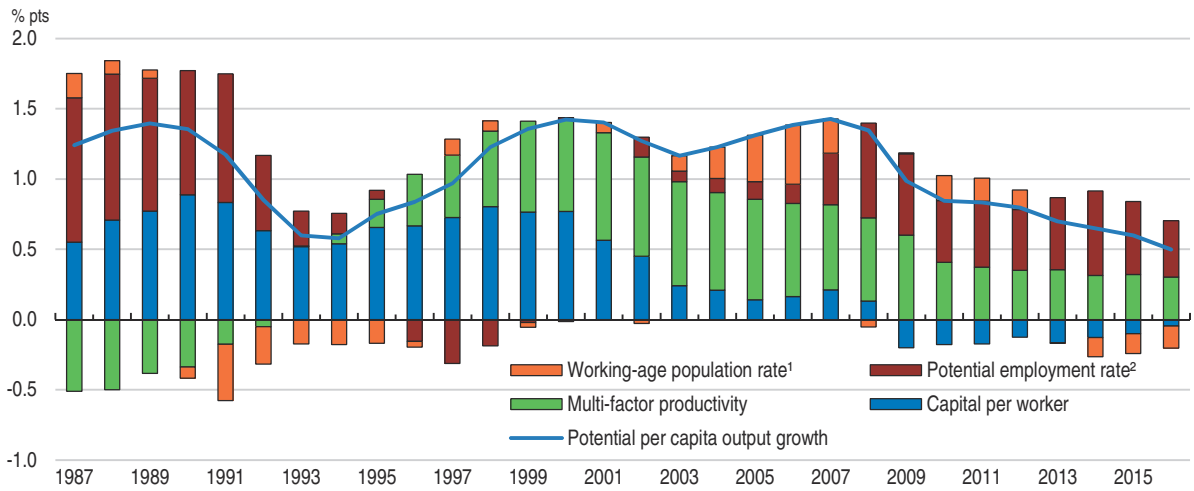
Figure 21. **Decomposition of the growth rate of Swiss potential output per capita**



1. Share of the population aged 15-74 in the total population.
2. Potential employment rate refers to potential employment in percent of the working-age population. In particular, it includes the evolution of structural unemployment, trend labour force participation rate and the ratio of national versus domestic workers (including cross-border).

Source: OECD calculations based on OECD, *OECD Economic Outlook 102 database*, preliminary version.

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Switzerland well placed to take advantage of digitalisation and the next production revolution. However, this depends on the diffusion of innovation and the responsiveness of the education and training system to changing skill needs (OECD, 2017d and 2017e).

The benefits from the higher employment rate could have been magnified with commensurate investment dynamism. Instead, declining capital intensity has detracted from productivity growth. Creating more conducive conditions for private investment would be helpful. For instance, investment is needed in a range of environmental areas, including in energy and transport (OECD, 2017f). A range of financial instruments can leverage private

capital for investment in clean infrastructure, for example (OECD, 2017g). In addition, public investment has been relatively weak, averaging about 3% of GDP since 2000, compared to 4% over the 1980s and 1990s. It is likely, although not certain, that raising it and directly increasing the public capital stock would boost MFP and potentially generate spill-overs to private investment. Intangible investment like spending on early childhood education and care also raises long-run productivity and enhances inclusiveness (Fournier and Johansson, 2016).

There is increasing cross-country evidence of linkages between decelerating productivity and rising inequality (OECD, 2016a). Swiss firm-level data (from the KOF Institute) indicate a widening productivity gap between the most efficient enterprises and the rest, which appears to be linked to a widening wage gap (Figure 22; Chapter 1). Studies of other OECD countries have linked wage divergence to growing productivity differentials between firms (Berlingieri et al., 2017; OECD, 2016b). While the KOF database is useful in shedding light on firm-level productivity developments, it is imperfect: for example, it lacks information on hours worked and excludes start-ups and young firms. Greater efforts should be made to resolve these problems and to participate in cross-country firm-level data-gathering exercises so as to enable firmer comparisons. Public policies (education spending, active labour market measures) to spur skills development across the population and cushion the effects of structural change would help to sustain long-term inclusive economic growth (OECD, 2016c; Chapter 2). In Switzerland potential explanations for productivity divergence include weak competition in domestic markets despite many competitive global firms and a lack of technology diffusion.

Figure 22. **Firm performance has diverged since the crisis**

Labour productivity[1], 2002=100

1. Markers denote survey years. Labour productivity is value added per employee; it is not adjusted for average hours worked per employee. The sample of the 1% most productive firms is recalculated each survey year at the 2-digit industry level. See Chapter 1 for further details of the calculation.

Source: OECD calculations based on KOF, *Swiss Innovation Survey database*.

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Improving the framework conditions for business development

Increasing competition

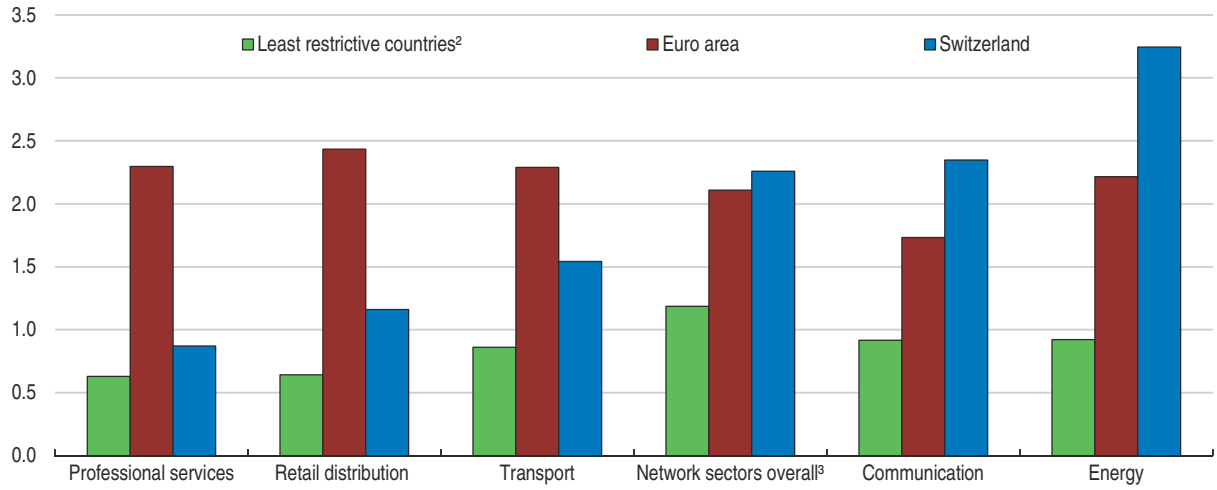
Improving framework conditions will remove hindrances for businesses, strengthen incentives and create opportunities. Lowering the stringency of product market regulations

tends to raise MFP, because competition enforces more effective adoption and diffusion of innovations, broadens consumer choice and lowers prices (Bouis and Duval, 2011; Égert, 2016). Anti-competitive regulations in upstream sectors, such as network industries, curb MFP growth, especially in countries closer to the global frontier (Bourlès et al., 2010). Government involvement can also inhibit firms' growth (OECD, 2015d). State control over business operations is especially high in Switzerland in international comparison. By improving the conditions for technology diffusion, increased competition would help Switzerland reap the benefits of the digital economy and technological change (OECD, 2017e).

Regulations in network industries – energy, telecommunications, postal and transport services – inhibit competition considerably more than in the least restrictive countries and generally than in the euro area (Figure 23). Swiss network sectors are characterised by public ownership, vertical integration (energy and rail), entry barriers that protect incumbents (gas, postal services, rail and road transport) and concentrated markets (gas, postal services and rail). Recent research comparing the governance of sector regulators in network industries in terms of their independence, accountability and scope of action suggests that the Swiss set-up is slightly less effective than the average OECD country's (Koske et al., 2016). As recommended in the last *Survey*, public ownership should decrease, notably in the telecommunications and energy sectors, including via the privatisation of Swisscom. A proposal intending to set the foundation for a future privatisation of Swisscom was recently rejected by Parliament. Indeed, that company receives an implicit state financial guarantee, lowering its costs (Moody's, 2016). Competitive neutrality should be ensured, including a regulatory level playing field, so that state-owned and private companies are treated equally (OECD, 2012a). For example, most stores should not be disadvantaged compared to those located in facilities owned by Swiss federal railways, and commercial activities operated by a public entity should be incorporated.

Figure 23. **Network sectors are highly regulated**

Product market regulation indicator[1], 2013



1. The product market regulation indicator is a composite index that encompasses a set of indicators that measure the degree to which policies promote or inhibit competition in areas of the product market where competition is viable.
2. "Least restrictive countries" is the average of the three countries with the lowest score in each sector. Scores range from 0 to 6 and increase with restrictiveness.
3. Network sectors overall is the unweighted average of communication, transport and energy.

Source: OECD, *Product Market Regulation database*.

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Promoting the work of COMCO (the competition authority) would also encourage competition. Its board comprises seven experts and five economic representatives. The latter have been controversial for many years; gradually removing them would give a clearer majority to the independent experts and increase COMCO's perceived independence (OECD, 2006). A closer relationship with EU institutions would facilitate a common, stronger position in cases involving large multinationals. Merger control is considered more "permissive" than elsewhere, because of the high bar for reducing competition before a merger is prohibited (OECD, 2006). Only 3 of 51 merger notifications in 2015-16 were investigated after preliminary examination (COMCO, 2017a). Planned updates to merger procedures to put more weight on negative consequences for competition will align Switzerland with European practices and should be expedited.

There is also considerable scope to enhance regulatory transparency and coherence across cantons. This would ease internal labour and capital mobility and increase market size, thereby raising productivity. It may also reduce the 20% gap between the most and least productive regions. Greater co-ordination is needed to overcome administrative fragmentation alongside continued efforts to harmonise regulations. Federal laws should be applied equally across the country; COMCO (2017b) found that some cantons have excessive restrictions on inter-cantonal market access for many occupations.

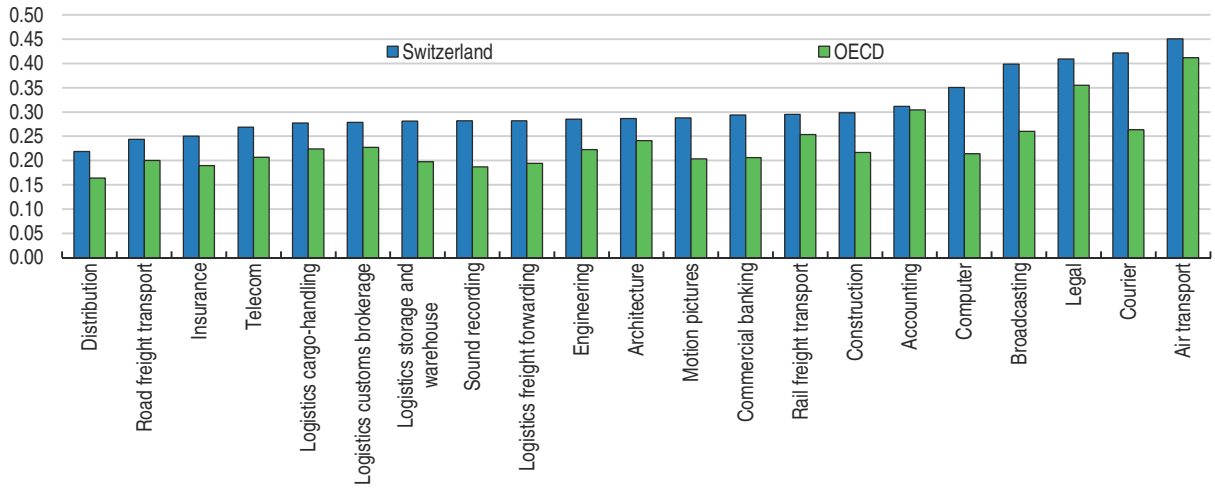
Liberalising foreign trade and investment

Developing trade can boost productivity through different channels, including access to a wider variety of inputs, diffusion of foreign knowledge and larger market size to seize opportunities for increasing returns (OECD, 2017h). While Switzerland has already benefited tremendously from globalisation, it should pursue ongoing trade liberalisation negotiations through the European Free Trade Association, notably with India, Indonesia, Malaysia, Vietnam, Ecuador and, most recently, MERCOSUR. Indeed, Argentina, Brazil, Indonesia and India together represent about 13% of world GDP but only 4% of global trade, indicating their potential for further opening. And while 5% of Swiss exports are currently sold to India, almost 90% are gold, suggesting lucrative opportunities in other markets. These agreements would further increase trade openness, which is empirically linked to higher MFP (Égert and Gal, 2017). Reducing border protection in agriculture – a costly way of supporting farmers – would facilitate trade negotiations, particularly with MERCOSUR, and benefit consumers (OECD, 2015b). While tariffs are generally low, those on food are high, with a weighted average of 27% in 2015. And even for industrial goods there is scope to lower tariffs and ease border procedures, as highlighted by the *Doing Business* indicators (World Bank, 2017).

Switzerland has more binding restrictions in services trade than the OECD average in all 21 major services sectors (Figure 24). The gaps are particularly large in computer services, broadcasting and courier services. Barriers include procedures that make it difficult to bring in foreign workers, obtain a business visa and register a company, as well as specific obstacles such as the monopoly on letter delivery and needing a commercial presence to provide courier services. Those constraints directly limit trade in services, increase domestic mark-ups by restricting competition and weigh indirectly on trade in manufactures, given the importance of services as intermediate inputs (Nordås and Rouzet, 2015; Rouzet and Spinelli, 2016). Lowering these restrictions would have positive productivity spill-overs. Easing visa processes for temporary foreign staff would also increase knowledge transfer and alleviate skills shortages.

Figure 24. **Regulation of trade in services is relatively restrictive**

OECD Services Trade Restrictiveness Index[1], 2016



1. Higher values mean heavier restrictions. Values range from 0 to 1.
Source: OECD, *Services Trade Restrictiveness Index database.*

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Facilitating firm entry and exit

Aggregate productivity rises when labour and capital resources move to more productive firms. This process depends on conditions that facilitate entry of new firms and exit of weak firms (OECD, 2015c). Switzerland's rate of firm creation appears to be close to the OECD average, but Swiss firms have a particularly high survival rate (Ecoplan, 2016). Nevertheless, entry rates could be higher: indicators of regulatory barriers to entrepreneurship are around the OECD median but above the best performers (Slovak Republic, New Zealand and Netherlands). The *Doing Business* indicators rank Switzerland 71st for starting a business, due partly to high minimum capital requirements and the time needed to register a firm (10 days against about 8 on average in OECD high-income countries) (World Bank, 2017). Half of all Swiss exiting businesses cite bureaucracy as the main cause, which is higher than for other comparable countries (Baldegger et al., 2015). Existing regulations should be reviewed with a view to streamlining them and reducing their disproportionate impact on smaller and especially younger firms who are important sources of innovation and job creation (Criscuolo et al., 2014; OECD, 2015c).

Swiss programmes to support entrepreneurs are fragmented. At the canton level, there are 87 different measures to finance existing firms and start-ups (FC, 2017b). Concentrating efforts by consolidating programmes, increasing transparency and developing e-government could increase the government's effectiveness. The envisaged virtual one-stop shop would ease administrative burdens and should be accelerated. It could be associated with physical contact points in cantons, which assist firms in overcoming the regulatory burden and bring together delivery of public financing programmes. Finally, perceptions that entrepreneurship is a good career choice are rarer than in other advanced economies (Baldegger et al., 2015). Promoting leadership, creativity and innovation at school and in post-compulsory education could raise the entrepreneurship rate, which is low for younger cohorts (OECD, 2010).

Improving the framework for exit of the weakest firms would free their labour and capital resources for more productive companies and reduce the cost of business failures

(Adalet McGowan et al., 2017). The OECD measure of the quality of the *de jure* framework is slightly better than of average peer countries (Table 7), but the *Doing Business* indicators which are based on a stylised case show that: i) the Swiss insolvency regime has a relatively low recovery rate; and ii) it takes about three years to complete proceedings, ranking Switzerland 30th amongst OECD countries. The regime would be improved by reducing the delays in conducting and concluding insolvency proceedings, in particular for large firms, and increasing the use of early warning mechanisms. However, creditors would continue to face significant upfront costs in initiating proceedings, adding to delays. Improving the regime's efficiency would free resources stuck in weak surviving businesses by facilitating their exit or restructuring, thereby raising productivity. An amendment being discussed in parliament would introduce additional options to restructure distressed companies and incentives to act at an early stage. Furthermore, the lack of an effective discharge proceeding from personal bankruptcy considerably limits the ability of individual entrepreneurs to obtain a "second chance". The government is currently conducting a preliminary study on whether to enhance the current legal regime in this respect. Reducing the period during which individuals are required to repay past debt from future earnings to three years would align Switzerland with international trends.

Table 7. **Comparison of the regime for resolving insolvency**

	Recovery rate (cents in the dollar)	Time (years)	Cost (% of estate)	OECD indicator of insolvency regimes[1]	Of which:	
					Time to discharge	Early warning mechanisms
Switzerland	46.6	3.0	4.5	0.32	1.0	1.0
OECD high-income countries	73.0	1.7	9.1	0.41	0.6	0.6

1. Composite indicator based on a survey with 13 indicators and takes values between 0 and 1. A lower value means a more efficient regime.

Source: World Bank *Doing Business 2017 database;* M. Adalet McGowan, D. Andrews and V. Millot (2017), "Insolvency Regimes, Zombie Firms and Capital Reallocation", *OECD Economics Department Working Papers*, No. 1399, OECD Publishing, Paris.

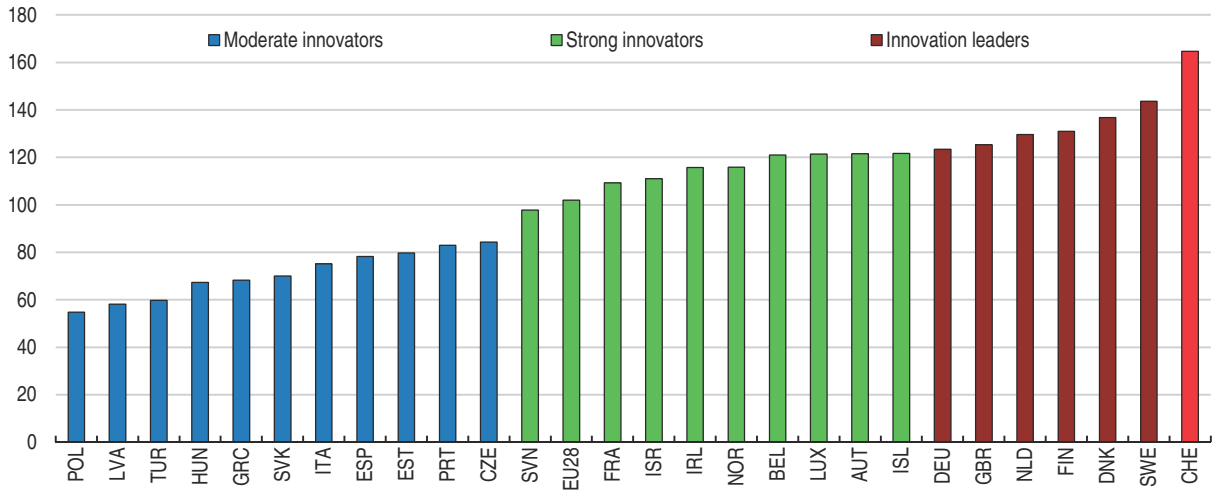
Benefiting more from the high level of R&D

Switzerland is a global leader in R&D spending, high-quality research and innovation performance (Figure 25). Its innovation performance has improved since 2010 compared to the EU despite declines in innovations by SMEs, falling exports of medium and high tech products, and shrinking opportunity-driven entrepreneurship (European Commission, 2017). The OECD-wide deceleration in productivity raises concerns about the implied downward trend in economic returns from R&D. Alternatively, other factors could be at play, such as: the mechanisms linking R&D and innovation to output; the capacity of workers to adopt and optimally use innovations; and the usefulness of new technologies. Andrews et al. (2014) relate the returns to innovative activity to the economic environment, including: well-functioning product, labour and capital markets; an efficient judicial system; and a suitable insolvency regime. Thus, the aforementioned reforms to regulation and insolvency processes could raise the returns to R&D.

The increasing divergence between leading and lagging firms partly explains the productivity slowdown observed in most OECD countries (Andrews et al., 2016). In Switzerland, a similar pattern is observed: the productivity of frontier firms has risen while the rest have stagnated, resulting in a low aggregate productivity growth rate (Chapter 1).

Figure 25. **Innovation performance is high**[1]

Performance relative to the 2010 EU28 level, 2016



1. Average performance is measured using a composite indicator building on data for 27 indicators (25 for Switzerland).
Source: European Commission (2017), *European Innovation Scoreboard 2017*.

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One explanation could be that a falling share of Swiss firms performs R&D, although those doing so spend a higher percentage of turnover (Arvanitis et al., 2017). The pharmaceuticals industry conducts almost 30% of total Swiss business R&D. The payoff from its R&D is especially long and variable. This specialisation in a particular industry and a few firms may also limit the mobility of researchers and knowledge spill-overs to the rest of the economy, contributing to the broader productivity slowdown.

The level of Swiss government support for business R&D is low by international standards, even though the share of firms receiving such support has risen in recent years (Arvanitis et al., 2017). Financial support is mostly through two funds: the Swiss National Science Foundation (focusing on basic research) and the Commission for Technology and Innovation (becoming Innosuisse, supporting applied research through entrepreneurship, start-ups and R&D projects). While the lack of incentives or grants for R&D has not prevented strong national performance, it may have contributed to its narrow base. The proposed corporate tax reform will allow domestic and multinational companies alike to benefit from R&D tax incentives. The envisaged patent box is not a high-quality innovation policy tool (Appelt et al., 2016), even if it serves mainly to compensate for the planned corporate income tax increase for multinationals. Likewise, the proposed R&D tax incentive will benefit many firms already conducting R&D.

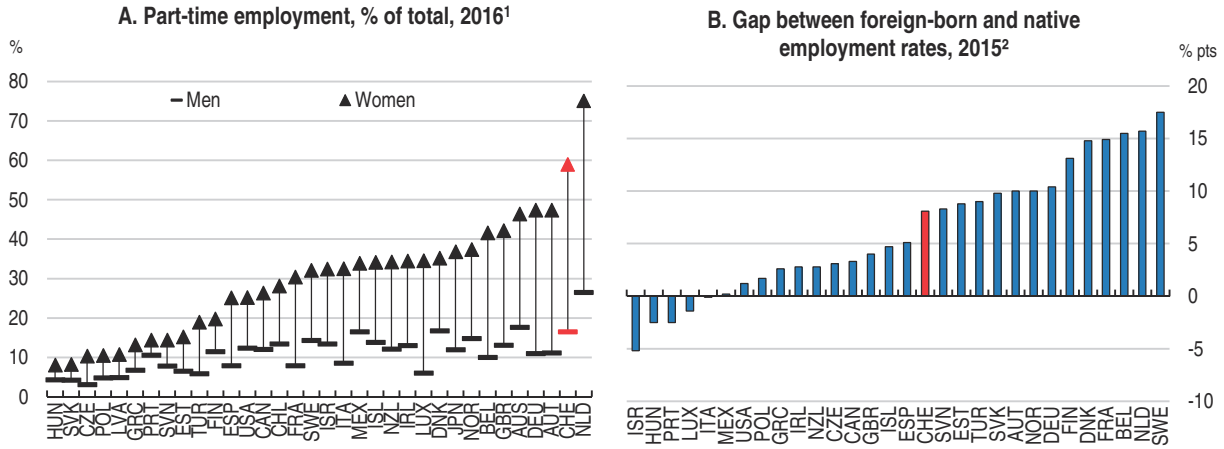
Policies that promote diffusion of knowledge and technology can reduce the productivity gap between firms and realise the potential of technological change (OECD, 2017d and 2017e). Government support could be broadened to help young firms overcome financing constraints and combat the trend decline in the number of firms investing in R&D (Arvanitis et al., 2017; Chapter 1). Continuing to promote incubators at higher education institutions would boost start-up rates, facilitate co-operation between firms and help diversify R&D and technology outside multinationals. Entrepreneurship could also be integrated more broadly into educational curricula, and professorial competencies could be raised.

A more inclusive economy can increase productivity

As Switzerland's high income level is closely related to its world-leading employment rate, demographic change will weigh on living standards unless labour productivity increases. The process has been partly postponed by immigration. Measures discussed above – including training and career planning – would increase inclusiveness and the productivity of older workers. Greater integration of immigrants and women in the labour market would increase well-being, raise productivity and mitigate the effects of population ageing.

Women disproportionately work part-time due to a lack of affordable childcare, including early childhood education, disincentives due to the family-based income tax system and personal preferences (Figure 26, Panel A). Lowering childcare costs would allow parents to work extra hours and maintain a solid career path (OECD, 2013; Dutu, 2014). The government has established and replenished a fund to expand childcare provision; to be effective the additional places should be located in areas of high demand and better cover parents' working hours. The government is also currently investigating whether childcare supply and demand are in balance. The Federal Council is proposing to increase tax allowances for childcare costs to encourage women to work more hours. Because this would benefit higher-income households more than their lower-income counterparts, it is all the more important to improve access to affordable childcare. In any case shifting to individual-based income taxation or implementing other equivalent tax changes would reduce tax-based work disincentives for second earners. Together these changes would improve aggregate productivity by better allocating women's skills and shrink the gender wage gap.

Figure 26. **Parts of the population are underutilised in the labour market**



1. Population aged 15 years and over.
2. The employment rate of native-born 25-64 year-olds less that of foreign-born among that age group.

Source: OECD, *Labour Force Statistics database*; OECD, *Migration Statistics database*.

StatLink http://dx.doi.org/10.1787/888933620949

Immigrants in Switzerland have one of the highest employment rates within the OECD. However, their employment rate is lower than that of natives, especially for tertiary-educated immigrants (Figure 26, Panel B). For non-EU/European Free Trade Association citizens recognition of foreign qualifications is rather complex and their language skills are often lacking, so many do not work in their field of expertise. Non-EU/EFTA immigrants have

the most difficulties achieving labour market success (Swiss Confederation, 2017). The Migrant Integration Policy Index ranked Switzerland only 21st out of 38 in 2014 (Huddleston et al., 2015); it is especially weak with reference to anti-discrimination laws and access to nationality laws. However, this contrasts with Switzerland's overall good performance in the integration of immigrants (OECD, 2012b). Several actions have been taken to facilitate the social and labour market integration of recognised refugees and temporarily admitted persons. Furthermore, Switzerland is currently adapting its law to reduce administrative hurdles to enter the labour market. Promoting uptake of high-quality language training, adult education, bridging courses and work placements and improving support for early childhood education would enhance immigrants' integration, helping them fully use their competencies (Huddleston, et al., 2015; OECD, 2015b). In addition, to the extent that immigrants help fill skills shortages (Swiss Confederation, 2017), the cost of the recent slowdown in net immigration could be mitigated if Switzerland would be more open to non-EU immigration.

Ensuring dynamic skills training and life-long learning

Switzerland uses its human resources better than most other OECD countries: it has high labour force participation and low unemployment rates across most segments of society, including youth. Previous OECD studies have shown that the comprehensive vocational education and training system does an excellent job of transitioning students of all aptitudes into the workforce (Hoeckel et al., 2009; OECD, 2009). After lower secondary school the system bifurcates into two streams: general (academic) and vocational. Most young people join the vocational stream, with apprenticeships and vocational schools, and may engage in tertiary vocational education or attend a university of applied sciences. The general stream leads to academic tertiary education. Looking ahead, the challenge is to ensure that the system produces the mix of skills the economy needs, can face ongoing changes such as from digitalisation, and is inclusive. A particular challenge is ensuring that both workers with vocational education as well as those with academic education are adaptable in a fast-changing world; cross-country research shows that vocationally trained workers tend to have lower employment rates later in their careers than those with a general education (Forster et al., 2016).

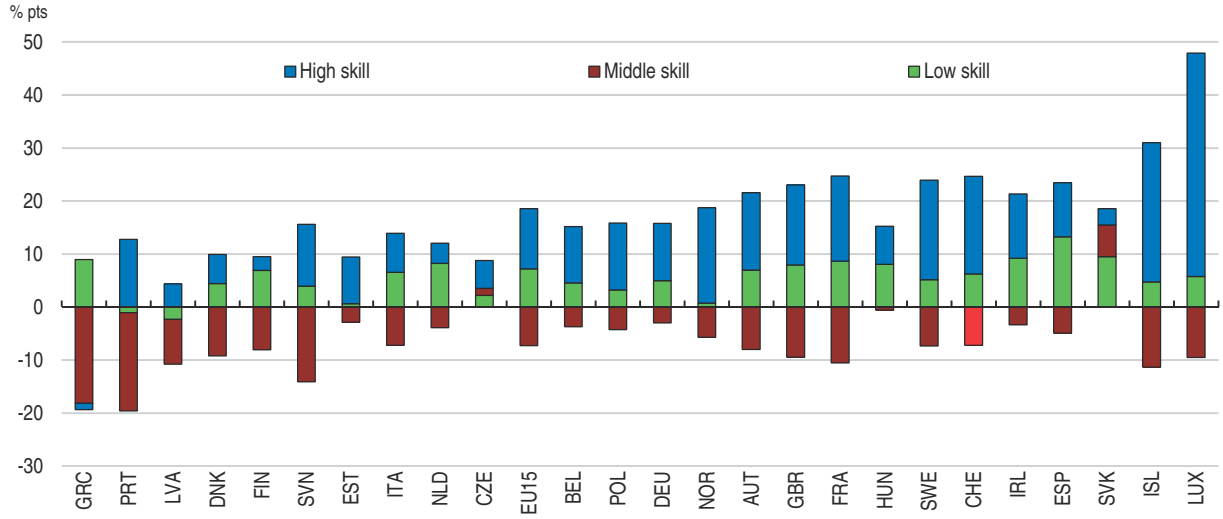
The needs of the economy are changing

Over the past decade and a half Switzerland has enjoyed comparatively strong employment growth averaging 1.1% per year. Most has been in high-skilled occupations, while the number of middle-skilled jobs fell (Figure 27). The lack of qualified staff remains a problem (SECO, 2017). Vacancy rates are persistently elevated in high-skilled sectors such as information technology and finance and insurance (Figure 28). Shortages of engineers have been enduring (Economiesuisse, 2017).

Digitalisation will change the structure of the labour market. Estimates of exposure based on sectors and occupations find that around half of all current Swiss jobs are at risk (Deloitte, 2015). But allowing for the types of tasks performed leads to lower estimates, averaging 9% across the 21 countries participating in PIAAC, with a further 25% of jobs changing significantly (Arntz et al., 2016). Digital skills gaps will need to be reduced (OECD, 2017d). The Swiss economy is also highly exposed to changes in foreign demand, with 36% of jobs depending on it. In the future new jobs will be generated through digitalisation and globalisation, but anticipating their skills requirements is difficult. Training should ensure

Figure 27. **Most of Switzerland's job growth has been in high-skill jobs**

Contributions to changes in total employment over 2000-16[1]



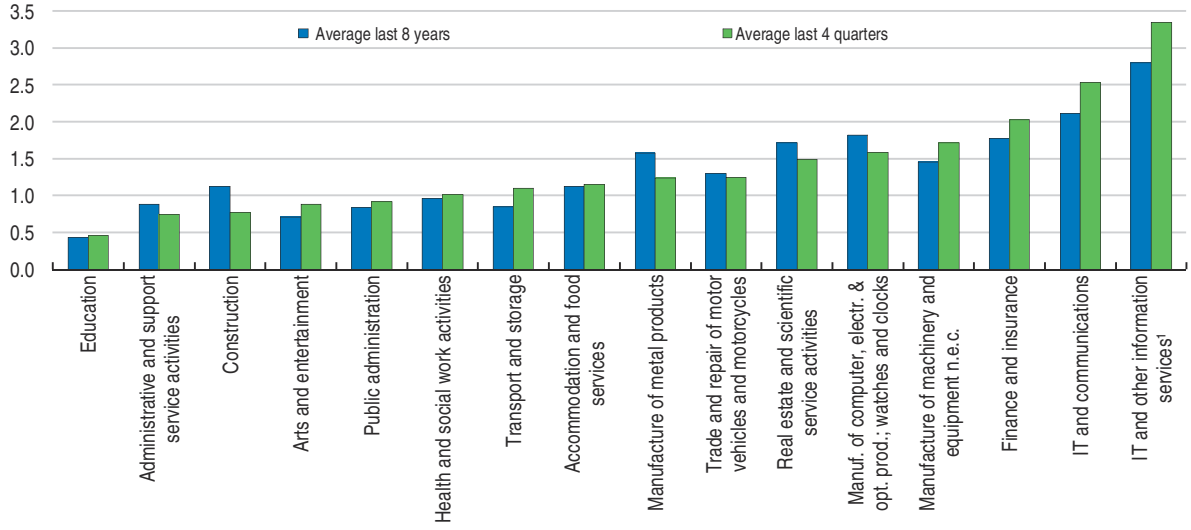
1. Countries are ordered by the change in net employment over 2000-16. High-skill occupations are: managers, professionals and technicians and associate professionals; medium-skilled occupations are clerical support workers, skilled agricultural, forestry and fishery workers, craft and related trades workers and plant and machine operators and assemblers; low-skilled occupations are service and sales workers, and elementary occupations. The armed forces and non-responses are not shown.

Source: Eurostat.

StatLink http://dx.doi.org/10.1787/888933620968

Figure 28. **Job vacancy rates by sector**

Per cent, 2017 Q2



1. IT and Other Information Services is a subsector of IT and Communications.

Source: Federal Statistical Office.

StatLink http://dx.doi.org/10.1787/888933620987

basic technological skills and the ability to think critically and work collaboratively and flexibly (OECD, 2016c).

Richer data on the distribution of Swiss workers' skills would enable policymakers to better respond to these challenges. A first step would be to participate in the next rounds of PIAAC – the OECD's periodic survey of adult skills. These results have been instructive in

formulating skills policy in other OECD countries. Developing longitudinal or cohort data within the Swiss education system would also assist policymakers.

The Swiss vocational education and training system is closely linked to the business sector, particularly the dual-track system, through firms' decisions to supply apprenticeships as well as the board of industry representatives that oversees study programmes. This has underpinned the strong school-to-work transitions. Programmes are reviewed at least every five years. However, the system can be slow to react to change (SERI, 2017). Time limits on curricular changes may be needed. Providing a broader range of skills than those specific to an occupation would increase the adaptability of workers to future changes in work, such as those from digitalisation, and allow students to change their studies more easily. In the school-based vocational system, linkages to the business sector could be strengthened to better ensure that curricula are flexible and relevant. Horizon-scanning-type exercises as in the United Kingdom (through the Commission for Employment and Skills) or Finland (through the Oivallus Project) could help stakeholders better anticipate shifts in skills demands.

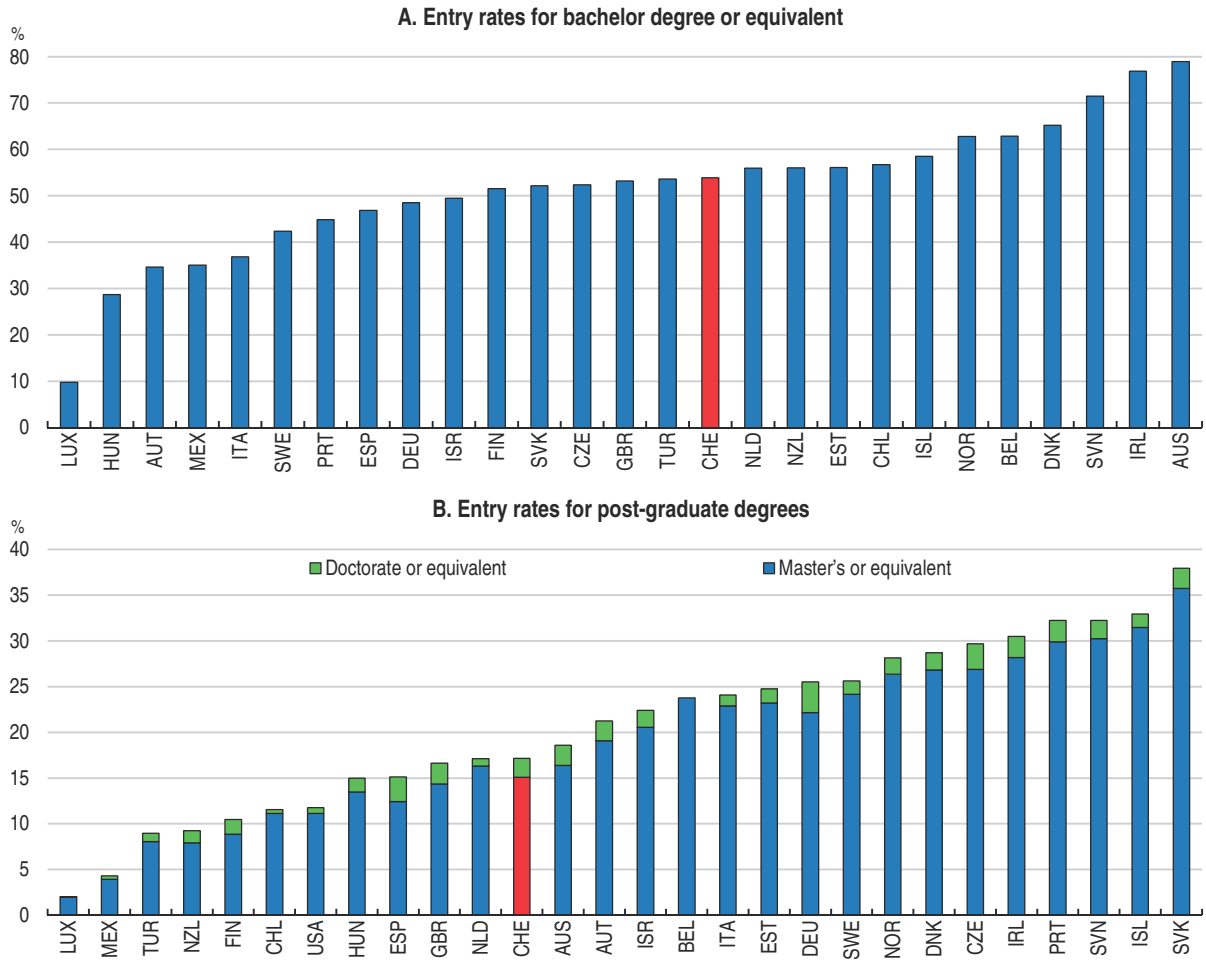
Increasing the supply of home-grown high-skilled workers

Despite a growing demand for tertiary-educated workers entry rates to tertiary education are still only around the OECD average (Figure 29). This is partly because only 41% of young people are expected to graduate from academic upper-secondary programmes, which is one of the OECD's lowest rates. However, the possibility to enter the academic institutions after the vocational education and training stream contributes to the bachelor's (or equivalent) overall graduation rate, which was 45% in 2015. Swiss wage premiums have previously attracted foreign skilled workers to fill shortages; in net terms, over half of all working-age immigrants over the past two decades were tertiary educated. The share of foreign workers is highest in natural sciences, medicine and pharmacy, and engineering (Economiesuisse, 2017). Switzerland's reliance on immigration combined with continent-wide shortages in some occupations and Europe's ageing population implies that more high-skilled workers are needed. That supply could be expanded by making it easier to move between vocational and academic streams, for example by increasing the academic component of vocational education and the applied component of academic education. Some OECD countries have altered the school curricula to improve preparedness for later tertiary studies in science and maths.

The supply and mix of employer-supplied vocational education and training has become an increasingly important issue. The number of places in handicraft and industrial professions is growing, but segments of the services sector, such as ICT, are under-represented. At the same time, many places go unfilled in some lower-skilled occupations, suggesting a supply-demand mismatch. Growing economic internationalisation may be reducing supply in newer industries since small firms, especially foreign firms, are less likely to participate (Muehlemann, 2014; SKBF, 2014). Sharing apprenticeships between firms, as in Germany and Austria, would lower administration costs (Kuczera, 2017). Training centres could take on a greater co-ordination role. These possibilities could be promoted more actively.

Continuing education will play an increasingly important role in ensuring that skills evolve to meet rapidly changing labour market demands and that people can work for longer. This is true for current workers, but also for those out of work and seeking to enter or re-enter the labour force, including people with low basic skills and those displaced from

Figure 29. **Tertiary qualifications in OECD countries[1], 2015**



1. First-time entry rates, excluding international students. First-time entry rates indicate the share of young adults expected to enter that type of tertiary education programme during their lifetime.

Source: OECD (2017), *Education at a Glance 2017*.

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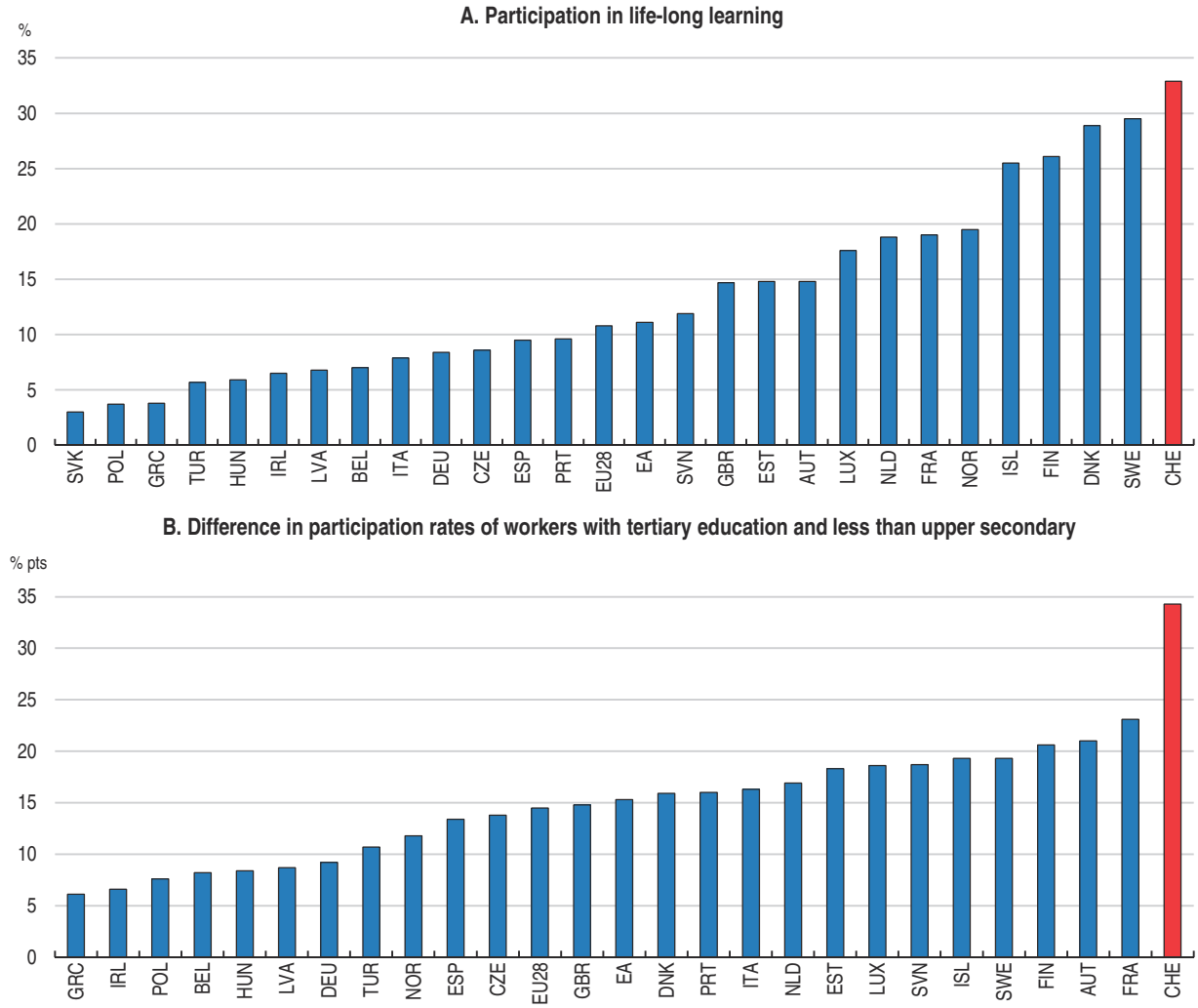
their jobs in structurally declining industries (Windisch, 2015). There is a higher barrier to participation for workers who are not working in the profession of their apprenticeship; in 2000 over half of all vocationally trained workers were not working in their original profession (Meyer, 2009). In 2011 around three-quarters of training participants stated that they were partly supported by their employers (SKBF, 2014). Reflecting high employer engagement, around a third of all 25-64 year-old residents participated in continuous education or training in 2016, the highest in Europe (Figure 30, Panel A). But the dispersion in participation by education level is also the largest (Panel B).

Swiss public funding of continuous education and training is limited. Personal spending is tax deductible, but this benefits higher-income households. Increasing public support for lifelong learning is hampered by the fragmentation of the system across jurisdictions and government departments. The Continuing Education and Training Act came into effect in 2017, giving effect to a 2006 constitutional amendment, and should help to increase co-ordination and improve the nationwide coherence of the system. It states that training is an individual's responsibility and should be market-based, but also that the

Figure 30. **Participation in life-long learning across Europe**

Per cent of population aged 15-64 participating in education and training in the preceding four weeks, 2016



Source: Eurostat, *Labour Force Survey 2016*.

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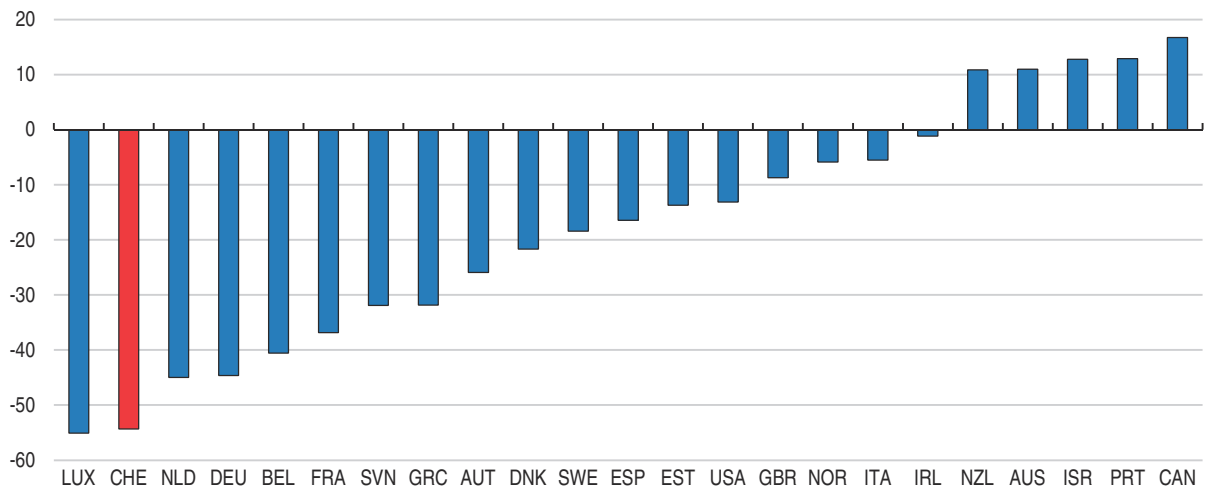
Confederation and cantons should contribute to the accessibility of training and equality of opportunity. Importantly, it will facilitate data collection. Because workers and firms may not fully internalise the need for further investment in human capital, subsidies may help incentivise take-up. Recognition of prior learning and work experience could also raise participation.

Ensuring equity in education and training

Overall, Switzerland performs relatively well in integrating immigrants, people from disadvantaged backgrounds and women in the economy, as evidenced by high employment rates (OECD, 2017b). But for women a high share of part-time work and an unadjusted gender earnings gap of 17% for full-time employees contribute to large differences in incomes (OECD, 2017b). Such gaps with the broader population highlight scope to better realise the potential of these population groups.

Youth with an immigrant background significantly underperform according to PISA. The gap in 2015 relative to non-immigrant students was the same for immigrant students and those born in Switzerland to migrant parents, implying that underperformance persists across generations. Recent evidence shows that almost three-quarters of the school underperformance of children from an immigrant background is accounted for by socio-economic characteristics (Cattaneo and Wolter, 2015). Clustering of students with immigrant parents across schools results in large differences in student performance between schools with high and low immigrant concentrations (Figure 31). In the past this reflected the fact that these students were often directed into "special education programmes"; these programmes are being used in a more focussed way now. Encouraging take-up of early childhood education for those from poorer socio-economic backgrounds, for example through conditional cash transfers, could boost later performance.

Figure 31. **Difference in PISA science score levels between students in schools with high and low concentrations of students with an immigrant background[1], 2015**



1. Students with an immigrant background are those who are foreign born or have foreign-born parents. Schools with a low (high) concentration of students with an immigrant background are those schools in bottom (top) half of the concentration distribution.

Source: OECD, *PISA 2015 database*.

StatLink http://dx.doi.org/10.1787/888933621044

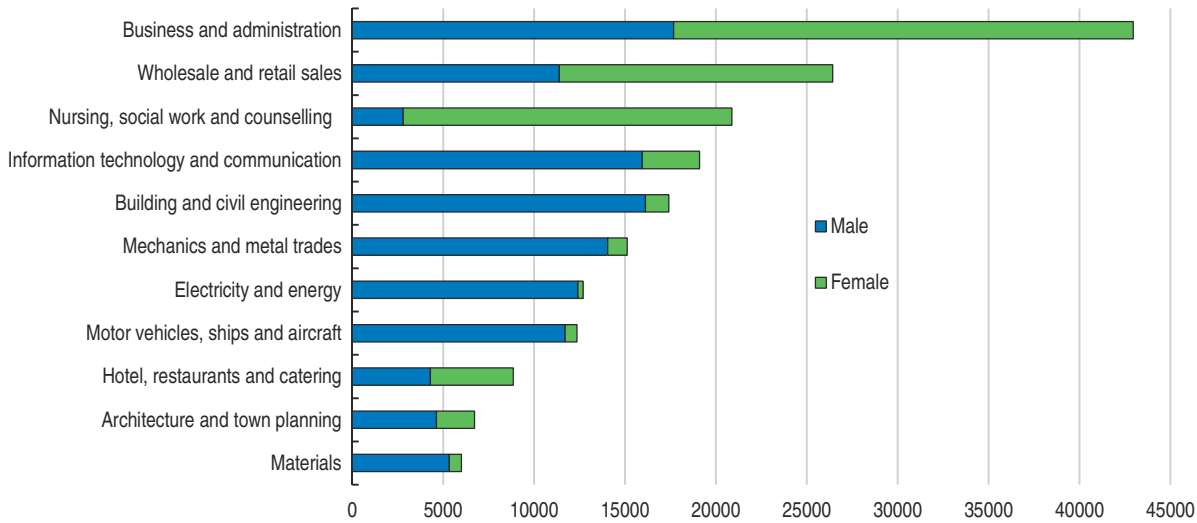
At age 15 students must choose between the academic and vocational streams. Cross-country evidence shows that the influence of parental background on children's secondary school performance is lower in countries with later tracking or with a comprehensive secondary school system (Causa and Johansson, 2010). In Finland the gradual move from tracking to a comprehensive system is estimated to have reduced the intergenerational income elasticity from 0.30 to 0.23 (Pekkarinena et al., 2009).

The extent of tracking has been reduced. In lower secondary schools students are now often separated by ability in the same school, rather than into schools based on different academic performance levels. But this will reinforce inequality if movement between streams is difficult and poorer performers systematically enter vocational education and training, as is the case in Switzerland. This could be overcome by reducing the number of classes grouping students by ability or easing the movement between streams, perhaps with some use of external assessment. There is a strong case to re-examine the age and way that students are separated to boost equity and intergenerational mobility.

The historical gender gap in education has now reversed, with Swiss women studying longer than men. However, large differentials across fields of study influence labour market outcomes. For example, female participation in technical courses in the vocational system, like engineering and computing, is a fraction of men's, while in nursing the gap is reversed (Figure 32). Because children choose their education path when not fully mature, family influence or their own pre-conceptions may be stronger. Indeed, in Swiss cantons with more *gymnasiums* (where choices are made later) than VET schools, gender allocation is less stereotypical (Imdorf et al., 2014). This may be because the general track offers students more opportunities to change paths or because they make career choices later. Re-examining the age at which students make career-determining choices and the ease of changing paths may improve gender equity.

Figure 32. **Students in vocational education and training**

Training sectors and gender, 2015/16[1]



1. The training sectors not shown represent 17% of the students.
Source: Federal Statistical Office.

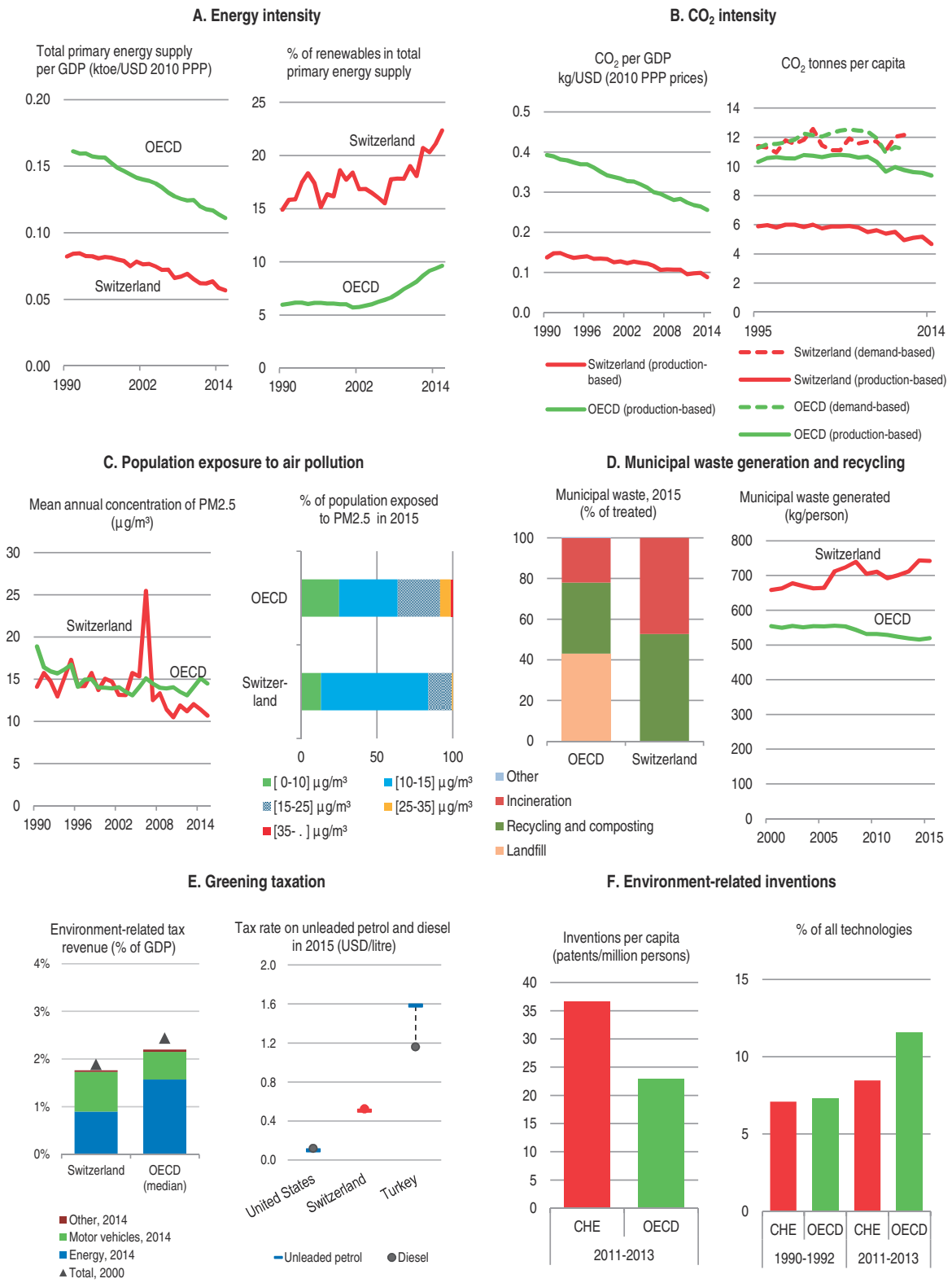
StatLink http://dx.doi.org/10.1787/888933621063

Enhancing environmental sustainability

Switzerland's per capita emissions of greenhouse gases (GHG) are only half the average OECD country's, largely because 93% of electricity is generated from hydroelectric and nuclear energy. Renewables' share in energy supply has risen rapidly over the past decade (Figure 33, Panel A). Nuclear power provides about one-quarter of total final energy supply, indicating the challenges in phasing out nuclear as planned, as new plants are prohibited and existing plants are ageing.

Although domestic per capita emissions are well below the OECD average, CO_2 emissions attributable to Swiss expenditure, which includes imports, are much higher and have recently increased above the OECD average (Figure 33, Panel B). Between one-half and three-quarters of Swiss environmental impacts are estimated to be embodied in imports (FOEN, 2014). Similarly, Swiss municipal waste has not yet decoupled from economic growth, driving a growing gap with the average OECD waste per capita, currently 40%. Although a large proportion of waste is recycled, much is incinerated. In surface water, organic micropollutants exceed legal limits. Planned upgrades to infrastructure should be pursued.

Figure 33. **Environmental indicators**



Source: OECD (2017) Green Growth Indicators (database). For detailed metadata see: *http://stats.oecd.org/wbos/fileview2.aspx?IDFile=02a134e1-c3ec-4c5c-9a05-4ebb41a60539.*

StatLink *http://dx.doi.org/10.1787/888933621082*

The recently passed package of measures under the Energy Strategy 2050 will steer changes in Switzerland's energy mix. It envisages a substantial increase in electricity production from non-hydro renewables (mostly solar and wind), by over 50% by 2020 and 300% by 2035 compared to 2015. Hydro will remain the main source of electricity, with triple the output of other renewables in 2035. The Strategy aims to cut average per capita energy consumption by 43% by 2035 compared to 2000. It includes measures to promote investment in renewables and energy efficiency. For Switzerland to meet its goal of reducing GHG emissions in 2030 by 50% from 1990 levels, upcoming revisions to the CO_2 Act for 2021-30 will be critical (OECD, 2017f).

Increasing environmentally related taxation would provide additional incentives to gradually green the economy. Total environmentally related taxation is low relative to GDP, and collected mostly via taxes on energy use and motor vehicles (Figure 33, Panel E). While earmarking is not recommended, additional resources would help meet needs for investment, including the transition costs away from nuclear. Switzerland prices 82% of its CO_2 emissions from energy use, and 63% at over EUR 30 per tonne of CO_2 (OECD, 2016d). The Energy Strategy proposes increasing the existing electricity network surcharge, which is used for the promotion of renewable energy, energy efficiency and improvement of water quality. Widening the CO_2 tax base and increasing other taxes designed to reflect externalities would also help to meet current ambitious targets. However, the earmarking of these revenues for environmental programmes should be further reduced to increase flexibility to meet changing needs (Table 8; OECD, 2017f). A combination of increased incentive-based taxation and a review of the cost-effectiveness of existing measures to manage municipal waste could help to curtail waste.

Table 8. **Past recommendations on addressing environmental sustainability**

Recommendation	Action taken since the November 2015 *Survey*
Make greater use of market mechanisms to lower the cost of the transition from nuclear to renewable energy. This includes redesigning the current feed-in tariff scheme. Exploit the opportunities offered by the move from nuclear to renewable sources of energy and green-house gas targets to put in place a framework that promotes competition in the energy sector.	With a complete revision of the Energy Law, renewables support will shift from feed-in tariffs to contracts for difference and investment grants from 2018. Operators of larger power plants in the feed-in system will have to sell their electricity to the market and take on full balancing responsibilities. Investment grants will be extended from currently only small-scale photovoltaics also to larger-scale photovoltaics, hydropower and biomass. A (partial) opening of the gas market by means of a yet to be drafted Gas Supply Act is planned.
Increase the CO_2 levy, and remove exemptions to this and other green taxes.	The CO_2 levy was increased from CHF 60 to CHF 84 per tonne of CO_2 in 2016 and will be increased again to CHF 96 in 2018.
Further promote private- and public-sector energy-related research, and continue engagement with foreign researchers to facilitate realisation of the Energy Strategy 2050.	The Swiss Parliament has approved CHF 120 million in funding for the second phase (2017-20) of the capacity building of the Swiss Competence Centres for Energy Research. These are R&D clusters grouping academia and industry to focus R&D on eight energy fields including electricity generation and storage and biomass. An additional CHF 19 million is earmarked for boosting co-operation between industry and universities.
Move forward with linking the Swiss and EU emissions trading systems.	Negotiations to link the Swiss and EU emissions trading systems via mutual recognition of emissions allowances were initiated in 2008 and concluded in 2016. Signature of the agreement is imminent.

Although Switzerland produces nearly twice as many environmental patents per head as the average OECD country, the share of environmental patents in all patents is lower. Mobilising the corporate and financial sector could help raise rates of eco-innovation and improve environmental performance, for instance through mandatory disclosure of

environmentally related information, including for buildings, and public-private partnerships to favour greener infrastructure investment (OECD, 2017f). Well-aligned climate, fiscal and investment policies can maximise the impact of public investment by leveraging private investment (OECD, 2017g).

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ANNEX

Progress in structural reform

This Annex reviews actions taken on recommendations from previous Surveys *that are not covered in tables within the main body of the Assessment and recommendations. Recommendations that are new in this* Survey *are listed at the end of the relevant chapter.*

Recommendations in previous *Surveys*	Action taken since November 2015
A. Boosting long-term growth and productivity	
Examine the roots of, and propose remedies for, the poor productivity performance, including by creating a productivity commission.	In June 2017 the Federal Council adopted its "New Growth Policy 2016-19", which contains 14 measures to promote growth in productivity, the resilience of the economy and the alleviation of negative side effects of economic growth.
Accelerate the pace of agricultural sector reform, including moving entirely to direct payments to farmers, and by further integrating the entire food value chain in international trade.	In December 2014 a project was launched to simplify the administration of agricultural policy and current regulations, of which 24 simplifications were enacted in January 2016 and 18 additional ones in January 2017.
Extend the network of free-trade agreements, including with India and the United States.	In 2016 negotiations were concluded with the Philippines and Georgia, and Guatemala acceded to the agreement between EFTA and Central America. Switzerland has ongoing negotiations with MERCOSUR, Malaysia, Vietnam, Indonesia, India and Ecuador. Negotiations with Russia/Belarus/Kazakhstan, Algeria and Thailand are on hold. Negotiations with Turkey and Mexico to modernise and broaden the scope of existing agreements are ongoing.
Continue to examine options for the introduction of tax incentives that encourage innovation, for example for business angels.	Studies on the taxation of business angels are ongoing.
Be prudent with the tax treatment of intellectual property to ensure that current measures are serving their intended purpose and are not unduly distortionary internationally.	The tax proposal 17 as suggested by the Federal Council in the consultation process contains measures that may ensure the intended purpose in relation to intellectual property: 1) a patent box that is in accordance with the international standard, which would be mandatory for all Cantons due to the federal harmonisation law and 2) research and development deductions.
Ease restrictions on starting a business by reducing the number of procedures and time required, for example by improving the web-portal "StartBiz" and abolishing the compulsory public notary authentication.	No action taken.
Put more emphasis on the early activation of migrants.	Since the establishment of Cantonal Integration Programmes in 2014, cantons evaluate the abilities, qualifications and professional experience of each migrant and offer training when needed. The recent extension for the period 2018-21 will concentrate on information, training, and communication. Pre-apprenticeship integration training will be offered as of 2018.
Give a more important role to job-insertion allowances, which provide subsidies to companies to employ youths, other new entrants or the long-term unemployed.	Expenses for job-insertion allowances have increased by 30% in the period 2012-16.
Do more at the federal level to co-ordinate employment services between cantons.	In a pilot phase, the outcome indicators of the current results-oriented agreement (valid from 2015 to 2018) were extended to jobseekers without benefit entitlements to strengthen the uniformity of enforcement and comparability between employment services across cantons.
B. Upgrading education	
Step up public funding of pre-schools.	In June 2017 the parliament granted an additional CHF 100 million over the next five years for subsidies to reduce childcare costs and foster the restructuring of childcare services to meet the needs of parents.
Address integration issues within the integrated school system as part of a comprehensive policy.	No action taken.
Learn from the experience of other countries, including Finland, with their teacher preparation programmes, which focus intensively on helping teachers develop practical remedial teaching skills that help to address weaker students within aptitude-level integrated classrooms.	In October 2016 Swiss universities' Chamber of the Universities of Teacher Education adopted recommendations on the integration of remedial teaching skills in initial teacher education.
Improve access to tertiary education for all segments of society, including special measures for those from lower socio-economic and immigrant backgrounds.	Since January 2016 expenses for tertiary vocational education can be deducted from taxable income. Deductions for calculating federal income tax payable may not exceed CHF 12 000 annually. Cantons can set their own limits.
Facilitate greater mobility between career paths by creating well-marked and more numerous pathways.	No action taken.
Boost the supply and attractiveness of fields of study that are in high demand in the labour market. Further clarify study streams across the tertiary education system.	The confederation is funding programs to motivate children and youth to take STEM subjects. The second cycle of the programme runs in 2017-20.
C. Enhancing competition	
Consider allowing criminal sanctions for anti-competitive actions.	No action taken.
Apply the prohibition principle to all hard-core cartels. Raise ComCo's resources, and ensure its independence by excluding members that represent economic interests.	No action taken.

Recommendations in previous *Surveys*	Action taken since November 2015
In the electricity sector, introduce ownership separation between generation and transmission; strengthen the regulator's powers; introduce price caps and benchmark regulation; and use regulatory accounting rules for the determination of network access prices.	The planned revision to the Federal Electricity Supply Act will give the regulator the possibility to make public various indices on cost, quality, tariffs and compliance used in the "cost plus" regulation (so called sunshine regulation).
In telecommunications, apply *ex ante* regulation to access conditions to the local loop and to interconnection charges.	No action taken.
Make tendering of regional rail passenger services compulsory, ensure non-discriminatory access to rolling stock, and allow PKP's rivals to propose investment projects. Base investment decisions on an independent cost-benefit assessment.	No action taken.
Liberalise completely network industries, benchmark the public sector, and implement more efficient territorial management.	A (partial) opening of the gas market by means of a yet-to-be drafted Gas Supply Act is scheduled for around 2021. Regarding territorial management, cantons are adapting their master plans to the Spatial Planning Act revision, which came into force in May 2014 and must be implemented by 2019. Some cantons already signed with the Federal Council.
D. Improving the tax system	
Widen the VAT base by removing exemptions. Unify VAT rates. Over the medium term raise VAT rates. Explore the technical feasibility of applying a VAT to banking services. If such a VAT is not introduced, consider an additional tax on financial institutions' profits and remuneration.	No action taken.
Lower the tax wedge on second earners, for example, by introducing separate assessment of partner income. Set up uniform rules concerning the taxation of several earners within one household across levels of government.	No action taken.
Replace progressive cantonal corporate taxes with proportional taxes and abolish capital taxes. Remove taxes on the issuance of equity and debt securities.	No action taken.
Abolish the lump-sum tax regime for rich individuals who are not economically active in Switzerland. Subject all residents to standard personal income taxation.	The revision of 28 September 2012 that increases taxation for new beneficiaries took effect in 2016.
E. Expanding women's role in the economy	
Use role models to make hard sciences more attractive for girls and social sciences and health to boys, and raise awareness of career and earnings prospects associated with study choices. Inform students about rewarding gender-atypical career choices.	As part of the "Fachkräfteinitiative", Switzerland took initiatives in raising the attractiveness of gender-atypical careers. One of the objectives of the "Fachkräfteinitiative" was to raise awareness of boys and men for professional activities and careers in the health and social work sectors (Federal Administration's "Equal Opportunity at Universities of Applied Sciences" Programme 2013-16).
Reduce the influence of socio-economic background on the extent of gender-typical study and career choices by providing earlier and more intensive guidance for disadvantaged students, and greater financial support.	No action taken.
Increase women's labour market options by raising public spending on childcare and by adjusting regulations to broaden the range of available price/quality options.	In June 2017 the parliament granted an additional CHF 100 million over the next five years for subsidies to reduce childcare costs and foster the restructuring of childcare services to meet the needs of parents. In April 2017 the Federal Council launched a consultation process to increase the tax deduction for childcare expenses, with a maximum deduction to CHF 25 000 (from 10 200) at the federal level and to at least CHF 10 000 at the cantonal level. The consultation process ended in July 2017.
Remove the so-called marriage tax penalty at the federal level by introducing individual, as opposed to family, taxation or some equivalent measure.	In June 2017 the Federal Council sent a proposal to the parliament to reduce the "marriage penalty".
Create paternity leave, and consecutive "take it or leave it" parental leave to be shared between fathers and mothers.	No action taken.
Implement a corporate governance code establishing gender goals to increase the number of women in senior management. Increase the proportion of women on company boards by setting ambitious targets combined with a "Comply or Explain" requirement or by setting quotas.	The Federal Council submitted to Parliament a proposal for a reform of company law that includes gender guidelines on a comply-or-explain basis according to which women should account for at least 30% of the board of directors and at least 20% of the executive board. The parliament has yet to vote on this proposal.
Foster a positive image of entrepreneurship amongst women by allowing successful women entrepreneurs to tour secondary and tertiary educational institutions to explain the rewards and advantages of setting up one's own business, especially given women's preference for flexible work solutions.	No action taken.

Recommendations in previous *Surveys*	Action taken since November 2015
F. Taming the housing market	
Monitor closely mortgage lending to firms or households for rental properties, which may not be as responsive as the owner-occupied segment to recent regulatory measures.	Supervisors continue to closely monitor bank lending.
Review spatial planning regulations to make it easier to build denser housing.	No action taken.
G. Increasing the efficiency of public spending	
Increase public spending on early childhood education and care, especially for children with disadvantaged socio-economic backgrounds (including those from immigrant backgrounds), which could be combined with a generalisation of the childcare voucher systems in the Canton of Lucerne.	In June 2017 the parliament granted an additional CHF 100 million over the next five years for subsidies to reduce childcare costs and foster the restructuring of childcare services to meet the needs of parents. This is intended to particularly benefit lower income families and thus children with a disadvantaged socio-economic background.
Evaluate solutions to reduce the drop-out rate in the university system.	No action taken.
Switch the system for setting generic drug prices to reimbursing a pre-determined fixed amount.	A modification of the law is envisaged in 2017 to set the reimbursement of generic drugs to a pre-determined fixed amount.
Cut the marginal effective tax rates on labour income of disability insurance beneficiaries.	No action taken.

Thematic chapters

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Chapter 1

Boosting productivity in Switzerland

Swiss GDP per capita stands amongst the top OECD performers. However, to face medium-term challenges productivity developments will be key to allow the country to maintain its enviable position. Recent trends have not been favourable, with productivity growth underperforming peer countries. Based on macroeconomic analysis and supported by firm-level data, results point to a significant role for competition, innovation, education, firm characteristics and entrepreneurship. The regulatory environment is a crucial element driving productivity and could explain some of the differences across cantons. It is also an important factor for productivity differences across sectors. Other issues weighing on Switzerland's future performance include risks from ageing, which can have major consequences on productivity via its influence on economic sectors and also via the age structure and the evolution of productivity through working life. Fully utilising the potential of underrepresented population segments would also be beneficial, notably encouraging full-time participation of women and better integrating immigrants. More enterprise creation could be achieved with increased entrepreneurship education, expanded non-bank financing and a reduced regulatory burden. R&D, while an obvious success in Switzerland, has apparently not produced commensurate returns in output. Diversification, more knowledge sharing, a stronger role for higher education institutions and promotion of start-ups would help reinforce the links from R&D to productivity.

The Swiss economy is performing relatively well in a variety of dimensions. Average GDP per capita is one of the highest amongst OECD countries; survey- and indicator-based measures of well-being also put Switzerland among the top countries; and income inequalities are quite modest. Yet, medium-term challenges will arise as ageing and digitalisation along with other macroeconomic risks – including protectionism in many parts of the world – bring about structural changes that endanger its relatively good performance. In this context putting in place the conditions to boost productivity is crucial. Without productivity improvements, economic problems such as those related to ageing and inclusiveness will be harder to solve. Indeed, faster productivity growth will naturally expand fiscal revenues needed to finance social transfers and ageing-related direct government spending. To achieve faster productivity growth, it is also crucial to underpin the competitiveness of Swiss firms and the attractiveness of the economy for foreign investors.

There has been a generalised productivity slowdown across OECD countries in recent years, pointing to a likely failure to translate technological change into commensurate innovations (OECD, 2016a). But, over the last several decades labour productivity has grown on average more slowly in Switzerland than in its main counterparts. Accordingly, it is important to identify any Swiss-specific structural weaknesses in order to avoid any persistence of such underperformance. This could in principle involve: slow adoption of new technologies; insufficient development of higher value added activities; skills shortages or mismatches; limited labour mobility; credit misallocation; weak aggregate demand (limiting the incentives and scope for innovations); and a lack of competition associated with heavy regulatory burdens. At the same time, its advanced ITC sector and developed infrastructure makes Switzerland well placed to take advantage of digitalisation and the next production revolution. However, this depends on the diffusion of innovation and the responsiveness of the education and training system to changing skill needs (OECD, 2017a and 2017b).

In most cases promoting productivity and fighting inequality involves no trade-off (Ostry et al., 2014). Therefore, economic policies should be carefully designed to encourage both higher and more inclusive growth. Switzerland has long favoured inclusiveness through its maintenance of very high employment rates, even though its unemployment rate has trended slightly upwards over time. However, forces such as digitalisation raise the risk that future growth is less equally shared if it translates into higher demand for highly skilled workers and a marginalisation of others.

This chapter examines Swiss productivity growth as the main driver of future improvements in standards of living. First, it discusses the macroeconomic environment and recent productivity developments. That covers a comparison of Switzerland with international peers, the decomposition of productivity growth into changes in capital intensity and total factor productivity, the role of ageing and regional aspects. The following section goes into more detail about what has potentially driven the productivity slowdown, drawing on firm-level data when possible. Scrutiny of sector characteristics complements analysis of capital and labour allocation, followed by firm entry and exit

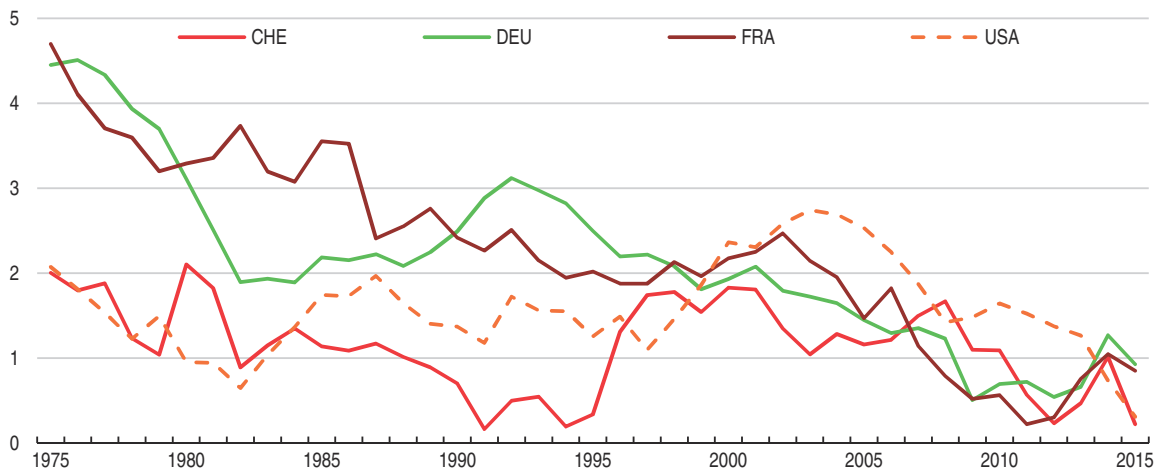
specificities for Switzerland. The section also highlights the importance of international trade and existing restrictions on its development as well as on competition. Additionally, the role of Swiss R&D is discussed. The chapter concludes by making policy recommendations aimed at designing a productivity growth framework that does not neglect distributional outcomes.

Productivity growth has under performed recently, but its level remains elevated

Hourly labour productivity growth in Switzerland has been lower than in most OECD countries in a context of a global productivity slowdown, which increases risks as to maintaining its relatively high living standards in the future (Figure 1.1). When removing the influence of the cycle, trend labour productivity growth (per employee) in Switzerland has fallen by more than half over the past two decades, from about 1.1% per annum over 1996-2006 to less than 0.4% over 2006-16. In comparison, OECD-wide trend labour productivity has grown 1.0% annually over the latter decade (1.6% over 1996-2006).

Figure 1.1. **Growth of output per hour worked**

5-year moving average growth rate, in per cent



Source: OECD, *Productivity database.*

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The level of productivity remains high when compared with international peers

Measurement issues can affect conclusions, even though they do not seem to be large enough to drive the recent decline (Box 1.1). Additionally, other elements not systematically incorporated in output matter for sustainability and are important to bear in mind (Box 1.2).

Productivity growth is essential, but Switzerland's relative underperformance could also be related to a higher starting level to which other countries hope to catch up. However, though Switzerland's GDP per capita ranking is enviable (third-best amongst OECD countries), its productivity level, while still good, is not as high (tenth rank; Figure 1.3). It is essentially the employment-to-population ratio (second best) that explains its good per capita GDP performance (OECD, 2015a). This happened in a context of a rising share of cross-border workers in the labour force (gaining 1 percentage point over 2010-15 to reach 6%). Continued labour force growth is also attributable to high levels of immigration (see below).

Box 1.1. **Role of measurement issues**

Mismeasurement of output can bias the analysis of productivity developments. Some issues are well known: for example, uncertainty and extensiveness of imputation methods for health, education and finance outputs. Over recent years there has been a surge in activities that barely existed previously or were drastically transformed. The process of digitalisation is clearly disruptive for producers and consumers. Indeed, increasing use of big data, peer-to-peer platforms, online and targeted advertising, crowd sourcing, free internet services, new forms of financial intermediation and activities of growing numbers of self-employed workers using new forms of transactions could potentially be difficult to measure in GDP. In addition, the new economy is characterised by the rising importance of intangible assets (e.g. intellectual property). Their prices can be volatile and depend on characteristics quite different from those for tangibles. Therefore, they are not broadly accepted to secure business loans, for example.

Those changes seem to affect consumer welfare more than market-sector production, as many new services are free and then partly uncounted in GDP. Ahmad and Schreyer (2016) argue that the accounting framework for GDP is broadly adequate to face the digitalisation era. There remains some scope though for improving statistics and measures of output and deflators. That includes better accounting for certain cross-border flows (like e-commerce) and the continued effort to differentiate quality and price changes, especially when dealing with new products or services. But measurement issues so far have been marginal in comparison with the actual productivity decline. And even the well-being gains do not seem to compensate for the observed slowdown (Syverson, 2016; Byrne et al., 2016). Conversely, Aghion et al. (2017) argue in the case of the United States that measurement issues were substantial (about 0.5 percentage point per year) over 1983-2013, but they fail to show a significant error increase that could explain the recent productivity slowdown.

Metrics that are related solely to GDP performance fail to catch all dimensions of improved well-being that matter most. Inclusiveness, well-being and environmental sustainability are all ultimate objectives, and higher productivity should be considered as a means to achieve higher levels of each of them. In particular, a specific measure of environmental productivity shows that Switzerland should pay more attention to the CO_2 content of its imports.

The availability of jobs for the entire population helps to moderate Switzerland's level of income inequality. However, it also reins in productivity, as the inclusion of a large set of workers including the less skilled drags down its average. In contrast, countries like

Box 1.2. **Environmental productivity**

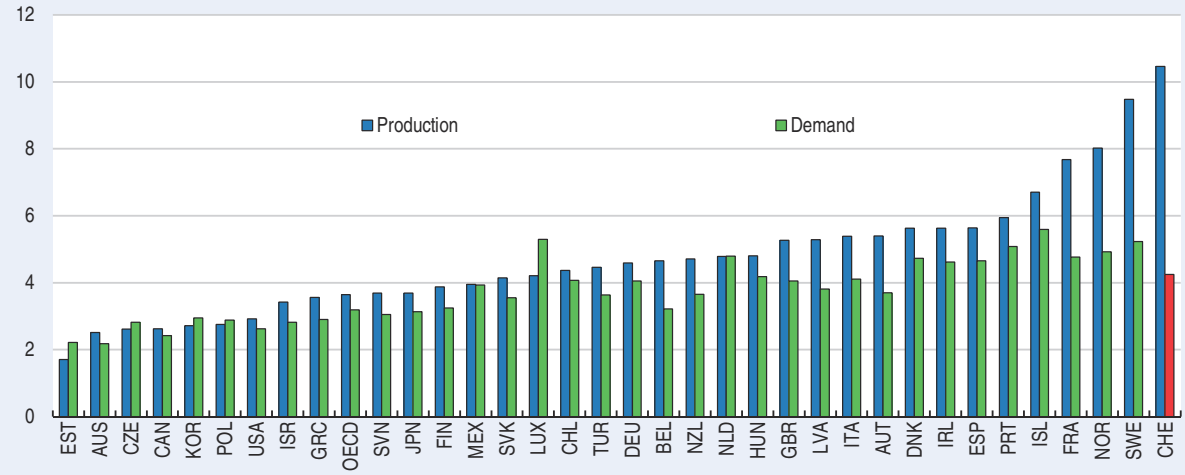
A central element of green growth is the efficiency of production and consumption in terms of environmental inputs and resource usage. The OECD has developed indicators to monitor the transition to green growth. They are derived from a comparison between the use of environmental services (including natural resources, energy and pollutants) as inputs and the generated output.

As CO_2 is a major contributor to greenhouse gases, its productivity measures to what extent ongoing climate change mitigation can affect economies. Switzerland is particularly efficient in that dimension from the perspective of production-based productivity; however, it is the OECD country which has the highest difference with the demand-based approach (Figure 1.2). Domestic production is highly efficient in terms of environmental inputs, notably because of Swiss specialisation in low-carbon industries. Nevertheless, Switzerland is responsible for a larger amount of CO_2 emissions that are embedded in national demand: between half and three-quarters of the environmental impact is estimated to be embodied in imports (OECD, 2017c).

Box 1.2. **Environmental productivity** *(cont.)*

Figure 1.2. **CO_2 productivity**

2010 PPP US dollars per kilogram, 2011



Note: Production-based productivity corresponds to real GDP generated per unit of CO_2 emitted in production. Demand-based productivity is real national income per unit of CO_2 emitted.

Source: OECD, *Green Growth Indicators database*.

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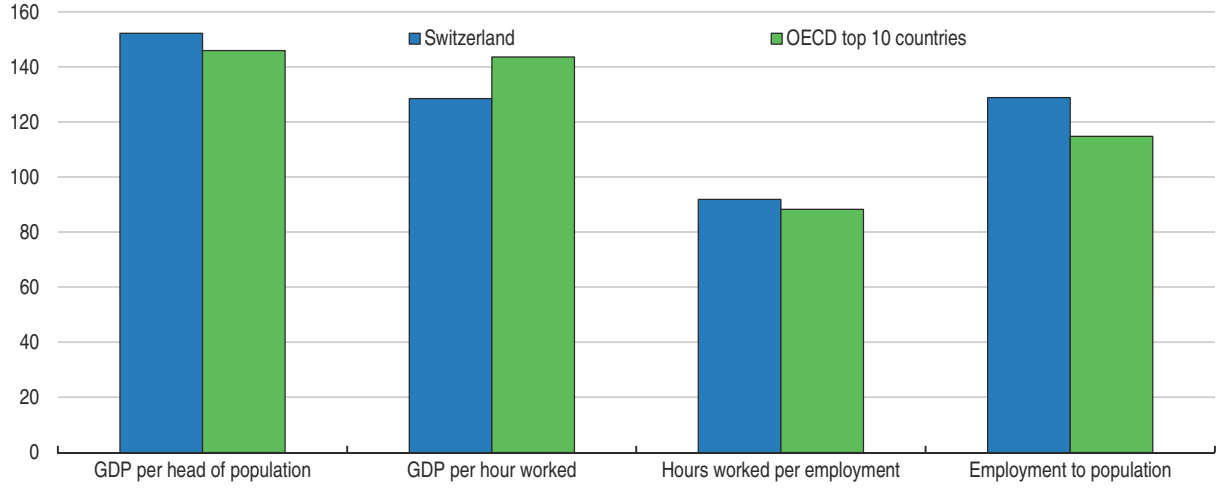
Figure 1.3. **Decomposition of GDP per capita amongst OECD countries**

2015, relative to OECD average (=100), in 2010 PPP USD



Note: OECD top 10 countries are selected according to their performance in GDP per capita.

Source: OECD, *Productivity database*.

StatLink http://dx.doi.org/10.1787/888933621139

Belgium, France and Ireland have higher average productivity but employ a much lower share of their populations. In addition, it appears that countries with higher productivity levels tend to have lower average hours worked (correlation of -0.8), in large part because of an income-elastic demand for leisure.

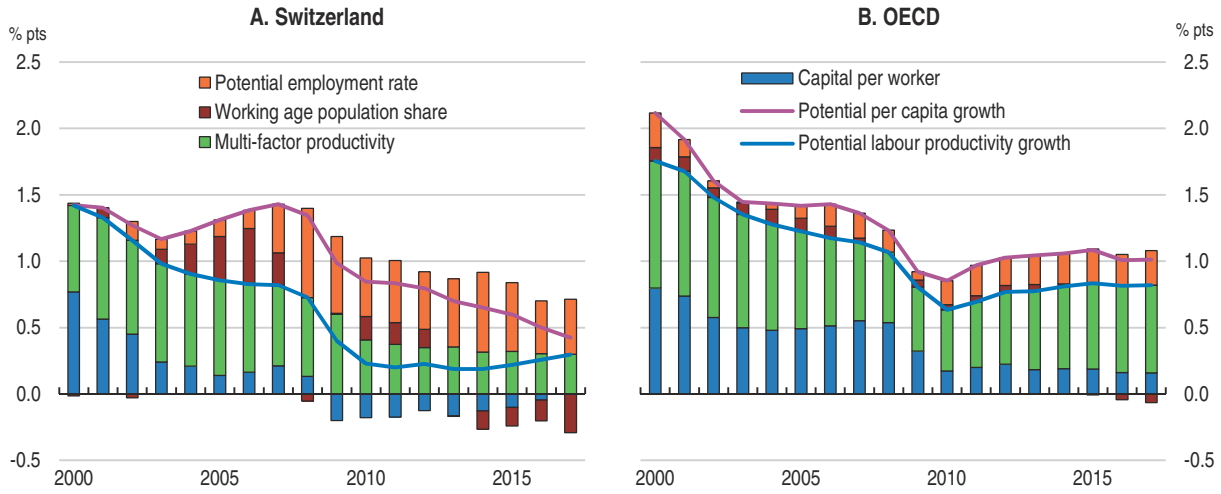
Low multi-factor productivity growth along with weak capital deepening are hampering the economy

Recent productivity outcomes and ageing have weighed on GDP per capita. In particular, population ageing has already started to dampen economic growth significantly (Figure 1.3). Switzerland had been counting on persistent rises in the employment rate to limit the divergence with OECD average growth in GDP per capita. This has favoured inclusiveness to some extent, as inequality increases with unemployment. The employment rate has, however, limited scope to rise any further, as it is already one of the OECD's highest. By 2018, OECD estimates imply that, without the contribution from a higher employment rate, GDP per capita would fall, which points to the crucial role of productivity developments.

Productivity growth has been trending down since 2000 for both Switzerland and the OECD average (Figure 1.4). While the gap in GDP per capita growth has been contained, the difference in productivity growth has become more pronounced. The contributions from both multi-factor productivity (MFP, a measure of technical change) and from capital deepening are shrinking, with no sign of recovery at the end of the projection period. This means that technological progress is modest and that investment has been too weak to compensate for the rise in labour input. This is consistent with findings for other OECD countries (Ollivaud et al., 2016). Further improving the business environment would boost investment and generate both an increase in the capital-labour ratio and a rebound in MFP.

Figure 1.4. **Decomposition of growth of potential output per capita**

Contribution to potential output per capita growth



Source: OECD (2017), *OECD Economic Outlook 102 database, preliminary version.*

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Boosting productivity will prop up the competitiveness of the economy, which has been eroded by currency appreciation and a relative increase in labour costs when expressed in foreign currency. Indeed, the increase in real wages since the crisis, together with the end of the currency ceiling in January 2015, have curbed Swiss firms' margins in the context of a very open economy (exports are almost two-thirds of GDP). This probably lies behind some of the weakness in business investment as a share of GDP – even though its five-year moving average has edged up in recent years. Nevertheless, the current

account surplus remains large and export performance strong, demonstrating continuing competitiveness at least for some industries and an ability to further increase investment financed by domestic saving.

Swiss public investment has been relatively weak in recent years, and it could be a factor dampening productivity. As a share of GDP, public investment has averaged around 3% since 2000, compared to 4% over the 1980s and 1990s. Raising public investment and increasing public capital stock can directly increase labour productivity and long-term growth even though gains suffer from decreasing returns (Fournier, 2016); it can also potentially generate spill-overs to private investment. Together with more spending on early childhood education and care (as recommended in the previous *Survey*), those additional expenditures are able to spur productivity in the long run and also enhance inclusiveness (Fournier and Johansson, 2016).

Ageing also impacts on productivity

As mentioned above, ageing represents a major challenge. On top of other impacts on the economy (OECD, 2015a), Switzerland's demographic structure also influences its productivity outcomes. Not only will the old-age dependency ratio increase (almost a third of the population will be over 60 by 2030), but also the average worker's age will rise. Productivity differs across age groups because of changing educational attainment, accumulation of experience, depreciation of knowledge and varying age-related capabilities. Employees' knowledge could also become gradually outdated as they age, which could penalise a typical worker's ability to adapt to technological changes and to job requirements. The impact depends on the occupation and the sector but has been estimated to have reduced labour productivity growth by about 0.1 percentage point each year over the past two decades in the euro area and could reach an annual loss of nearly 0.2 percentage point in the next 20 years (Aiyar et al., 2016). The large effect suggests strengthening policies to limit productivity decline through one's working life, including by improving and promoting preventative health programmes and lifelong training for older workers (Chapter 2). In addition, health care has a direct positive impact on productivity, as people in ill-health are less able to take part in productive activities (OECD, 2016a). Removing unnecessary barriers to labour mobility is also crucial, as older workers tend to be less willing to move between firms and regions.

Demographics are also affecting the structure of the economy, but the overall effect of ageing on productivity is difficult to observe. Consumption will be increasingly driven by the needs of the elderly. It will therefore accentuate the recent shift towards more services (such as health and personal care) to the detriment of manufacturing, which is normally more productive (Siliverstovs et al., 2011). However, it appears difficult to find any negative relationship in recent decades between countries experiencing rapid ageing and their GDP per capita growth rate. Demographic changes seem to force countries to adopt automation technologies more quickly because of lower labour supply (Acemoglu and Restrepo, 2017). In the Swiss case, there appears to be no shortage of labour, but adoption of robots could become more systematic, for example in the case of specific skills scarcity possibly due to lower net immigration flows. However, so far, digitalisation seems to have had a rather limited effect on employment in Switzerland (Arvanitis et al., 2017a).

Immigration has been one temporary solution to ageing problems and can potentially boost productivity. The share of immigrants in Switzerland's population increased from about

21.9% in 2000 to 29% in 2015 (the highest share amongst OECD countries, after Luxembourg), which has slowed the rise in the dependency ratio. As pointed out in the last *Survey* (OECD, 2015a), most immigrants have originated from the European Union (especially Italy and Germany) and have actually filled skills gaps (see Chapter 2). Evidence based on a panel of countries shows that they have generally boosted overall productivity (Box 1.3). In recent years immigration has decelerated, especially that from Europe, partly because of an economic upturn in some origin countries and possibly also uncertainty generated by the 2014 referendum that called for the application of limits. The amendment voted in December 2016 and the draft ordinance presented in June 2017 look likely to be less severe; the draft proposed forcing firms wishing to hire in professional categories with unemployment above 5% to go through a local job centre for a short period before the advertisement can be widely disseminated. The final ordinance will be decided in early 2018. Nevertheless, in order to achieve the benefits of immigration on productivity, Switzerland should pursue policies that encourage integration of migrants in society and facilitate inflows, and especially try to attract high-skilled immigration from outside the European Union.

Box 1.3. **The effects of immigration on productivity outcomes**

Immigration impacts economies via different channels including by changing wages, income, competitiveness, the fiscal balance, employment, financial flows and productivity. Jaumotte et al. (2016) find that immigration increases GDP per capita for host countries, mostly by raising labour productivity: a one percentage point increase in the share of migrants in the adult population can raise GDP per capita by up to 2 per cent in the long run. The effect on productivity comes via several channels. While it depends largely on migrants' profile, the positive demographic shock usually increases the share of the most productive workers in the total population, in part because they are younger on average. Migrants arrive with skills and abilities that supplement the stock of human capital in the host country. Some immigrants also import innovation in processes and in products, and more broadly they bring with them their knowledge. Highly educated people (who arrived between 2010 and 2015) represented about 30% and 45% of total migrants for European OECD countries and the United States, respectively (OECD, 2016b). In addition, immigrants are more likely to study science and engineering and subsequently tend to produce more innovations (Hanson, 2012). Even low-skilled workers that arrive can improve the efficiency of an economy: they fill in occupations that are important but neglected by natives; they tend to be more mobile; and high-skilled workers can concentrate more on their jobs when non-work chores are done by less skilled migrants. Productivity is then positively correlated with immigration even in countries that have non-selective migration policies (Boubtane et al., 2016). In the context of the free movement of persons in Europe, mobility also helps provide each labour market with appropriate skills and limits mismatches that in turn harm productivity. Admittedly, the effect can become negative if migrants, for example, work largely in labour-intensive sectors, such as construction or tourism where productivity is below average (Nicodemo, 2013). The recent large inflow of refugees in several European countries, including Switzerland, may also temporarily lower average productivity, because such immigrants tend to have more problems integrating in society as employers have difficulties in evaluating their employment experience and qualifications are not always recognised, among other obstacles. The language barrier also creates additional challenges.

Regional differences are diminishing, but some barriers may still hinder economic developments

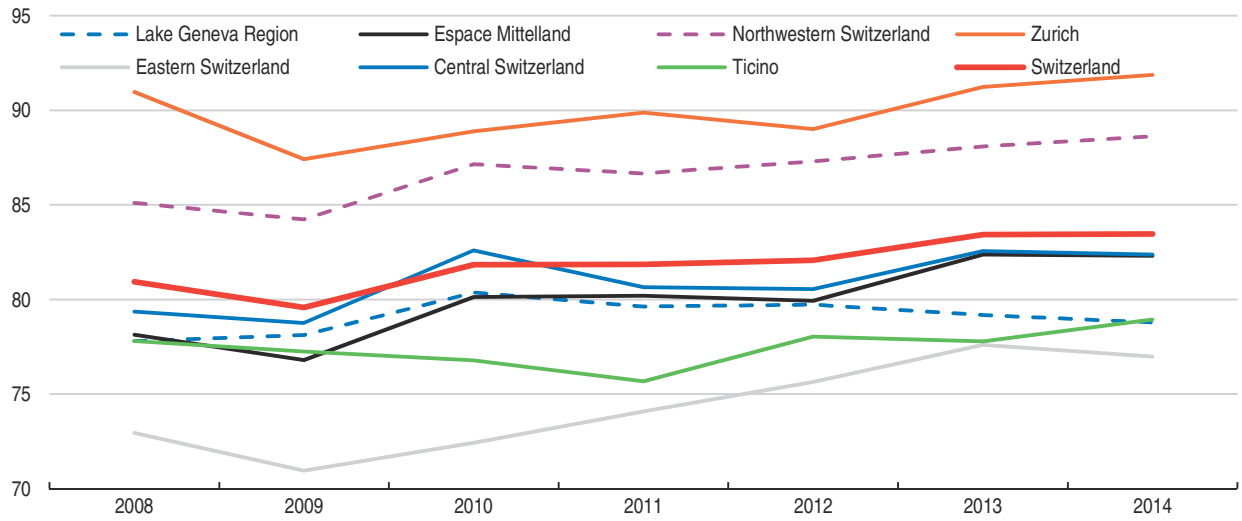
Switzerland is a highly decentralised confederation with four linguistic regions (German, French, Italian and Romansh). The 26 cantons (first level of administrative subdivision) have their own governments, laws, courts and constitutions. In particular, they raise taxes and are

responsible for most education and health care. In that context, productivity variations can derive from cultural and legislative differences as well as geographical and historical legacies.

At the onset of the global crisis in 2008 the difference in productivity levels between the most and least productive Swiss regions stood at about CHF 18 per hour worked (Figure 1.5). The crisis affected the regional leader, Zurich, to a greater extent than others, probably due to its specialisation in finance, and thus reduced the gap, but that could be only temporary as Zurich's productivity growth has outperformed the national rate in the last two years. However, productivity differences continued to decrease after the crisis, as the lagging Eastern part, along with the Swiss Plateau continued to outperform, with average productivity growth of about 0.9% per annum over 2009-14, substantially above the national average of 0.5%. Conversely, Ticino and the Lake Geneva region have underperformed: they started with lower productivity levels but failed to catch up, except with Zurich. This diversity justifies more analysis to better understand the drivers in order to both spread good practices and remove hindrances in the business environment in lagging regions.

Figure 1.5. **Labour productivity trends by major regions**

In Swiss francs per hour worked, current prices



Source: Federal Statistical Office.

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The New Regional Policy, which entered into force in 2008 and was renewed in 2016, aims at boosting lagging areas. It focuses on rural, mountainous and border regions, even though others could be eligible. The project's objective is to facilitate innovation, value added creation and competitiveness under the European Territorial Co-operation (Interreg) programme. However, there is no explicit requirement to assess regulatory and policy differences across sub-national governments, which could also contribute to some productivity deficit. For example, the persistence of below-average early-stage entrepreneurial activity in Ticino (Baldegger et al., 2015) could be further studied, including if the late-2015 cantonal law on innovation (which focused on shrinking deadweight losses) helps to reduce the gap. In addition, policy makers should provide all regions with the means to unlock their growth potential, not only the laggards. The significant extent of administrative fragmentation (OECD, 2016c) also intensifies the need for co-ordination and harmonisation.

Some cantonal regulations may explain part of the differences. In February 2017 COMCO (the competition authority) reported that several cantons (Bern, Vaud, Ticino) have excessive restrictions on cross-cantonal market access for many occupations, including private security, childcare, architects and engineers (COMCO, 2017a). It is crucial that coherence is maintained between cantons and that federal laws are applied equally across regions to ensure a correct territorial allocation of labour and capital according to inherent advantages.

It is equally important not to erect barriers to internal migration. Indeed, there should be enough mobility to avoid having locations with falling employment co-existing with other areas experiencing excess demand other than in a transition period. This flexibility would bring more inclusiveness in the confederation and also stimulate productivity. In that regard domestic language barriers hinder labour mobility to some extent.

Understanding the drivers and determinants of productivity

Sector characteristics

The structure of the economy, manufacturing's share in particular, has a large impact on productivity growth but can also explain differences between countries. Indeed, specialisation on more or less productive activities translates directly into higher or lower overall productivity growth and could shed light on overall macroeconomic developments. There is a general trend amongst OECD countries that activity is shifting away from manufacturing towards services, with a negative impact on productivity. Switzerland, however, still has a sizeable manufacturing sector.

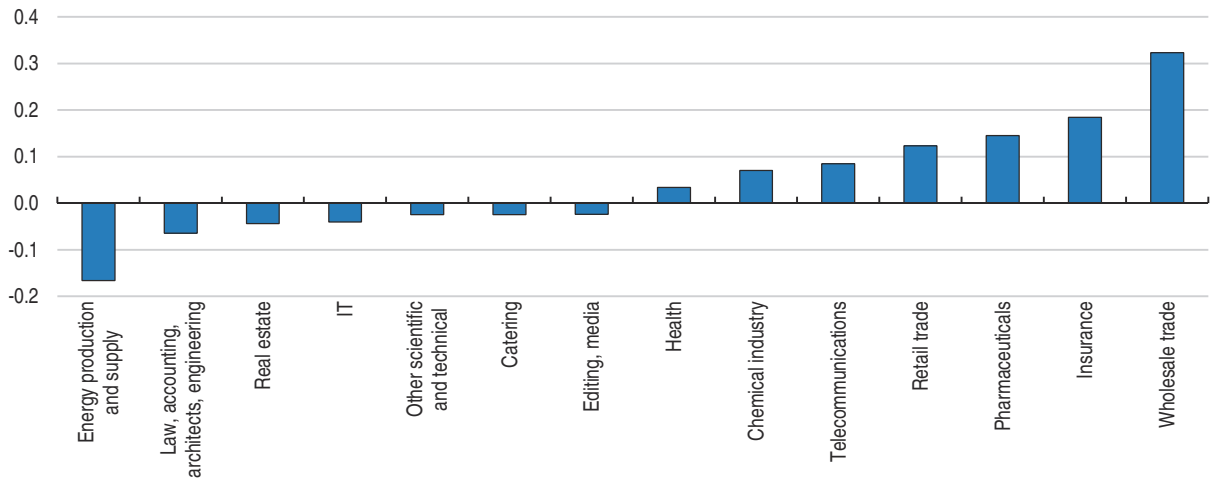
In Switzerland, over the period 1998-2015, energy, media and professional, scientific and technical services (including law, accounting, engineering and architecture) accounted for most of the drag on productivity growth (Figure 1.6). Surprisingly, IT also figures among the poorest performing sectors. This might be related to measurement problems (Kaiser and Siengenthaler, 2015), but could also be related to trade restrictions in computer services (see below). Conversely, chemicals and pharmaceuticals, insurance services and trade all experienced above-average gains over that period.

Labour reallocation has not always favoured productivity outcomes as employment gains in some sectors limited productivity growth. Indeed, the employment shares of some low performing sectors in terms of productivity growth have risen over 1998-2015, notably IT and the professional services sector (Figure 1.7). Conversely, trade, finance, insurance and chemicals have lost some ground, despite good productivity growth performance.

Over 1998-2013 Swiss productivity ranks more highly relative to other European countries when only the market sector is compared than when non-market activities are included (Eberli et al., 2015). In addition, the authors split overall productivity growth into structural change, a growth impact and an interaction term. They find that overall, structural change has been a steady positive contributor to productivity in Switzerland, unlike in Belgium, Germany and the Netherlands. This would suggest that the effect through specialisation by successfully moving the economy from traditional to highly innovative industries (like life sciences) has been stronger than the effect from strong employment growth in health or government services. However, they conclude that Switzerland is highly dependent on a few activities, while other countries' drivers of productivity are much more diversified.

Figure 1.6. **Contribution to productivity growth by sector**

Within-sector contribution to average growth per annum[1], percentage points, 1998-2015



1. Direct contribution within the sector only, corresponding to average labour productivity growth times the employment weight in 1997. Shows the 7 top and 7 bottom 2-digit industries (amongst 47) ranked by contributions.

Source: Federal Statistical Office; OECD calculations.

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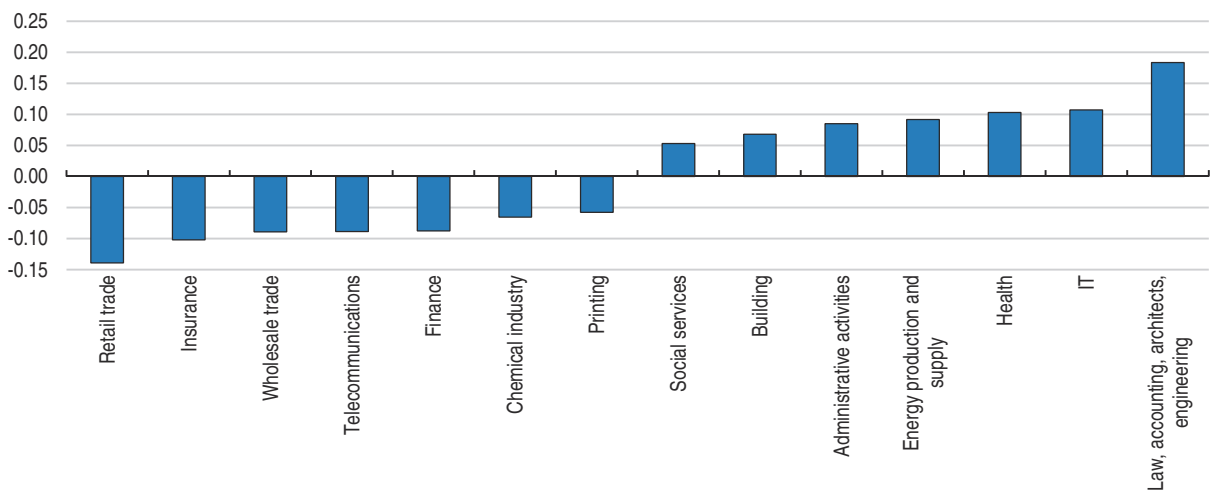
Figure 1.7. **Labour reallocation**

Contribution from relative change in employment shares to average labour productivity growth[1], percentage points, 1998-2015



1. Shows the 7-top and 7-bottom 2-digit industries (amongst 47) ranked by contribution.

Source: Federal Statistical Office; OECD calculations.

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Optimising capital and labour allocation

Recent changes in the allocation of labour inputs

Through time it is expected that the most efficient firms gain market shares and command a relatively larger share of industry inputs. The process may in turn boost overall productivity, but it also depends on the distribution of firms. Starting from the approach developed in Olley and Pakes (1996), sector and firm information is used to analyse labour productivity and employment developments. When the weighted average of firms' labour

productivity increases compared to a non-weighted average, it means that more resources are devoted to the most productive firms, and that a better allocation of inputs is leading to higher overall productivity.

Using the Swiss Innovation Survey (SIS) database (Box 1.4), the allocation of inputs is found to follow an upward trend – 2013 being an exception (Figure 1.8). That shows that more productive firms have tended to increase their employment shares, but this includes as well structural change across industries. Applying the same approach at the 2-digit industry level shows that within-industry reallocation is much more stable over time. It suggests that input allocation did not change efficiently during a period characterised by a global crisis (with higher exit rates) but improved in 2015 following the large appreciation. While the KOF database is useful in shedding light on firm-level productivity developments that are otherwise unattainable, it has some caveats. For example, it lacks information on hours worked and excludes information on young firms. Nonetheless while omitting hours worked can bias estimates of the productivity level, the impact on the growth rate is more limited as average hours worked over the period considered at the aggregate level moved much less than employment growth.

Box 1.4. **Availability of Swiss firm-level data**

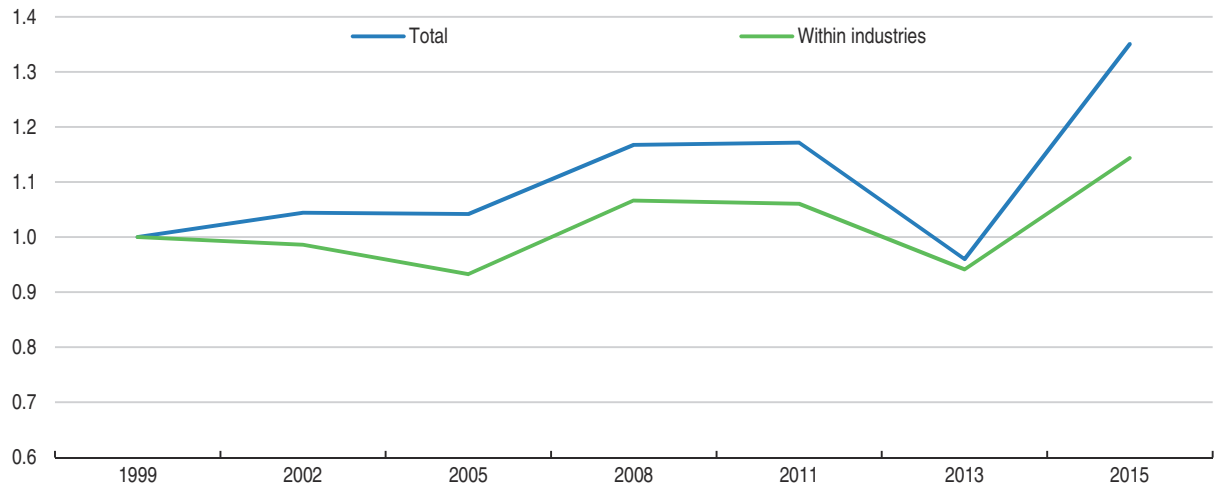
Determining the causes of productivity developments through a firm-level approach has gained importance in recent years. The OECD has developed several statistical projects in that respect to offer more inputs in understanding how different policy frameworks impact on firms, in particular using the *MicroBeRD, Multiprod* and *DynEmp* databases. However, Switzerland is unfortunately absent from these databases: see, for example, Criscuolo et al. (2014). Switzerland is also one of the rare OECD countries that is not fully represented in *Entrepreneurship at a Glance* (OECD, 2016d), preventing a comprehensive comparison with other countries in that dimension. Ecoplan (2016) – a study on creation of new businesses and high-growth firms in Switzerland with some limited comparison with other OECD countries – was welcome in that regard. However, this *ad hoc* exercise could be more easily repeated and expanded if Swiss firm-level data were more available and accessible. The KOF institute in that regard also contributes to fill in some of the gap.

To allow some comparison of Swiss productive growth with cross-country findings from OECD work, this chapter makes use of firm-level data from the Swiss Innovation Survey (SIS), while other OECD studies use the Orbis database (where Switzerland coverage is not satisfactory for many variables) or national statistical agencies' registry. The SIS is maintained by the KOF Economic Institute, which conducts economic research notably through surveys. The SIS is based on a stratified random sample of firms with at least five employees, covering all relevant industries in the Swiss business sector. The analysis uses data for 1999, 2002, 2005, 2008, 2011, 2013 and 2015. Annex 1.A1 further describes the dataset and some caveats that should be borne in mind when using it.

Using a sample of 21 countries, Andrews and Cingano (2014) compute an index of allocative efficiency for 2005 (based again on the difference between a weighted and an unweighted measure of labour productivity) and similarly find that Switzerland, with a value close to zero, is the fifth-worst performer and was not allocating resources to its most productive firms. More broadly, the authors highlight a negative relationship between that index and the amount of policy-induced frictions, in particular regarding employment

Figure 1.8. **Allocation of labour input across firms and labour productivity**

Ratio of weighted to unweighted labour productivity[1], 1999 = 1



1. Unweighted labour productivity is the simple average of labour productivity across firms. Weighted labour productivity is the sum across firms of value added divided by the respective sum of total employment, not adjusted for hours worked. Total refers to the comparison by year between the simple average of all firms' productivity with the weighted measure. Within-industries is the same approach but computed at 2-digit industry level; the difference is then weighted by employment in that sector to have an aggregate measure by year.

Source: KOF, *Swiss Innovation Survey database*; OECD calculations.

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protection legislation, product market regulations and constraints on foreign direct investment. This work highlights the need for Switzerland to pay attention to remaining barriers in the economy (see below) that prevent better resource allocation, which would boost productivity.

Further improving labour utilisation

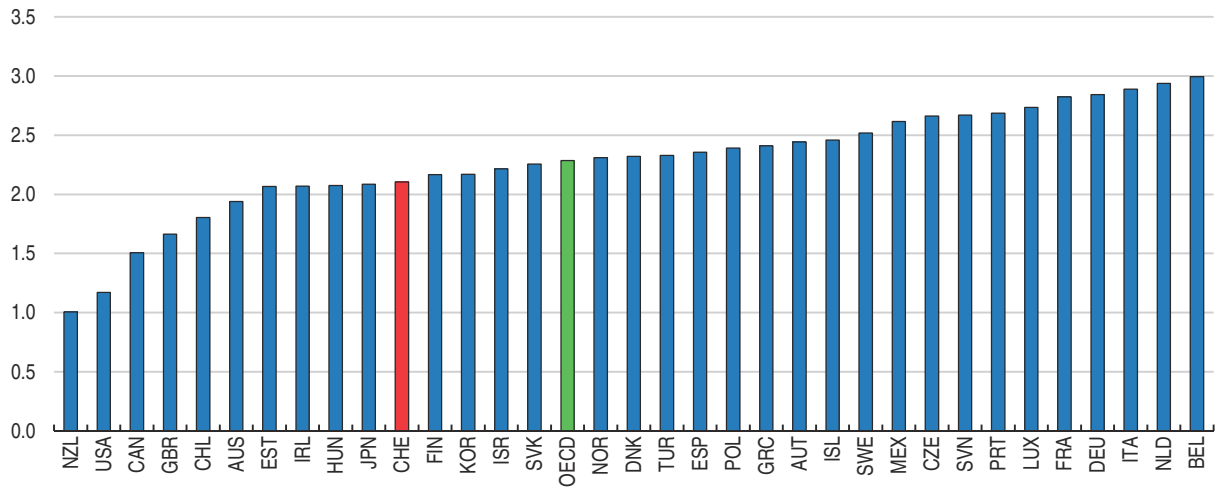
Labour market and skills. The Swiss labour market is quite flexible in comparison with the OECD average, but layoff restrictions remain significantly above those in New Zealand, United States, Canada and the United Kingdom (Figure 1.9). In addition, there has been a recent tendency to add more constraints (like minimum wages in some cases and the obligation to advertise jobs first in local employment centres when unemployment is considered too high). They should be carefully monitored to avoid imposing unnecessary economic costs and weighing on the labour market.

More labour market deregulation is not always followed by an improvement in productivity (Égert, 2016), because there are other factors at play. For example, people may not invest in job-specific skills but rather in general skills to make themselves attractive to future employers. Deregulation may also boost turnover, thereby reducing productivity, because new workers take time to adapt to their new company. Finally, employers may devote less time to screening and training if they can fire more easily. Conversely, more flexibility gives employers more leeway to adjust to changes in market conditions and so would avoid the costs of having labour stuck in poorly performing firms. More flexibility also provides incentives for workers to optimise their efficiency.

Skills mismatch is a common concern in many OECD countries and has been linked with lower productivity performance. Public policies play a large role (Adalet McGowan and Andrews, 2015). The well-functioning Swiss education system succeeds in producing the

Figure 1.9. **Employment protection legislation strictness**

Protection of permanent workers against individual and collective dismissals[1], 2013



1. Indicators of employment protection legislation measure the procedures and costs involved in dismissing individuals or groups of workers and the procedures involved in hiring workers on fixed-term or temporary work agency contracts. Index values range from 0 (least restrictive) to 6 (most restrictive).

Source: OECD, *Employment Protection Legislation database*.

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right skills relatively efficiently thanks to strong collaboration with the business sector (see Chapter 2). The country has also resorted to immigration in the past to fill in missing competencies (Swiss Confederation, 2017). However, the recent decline in the number of migrants could potentially increase mismatches, hampering productivity. Those restrictions could also put greater pressure on the Swiss education system to respond to labour market needs. In parallel, there should be constant focus on lifelong learning, skills upgrading and the necessity to avoid leaving any part of the population behind.

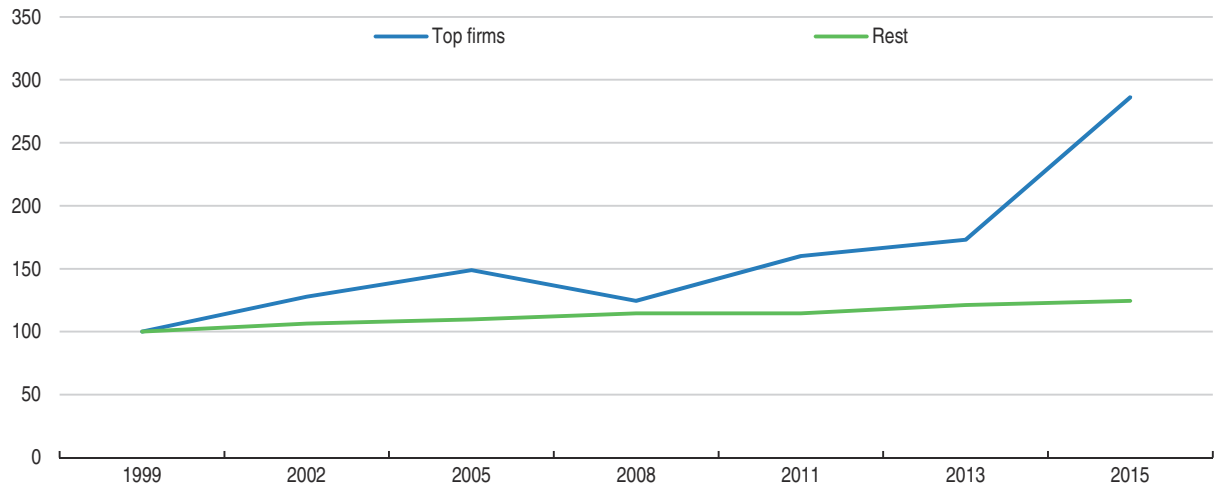
The role of education and skills in boosting both productivity and inclusiveness is widely acknowledged and has been key to understanding both the convergence of certain countries to higher economic standards and the continued growth in productivity in leading economies. In that regard Switzerland is outstanding in many metrics (see Chapter 2), notably thanks to a very effective vocational education and training system. It also has some of the best universities in the world, which places it at the forefront of R&D and innovations. At the firm level higher educational attainment of staff is positively correlated with productivity growth (Annex 1.A1), underlining the importance of a well-functioning education system. This also contributes, together with a very high employment rate, to making Swiss growth go hand in hand with a high degree of inclusiveness.

More inclusiveness and equality can spur productivity. Having several globally top-performing firms means that Switzerland has a favourable position in certain industries where competition is global. However, it may have drawbacks domestically, especially in terms of inclusiveness, because of a lack of spill-overs from the most productive firms to the rest of the economy. Inequality and poverty are relatively low, although there remains scope for improvement (see previous *Survey*). Evidence from OECD countries shows inequality and poverty can also hurt economic growth, notably via their indirect impact on human capital and hence productivity (OECD, 2016a).

Analysis using firm-level data shows that average wages offered by frontier firms have tended to increase more than in the other 95% (Figure 1.10). That is particularly the case for 2015, but the trend would need to be confirmed with the next SIS update. Even between 1999 and 2013, the pace of average annual wage growth of the top 5% of firms was twice that of the others. It suggests that the increasing gap in productivity has also been translated into a commensurate between-firm expansion in the wage gap; in other words, the benefits have been shared with workers. Indeed, as wages in top firms follow global trends in a few industries rather than evolving in line with domestically determined wages, inequality tends to increase. This may harm productivity in the long-term, notably through less widespread human capital investment. A similar trend is observed in other OECD countries showing divergence in wages between firms in the same sector (Berlingieri et al., 2017). The evolution is associated with growing differences between high- and low-productivity firms, which are also confirmed for Switzerland (more below). Travail.Suisse (2017) also points to a growing divergence of wages of top executives from those of other employees over 2011-16 (with growth of 11% and 3.4%, respectively).

Figure 1.10. **Wage differences between leading and other firms**[1]

1999 = 100



1. Wages are proxied by labour costs per employee at the firm level (see Annex 1.A1). Top firms are those 5% with the highest level of labour productivity at the 2-digit industry level for each survey year and may not be similar across surveys. The difference in wages is around 13% in 1999.

Source: KOF, *Swiss Innovation Survey database*; OECD calculations.

StatLink http://dx.doi.org/10.1787/888933621272

Barriers to some groups fully participating in the economy can also weigh on productivity as their potential is not fully utilised. Improving the integration of these groups would better exploit the competences of all, and increase motivation and diversity in the workplace. In Switzerland, two groups particularly need policy attention – women and migrants – even though they both have high employment rates relative to other countries.

As highlighted in OECD (2013), increasing the role of women in the economy could boost Swiss productivity. Switzerland is leading the OECD in women's employment rate but has one of the highest incidences of female part-time work. This is due to the high cost of childcare, low supply of early childhood education, the organisation of the school day, and to disincentives to return to full-time work (a high marginal income tax rate due to

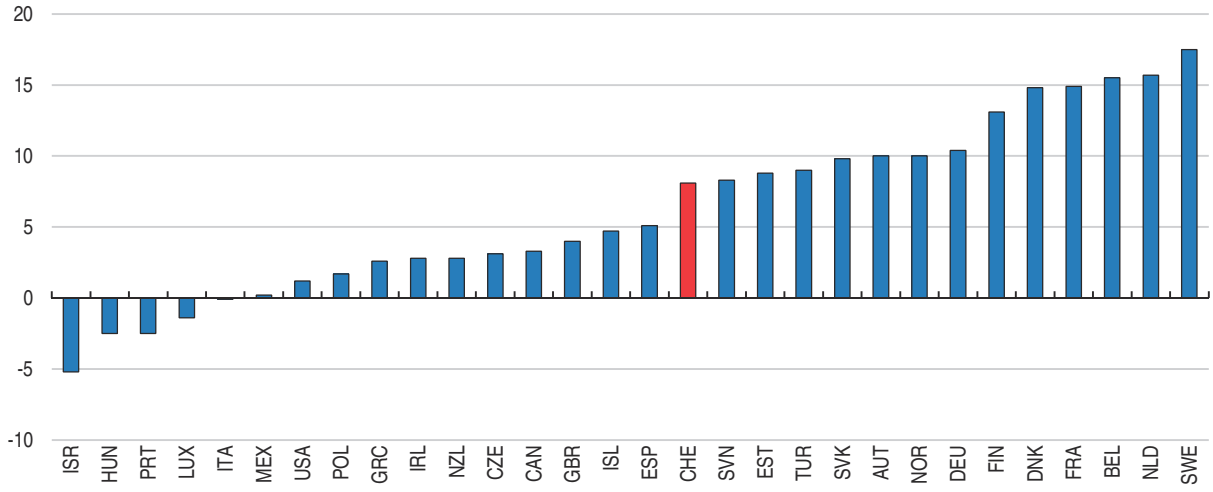
taxation at the family, rather than individual, level and deterrent effects of social benefits for second earners), as well as personal preferences. They are accordingly significantly underrepresented in top positions compared to other OECD countries (Deloitte, 2015).

Establishing a federal statutory parental-leave system (to be divided between parents), as in most European countries, would facilitate mothers' post-maternity reintegration into the labour force (OECD, 2013). It would bring paid-leave entitlements available to mothers closer to the OECD average and may have important positive economic and social spill-overs even if returns to productivity take longer to materialise (Adema et al., 2015). The availability of affordable childcare should also be expanded to help women work extra hours, if desired (OECD, 2015a). An evaluation of childcare is currently underway. The recent implementation of a dedicated five-year fund to expand childcare is welcome. It needs to better match parents' working hours and be concentrated in places of larger tensions between supply and demand. A proposal to increase tax credits for childcare costs is being discussed and could reduce work disincentives for women, especially in high-income households. The government is also planning to eliminate circumstances in which married couples pay more federal income tax than unmarried ones (discouraging work for second earners).

A second under-represented group of workers is immigrants. Switzerland's performance in migrants' integration is good (OECD, 2012a), but greater integration would increase their employment rate and could boost productivity. The Migrant Integration Policy Index ranked Switzerland 21st out of 38 countries in 2014 (Huddleston et al., 2015), especially due to relatively weak anti-discrimination laws. Indeed, migrants suffer longer unemployment periods partly due to discrimination against them (Auer et al., 2016). The employment rate is lower than for natives (Figure 1.11), even though it is one of the highest within the OECD. As proposed in the previous *Survey*, providing more support for immigrants, especially in early childhood education, would prevent them from lagging behind during their whole career (OECD, 2015a). Expanding the supply and uptake of high-quality language training at all ages, adult education, bridging courses, work placements and improved recognition of foreign diplomas (for non-EU/EFTA citizens) would also help them to maximise the use of their skills.

Figure 1.11. **Employment rate differences between native- and foreign-born population**

2015, population aged 25-64, in percentage points



Source: OECD, *Migration Statistics database*.

StatLink http://dx.doi.org/10.1787/888933621291

The 2016 joint pledge by the State Secretariats for Migration and for Education, Research and Innovation, and the Conference of Cantonal Ministers for Education, to have the same objective of 95% of both Swiss and non-Swiss recently arrived youths with at least a secondary diploma is welcome. Offering pre-apprenticeship integration training from 2018 will also provide additional qualifications for migrants in need. The expansion of compulsory early childhood education to two years (starting from the age of 4) in almost all cantons by 2017 is also welcome.

In addition, given that migrants were mainly employed in sectors with insufficient local labour supply (Swiss Confederation, 2017), the recent slowdown in the number of EU migrants could accentuate labour shortages in some sectors (Chapter 2). Recourse to non-EU immigration would be beneficial if it meets labour market needs and should be facilitated. More broadly, policies aiming at reducing inequality and poverty, notably through effective education spending and active labour market measures, will sustain long-term inclusive economic growth as they spur skills development for a whole range of the population (OECD, 2016e).

Facilitating firm entry

Starting a business

Starting a business in Switzerland is not particularly easy: the World Bank's *Doing Business* ranks the country 71st in 2017, down from 66th in 2016 (World Bank, 2017), notably because of the number of procedures and the time required to register a firm. Nevertheless, according to Ecoplan (2016), new firm creation was stable in Switzerland over 2007-13 and was close to the OECD average, thanks to the services sector, while the number of new industrial corporations has remained weak since the crisis. The five-year survival rate is quite high – only Austria, Belgium and Sweden do better – but the exit rate after one year tends to be high. However, there is a question of international comparability, highlighting the benefits of the Federal Statistical Office participating more in OECD data collection on firm characteristics (Box 1.4).

Public infrastructure makes it possible for firms to tap into available skills, technology and capital. It also represents a major element for attracting firms and putting in place conditions for new entry. New public spending tends to boost productivity (even though it can take some time) when the new facility responds to needs and is appropriately financed. Switzerland is rather well endowed with infrastructure according to the World Economic Forum (WEF, 2016) and is even the leader in quality terms.

Firm size and age

While there are no comparable international data on entry rates, the share of small firms in Switzerland also points to difficulties in starting up businesses, given the size of the country. In comparison with other OECD countries, Switzerland has one of the lowest shares of small enterprises (fewer than 20 employees) in manufacturing, services and construction and ranks 6th, 1st and 5th in terms of the share of large enterprises (above 250 employees) in those same sectors, respectively (Figure 1.12).

Firms' size can impact on productivity, but its role is difficult to capture. Small enterprises that are unable to grow coexist with those with high potential to conquer a larger market. Success depends on many characteristics, including the capacity to develop disruptive innovations, entrepreneurship and managerial capabilities, and agility to respond to customers' needs. The process, also dependent on effective competition, is

Figure 1.12. **Share of small enterprises by main sector**

In percentage of total number of firms, 2014 or latest available year[1]

1. Small firms are those with 20 employees or fewer. Definitions vary slightly across countries. For Canada, Switzerland, the United States and Russia, data do not include non-employers. UK data exclude about 2.6 million unregistered small businesses.

Source: OECD, *Structural and Demographic Business Statistics database*.

StatLink http://dx.doi.org/10.1787/888933621310

highly valuable for the economy in order to avoid a rigid structure and be productive. Conversely, large firms can reap economies of scale, attract the best talent and afford to invest in a wide variety of innovations. Overall, firm-level evidence suggests that small enterprises tend to have lower productivity growth than medium-sized companies, suggesting that non-high-growth small firms outnumber more dynamic ones (Annex 1.A1). Finally, large firms have higher productivity growth notably because they are more innovative (see below). Furthermore, they usually have management practices that involve a better allocation of workforce to required tasks, boosting their productivity (OECD, 2016f).

Small firms usually receive a lot of policy attention across OECD countries, as they are responsible for a large share of new and existing jobs. But more than their size, firms' age matters more for job creation, because young (usually small) businesses can have huge productivity increases and should then receive more public policy attention (Criscuolo et al., 2014). Baldegger et al. (2015) reports that more than 50% of all Swiss firms that exit report bureaucracy as the main cause, far more than for other similar countries, even though the exit rate is the lowest across 16 OECD innovation-driven economies. Compliance with regulations has a fixed-cost element, which affects small firms disproportionately. The stock of regulations should be reviewed, focusing on those that are most costly for young firms. Enhancing transparency and developing e-government could lower the cost of accessing information and complying with regulations, and enable the government to adapt more quickly to ongoing disruptions.

Streamlining direct support to firms across the different levels of government is important. Depending on the canton, there exist up to 87 different programmes of public financing for firms (Federal Council, 2017). On top of inherent difficulties to create a start-up, there is a potential need for one-stop shops at the cantonal level to concentrate efforts towards start-ups, notably in terms of financing. SERI (2016) also listed 126 services providers that encourage innovation (93 at cantonal, 14 at regional and 19 at national levels), which often fail to co-ordinate. The envisaged implementation of a virtual one-stop shop at the federal level is also crucial for all activities that are not dependent on cantons (like registration) and for agreed common procedures across them.

The number of high-growth small firms in Switzerland is above average according to a recent government report (Federal Council, 2017). There are about seven recent start-up firms per 100 000 inhabitants, more than in Israel (six) and the United States (five), which are usually top-ranked in that domain. This top position results mostly from a high survival rate, rather than from a larger number of creations. Indeed, the low unemployment rate, together with cultural preferences, reduces incentives for entrepreneurship and puts the number of new firms below the international average. Only 40% of Swiss inhabitants view entrepreneurship as a good career choice, compared to about 56% on average in 16 OECD innovation-driven economies (Baldegger et al., 2015). Developing competency in leadership, creativity and innovation at school could have a leverage effect (Lackéus, 2015). That would help spur entrepreneurship, notably for the 18-24 age category, for which Switzerland stands 18th out of 22 countries (measured by the number of entrepreneurs as a share of the population in the age group).

An important complement to boosting start-up rates is to ensure relatively small firms are able to scale up. As mentioned earlier, e-government should be enhanced to reduce administrative burden and information costs, and some government regulations (economy-wide or sector-specific) could prevent firms' growth and should be reviewed.

When start-ups benefited from government support, there could be also some follow-up programmes that would monitor those firms in order to measure their success. In the end, the government should continue its support to those firms that will be able to scale up as they vastly contribute to overall employment growth (Criscuolo et al., 2014). A report for the United Kingdom states that only 6% of high-growth firms have contributed to half of employment growth over 2002-08 (NESTA, 2009). More broadly, successful companies could be used more as role models.

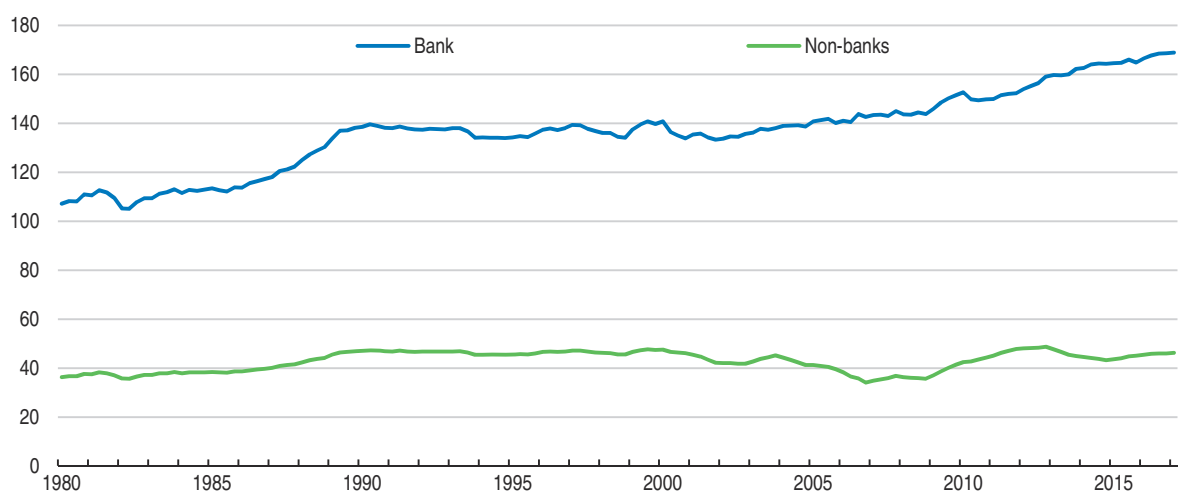
Finance

Switzerland has a unique and well-developed finance industry. This should be an advantage in adequately funding the right projects and accompanying the disappearance of unviable enterprises. It is also important to fund innovation. That depends notably on solid bank capital and appropriate regulations. On top of the direct contribution of the financial sector to the economy (which has decreased in the wake of the global recession), the positive link between finance and productivity is fairly widely agreed, at least up to a certain limit (Heil, 2017). But financial frictions can limit the positive relationship and impede access to capital for investors: they can be market-wide, peculiar to a particular provider of funds or originate with the borrowing firm. In addition, the financial sector can ease the process of digitalisation, though Swiss firms point to a lack of financial means as an important hampering factor, especially for small firms (Arvanitis et al., 2017a).

In Switzerland credit from non-banks to the private sector has lost ground to other forms since the turn of the century (Figure 1.13). It should be developed more, along with private equity markets, as it offers more options for firms to get adequate project funding, because it circumvents some potential financial frictions and increases competition. In particular, smaller and younger firms tend to be confronted with higher interest rates, as well as credit rationing. Offering them new opportunities is crucial to stimulate innovative entrepreneurship and is particularly relevant for young and innovative companies with no track records and untested business models. The deeper are markets for seed and early-stage venture capital the greater the productivity and size of frontier firms (Andrews

Figure 1.13. **Importance of bank and non-bank financing**

Private non-financial sector, total credit, in percentage of GDP



Source: BIS, *Credit to Non-Financial Sector database.*

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et al., 2015). The extent of policy support for such markets is also positively associated with more technological diffusion and a reduction in the productivity gap. While venture capital is rather developed in Switzerland compared to the rest of Europe (but not by Israeli and US standards), alternative online finance is not (Zhang et al., 2016). That suggests reviewing associated regulations including regarding peer-to-peer lending and equity-based crowdfunding. Recent developments in fintech industries and crowdfunding (OECD, 2017d) and a proposed law to supervise them are all positive steps.

Overall, evidence from a sample of 20 European countries (unfortunately excluding Switzerland) shows that strong credit expansions tend to slow economic growth, while more reliance on stock markets seems to boost productivity (Cournède and Denk, 2015). Moreover, both are correlated with a less equal distribution of household disposable income (Denk and Cournède, 2015). The financial sector also tends to offer substantial wage premiums, estimated to be 25% of average earnings and up to 40% for top-paid workers (Denk, 2015a) and is overrepresented among the top 1% of all earners (Denk, 2015b). Those rents are likely to reduce overall measured productivity (if their wages exceed their productivity) and increase inequality. Ongoing reforms to too-big-to-fail guarantees and monitoring should help.

Removing barriers to exit and to firm restructuring

Having an efficient process for exit of the weakest firms is desirable, as it will free resources for more productive companies. Using cross-country analysis Adalet McGowan et al. (2017a) demonstrate that the share of "zombie" enterprises (firms that survive despite financial weaknesses and would typically exit or be forced to restructure in a competitive market) rose since the mid-2000s in nine OECD countries and that their existence constrains the growth of other firms, thereby limiting optimal capital reallocation. The recent low level of interest rates could have helped to sustain the weakest firms by cutting their debt repayments. Banks can also help those weak firms to survive to avoid facing the immediate cost of dismantling them and simultaneously fail to provide funds for new ones: see, for instance, Caballero et al. (2008) for a discussion of Japan's situation in the 1990s. It also creates additional barriers for newcomers in those affected industries.

Framework conditions for the insolvency regime are slightly better than the OECD average (Table 1.1). Regulations were upgraded in 2014 to offer firms easier access to insolvency proceedings and tools to redress financial difficulties. But the changes seem to have been partly ineffective, possibly due to delays in adopting the new system and to a tendency to wait before a recourse to an insolvency proceeding. Lowering the cost of failure can also boost start-up rates (Peng et al., 2010). In Switzerland the lack of an effective discharge proceeding from personal bankruptcy considerably limits the ability of individual and personally liable entrepreneurs to obtain a "second chance". The regime would be improved by introducing an effective discharge proceeding for personal bankruptcy that reduces the period during which individuals are required to repay past debt from future earnings to three years, in line with international trends, and increasing the use of early warning mechanisms for all firms (Adalet McGowan et al., 2017b). Indeed, Switzerland is poorly ranked (30th amongst OECD countries) on the efficiency of its insolvency regime according to the Doing Business indicator (World Bank, 2017) due to the low recovery rate, and the time and cost of resolving insolvency. Creditors continue to face significant upfront costs in initiating proceedings, adding to delays. A welcome amendment is currently being discussed in parliament: it would propose additional options for restructuring distressed companies, including creating incentives to take actions at an early stage and avoid insolvency.

Table 1.1. **Comparison of the regime for resolving insolvency**

	Recovery rate (cents in the dollar)	Time (years)	Cost (% of estate)	OECD indicator of insolvency regimes[1]	Of which:	
					Time to discharge	Early warning mechanisms
Switzerland	46.6	3.0	4.5	0.32	1.0	1.0
OECD high-income countries	73.0	1.7	9.1	0.41	0.6	0.6

1. Composite indicator based on a survey with 13 indicators and takes values between 0 and 1. A lower value means a more efficient regime.

Source: World Bank, *Doing Business 2017 database;* M. Adalet McGowan, D. Andrews and V. Millot (2017), "Insolvency Regimes, Zombie Firms and Capital Reallocation", *OECD Economics Department Working Papers*, No. 1399, OECD Publishing, Paris.

Easing the exit process of the weakest firms facilitates creative destruction and capital reallocation. However, the cost to workers can be significant due to insufficient skills adaptation, geographical displacement and earnings losses. And the impact is greater for low-income workers. Under certain conditions, higher spending on active labour market policies can help mitigate those negative effects (Andrews and Saia, 2017). In addition, reducing the number of near-insolvent enterprises overall increases employment growth (Adalet McGowan et al., 2017a) and could limit skills mismatch (Adalet McGowan and Andrews, 2015).

Continuing to seek the benefits from international trade openness

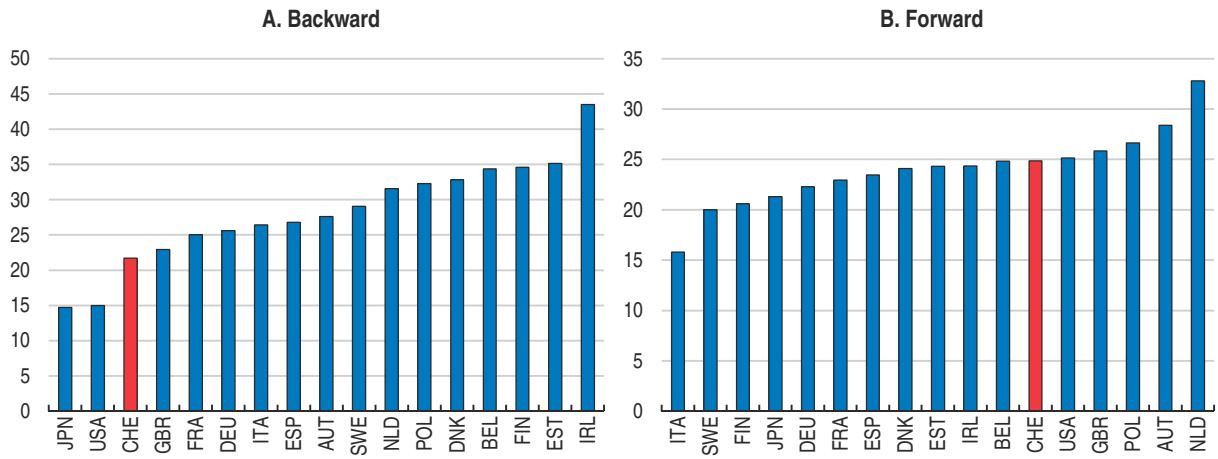
International trade has long been viewed as beneficial to global productivity (Hufbauer and Lu, 2016), as countries specialise in production for which they have a comparative advantage and thus exploit available economies of scale. In addition, flows of goods and services are accompanied by exchanges of technologies and knowledge spill-overs. Finally, trade raises productivity because of increased competition, which favours creative destruction at a global level. That points to the advantages of continuing to liberalise trade world wide. For example, Ahn et al. (2016) estimate that for advanced economies the implied productivity gains from eliminating remaining tariffs are about 1%, excluding additional benefits from removing non-tariff barriers.

Compared to other OECD countries, Switzerland is relatively well positioned in terms of forward participation in global value chains (GVCs) but is not as highly ranked regarding backward participation, indicating potential net value-added gains from linking more extensively into GVCs (Figure 1.14). Forward linkages (local inputs into foreign exports) have improved over the last decade, but that may be related to the increasing importance of pharmaceuticals (an industry that uses GVCs quite extensively), which surged from 5% of total goods exports in 1990 to more than 20% in 2016. Backward linkages (foreign inputs into local exports) could be promoted, especially given Switzerland's location next to the largest members of the European Union. Together with the associated foreign direct investment, this would facilitate knowledge diffusion and accelerate the reallocation of domestic resources towards the most productive firms. Greater GVC linkages, on top of direct trade channels, would encourage the diffusion of productivity improvements to the rest of the economy, because impacted firms operate in the domestic economy too. More generally, countries that have increased their participation in GVCs the most have also experienced the largest increases in productivity (OECD, 2017e).

Given likely spill-overs to productivity, Switzerland should pursue ongoing trade liberalisation negotiations through the European Free Trade Association, notably with Asia

Figure 1.14. **Backward and forward participation in global value chains**[1]

In per cent, 2011



1. The backward participation index is defined as the percentage share of foreign value added in a country's gross exports. Forward participation is defined as the share of domestic value added embodied in foreign countries' exports. For comparability and readability reasons, the comparison is restricted to selected OECD members.

Source: OECD-WTO, *Trade in Value Added database*.

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(India, Indonesia, Malaysia and Vietnam in particular) and MERCOSUR. That will boost GVCs whose development can suffer heavily from even low rates of duty.

The role of multinational enterprises is usually associated with productivity improvements through within-firm optimisation. Alfaro and Chen (2012) compared such gains with those from increased inter-firm competition and implied factor reallocation, as multinationals can crowd out the weakest domestic companies. The authors conclude that the second mechanism accounts for the majority of aggregate productivity gains. That suggests that in Switzerland opening more markets to international competition and corporations would be especially beneficial.

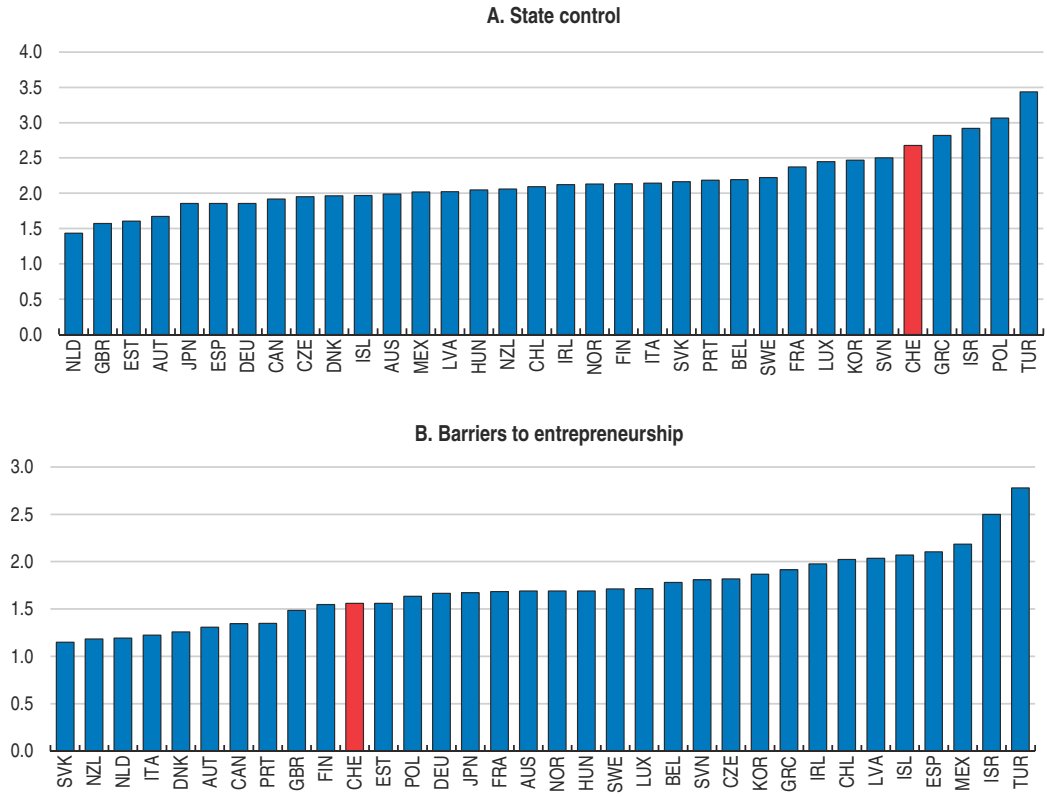
Improving the framework conditions for business development

Competition

The regulatory environment has a substantial role in driving productivity gains, as it can grease or seize up the mechanisms at play. In particular, less stringent product market regulations (PMRs) tend to raise aggregate productivity (Bouis and Duval, 2011; Égert, 2016), which makes it crucial to reduce their burden. And they do not consistently alter income equality (Causa et al., 2016). While barriers to entrepreneurship in Switzerland are slightly lower than the OECD average, the grip of the state on business enterprises is quite firm (Figure 1.15). There seem to be many restrictions in the energy sector (Figure 1.16) – related mostly to electricity but also to gas. Telecommunications regulations are also stringent. In addition, the governance of regulators in network industries (gas, electricity, telecom, rail transport and airports), in terms of independence, accountability and scope of action, is slightly worse than the OECD average (Koske et al., 2016).

Firm-level information provides more details on the impact of competition on productivity. Two indicators were used to measure the influence of competitive pressures (Annex 1.A1). First, price versus non-price competition was assessed against productivity using the SIS database. While this should be interpreted cautiously given endogeneity

Figure 1.15. **PMRs in international comparison, 2013**[1]

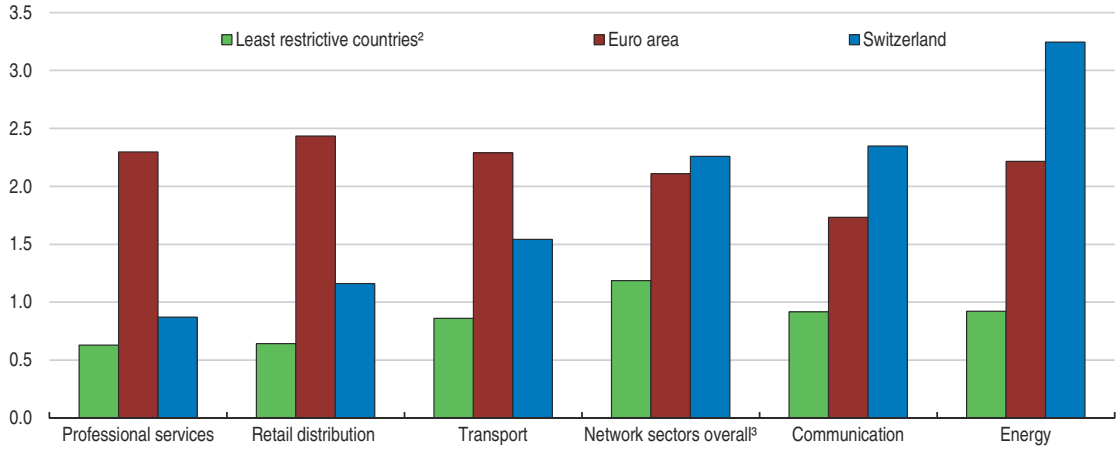


1. The Product Market Regulation (PMR) indicator is a composite index that encompasses a set of indicators that measure the degree to which policies promote or inhibit competition in areas of the product market where competition is viable. Scores range from 0 to 6 and increase with restrictiveness.

Source: OECD, *Product Market Regulation database*.

StatLink http://dx.doi.org/10.1787/888933621367

Figure 1.16. **International comparison of PMRs by sector, 2013**[1]



1. The Product Market Regulation (PMR) indicator is a composite index that encompasses a set of indicators that measure the degree to which policies promote or inhibit competition in areas of the product market where competition is viable. Scores range from 0 to 6 and increase with restrictiveness.
2. Least restrictive countries are the 3-top countries' average by sector.
3. Network sectors overall is the unweighted average of communication, transport and energy.

Source: OECD, *Product Market Regulation database*.

StatLink http://dx.doi.org/10.1787/888933620892

issues, the results point to a significant relationship with both types of competition but with a different sign. Price competition seems to weigh on productivity, probably through lower profitability and room for investment; however, the effect may differ with more lags; to some extent, the least productive firms can also be discouraged from catching up when competition is fierce.

This is consistent with some findings linking negatively firm productivity with local competition (Bellone et al., 2016). A robustness check also points at some sectoral difference: for instance when excluding water and energy production together with some part of manufacturing industries, the negative impact is not significant anymore (Annex 1.A1). The indicator of non-price competition, however, affects productivity positively, likely because of incentives to innovate so as to differentiate the product.

A second indicator of competition was also tested, suggesting a negative relationship between the number of competitors and productivity growth. Interpretation is complicated because, as for the price competition indicator, firm-level price reactions are not known and new entrants that gain market share are not included in the database.

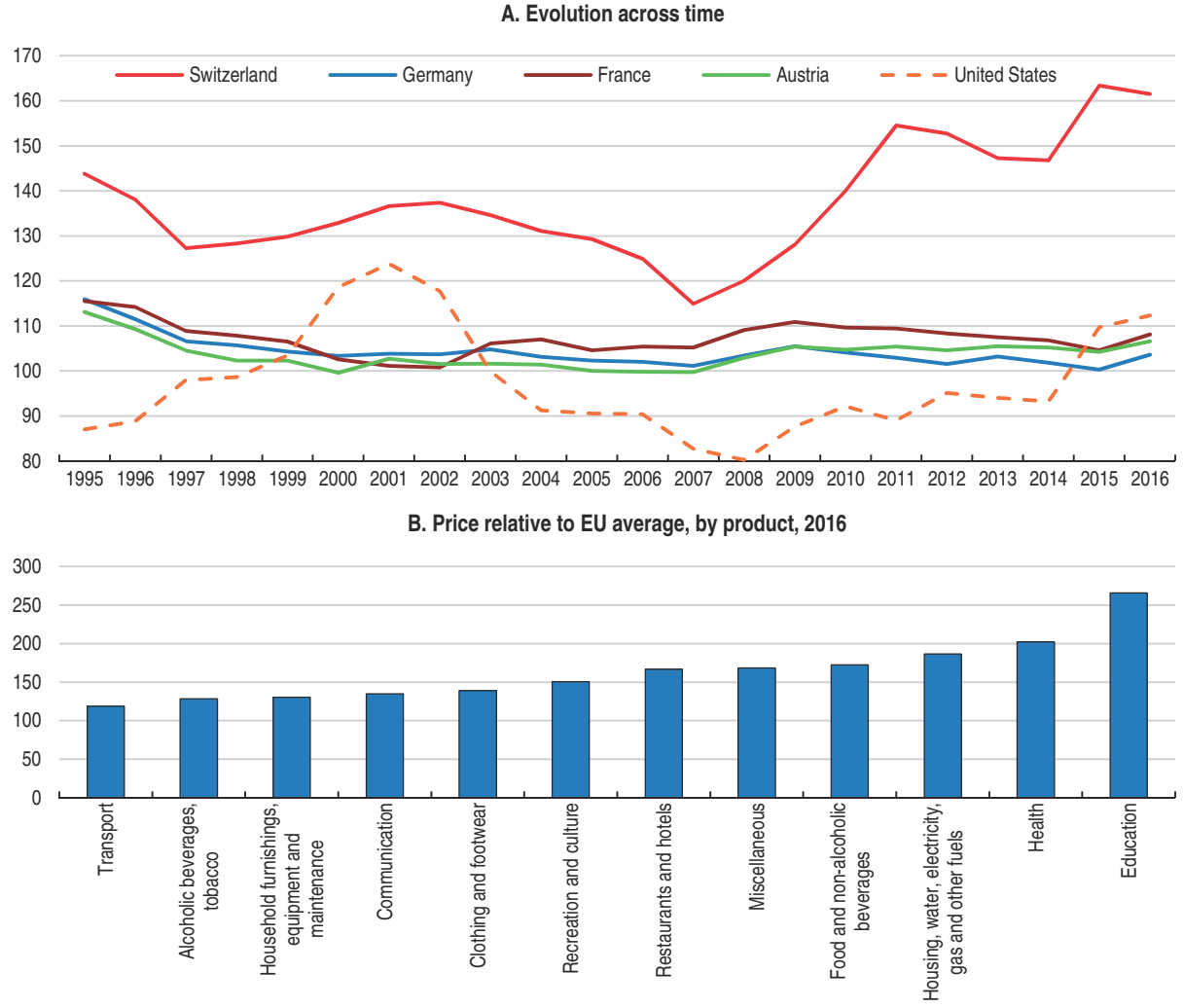
The Swiss price level is above that in other similar countries. Part of the premium may be driven by weak competition. Not only is the premium not fully explained by higher GDP per capita (OECD, 2006), but the differences in household expenditure have also increased dramatically in recent years (Figure 1.17, Panel A). The 2015 currency appreciation has apparently not been transmitted into lower consumer prices. Food and communication, highlighted for being less competitive, have some of the largest differences (Panel B). In addition, over 2007-16, communication prices have outpaced those in the EU by more than 60%. Regarding gross fixed capital formation, prices are relatively close to the EU average for machinery and equipment, and especially software, suggesting robust competition is at play.

Overall, the government should pursue more liberalisation, especially in certain sectors where competition is weak, notably in network industries. Strengthening competition will boost productivity and have positive spill-overs to consumers. Indeed, some of those network industries have been clearly dragging down productivity over the recent past (see above).

Other factors serve to intensify competition like promoting and facilitating COMCO's work. Its co-operation with EU institutions should be further developed, notably to ease dealing with the many multinationals operating in both the European Union and Switzerland. Mergers and acquisitions need close scrutiny because of their competition-inhibiting effects, but the Swiss regime is considered more permissive (OECD, 2006). Indeed, in 2015-16 only 3 of 51 merger notifications were investigated after preliminary examination (COMCO, 2017b). All in all, greater market power potentially leads to larger economic rents, helping those firms to block new entry through their credible threat to resort to their deep pockets. To that end, on 22 June 2016 the Federal Council decided to revise merger control before the end of 2017. In particular, harmonisation with the European Union's merger control system would be beneficial, including adopting the SIEC test ("significant impediment of effective competition"), which focuses on the subsequent changes to competition in a market following a merger rather than on acquiring an excessive level of market power (Röller and De La Mano, 2006). Additionally, characteristics such as a part-time board and a large proportion of whom representing special interests raise some controversy regarding the weakness of COMCO's governance and pose concerns regarding their independence (OECD, 2006).

Figure 1.17. **Price level comparison for household final consumption expenditure**

EU28 level = 100



Source: Eurostat, *Purchasing Power Parities*.

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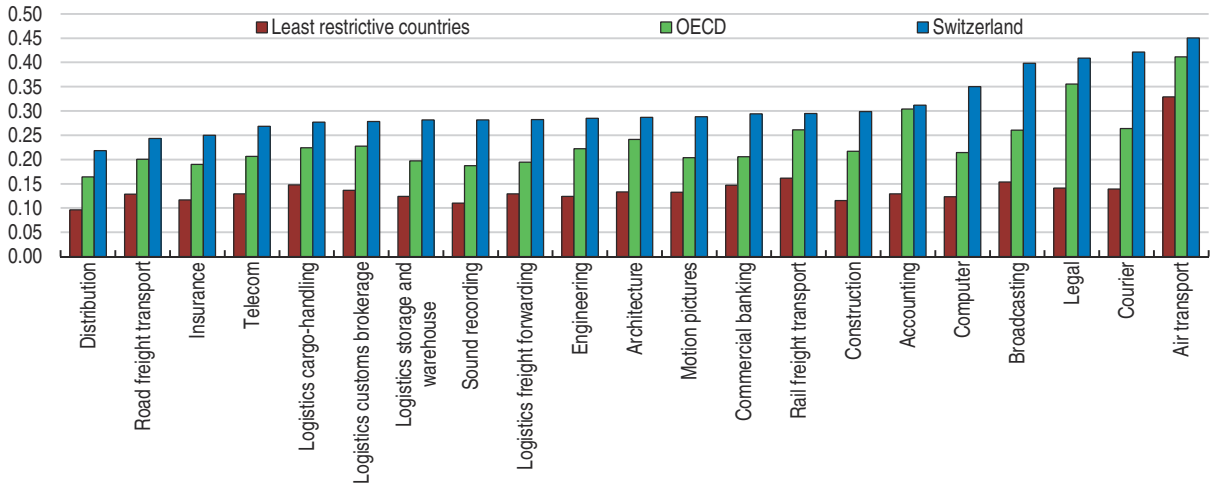
Competitive neutrality is crucial especially given the extent of public ownership in Switzerland (both at the federal and sub-national levels). A level playing field with respect to regulation should be ensured to avoid different treatment of state-owned and private companies (OECD, 2012b). For example, Swiss Post is able to use night truck drivers while this is forbidden for other companies. Likewise, stores operating in facilities owned by Swiss federal railways are advantaged by having longer opening hours than other stores. Commercial activities operated by a public entity should be incorporated to avoid conflicts of interest, abuse of dominant position and more generally policies harming competition. As recommended in the last *Survey*, public ownership should decrease, notably in the telecommunications and energy sectors, including via the privatisation of Swisscom. Indeed because of a 51% stake in the company, Swisscom benefits from an implicit State guarantee lowering its costs: for example, Moody's ratings agency treats Swisscom as a government-related issuer resulting in two-notch uplift in rating (Moody's, 2016). A recent proposal to set the framework for future privatisation of Swisscom was, however, recently rejected by the Parliament.

Foreign trade and investment

Having an efficient services sector is crucial, because services are such a dominant sector in all OECD countries for both households and business users. Services are important as direct exports and also as intermediate inputs for goods exporters. In each and every component of the OECD Services Trade Restrictiveness Index (STRI), which summarises related regulatory constraints, Switzerland runs behind the OECD average (Figure 1.18). The STRI contains factual information on laws and regulations in five areas: restrictions on foreign entry; restrictions on the movement of people; other discriminatory measures; barriers to competition; and regulatory transparency. This indicator has been found to be negatively and significantly correlated with exports and imports of services and also weighs on trade in manufactured goods (Nordås & Rouzet, 2015). GVC involvement is particularly sensitive to the quality and efficiency of services (OECD, WTO and World Bank, 2014). Policies should concentrate on liberalising computer services (focusing on restrictions on movement of people such as limitations on duration of stay for services suppliers), broadcasting and courier services (limitations on foreign entry such as equity restrictions), which are the sectors for which the difference from the OECD average is greatest. Telecommunications also suffer from relatively important barriers to competition.

Figure 1.18. **Services trade restrictiveness index[1], 2016**



1. Higher values mean heavier restrictions. Least restrictive countries are the five countries with the lowest score in each sector.
Source: OECD, *Services Trade Restrictiveness Index database.*

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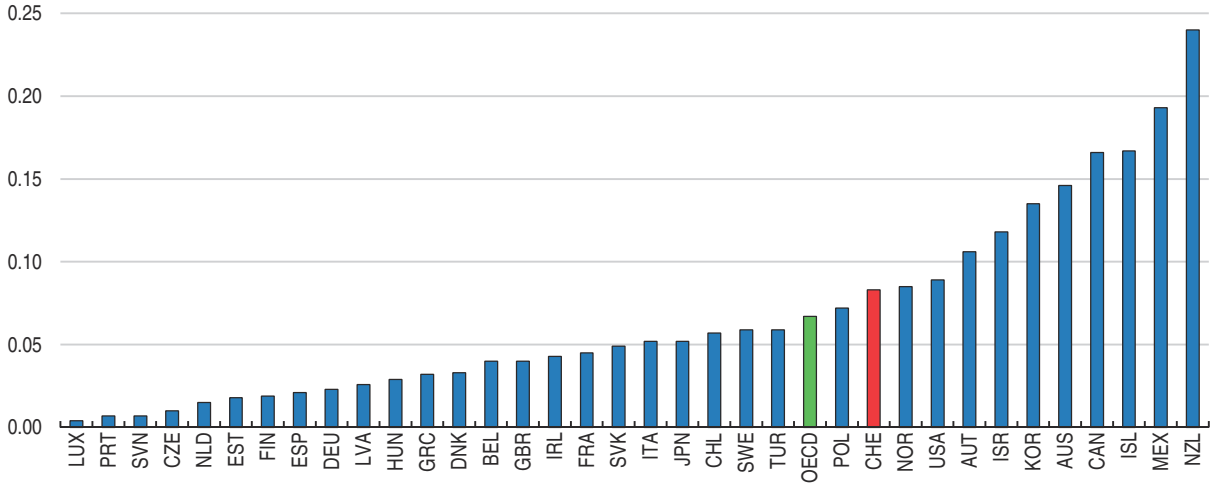
More broadly, there is evidence that services trade restrictiveness is associated with weak competition in Switzerland. Rouzet and Spinelli (2016) found that heavier restrictions enable firms to charge higher mark-ups in a majority of services sectors. The authors suggest that there is scope for improving competition from trade liberalisation, especially in broadcasting (where Swiss regulation is particularly restrictive), construction, storage, and air and maritime transport.

Restrictions in goods trade also remain significant in some areas, both in terms of tariffs and non-tariff barriers. In particular parallel imports can be hindered by custom formalities (including difficulties in delivering the requisite certificates of origin), technical barriers to trade, and exceptions (notably to the "Cassis de Dijon" rule which allows a product to be

traded in Switzerland as long as it complies with rules of the EU or the EEA) which limit domestic competition and contribute to Switzerland's comparatively high prices (Federal Council, 2016a). The *Doing Business* indicators emphasise that the cost of exporting and importing is systematically much higher than for other OECD high-income countries (World Bank, 2017). Some sectors are particularly affected by tariffs, notably food, where the weighted average effective tariff rate was 27% in 2015. The overall weighted average on all products is much smaller (1.3%); however, even small duties can affect trade volume as they imply formalities and administrative costs. Export and import subsidies also distort trade (Jarrett and Moeser, 2013).

Similarly, but to a lesser extent, Switzerland imposes constraints on inward foreign direct investments (FDI) (Figure 1.19), especially regarding electricity and the media, more so than on average in the OECD and much more than best practice. Constraints are mainly through equity restrictions, whereas other aspects are fairly unrestricted. Reducing the burden of regulation where possible, particularly in energy and telecommunications, would have a large payoff in terms of productivity developments.

Figure 1.19. **FDI Regulatory Restrictiveness Index[1], 2016**



1. The FDI Regulatory Restrictiveness Index measures statutory restrictions on foreign direct investment by looking at the four main types of restrictions on FDI: 1) Foreign equity limitations; 2) Discriminatory screening or approval mechanisms; 3) Restrictions on the employment of foreigners as key personnel; and 4) Other operational restrictions, e.g. on branching and on capital repatriation or on land ownership by foreign-owned enterprises.

Source: OECD, *FDI Regulatory Restrictiveness Index database*.

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The importance of the performance of highly-productive Swiss firms for driving aggregate productivity

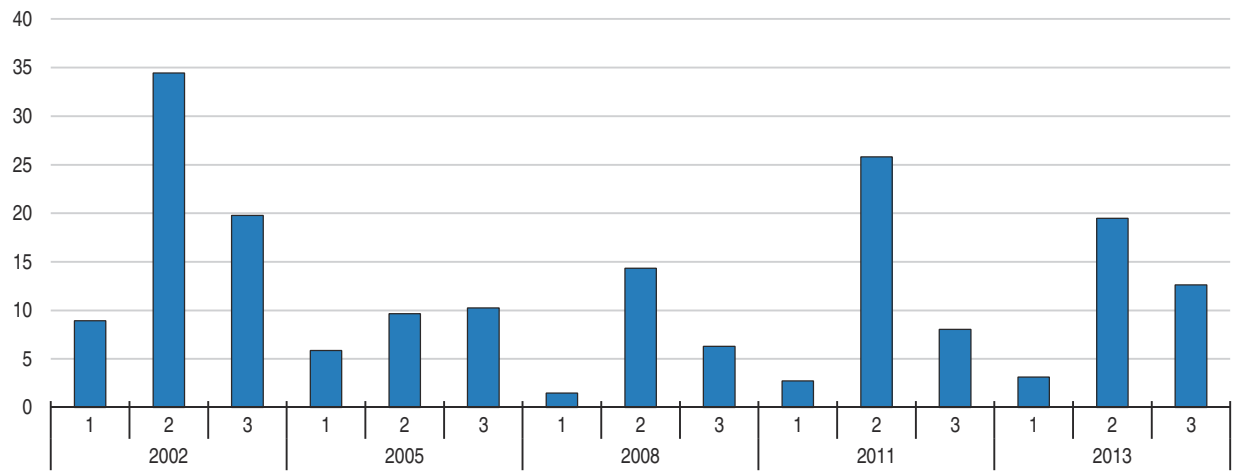
International comparison

Recent research has noted that over the last decade, across many OECD countries, a productivity divergence has opened up between frontier firms (the most productive) and others (Andrews et al., 2016). The global slowdown in productivity growth is then associated with a divergence of those leaders from others that may have been incapable of reaping the benefits of ongoing innovation waves. Switzerland is absent from this comparison due to missing micro-data in the Orbis database.

Resorting to a specific Swiss database from the KOF research institute allowed a comparison with the global productivity frontier – in terms of labour productivity levels – as determined by Andrews et al. (2016) using the top 5% of firms within each industry and year (Annex 1.A1). There seems to have been a trend decline in the number of Swiss firms among the global leaders before the global crisis and a rebound after (Figure 1.20). While productivity levels are highest in the manufacturing industry, only 3% of Swiss manufacturers belonged to the global frontier group in 2013. In construction and services, however, well over 10% of Swiss firms are among the top 5% of global firms.

Figure 1.20. **Share of Swiss firms that are highly productive**[1]

In per cent of total number of firms by sector



1. Share of Swiss firms with labour productivity level above the global productivity frontier estimated in Andrews et al. (2016). Labour productivity is defined as value added per employee converted in PPPs (using sectoral PPPs) and is not adjusted for average hours worked per employee. 1 refers to manufacturing, 2 to construction and 3 to services. The comparison is made between the global labour productivity frontier (as in Andrews et al. 2016) and Swiss firms' real labour productivity (see Annex 1.A1 for details).

Source: D. Andrews, C. Criscuolo and P. Gal (2016) "The Best versus the Rest: The Global Productivity Slowdown, Divergence across Firms and the Role of Public Policy", *OECD Productivity Working Papers*, No. 5; KOF, *Swiss Innovation Survey database*; OECD calculations.

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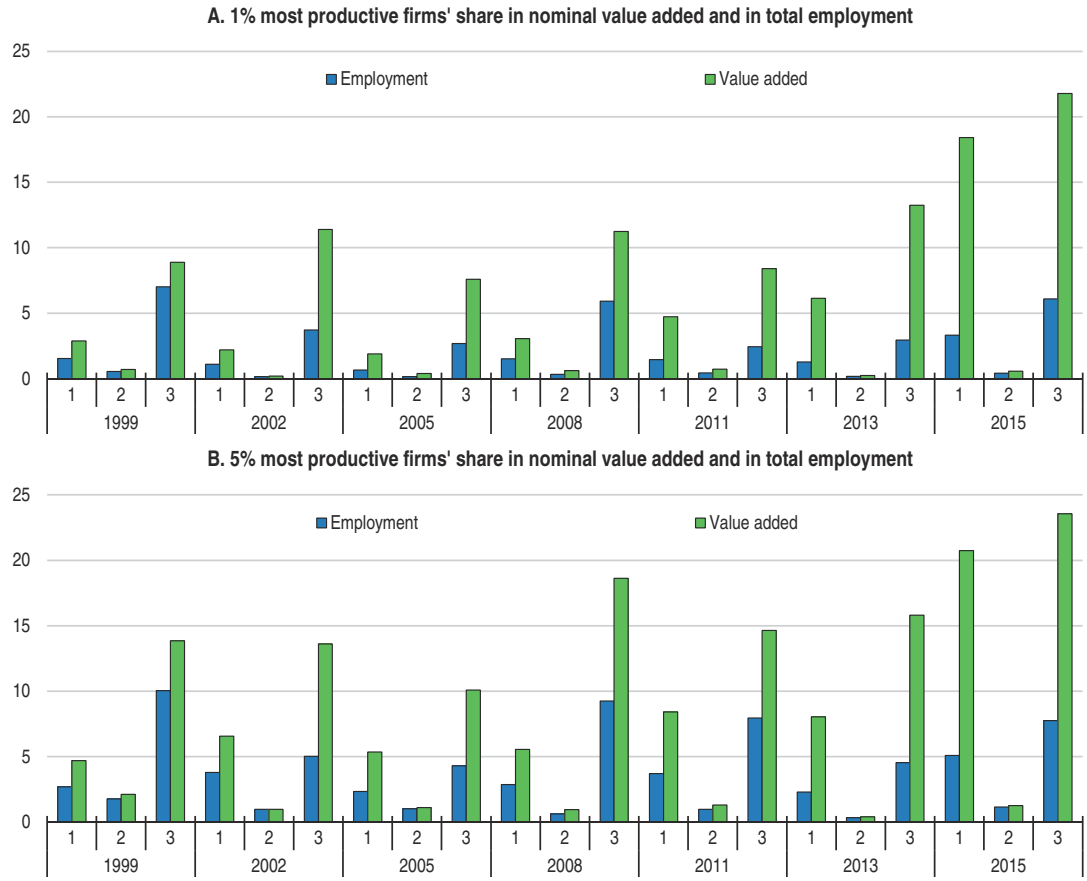
National perspective

Evaluating the performance of the Swiss frontier firms against the rest sheds light on the drivers of Swiss productivity developments. Over 1999-2015, their share in sectoral value added has been rising, especially in recent years (Figure 1.21). While the construction sector is not especially concentrated around a few prominent firms, the top firms in services account for a significant and growing share of value added. In manufacturing, frontier-firm concentration has also been rising in the most recent period.

As there has been no commensurate rise in employment in frontier firms, productivity in services and manufacturing has soared. Indeed, even though the most productive firms were more impacted by the crisis, the pre-existing gap with the rest of the economy has widened in recent years (Figure 1.22). The firm-level data reveal that a majority of the top performers are large, export-oriented and innovative, which is consistent with their good performance.

The increasing gap between leading and lagging firms can result from: i) a decline in diffusion of technology and knowledge away from frontier firms; ii) poorly performing firms hanging on rather than exiting, thereby trapping resources in unproductive activities;

Figure 1.21. **Importance of the most productive firms**[1]



1. 1 refers to manufacturing, 2 to construction and 3 to services.

Source: KOF, *Swiss Innovation Survey database*; OECD calculations.

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Figure 1.22. **Labour productivity of the most productive firms versus the rest**[1]

Labour productivity per employee, 2002 = 100

1. Labour productivity is defined as value added per employee, not adjusted for average hours worked. Top firms are the best firms in terms of the level of labour productivity at the 2-digit industry level. Rest is the 95% remaining firms. In 2002 top 1% firms were nearly 3 times more productive than the rest. The sample of the 1% and 5% most productive firms is recalculated each survey year at the 2-digit industry level.

Source: KOF, *Swiss Innovation Survey database*; OECD calculations.

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iii) increasing concentration of high-skilled workers in frontier firms; and iv) growing market power of, and rent-seeking by, frontier firms (OECD, 2015b). Recent evidence from other OECD countries highlights the role of competitive pressures in containing the divergence in productivity, which would suggest the importance of the fourth driver of the divergence (Andrews et al., 2016).

Before the crisis there was apparently a convergence process, with non-frontier firms' productivity catching up with the most productive firms. However, after the crisis, a divergence appeared. The two periods seem to point to two different drivers of the overall productivity slowdown in recent Swiss history. Pre-crisis, productivity growth of all firms was moderate but even more so for frontier firms, while post-crisis productivity growth of frontier firms accelerated compared to the rest of the economy, but not enough to pull up the aggregate outcome. Indeed, that period coincides with frontier firms becoming increasingly productive in international comparison. One reason for that success lies in the importance of R&D for productivity growth and the concentration of R&D in fewer firms (see below). But it remains unclear why R&D has been recently more concentrated. There are probably other factors at play, including a differential impact of the exchange rate appreciation (penalising exporters selling products with higher price elasticities), different market perspectives (some firms operating globally, while others are more dependent on European or Swiss markets, which have been lacklustre in recent years) and potential divergent credit conditions (as banks have been keener to lend to already profitable firms since the crisis).

Improving the link from R&D to output

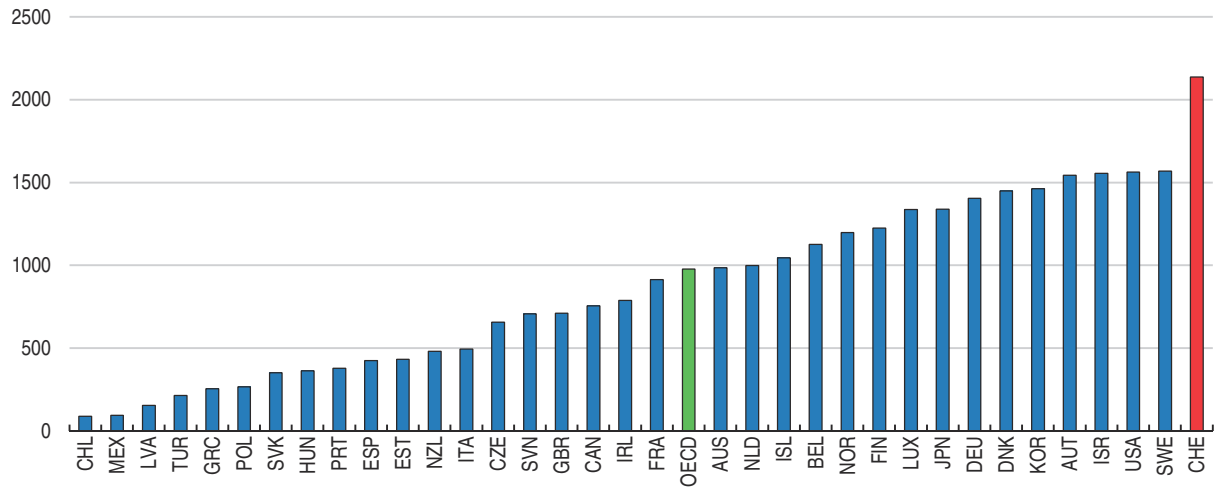
The role of technological advances in driving productivity and growth is clear, but a debate has emerged about the current global pace of innovation. On one side, authors such as Gordon (2012) argue that the actual rate of innovation is poor compared to previous industrial revolutions, contributing to the global productivity slowdown. Conversely, Brynjolfsson and McAfee (2011), for example, blame measurement issues and slow adoption of an ongoing wave of technological improvements. While other factors play a role, Switzerland is confronting a gap between its leading positions in innovation and R&D and relatively poor labour productivity growth, much like Israel (OECD, 2016g).

Increasing the returns to R&D

Switzerland is a leader in R&D spending per capita (Figure 1.23), production of high-quality research (Figure 1.24) and innovation performance (Figure 1.25). According to the Federal Statistical Office, in 2015 Switzerland devoted more than CHF 22 billion (EUR 20 billion) to R&D (over 3% of GDP), of which about two-thirds came from firms. However, in Switzerland and also world wide, the question of its economic returns is raising concerns. Over the last 50 years the number of researchers has increased substantially, while overall labour productivity growth has continued to decline. This apparent drop in yield could also be related to: the linkages from R&D and innovation to output; the capacity of workers to adopt and optimise innovations; and the usefulness of new technologies. Understanding its drivers is crucial, especially if some could be mitigated though policy changes. In particular, there are potential needs for complementary investments, e.g. in skills and organisational change, and for significant business dynamism. Promotion of diffusion of knowledge and technology can also reduce the productivity gap between firms and realise the potential of technological change (OECD, 2017a and 2017b).

Figure 1.23. **Gross domestic expenditure on R&D**

Current PPP $, per capita, 2015[1]



1. 2013 for Australia and 2014 for Ireland.

Source: OECD, *Main Science and Technology Indicators database*.

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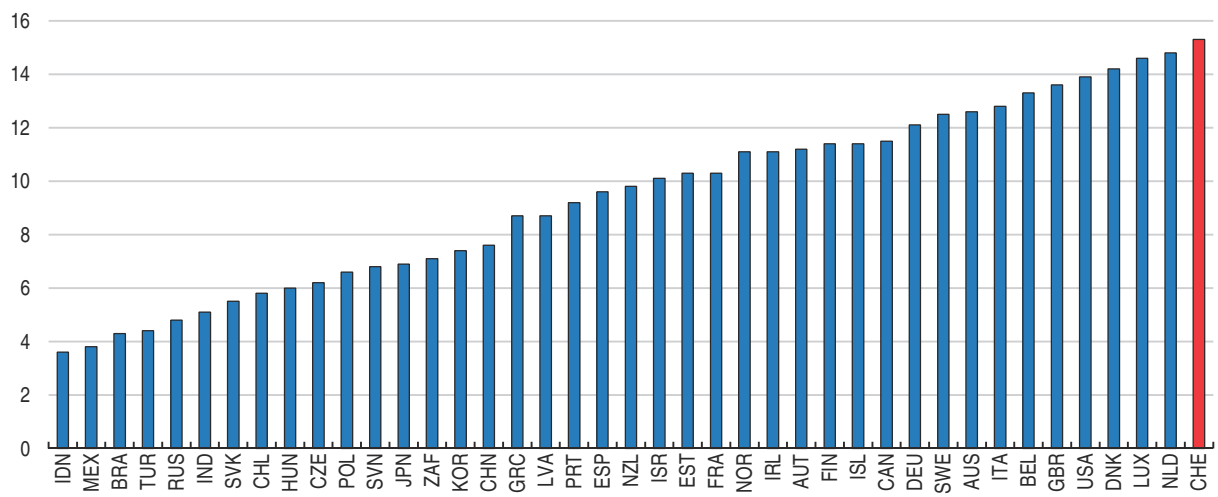
Figure 1.24. **Quality of academic publications**

Share in world top-cited publications,[1] 2003-12



1. Top-cited publications are the 10% most-cited papers in each scientific field.

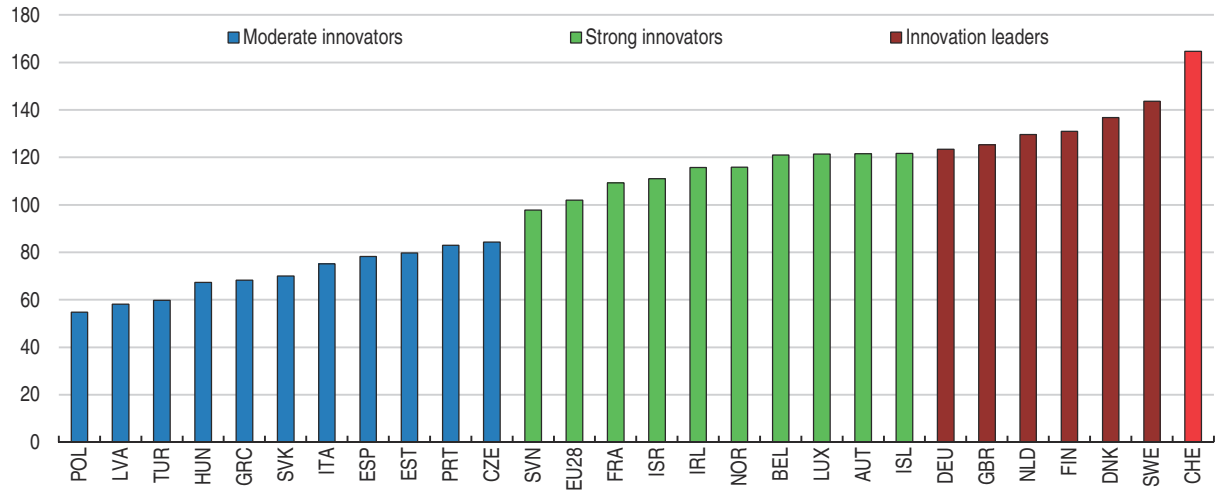
Source: OECD (forthcoming), *OECD Science, Technology and Industry Scoreboard 2017*.

StatLink http://dx.doi.org/10.1787/888933621519

Using the KOF firm database, the private returns to R&D expenditures for Swiss firms conducting such spending is estimated at only 1.4% per year over the period 1999-2015 (Annex 1.A1). This is relatively low compared to the range of estimates in the literature (Hall et al., 2010), which in general are of the order of 10-20%. That would need some further investigation but could be related to the fact that the R&D benefits in terms of output are not mainly going to Switzerland, as an important share of R&D is made by multinationals which operate globally. This estimate excludes spill-overs to the rest of the economy. For example, innovations can affect the performance of other firms (in all

Figure 1.25. **Innovation performance remains high**[1]

Performance relative to the 2010 EU28 level, 2016



1. Average performance is measured using a composite indicator building on data for 27 indicators (only 25 for Switzerland).
Source: European Commission (2107), *2017 European Innovation Scoreboard*.

StatLink http://dx.doi.org/10.1787/888933620930

industries) and can also trigger new avenues of research and find new applications elsewhere. The existence of a social return on top of the private measure helps to underscore the importance of R&D for an economy, supporting the arguments for well-designed government support.

Likely associated with the high level of R&D expenditure, Switzerland is performing well above the European Union in innovation, especially regarding international scientific co-publications, non-R&D innovation expenditure and human resources. The worst performing areas are employment in fast-growing enterprises and venture capital expenditure. European Union (2017) also reports that the areas underperforming over 2010-16 in Switzerland were medium- and high-tech product exports, SMEs' product and process innovations and opportunity-driven entrepreneurship.

Andrews et al. (2014) relate the returns to innovative activity to the economic environment, including: well-functioning product, labour and capital markets; an efficient judicial system; and an appropriate bankruptcy regime. Weaknesses in the Swiss economic environment could drive low private returns to R&D. Another aspect that affects firms globally is the need to register patents in different jurisdictions to protect inventions and the necessity to monitor existing patents as regards possible infringements. That is clearly a larger obstacle for small firms and can both rein in innovations and delay their market exploitation.

Another analysis based on the SIS database shows that firms that have introduced innovations (in processes or products) have higher productivity growth (see Annex 1.A1). Just as there is a rising productivity gap between leading and lagging firms, Arvanitis et al. (2017a) find a falling share of firms in Switzerland performing R&D, but that those doing so are spending a higher percentage of turnover. Based on the divergence in productivity, there is a growing risk that digitalisation will entrench a two-speed economy, with successful firms adapting to technological changes and adopting new technologies and new knowledge, and others lagging behind (EY, 2017). As innovation is increasingly occurring in large enterprises, there should be renewed public policy attention to helping young firms to invest in R&D and

produce innovations (see below). In particular, digitalisation is a growing concern for firms: 60% of enterprises surveyed by EY in 2017 considered digital technologies to be important (compared to 45% the previous year), but 15% of them lack the requisite financial capacity, 9% the qualified personnel and 8% the know-how to exploit them. Given the necessary large investment for R&D, and possible scale economies, there should be more SME collaboration in innovation. Public-sector initiatives through research institutes and laboratories could help those firms to band together. Another innovation barrier is the lack of specialised workers for SMEs, which should be better tackled by using the flexibility of the VET system (Chapter 2; Arvanitis et al., 2017a). To some extent, larger firms exploit talents from abroad to fill their gaps.

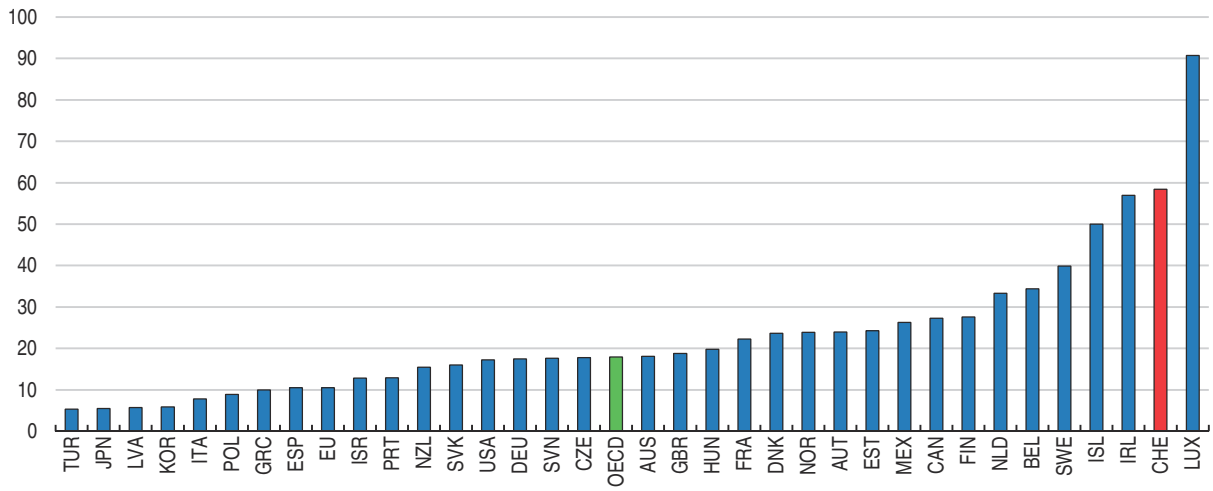
Boosting technology diffusion in Switzerland by reconsidering the role of multinationals

One explanation for the high level of R&D in Switzerland is the prominence of a limited number of multinational enterprises that perform a significant share of R&D (Federal Council, 2016b). Between 2006 and 2011, 63.4% of patents registered in Switzerland originated from just 20 firms and 25% from only two pharmaceuticals producers (SERI, 2016). Thanks to good framework conditions (including infrastructure and skilled labour), the economy has successfully attracted international companies that reinforce the Swiss position in R&D spending. Policies that would help to ensure Switzerland continues benefiting from the internationalisation of its economy include easing immigration from outside the European Union to compensate for the recent decline of flows from the European Union to Switzerland, which could accelerate due to ageing in Europe.

An important share of Swiss R&D involves international co-operation, but Switzerland should avoid just being a place to record innovations. Together with Luxembourg and Ireland, Switzerland has a high share of patents for which the research has been conducted in another country (Figure 1.26). Up to a certain point, participating in international collaboration is advantageous, as leading research can be disseminated all over the world. However, patent location can also be influenced by lower corporate income tax rates and preferential

Figure 1.26. **Patents covering inventions made abroad**

Percentage of total patents, 2013



Source: OECD, *International Co-operation in Patents database.*

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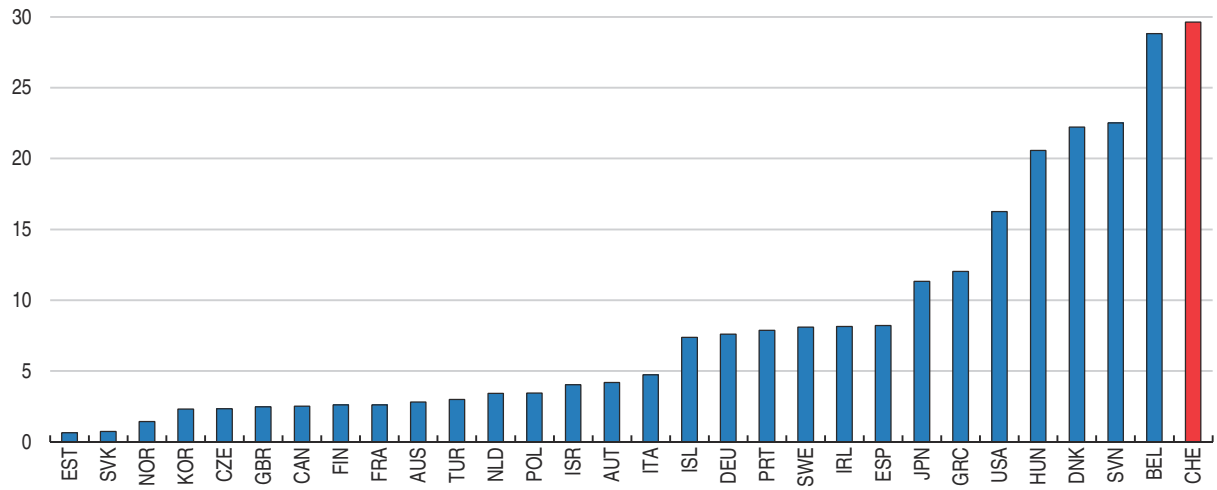
intellectual property regimes (Bieltvedt Skeie et al., 2017). In Switzerland, until the ongoing corporate tax reform is implemented (more below), multinationals benefit from preferential corporate income tax rates which may influence the location of patents. Patents that are derived from domestic R&D are important because they will raise social returns, while patents that are only recorded in the country or have limited Swiss inputs will have negligible positive spill-overs. The ongoing corporate tax reform is an opportunity to reinforce the Swiss position as an R&D hub with R&D tax incentives available for all firms including domestic ones. If this induces additional R&D, it may help reduce the gap between frontier firms and the rest.

The importance of pharmaceuticals is also a sign of the importance of multinationals for Switzerland. Almost 30% of business R&D spending is in the pharmaceuticals industry (Figure 1.27). To some extent, this fairly unusual share points to excessive dependency. While it can have potential positive externalities, it may generate crowding-out effects (financial and labour resources devoted to the sector are not available for the rest of the economy) and risks of a sudden stop (regarding a product or a firm), which can also negatively impact the rest of the economy. More diversification would be positive for Switzerland as the payoff from pharmaceuticals R&D is especially long and variable.

Figure 1.27. **Business R&D expenditure in the pharmaceuticals industry**

As a percentage of total R&D expenditure, 2013[1]



1. 2012 data for Switzerland, using ISIC Rev 4 industry classification.

Source: OECD, *Business enterprise R&D expenditure by industry*.

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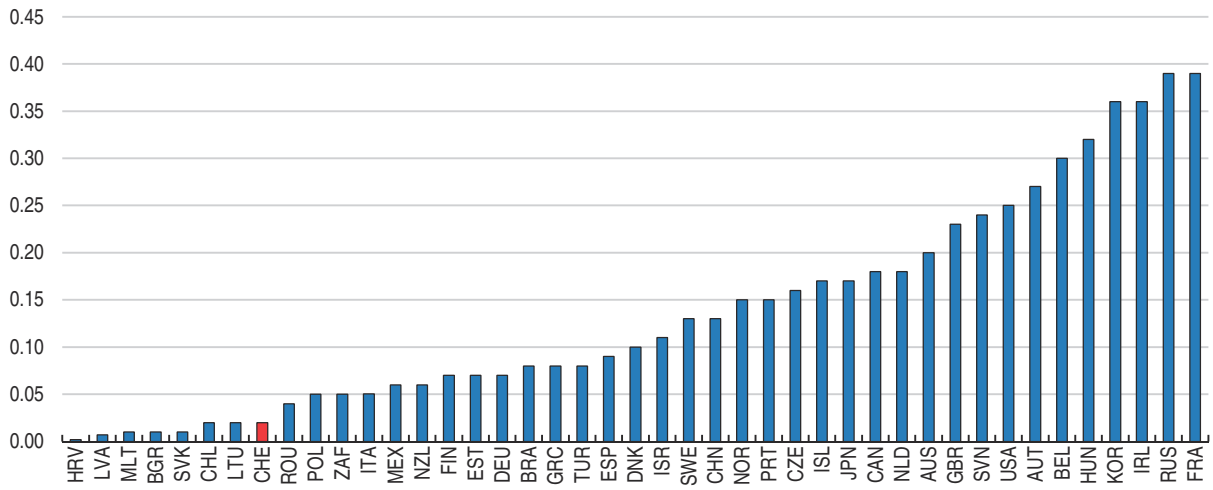
Government support for business R&D is low

Swiss government support (including direct support and tax incentives) for business R&D activities is modest compared to other OECD countries' (Figure 1.28). Even though there is no consensus on causality, the level of government support tends to be positively correlated across countries with R&D intensity in the business sector (OECD, 2015c). Some studies using firm-level data find a more direct impact of tax incentives on R&D spending (Guceri and Liu, 2017), but the literature is less clear-cut about finding an impact on productivity (OECD, 2015b; Westmore, 2013; Appelt et al., 2016). Neubig et al. (2016) highlights the need to have fiscal incentives tailored to favour the development, diffusion and use of new knowledge and innovations and avoid rent-seeking, arbitrage and

Figure 1.28. **Total government support to business R&D**

In per cent of GDP, 2014



Source: OECD, *R&D Tax Incentive Indicators*.

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supporting less efficient activities and incumbents. That said, Switzerland currently offers no tax incentives (except the canton of Nidwalden), and business R&D is relatively high (as in Germany and Sweden), showing that government support is at least not a prerequisite, although it is relatively narrowly based (see Figure 1.26 above). While about 63.5% of R&D in 2015 was financed by the business sector, the government funded about 24% of R&D, mostly carried out by higher education institutions (representing 0.8% of GDP, above the OECD average of 0.6%). Government financing goes through the Swiss National Science Foundation (for basic research) and the Commission for Technology and Innovation (becoming Innosuisse, supporting applied research through entrepreneurship, start-ups and R&D projects). The involvement of the government is important as it provides funding for projects that have low internal returns but high externalities.

The Swiss government is planning a corporate tax reform and will likely offer a "patent box", which is a reduced tax rate on revenues from patents, and supplementary tax deductions for R&D expenditure. The patent box is to be in accordance with the international standard and mandatory for all cantons (due to the federal harmonisation law). It should be carefully designed to avoid providing windfall gains to incumbents without stimulating additional innovation. However, the tool is not considered very effective in promoting innovation, even though it is used in many OECD countries (Appelt et al., 2016). The proposed tax incentives for R&D expenditure provide incentives to domestic firms and multinational firms alike. However, these will provide windfall gains to firms already conducting R&D. The design and implementation should be evaluated to allow improvements to the instrument in generating additional R&D activity.

The share of firms receiving government support for R&D has risen in recent years (Arvanitis et al., 2017b). Direct government support should concentrate on early-stage financing for start-ups, which is lacking in Switzerland (OECD, 2015b). Support for R&D can negatively impact productivity if it benefits incumbents more than innovative start-ups (Bravo-Biosca et al., 2014). Howell (2017) shows that R&D subsidies, when provided in early-stage development, have positive impacts on revenues and patenting. Nevertheless, support

for young firms should remain temporary, as start-ups need to test the value of their business model. Indeed, incentives to remain small can hurt productivity (Benedek et al., 2017).

Public authorities should promote more the need for specialised workers in R&D, as both the share of researchers in the workforce and of women in the research labour force is low by international standards (SERI, 2016). The quality of Swiss education is particularly high, but the share of the population with a higher education qualification is not, most likely because of the importance of vocational training (Chapter 2). It is also related to a risk of Swiss students being crowded out of excellent institutions, given their reputation, by foreign candidates. As a result the lack of specialised workers constrains innovation for medium-sized firms (Arvanitis et al., 2017b).

Additionally, the Swiss consumer market is relatively small and thus does not suffice for many start-ups to be created or grow. As in Israel or the United States, Switzerland could make use of public procurement to spur the development of small firms, including start-ups, through targets for the maximum involvement of large firms. That can be facilitated by more public procurement being publicly available on the electronic platform *simap*. OECD (2017f) also makes several recommendations to utilise procurement for promoting innovation and highlights the absence of a strategic framework in Switzerland. This lack of a strategy also means that there is no assessment of such public procurement. For example, Finland has set an objective of 5% for innovative public procurement (OECD, 2016h). Sub-national governments can also play a role; in Finland municipalities incorporate innovation objectives, especially in construction, social and health care services, and energy and water supply.

The interaction between innovation and inclusiveness can also bring with it some productivity enhancement. Aghion et al. (2015) suggest that in the United States innovativeness could explain 17% of the total increase in the income share of the top 1% of earners between 1975 and 2010. The innovative process should be opened to the whole of society to allow for social mobility and avoid allowing incumbents to lock in rents. That suggests further lowering entry barriers for innovators and developing government mechanisms to accompany them, including help to find funding and provision of information on existing regulations and on possible public support (especially as some differences exist across cantons). That would contribute to diversifying R&D across industries and firm sizes. In addition, becoming an inventor is strongly related to one's education, which should also be utilised as a tool of innovation policy. Indeed, using German data, Frosch et al. (2015) find a positive link between the degree of education and inventor productivity. But schools should also help to develop creativity, leadership and innovation skills for a wider range of students to become inventors. In addition, providing training to (future and existing) entrepreneurs, notably in finance, is important.

Enhancing access to academic knowledge would facilitate the diffusion and use of technologies. In that regard the role of universities, already significant in Switzerland, is important to provide resources in terms of publications, scientists and machinery, but there are practical barriers to benefit from all those materials including the cost and the know-how. Andrews et al. (2015) find that R&D collaboration between business and universities matters for increasing technological diffusion. In Switzerland 17% of innovative firms co-operate with universities, which is similar to Germany but far short of outcomes for Finland, Austria and Denmark (SERI, 2016), revealing some room for improvement. One possibility would be to further promote incubators at higher education institutions as a bridge between academia and business (see Prencipe, 2016 for a study on Italy). The

recruitment and career development of academic staff could also take into consideration entrepreneurial experience or support activities. Collaboration with the business sector could be improved with more entrepreneurial education integrated into curricula.

Recommendations to boost Swiss productivity
(Key recommendations in bold)

Better using the skills of older workers, women and immigrants

- Promote preventative health programmes, lifelong training and tailored job-search assistance to older workers to lengthen their healthy working lives.
- **Increase childcare affordability.**
- **Shift income taxation to individual rather than household incomes, or implement equivalent measures.**
- **Facilitate high-skilled immigration from non-EU countries to meet labour market needs.**

Improving framework conditions

- **Increase private ownership and remove barriers to entry, including restrictions on the number of competitors, in energy, telecommunications and transport.**
- Review existing regulations that could hinder young and small firms. Enhance transparency and use of information technology, and develop e-government.
- **Finalise the virtual one-stop shop for administrative affairs.**
- **Establish cantonal physical contact points to improve delivery of advisory services and public financing programmes.**
- **Complete the negotiations for free-trade agreements that are underway with Asian nations and MERCOSUR.**
- **Lower restrictions on trade in both goods and services, notably in highly protected agricultural products.**
- Facilitate foreign investment, notably by removing equity restrictions.
- **Remove representatives of economic associations from the board of the competition authority.** Improve the merger control system through adopting the EU approach.
- Improve the insolvency regime by introducing early-warning mechanisms and shortening the period during which individuals are required to repay past debt from future earnings to three years.
- Lower barriers to mobility and trade across cantonal borders.
- Develop internationally comparable firm-level data to expand analytical possibilities.
- Develop more non-bank financing, including expanding online alternative sources of funding through reviewing regulations regarding peer-to-peer lending and equity-based crowdfunding.

Innovation and R&D

- Promote incubators at higher education institutions, and recruit academic staff with entrepreneurial skills to boost start-ups' creation and success. Focus government support on early-stage development of start-ups.
- Facilitate more innovative small firms' participation in public procurement by extending the use of the electronic platform.
- Use universities and research laboratories to increase collaboration between start-ups.

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ANNEX 1.A1

Firm database

Firm-level data throughout the chapter are based on the Swiss Innovation Survey (SIS), maintained by the KOF economic institute which conducts economic research notably through surveys. The SIS is based on a stratified random sample of firms with at least five employees, covering all relevant industries in the Swiss business sector. Data exist for 1996, 1999, 2002, 2005, 2008, 2011, 2013 and 2015 but are less comprehensive for the first year. For the latter two years, the structure of the questionnaire has been brought into line with the Community Innovation Survey, a project carried out by Eurostat for EU Member states.

The 2015 survey contains 5 908 firms' responses, of which 3 099 are small, 2 320 medium-sized and 489 large. Because the average size varies across industries, thresholds used to define the size class are determined by the method of optimal stratification (Cochran, 1977). The database covers manufacturing, construction and services sectors. The rate of response is about a third, driven down by small firms (just above a quarter).

Firm labour productivity is the main variable of interest from this database. It is computed as value added divided by the total number of employees. Variables used in the chapter include:

- Value added
- Turnover
- Total number of employees
- Labour costs
- Gross investments
- Export (Yes/No)
- Intensity of price competition (from 1 to 5)
- Intensity of non-price competition (from 1 to 5)
- Annual R&D spending as a share of turnover
- R&D (Yes/No)
- Innovations in process and in products (Yes/No)
- Number of competitors (<= 5, 6-10, 11-15, 16-50, > 50)
- Share of employees with higher education (degree or further education)
- Size class (small, medium, large)

Limitations

The database is representative of the economy but is not a fully comprehensive picture of Switzerland's business sector. First, very small firms are not covered, as only those with at least five employees are questioned. That also means that young firms are underrepresented as they typically start very small. Second, the questionnaire is sent to firms that are part of the official registry of BFS (the federal statistical office), which is revised only every five years, thereby also excluding the youngest enterprises. Third, not all corporations answer the request and while large firms are well covered in all industries, the smallest ones tend to be underrepresented. Finally, amongst answers, some questions are left blank. To mitigate those issues, several exercises are performed at KOF:

- For every survey wave, a check analysis is done by calling 500 firms that have not sent back the questionnaire asking only three questions. The comparison of their answers with database results revealed no significant divergences between the two sets of information.
- Missing values are estimated following multiple imputation techniques developed in Rubin (1987), filling in with imputed variables on top of raw information.
- The SIS also contains firm-specific sample weights that correct for stratification and the different response probabilities of firms.

Data manipulation

Deflator

The SIS database has only nominal value added, which needs to be deflated to get a measure in constant terms. OECD national accounts data by industry have been used to complete the information with 2-digit industry deflators based on ISIC Rev 4. But this means that there is no information on price reaction at the firm level.

Purchasing power parities

To compare the SIS database with the global frontier productivity and remain as close as possible to Andrews et al. (2016) the data have to be converted to 2005 PPP. PPP conversion factors at the industry level have been derived from Inklaar and Timmer (2013). As Switzerland is missing from the authors' calculation, sector PPP information for Switzerland is based on EU27, while PPP conversion at the country level matches official OECD information.

Firms' size

The SIS database covers firms of at least five employees, but in the particular exercise of the comparison with the global productivity frontier in Andrews et al. (2016), companies of less than 20 employees are excluded.

Wages

The average wage in an enterprise is estimated as the ratio between total labour costs and the number of employees. This should provide a good proxy. As each firm is treated the same way, inter-firm comparisons are facilitated, but it does not allow within-firm analysis. To remove the influence of outliers, enterprises with estimated wages per employee above CHF 4 million are removed (3 in 2013 and again in 2015).

Rate of return to R&D activities

Investment in R&D and innovation is particularly expensive because of fixed costs and uncertainty, and accounting for its private return is key to understanding firm incentives. Inspired by Hall et al. (2010) and adapted to the SIS database, the equation below is estimated on all firms that spend on R&D in the SIS database, where *i* stands for the firm, *t* for time and *s* for the 2-digit sector:

$$\Delta y_{i,t} = \alpha_s + \gamma_t + \beta_1 \Delta l_{i,t} + \beta_2 \Delta c_{i,t} + \beta_3 \Delta k_{i,t} + \Delta u_{i,t} \quad \text{(A1)}$$

All variables are in logarithms, with *y* standing for firm productivity, *l* labour costs per employee, *c* physical capital stock per employee, *k* R&D capital stock per employee and *u* the residual term. The R&D capital stock intensity is approximated by R&D expenditure divided by turnover with the assumption that the growth rate and the depreciation rate of R&D at the firm level are broadly constant, following Hall et al. (2010). The same approach is used for the physical capital stock (proxied by gross investment per employee). Results are presented in Table 2. This does not take into account social returns or spill-overs to the rest of the economy.

Table A1.1. **R&D rate of return**

Dependent variable: labour productivity growth; unbalanced panel

	Coefficient	Standard error
Change in labour costs per employee	0.440***	(0.070)
Change in investment per employee	0.003	(0.010)
R&D expenditure as share of turnover	0.014**	(0.007)
Observations	1713	
R^2	0.18	

Note: Significance at 1%, 5% and 10% represented by ***, ** and *, respectively. Constant, time and sector effects are excluded from the table.
Source: Authors' calculation based on KOF, *Swiss Innovation Survey database*.

Determinants of productivity growth

In the SIS database, several variables can be exploited to look at correlations with labour productivity growth. A first set of regressions is performed on the type of competition using available firms' answers regarding the intensity of price versus non-price competition (Table A1.2, column 1). Contemporaneous effects are not significant, but there seems to be a correlation with a lag (which corresponds to the time between two surveys). When firms compete on prices, productivity is apparently dragged down, while non-price competition seems to boost subsequent value added per employee.[1] This could go through incentives to innovate in processes or in products, while fierce price competition may for instance negatively affect investment. However this seems to be driven by part of the manufacturing sector (at the 1-digit level, comprising: manufacture of transport equipment; other manufacturing and repair and installation of machinery and equipment; electricity, gas, steam and air-conditioning supply; water supply, sewerage, waste management and remediation) as the price competition coefficient loses significance when the sector is excluded (column 2).

Looking at competition from a different angle, Table A1.3 (column 1) suggests a negative correlation between the number of competitors (including outside Switzerland) and productivity growth. However, for example the absence of young firms in the SIS database could hide the benefits of competition in terms of productivity as their market share gains are

Table A1.2. **Type of competition**

Dependent variable: labour productivity growth; unbalanced panel

	(1)	(2)
Productivity level (one lag)	-0.500***	-0.516***
	(0.022)	(0.023)
Intensity of price competition (one lag)	-0.013**	-0.005
	(0.006)	(0.006)
Intensity of non-price competition (one lag)	0.016***	0.025***
	(0.006)	(0.006)
Observations	7025	6569
R^2	0.24	0.26

Note: Significance at 1%, 5% and 10% represented by ***, ** and *, respectively. Constant, time and sector effects are excluded from the table. Robust standard errors in parentheses.
Source: Authors' calculation based on KOF, *Swiss Innovation Survey database*.

Table A1.3. **Correlations with productivity growth**

Dependent variable: labour productivity growth; unbalanced panel

	(1)	(2)	(3)	(4)	(5)	(6)
Productivity level (one lag)	-0.484***	-0.484***	-0.486***	-0.487***	-0.488***	-0.496***
	(0.022)	(0.022)	(0.022)	(0.022)	(0.022)	(0.022)
Number of competitors						
6-10	-0.03*	-0.03*	-0.03**	-0.03**	-0.03**	-0.03**
	(0.015)	(0.015)	(0.015)	(0.015)	(0.015)	(0.015)
11-15	-0.06***	-0.06***	-0.06***	-0.06***	-0.06***	-0.06***
	(0.018)	(0.018)	(0.018)	(0.018)	(0.018)	(0.018)
16-50	-0.06***	-0.06***	-0.06***	-0.06***	-0.06***	-0.06***
	(0.021)	(0.021)	(0.021)	(0.021)	(0.021)	(0.021)
>50	-0.13***	-0.12***	-0.12***	-0.12***	-0.12***	-0.12***
	(0.018)	(0.018)	(0.018)	(0.018)	(0.019)	(0.019)
Firm size						
small		-0.043***	-0.04***	-0.04***	-0.03***	-0.04***
		(0.012)	(0.012)	(0.013)	(0.013)	(0.013)
large		0.025	0.025	0.02	0.02	0.01
		(0.018)	(0.018)	(0.018)	(0.018)	(0.017)
Export			0.028*	0.018	0.017	0.007
			(0.015)	(0.015)	(0.015)	(0.015)
R&D spending				0.042***	0.021*	0.009
				(0.014)	(0.017)	(0.017)
Innovations					0.034**	0.035**
					(0.016)	(0.016)
Higher education						0.002***
						(0.0004)
Observations	6486	6486	6449	6446	6446	6446
R^2	0.24	0.24	0.24	0.24	0.24	0.25

Note: Significance at 1%, 5% and 10% represented by ***, ** and *, respectively. Constant, time and sector effects are excluded from the table. Robust standard errors in parentheses. Number of competitors should be interpreted in reference to the category 'below 5 competitors'. Firm size coefficients are in reference to medium-sized firms.
Source: Authors' calculation based on KOF, *Swiss Innovation Survey database*.

not included. Another problem lies in the use of the aggregate deflator at the industry level instead of individual firms' price settings. Finally the coefficients, while significant, are not statistically different except for the last category.

When firm size is controlled for, competition effects remain, but there is a clear relative bias for large firms to have faster productive growth than small firms (Table A1.3,

column 2), presumably because of scale economies. This can be compensated somewhat by the effect of the lagged productivity level (assuming that large firms have higher productivity levels), which shows convergence in productivity level when sectors and years are controlled for: the higher the productivity level, the lower the growth rate. This could also indicate some level of technology diffusion across firms through the period.

Being an exporter seems to be associated with higher productivity growth, but it does not remain when R&D expenditure is included (columns 3 and 4). The large-firm dummy variable also becomes insignificant as larger companies probably tend to spend more on R&D. The R&D spending impact is blunted by the inclusion of the innovation dummy – some of the effect is probably picked up through increased probability of undertaking innovation – and disappears entirely with the use of the share of highly educated employees (columns 5 and 6).

Note

1. The regression results should be interpreted cautiously as endogeneity issues may bias the coefficients.

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Chapter 2

Ensuring a dynamic skills-training and life-long learning system

Switzerland makes more use of its human resources than most other OECD countries. Labour force participation is high and the unemployment rate low for most segments of society. This ensures a high standard of living for most Swiss people. Nevertheless, productivity growth is relatively slow. While this may in part be attributable to already being an advanced economy, it also means that Switzerland cannot be complacent with regard to education and skills. Its admirably low youth joblessness suggests that the transition from education to work is functioning soundly. However, there is mounting evidence that as the structure of industry is changing, due to globalisation and digitalisation for instance, vacancies and skills mismatches are spreading. The mix of skills being taught differs from those taught in most other high-income OECD countries in which a common secondary school track predominates and the emphasis is on equipping young adults with academic tertiary qualifications. In this context, it is important that the system is flexible enough to respond to shifts in the demand for skills and that workers continue to learn. While the participation of women and immigrants in the economy compares relatively well, more can still be done to improve equity in the accumulation of skills.

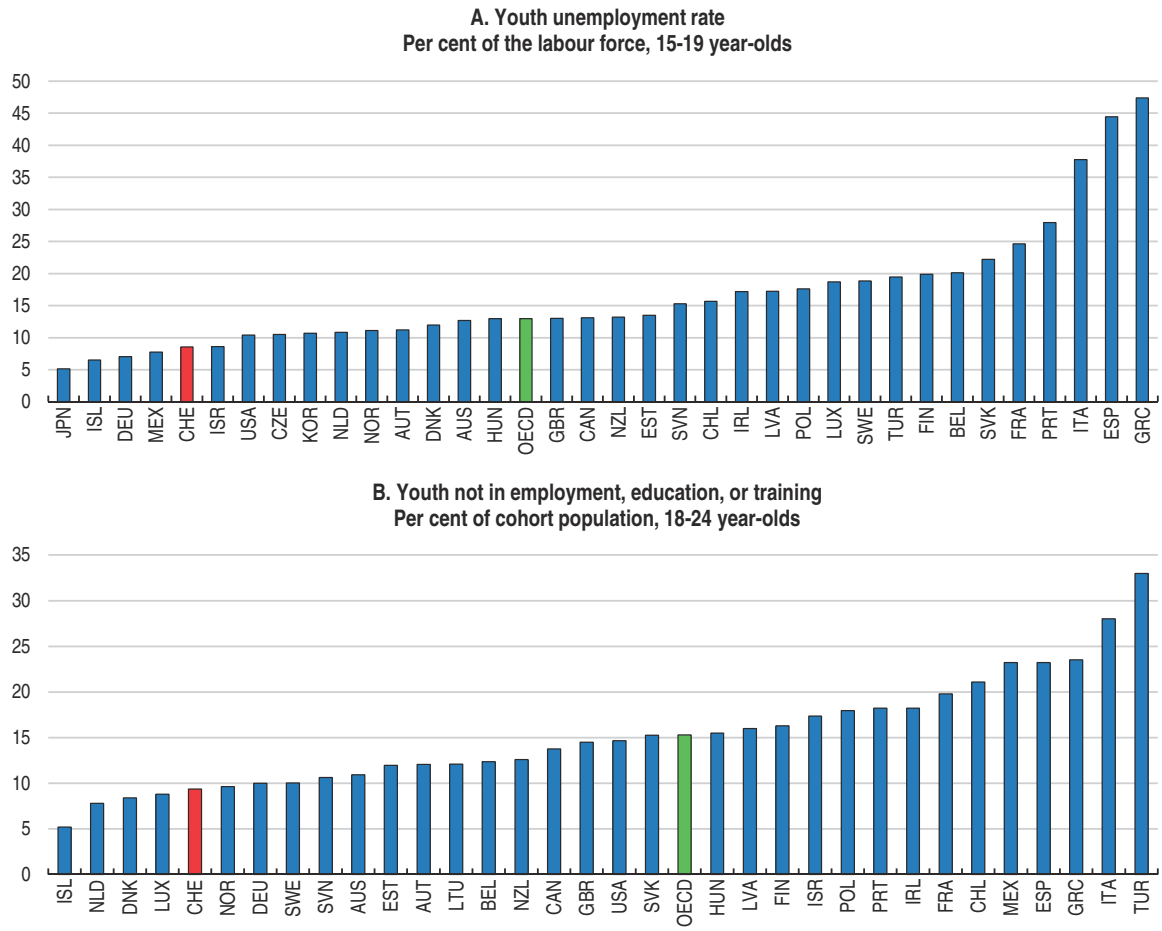
The fundamental importance of education in economic and social development cannot be understated. Sustained long-term growth is underpinned by education. Without proper investment in skills, technological progress does not translate into economic growth, and countries can no longer compete in an increasingly knowledge-based global society (Hanushek and Wößmann, 2008 and 2011; Krueger and Lindahl, 2001). Moreover, cognitive skills directly affect individual earnings and the distribution of income. Not only are the income returns to education monotonically positive on average, but even more fundamentally, education helps people make informed economic and social choices and raises social engagement and health outcomes (OECD, 2010a; Campbell, 2006). Crucial and complex phenomena such as digitalisation, deindustrialisation and the future of work require skills policies that make societies more resilient to the changes that lie ahead – including skills upgrading and ensuring a better use and distribution of existing skills.

The accumulation of human capital boosts labour productivity, and more broadly it also feeds into multi-factor productivity by smoothing the interface between labour and capital. But the types of skills needed shift over time as the structure of the economy changes with the introduction of new technologies and evolving consumer tastes. Education systems need to be flexible enough to respond. One approach is to put heavy emphasis on providing students with foundation skills and the capacity to learn, thereby equipping them with a solid footing upon which subsequently specialised skills can be efficiently built, as needs arise. In this way, the workers themselves are adaptable throughout their working lives. The other approach is to have a system that promotes specialisation but is flexible enough to quickly adapt to changing labour market demands. Of course, a mix of these two approaches is also possible (OECD, 2012a). Skills should also be seen as a tool to be honed over an individual's lifetime. It is therefore important to take a strategic approach to assess the impact of different kinds of learning – from early childhood education through formal schooling to formal and informal adult education and training – with the aim of balancing the allocation of resources to optimise economic and social outcomes.

Switzerland's high living standards are partly attributable to its level of human capital, which compares very well to that of other OECD countries as measured by overall education participation and outcomes. The education system prepares young people commendably for the transition from education to work, with an enviably low youth unemployment rate (Figure 2.1, Panel A) and low numbers of youth not in employment, education or training (Panel B). Part of this success is due to the comprehensive and well-integrated vocational education and training system, which does an excellent job of transitioning students of all abilities into the workforce (Hoeckel et al., 2009; OECD, 2009 and 2010b; Box 2.1).

Switzerland, like Germany, the Netherlands, Austria and the Scandinavian countries, is characterised by a high level of educational stratification, with a well-established track of vocational education and training both at secondary and tertiary levels. Around two-thirds of secondary students follow the vocational track, where courses of study are typically of shorter duration, and this in part explains Switzerland's average ranking in

Figure 2.1. **Youth labour market outcomes, 2016**



Source: OECD, *Employment database*; OECD (2017), *Education at a Glance 2017*.

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Box 2.1. **Strengths of the Swiss vocational education and training system**

Earlier OECD studies of Switzerland's vocational education and training (VET) system highlighted a number of strengths of the system that contribute to its good labour market outcomes. These include:

- The system is strongly employer and market driven. Employers and professional associations are engaged with and actively contribute to education and training. The partnership between Confederation, cantons and professional organisations works well.
- School and work-based learning are well integrated and workplace training is not too company-specific.
- The tertiary VET system ("professional education and training") offers a wide range of progression opportunities for apprentices graduating from upper-secondary VET.
- There is a broad spectrum of tertiary VET offerings. The system offers a flexible and effective response to diverse student requirements, with part-time, evening, weekend and modular provision. Work-based learning is generally well integrated into tertiary VET programmes, with work linked to study for part-time students, and substantial internships for full-time students.

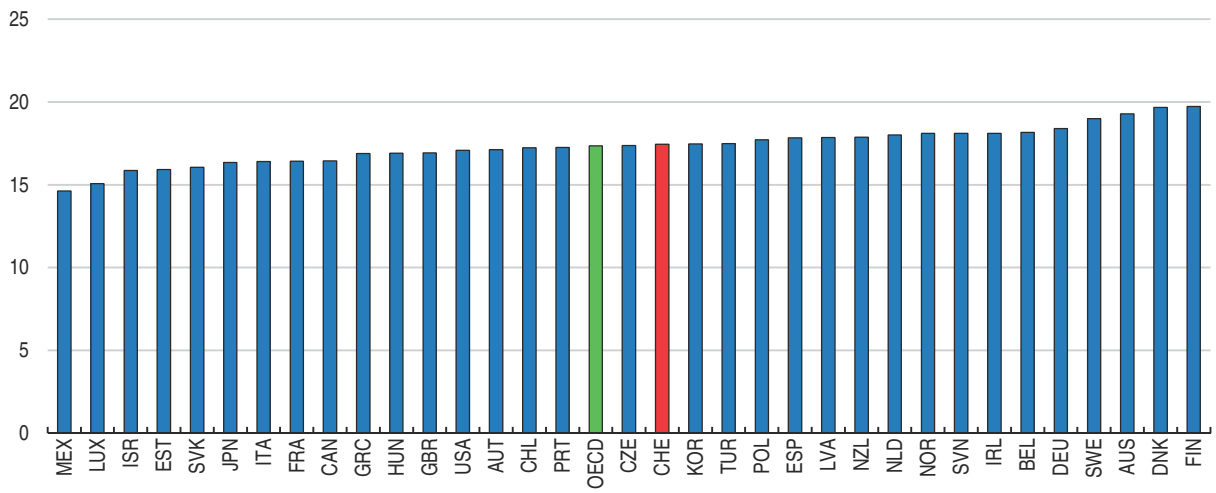
Box 2.1. **Strengths of the Swiss vocational education and training system** *(cont.)*

- Teachers and trainers in professional colleges are well prepared both in their vocational field and in pedagogy.
- The professional exams in the tertiary VET system effectively link upskilling to recognition of prior learning.

Source: Fazekas, M. and S. Field (2013), *A Skills beyond School Review of Switzerland*, OECD Publishing, Paris. *http://dx.doi.org/10.1787/9789264062665-en*; Hoeckel, K., S. Field and W. Grubb (2009), *Learning for Jobs: OECD Reviews of Vocational Education and Training: Switzerland*, OECD Publishing, Paris, *http://dx.doi.org/10.1787/9789264113985-en*.

terms of years at school (Figure 2.2). While there was a rapid increase in the average years of schooling through the 1960s and 70s – the period during which the vocational education and training system including apprenticeships was formalised – this increase all but stopped until the late 2000s, while in many other OECD countries it continued.

Figure 2.2. **Expected average years of schooling of the adult population**[1]



1. This indicator is the average duration of education in which a five year-old child can expect to enrol during his/her lifetime until the age of 39. It is calculated under the current enrolment conditions by adding the net enrolment rates for each single year of age from the age of five onwards.

Source: OECD (2016), *Education at a Glance 2016*.

StatLink http://dx.doi.org/10.1787/888933621614

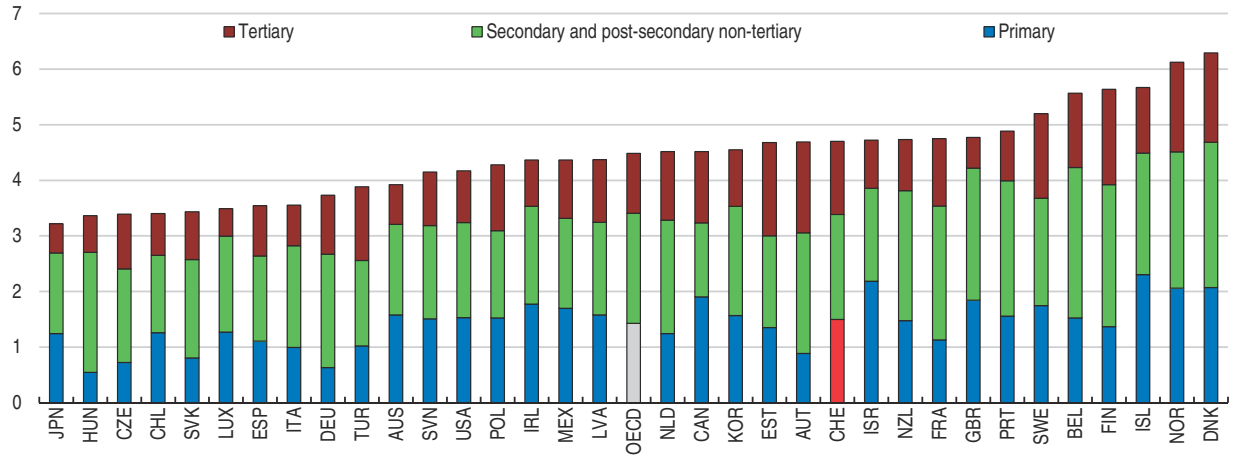
The high level of stratification and relative complexity of the Swiss education system reflects the extensive organisational decentralisation, based on the principles of subsidiarity and direct democracy. Financing is also highly decentralised with 96% of public funds from sub-national government, even before transfers (OECD, 2017a). Pre-school, primary and lower secondary education are essentially under cantonal jurisdiction. Only in 2006 was the constitution modified to give the federal authorities the right to enact regulations concerning compulsory schooling under certain conditions. After compulsory schooling, responsibilities vary between the academic and vocational streams. Upper-secondary general (academic) education is managed largely at the cantonal level, while vocational education and training is the responsibility of the federal government. In tertiary education jurisdiction is cantonal for universities, regional for universities of

applied sciences and federal for the Swiss Federal Institutes of Technology. There is, however, substantial co-ordination between all levels. The segmented structure of the education system means that students of all aptitudes and preferences are catered for and therefore remain in education after completing compulsory education, usually at age 15. At the age of 18 around 83% of the population is still in some form of education (FSO, 2015). Switzerland also ranks highly in the proportion of people who have attained at least an upper-secondary school education (88% of 25-64 year-olds; OECD, 2013 and 2017a).

Switzerland's public spending on educational institutions, from primary to tertiary, is close to the OECD average relative to GDP (Figure 2.3). In 2014 public spending was 14% of government expenditure, above the OECD average of 11%. Spending per student is high in PPP-adjusted terms (USD 17 436) relative to other OECD countries (where public and private average USD 10 759). As in other OECD countries, average spending per student is higher at tertiary educational institutions than the average of lower levels of education. Spending per tertiary student is outdistanced only by Luxembourg and the United States. However, Switzerland's high level of spending is driven by R&D activities and the level of spending is closer to the average when these are excluded.

Figure 2.3. **Public expenditure on educational institutions by level of education**[1]

Per cent of GDP, 2014



1. Including public subsidies to households attributable for educational institutions, and direct expenditure on educational institutions from international sources.

Source: OECD (2017), *Education at a Glance 2017*.

StatLink http://dx.doi.org/10.1787/888933621633

With regard to outcomes, in the 2015 PISA exercise Switzerland ranked third among OECD countries in the mathematics performance of 15 year-olds, 12th in science and 22nd in reading (OECD, 2016a). Indeed, in the 2015 iteration Switzerland is notable with regard to the dispersion of its rankings across subjects. Germany, for example, ranked 11th, 10th and 9th across subjects, and the Netherlands ranked 6th, 11th and 12th. While student performance across Swiss linguistic regions is remarkably homogeneous, the very large number of students who speak a language other than that used at school (above the OECD average) may explain the weaker reading scores (OECD, 2016b).

Switzerland did not participate in the OECD Survey of Adult Skills (PIAAC) in 2016. This is unfortunate, as making up-to-date international comparisons of Switzerland's

performance relative to other OECD countries would have been instructive, especially given skills shortages and the challenges posed by digitalisation and other far-reaching changes (see below). Moreover, the virtual absence of longitudinal or cohort data within the Swiss education system makes in-depth analysis difficult (SKBF, 2014). This lack of data makes it hard to assess the effect of the current education arrangements on equity and labour market and other outcomes. The creation of student identifiers in educational statistics will bring about an improvement in this respect over the long term, as it will allow better individual tracking in the statistics.

The previous *Survey* (OECD, 2015a) made several recommendations as to how Switzerland could make its education system more inclusive and responsive to labour market needs. One of the main recommendations was to raise enrolment in early childhood education and care, which would increase the overall effectiveness of the system, especially for underprivileged students, including migrants. This issue is taken up in further depth in this chapter, especially regarding the effect on equity of the education system, which splits students into vocational and academic streams as well as classes based on ability.

Demand for skills and skills mismatch

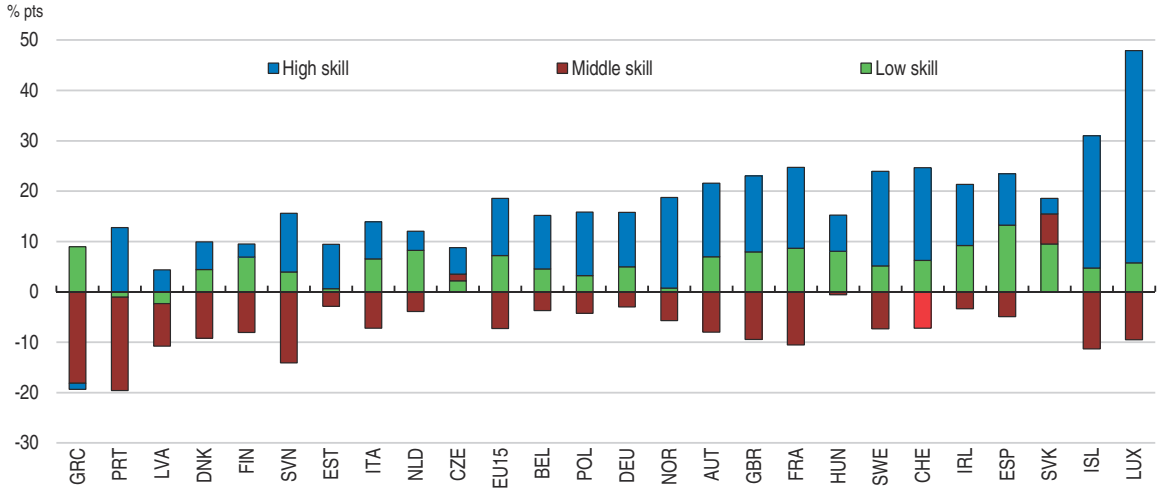
One of the principle objectives of every education system is to prepare young people for the workforce by providing them with the knowledge and skills that match those in demand in the jobs market. Without sufficient investment in skills, people languish on the margins of society, technological progress does not translate into economic growth, and countries can no longer compete in an increasingly knowledge-based global society (OECD, 2016a). In addition, for skills to retain their value they must be maintained and upgraded throughout life. Matching the skills taught with job-market demands is a challenge that countries increasingly have to face as technological change accelerates.

Over the past decade and a half Switzerland has enjoyed comparatively strong employment growth, averaging 1.1% per year. As in most other European countries, most of this growth has been in the high-skilled occupations (Figure 2.4), while low-skilled jobs have grown more moderately, and the number of middle-skilled jobs has retreated. The demand for labour has clearly been tilted toward high-skilled workers and away from their middle-skilled counterparts.

While overall both the unemployment and job-vacancy rates have been admirably low, a change in the skills demanded in the Swiss job market is evident in the divergent job-vacancy rates across industrial sectors. Vacancy rates have tended to be highest in high-skilled sectors like finance, and information and communications technology (ICT), as well as manufacturing. Shortages of engineers have been also enduring (Economiesuisse, 2017). Moreover, it is in these sectors that vacancy rates have also increased most rapidly over the past eight years, most notably in the ICT sector (Figure 2.5, Panel A). The new OECD Skills for Jobs indicators also point to particularly high skills shortages for information and communications technicians as well as health-related professionals and personal care workers. Shortages of ICT workers are not unique to Switzerland, with ICT-sector vacancies increasing across most of Europe (Panel B). Beyond illustrating the growing gap domestically, shortages that are common to Europe mean that Switzerland is unable to attract workers it needs with these skills from other European countries in sufficient numbers (despite paying a wage premium), as it has for other sectors thanks to the free movement of people

Figure 2.4. **Most of Switzerland's job growth has been in high-skill jobs**

Contributions to changes in total employment over 2000-16[1]



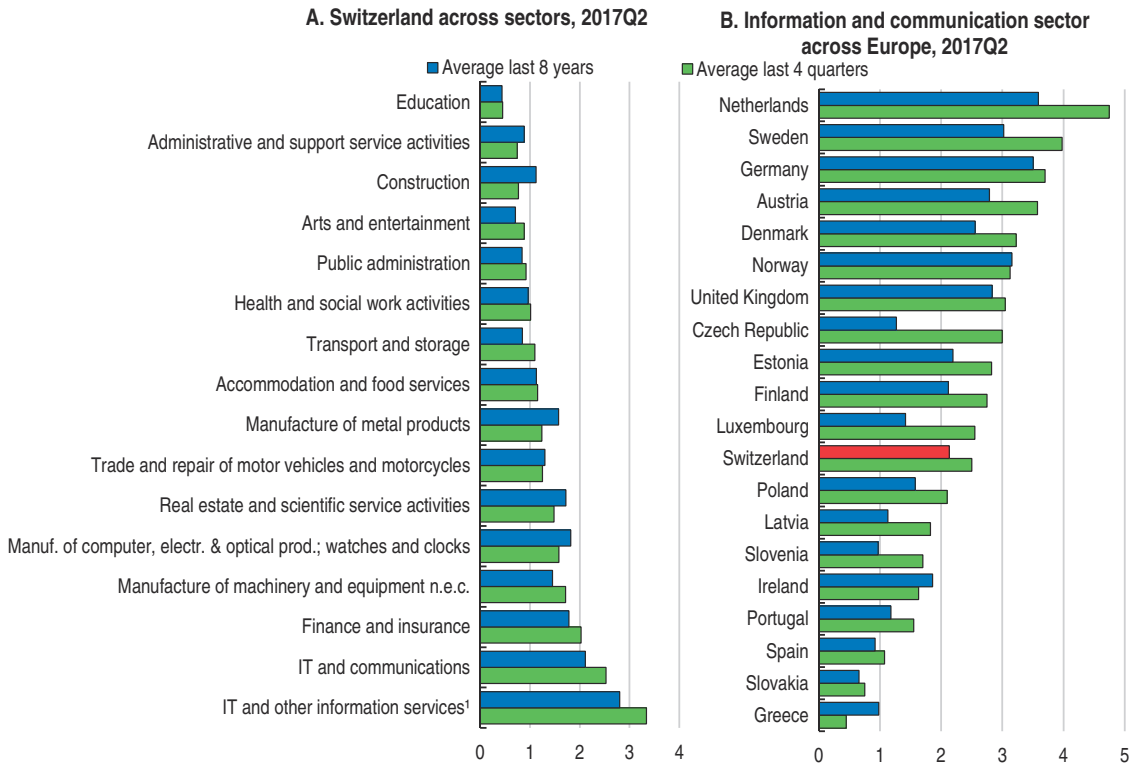
1. Countries are ordered by the change in net employment over 2000-16. High-skill occupations are: managers, professionals, and technicians and associate professionals; medium-skill occupations are clerical support workers, skilled agricultural workers, craft and related trades workers and plant and machine operators and assemblers. Low-skill occupations are service and sales workers, and elementary occupations. The armed forces and non-responses are not shown.

Source: Eurostat.

StatLink http://dx.doi.org/10.1787/888933620968

Figure 2.5. **Job vacancy rates by sector in Switzerland and in the ICT sector across Europe**

Per cent



1. IT and Other Information Services is a subsector of IT and Communications.

Source: Federal Statistical Office; Eurostat.

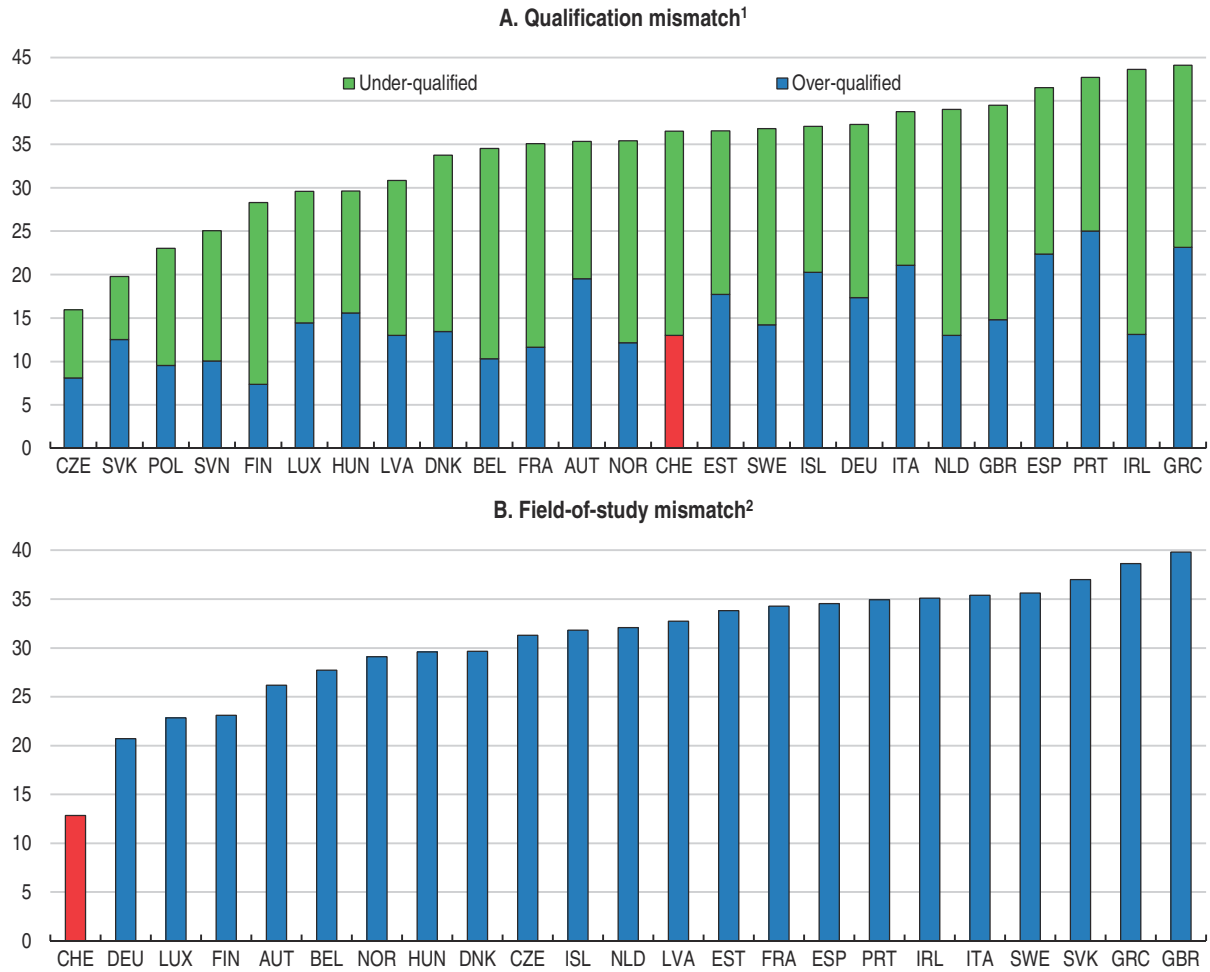
StatLink http://dx.doi.org/10.1787/888933621652

agreement with the European Union (Swiss Confederation, 2017; SECO, 2017). The share of foreign workers is highest in natural sciences, medicine and pharmacy, and engineering (Economiesuisse, 2017).

In addition to rising vacancies in certain sectors, there is growing evidence of increased labour market mismatches. According to the EY Mid-Market Barometer (February 2017), the lack of qualified personnel remains a problem, with 61% of surveyed firms reporting difficulties in recruiting suitable employees. Shortages particularly affect technical manufacturing and the services sector, with 65% of firms reporting that they were finding it rather difficult or very difficult to find adequately qualified new staff. Furthermore, according to labour force data, 37% of workers in Switzerland were inappropriately skilled for their jobs in 2015, being either over- or under-qualified, up from 28% in 2006 (Figure 2.6, Panel A; OECD, 2016c). Swiss qualification mismatch is mostly due to under-qualification, which contrasts with neighbouring Austria where over-qualification prevails. The share of

Figure 2.6. **Types of mismatch in Europe**

Percentage of employed aged 15-64, 2015



1. Qualification mismatch arises when workers have an educational attainment that is higher or lower than that required by their job. If their education level is higher than that required by their job, as measured by the modal level of qualification, workers are classified as over-qualified; if the opposite is true, they are classified as under-qualified.
2. Field-of-study mismatch arises when workers are employed in a different field from what they have specialised in.

Source: OECD, *Skills for Jobs database.*

StatLink http://dx.doi.org/10.1787/888933621671

part-time workers who are mismatched is 20 percentage points higher than that of full-time workers (OECD, 2017b). Mismatch is also higher for foreign-born workers. In contrast, only 13% of workers were employed in a different field of study than their specialisation, which is the lowest across countries included in the study (Panel B).

It is hard to come to grips with precisely what is driving the skills mismatch in Switzerland, how this contributes to divergent vacancies across industrial sectors and the role of skills training. Better measures of skills mismatch can be constructed from the OECD Survey of Adult Skills (PIAAC), but, as mentioned, Switzerland did not participate. It did participate in the 2003 Adult Literacy and Life Skills Survey (Box 2.2), which showed a strong relative performance in numeracy and problem solving but less so in literacy.

Richer data on the distribution of Swiss workers' skills would allow policy-makers to fine-tune the system. A first step would be to participate in the next round of PIAAC. PIAAC results have been instructive in formulating skills policy in other OECD countries. For example, they have been used to answer questions such as how the mix and content of vocational programmes are determined with reference to labour market needs; and how to build core academic skills (particularly literacy and numeracy) into vocational programmes. The results have helped answer questions about how to construct effective avenues of progression from initial vocational programmes to both higher-level vocational and academic curricula and the role of work-based training. PIAAC also provides guidance on how skills – including digital skills – are assessed, certified and used and how qualifications can reflect labour market needs that are nationally consistent but flexible enough to allow for locally negotiated elements.

The true significance of differing vacancy rates, shortages or skills mismatches across sectors is hard to gauge because of the openness of the Swiss labour market to inflows from abroad since the free movement of people agreement with the European Union was enacted

Box 2.2. **The 2003 OECD Adult Literacy and Life Skills Survey**

Switzerland participated in the OECD's 2003 Adult Literacy and Life Skills Survey (ALL). The skills measured in the ALL survey included prose literacy, document literacy, numeracy and problem solving, and it covered the population aged 16 to 65. Additional skills assessed indirectly included familiarity with and use of information and communications technologies. Although the range of countries surveyed was very limited (Bermuda, Canada, Italy, Norway, the United States and Switzerland), Switzerland nevertheless performed relatively well, particular in numeracy and problem solving (Figure 2.7). Also, within all domains Switzerland exhibited relatively little variance. Nevertheless, the skills gradient across age groups was as steep as in the other surveyed countries. While in general women performed less well than men across the subject areas, the Swiss gender gap was smaller than in the other countries.

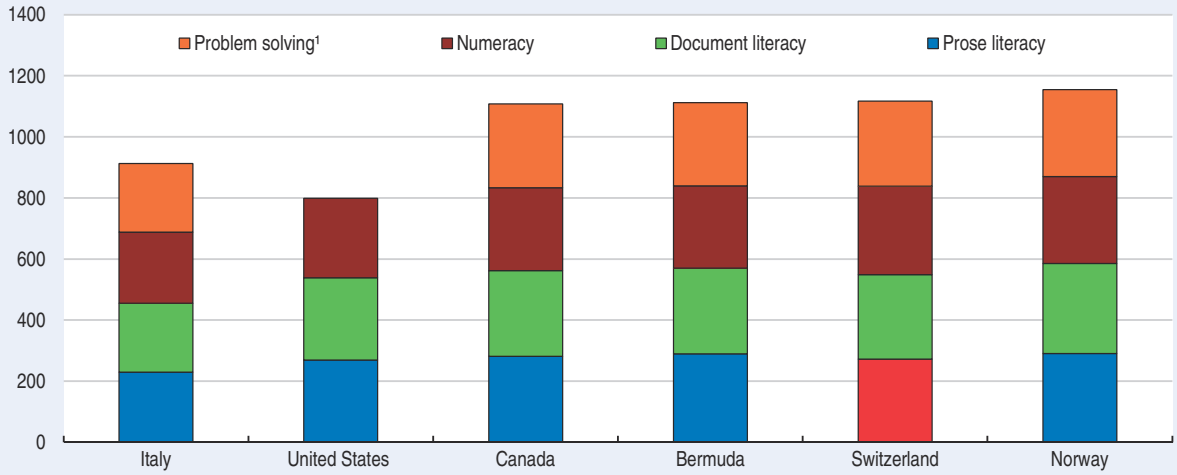
The Survey showed that individual differences in upper-secondary attainment status are strongly related to differences in observed skills. Indeed, compared to other countries, Norway and Switzerland displayed, on average, the highest skills proficiencies associated with each additional year of schooling beyond upper-secondary education. That said, while participation in adult learning improved significantly in the 1990s, those with low skills and levels of education lagged behind.

How skills are rewarded varied considerably even across the small sample of countries. The ALL Survey suggested that in Switzerland extra skills are rewarded only if there is a commensurately higher level of education – that is to say that skills are rewarded only in so far as adults who have completed additional years of schooling also have higher skills proficiencies. This highlights the importance of formal qualifications for employment in Switzerland.

Box 2.2. **The 2003 OECD Adult Literacy and Life Skills Survey** *(cont.)*

Overall, the ALL results for Switzerland are quite idiosyncratic, perhaps reflecting its unique education system and industrial structure. This makes it difficult to infer specific lessons for Switzerland from the recent PIAAC Survey by comparing it with seemingly "peer" countries.

Figure 2.7. **Adult Literacy and Life Skills Survey (ALL) scores, 2003**



1. The United States was not surveyed on problem solving.

Source: OECD (2005), *Learning a Living: First Results of the Adult Literacy and Life Skills Survey*, OECD Publishing, Paris.

StatLink http://dx.doi.org/10.1787/888933621690

Table 2.1. **Sources of working-age population growth**

By education and nationality, at June of year shown

	Share of working-age population (%)		Contribution to working-age population growth over period shown (% points)		
	1997	2017	1997-2017	1997-2007	2007-17
Swiss	**81.3**	**76.0**	**11.3**	**5.2**	**5.7**
Lower secondary	19.1	12.2	-4.2	-1.5	-2.5
Upper secondary	48.6	38.1	-2.2	-0.3	-1.7
Tertiary	13.7	25.7	17.7	7.0	9.8
Other nationalities	**18.7**	**24.0**	**10.6**	**3.3**	**6.7**
Lower secondary	7.0	7.5	2.1	1.0	1.0
Upper secondary	8.0	8.3	2.1	0.4	1.6
Tertiary	3.6	8.2	6.4	1.9	4.1
Cumulative growth in the working-age population			**21.9**	**8.5**	**12.4**

Source: Federal Statistical Office.

in 2002. This is in addition to standard methodological and data issues that complicate measurement of shortages and mismatch. For instance, a low vacancy rate in a certain sector, be it high- or low-skilled, may disguise a mismatch between the demand for these skills and their domestic supply: it may just mean that Switzerland has been more successful in attracting workers in these sectors from abroad. Indeed, Switzerland has consistently attracted large inflows of high-skilled workers (Table 2.1; OECD, 2013 and 2015a). While low-skilled immigration was significant prior to the crisis, workers with an upper-secondary

education or non-tertiary degree are now a more significant source of population growth (Table 2.1). Empirical studies have found insignificant or small effects of the EU agreement on overall native-born labour market outcomes (Basten and Siegenthaler, 2013; Gerfin and Kaiser, 2010; Beerli and Peri, 2015). There is some evidence that high skilled workers' wage growth may have been affected. Overall, the fact that native-born labour market participation rose, as did real wages, suggests that migrants have probably helped meet labour market needs and facilitated economic growth (Swiss Confederation, 2017).

The impact of digitalisation on work

Digitalisation, computerisation and automation are likely to continue to have a dramatic impact on the structure of OECD country economies and labour markets in the coming decades, including on jobs in production, transportation and logistics, services and sales, as well as a wide range of administrative support and office occupations. Since the first industrial revolution around 1750, innovative technologies have displaced workers from many jobs. But also, like then, today's new technologies are creating new tasks, occupations and industries, and are requiring new skills at a faster pace than before. Digital skills gaps across the workforce will need to be reduced so that some groups, such as older workers, are not left behind (OECD, 2017c). The overall impact on employment is therefore ambiguous. Indeed, as evidenced by the trend decline in labour's share of income over recent decades in many OECD countries, there is strong evidence that technological change is capital-biased (Berger and Frey, 2016). This means that each worker works with a greater quantity and quality of capital, and working with the new technologies embodied in that capital requires new skills. However, a puzzle in the Swiss case is that the capital deepening has not occurred, at least not according to aggregate data (Chapter 1).

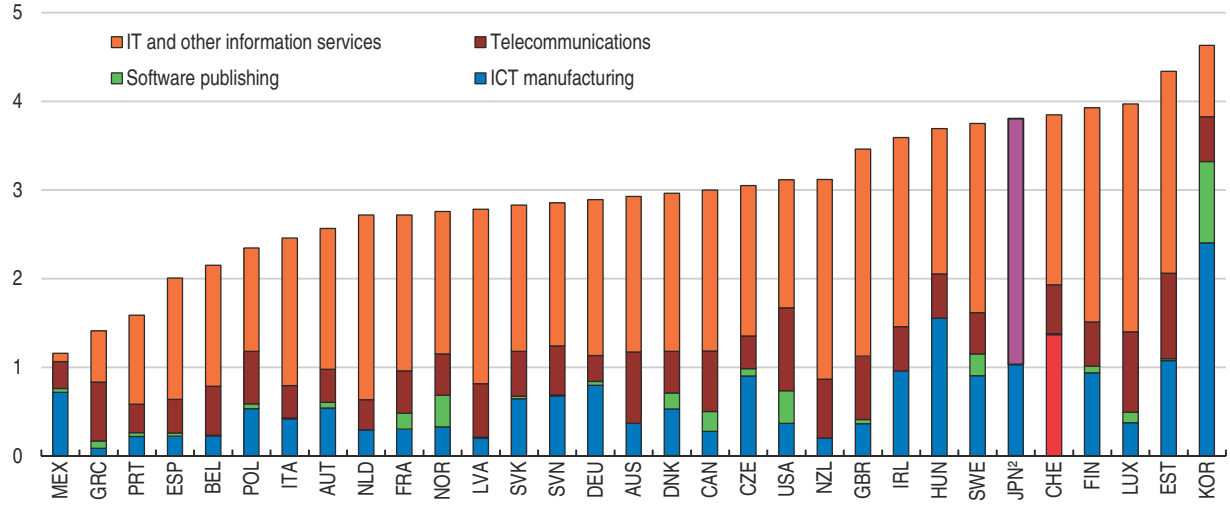
Among OECD countries, Switzerland already has one of the highest shares of jobs engaged directly in the ICT sector, at around 3.9% of total employment, higher than in the United States (3.1%) and Germany (2.9%) (Figure 2.8). Likewise, IT specialists represented 5.0% of total employment in 2016, the fourth-highest share in the OECD. In recent years the ICT sector has played a significant part in the evolution of labour productivity growth, both through growth in the overall sector and reallocation towards the high-productivity sector. Indeed, it is one of the most productive in the OECD (Figure 2.9). However, falling labour productivity within the IT services sector has dragged on labour productivity growth in the sector more broadly (Chapter 1). Furthermore, over the past decade and a half, labour productivity growth in Switzerland's ICT sector has not been as strong as in many other European countries.

This is not to deny that digitalisation and the related automation can substitute for parts of or entire jobs and thus lead to job losses. Studies estimate that 35-60% of EU jobs are at risk due to digitalisation-induced automation, with medium-skilled jobs, such as office and administrative support work, manufacturing, and transportation considered to be most at risk (Frey and Osborne, 2013). Based on its occupational mix, Switzerland may be particularly exposed to the impact of digitalisation on jobs over the forthcoming decades. Some studies estimate that roughly half of all jobs in Switzerland are highly susceptible to automation, on a par with the United States, while it is 42% in Germany and 35% in the United Kingdom, Denmark and Finland (Berger and Frey, 2016; Deloitte, 2015; ETLA, 2014; Frey and Osborne, 2013 and 2014).

Arntz et al. (2016), however, sound a note of caution: the aforementioned studies assume that whole occupations rather than single job-tasks are "automatable", an

Figure 2.8. **Employment in the ICT sector and its sub-sectors**[1]

Per cent of total employment, 2015



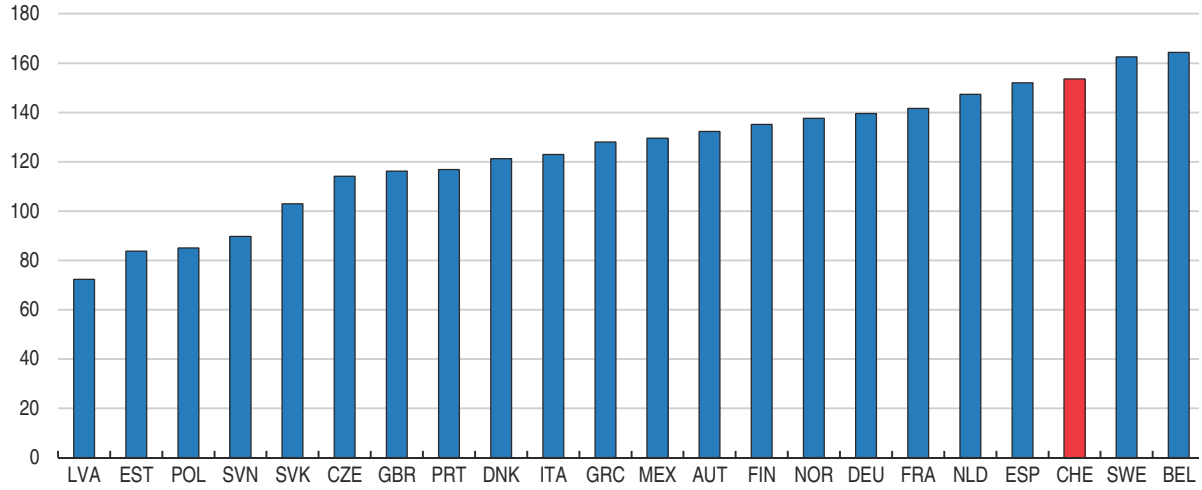
1. The ICT sector is defined here as the sum of industries ISIC rev.4 26, 582, 61 and 62-63. For France, Germany, Latvia, Spain, Sweden and Switzerland, data refer to 2014.
2. A breakdown of ICT services is not available for Japan.

Source: OECD (2017), *Digital Economy Outlook 2017*.

StatLink http://dx.doi.org/10.1787/888933621709

Figure 2.9. **Labour productivity in the ICT sector is high**

Value added per worker in ICT manufacturing and services, 2014, USD PPP-adjusted[1]



1. Updated data for Switzerland to reflect upward revisions to value added and employment are not yet available.

Source: OECD, *STAN industrial analysis database*.

StatLink http://dx.doi.org/10.1787/888933621728

assumption that may over-estimate job "automatibility", as occupations labelled as high-risk often still contain a substantial share of tasks that are hard to automate. Using a task-based instead of a broader occupation-based approach, they find that only 9% of jobs are automatable on average across 21 OECD countries. Unfortunately, as it did not participate in PIAAC, no such estimate is available for Switzerland. Nevertheless, the PIAAC conclusions can be generalised to any country: less qualified workers are likely to bear the brunt of the adjustment costs as the automatibility of their jobs is higher than those of highly qualified

workers. In Austria and Germany 30% of all jobs are at risk of significant change (in addition to those at risk of disappearing), compared to an average of 25% across OECD countries (Arntz et al., 2016). The challenge is thus to cope with rising income inequality and ensure sufficient training and retraining, especially for less-qualified workers.

While automation has tended to benefit higher-skilled workers, there is evidence that it is routine-biased, so that technology seems a better substitute for average-paid clerical and manufacturing jobs than for personal service jobs at both the top and bottom end of the professional skills range. Oesch and Menés (2010) analyse occupational change over the last two decades in Britain, Germany, Spain and Switzerland and find that massive occupational upgrading at the top end matches educational expansion. That is, employment expanded most at the top of the occupational hierarchy: among managers and professionals in business and social services. However, in parallel, intermediate occupations (such as clerks and manufacturing workers) shrank relative to those at the bottom (personal service workers). While the surge in high-skilled jobs is consistent with the evolution of skills on the supply side and a skill-biased version of technological change on the demand side, the authors argue that this labour market polarisation with a U-shaped pattern of upgrading alongside hollowing out of the middle is consistent with the "routinisation" hypothesis.

It is important not to lose sight of the very strong likelihood that technological change will also generate additional jobs through demand for new technologies and through potential gains in competitiveness (not to mention the second-round effects of higher productivity and wages). The policy challenge in the face of digitalisation and automation is therefore twofold. The first is to cushion the impact of rapid structural change on people's lives. And the second is to ensure that those losing the 'old' jobs have the skills and the opportunities to undertake the 'new' ones and that those just joining the labour force are suitably prepared. This undoubtedly means equipping them with the right education and skills. For example, in the near future, it is expected that new jobs will increasingly have a technology component to them. This does not mean, however, that the focus should be entirely on core science, technology, engineering and mathematics (STEM) fields or computer programming. What will increasingly be needed is good training in basic technology competence combined with the ability to think critically and analytically and to work collaboratively and flexibly (OECD, 2016d and 2017c). To increase take-up of STEM fields, some OECD countries have altered the school curricula to improve preparedness for later studies in science and maths.

The Swiss economy is also highly exposed to foreign demand, with 36% of jobs depending on it, compared to 29% in the average OECD country. In manufacturing and financial intermediation the share was a little over 60%. Similar skills will be needed to adapt to changes in globalisation as for digitalisation: basic skills like literacy, numeracy and problem solving, as well as management and communication skills and a willingness to keep learning (OECD, 2017d). Continuing to invest in skills development will also help countries gain more from greater participation in global value chains.

Overview of the Swiss education system

Whether the Swiss system of education is well designed to accommodate the process of digitalisation- and automation-induced structural change is worthy of exploration. This section will start with an overview of the education system as a whole and then focus specifically on the skills mix it generates and whether it is both appropriate and sufficiently flexible in the face of rapid change.

One defining feature of Swiss education, reflecting the decentralised nature of the political system, is that there is no single dedicated federal Ministry of Education. However, the main responsibilities at the federal level responsibilities lie with the Federal Department of Economic Affairs. The cantons are responsible for compulsory education, which generates differences across cantons and makes co-ordination more difficult. Likewise, the division of responsibilities for non-compulsory education between federal and cantonal levels creates challenges for co-ordination (Table 2.2). To address these challenges, there are multiple co-ordinating bodies, including the Swiss Conference of Cantonal Ministers of Education (between cantons), the Swiss Conference of Higher Education Institutions (between the confederation and cantons), the Swiss Conference of Rectors of Higher Education Institutions and the Swiss Accreditation Council. The Continuing Education and Training Act that came into effect in 2017 aims to improve co-ordination in that domain.

Table 2.2. **Responsibilities for non-compulsory education**

	Confederation[1]	Cantons
Upper secondary	Regulation and co-funding (SERI) of vocational education and training (funding is mostly private) Providing basic and continuing training to teachers, trainers, instructors and examiners (SFIVET) Responsible with cantons for Swiss-wide recognition of the Baccalaureate	Provision, supervision and funding Inter-cantonal regulations apply for the recognition of upper-secondary specialised schools and their qualifications
Professional tertiary education - Federal examinations - Colleges of higher education	Strategic planning, regulation (SERI) Providing basic and continuing training to teachers, trainers, instructors and examiners (SFIVET) Co-funding	Most funding Some provision via colleges
Academic tertiary education		
- Universities of Applied Sciences	Co-funding for projects	Regulation and most funding
- Universities of Teacher Education	Regulation and co-funding	Most funding
- Universities	Some co-funding	Regulation, funding and management
- Federal Institutes of Technology	Regulation, funding and management	
Continuing education and training	Regulation and promotion (but mostly privately funded)	Provision of some training programmes

1. SERI: State Secretariat for Education, Research and Innovation; SFIVET: Swiss Federal Institute for Vocational Education and Training.

Source: Various websites including those of SERI and educa.ch.

Given that the cantons are responsible for compulsory education, there is some variation in regimes across the country. In general, children do two years of kindergarten starting at the age of four, and in most cantons two years of kindergarten are now compulsory. Primary school begins at six. In total, the two levels of compulsory schooling – primary and lower secondary – last for nine years in most cantons. A 2009 initiative, called the HarmoS programme, was developed to make cantonal education more consistent throughout the country. However, variations still exist between cantons, and certain areas have voted not to conform to these regulations.

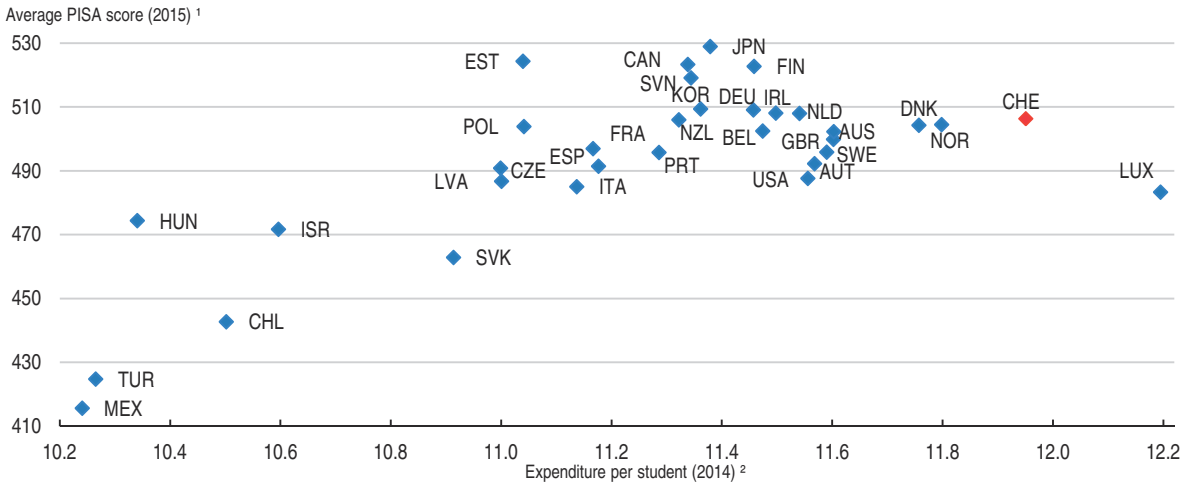
Public compulsory education is free of charge for all children. Public institutions are attended by 95% of children, with only a small (but growing) minority attending private schools. Pupils with different developmental statuses, capabilities, social circumstances, linguistic backgrounds and behavioural characteristics all attend the same school. This heterogeneity regarding pupils' capabilities and talents, along with the cultural

heterogeneity in the classes, poses challenges for schools. While similar challenges exist in all OECD countries, in Switzerland where children of non-Swiss "origin" make up around one-quarter of the student population in the compulsory system, it is particularly apposite.

In lower secondary school, at around the age of 12, classes typically become grouped based on ability. This decision is largely made on the basis of students' academic ability, which is assessed by academic performance with the subjective assessment of their teachers and sometimes parental input. There may also be an exam. Then in upper secondary school, at around age 15, the education system separates into two streams: general (academic) and vocational, as in Germany and Austria.

At the age of 15, Swiss students perform well in international comparisons, although, as with Luxembourg, this comes at a higher per-point cost than in most other OECD countries, suggesting strongly decreasing returns after a certain level of per student spending (Figure 2.10). Swiss students perform well in mathematics and science but less so in reading. And in line with many other countries boys outperform girls in mathematics and science, while girls perform better in reading (Table 2.3).

Figure 2.10. **PISA outcomes versus expenditure per student**



1. Average of reading, science and mathematics scores.
2. Cumulative expenditure per student by educational institutions over the expected duration of primary and lower secondary studies. In log of equivalent USD converted using PPPs.

Source: OECD (2016), *Education at a Glance 2016*.

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Upper-secondary and tertiary education

After nine years of compulsory schooling, the vast majority of young people in Switzerland continue on with upper-secondary education, be it in the vocational stream with apprenticeships and at vocational schools, or in the academic stream at baccalaureate schools leading mainly to universities. Many empirical studies find that, after the general level of cognitive skills is considered, years of both pre-tertiary and tertiary schooling seem to have little or no independent empirical effect on growth (Hanushek and Wößmann, 2008). In contrast, a variety of models, such as those of Vandenbussche et al. (2006) and Aghion and Howitt (2009), suggest that tertiary education is particularly important for countries near the technological frontier where growth requires new inventions and

Table 2.3. **PISA scores and gender differences across selected countries**

	Mathematics		Reading		Science	
	Level	Gender difference	Level	Gender difference	Level	Gender difference
Switzerland	521	12.0	492	-25.3	506	6.1
Denmark	511	9.4	500	-22.2	502	6.0
Germany	506	16.6	509	-20.8	509	10.5
Austria	497	27.0	485	-20.2	495	18.8
France	493	6.0	499	-29.1	495	1.9
OECD average	490	7.9	493	-26.9	493	3.5
Italy	490	19.9	485	-16.0	481	17.0
Luxembourg	486	11.3	481	-21.3	483	7.6

Note: Gender difference is boys' average score less girls' average score.
Source: OECD (2016), *Education at a Glance 2016*.

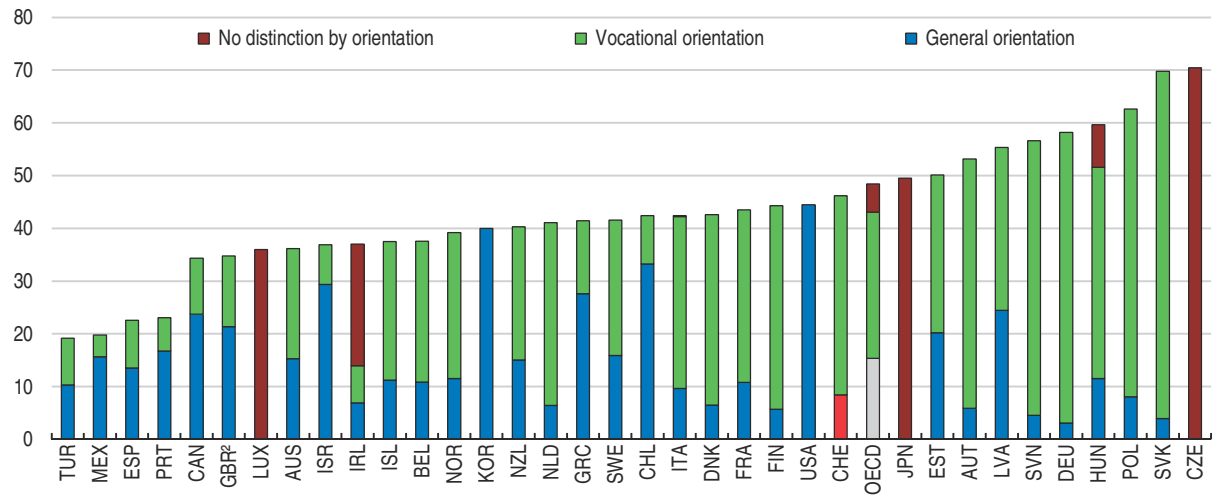
innovations. However, these studies do not make a distinction between types of tertiary education: academic or vocational or a mix thereof.

In Switzerland, the direction that students take in their upper-secondary studies is determined by which academic ability group they had attended in lower secondary school. Like many northern and eastern European countries, vocational education and training plays an important role in upper-secondary education, with over two-thirds of students opting for this stream. Around 12% opt for a transitional arrangement, delaying upper secondary education. Only 41% of young people in Switzerland are expected to graduate from general (academic) upper-secondary programmes, compared with an OECD average of 52% (OECD, 2017a). Indeed, as of 2016, 46% of Swiss 25-64 year-olds had ended their formal education with only an upper-secondary or post-secondary non-tertiary qualification, with the vast majority of these having a vocational rather than a general qualification (Figure 2.11). However, the share of 25-34 year-olds graduating from upper-secondary education has fallen to 45%, from 64% in 2000, suggesting that more and more Swiss students are choosing to invest in tertiary education, a trend that is also evident in Germany and Austria but to a much smaller degree (OECD, 2015b).

In 1997 the Swiss Confederation started to adopt laws concerning adult education, especially regarding vocational education and training. Since the 2004 implementation of the Vocational Education and Training Law and Decree, all areas of vocational education and training have had a uniform legal framework. This law takes into account the growing number of careers and introduces new qualification procedures. Additionally, much work has been done over recent decades to develop opportunities for those in the vocational track to continue on to tertiary education.

Until the mid-1990s, a transition from basic vocational education and training (VET) to academic tertiary-level programmes was next to impossible in Switzerland. Reforms in the 1990s transformed some tertiary-level professional education and training colleges and programmes into universities of applied sciences that are open to holders of a newly introduced professional baccalaureate. The professional baccalaureate, which is based on the Federal Certificate, typically extends VET duration by one year (Figure 2.12). Also in recent years there has been an attempt to address the perceived lack of permeability between the vocational and academic tracks with the introduction of pathways between the two parallel systems, allowing students to transition mid-stream. However, these links are still rarely utilised, as they are expensive in terms of lost time and opportunity cost.

Figure 2.11. **Percentage of 25-64 year-olds whose highest level of education is upper-secondary or post-secondary non-tertiary, by programme orientation (2016)**[1]



1. For Denmark, Finland, Ireland, Latvia, Luxembourg and Slovenia data for the breakdown by programme orientation are available only for 15-34 year-olds. Reference year is 2015 for Chile and Ireland.
2. The United Kingdom: data for upper-secondary attainment includes completion of a sufficient volume and standard of programmes that would be classified individually as completion of intermediate upper-secondary programmes (18% of the adults are in this group).

Source: OECD, *Education at a Glance database*.

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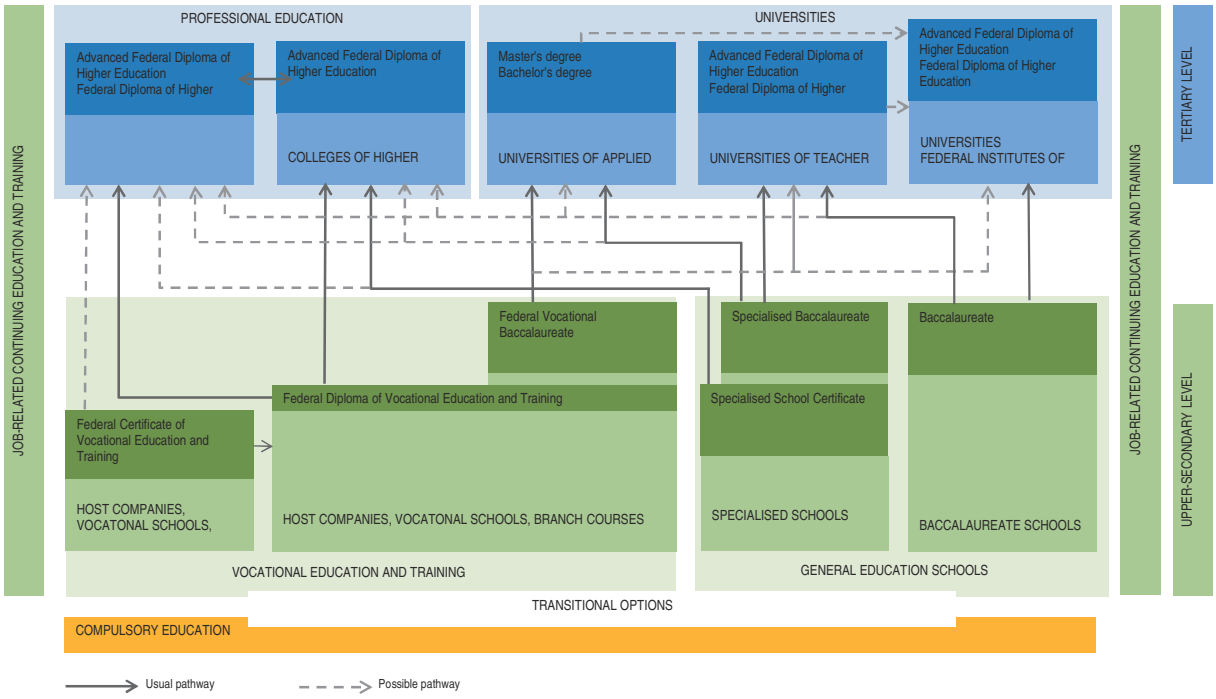
Figure 2.12. **The post-compulsory education system**



Source: SERI (2016), *Vocational and Professional Education and Training in Switzerland: Facts and Figures 2016*.

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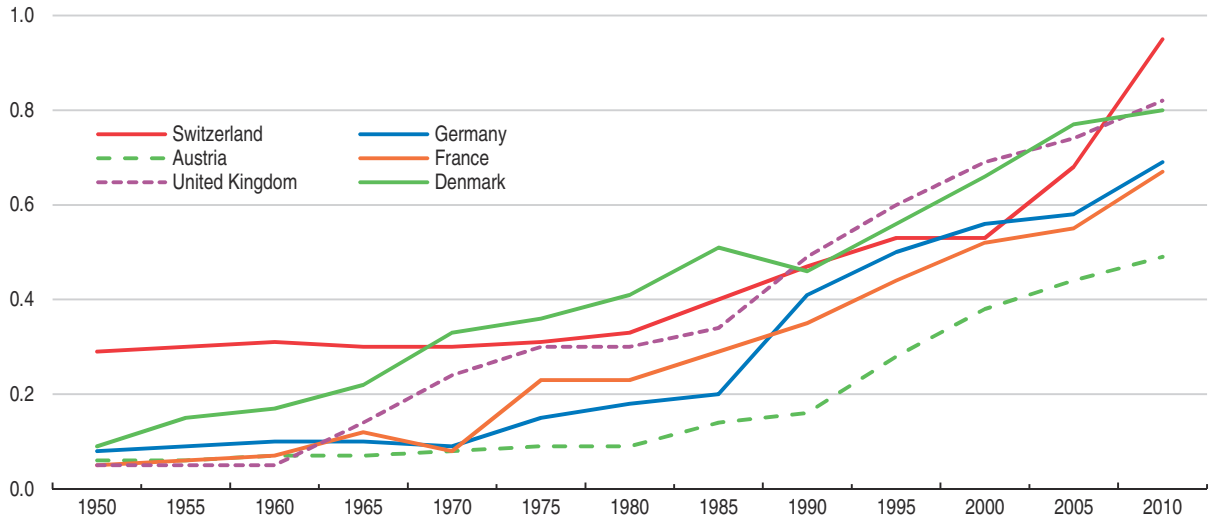
Today, about one eighth of each age cohort obtains a professional baccalaureate, and attendance at universities of applied science has contributed heavily to boosting enrolment in tertiary education, which previously had begun to lag international standards. Since the introduction of these reforms, Switzerland has shot ahead of its peers in terms of average years of tertiary schooling (Figure 2.13).

Figure 2.13. **Average years of tertiary schooling for the total population, 1950 to 2010**



Source: Barro and Lee Educational Attainment Dataset (2016).

StatLink http://dx.doi.org/10.1787/888933621804

The vocational stream

The Swiss vocational education and training system is complex and has become more so with a proliferation of pathways and extensions that offer greater opportunities for those within this stream to gain higher qualifications (Meyer, 2009). Moreover, there are certified vocational education and training programmes at the basic (upper-secondary) level for some 230 different professions. That said, a real advantage of the Swiss system is that the vocational stream has been responsive to the demands of the labour market, which has contributed to the notably smooth transition of young people into the labour force (Geel and Backes-Gellner, 2011). While an estimated 59% of UK tertiary graduates end up with non-graduate jobs (close to highest rate of mismatch in Europe), in contrast less than a tenth of Swiss graduates end up in such jobs – the best performance in Europe in this regard, followed by Germany, the Netherlands and Slovenia (CIPD, 2015). It is perhaps no coincidence that these countries are all ones with a long history of high-quality VET.

After completing three years of lower-secondary school, students in the vocational stream can sign up for a two- to four-year apprenticeship. Potential apprentices go through a recruitment process, and a training contract is drawn up between the apprentice and the firm offering the apprenticeship. This contract is subject to the oversight of cantonal authorities, and the apprentice receives a modest monthly salary that is below a qualified employee's salary but increases each year. The programme typically involves a dual engagement of practical work and study. The study component takes place at vocational schools and typically involves one to two days a week.

To complete an apprenticeship, individuals need to take a final examination. After successfully completing the three- and four-year programmes, apprentices qualify with a Swiss federal vocational diploma, while those who successfully complete the two-year programme are awarded a Swiss federal vocational certificate (Figure 2.12). By combining the diploma for the three- and four-year apprenticeship with a Swiss federal vocational baccalaureate, students can also attain a vocational baccalaureate qualification, which allows them to enrol in a university of applied science or to prepare for the University Aptitude Test, allowing them to enrol in a cantonal university or federal institute of technology.

After completing an apprenticeship, students also have access to further study at a Professional Education and Training college. These colleges offer a broad spectrum of technical courses, which teach students the skills required to assume professional and management responsibilities in their field. The professional organisation for the relevant sector is responsible for organising and holding the examinations at the end of these courses.

The supply of VET

The strong labour-market matching outcomes of Swiss vocational education and training are in no small part attributable to the central role played by industry in managing the system. First, the supply of apprenticeships is by definition determined by employer needs. Second, VET study programmes are subject to regulation by a board of industry representatives. Every year the boards certify additional VET programmes, including their syllabi and qualification requirements. VET programmes must be reviewed every five years and updated at least every 10 years. New programmes can be created by a profession board interacting with the State Secretariat for Education, Research and Innovation and adjusting the plan as needed ahead of and following consultations with stakeholders. The State Secretariat ultimately approves the plan.

The collaboration with employers ensures a good match between industry demand and the supply of qualified workers, but it is unclear if this system is sufficiently responsive to the faster-paced changes digitalisation is expected to bring (SERI, 2017; Ecoplan, 2017). Creating or changing programmes can be slow and could be sped up using time limits or streamlining processes. In the school-based VET system where school-to-work transitions are rougher due to weaker links with industry, linkages with employer associations should be strengthened further to better ensure training is meeting current and future labour market needs. More generally, the employer representatives on the profession boards are typically from incumbent firms and may be more focused on immediate needs rather than sufficiently anticipating developing trends. In this regard, it could be helpful to complement the existing framework with a mechanism that helps players in education and training, including these VET boards, to better forecast and anticipate shifts in the demand for skills. This would also inform education and labour market policies more broadly and complement existing skills assessments that focus on current needs. Box 2.3 details how some other OECD countries forecast skills needs.

The number of vocational training places has also become an important issue. The share of companies offering training declined from 23% in 1985 to 18% in 2008, partly due to a rapid increase in the number of very small companies (SKBF, 2014). According to SERI (2016), of those companies that could offer apprenticeships, only around 40% do so. Older

Box 2.3. **Forecasting skills needs**

Occupational and educational forecasting has a long tradition in many OECD countries, including Australia, Canada, France, Germany, Italy, the Netherlands, the United Kingdom, the United States and, more recently, Finland, New Zealand and Israel. Forecasting is conducted by academic and government organisations, the private sector and increasingly at the international (e.g. European) level. Most forecasts rely on dynamic macroeconomic models and use a "top-down" approach to forecasting labour demand. Dynamic macroeconomic modelling has been labelled "best practice" in international skills forecasting, but there are limits to its effectiveness. These macroeconomic models require the specification of a large set of external parameters related to the development of the world economy, such as oil prices and exchange rates. A problem common to many of the reviewed forecasts is that it is difficult to forecast future migration and its skills composition.

In England, the UK Commission for Employment and Skills conducted a National Strategic Skills Audit in 2010, combining quantitative and qualitative methods in order to incorporate a broader "scenario-based" approach to assessing future skills needs. The overall intention of this ongoing project is to provide insights to government, employers, individuals and providers on England's strategic skills needs, reporting information on key issues and periodically updating the results. The project includes three main instruments:

Working futures: consists of quantitative forecasts of employment prospects for industries and occupations, qualification/level of diploma, gender and employment status for the United Kingdom, its individual nations and English regions. It aims to provide a comprehensive picture of the labour market in 2020.

Horizon scanning and scenario development: identifies key issues and changes taking place in the United Kingdom and globally that may affect employment and skills over the long term. It uses a range of horizon-scanning techniques, including scenario development and a series of interviews with key experts to contemplate scenarios for 2020.

Targeted skills assessment reports: in-depth skills assessments conducted in key emerging sectors to enhance understanding of important developing areas of the economy, such as low-carbon industries, digital sectors and advanced manufacturing.

Despite the different methodologies used in forecasting, the results are often similar. In general, low-skilled jobs are forecast to decline, while employment for highly skilled workers is projected to increase, though some projections indicate a future excess supply of highly skilled workers in some fields. The trend is for employment to continue to shift from primary and secondary industries towards service-based sectors.

Employers, too, can be involved in forecasting skills needs. For example in Finland, the Oivallus Project (Oivallus means literally "Insight") was launched by the Confederation of Finnish Industries (EK) in 2008 and ran until December 2011. The project, financed by EK, the European Social Fund and the Finnish National Board of Education, focused on future competence needs of businesses. Representatives from companies, academics and teachers and other experts examined the underlying premise that working life in 2020 will be even more networked. Oivallus found that competence needs are changing because the ways of working are changing, as jobs are becoming less and less routine and fewer jobs can be done "by the book". Future working lives resemble film-making: work is increasingly done on a project basis in collaboration with various contributors (commonly referred to as the "gig economy"). There is also a tendency for tasks to become more variable. The ability to apply network skills is the foundation of future work, and network skills find their application in the ability to find, use and disseminate knowledge. A learning network can identify new

Box 2.3. **Forecasting skills needs** *(cont.)*

opportunities and find solutions to problems, where the key to success is the ability of people with different competences to work together. Working as a network, learning from one another and building on existing ideas are skills that require practice and should be developed from early on throughout education. For more information, see *http://ek.multiedition.fi/oivallus/en/index.php*.

Skills anticipation exercises typically forecast skills needs and/or skills supply over the medium term (two to five years), but a number of countries forecast scenarios over 10 to 100 years. For example, Austria's AMS Qualifications Barometer provides forecasts of up to three or a maximum of four years. Longer-term exercises are particularly common in the Nordic countries.

Source: OECD (2016), *Getting Skills Right: Assessing and Anticipating Changing Skill Needs*, OECD Publishing, Paris; OECD (2012), *Better Skills, Better Jobs, Better Lives: A Strategic Approach to Skills Policies*, OECD Publishing, Paris; E. Lüdemann (2012), *Review of Recent Projections of Skill Supply and Demand at the National and European Level*, Institute for Economic Research (Ifo), Munich.

data show that growth in training places has been biased in favour of handicraft and industrial professions, while services sector professions including ICT remained under-represented (Meyer, 2009). These findings are borne out by more recent data: recent editions of the April "Apprenticeship Barometer" (which surveys firms and students at the start of the apprenticeship allocation period) show that demand for apprenticeships has consistently exceeded supply in "health and social activities", "information", and "printing, design and arts". The growth in the number of small firms was partly responsible for the earlier decline in offers of training places due to their greater specialisation and lack of qualified apprenticeship trainers (SERI, 2016; SKBF, 2014). Facilitating shared apprenticeships between small firms, as in Germany and Austria, would lower administration costs (Kuczera, 2017). This could be through a greater co-ordination role for training centres or promoting joint apprenticeships more actively, whereby one of the firms leads the apprenticeship but does not need to take full responsibility.

The increasing role played by foreign firms in the economy has also been considered a risk to the supply of vocational training places (Ecoplan, 2017; Hoeckel et al., 2009). Muehlemann (2014) finds that large multinationals (those with more than 100 employees) have a higher training rate than corresponding Swiss firms, whereas the rate for small multinationals (having less than 50 employees) is less than half of that for their Swiss counterparts. One reason is that small multinationals are more specialised, but another barrier may be that many work in English. The canton of Zug created a pilot bilingual VET programme with federal government support in 2014, which will run to 2019. If it is found to be cost effective, other cantons could be supported in beginning similar programmes.

Census-based data show that even in 2000 over half of vocationally trained workers did not work in the profession in which they initially undertook their apprenticeship (Meyer, 2009). The combination of increased longevity and technological change means that workers will increasingly need to move between occupations. As mentioned above, during their lifetimes workers are more likely to move from the goods-producing to the services sector. This phenomenon has been linked to the idea of 'deprofessionalisation' (*Entberuflichung*), also postulated in Germany, due to the rise of the services sector, the knowledge society, digitalisation and globalisation (Meyer, 2009). Although occupation-specific skills appear to

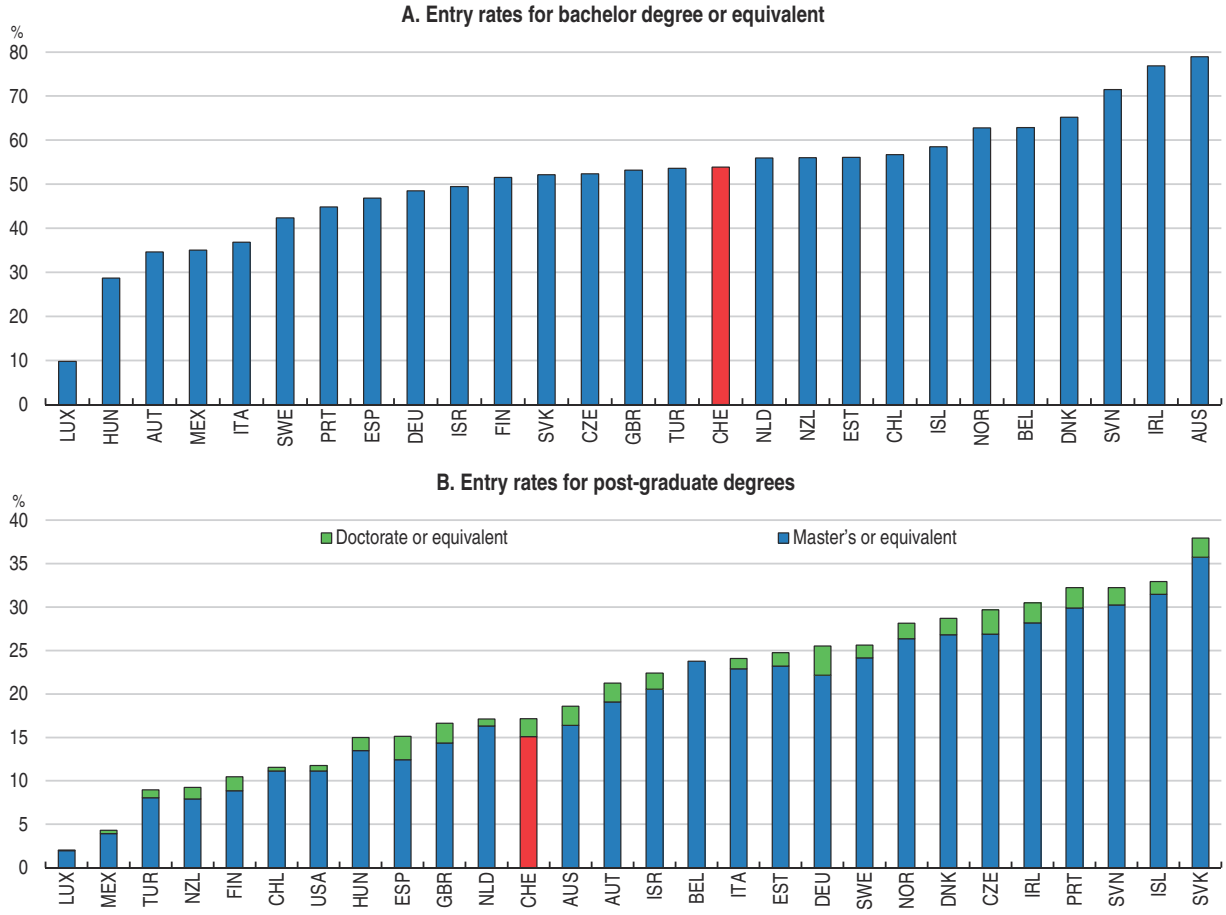
help with school-to-work transitions, general skills appear to be linked with employability later in life (Hanushek et al., 2016; Hampf and Woßmann, 2016; Forster et al., 2016). However, it is less clear whether the effect is stronger in countries where vocational education and training dominates. Switzerland was not included in these studies, which were based on PIAAC data; other data suggest that the decline in employability may be less severe in Switzerland (OECD, 2017a). Nonetheless, the cross-country results and pace of labour market change imply that while vocational education and training has been a cornerstone of Swiss labour market success, the balance of occupational versus academic training should be assessed to ensure the labour force can continue to adjust to changing skills demands. To improve flexibility and adaptability of its vocational system, Austria introduced modular apprenticeships that comprise a base module, several main modules and a special in-depth module, which ensures that apprenticeships are built on a common base of fundamental skills and increases mobility between occupations (OECD, 2017e).

The post-secondary education mix

Labour market indicators suggest that, despite a lack of apprenticeship offers, demand for highly qualified labour considerably exceeds domestic supply. As seen above, vacancy rates in the high-tech, manufacturing and finance sectors are well above the national average, and climbing (see Figure 2.5 above). Over recent decades Switzerland has relied on migrant labour to fill these jobs, with more than half of all immigrants to Switzerland holding a tertiary degree. Indeed, as observed already in the 2013 *Survey*, Switzerland draws in large numbers of both low- and high-skilled labour, and it has continued to do so. However, with recent slower growth in Switzerland and uncertainty created by the 2014 referendum that aimed to limit immigration, the inflow of higher-skilled workers has declined. There is a risk that this will continue, and the number of foreign-born residents leaving continues to rise as the euro area recovery gains pace. Moreover, in many high-skilled sectors vacancy rates remain high, despite the migratory inflows. Switzerland should therefore do more to boost its domestic supply of skills.

Despite the trend towards increasing tertiarisation of Swiss post-school education, participation still appears low compared to other OECD countries. The first-time entry rate of Swiss youth into bachelor's or equivalent courses is low by international standards at only around 38% of under 25 year-olds in 2015 (excluding international students), although for all age groups the rate is around the OECD average, at 54% (Figure 2.14, Panel A). The bachelor's (or equivalent) graduation rate is 45% excluding international students – the third-highest in the OECD. Even with the growth in universities of applied sciences, the likelihood of continuing to tertiary education following vocational education and training is still only a fraction of that for graduates from general education programmes. At the post-graduate level the Swiss entry rate is around average (Panel B). Interestingly, it ranks highest in terms of overall doctorate and other advanced research studies due to the significance of international students, who accounted for 54% of doctoral students, which was the OECD's second-highest share after Luxembourg (87%) (OECD, 2017a). Supply could be expanded by making it easier to move between vocational and academic streams, for example by increasing the academic component of vocational education and the applied component of academic education. Strengthening linkages between higher education institutions and employers, including through closer co-operation in course design and facilitating linkages between students and employers, could help ensure that the academic stream produces the skills needed to meet changing labour market needs.

Figure 2.14. **Tertiary qualifications in OECD countries, 2015**[1]



1. First-time entry rates, excluding international students. First-time entry rates indicate the share of young adults expected to enter that type of tertiary education programme during their lifetime.

Source: OECD (2017), *Education at a Glance 2017*.

StatLink http://dx.doi.org/10.1787/888933621006

Life-long learning

In addition to formal study preparing young people for their working lives, continuing adult learning must play an important role in the context of the evolving structure of the economy. On average across the OECD, at any point in time only around one-fifteenth of the working-age population is engaged in formal education. The others need to be catered for in terms of updating their skills in the face of the changing profile of skills demanded as the structure of the economy shifts. Not only is this true for people with jobs but also for those out of work and seeking to enter or re-enter the labour force – including mothers planning re-entry into the job market, migrants, people with low literacy and basic skills, or simply people rendered structurally unemployed as their previous jobs have disappeared (Windisch, 2015). The rapidly changing nature of ICT and digitalisation makes continued learning through courses, seminars and other types of non-formal training, in addition to formal education, increasingly important for enhancing workers' skills.

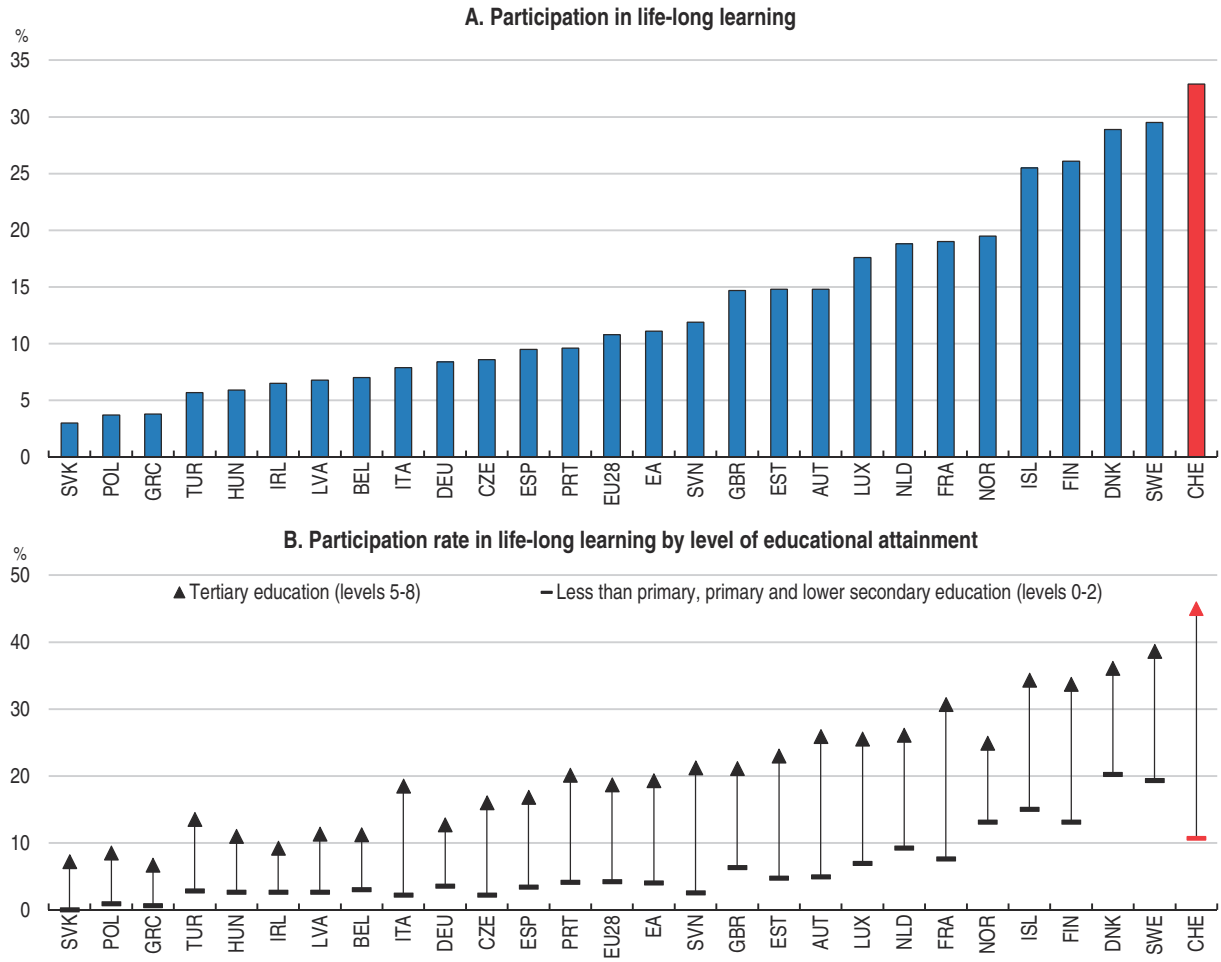
Continuing education and training (CET) does not appear to have been a priority objective for Swiss education policy until very recently, perhaps due to the relatively high

rates of CET relative to other countries. It still receives only limited public funding. Spending by individuals is tax deductible, but this primarily benefits households with higher taxable incomes. Employers assume a large share of CET costs, whether in the form of financial support for direct costs or of permission to make use of paid working hours. Employer CET support is widespread, with about three-quarters of CET participants stating that they have been partly supported by their employer (SKBF, 2014).

In 2016 around one-third of all Swiss residents aged 25 to 64 surveyed had participated in some kind of CET course in the preceding four weeks (Figure 2.15, Panel A). This average figure is high by international comparison. However, as in other countries, training is generally concentrated in certain groups: the younger, the more educated, and those working in larger enterprises. The lower participation of less advantaged groups in Switzerland in continuing education is more ascribable to a lack of incentives to participate and support from employers than financial constraints themselves (SKBF, 2014). For instance, in 2016 adult participation (aged 25-64) in general and vocational education (in the preceding four weeks) was 45% for those with a tertiary degree, but only 11% for those with just compulsory education, giving rise to the largest difference in Europe (Panel B).

Figure 2.15. **Participation in life-long learning across Europe by educational attainment**

Per cent of population aged 25-64 participating in education and training in the preceding four weeks, 2016



Source: Eurostat, *Labour Force Survey 2016*.

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Even though the share of the population with only a compulsory education is low, more should be done to increase their participation, as they would probably benefit substantially, including through greater resilience to future labour market changes. These workers may also be less aware of the benefits of continuing education and training. Changes to the legal framework (described below) will give the federal government authority to help address under-participation in some types of continuing education and training. Those who are working in a different profession to their field of study can face also barriers to formal training because their qualifications are not recognised.

Depending on the canton, general (non-job-related) CET can be regulated differently, e.g. based on a specific CET law, within the framework of the regulations on job-related CET, in laws on education and culture, or on another legal basis. Financing of job-related CET also differs across cantons. The cantons co-ordinate trans-regional CET programmes via the Inter-Cantonal Conference for Continuing Education and Training (IKW). The IKW is a specialist sub-group within the Swiss Conference of Cantonal Ministers of Education and acts in the interest of life-long learning.

At the federal level responsibilities for continuing education have been fragmented, reflecting the many types of continuing education but this is improving. Vocational continuing education is now the responsibility of the State Secretariat for Education, Research and Innovation (SERI). As part of the implementation of the Continuing Education and Training Act, responsibility for literacy policies will shift to SERI from the Federal Office for Culture, within the Federal Department of Home Affairs. The State Secretariat for Economic Affairs oversees continuing education programmes for the unemployed. Other federal offices are in charge of specific adult learning and education segments, such as the education of the disabled, migrants and the elderly.

A 2006 revision of the education regulations in the Federal Constitution (article 64a) gave the Confederation the authority to lay down principles of CET in law. The Continuing Education and Training Act finally came into effect in 2017 and should increase funding and co-ordination in the part of CET outside of the formal higher education sector. It establishes training as an individual's responsibility and that it should be market-based, but also that the Confederation and cantons should contribute to the accessibility of training and equality of opportunity. Importantly, it will facilitate data collection, which will help improve policymaking and access for all Swiss. This should be accelerated. Overcoming the fragmentation of responsibilities across departments and levels of government is crucial. The new Act provides an opportunity to establish an overarching approach. As of July 2017, 18 of the 26 cantons had agreed to sign performance agreements with the State Secretariat for Education, Research and Innovation to create a set of common strategic objectives to help adults acquire basic skills, but five had renounced participation. The aim is to ensure adults anywhere in the country can access local courses to acquire literacy, numeracy and ICT skills, with funding available to 2020.

CET will become increasingly important as rising longevity means longer working lives and digitalisation causes changes in occupations and skills needed. As acknowledged by the Skilled Workers Initiative, CET will be necessary to improve the potential of the workforce (SECO, 2017). Because workers and firms may not fully internalise the need for further investment in human capital, subsidies may help incentivise take-up for groups with low participation rates. Canada and the Netherlands provide individual training accounts. The German government provides funds for retraining to workers without qualifications or who

have spent at least four years in a job unrelated to their initial training (OECD, 2017f). In principle, financial incentives should be simple, able to adapt to new and emerging skill needs and complemented by information on skills and programmes and career guidance (*ibid*). Access to information and career guidance are important since workers may not realise that they can benefit from lifelong learning. In Austria, companies undergoing organisational change can access free counselling from the public employment service that includes the area of continuing vocational training. More flexible training such as distance learning or self-paced online courses could lower barriers to participation.

Equity in skills and education

Maximising the employment of human resources in the economy means both encouraging participation and facilitating the accumulation of human capital for all segments of society, including women and migrants. In regard to both of these, Switzerland performs well relative to other countries (OECD, 2017g). Nonetheless, there are still gaps, implying more should be done.

Gender

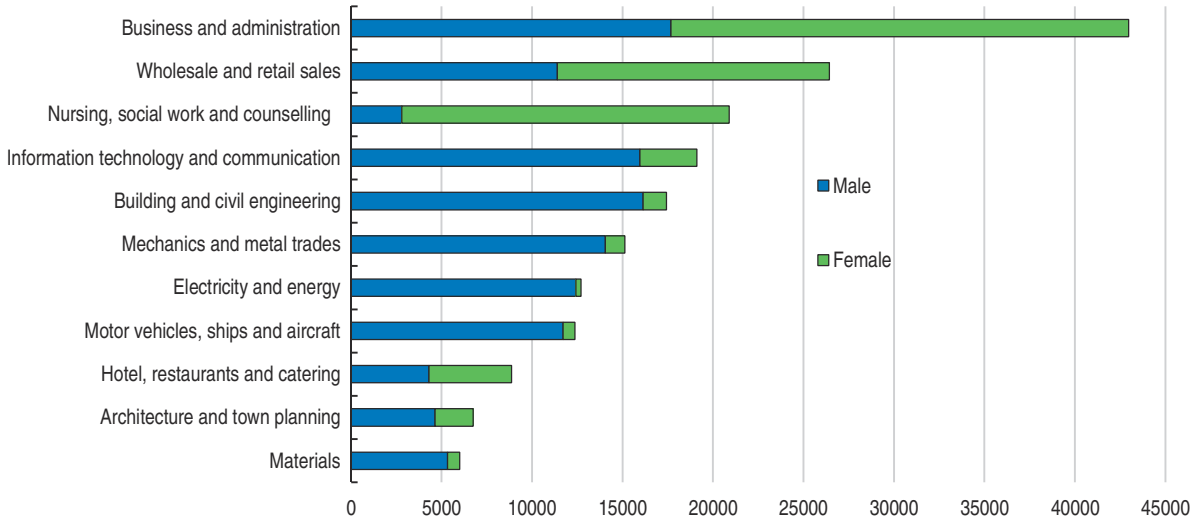
As discussed in the 2013 *Survey* large gender-based economic disparities exist in Switzerland. While female participation in the labour force is very high by international standards, it is low compared to their male counterparts', and a very large proportion work only part-time. This, together with the unadjusted gender wage gap of 17% (relative to male median full-time earnings), contributes to large differences in annual incomes (OECD, 2017g). In contrast, the earlier gender gap in education has now completely closed and even reversed, with Swiss women now accumulating more years of schooling than men. But in fields of study there remains a large differential. For example, in vocational education and training female participation in technical courses, such as engineering and computing, lags considerably, while in nursing the gap goes dramatically the other way (Figure 2.16). This heterogeneous pattern also occurs in courses of study at universities (OECD, 2013). It may also relate to the differences in attitudes and skills that develop early in the education system, as shown by the gender gaps in PISA scores for reading, maths and science (see Table 2.3 above).

Some researchers have suggested that a possible explanation for this gender-segmented allocation of students across fields of study may be found in the system of streaming at upper-secondary level. The Swiss post-compulsory education system is split between VET, capturing two thirds of students, and *gymnasiums* and specialised upper secondary schools providing general academic education for the remaining third. The split in education streams at age 15 requires students to make career choices early on. Statistical analysis (Imdorf et al., 2014) has shown that cantons with proportionally more *gymnasiums* have a lower degree of gender-typical allocation of men and women across fields of study. There can be several reasons for that. First, more academically oriented education systems offer more opportunities for students to change career paths according to preferences and abilities. By contrast, the variety of differentiated education options in the VET system may favour gender-typical choices at an age when gender plays an important role in shaping individual identity. Second, the academic track allows students to gain more maturity before making career choices.

The fact that people think or behave differently from one another is rooted in individual differences in brain anatomy and connectivity, which develop later in life (Mueller et al., 2013). This maturity allows them to be less influenced by their friends and family, who may suggest gender-typical careers, and more by their personal interests or comparative advantages.

Figure 2.16. **Students in vocational education and training**

Training sectors and gender, 2015/16[1]



1. The training sectors not shown represent 17% of the students.

Source: Federal Statistical Office.

StatLink http://dx.doi.org/10.1787/888933621063

Alternatively, the reason that girls are not rushing into scientific careers, or boys into care-based professions, may simply reflect individual preferences. Cross-country evidence collected for the 2012 OECD Gender Initiative points to a role for individual characteristics, family background and socio-economic background in determining post-secondary subject choices (OECD, 2012b). Mentors and positive atypical role models in the family, the educational system and professional life can help men and women choose gender-atypical careers, inducing others to follow suit.

Schools can help counter gender-based stereotypes by providing more information about potential careers (OECD, 2016b). Students are currently required to see a career counsellor once in their final year of lower secondary school, but this service could be expanded further. Employer talks have been found to be a cost-effective way of helping students better understand careers (Kashefpakdel and Percy, 2016). These could also be used to erode gender stereotypes. Reducing them may also help alleviate shortages in STEM and health-care professions.

Migrants

Switzerland has one of the OECD's largest immigrant population shares, and the country has long relied on foreign labour and skills to fill vacancies in the labour market. Over 2005-15, most migrants came from Germany, Portugal, France and Italy, which are all covered by the EU agreement on the free movement of people. Migrants from the former Yugoslavia are another important group in the population. Overall, labour market outcomes for the children of immigrants are highly favourable in international comparison. This is partly attributable to good overall labour market conditions and other factors such as the strong role of apprenticeship training, which seems to be a particularly beneficial school-to-work transition mechanism for such children (Liebig et al., 2012). However, there is strong evidence that Switzerland is not getting the best out of its population with a migrant background.

Migrant youth significantly underperform native-born youngsters in Switzerland. This pattern has been observed over all recent iterations of the PISA survey, suggesting that any oversampling issues in the latest iteration of PISA in Switzerland do not affect this particular result. For instance, in science not only migrant youths but also those born to migrant parents underperformed youngsters with native-born parents by around 12%. Overall, unlike other OECD countries with substantial immigrant shares such as Australia and Canada, in Switzerland the gap relative to students with native-born parents was equivalent for both foreign-born students and those who are born to immigrant parents, suggesting that lower performance seems to persist across generations of migrant families.

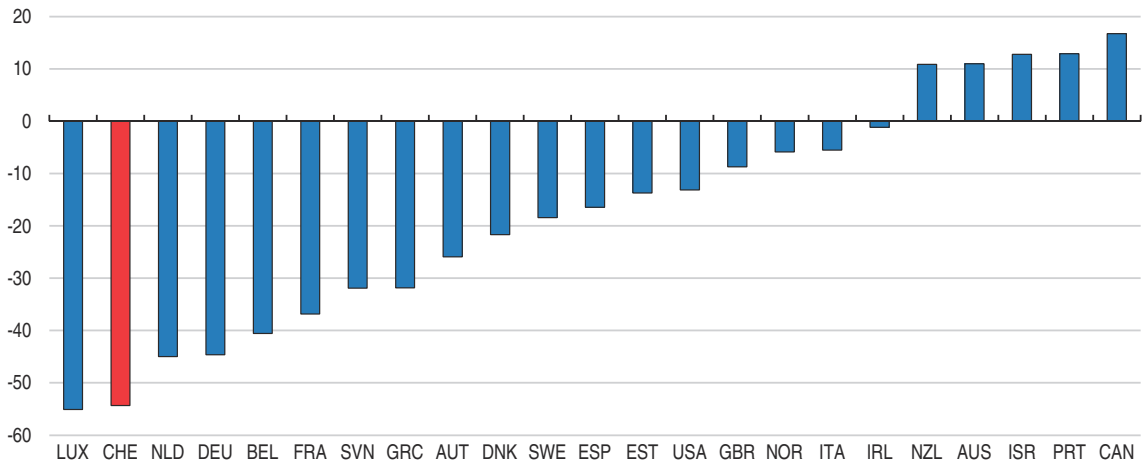
OECD research suggests that across countries, and despite improvements, having an immigration background is related to lower academic performance, which may have long-lasting consequences for individuals as they leave school and enter post-secondary education, training or the labour market (OECD, 2012a and 2015b). At the same time, empirical evidence shows that almost three-quarters of the performance at school of children with a migrant background is accounted for by socio-economic determinants, rather than their immigrant status *per se* (Cattaneo and Wolter, 2015). The government should therefore boost assistance aimed directly at socio-economically disadvantaged families. It should also encourage enrolment of children from families with an immigrant background in early childhood education and care, including with additional spending, as recommended in the previous *Survey*. These families may be relatively less aware of the benefits of early childhood education. Conditional cash transfers could be used to encourage participation and could be trialled as a pilot programme in the first instance.

The problem of underperforming native-born children of immigrants, noted in the 2009 *Survey* (OECD, 2009), starts early. The failure to acquire a national language at an early age is a major impediment to success at education. A survey of parents conducted in Basel and its environs showed that children with an immigrant background have the least opportunity to access facilities provided outside the family, thereby hampering their ability to master an official language early on (CSRE, 2014).

The solution to underperformance of youths of immigrant background had been to direct them into "special education programmes". Children from an immigrant background were vastly overrepresented there: while around a quarter of all students in the compulsory system (up to age 15) are of migrant origin, they comprised almost half of all students in such programmes. However, even after two years in these and other special beginners' classes, most children of immigrant background were still not deemed capable of integrating into normal school classes due to a lower-than-average level of cognitive development and knowledge of the official language (Field et al., 2007). These special education programmes are used in a more focussed way now.

There is considerable clustering of students with immigrant backgrounds across schools. Around 60% of students with an immigrant background are in schools where at least half of the students have an immigrant background. However, while this may seem high, this degree of concentration is below the OECD average and lower than in comparable countries such as Sweden, Denmark and Canada, despite the especially high share of such students in Switzerland (OECD, 2015c). However, in Switzerland the clustering of students of migrant background is particularly deleterious in terms of outcomes. For instance, the difference in PISA science scores of students in schools with high and low concentrations of these students is particularly large in Switzerland (Figure 2.17).

Figure 2.17. **Difference in PISA science score levels between students in schools with high and low concentrations of students with an immigrant background, 2015**[1]



1. Students with an immigrant background are those who are foreign-born or have foreign-born parents. Schools with a low (high) concentration of students with an immigrant background are those schools in the bottom (top) half of the concentration distribution.

Source: OECD, *PISA 2015 database*.

StatLink http://dx.doi.org/10.1787/888933621044

Increased education spending on children with immigrant backgrounds promises above-average returns. In 2006 the Swiss Confederation and the cantons set an objective that 95% of all 25 year-olds hold an upper-secondary qualification. In the past 20 years that rate has fluctuated between 90 and 92% (CSRE, 2014). That goal has now been reached for the Swiss born, but outcomes are still far from the target for those born abroad (Wolter et al., 2014). However, some progress has been made. The PISA reading performance differential between young people with and without an immigrant background fell from 86 to 48 points between 2000 and 2009. In mathematics it also fell, from 76 to 63 points between 2003 and 2012. But roughly three-quarters of the narrowing, which primarily concerned migrant students, that is young people who were not born in Switzerland, can be ascribed to an increase in immigration from countries such as France and Germany, whose languages overlap with Switzerland's (Cattaneo and Wolter, 2015). Given sampling issues in the 2015 PISA iteration, it is hard to gauge the extent of recent changes.

Moreover, completing university has been shown to increase the earnings of men in Switzerland with disadvantaged family backgrounds, including from migrant backgrounds, even more than for those from more favoured backgrounds (Perini, 2014). The boost to employment rates is smaller, however (OECD/European Union, 2015). If increased pre-primary spending helps to increase the probability that these children get to university level, the net return would be even higher.

Another contributing factor to weaker performance by children with an immigrant background is the lack of diversity among teachers. A quarter of the Swiss population was born outside of the country, but foreign-born students represent only about 8% of those planning to teach at compulsory education level. A lack of linguistic and cultural diversity among the teaching profession can be problematic, in Switzerland as in other OECD countries, and a higher share of teachers from migrant families would help the integration of students from similar backgrounds. Specific measures such as those being implemented in Germany by the MigraMENTOR project could be fruitfully developed in Switzerland, making a teaching career more attractive to foreign students in particular.

Tracking and equity

In most cantons there is stratification by ability in lower secondary school before separating into vocational and academic schools at upper secondary school. The 2015 PISA results show that 29% of Swiss students were in schools where all classes are grouped by ability, which was the third-highest in the OECD. Grouping classes by ability appears to be becoming more common across countries, but PISA data caution that it does not improve the shares of low and top performers in an education system and that it can raise inequality (OECD, 2016e and 2012c; Causa and Johansson, 2010; Field et al., 2007). The risk is that students remain in one stream, and initially low-performing students will proceed to the vocational stream in upper secondary school as a matter of course, rather than the academic stream that is a pathway to a university education.

Previous *Surveys* and other OECD work have long argued in favour of a more comprehensive system of upper secondary education, not only in the case of Switzerland but also in other countries with similar systems, and that, if it is to exist, tracking should take place at an older age, although this may be difficult due to the link to the apprenticeship system. In recent years the rigidity of this system – that is the lack of permeability between the tracks – was alleviated through the introduction of the professional baccalaureate and universities of applied sciences that are open to vocational-stream students. *Passerelles* (pathways) were created that allow students to transition from the vocational stream to the traditional universities. However, the *passerelles* are still little-used, as they are expensive in terms of lost time and opportunity costs. Increasing the academic content in the early years of the two systems (and vice versa) may improve permeability and therefore flexibility and equity in the system overall.

One of the principle objections to early tracking is that it re-enforces intergenerational immobility in terms of educational achievement, educational paths and later economic outcomes. Empirical studies suggest that there is a positive association between enrolment in vocational education and training and the influence of parental background on offspring secondary achievement (Falcon, 2013; Jann and Seiler, 2013; Felouzis and Charmillot, 2013). The influence of parental background on offspring performance at secondary school tends to be lower in countries where tracking takes place at a later stage and/or in "comprehensive" systems where ability grouping within schools occurs to a lesser extent (Causa and Johansson, 2010). Bauer and Riphahn (2005) used the variation in age at tracking across cantons and found that early tracking reinforces the relative advantage of children of highly educated parents over those of parents with low levels of education (tracking happened at an earlier age at that time, but the principle still undoubtedly holds). Furthermore, early tracking appears to exacerbate achievement differences associated with the school's socio-economic mix without increasing overall performance (Causa and Johansson, 2010).

Research also shows considerable influence of gender, cultural and family background on the assigned type of track (Kronig, 2007). Finally, research by Pekkarinena et al. (2009), which exploits the fact that the move from tracking to a comprehensive system in Finland was implemented gradually across the country's municipalities during a six-year period, indicates that the reform reduced the intergenerational income elasticity from 0.30 to 0.23. Tracking is also adding to the length of time taken to complete schooling via use of "transition years" between lower and upper secondary school. Jaik and Wolter (2016) show that "locus of control" – believing that outcomes depend on one's actions rather than

external factors – is negatively related to delaying upper secondary school. Parental education and immigrant status is also linked to the decision to delay entering upper secondary school. This suggests that within the current system greater career guidance may be needed. But it also confirms that tracking may be taking place at an age at which students are ill-prepared to make important decisions.

Recommendations to make education and skills training more responsive (Key recommendations in bold)

Increasing the responsiveness of the system to changing demands

- **Collect more detailed data on skills to facilitate adjustments to education in response to changing labour market needs.** Commit to participating in the next rounds of PIAAC.
- Improve the availability of longitudinal or cohort data within the Swiss education system in order to better fine-tune the system in response to rapid changes in the structure of the economy.
- Undertake a review of the mix of education and skills training, given the high vacancy rates in the high-skill economic sectors.
- **Increase the effectiveness of pathways between vocational and general streams by increasing the academic component of the vocational curriculum and vice versa.**
- **Strengthen linkages between the vocational education and training system and employer associations in school-based vocational training.** Reduce delays in curriculum changes in the dual apprenticeship training system.
- **Encourage small firms to participate more in apprenticeships by promoting sharing of apprenticeship places between firms and training centres that undertake part of the training.**
- Complement the existing framework with a mechanism that helps players in education and training to make better forecasts and to anticipate shifts in the demand for skills.
- Strengthen linkages between higher education institutions and employers, including through closer co-operation in course design and facilitating linkages between students and employers.
- **Use subsidies to encourage participation in continuing education and training for groups with low participation rates.**
- Reduce fragmentation among jurisdictions and government departments responsible for continuing education and training and accelerate data collection.

Ensuring equity in education and training

- Ensure that lower secondary school students are assessed so that they can move between ability-based classes.
- Increase efforts to promote a better gender balance across occupations, and reduce gender stereotyping, including through increased career guidance and employer talks in lower secondary school.
- Encourage take-up of early childhood education for those from poorer socio-economic backgrounds, including immigrant backgrounds, for example by trialling means-tested conditional cash transfers.

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Volume 2017/
Supplement 6
November 2017

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ISSN 0376-6438
2017 SUBSCRIPTION
(18 ISSUES)

ISBN 978-92-64-28302-2
10 2017 24 1 P

9 789264 283022