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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.

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Information about the latest as well as previous Surveys and more details about how Surveys are prepared is available at www.oecd.org/eco/surveys

BASIC STATISTICS OF ICELAND, 2019*

(Numbers in parentheses refer to the OECD average)**

LAND, PEOPLE AND ELECTORAL CYCLE					
Population (million)	0.4		Population density per km² (2018)	3.5	(38.1)
Under 15 (%)	19.6	(17.9)	Life expectancy at birth (years, 2018)	82.9	(80.1)
Over 65 (%)	15.2	(17.1)	Men (2018)	81.3	(77.5)
International migrant stock (% of population)	15.5	(13.3)	Women (2018)	84.5	(82.8)
Latest 5-year average growth (%)	2.0	(0.6)	Latest general election		June 2020
ECONOMY					
Gross domestic product (GDP)			Value added shares (%)		
In current prices (billion USD)	24.8		Agriculture, forestry and fishing	4.9	(2.6)
In current prices (billion ISK)	3 045.1		Industry including construction	21.7	(26.8)
Latest 5-year average real growth (%)	4.4	(2.2)	Services	73.4	(70.6)
Per capita (1000 USD PPP)	60.0	(48.3)			
GENERAL GOVERNMENT (Per cent of GDP)					
Expenditure	43.4	(40.6)	Gross financial debt (OECD: 2018)	61.5	(107.6)
Revenue	41.9	(37.5)	Net financial debt (OECD: 2018)	6.5	(67.8)
EXTERNAL ACCOUNTS					
Exchange rate (ISK per USD)	122.61		Main exports (% of total merchandise exports)		
PPP exchange rate (USA = 1)	140.57		Food and live animals	44.7	
In per cent of GDP			Manufactured goods	37.3	
Exports of goods and services	44.4	(54.2)	Machinery and transport equipment	8.5	
Imports of goods and services	39.3	(50.6)	Main imports (% of total merchandise imports)		
Current account balance	6.4	(0.3)	Machinery and transport equipment	33.6	
Net international investment position	22.1		Manufactured goods	12.1	
			Miscellaneous manufactured articles	12.0	
LABOUR MARKET, SKILLS AND INNOVATION					
Employment rate (aged 15 and over, %)	78.4	(57.6)	Unemployment rate, LFS (aged 15 and over, %)	3.5	(5.4)
Men	81.6	(65.6)	Youth (aged 15-24, %)	8.7	(11.7)
Women	75.0	(49.9)	Long-term unemployed (1 year and over, %)	0.2	(1.4)
Participation rate (aged 15 and over, %)	81.0	(61.1)	Tertiary educational attainment (aged 25-64, %)	45.0	(38.0)
Average hours worked per year	1,454	(1,726)	Gross domestic expenditure on R&D (% of GDP, 2018)	2.0	(2.6)
ENVIRONMENT					
Total primary energy supply per capita (toe)	16.8	(3.9)	CO_2 emissions from fuel combustion per capita (tonnes)	5.2	(8.3)
Renewables (%)	90.1	(10.8)	Water abstractions per capita (1 000 m³, 2014)	9.2	
Exposure to air pollution (more than 10 µg/m³ of PM 2.5, % of population)	3.5	(61.7)	Municipal waste per capita (tonnes, 2017, OECD: 2019)	0.7	(0.5)
SOCIETY					
Income inequality (Gini coefficient, 2017, OECD: 2016)	0.250	(0.310)	Education outcomes (PISA score, 2018)		
Relative poverty rate (%, 2017, OECD: 2016)	4.9	(11.4)	Reading	474	(487)
Median disposable household income (1000 USD PPP, 2017, OECD: 2016)	34.7	(24.4)	Mathematics	495	(489)
Public and private spending (% of GDP)			Science	475	(489)
Health care	8.8	(8.8)	Share of women in parliament (%)	38.1	(30.7)
Pensions (2017)	7.1	(8.6)	Net official development assistance (% of GNI, 2017)	0.3	(0.4)
Education (% of GNI, 2018)	7.4	(4.5)			

* The year is indicated in parenthesis if it deviates from the year in the main title of this table.
** 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 80% of member countries.
Source: Calculations based on data extracted from databases of the following organisations: OECD, International Energy Agency, International Labour Organisation, International Monetary Fund, United Nations, World Bank.

Executive summary

Iceland stands up after a deep fall

After a deep contraction, the economy is recovering from the COVID-19 pandemic on the back of robust export growth.

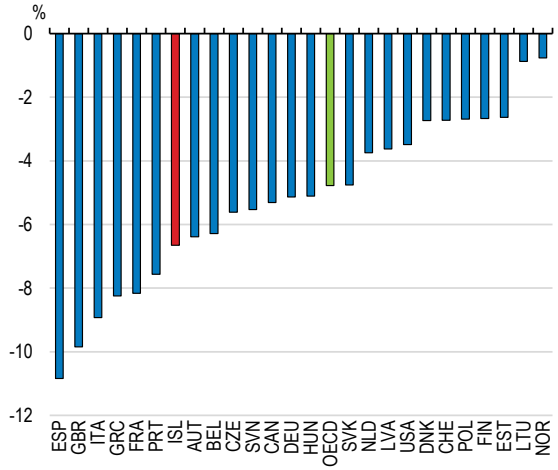
The health situation is under control, and new infections are rare. All domestic restrictions were lifted end of June. Vaccination is progressing rapidly.

The government extended most support programmes until end-2021. It also set up a five-year programme to invest in infrastructure, digitalisation and research and innovation accounting for 0.5% of GDP per year.

Following a 6.6% contraction in 2020, the economy is expected to grow by 2.8% in 2021 and 4.5% in 2022 (Figure 1,Table 1), **driven by a rebound of tourism, a successful vaccination programme and the lifting of restrictions.** Unemployment will edge down to around 7% in 2022 on the back of accelerating growth.

Figure 1. The economy plunged

GDP decline in 2020



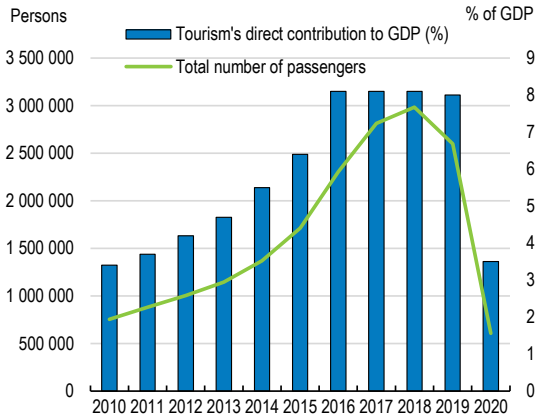
Source: OECD, National Accounts database.

StatLink https://stat.link/f9wgnb

Non-tourism exports are on the rise. Intellectual property services now account for around 15% of service exports. Data processing and storage are growing rapidly, attracted by low energy prices and a cool and windy climate.

Domestic tourism has only partly replaced foreign travellers. In 2020, pandemic-related travel restrictions reduced foreign arrivals to around a fourth of the previous year (Figure 2). To a limited extent, this sharp decline was offset by Icelanders travelling in their own country.

Figure 2. Border restrictions hit the tourism sector hard



Note: Passengers who go through security at Keflavík Airport.
Source: Statistics Iceland.

StatLink https://stat.link/q72pom

Table 1. The economy is projected to accelerate

	2019	2020	2021	2022
			Projections	
	Percentage changes, volume (2005 prices)			
GDP at market prices	**2.6**	**- 6.6**	**2.8**	**4.7**
Private consumption	1.9	- 3.3	2.1	4.9
Gross fixed capital formation	- 3.7	- 6.8	8.0	3.4
Exports	- 4.6	- 30.5	6.5	12.0
Imports	- 9.3	- 22.0	8.2	8.2
Consumer price index	3.0	2.8	4.1	2.5
Unemployment rate	3.9	6.4	8.0	7.6
Budget balance (% of GDP)	- 1.5	- 7.3	- 10.3	- 7.1
Current account (% of GDP)	6.4	1.0	-1.0	0.0

Source: OECD, Economic Outlook No. 109.

Monetary and fiscal policies are accommodative

Notwithstanding the recent interest rate hike, monetary policy remains accommodative. Fiscal policy continues to support households and firms.

Monetary policy has been eased in response to the crisis and remains appropriately accommodative. Between March and November 2020 the central bank reduced its key interest rate by 2 percentage points to 0.75%. As inflation and short-term inflation expectations have risen above the target, the bank raised the interest rate again to 1% in May.

The easing monetary conditions have helped households more than firms. Mortgage credit rose in 2020, and real estate market activity and house prices rose. Yet corporate lending stagnated, despite measures to ease access to credit, with liquidity constraints a concern especially for the tourism sector.

Fiscal policy is supporting the economy. The budget deficit widened to 7.3% of GDP in 2020. Parliament suspended the fiscal rule and the rolling five-year fiscal plan it approved in late 2020 as well as the one it endorsed in Spring 2021 aim to support the economy in the short term and to reach a positive primary balance by 2025, when gross public debt according to the National Accounts is set to stabilise at 100% of GDP.

Tax reforms help low-income households and the environment. The third and last stage of an income tax reform reduced tax rates by up to 8 percentage points. Environmentally-friendly transport modes receive temporary VAT reliefs.

Regulation should be eased and skills improved

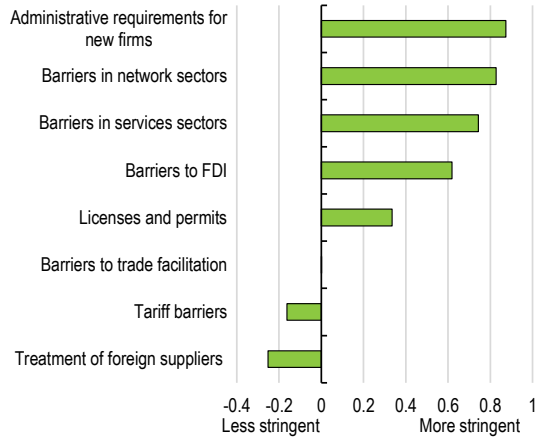
Regulatory barriers are stringent, slowing innovation and the entry of new firms. At the same time, skills gaps need to be addressed.

Productivity has recently accelerated but has overall remained sluggish over the past decade. The competitiveness gains built up shortly after the 2008/09 crisis were exhausted by the late 2010s.

Stringent regulation stifles competition. The state sector is small and well run, but barriers to entry facing domestic and foreign firms are high (Figure 3), hampering competition. Administrative burdens and an extensive licensing and permit system protect incumbents and slow new and innovative start-ups.

Figure 3. Barriers to entry are high

PMR gap with OECD average, 2018



Note: Positive values mean more stringent regulation than the OECD average, negative values less stringent regulation.
Source: OECD, Product Market Regulation database.

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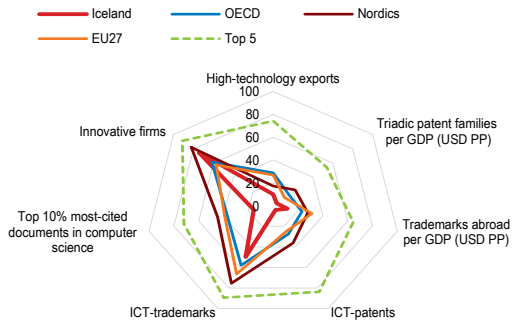
Iceland has untapped innovation potential (Figure 4**).** More effective support for business R&D would unlock private investment and improve the ability of smaller firms to innovate. Encouraging firms to adopt digital technologies would help Iceland to make the most of innovation niches, with productivity gains. The public sector too could become more digitalised with positive societal impact. Skills for the digital era and strong knowledge exchange through closer business-research collaboration on innovation and international cooperation in research are essential for stronger innovation.

Figure 4. Innovation lags behind

Innovation outcomes in international comparison



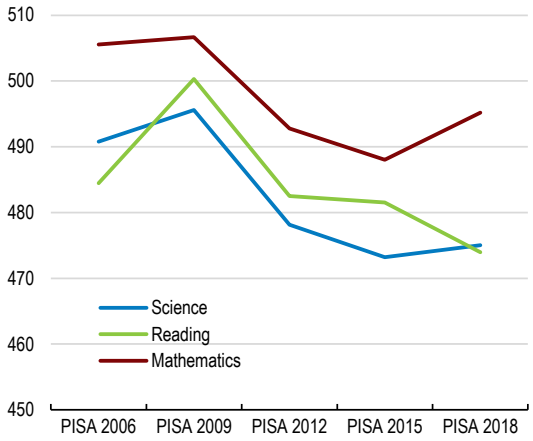
Note: Higher values reflect better outcomes. More information is given in chapter 2.

Source: World Bank, World Development Indicators; OECD, Main Science and Technology Indicators; OECD, Information and Communication Technology; OECD, Education at a Glance database; and Global Innovation Index 2020.

StatLink https://stat.link/zm820i

The quality of primary and secondary education is declining, although the system is remarkably equitable. PISA scores are trending down (Figure 5), as teacher qualifications fail to keep up with requirements, and teacher salaries provide few rewards for experience and excellence.

Figure 5. PISA scores have trended down



Source: OECD, PISA 2018 database.

StatLink https://stat.link/ukvhox

Tertiary education induces skills mismatch. Links between universities and the labour market are weak. Funding levers make it attractive for universities to focus on enrolment rather than performance. Collaboration between research institutions and firms is improving, however.

Vocational education and training is underdeveloped. Participation is lower than in any European country and limited to traditional technical and crafts professions. School-based and work-based learning are weakly integrated, and there are only few pathways to higher education.

Addressing climate change

Iceland has committed to reduce carbon emissions substantially over the coming decade. It should do so in a sustainable, cost-efficient and inclusive manner.

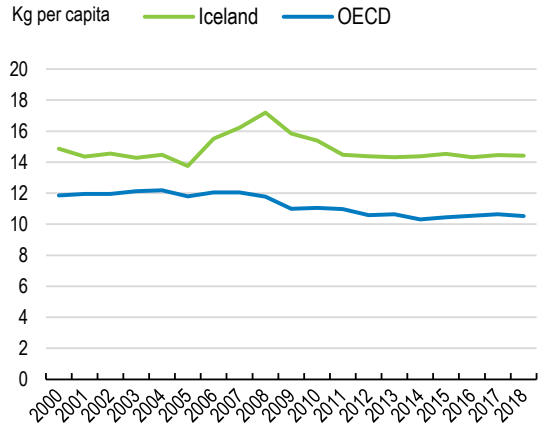
Iceland's per capita carbon emissions exceed the OECD average, partly because of industry's reliance on low energy generation cost (Figure 6). The government committed to reduce emissions from their 2005 level by at least 40% by 2030.

Iceland's climate policy should rely on effective carbon pricing, complemented by investment in low-carbon infrastructure, targeted spending on green research and development, and well-designed environmental regulation. To ease the transition, the country should remove barriers for new and innovative firms and foster the creation of green jobs and skills.

To garner political support and make the low-carbon transition beneficial for all, proceeds from carbon pricing could be redistributed to households and firms, at least partly.

Figure 6. Carbon emissions exceed the OECD average

Total greenhouse gas emissions per capita



Source: OECD Green Growth Indicators.

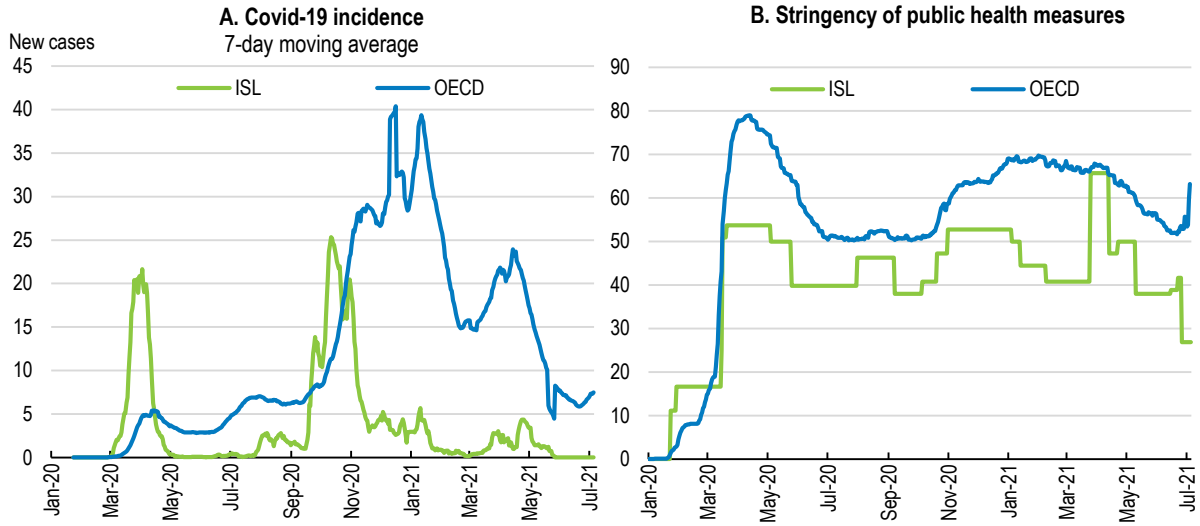
StatLink https://stat.link/52c4d1

MAIN FINDINGS	KEY RECOMMENDATIONS
Policies to support the recovery	
Inflation and short-term inflation expectations are above target.	Keep monetary policy accommodative, but stand ready to tighten further if long-term inflation expectations risk becoming unanchored.
The merger of the Central Bank and Financial Supervisory Authority is expected to strengthen the overall surveillance of the financial system.	Remain vigilant to maintain a sound and resilient financial system.
Fiscal policy is supporting the economy.	Continue supporting the economy and start fiscal consolidation as planned once the recovery is firmly established.
Barriers to the entry of new firms are high.	Reduce barriers to sound competition in the tourism and construction sectors. Facilitate access to professions by easing stringent occupational licensing.
Skills mismatch is high. Labour shortages have intensified in some sectors, slowing reallocation.	Continue and extend the training programme for professions in short supply. Strengthen vocational education and training (VET) by extending work-based learning and by facilitating access to tertiary education for VET graduates. Strengthen the link between tertiary education and the labour market, by linking part of university funding to labour market needs.
Promoting innovation	
Business R&D intensity does not match the rapid increase in tax support for R&D in recent years and innovation outcomes of smaller firms, which are the main beneficiaries of such support, are relatively weak.	Ensure that R&D tax-incentives better target smaller innovative firms.
Venture capital, an important source of financing for young and innovative firms without collateral, is not yet well developed.	Ensure that the new publicly-owned venture capital fund invests in privately-owned venture capital funds with large potential to promote start-ups and innovation companies.
The tertiary system does not provide sufficiently broad skills.	Increase the provision of vocational education programmes at the tertiary level and of entrepreneurship programmes.
Collaboration between research institutions and the business sector is weak, limiting knowledge transfer.	Introduce carefully-designed policy initiatives to encourage business-research collaboration on innovation, including specific programmes that connect smaller firms with researchers.
Addressing climate change	
Climate policies lack prioritisation and sequencing and rely mostly on technical measures.	Develop a consistent climate policy framework to guide scope, priorities, and sequencing of actions and measures.
Geothermal energy, waste management and agriculture are not subject to carbon pricing.	Submit all sectors to carbon pricing, taking into account interactions between carbon taxes and emissions trading systems.
There is room for further investment in low-carbon infrastructure.	Step up spending on low-carbon transport infrastructure, energy transition and the digital transformation.

1 Key policy insights

Iceland is recovering from a comparatively mild COVID-19 health crisis. The number of victims and the stress on the health system have remained low. A smart testing and tracking strategy helped the authorities to identify infections early and to implement targeted health measures. Containment was short and less restrictive than in many other countries, and all domestic restrictions were lifted at the end of June 2021 (Figure 1.1). Preschools and primary schools operated almost without interruption, while remote learning became more widespread at secondary and tertiary level. International borders remained open to the Schengen area, with the rules on testing and quarantining gradually being eased since spring 2021. Vaccination is progressing fast, with all people over 16 years old planned to get at least one dose by early summer.

Figure 1.1. The pandemic hit Iceland mildly

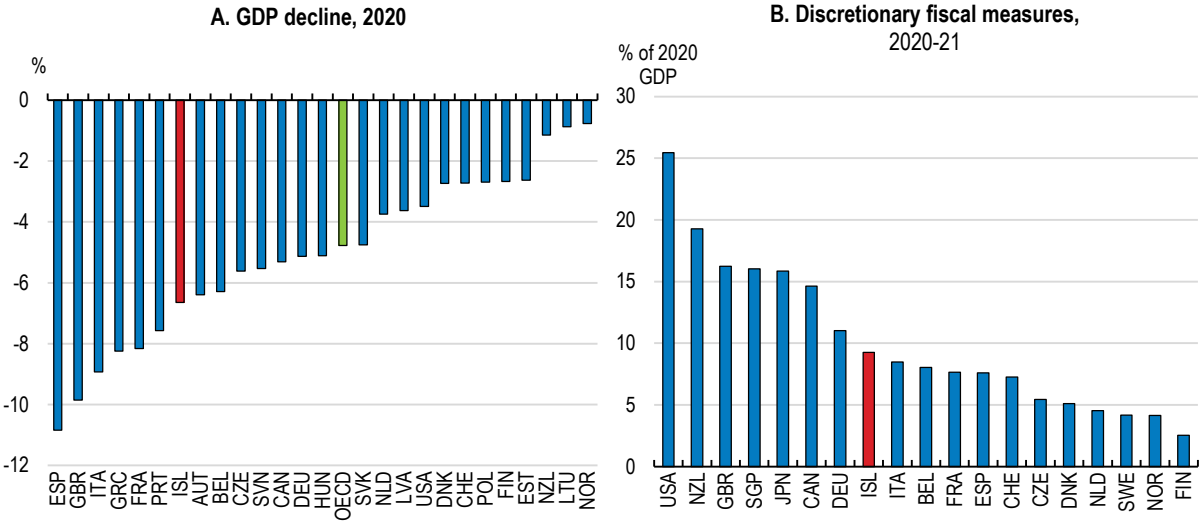


Source: Oxford University; Our World in Data, as of 5 July 2021.

StatLink https://stat.link/vq0ao2

The economic impact of the pandemic was severe but contained by policy action (Figure 1.2). Following widespread lockdowns and travel restrictions worldwide, foreign tourism collapsed, with only around a fourth of foreigners arriving in 2020 compared to the previous year. Icelanders, unable to travel abroad, visited their own country, but this made up only a part of lost revenues. Like in other countries, the government promptly took a range of measures to help the ailing economy, notably with a short-term work scheme to support households and firms (Box 1.1). The central bank's interest rate cuts and liquidity assistance helped to preserve financial stability. Thanks to these measures, total domestic demand declined by 1.3% only. The economy plunged by 6.6% in 2020, still considerable but less than at the time of the global financial crisis.

Figure 1.2. The economy suffered a large contraction, but policy support helped



Source: OECD, National Accounts database; and IMF, Fiscal Monitor Database of Country Fiscal Measures in Response to the COVID-19 Pandemic.

StatLink https://stat.link/ld5e0n

The dramatic unfolding of the pandemic overshadowed deeper structural shifts in Iceland's economy. Tourism, whose breakneck growth drove the recovery after the 2008/09 financial crisis, peaked already in 2018, and the country's second airline became insolvent in 2019. While tourism might grow less in the medium term, other sectors are taking its place as growth engines. The pharmaceutical industry continues to develop rapidly, and digital service exports such as data processing and storage are booming, benefitting from Iceland's low energy prices and cool and windy climate. Fisheries are climbing up the value chain with fresh seafood and aquaculture rising. Innovative carbon capture technologies help reduce carbon emissions and can provide export income. Yet, structural change is slowed by a lack of relevant skills and overly stringent regulation.

Box 1.1. Government measures have helped households and firms through the pandemic

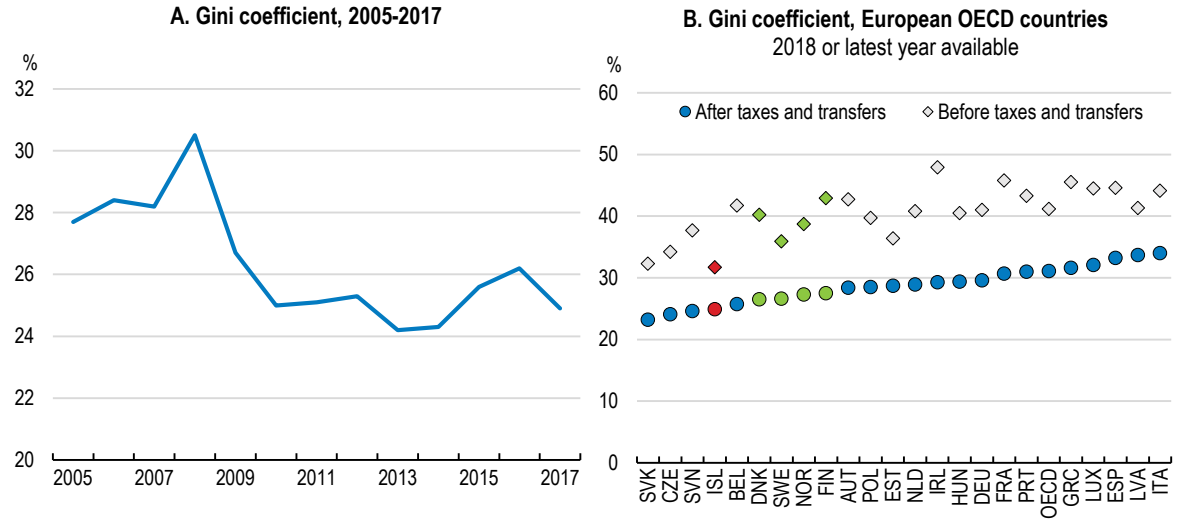
Mid-March 2020, soon after putting in place the first containment measures, the government adopted a support programme to avoid a meltdown of business and household income. The programme was broadened in April and extended in November, with some measures planned to expire mid-2021. It first focused on immediate financial support to households and firms and the health care system and then gradually shifted towards encouraging public and private investment to support the recovery and long-term growth.

The most significant measures included a short-term work scheme; additional child and family benefits; households allowed to draw on third-pillar pension savings; special support for vulnerable groups; and the deferral of income and value-added tax payments of up to a year. Businesses whose revenues fell by more than 40% received financial relief, with the severely hit tourism and aviation industry getting special help. Discretionary fiscal measures amounted to around 9% of 2020 GDP in 2020-21, while the automatic stabilisers (declining tax revenues, unemployment benefits) contributed another 8%. The government also embarked on a five-year investment programme focussing on infrastructure, research and development of around 0.5% of GDP annually. The government issued few guarantees, helping to keep contingent liabilities under control.

Source: OECD COVID-19 policy response tracker database

Iceland remains one of the most egalitarian economies of the OECD thanks to high labour force participation of both men and women and a compressed wage distribution (Figure 1.3). After the global financial crisis, lower incomes grew faster than those at the top, making Iceland even more egalitarian. The social welfare system including pensions is well targeted, reducing inequality further. Access to education and health care is universal, and socio-economic status appears to have a weaker influence on education or health outcomes than in most other OECD countries. An area where Iceland is actually the most *un*equal OECD country is the gap in hours worked between men and women (Figure 1.16). As a result, the gender wage gap is only little below the OECD average.

Figure 1.3. Iceland's economy is highly egalitarian



Note: Gini coefficient after taxes and transfers for the 18-64 year olds. Latest data for Iceland refer to 2017.
Source: OECD, Income Distribution and Poverty database.

StatLink https://stat.link/8m1lc3

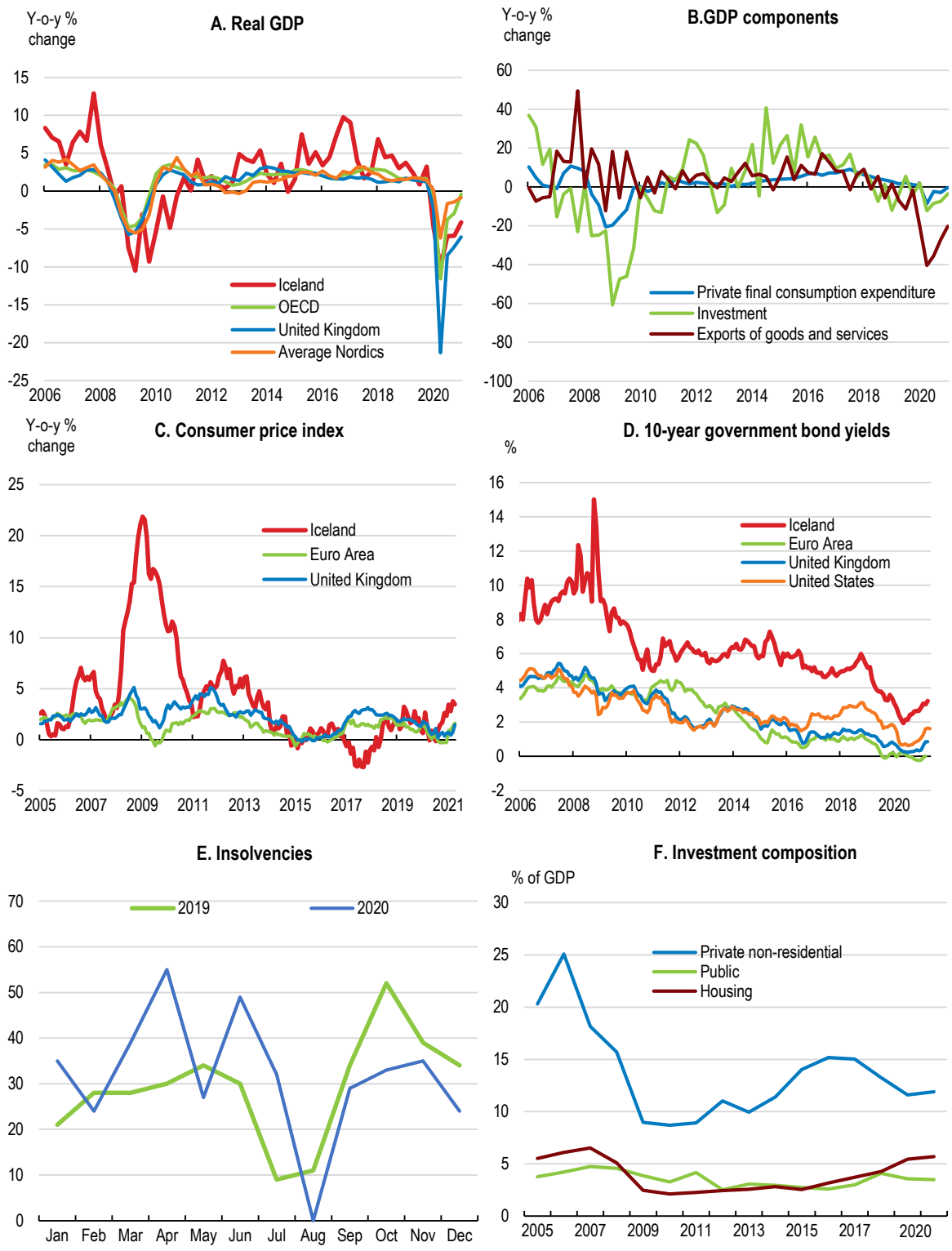
Against this background, the Survey's key messages are:

- Support a resilient, inclusive and sustainable recovery, and start fiscal consolidation as planned once the recovery is firmly established.
- Foster a business-friendly regulatory framework, improve skills and spur innovation by offering well-targeted support for business R&D and promoting e-government.
- Move towards a low-carbon economy, by pricing carbon emissions efficiently, investing in low-carbon infrastructure and fostering research and innovation in green technologies.

The economy is recovering

The economy is recovering (Figure 1.4). Tourism is rebounding, following the easing of the rules on testing and quarantining. Fisheries' exports remain strong, especially of higher-value fresh seafood and aquaculture. Some sectors such as pharmaceuticals and data storage and processing, continue growing fast. Business investment is benefitting from pent-up demand and a five-year government investment programme. Monetary and fiscal policy provide support to businesses. Household consumption remains robust based on growing wages, regained confidence and the drawing down of savings accumulated during the pandemic. Headline inflation is creeping up as wages and oil prices are rising, and policy remains accommodative.

Figure 1.4. The economy is recovering



Source: OECD, National Accounts database; OECD, Main Economic Indicators; and Statistics Iceland.

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After the contraction in 2020, momentum is gradually returning. While the health situation seems under control and confidence has rebounded, tourism continues to suffer from the impact of the pandemic. The short-term work scheme was terminated in mid-2021, while most other policy support measures introduced at the onset of the crisis have been extended until end-2021. The government's investment programme is expected to continue to support business investment and long-term growth beyond that date. GDP is set to grow by around 3% in 2021 and 4% in 2022 (Table 1.1).

Projections are subject to substantial uncertainty and risks. The recovery of the tourism sector relies strongly on foreign arrivals and hence on economic and health conditions overseas. The economy may further face unforeseen events, including supply shocks such as the disappearance of a specific fish stock or a disruption to international travel links due to a volcanic eruption (Table 1.2). Brexit may negatively affect Iceland's economy notwithstanding the recently announced trade agreement with the United Kingdom. There are also upside risks, however: a faster than planned vaccination overseas could give a stronger boost to travel and tourism.

Table 1.1. Macroeconomic indicators and projections

	2017	2018	2019	2020	2021	2022
	Current prices (ISK billion)				Projections	
		Percentage changes, volume (2015 prices)				
GDP at market prices	2 642.0	4.7	2.6	- 6.6	2.8	4.7
Private consumption	1 323.5	4.8	1.9	- 3.3	2.1	4.9
Government consumption	625.5	4.7	3.9	3.1	2.2	0.9
Gross fixed capital formation	575.2	1.2	- 3.7	- 6.8	8.0	3.4
Final domestic demand	2 524.3	3.9	1.1	- 2.5	3.4	3.5
Stockbuilding[1]	- 0.8	0.2	- 0.5	1.2	0.0	0.0
Total domestic demand	2 523.5	4.2	0.3	- 1.3	3.4	3.5
Exports of goods and services	1 208.2	1.7	- 4.6	- 30.5	6.5	12.0
Imports of goods and services	1 089.7	0.5	- 9.3	- 22.0	8.2	8.2
Net exports[1]	118.5	0.6	1.9	- 4.9	- 0.6	1.2
Memorandum items						
GDP deflator	_	2.7	4.5	3.4	2.3	2.7
Consumer price index	_	2.7	3.0	2.8	4.1	2.5
Core inflation index[2]	_	2.5	2.9	2.9	3.7	2.4
Unemployment rate (% of labour force)	_	3.1	3.9	6.4	8.0	7.6
General government financial balance (% of GDP)	_	0.9	- 1.5	- 7.3	- 10.3	- 7.1
General government gross debt (% of GDP)[3]	_	60.4	61.5	69.1	78.7	84.0
Current account balance (% of GDP)	_	3.8	6.4	1.0	-1.0	0.0

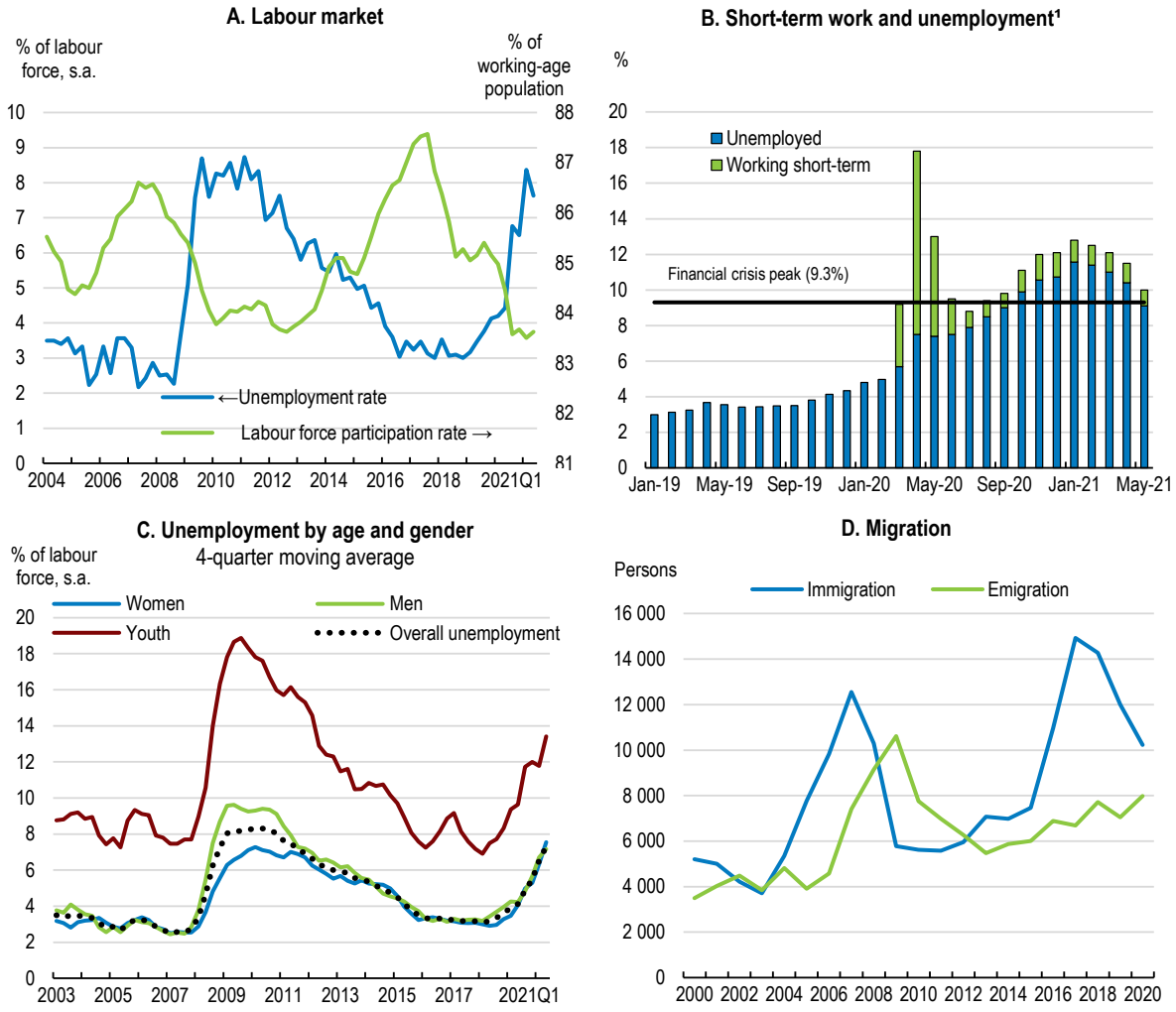
1. Contributions to changes in real GDP, actual amount in the first column.
2. Consumer price index excluding food and energy.
3. Unlike in some other OECD countries, this includes unfunded liabilities of government employee pension plans.
Source: OECD Economic Outlook database No. 109.

Table 1.2. Events that could entail major changes to the outlook

Shock	Potential impact
New or extended travel restrictions for foreign tourists related to renewed COVID-19 outbreaks	Economic growth and the recovery of employment would suffer.
Disappearance of fishing stock	Export revenues would fall.
Large-scale volcanic eruption	International and domestic transport links could be disrupted, hampering some economic activities.

The labour market is stabilising (Figure 1.5). Unemployment, which peaked at over 8% of the labour force in late 2020, is receding fast. Labour participation is rebounding after falling to a historical low. The short-term work scheme helped avoid an unemployment surge during the first wave in spring 2020. Unemployment rates for both men and women have remained almost identical throughout the crisis. Notwithstanding the uptick in early 2021, youth unemployment is evolving in line with general unemployment, suggesting that labour market developments have not disproportionally hit the young. Rising student numbers suggest that part of the rise in youth unemployment is being absorbed by the education system. Immigration has declined sharply, while emigration also slowed as the employment outlook is hardly better abroad.

Figure 1.5. The labour market is stabilising



Note: 1. Data refer to unemployment as registered by Directorate of Labour, as opposed to the Labour Force Survey data show in Panels A and C.
Source: Ministry of Finance; and Statistics Iceland.

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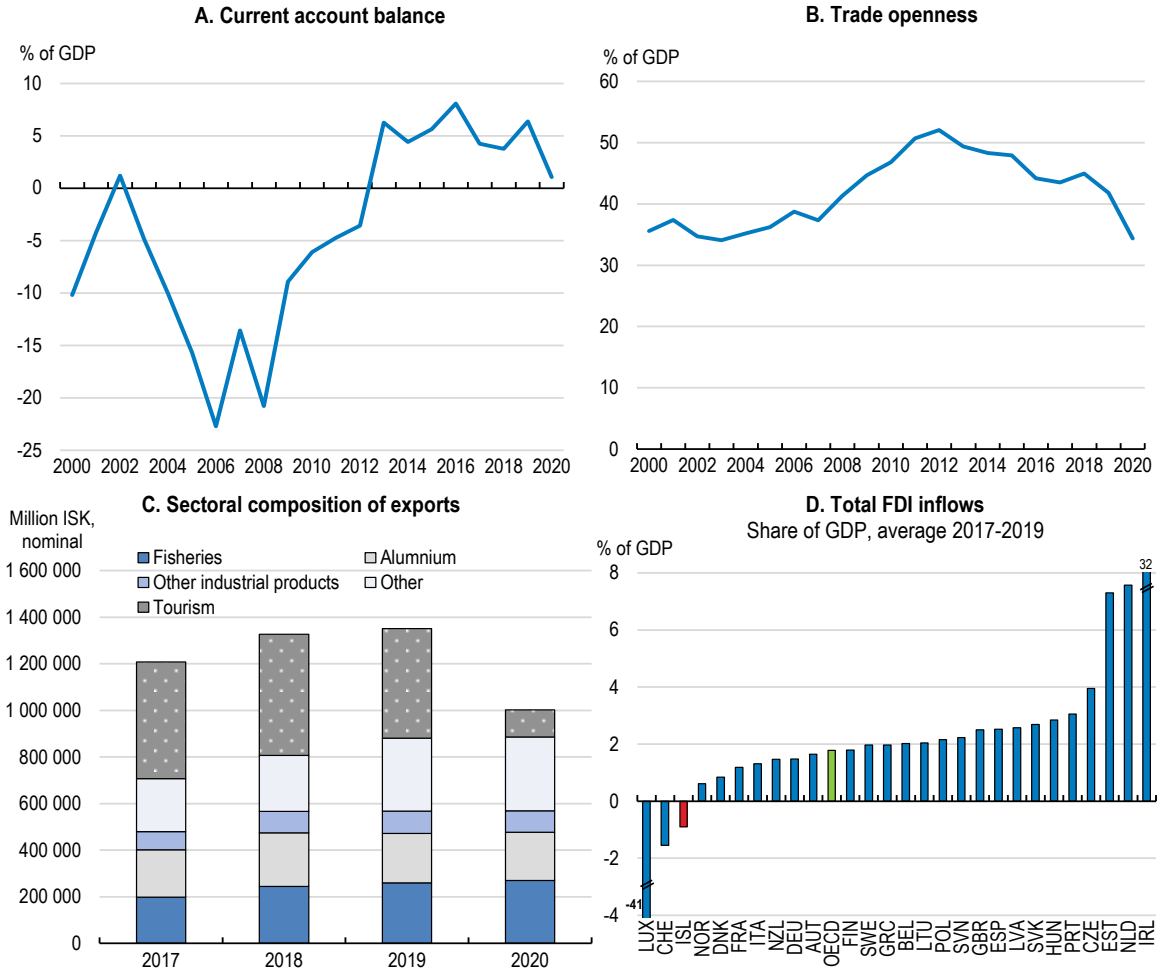
The pandemic is exacerbating labour market imbalances. Iceland's labour market is open and flexible, facilitating reallocation. Even so, unemployment remains high in the tourism and associated service sectors, while qualified labour has become scarcer in some technical and digital sectors. To underpin

reallocation, the government set up a vocational training programme for professions in short supply, especially technicians, crafts and trade, and health care workers. The government also plans to ease access to work permits for high-skilled workers from outside the European Economic Area, to ease labour shortages. The training programmes should be extended, to prepare workers for jobs in areas with high demand.

The external position has been affected by the collapse of foreign tourism, Iceland's largest pre-COVID-19 export sector (Figure 1.6). The current account surplus shrank but remained positive, especially as lower imports – notably Icelanders travelling abroad – partly compensated for the loss of foreign tourism revenue. As one of only few OECD countries, foreign direct investment (FDI) flows turned negative over the past few years, and this trend might have accelerated following the pandemic. The net investment position improved, however, reflecting valuation gains on assets held overseas. Overall, openness continues to decline and remains low in view of the country's small size. Against this background, Iceland should ease restrictions for foreign capital, to fund investments in new and growing sectors and in climate action.

Figure 1.6. External positions have weakened



Note: Panel B: Trade openness is measured as the average of goods and services imports and exports divided by GDP.
Source: OECD, Balance of Payments database; OECD, National Accounts database; Ministry of Finance; and OECD, FDI Statistics.

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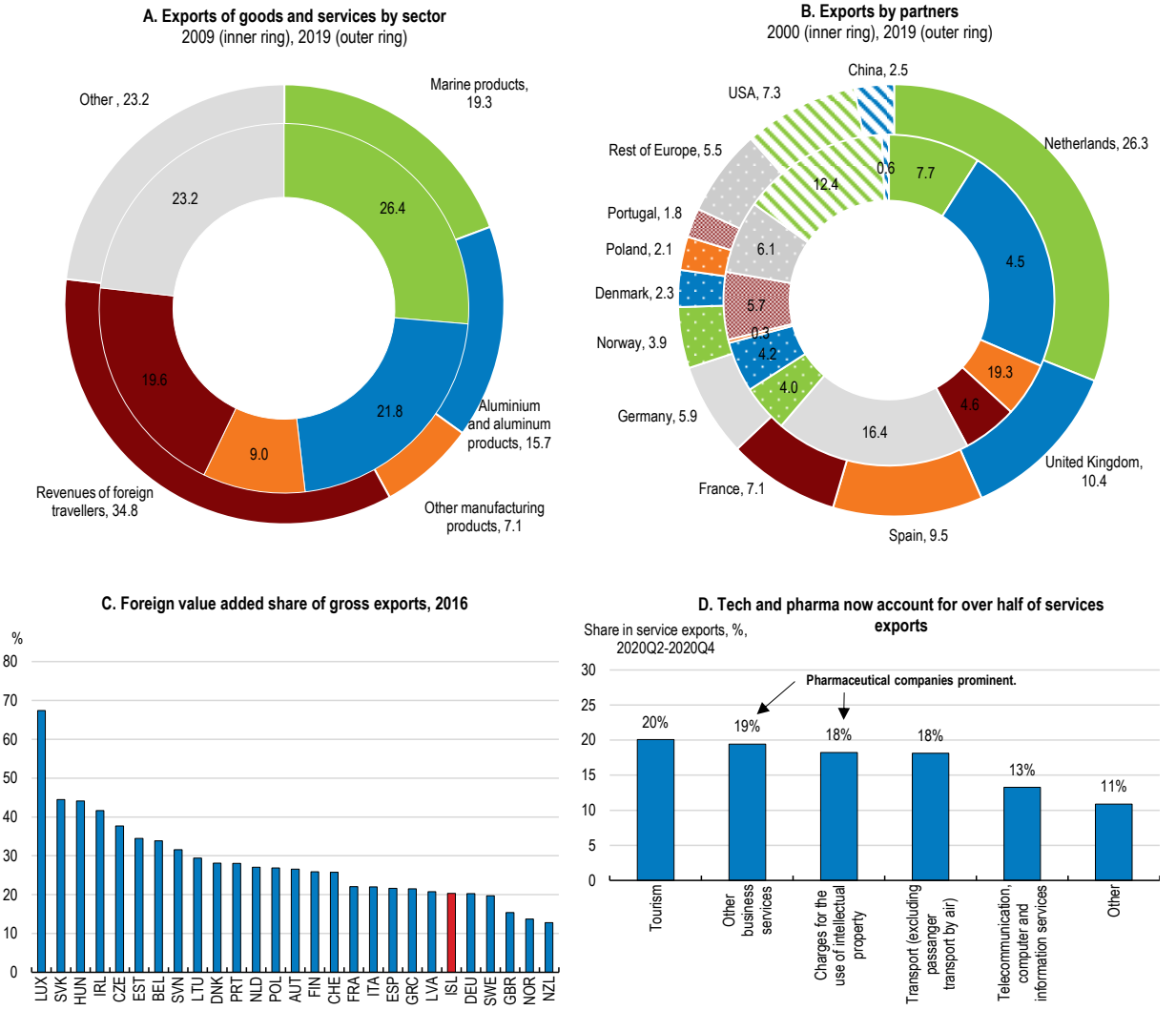
The composition of exports has changed in recent years, even before the pandemic, which abruptly reduced the share of tourism (Figure 1.7). The share of intellectual property services, especially those related to licenses of the pharmaceutical industry, has risen. The energy-intensive data processing and storage industry is assumed to make up around 2% of GDP and seems to have grown rapidly as well, attracted by low energy prices and a cool and windy climate (Adalbjornsson, 2019[1]). Further expansion is hampered by Iceland's remote position and capacity constraints, with only three submarine data cables linking the island to Europe and North America. Increasing transmission capacity of the existing cables or investing in new cables as planned could strengthen competition and raise export revenues.

Figure 1.7. Services other than tourism are getting more important



Source: Statistics Iceland; UN Comtrade, International Trade Statistics database; OECD, Trade in Value Added database; and Ministry of Finance.

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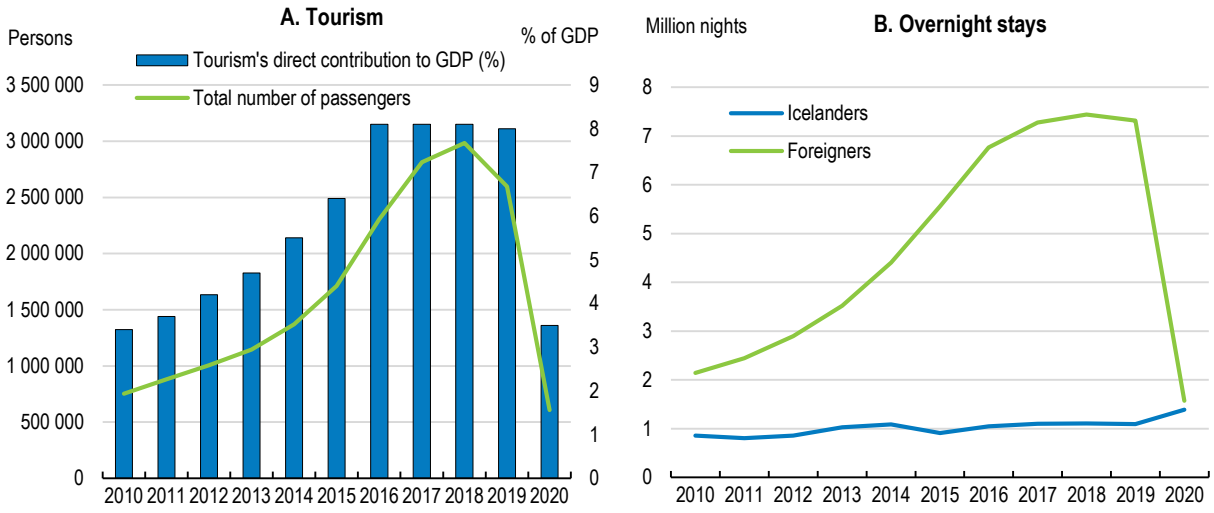
Growing domestic tourism helped offset the collapse of foreign tourism a bit. Foreign tourism started to cool in 2019 following slowing demand overseas and the insolvency of WOW Air. In 2020, the pandemic reduced foreign arrivals to around a fourth of the previous year. In turn, Icelanders almost doubled domestic trips, cushioning the blow to other services such as accommodation, restaurants and cultural activities (Figure 1.8). In addition, since travelling abroad makes up a higher share of imports than in most other OECD countries, its sharp fall made up for some of the losses stemming from the lack of foreign tourists.

Figure 1.8. Foreign tourism collapsed, while domestic travel compensated a bit



Note: Passengers who go through security at Keflavík Airport, including foreigners residing in Iceland, foreign labour leaving the country and transit passengers who go through security.
Source: Statistics Iceland.

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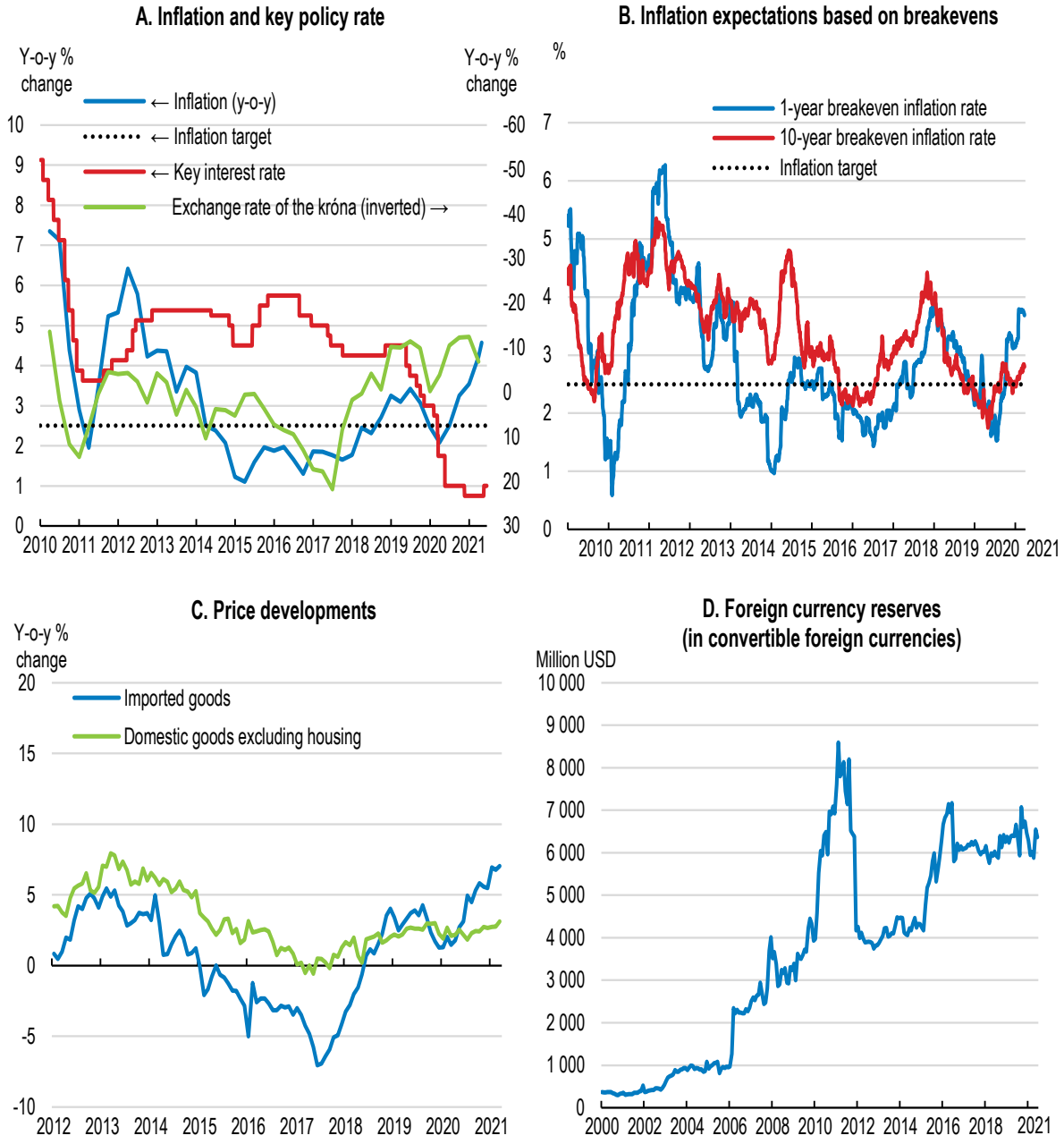
Monetary policy has been eased in response to the Covid-19 crisis

Monetary policy has been relaxed since the onset of the pandemic and remains accommodative. Mid-May the Central Bank raised the key interest rate by 0.25 percent points to 1%, but rates remain at historically low levels following the 2 percentage point reduction from March 2020 (Figure 1.9) and are lower than in the euro area in real terms. As part of a broader monetary and financial response package, monetary easing helped to counter the adverse effects of the pandemic and related containment measures on economic activity, in a context of heightened uncertainty (Box 1.2).

Inflation was around the 2½ per cent target before the onset of the pandemic but has risen since, largely because of exchange rate depreciation, but also more recently due to rising wages and house prices, soaring global commodity prices, supply bottlenecks in certain sectors and base effects. It hovered around 4¼ per cent in the first quarter of 2021 on a year-on-year basis. The króna has appreciated somewhat in recent months, and the Central Bank expects that headline inflation will ease in the near term, once the effects of the exchange rate depreciation have abated, and against a backdrop of slack in the economy. Long-term readings remain close to target, but short-term inflation expectations have risen above the target. Moreover, real wage growth has been strong, at around 6% in early 2021 year-on-year, despite the crisis-related rise in unemployment, following the 2019 collective agreements. Moving forward, monetary policy should remain accommodative, given the uncertain outlook, but the authorities are advised to monitor developments closely and stand ready to act to ensure inflation expectations remain well anchored.

Figure 1.9. Monetary policy remains accommodative



Note: Breakeven inflation rate is calculated from yield spreads between nominal and index-linked Government and Government-backed bonds (5-day moving averages). Daily data.
Source: OECD, Main Economic Indicators; Statistics Iceland; and Central Bank of Iceland.

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Box 1.2. Monetary and financial measures to deal with the Covid-19 crisis

In response to the COVID-19 pandemic, the Central Bank has taken a wide range of actions to ease the monetary stance and boost liquidity in order to shore up demand, support access to credit and preserve financial stability.

- From March to November 2020, it cut the policy interest rate in steps by 2 percentage points to 0.75%.
- Measures were taken to inject liquidity in the financial system. In March 2020 the average reserve requirement for deposit institutions was lowered from 1% to 0%. Changes were also made to the treatment of the fixed reserve requirement (1%) in liquidity rules, so that the Central Bank could allow the reserves to be used in cases of liquidity outflows. Fixed reserves now count as liquidity buffer. The countercyclical capital buffer was also reduced in March from 2% to 0%. Moreover, the Bank reduced and subsequently eliminated its offerings of one-month term deposits. These deposits had been one of financial institutions' main avenues for investing in króna-denominated liquid assets and complying with liquidity requirements, as Treasury bonds had been in short supply. The commercial banks held a large share of their liquid assets in these accounts, and interest rates on them had been somewhat above the Bank's key rate. Furthermore, a special temporary collateralised credit facility was established in April 2020 with an expanded list of eligible collateral.
- The Central Bank initiated purchases of Treasury bonds on the secondary market to meet the increase in Treasury bond issuance and ensure the transmission of monetary easing to households and businesses. These purchases have nevertheless been small.
- Since the onset of the crisis, the Bank has intervened in the spot foreign exchange market to mitigate exchange rate volatility. In 2020, the Bank's net foreign currency sales totalled Euro 825 million or 37% of total market turnover. In addition, in September 2020 the Bank launched a regular programme to sell foreign exchange in the domestic market, arguing that it should be deepened and price formation improved. The programme was discontinued in May 2021 as the króna has appreciated and the Bank assessed that equilibrium in the foreign exchange market has improved.
- Other measures included a voluntary temporary suspension of foreign exchange purchases by pension funds and the payment of dividends or equity buy-backs by financial institutions and insurance companies.

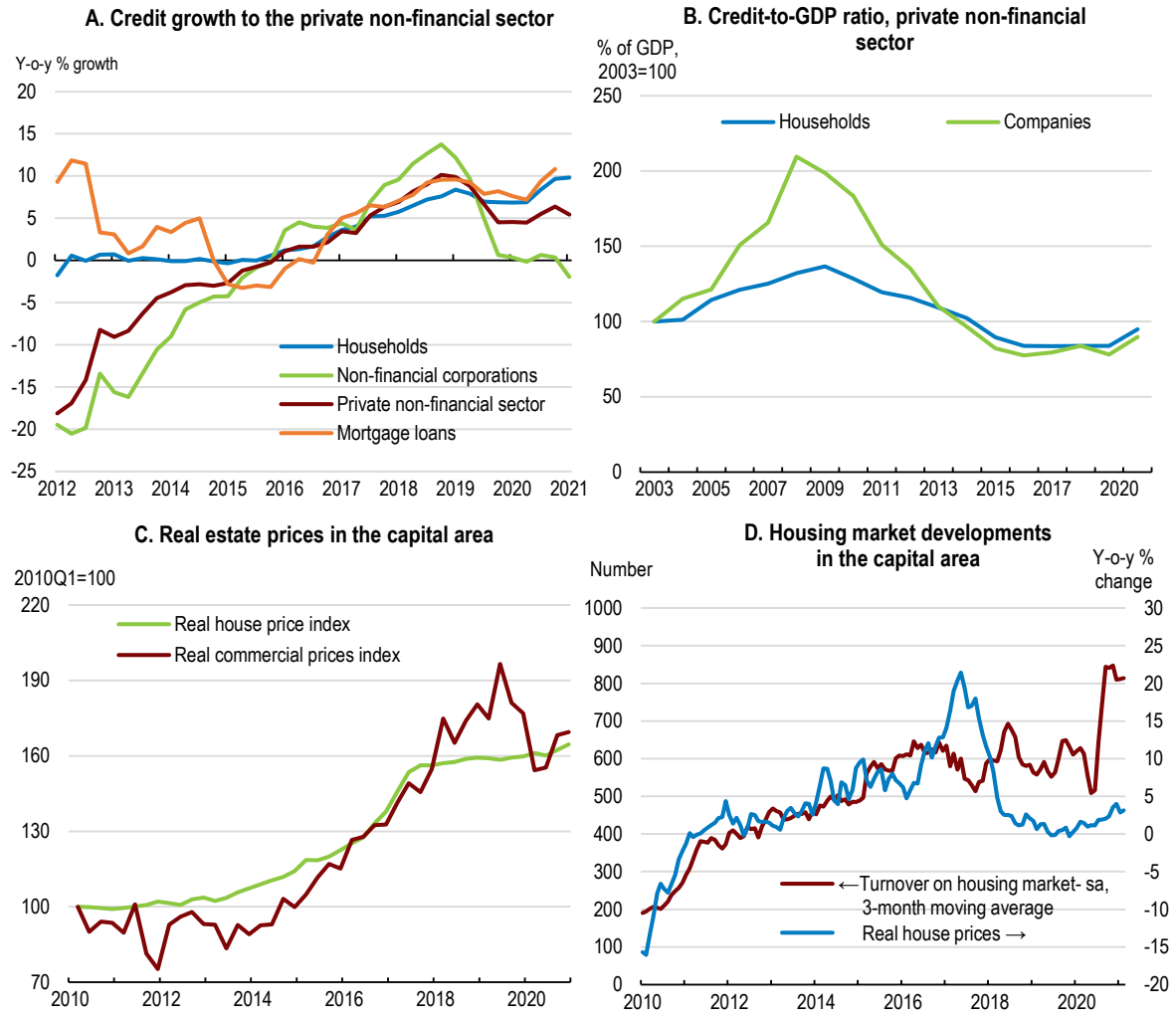
Source: Central Bank of Iceland.

The financial system is considered to be sound but vigilance is warranted

The easing of monetary conditions has benefitted households more than firms. Lending to households rose robustly in 2020, along with a surge in real estate market activity (Figure 1.10). The number of first-time buyers increased rapidly, accounting for one-third of homebuyers in the first quarter 2021, a record high (Central Bank of Iceland, 2021[2]). House price increases, however, are broadly in line with macroeconomic fundamentals, according to the assessment by the Central Bank. Housing supply increased as construction initiated by the earlier tourism boom came on stream. Better borrowing terms encouraged mortgage refinancing: demand for non-indexed mortgage loans, and the share of variable-rate loans in total lending, have increased (Central Bank of Iceland, 2021[3]). In contrast, corporate lending stagnated, possibly reflecting tighter access to credit as a result of increased risk, and/or a fall in demand for credit as the pandemic-related crisis reduced firms' risk appetite (Central Bank of Iceland, 2020[4]). Liquidity constraints are mainly a concern for companies in the tourism and personal services sector, but

related sectors, such as commercial property leasing, have also been affected. Household and non-financial corporate debt ratios to GDP have increased, in part due to the GDP contraction, but remain low by historical standards (Figure 1.10).

Figure 1.10. Households benefitted more than firms from the easing of monetary conditions



Note: Credit stock adjusted for reclassification and effects of government debt relief measures.
Source: Central Bank of Iceland; Statistics Iceland; and Registers Iceland.

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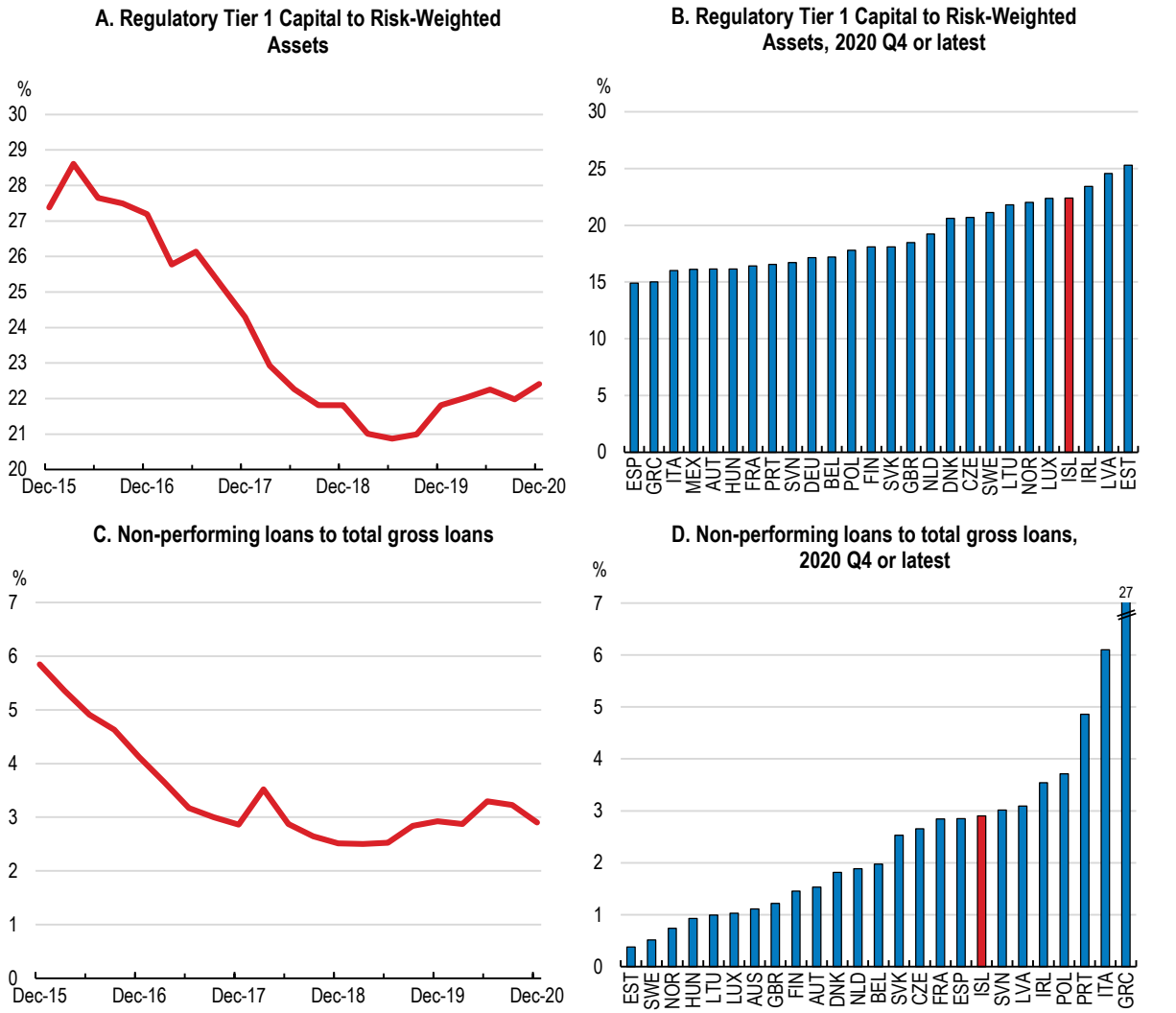
The financial system has held up well in the face of pandemic-related stress and helped to cushion the economy from the severity of the health shock through moratoria on payments and increased credit to private sector (Figure 1.10, Panel A). The overhaul of the banking sector after the 2008 crisis and increased use of macro-prudential tools have put the banking sector on a more solid footing to withstand the adverse effects of the pandemic (Figure 1.11). The recent merger of the Central Bank and Financial Supervisory Authority (see previous Survey) is expected to strengthen the overall surveillance of the financial system. The authorities consider that bank capital and liquidity buffers are strong, since adequacy ratios of systematically important banks are well above requirements and banks have ample liquidity to support the economy. Loan-to-value ratios and debt service ratios on new bank loans have fallen, despite an increase in banks' share in the household mortgage market at the expense of other lenders (Central Bank of Iceland,

2021[5]). Indicators of credit quality are generally positive. Despite renewed buoyancy, the real estate market is not expected to pose risks for financial stability in the near term, though close monitoring needs to continue (Figure 1.10). The crisis may pose longer-term challenges to real estate market related to changes in habits and work practices associated with the increase in teleworking, which may shift demand durably, affecting especially commercial property.

Figure 1.11. The banking sector appears sound



Source: IMF, Financial Soundness Indicators database.

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Several measures have been taken to support access to credit and preserve financial stability. Reserve requirements have been relaxed, along with countercyclical capital buffers, and quantitative easing coupled with interventions in foreign exchange markets have helped to ease monetary conditions (Box 1.2). In particular, the easing of the countercyclical capital buffer from 2% to 0% in March 2020 provided commercial banks room to lend even as they restructured loan portfolios.

The COVID-19 crisis still poses challenges, warranting vigilance. The impact of the pandemic on financial institutions' balance sheets requires close attention, even if the banking system appears to have entered the crisis in a strong position. The average non-performing loan ratio, for example, rose slightly from 2.6%

at end-2019 to 2.9% at end-2020. Nonetheless, some early indications of increased credit risk can already be observed. For instance, the share of "non-performing" corporate loans, based on a very prudent methodology (i.e. loans past due by over 90 days, frozen or deemed unlikely to be paid) jumped from around 5% at end-2019 to 18½ per cent in early 2021, with the tourism sector recording the highest share (Central Bank of Iceland, 2021[6]). This mainly reflects the fact that many loans previously protected by special pandemic-related payment deferrals are now considered non-performing, according to this methodology (Central Bank of Iceland, 2021[3]). If the recovery is weak, or the pandemic-related shock persists, some vulnerable firms may become insolvent and non-performing corporate loans may increase further. Going forward, it is advisable to maintain liquidity support for distressed firms that are deemed viable, until the recovery is well-established. The share of non-performing household loans rose marginally between end-2019 and early 2021 but remains low at around 3%. However, with variable-rate instruments now comprising a relatively high share of housing loans, household budgets have become sensitive to interest rate rises, thereby increasing risks (Central Bank of Iceland, 2020[4]).

The previous OECD Economic Survey recommended to go ahead with privatisation plans in the banking sector. Two of the three commercial banks that represent approximately 97% of the deposit money market, and which are considered systematically important institutions, are state-owned. Privatisation has started to be implemented, with the sale of 35% of Íslandsbanki in June 2021. Appropriate post-privatisation ownership and management are essential to minimising risks in the future.

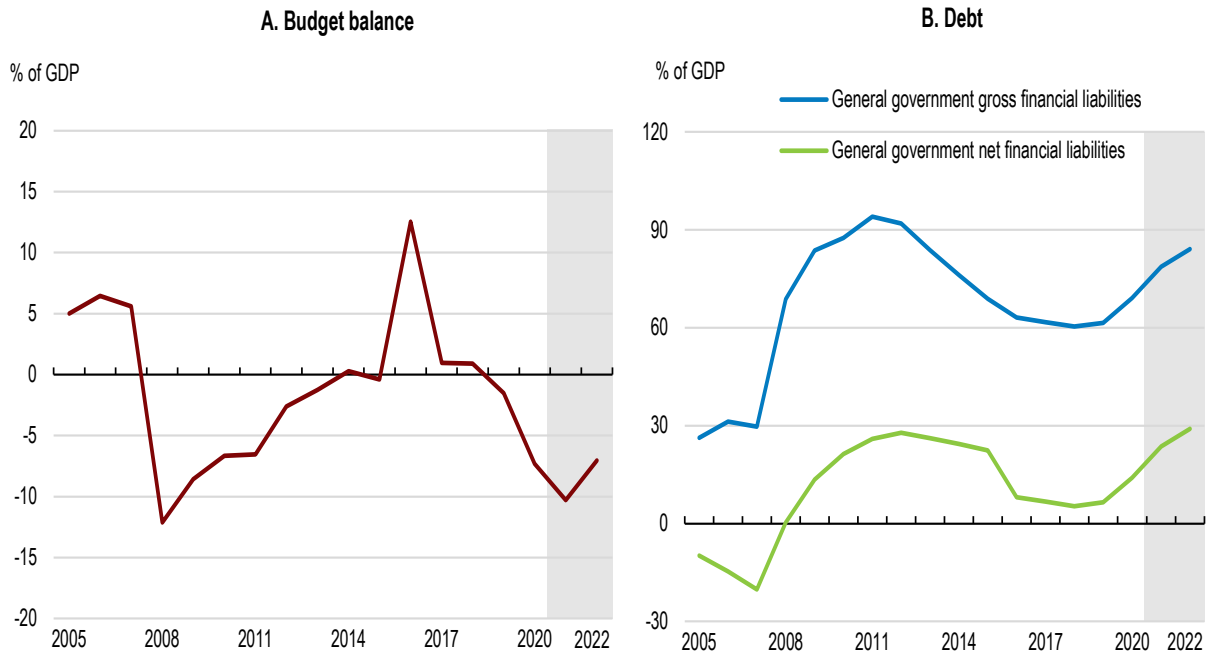
Iceland made considerable progress over the past few years towards strengthening its anti-money laundering and counter-terrorist financing (AML/CTF) regime, following the publication of the 2018 Financial Action Task Force (FATF) Mutual Evaluation Report (FATF, 2018[7]). To that effect, actions have been taken to enhance supervision related to both financial institutions (supervised by the Central Bank) and designated non-financial businesses or professions (supervised by the Directorate of Internal Revenue). The Central Bank currently conducts systematic risk assessment on approximately 80 entities under its supervision ("obliged" entities) to ensure implementation of targeted financial sanction obligations through extensive supervisory engagement. Resources allocated to combatting AML/CFT have been considerably increased over the past two to three years. Cooperation and co-ordination between relevant competent authorities in the AML/CFT field has also been enhanced and a Steering Committee was appointed as the national co-operation and co-ordination mechanism. A National Risk Assessment on money laundering and terrorist financing is now published every two years, followed by an action plan responding to the threats and weaknesses. Furthermore, the Central Bank has increased its focus on guidance to raise awareness among the obliged entities of AML/CFT risks. The November 2020 follow-up report of the Financial Action Task Force (FATF) has rated Iceland as "compliant" or "largely compliant" in 37 out of 40 priorities areas, and "partially compliant" in the remaining three, including those related to virtual assets and virtual asset service providers (FATF, 2020[8]). Iceland is committed to continuing to work with the FATF to improve its AML/CTF regime further.

Fiscal policy is supporting the economy

Like in most countries, the fiscal position deteriorated because of the pandemic-related support programmes and the working of automatic stabilisers (Figure 1.12. A). The 2020 general government budget deficit amounted to 7.3% of GDP, with automatic stabilisers and discretionary COVID-19 measures each accounting for around half of the deficit increase. Gross public debt rose to 69% of GDP, still below the peak reached after the 2008/09 financial crisis, while net public debt, accounting for government assets, remains below 30% of GDP. The short-term work scheme was the largest programme in financial terms, supporting employment especially during spring 2020 (Figure 1.5B). Specific support was directed at firms that had lost more than 40% of their turnover, mainly in the tourism and aviation industry. Contingent liabilities, mostly related to state guarantees for the Housing Fund, continued to decline from 75% of GDP

in 2014 to 32% at the end of 2020. The recent revision of national government financial statistics for the years 1998-2019 has reclassified most contingent liabilities as general government debt.

Figure 1.12. Fiscal policy is supporting the economy



Note: Reflecting differences in the treatment of public entities, contingent liabilities and pension funds, government debt may differ between National Accounts and Statistics Iceland.
Source: OECD, National Accounts database; OECD Economic Outlook database No. 109; and Statistics Iceland.

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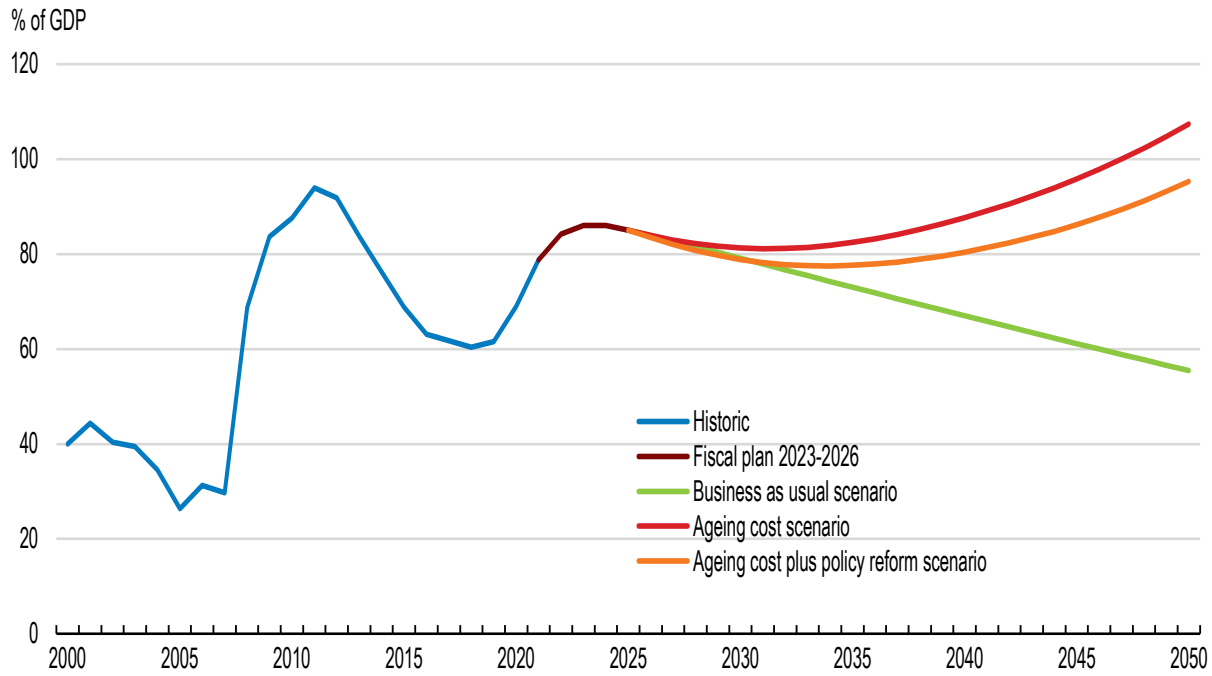
The authorities reacted boldly and flexibly to mitigate the crisis, but have also set out a trajectory to bring public finances back on a sustainable path once the recovery is under way. In Autumn 2020, the parliament suspended the numerical fiscal rule first until 2022 and then until 2025, and approved a new five-year fiscal plan through 2025. In May 2021, it endorsed an updated fiscal plan running through 2026. According to the fiscal plan, the general government budget deficit is expected to reach 11.4% of GDP in 2021 and then to decline by around 2.5% annually until 2025, when it is expected to reach 1.6% of GDP. Gross public debt according to the National Accounts definition should stabilise in 2025 at 100% of GDP, while net debt is expected to remain considerably below, in view of large government assets (Figure 1.12. B).

Fiscal policy should continue to support vulnerable firms and households until the recovery is well underway, while avoiding that public debt climbs to unsustainable levels. With the health situation improving, restrictions gradually easing and many households waiting to draw down savings, demand growth is expected to resume. Going forward, ageing costs could push up debt to unsustainable levels, while policy reform to contain spending, in particular in the disability benefit system, could help contain further debt increases (Figure 1.13). Support for firms should be phased out when the recovery has been sustained (OECD, 2021[9]). Structural reforms should accompany fiscal support measures to speed up the recovery.

Figure 1.13. Adjustments will be required to stabilised the debt ratio over the longer run

Debt evolution under different scenarios



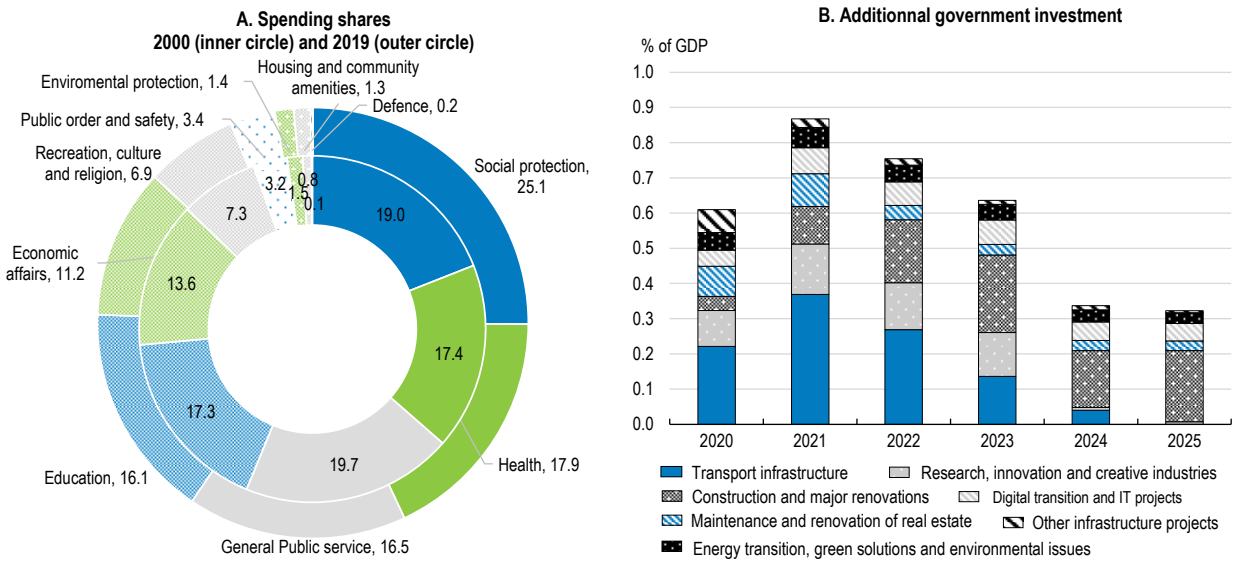
Note: Debt projections until 2026 follow the fiscal plan as published in March 2021. The business as usual scenario assumes a primary balance of 0.7% of GDP and the age structure of the population remaining the same. The "ageing cost scenario" adds public health, long-term care and pension spending obligations on top of the business as usual scenario. The "ageing cost plus policy reform" scenario reflects a reduction of disability benefits with positive growth and fiscal effects as shown in boxes 1.4 and 1.5. Calculations are based on Guillemette et al. (2017). Debt is defined according to OECD National Accounts.
Source: OECD Economic Outlook database No. 109; and OECD calculations.

StatLink https://stat.link/dsyitz

Spending reforms should address long-standing weaknesses of public finance

The quality of spending has gradually declined over the past 15 years, exerting a drag on growth as described in the previous OECD *Economic Survey* (OECD, 2019[10]). In particular, the disability benefit system has grown from 4.8% to 7.4% of public spending between 2000 and 2015, driven by a rising incidence of mental health disorders among young claimants (Figure 1.14). The system reaches almost 9% of the working-age population. Also subsidies remain high, covering around 3.5% of public spending, with agriculture absorbing around half of all subsidies. On the other hand, ageing costs are still low thanks to a young population, a high retirement age and a well-funded pension system. Against this background, the government should reform the disability benefit system, putting more emphasis on returning to and remaining in work. Also, the government should cut subsidies, especially in agriculture. The government's plan to increase spending on infrastructure, digital transition, green transition, and research and development by around 0.5% points of GDP per year is welcome.

Figure 1.14. Spending quality will improve as public investment is stepped up



Source: Statistics Iceland; and Ministry of Finance.

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Spending reviews can both help keep expenditure in check and foster the effectiveness of public service delivery. The government made progress by carrying out spending reviews in the areas of education, elderly care and disability, building on earlier exercises in the Ministries of Justice and of Industry and Innovation, which is welcome. The Ministry of Finance and Economic Affairs is in the process of establishing a specific unit to carry out such reviews, and assists those who participate. Against this background, spending reviews should become a routine part of the budget process, as planned by the government. Regular and thorough spending reviews as in the Netherlands or the United Kingdom would help address issues raised in the thematic chapter of the previous OECD *Economic Survey* (OECD, 2019[10]).

Table 1.3. Past recommendations and actions taken in monetary, financial and fiscal policies

Monetary and financial policies	
Key recommendation	**Actions taken**
Adjust interest rates in line with inflation developments.	The central bank gradually cut the policy interest rate from 4.5% in mid-2019 to 0.75% in November 2020. It increased the rate again to 1% in May 2021.
Proceed with privatisation plans.	The Government has sold 35% of its share in Íslandsbanki in June 2021.
Complete the reform of the financial sector, while ensuring that regulatory and operational functions remain separated.	The reform was completed.
Fiscal policy and public finance	
Follow the deficit rules of the fiscal framework. Reduce debt further.	The measures to address the economic impact of the COVID-19 pandemic caused deficits and debt to rise. The fiscal rules have been temporarily suspended. The government plans to halt the rise in the debt-to-GDP ratio by 2025.
Apply more stringent cost-benefit analysis.	New legislation on public investments is being drafted. A working group is preparing a new framework for cost-benefit analysis for public investment projects.

Raise investment in transport, energy and digital infrastructure.	The government will increase investment by around 0.5% points of GDP.
Introduce road pricing for demand management and funding of transport infrastructure.	A working group is preparing proposals for use-related car taxation.
Reform the disability system by shifting the focus from paying benefits towards return to work.	In light of the pandemic, steps have been taken to foster return to and remaining in work.
Tighten eligibility criteria while offering more support for remaining employed.	Some steps were taken to support employment during the pandemic.
Extend spending reviews to core policy areas like education or health care, relying on international experience.	Three spending reviews are being carried out in adult education, elderly care and social welfare. The spending review methodology is being developed in line with international experience and spending reviews are to become annual.
Strengthen the role of the fiscal council and possibly merge it with the national accounting office.	No action taken.

Tax reforms benefit low-income earners, innovative firms and the environment

Iceland's tax burden is above the OECD average, and close to the average of the Nordic countries if the compulsory contribution of 15.5% of wage income to the private second-pillar pension funds is accounted for (Figure 1.15 A). As in the other Nordics, Iceland's tax system is geared toward income taxation. Following the gradual decline and then abrupt fall of the economy since 2019, tax revenues dwindled both in absolute terms and as a share of GDP (Figure 1.15 B). Recent reforms to income taxation made the system more innovation-friendly and reduced tax pressure, especially for low-income households (Box 1.3).

Box 1.3. Overview on recent tax reforms

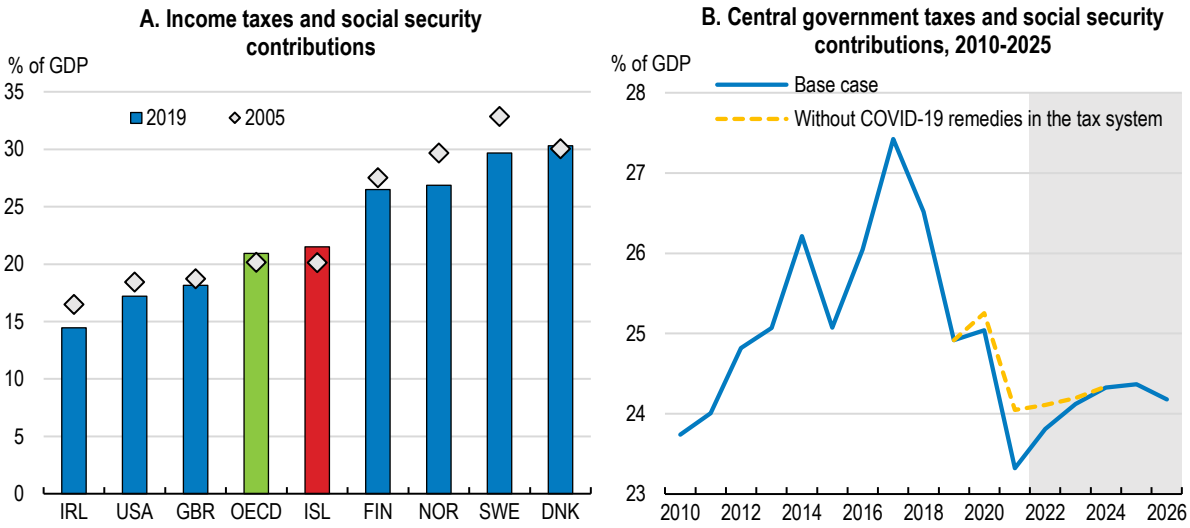
The government has been active in the area of taxation and passed several reforms over the past two years, mainly to reduce tax pressure on low-income households:

- *Personal income taxes*. The government implemented the third and last stage of a tax reform started in 2019. Tax rates on low and medium incomes were reduced by up to 5.5 percentage points, and a third tax bracket was created. Thresholds and brackets will be adjusted in line with productivity and inflation developments. Social security contributions were reduced further. The government is taxing pension savings that households were allowed to withdraw during the pandemic.
- *Corporate income taxes.* Temporary legislation allows companies to apply a higher depreciation rate to "green" assets for the years 2021-2025. Environmentally-friendly company cars can be fully depreciated in the year of acquisition. The annual ceiling on qualifying R&D expenditure was raised and different tax credit rates for SMEs and large firms introduced, at 35% and 25% respectively.
- *Value-added tax*. In 2020 the government introduced a number of VAT reliefs for environmentally-friendly transport modes, to be phased out in 2023. The VAT revenue ratio, i.e. the ratio of VAT collection to what could be collected if a uniform VAT rate were applied to all consumption, is at 55%, the lowest among the Nordic countries and slightly below the OECD average.
- *Environmental taxes.* In 2020, the government introduced a tax on fluorinated carbons, thereby broadening carbon taxation. There are no plans yet to increase carbon tax rates further. A tax on landfills has been postponed.

Source: OECD Tax Policy Questionnaire 2021.

COVID-19-related temporary tax relief will further reduce tax revenues in 2021, in particular extended VAT reimbursements for construction projects and a deferral of the hotel accommodation tax. VAT tax expenditures, especially in the tourism sector, contribute to the below-average VAT revenue ratio and should be cut.

Figure 1.15. Tax revenues declined



Note: Income taxes and social security contributions do not include contributions to private pension funds.
Source: OECD Revenue Statistics database; Statistics Iceland; and Ministry of Finance.

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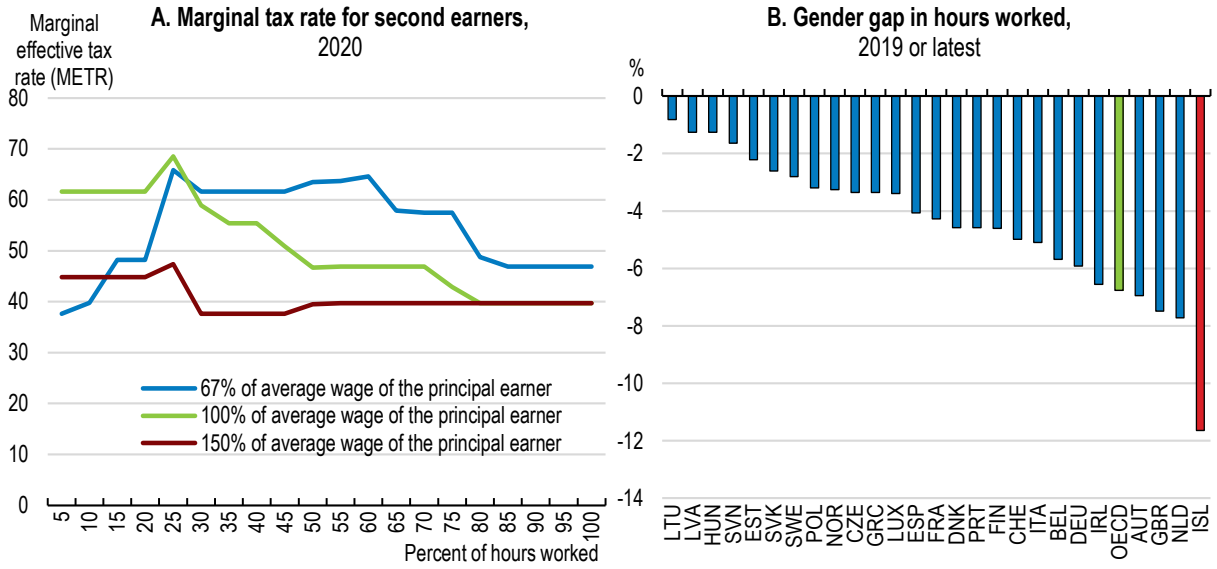
Social benefits are well targeted but tend to penalize second earners, often women

Iceland's tax-and-benefit system is well-targeted (OECD, 2020[11]). Most social benefits, including family and pay-as-you go pensions, are means-tested, and income taxation is progressive, supporting low-income households. The flipside of such a targeted system is that it results in high marginal tax rates, discouraging second earners, often women, from working longer hours (Figure 1.16 A). Although the gap in hours of (paid) work between men and women has been falling over the past two decades from a high level (Olafsdottir, 2020[12]), it remains the widest in the OECD (Figure 1.16 B). High marginal tax rates could have slowed the path towards reducing the gender gap in hours worked. Despite the recent income tax reforms, low-income earners still face high marginal tax rates if working more than around 20% of full time. The 2021 reform of parental leave, extending benefits and encouraging a more equal division of childcare, is welcome as it will reduce the gender gap further (Work in Iceland, 2021[13]). Against this background, the government should continue to reduce work disincentives for second earners, for example by tapering child and family benefits less.

Figure 1.16. High marginal tax rates discourage second earners, often women



Note: Panel A: Marginal effective tax rate (METR) is computed according to the following formula $= 1 - \frac{\Delta y \ net \ earnings}{\Delta y \ gross \ earnings}$. Panel B: Percentage point difference in hours worked between men and women in full-time dependent employment. Data for Australia refer to 2018.
Source: OECD, Tax-Benefit model; and OECD, Labour Force Statistics database.

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Implementing the fiscal recommendations from this Survey would slightly deteriorate the budget balance in the medium term (Box 1.4).

Box 1.4. Quantifying fiscal policy recommendations

The following estimates roughly quantify the fiscal impact of selected recommendations within a 5-10 year horizon, using simple and illustrative policy changes. The reported effects do not include behavioural responses.

Policy measure		Impact on the fiscal balance, % of GDP
Deficit-increasing recommendations		
Lower tax rates for second earners	Reduce marginal tax rates for second earners by 5 percentage points	-0.4
Spending on infrastructure, digital transition, green energy and innovation	Implement the government investment programme as planned	-0.5
Deficit-reducing recommendations		
Less spending on disability benefits	Reduce spending on benefits by one-half of the increase since 2000 (from 3.1% to 2.6% of GDP)	+0.5
Fewer agricultural subsidies	Reduce agricultural subsidies by 0.3% points of GDP (one fifth of current level)	+0.3
Total fiscal impact		**-0.1**

Policies to increase productivity and employment

Competitiveness has improved but is at risk

Competitiveness improved in the late 2010s, with productivity accelerating and wages slowing. Even so, productivity growth has been sluggish over the past decade. The competitiveness gains achieved after the 2008/09 crisis, owing to the devaluation of the króna and deep cuts in real wages, are exhausted by now (Figure 1.17 A). Productivity growth was rather weak in the network industries such as electricity generation, and average in employment-rich but productivity-poor services such as tourism (Figure 1.17). Against this backdrop, structural reforms in these and other sectors recommended in this *Economic Survey* could help raise productivity and employment (Box 1.5).

Box 1.5. Quantification of structural reforms

Selected reforms proposed in the Survey are quantified in the table below, using simple and illustrative policy changes and based on cross-country regression analysis. Other reforms, including in the areas of education or environmental policy, are not quantifiable under available information or given the complexity of the policy design. Most estimates rely on empirical relationships between past structural reforms and productivity, employment and investment, assuming swift and full implementation, and they do not reflect particular institutional settings in Iceland. Hence, the estimates are merely illustrative, and results should be taken with caution.

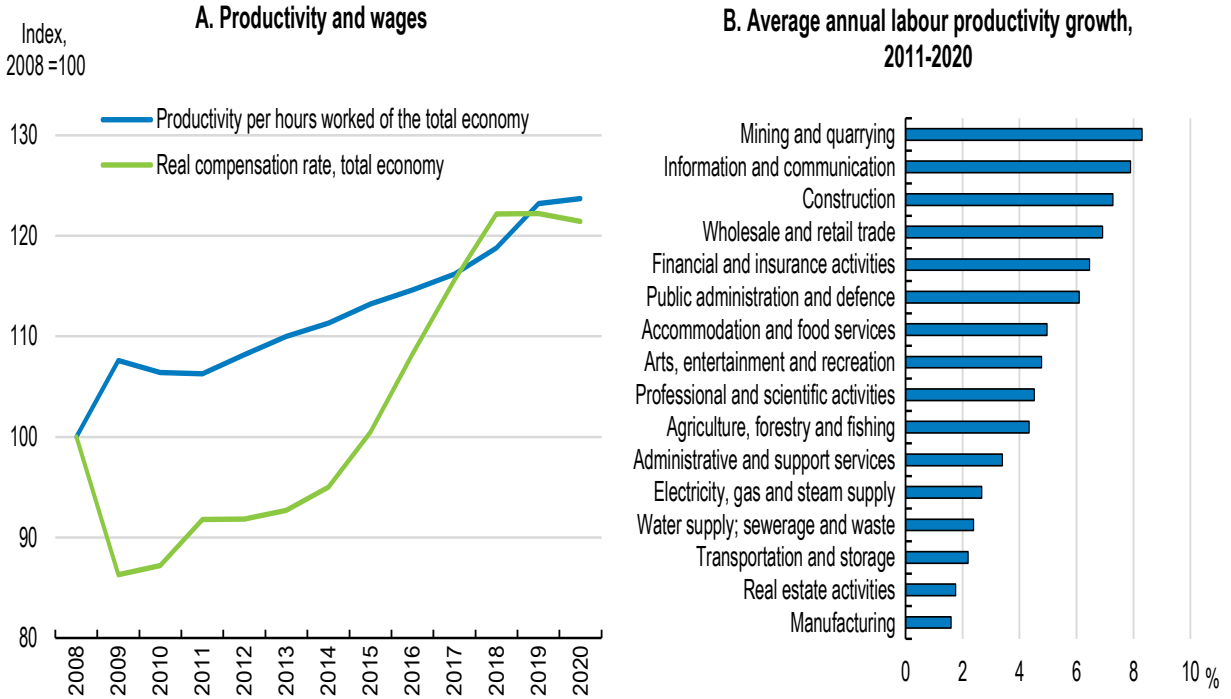
Table 1.4. Potential impact of structural reforms on per capita income

Policy	Measure	10-year effect, %
Higher trade openness	Lift trade openness by 5% points of GDP	1.6
Competition reform	Implement the OECD competition review recommendations for the tourism and construction sectors	1.0
Reform the electricity market	Separate ownership of generation, transmission and distribution of electricity completely, and fully open the wholesale market	0.8
Lower tax rates for second earners	Reduce marginal tax rates for second earners by 5% points	1.1
Better control of corruption	Increase control of corruption to Iceland's average level reached over 2010-16	0.0 - 1.4
More public investment on infrastructure, digital and green transition, and innovation	Increase public investment by 0.5% points of GDP as planned	1.5
Less spending on disability	Reduce spending on benefits by half the increase since 2000 (from 3.1% to 2.6% of GDP)	0.4
Fewer agricultural subsidies	Lower agricultural subsidies by one fifth or 0.3% of GDP	0.6

Note: The recommendation to increase carbon taxes is included in the fiscal quantification (Box 1.3), but its impact on GDP cannot be quantified.
Source: OECD calculations based on (Égert and Gal, 2017[14]) (Cournède et al., 2018[15]) and (OECD, 2020[16]).

Trend wage growth has been slowing notwithstanding an acceleration of real wages in 2020 (3.4% against 1.8% in 2019), partly thanks to the 2019 wage agreements that coupled future wage increases to GDP per capita developments. The agreements contributed to weather the economic consequences of the pandemic, helping to support purchasing power of low-income earners. Even so, productivity would be a better anchor for maintaining competitiveness and macroeconomic stability while ensuring that growth continues to benefit all. Against this background, the 2016 wage bargaining reforms in Finland, which link wages more tightly to productivity developments, could serve as a model for the social partners in Iceland once the recovery is firmly on its way (OECD, 2018[17]).

Figure 1.17. Competitiveness has improved but productivity growth is low in some sectors



Note: In panel B, labour productivity is defined as gross value added per hour worked and expressed in ISK.
Source: OECD, Economic Outlook No.109 database; and Statistics Iceland.

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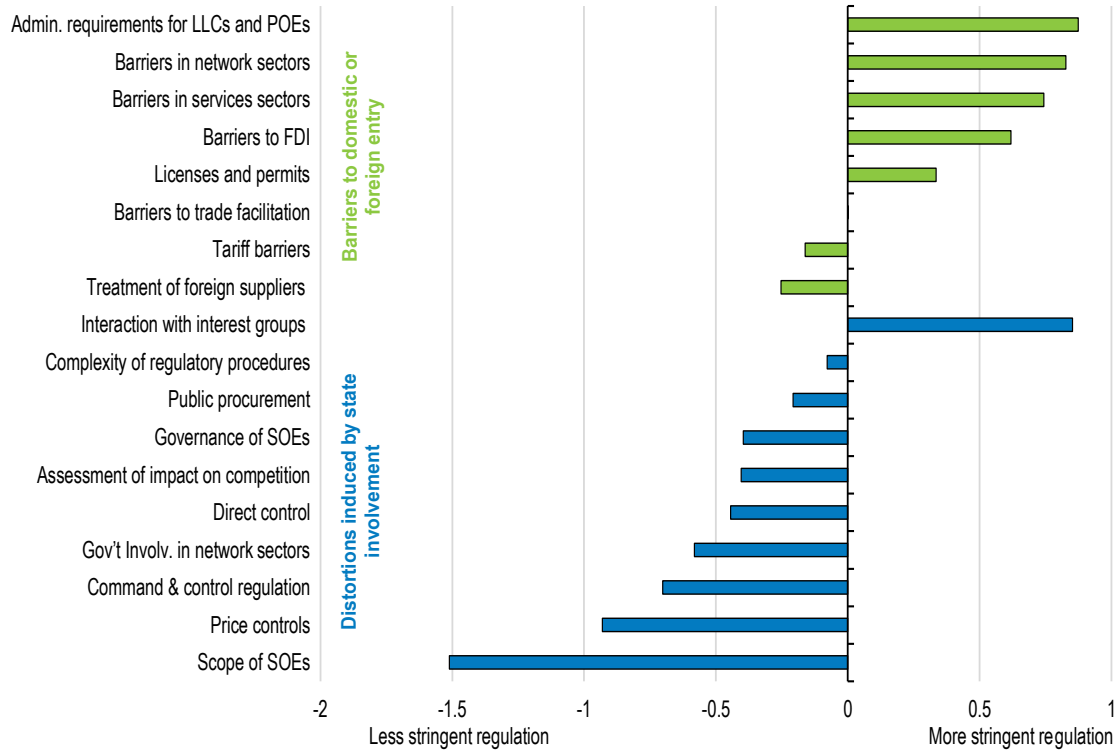
Stringent regulation stifles competition

The stringency of Iceland's product market regulation is close to the OECD average, but with wide differences between areas (Figure 1.18). While the state sector is small and well run, barriers to entry are high for both domestic and foreign firms, hampering sound competition. Considerable administrative burdens for new companies, and an extensive licensing and permit system, protect incumbents and slow new and innovative start-ups. Finally, close and potentially unchecked ties between the political sector and interest groups, raise the risk of distortive lobbying activities. Iceland should foster an open and competition-friendly environment and ensure a strict separation between public and private interests. The recent introduction of cooling periods between the civil service and interest groups is welcome.

Figure 1.18. Barriers are high for firms to enter the market

Product market regulation, gap with OECD average, 2018



Note: Negative bar values reflect less stringent regulation; positive bar values reflect regulation that is more stringent. Green bars belong to the high-level indicator "Barriers to domestic and foreign entry", while blue bars belong to the high-level indicator "Distortions induced by state involvement". LLCs refer to Limited Liability Companies and POEs refer to Personally-Owned Enterprises.
Source: OECD, Product Market Regulation database.

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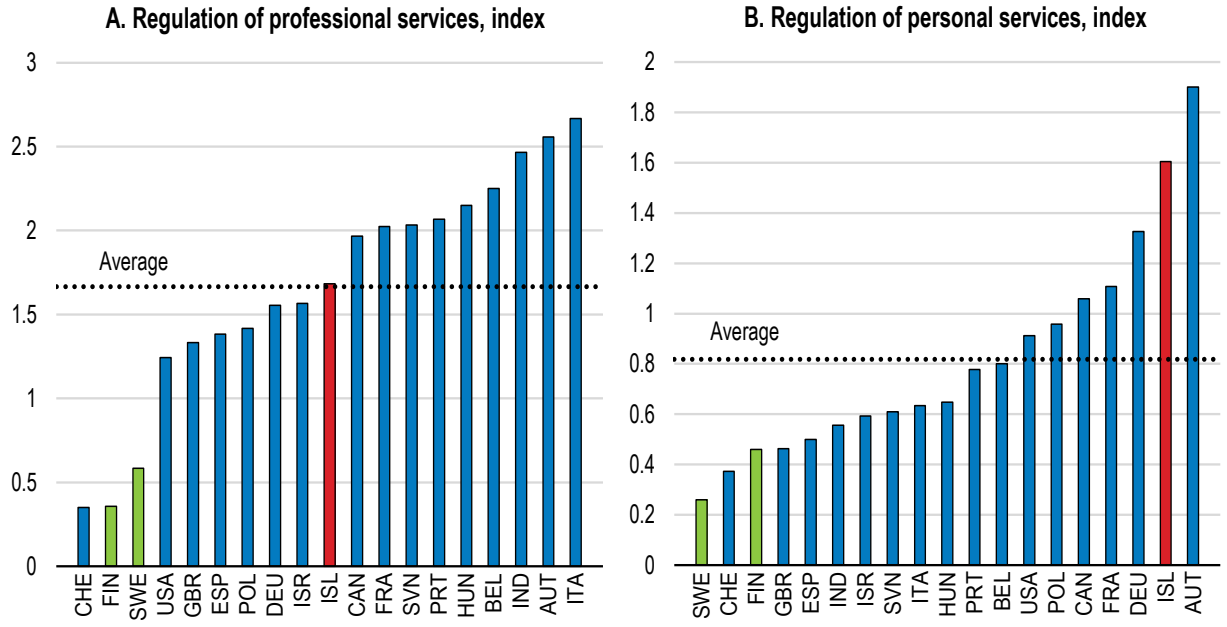
A recent OECD Competition Review assessed regulation in two sectors, namely tourism and construction, to prepare policy reforms for a more pro-competitive regulatory framework (OECD, 2020[16]). These two sectors are key pillars of the Icelandic economy, together representing around 17% of GDP and 23% of employment.

- The main recommendation for the tourism sector is to overhaul the inefficient and costly airport ownership and operation scheme. Since competition between airports is hardly possible in Iceland, airport operation should be subjected to tendering, and airport tariffs should be regulated properly. The report also proposes revising the concessions of commercial activities to improve productivity in ancillary services, including bus transport, at Keflavik International Airport. Finally, the report suggests easing the regulation for tour operators and taxis.
- Recommendations for the construction sector include a targeted easing of planning and building regulations, especially to address a burdensome permit process and ease some building materials regulations that raise costs without improving building quality. Moreover, the broad and restrictive occupational licensing framework in the two sectors should be eased, to allow new jobs to be created (see below).

The report identifies more than 670 individual regulations slowing competition, and finds that removing or amending them could raise Iceland's GDP level by around 1%. In spring 2021, the government presented parliament with a bill to cut the administrative burden in the restaurant and car rental sectors. Against this background, the government should assess the impact of regulation in other sectors, especially agriculture and energy, and abolish harmful regulation.

Regulation of professional and personal services is tighter than in most OECD countries (Figure 1.19). Professionals are not allowed to operate any manual trade without a licence. Many activities require multiple professional designations, compounding the burden on professional entrants especially in the construction sector (OECD, 2020[16]). Foreign professionals, even from the European Economic Area, need to pass additional exams in Icelandic. While occupational licensing may respond to policy objectives such as health and safety, restrictive access to professions may slow employment and productivity and stifle the transition towards a more innovative economy. The government should remove the regulation of services if no compelling reasons to maintain restrictions exist, while addressing concerns such as consumer protection through relevant legislation.

Figure 1.19. Regulation of professions is stringent



Note: A higher index value reflects more stringent regulation. A value of 0 indicates the absence of regulations, 6 reflects a fully regulated market. Dotted lines show the OECD average. Regulations for Canada and the United States represent the unweighted average of province/state level regulations.
Source: (von Rueden and Bambalaite, 2020[18]) Measuring occupational entry regulations: a new OECD approach.

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Foreign direct investment is restricted, partly explaining its low share in GDP (see chapters 2 and 3). Legislation, going back to the 1990s, limits investment of foreign companies domiciled outside of the European Economic Area in the fishing as well as in the energy and aviation industry. More generally, foreign investment may be "blocked" if it is deemed to reduce competition or to have a detrimental effect on the domestic economy, although this provision has never been used. Half of the board and the CEO of corporations need to be resident in Iceland or European Economic Area (EEA) member countries. Access for foreign companies to public procurement is open, yet onerous regulation on auditing favours locally

licensed auditors. Finally, investment in real estate for non-nationals is restricted. The telecom market, in contrast, is very open. Against this background, the government should further ease restrictions on foreign direct investment in sectors where there are no compelling reasons to maintain them.

Regulation in the network sectors, especially in electricity provision, is restrictive, limiting the potential of the sector's ability to deliver on the sector's innate comparative advantages. Iceland's electricity generation is physically separated from European or North American transmission networks, giving considerable market power to domestic electricity providers (and creating almost insurmountably high barriers for foreign providers). Projects to build an energy transmission cable to the United Kingdom have been aborted. Since 2003 Iceland follows the minimum regulatory requirement of the European Union to unbundle generation, transmission and distribution of electricity, yet the market remains dominated by a few mostly public players. Against this background, the government should improve the regulatory framework in the power market, particularly by separating ownership of generation, transmission and distribution companies and by fully opening the wholesale market.

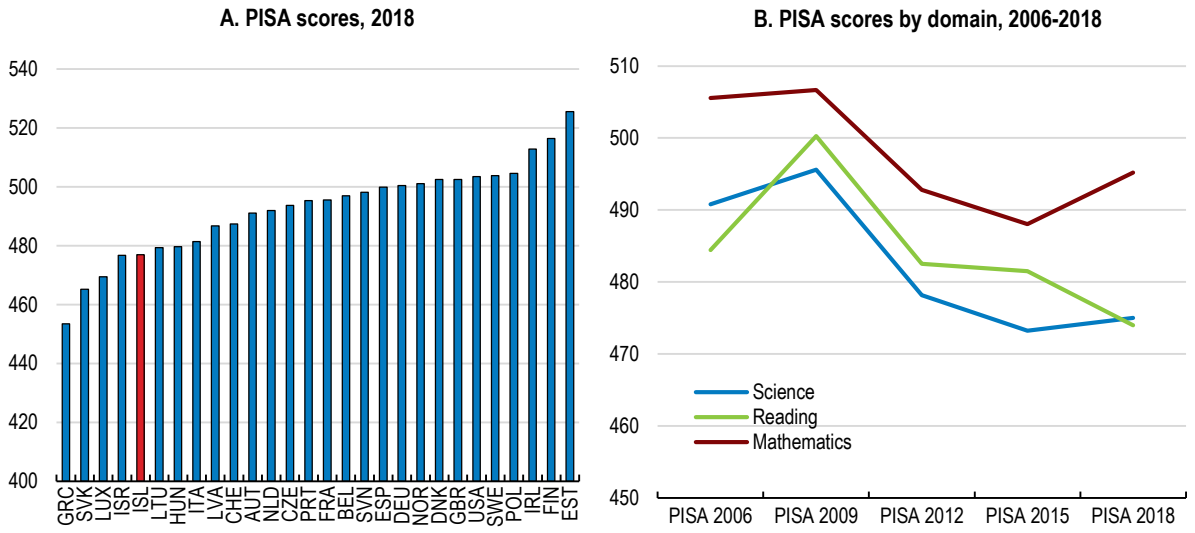
Addressing skills gaps is key

The pandemic highlighted the need to reallocate labour more rapidly and to strengthen skills in line with labour market needs. The transition towards a more digital and low-carbon economy, and the demographic pressure also require skills to be transferable to new activities. The government started to address these new challenges. Universities and schools, under joint guidance of the education and labour ministries, have developed re-skilling courses in sectors with labour shortages, especially for technicians, craft, and health care workers. The government also strengthened programmes to improve language skills of immigrants. Research funds allocated to innovation were increased, with a larger number of students working on projects undertaken jointly by universities and firms, likely fostering relevance. Finally, the government has started to compile skills forecasts.

Still, deep-reaching education and skills reforms are needed to prepare Iceland for the longer-term economic transition challenges:

- Primary and secondary education, as reflected in PISA scores), remains weak (Figure 1.20). Boys' reading skills are weaker than girls', and the gap is wider than in other Nordic countries. The gap between native and immigrant students is also larger than in most Nordic peers (OECD, 2019[19]). The 2015 national literacy strategy and a new teacher competency framework developed in 2017 have yet to deliver tangible results. While Iceland's education system is remarkably equitable, social recognition for teachers is lower than in many other OECD countries, teacher qualifications have been declining, and the salary and compensation system provides few rewards for experience and performance in the classroom. Against this background and as recommended in the previous OECD *Economic Survey*, the government should improve the compensation system to attract high-quality teachers, reward them better for excellence, and adapt the curriculum to pupils' capacity and needs.
- Tertiary education is little oriented towards labour market needs, inducing skills mismatch. Participation in science, technical, engineering and mathematical (STEM) courses, especially in digitalisation where labour market demand is highest, remains below potential needs. The funding system makes it attractive for universities to focus on enrolment rather than performance, prompting a bias towards inexpensive courses and popular studies. Public funding predominates, although collaboration between universities and the private sector is improving. Against this background, university funding should be more tightly linked to performance and labour market outcomes as in Denmark (Box 1.6).

Figure 1.20. Basic skills are relatively weak



Note: In panel A, bars reflect the simple average of science, reading and mathematics scores.
Source: OECD, PISA 2018 database.

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Box 1.6. The Danish university funding reform

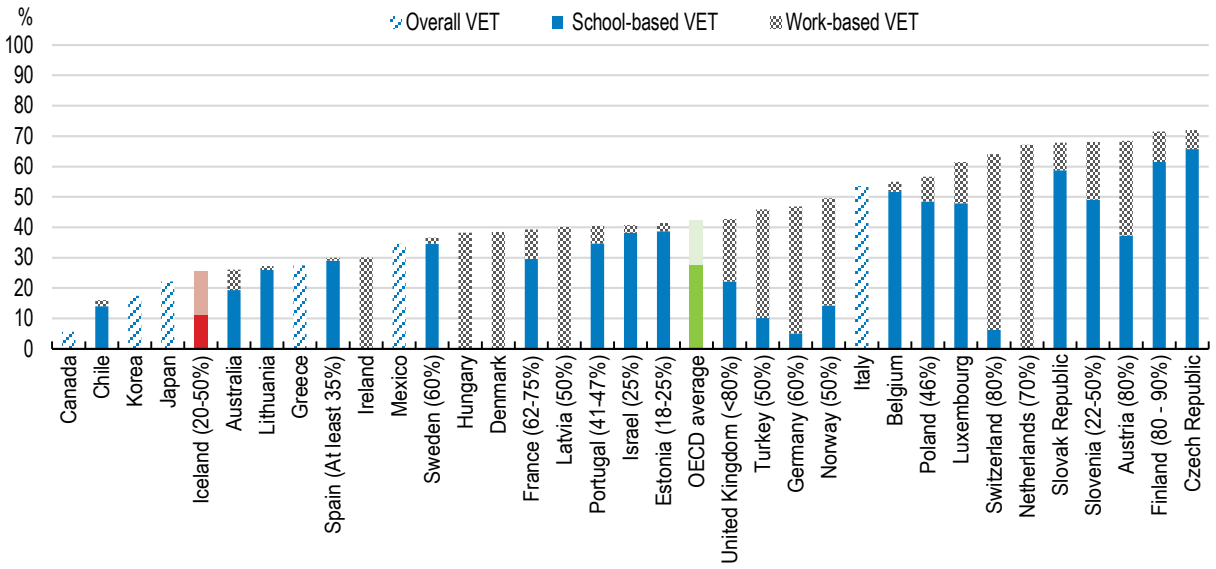
Like Iceland, Denmark is facing difficulties to meet labour demand for certain skills. Skills shortages appear in various knowledge areas such as education and training, mathematics and computer and electronics. While the share of the adult population with tertiary education is slightly above the OECD average, fewer students are choosing STEM as their field of education than in other OECD countries. The share of firms facing difficulties in filling vacant positions of ICT specialists is among the highest among OECD countries.

Against this background, the government launched an initiative to encourage students to choose study fields that are in line with their abilities, to complete education in a reasonable time, and to focus on occupations in high demand. An agreement was passed in December 2017 to reform university funding based on quality and outcomes of students. Funding will be based for 25% on the present budget level, for 67.5% on activity (number of courses offered) and for 7.5% on a labour-market outcome-oriented allocation. The Government also launched a Technology Pact, aiming to raise the number of STEM graduates in collaboration with companies, educational and research institutions.

Source: (OECD, 2019[20]).

Vocational education and training (VET) needs to be strengthened. After compulsory education, only 25% of secondary students embark on vocational education, less than in any other European OECD country (Figure 1.21). While the VET system has a strong firm-based or apprenticeship component, especially in the traditional technical and crafts professions, school-based and work-based learning are still weakly integrated. Against this background, extending work-based learning to service sectors such as digital technology or tourism could help strengthen labour market relevance. Offering more work-based learning opportunities could also help address the dropout challenge, given that Iceland has one of the highest shares of 25 to 34 year olds without an upper-secondary education degree (OECD, 2020[21]). The government has started to offer VET students more pathways towards tertiary education, for example by facilitating access to universities and by creating specific tertiary vocational branches, which is welcome.

Figure 1.21. Vocational education and training needs strengthening



Note: Figures in parentheses refer to the most typical duration of the actual work-based component as a percentage of the total firm-based programme duration. For example, in Germany, time spent at work accounts for about 60% of the total firm-based programme duration, while the remainder is spent at school.
Source: OECD, Education at a Glance database. For the Czech Republic and Lithuania, data rely on European Center for the Development of Vocational Training (CEDEFOP).

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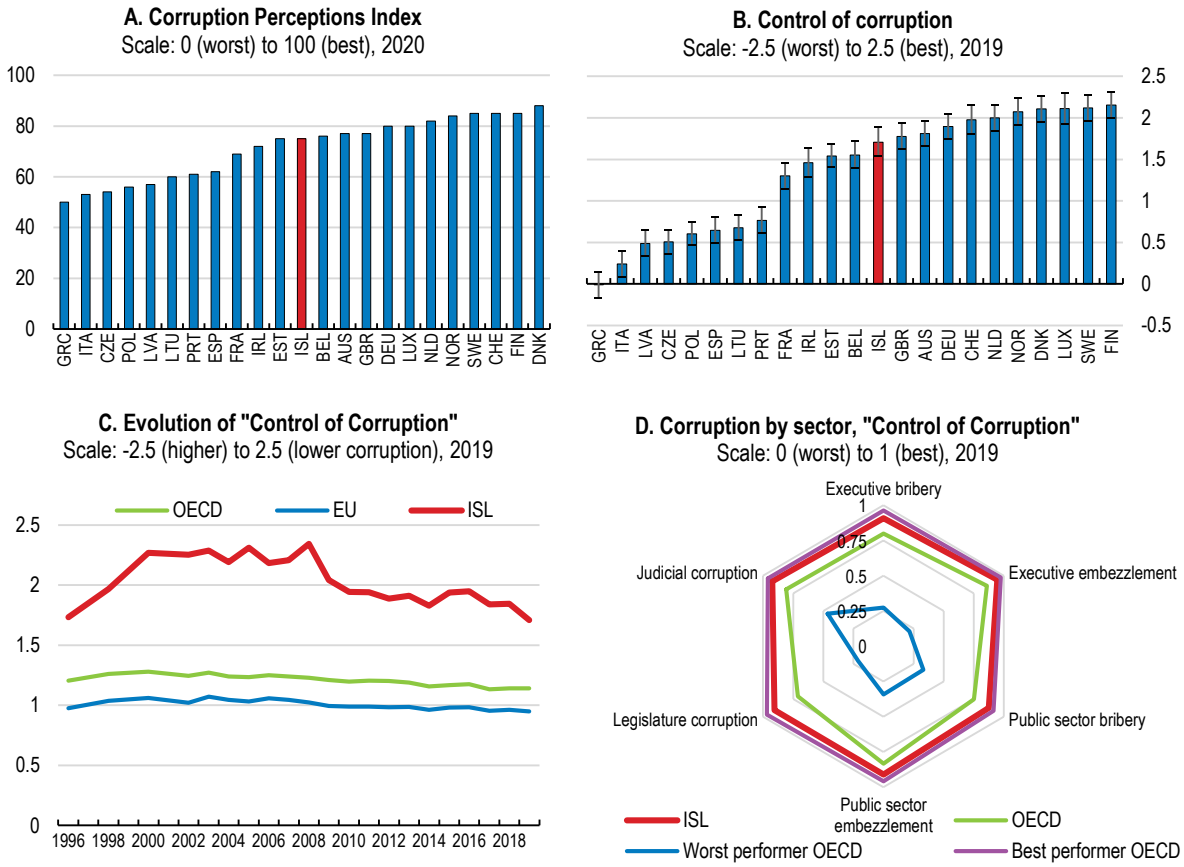
Table 1.5. Past recommendations and actions taken to raise competitiveness and skills

Key recommendation	Actions taken
Reduce the regulatory burden, especially in the service sector and the network industries.	The government has set up an action plan to implement the recommendations of the OECD competition review published in 2020. A bill to ease regulation in the restaurant and car rental sectors is before parliament.
Reduce barriers to foreign investment.	In 2019 the requirement for board members to reside in Iceland has been removed.
Follow productivity growth when settling wages and rely on "wage guidelines" established by an expert group.	A Committee on Labour Market Statistics, established in 2019, helps prepare and follow-up collective wage agreements.
Improve teaching quality by extending the period of practical training in initial education programmes and by providing more custom-made opportunities for teachers' professional development.	Students can follow paid internships in their final year of initial teacher education. Continued professional development of teachers has been extended.
Offer effective language training programmes.	The number of language courses offered to immigrants increased.
Develop methods and tools for monitoring skills needs that rely on several information sources, preferably both quantitative and qualitative.	The government has started to compile skills forecasts.
Strengthen vocational skills by better integrating work- and school-based training.	Schools have become more active in integrating apprenticeships into the curriculum.
Link university funding partially to the success of tertiary courses in providing skills corresponding to labour market needs.	No action taken.

Improving public governance and integrity

Indicators of public integrity and control of corruption suggest that Iceland performs above the OECD average but that its lead is declining (Figure 1.22). Low transparency in government decision-making and frequent conflicts of interest seem to be the drivers according to some observers. Closeness of public and private actors seem to be a problem as noted above. Iceland's institutional framework, in particular the rule of law, is strong, yet is deemed weaker than in other Nordic countries. Trust in government sharply slid below the OECD average after the global financial crisis, but has been rising again over the past few years.

Figure 1.22. Corruption is perceived as low



Note: Panel B shows the point estimate and the margin of error. Panel D shows sector-based subcomponents of the "Control of Corruption" indicator by the Varieties of Democracy Project.
Source: Panel A: Transparency International; Panels B & C: World Bank, Worldwide Governance Indicators; Panel D: Varieties of Democracy Institute; University of Gothenburg; and University of Notre Dame.

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Iceland has taken a number of steps to improve anti-corruption measures. In spring 2020, it adopted legislation to strengthen the protection of whistle-blowers in the public and private sector and improve access to information. The country should undertake efforts to ensure proper implementation and effectiveness of the new legislation (OECD, 2020[22]). Iceland has not yet concluded a foreign bribery case and, where credible allegations of foreign bribery have been reported, the allegations were not assessed. A first foreign bribery case is currently under investigation. Public integrity should remain a guiding principle in the government's anti-corruption policies, given the role of such efforts in raising productivity and inclusiveness (OECD, 2020[23]).

Table 1.6. Findings and recommendations to foster a strong, resilient and inclusive recovery

Monetary and fiscal policies for a strong, resilient and inclusive recovery	
Inflation and short term inflation expectations are above target.	**Keep monetary policy accommodative, but stand ready to tighten further if long-term inflation expectations risk becoming unanchored.**
Fiscal policy is supporting the economy.	**Continue supporting the economy and start consolidating as planned once the recovery is firmly established..**
More public investment is needed to support reallocation.	Ensure that the investments in infrastructure, education, innovation and digitalisation are carried out as planned.
Subsidies and VAT expenditures are high.	Reduce subsidies, especially in agriculture, and reduce VAT expenditures.
Spending reviews can help increase the quality of public spending.	Ensure that spending reviews become a routine part of the budget process, as planned by the government.
Structural policies to foster inclusive growth	
Barriers to the entry of new firms are high.	**Reduce barriers to sound competition in the tourism and construction sectors. Facilitate access to professions by removing stringent occupational licensing.**
Foreign direct investment is low and declining.	Increase openness by easing restrictions on foreign-owned companies, public procurement and auditing.
Competition is weak in the electricity sector.	Separate ownership of power generation, transmission and distribution companies, and fully open the wholesale market.
PISA scores are weak and trending down.	Improve the compensation structure to attract high quality teachers and reward them for excellence.
Skills mismatch is high. Labour shortages have intensified in some sectors, slowing reallocation.	**Continue and extend the training programme for professions in short supply Strengthen vocational education and training (VET) by extending firm-based learning and by facilitating access to tertiary education for VET graduates. Strengthen the link between tertiary education and the labour market, by linking a part of university funding to labour market needs.**
The gap in working hours between men and women is large, bringing about a considerable gender wage gap.	Reduce high marginal tax rates on second earners, e.g. by tapering child and family benefits less.
Spending on disability benefits is high.	Continue the reform of the disability benefit system, putting emphasis on returning to and remaining in work.
Perception of corruption is low but increasing.	Tighten rules on public-private relations, notably with respect to cooling periods. Ensure proper implementation and effectiveness of the new whistle-blower legislation.

Note: Key recommendations are in bold and feature in the executive summary.

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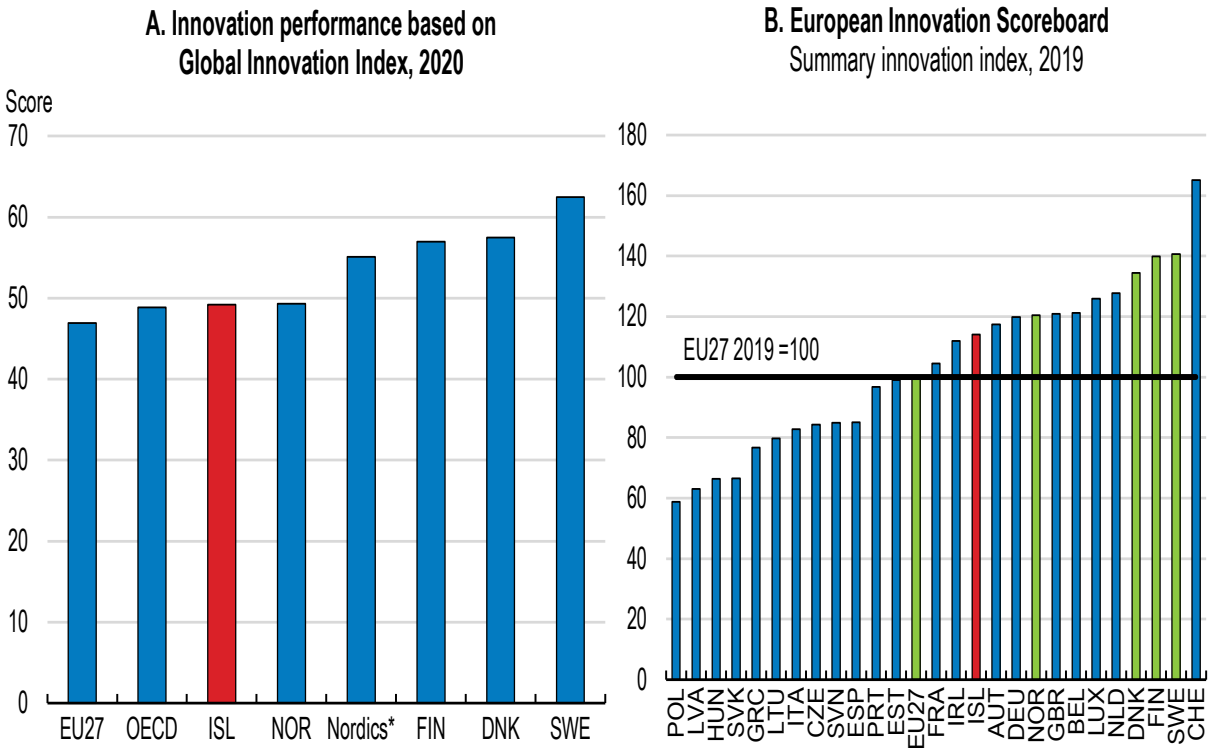
2 Fostering innovation for the digital era

Iceland is an innovative country, but has untapped innovation potential. Strengthening innovation, especially in the ICT area, is crucial for strong productivity growth and performance in an increasingly digitalised world, as well as a sustained recovery from the COVID-19 pandemic. Ensuring more effective public support for business R&D is important. The R&D tax incentive scheme is generous by international comparison, but take-up has been low and many smaller firms have not been inclined to innovate. Following increased support, outcomes need to be monitored regularly. Adopting new technologies is also essential for stronger innovation outcomes. Competition-friendly framework conditions are key to sharpening firms' incentives to adopt advanced technologies. The public sector too could become more digitalised. The education system needs to provide relevant skills. Participation of adult workers, especially the less educated, in re-skilling and up-skilling programmes should increase further. At the same time, business and universities need to collaborate more to maximise knowledge flows, with important benefits for innovation and society.

Iceland has scope to become more innovative and productive

Iceland is an innovative country. Technological innovations are evident in the energy and fishing sectors, including cutting-edge processes for carbon capture and sustainable fish farming, with strides in health technology and towards the development of high-tech solutions in the food industry (Government of Iceland, 2019[1]). In international comparison, Iceland outranks many European countries in terms of overall innovation performance, even though its Nordic peers perform even better (Figure 2.1). A highly educated workforce and attractive research systems, along with widespread access to, and use, of the Internet provide solid foundations for the digital era (Figure 2.2, Panel A). Notably, Iceland's density of Internet subscriptions in higher speed tiers, underpinning digital transformation, is well above the OECD average.

Figure 2.1. Iceland's overall innovation performance compares well internationally



Note: The country group aggregates represent the unweighted averages for the countries that are available in the database. Nordics refer to Denmark, Finland, Iceland, Norway and Sweden.
Source: European Commission, European Innovation Scoreboard 2020; and Global Innovation Index 2020.

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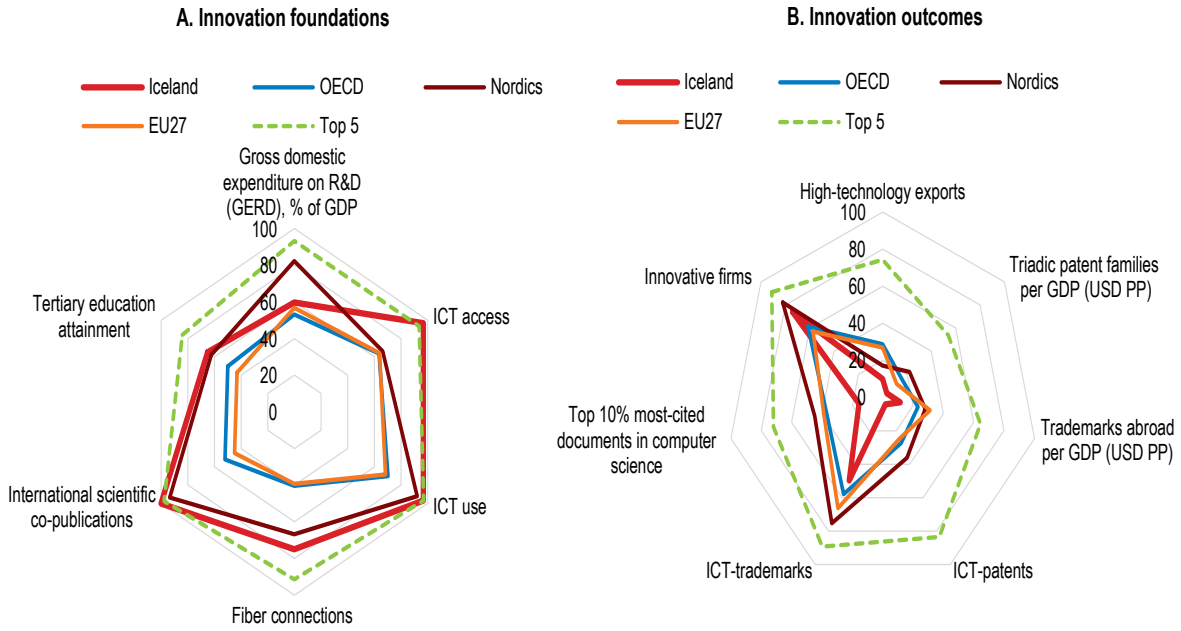
Figure 2.2. Innovation foundations are solid but some critical outcomes remain weak



Note: Numbers have been normalised using (value – min)/(max – min)*100. Max refers to the top OECD performer and min to the bottom OECD performer in each category for which the data are available for a given indicator. Top 5 stands for the average of the five best performers. Data for country aggregates represent weighted averages when possible. Nordics includes Denmark, Finland, Iceland, Norway and Sweden. Nordics always refers to an unweighted average.
Source: OECD, Main Science and Technology Indicators database; Global Innovation Index 2020; OECD Information and Communication Technology database; European Commission, European Innovation Scoreboard 2020; OECD, Education at a Glance database; World bank, World Development Indicators; OECD, Science Technology and Patents database; World Innovation Property Organisation; OECD 2019 measuring digital innovation https://doi.org/10.1787/9789264311992-en; and Eurostat, the Community Innovation Survey 2018.

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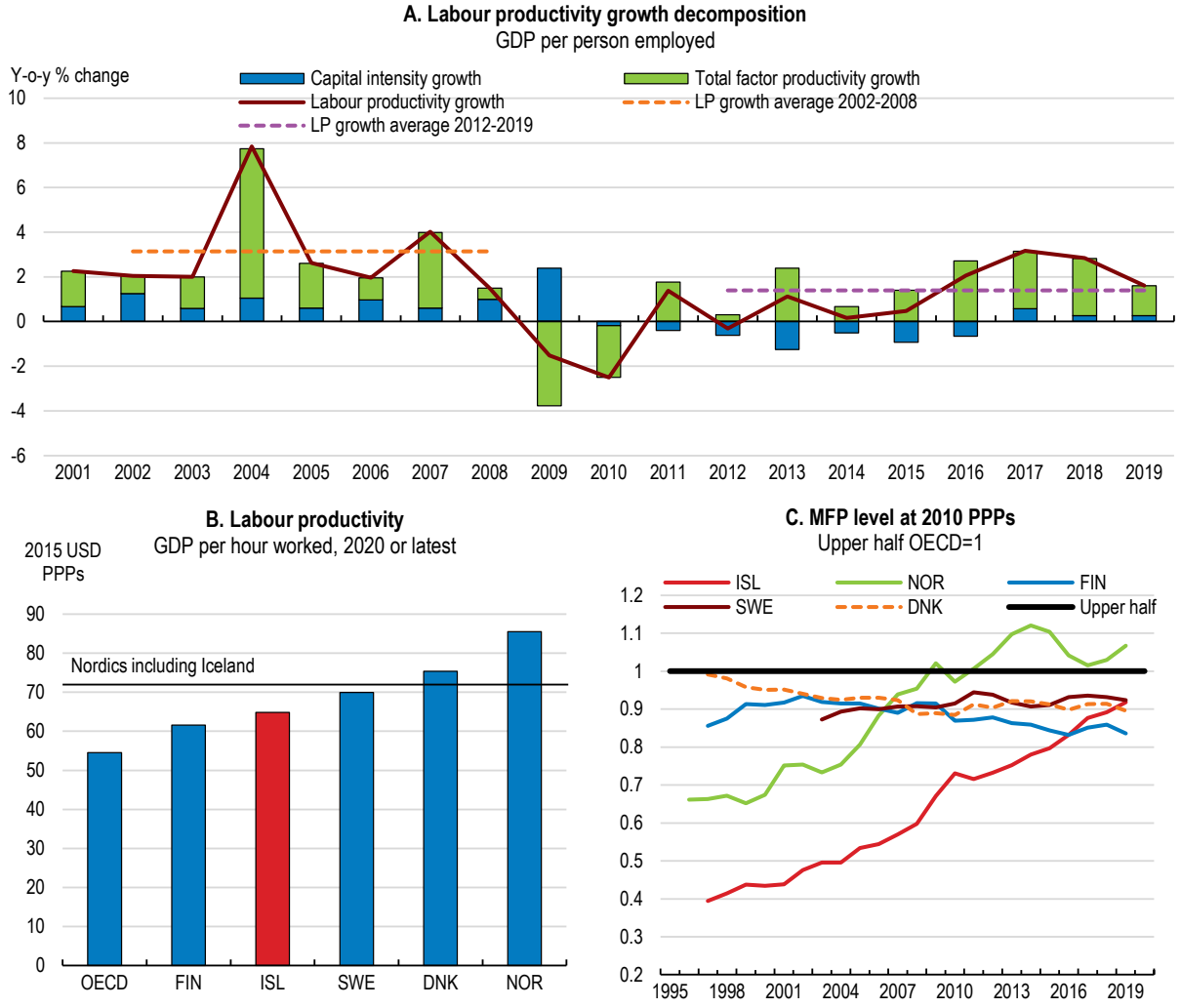
Iceland's innovation potential can be strengthened further. Patents and trademarks, including those relating to information and communications technology (ICT), and exports of technology companies lag behind Nordic standards (Figure 2.2, Panel B). This may partly reflect the large weight of tourism in the Icelandic economy, a sector that has comparatively low technological intensity, and the prevalence of SMEs, which are less likely to innovate than their larger peers. The relative small size of the country may be another factor.

Strengthening innovation, especially in ICT-enabled innovation (digital innovation), can do much to boost productivity and create new sources of growth, paving the way for a diversified economy and solid performance in an increasingly digitalised world. Innovation can also contribute to a stronger recovery from the COVID-19 crisis, given that labour productivity has increased since the global financial crisis but remains below the average of the Nordic countries (Figure 2.3). Moreover, productivity growth appears to have slowed recently, reflecting mainly a weakening in multi-factor productivity (MFP). Strong innovation can also help pursue environmental goals (Chapter 3).

Figure 2.3. There is scope to boost productivity



Source: OECD National Accounts database; OECD Economic Outlook, No. 109 database; and OECD Productivity database.

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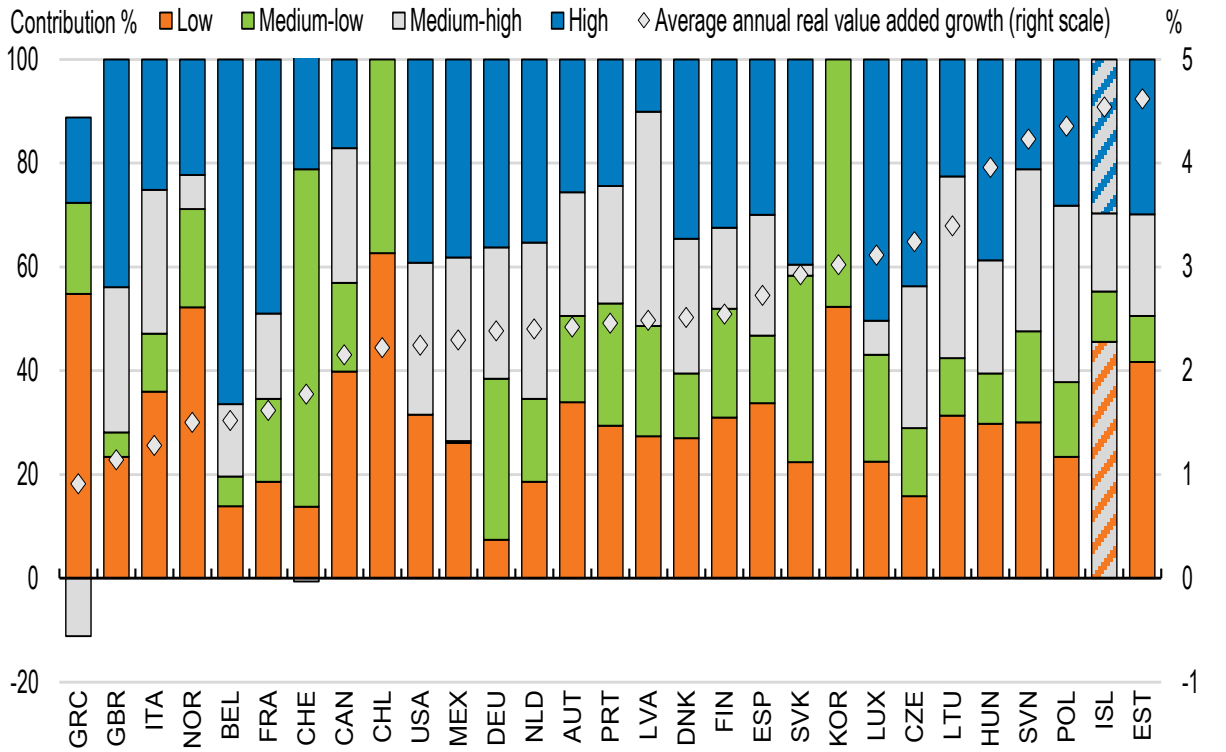
Going forward, Iceland needs to ensure effective support for business R&D, building on past achievements. Seizing the opportunities of new technologies is essential. Digital-intensive sectors (high and medium-high) contribute less to growth in value added than the average of OECD countries (Figure 2.4). Wider adoption of advanced technologies by firms would strengthen innovation, while yielding productivity gains (OECD, 2020[2]; Sorbe et al., 2019[3]). Scale matters and a small country like Iceland cannot be expected to contribute to genuine innovation and push the technology frontier as much as large countries. Adopting advanced technologies is thereby particularly important for Iceland, helping to explore and make the most of innovation niches. To this end, framework conditions for innovation in the private sector need to be improved. In the public sector, further developing digital government could have a positive societal impact. The provision of appropriate skills is a prerequisite for becoming more innovative and staying competitive in the digital era. To make the most of research outcomes, knowledge exchange between industry and research sectors needs to be strengthened. Deepening the benefits of international co-operation in research would bring additional gains in terms of knowledge flow. The government innovation strategy ("The Innovative Iceland"), currently under implementation, addresses many of these challenges (Box 2.1), but reform efforts need to continue.

The chapter discusses the innovation-related challenges Iceland faces in a digital age and potential areas of further reforms, focussing on: government schemes to support business R&D; options for overcoming barriers to firms' adoption of digital technologies; further development of digital government; education and adult training policies for the provision of relevant skills; and policy levers to strengthen business-research sector collaboration on innovation. The main findings and recommendations are summarised in a table at the end of the chapter.

Figure 2.4. The contribution of digital-intensive sectors in added value is comparatively low

Digital-intensive sectors' contribution to value added growth, as a percentage of average annual growth in real value added 2015-18, chain-linked volumes (reference year 2015)



Note: "High" identifies sectors in the top quartile of the distribution of the values underpinning the "global" taxonomy, "medium-high" the second highest quartile, "medium-low" the second lowest, and "low" the bottom quartile. Digital-intensive sectors comprise high- and medium-high sectors. 2015-17 data for Germany, Latvia, Lithuania, Norway, Portugal, and Switzerland. 2015-2019 data for Iceland and Greece. Digital intensity is defined according to the taxonomy described in: Calvino, F., C. Criscuolo, L. Marcolin and M. Squicciarini (2018), "A taxonomy of digital-intensive sectors", OECD Science, Technology and Industry Working Papers, No. 2018/14, OECD Publishing, Paris. Factors that define digital intensity of sectors include: ICT tools; human capital needed for their effective use; ICT tangible and intangible (i.e. software) investment; purchases of intermediate ICT goods and services; stock of robots; and turnover from online sales.
Source: Going Digital Toolkit. https://goingdigital.oecd.org/en/indicator/08/.

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Box 2.1. Iceland's Innovation Policy: main features

A new 10-year Innovation Policy, "The Innovative Iceland", launched in 2019, aims to prepare Iceland for future technological changes and related economic and societal challenges. It focuses on three broad challenges associated with the "Fourth Industrial Revolution", the environment and climate change, and demographic changes.

In brief, the Policy is based on five main pillars:

- Mind set: an attitude that is prevalent in the community towards innovation, research, development and start-up activities. Ingenuity of individuals is seen as the most important source of innovation. The essence of the mind set pillar is that innovation is not only the basis of economic success, but rather the key to solving the tasks people face, both today as well as in the coming decades. To this end, innovation will be a part of education policy to ensure that students acquire the necessary skills to thrive in an innovative environment, knowledge derived from innovative projects will be communicated publicly, while emphasis will be placed on improving society's understanding that innovation outcomes tend to take time to materialise.
- Finance: funding of research, development, and innovation and start-up activities. The amount, source and distribution of funds in the innovation environment have a significant impact on the scope and nature of innovation.
- Market access: access by Icelandic entrepreneurs and investors to markets needs to be enlarged to enable more diverse innovation activities.
- The framework, in the form of support agencies, the legal framework, infrastructure and social structure. The support for innovation, along with the general rules of the game regarding innovation and business operations, must always be competitive on a global scale.
- Human resources available to innovative companies: Iceland must develop relevant skills and attract specialized foreign professionals to face international competition.

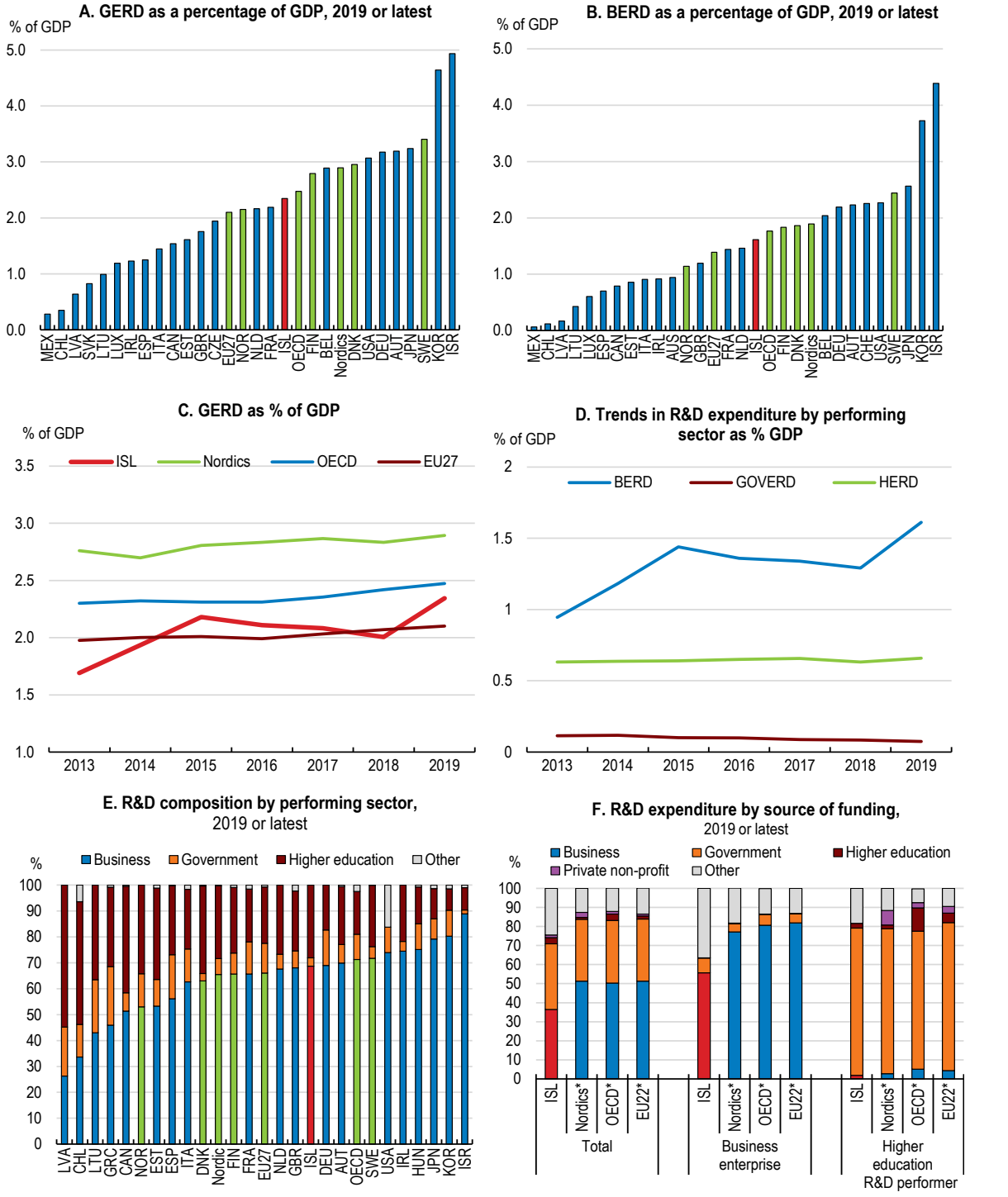
The Policy is currently under implementation. Recent initiatives include the establishment of Kría, a start-up and innovation fund (discussed below), and provision of funds to entrepreneurs, start-ups and institutions in the fields of innovation through increased contributions to the technical development and research funds and specific funding to stimulate entrepreneurship in the countryside. Special focus has been placed on green innovative solutions and innovative solutions in health technology. At the same time, government support to innovation infrastructure is being reorganised to enhance efficiency. Initiatives under the Policy further include the establishment of a new Technical Centre whose main role is to support and stimulate academia-business collaboration in high-tech innovation. Efforts also are being made towards opening access to data from public institutions (discussed below).

Source: (Government of Iceland, 2019[4]); (Government of Iceland, 2020[5]); (OECD, 2020[6]).

Improving R&D support for businesses

Iceland invests approximately 2.3% of GDP on R&D, close to the OECD average (Figure 2.5). Effective government support will help to increase this share further, not least by mobilising private investment, given that the business sector accounts for around two-thirds of overall R&D (Figure 2.5, Panel E). Solid framework conditions and closer business-university collaboration (both discussed further below) are also vital.

Figure 2.5. Iceland has scope to raise R&D spending



Note: GERD stands for Gross domestic expenditure on R&D and BERD for Business enterprise expenditure on R&D. In panels A, B, C, and E OECD, EU27 and Nordics refer to weighted averages of the member countries for which the data is available. Nordics include Denmark, Finland, Iceland, Norway and Sweden. In Panel F, country aggregates that are marked with "*" refer to simple averages of member countries for which data are available.

Source: OECD, Main Science and Technology Indicators database; and OECD, Research and Development Statistics database.

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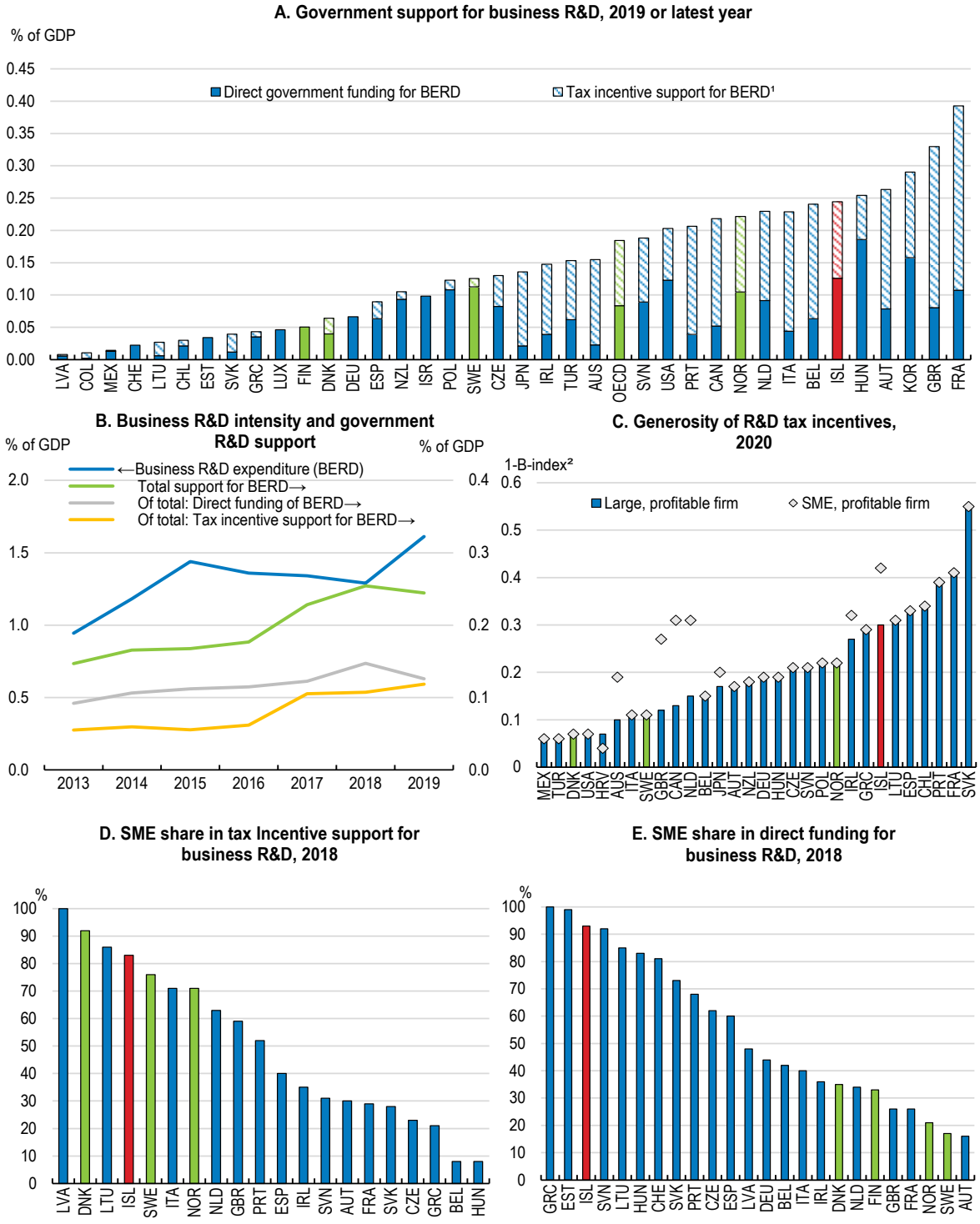
Unlocking innovation potential through R&D support

Iceland's R&D tax incentive scheme is generous by international comparison. Public support for business R&D has increased as a share of GDP in recent years to above OECD and Nordic averages, with tax incentives growing faster than direct support (Figure 2.6). The R&D tax credit scheme is volume-based, allowing companies to claim a tax rebate on qualifying R&D expenditures up to a ceiling (OECD, 2021[7]). A minimum level also applies to R&D projects. In case of insufficient tax liability, firms are entitled to an immediate refund of unused credits. Changes in 2020, as part of a broader package to counter the impact of the COVID-19 crisis, raised the annual ceiling on qualifying R&D expenditure and introduced different tax credit rates for SMEs and large firms, at 35% and 25%, respectively, from a common rate of 20% previously. These changes increased the generosity of the R&D tax credit (OECD, 2021[7]).

Government tax support for business R&D could be more effective. Business R&D intensity does not match the rapid increase in government support in recent years, especially tax incentives, although the uptick in 2019 is encouraging (Figure 2.6, Panel B). While the take-up of tax incentives has increased, especially among SMEs, it remains low by international comparison, despite relatively generous provisions (OECD, 2020[8]). The structure of the economy with large natural resources and service sectors, where firms tend to be less likely to undertake R&D-based innovation, and a preponderance of small firms, needs to be accounted for in designing R&D policies. Innovation outcomes of smaller firms, which are the main beneficiaries of government tax support for R&D, remain relatively weak and the gap between small and large firms is non-negligible (Figure 2.7). Whereas innovation outcomes can be influenced by other factors as well, ensuring effective tax support for business R&D is very important. R&D tax incentives should better target smaller innovative firms through more generous provisions for young innovative firms, on the basis of carefully designed eligibility criteria. Such firms face most difficulties to access finance. Some countries such as France, the Netherlands and Portugal specifically target young firms and start-ups. Reform options include the provision of a higher tax credit rate for young innovative firms or more generous refund conditions for such firms in the case of insufficient tax liability (Criscuolo et al., 2016[9]). This could be financed, for instance, by a reduction in the tax credit rate for larger firms or a reduced ceiling, to make the reform revenue neutral. When targeting young innovative firms, it is important to avoid incentives to split parts of a company just to meet the age criteria, for example, through restrictions on associated enterprises and mergers (Ognyanova, 2017[10]).

The cost-effectiveness of R&D tax incentives needs to be assessed regularly to inform policy choices and further reforms. The government aims to evaluate the tax credit scheme since its introduction in 2011 (Government of Iceland, 2020[5]). The assessment is of high priority and will focus on the uptake, utility and efficacy of the R&D tax credit and its impact on stimulating private investment and improving the competitive position of innovative firms. The review is welcome and should be completed as scheduled. Crucial to this assessment is input additionality, or the extent to which public support prompts R&D over-and-above the amount that would be undertaken without it. This requires comprehensive information on R&D investment, including matched R&D activity and tax relief data. Initiatives in this area in other OECD countries, including the Netherlands and Norway, are instructive and suggest that introducing a limitation (e.g. threshold or ceiling) beyond which the rate of R&D tax credit will be reduced can do much to encourage additionality (OECD, 2020[11]). Consideration could also be given to output additionality, or the outputs from R&D activities which would have been achieved without public support, as well as assessments of wider economic and social impacts (Appelt et al., 2016[12]).

Figure 2.6. Support to business R&D is comparatively generous



Note: BERD stands for Business enterprise expenditure.1. Subnational tax support for BERD is included in tax support for BERD. 2. The B-index specifies the pre-tax income needed for a "representative" firm (typically defined for convenience as one with sufficiently large profits to be able to fully make use of earned tax credits in the reporting period) to break even on a marginal, monetary unit of R&D outlay (OECD, 2020). It is customary to present this indicator in the form of an implied subsidy rate, namely one minus the B index.
Source: OECD R&D Tax Incentives database. http://oe.cd/rdtax.

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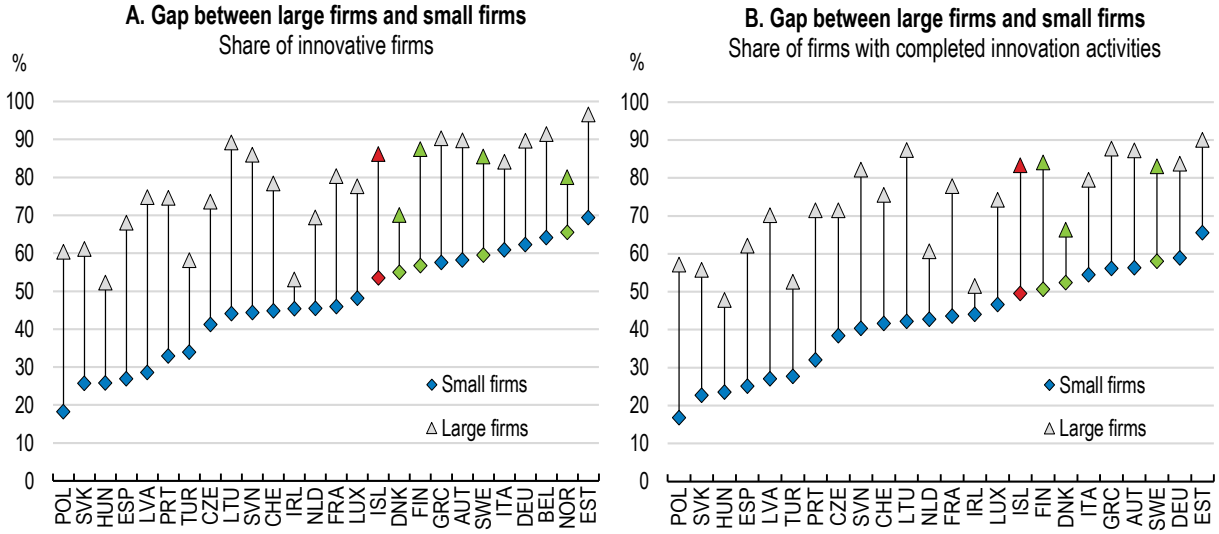
Figure 2.7. Innovative outcomes of smaller firms could improve

2018



Note: 1. The enterprise is considered as innovative if during the reference period it introduced successfully a product or process innovation, had ongoing innovation activities, abandoned innovation activities, completed but yet introduced the innovation or was engaged in in-house R&D or R&D contracted out. 2. Firms with completed "innovation activities" are those which implement product and/or process innovation and at least one innovation activity, such as R&D and acquisition of equipment or software, during 2016-18. For further methodological details, refer to Community innovation survey 2018 (CIS2018) (inn_cis11) (europa.eu).
Source: Eurostat, the Community Innovation Survey 2018.

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The effectiveness of tax incentives in promoting collaboration between businesses and research institutions also deserves attention, because this type of collaborative projects tend to have closer links to basic research and, as a result, provide the basis for disruptive innovations (Appelt et al., 2016[12]). Iceland provides explicit incentives for R&D collaboration, but businesses finance only a very small share of the R&D performed by higher education institutions (Figure 2.5, Panel F). The R&D tax credit scheme, in particular, foresees an increase in the ceiling on qualifying costs in the case of collaborative projects, but it does not discriminate between collaboration among firms, and between firms and research institutions (OECD, 2020[13]). A higher R&D tax-credit premium could therefore be considered for business-research collaborative projects than for other collaborative ventures that do not include research institutions. For example, in Japan, the credit-tax rate rises to 30% for joint or contracted R&D with universities and national research institutes from 20% in the case of collaboration among qualifying companies (apart from venture companies where the applied rate is 25%) (OECD, 2020[14]). In France, expenditures on subcontracted R&D count double if the R&D is outsourced to certain approved research institutions. Reform to the R&D tax-credit scheme would in any case need to be complemented by action in other areas (discussed below) to strengthen collaborative research.

Moreover, R&D tax incentives need to keep adapting to evolving conditions, especially in a digital era. Regular assessments of the scheme's key parameters, such as the scope of eligible R&D and the ceiling for qualifying R&D expenditure, are crucial to ensure cost-effectiveness. In the United Kingdom, for instance, reforms are under way aiming to broaden the scope of qualifying expenditure under the tax credit scheme to include data and cloud computing (OECD, 2020[15]). R&D tax incentives may apply to R&D expenditure or to the income generated from business R&D and innovation.

Patent boxes, also referred to as intellectual property (IP) regimes, provide preferential tax treatment to income generated from intellectual property, even though such regimes could lead to wasteful tax competition without a concomitant increase in innovation activity (Gaessler, Hall and Harhoff, 2018[16]). OECD countries agreed on a "modified nexus approach" for IP regimes in 2015 restricting the scope of qualifying IP assets and requiring a link between R&D expenditures, IP assets, and IP income (Asen, 2019[17]). Most countries have by now amended or abolished their regime to ensure compliance with the nexus approach (OECD, 2020[18]). Also, by favouring patent holders, patent boxes reduce incentives to innovate through risky experimentation, which is an important driver of R&D dynamics and innovation in the digital era (OECD, 2015[19]). Moreover, young firms that have particular strengths as R&D performers (e.g. in creating radical innovations) are unlikely to benefit from the patent box given the long lags that characterize the patenting process. Instead, large, often multinational, corporations are the main beneficiaries. A careful assessment of the benefits and costs of this type of tax incentive would be required.

A balanced mix of indirect support (tax incentives) and direct funding for business R&D is essential to spur innovation, given their complementarity (OECD, 2020[11]). Indeed, R&D tax incentives are more likely to stimulate short-term applied research and boost incremental innovation, whereas direct funding is more suited for longer-term, high-risk research and for targeting specific areas with long-term research and radical innovations (Appelt et al., 2016[12]); (OECD, 2020[11]). It will be important, in this context, to maintain direct funding to achieve balanced support for business R&D as the economy recovers from the COVID-19 crisis (Figure 2.6). Such funding also forms the basis for applications by Icelandic firms to international funds that can improve knowledge transfers and innovation (Government of Iceland, 2020[5]). As a welcome step, the current government fiscal plan provides for a significant increase in direct funding for R&D, including for the Tech Development Fund and Research Fund budgets. Evaluation of the supported projects on the basis of rigorous cost-benefit analysis and systematic impact assessments are vital to ensure that government spending on business R&D is prioritised to private sector innovation with disruptive potential.

Greater coordination will strengthen the innovation system

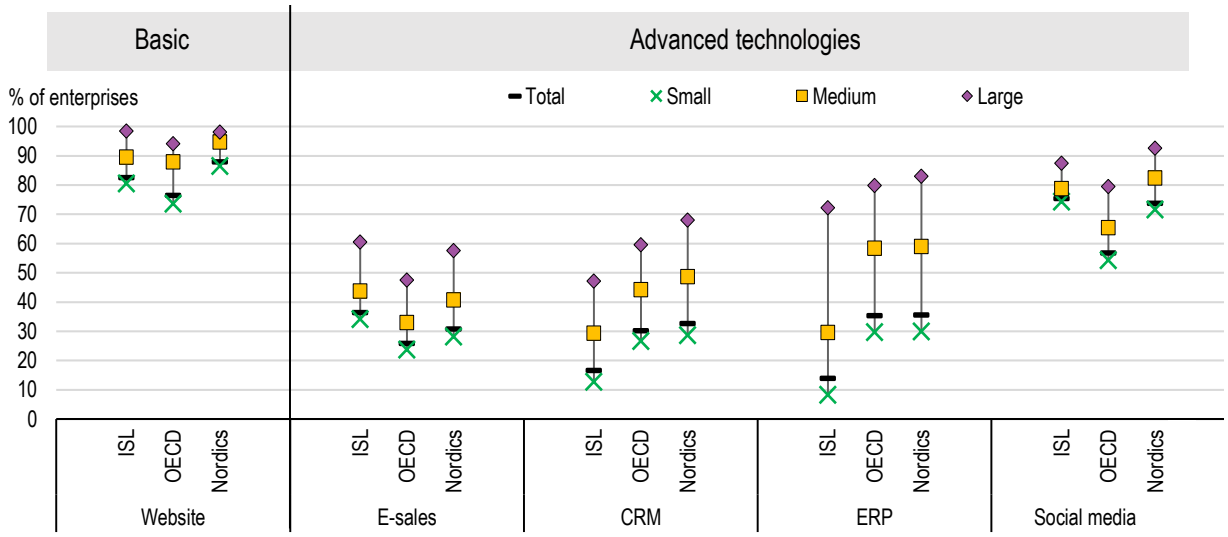
Fragmentation and an insufficient focus on implementation are key shortcomings of Iceland's science and innovation system, with several initiatives in recent years aiming to address these weaknesses. An international peer review of the system in 2014 highlighted, in particular, the scope for enhancing horizontal co-ordination and to clarify and strengthen the role of the Science and Technology Policy Council (ERAC, 2014[20]). It also stressed the need for a more evidence-based policy-making in science and innovation. Since 2014, the Science and Technology Council has been issuing a policy and action plan, which has led to a greater transparency in the implementation of the policy (The Prime Minister's Office, 2020[21]). In addition, the Council's connections with the ministries' functions were strengthened as the directions set by the action and policy plan are incorporated in the government's five-year fiscal strategy.

Efforts need to be stepped up to enhance coordination and strengthen policy design. A task force, set up in 2018 to review the legal framework of the Science and Technology Policy Council, proposed a new organisational structure based on international experience, which is currently under consideration. Central to the proposed reforms is the establishment of a new statutory ministerial committee with a strategic role, which would replace the existing Science and Technology Policy Council alongside a new Council (the Science and Innovation Council) with an advisory role (The Prime Minister's Office, 2020[21]). The Council would provide feedback to the ministerial committee based on solid analysis and operate as an independent body. The task force has also proposed to transfer the policymaking responsibilities in the science and innovation area to individual ministers in order to ensure ownership. The ministerial committee would be in charge of policy coordination. The proposed changes go in the right direction. Important to success, if the government goes ahead with these reforms, is that the policies developed at the ministerial level have clear objectives and are effectively coordinated. Efforts in this area need to be complemented by the development of a comprehensive database for analysis and policy evaluation.

Encouraging firms to adopt advanced technologies

Firms that effectively use digital technologies tend to be more innovative and productive (European Investment Bank, 2020[22]; Gal et al., 2019[23]; OECD, 2016[24]). Iceland fares well in some areas, such as social media use by businesses and e-sales, but it lags behind in others such as the use of enterprise resource planning software (ERP) and customer relationship management (CRM), which enable firms to digitalise and optimise processes and integrate deeper in digital market (Figure 2.8). As in other countries, there is a digital gap between large and small enterprises. Small firms face barriers to adopt new technologies related to the availability of finance to make the necessary investment, and a lack of requisite human resources and management expertise (OECD, 2019[25]). They may also be more vulnerable to cyber threats.

Figure 2.8. Icelandic firms, especially smaller ones, have scope for greater adoption of digital technologies



Note: Data for Customer Relationship Management (CRM) and Enterprise Resource Planning (ERP) refer to 2017, data for website refer to 2018, data for social media refer to 2019 and data for e-sales refer to 2020. In the figure, “OECD” is the simple average across all OECD countries for which data are available. "Nordics" refers to the simple average of the latest values for Denmark, Finland, Iceland, Norway and Sweden. “Small" stands for enterprises with 10-49 employees, "Medium" for enterprises with 50-249 employees and “Large” for enterprises with 250 employees and over. Total refers to the enterprises with at least 10 employees.
Source: OECD, ICT Access and Usage by Businesses database.

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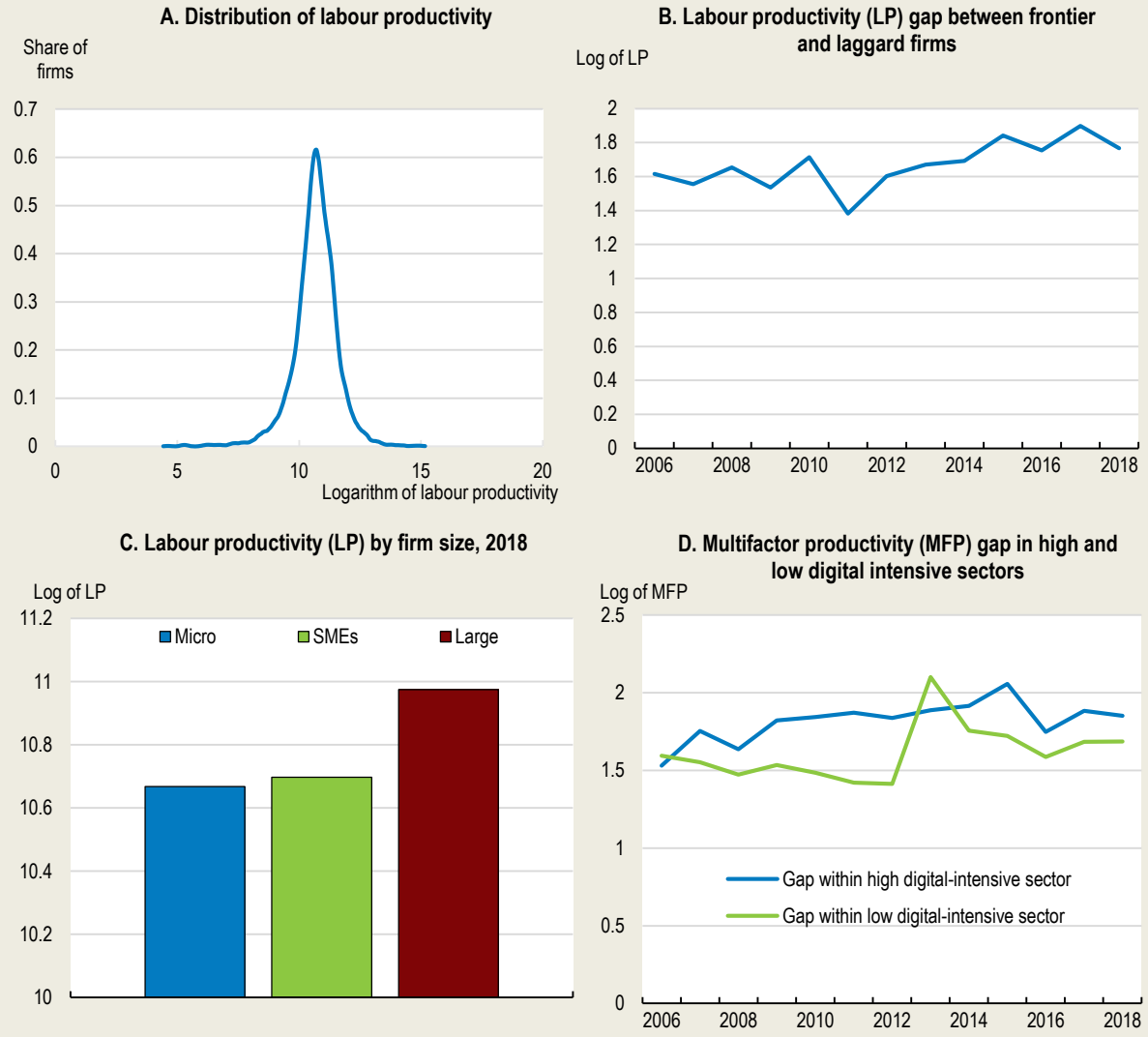
Illustrative OECD scenarios suggest that policy reforms can encourage firms to adopt digital technologies, with associated productivity dividends (Sorbe et al., 2019[3]). This would also help shorten the tail of low-productivity firms (Box 2.2). For example, increased take-up of high-speed broadband and improved skills (discussed further below) can sharpen the incentives of firms to take advantage of new technologies, but the largest productivity gains are associated with improvements in framework conditions, in particular by reducing regulatory barriers, and easing access to finance for young innovative firms (Figure 2.11). To enhance the impact, pro-competitive regulations need to be combined with insolvency regimes that do not over-penalise entrepreneurial failure. At the same time, the labour market should remain flexible, while safeguarding workers (Chapter 1). Sufficiently flexible employment protection regulations encourage experimentation with new technologies and organisational changes. The sections below discuss these policy enablers.

Box 2.2. Digitalisation and productivity: some empirical findings

Firm-level analysis of labour productivity conducted for this *Survey* reveals a relatively large tail of low-productivity firms in Iceland (Cho and Koutsogeorgopoulou, 2021[26]) (Figure 2.9). In addition, the labour productivity gap between top- and bottom-performing firms has increased in recent years from already high levels. Digitalisation is a possible contributor to this widening gap, as more productive firms are more likely to adopt advanced digital technologies and benefit from production process reorganisation than their less productive counterparts (Gal et al., 2019[23]). This is because the required digital skills for the adoption of advanced technologies are more likely to be found in highly productive firms. In addition, labour productivity varies according to firm size, with smaller firms underperforming their larger counterparts.

Figure 2.9. Productivity dispersion remains large

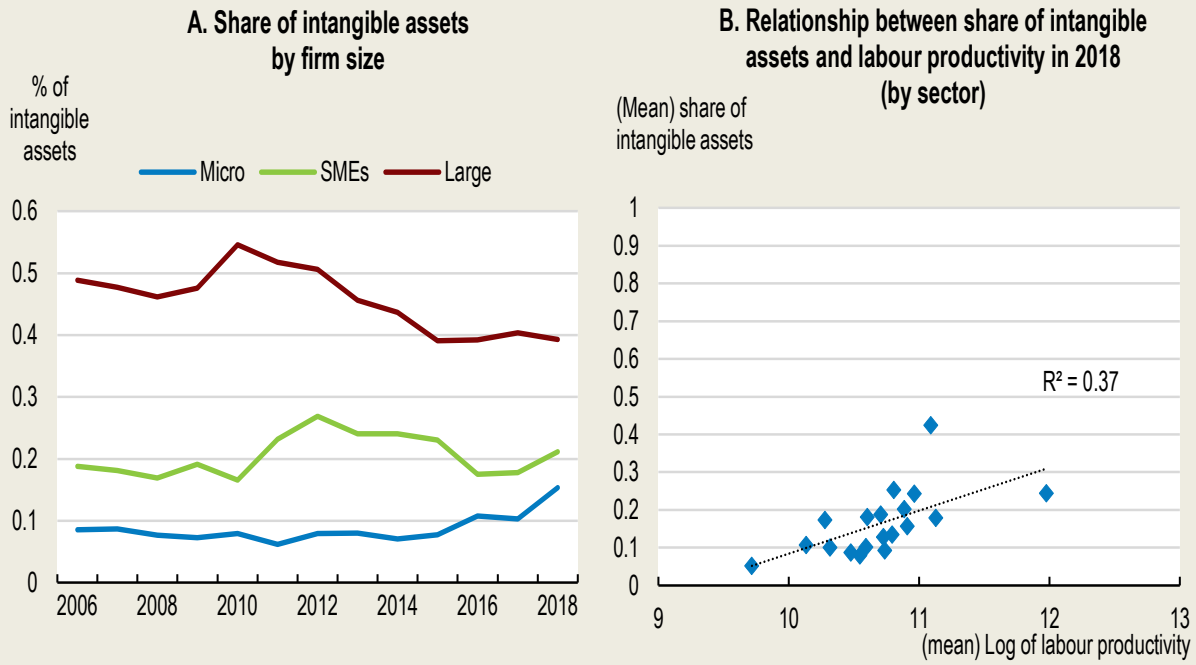


Note: Labour productivity is computed as the ratio of real value added to number of employees. Multifactor productivity measurement is based on the Wooldridge (2009) method. The "frontier" is measured by the unweighted average of the logarithm of productivity for the top 5% of firms with the highest productivity levels in each 2-digit industry and year. "Laggard firms" are measured by the unweighted average of the logarithm of productivity of remaining firms. "Micro" enterprises comprise fewer than 10 employees; small and medium-sized enterprises (SMEs) 10 to 249 employees; and large enterprises more than 250 employees. Sectors are classified as having "high" of "low" digital intensities following the taxonomy by (Calvino et al., 2018[27]). The analysis covers 2-digit industries NACE Rev.2 10 to 82 (excluding 64 to 66).
Source: OECD calculations based on ORBIS data.

At a more aggregate level, the analysis also shows that the productivity gap (measured in terms of multifactor productivity) between top- and bottom-performing firms is larger in more digitally-intensive sectors, such as ICT (Figure 2.9, Panel D).

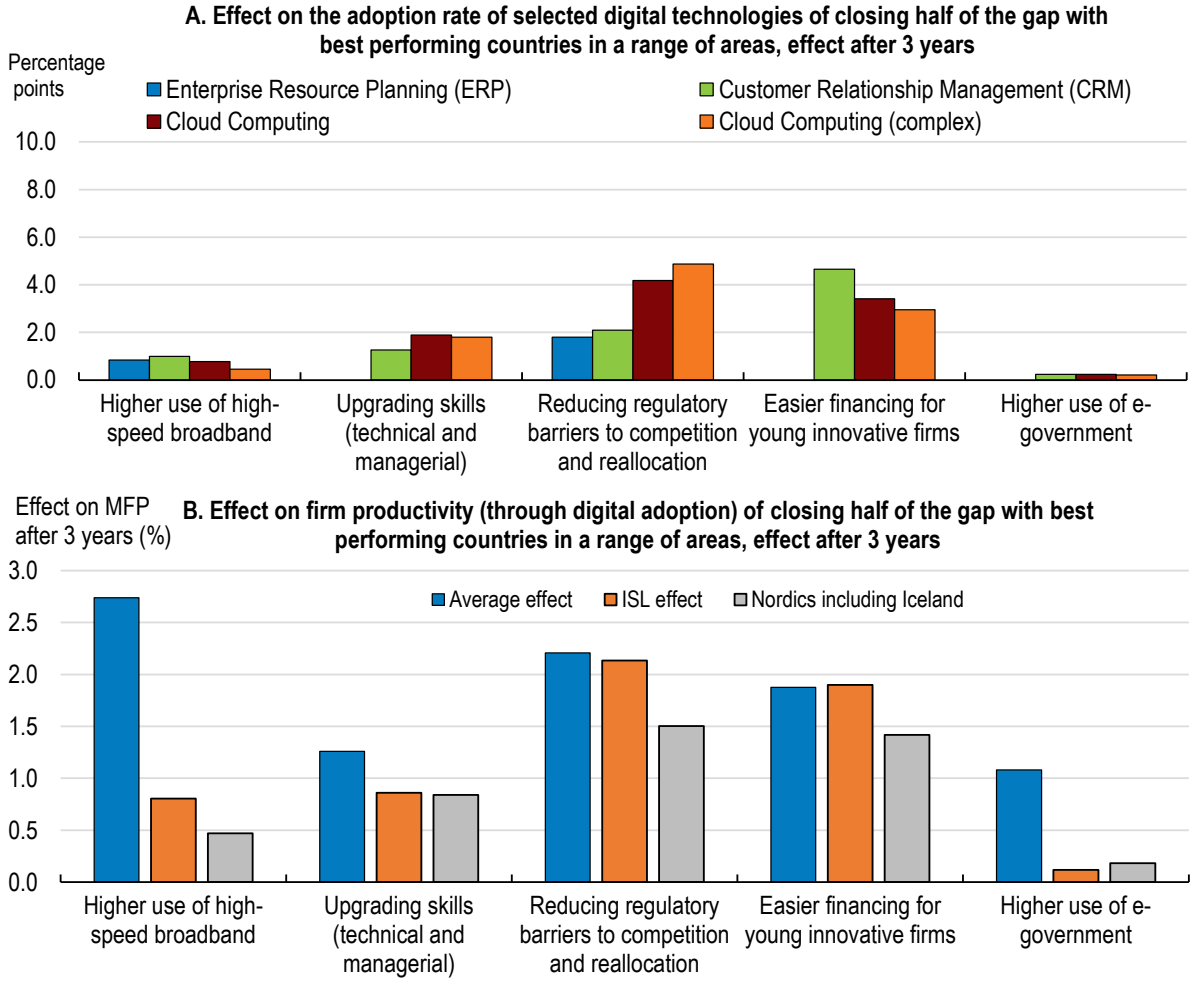
These productivity disparities can be related to differences in investment in intangible assets, given the complementarity that exists between of such investment and adoption of digital technologies (Andrews, Nicoletti and Timiliotis, 2018[28]). Smaller firms, in general, tend to have lower shares of intangible assets compared to larger ones, which can affect their ability to adopt increasingly sophisticated technologies (Figure 2.10). The results of the sectoral analysis further reveal a positive correlation between productivity performance and intangible investment. The findings suggest, in particular, that more digitally-intensive industries tend to have a higher share of intangible assets and record higher overall productivity compared to their less digitally intensive peers.

Figure 2.10. Investment in intangibles can boost productivity



Note: Labour productivity is computed as the ratio of real value added to number of employees. The analysis covers 2-digit industries NACE Rev.2 10 to 82 (excluding 64 to 66). "Micro" enterprises comprise fewer than 10 employees; small and medium-sized enterprises (SMEs) 10 to 249 employees; and large enterprises more than 250 employees.
Source: OECD calculations based on ORBIS data.

Figure 2.11. Adoption of advanced technologies has much productivity potential



Note: Estimated effect on the average digital adoption rate (Panel A) and the multi-factor productivity (MFP) of the average firm (Panel B) of a range of policy and structural factors. The effect of "Higher use of high-speed broadband" on productivity combines the direct and indirect effects. "Upgrading skills" covers quality of management schools. "Reducing regulatory barriers to competition and reallocation" includes lowering administrative barriers to start-ups, relaxing labour protection on regular contracts and enhancing insolvency regimes, where Iceland is the best performer. "Easier financing for young innovative firms" covers the development of venture capital markets and the generosity of R&D tax subsidies. For each of the underlying indicators, it is assumed that half of the gap to the best performing country in the sample is closed. It is also assumed that policy factors in each group are largely independent from each other.
Source: Sorbe et al., 2019.

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High-speed broadband could be utilised more by firms

Iceland has an advanced fibre-optic network infrastructure (ITU, 2020[29]). Reforms over the past decade, guided by the Electronic Communication Plan (2011-2022), have increased connectivity and the speeds experienced by users (Figure 2.2, Panel A). Iceland currently ranks at the top of European countries in terms of fibre deployment, with a penetration rate close to 80% (FTTH Council Europe, 2021[30]). Ensuring an effective use of high-speed broadband by firms, especially the smaller ones, is vital for a wide adoption of digital technologies.

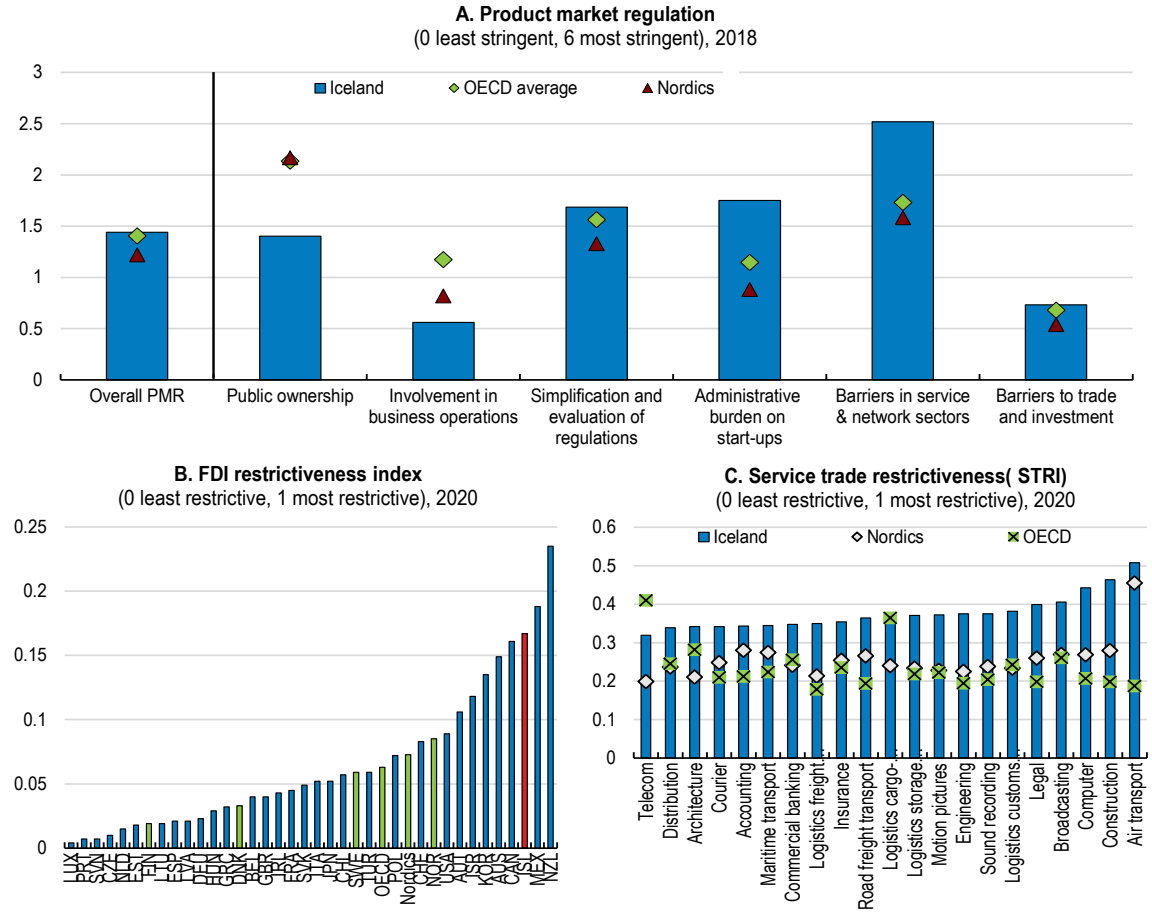
Ongoing efforts focus on expanding fibre networks to rural areas. The aim is to secure universal access to optical fibre by end-2021, facilitating access to **100 Mb/s fixed line connections** (ITU, 2020[29])**.** Deployment of 5G is also a policy aim. In May 2018, Iceland signed a declaration of intent for a cooperation

on 5G with other Nordic countries (European Commission, 2018[31]) and 5G coverage already reaches half of the population. In addition to its focus on accelerating the development of 5G, the declaration also identifies areas in which Nordic cooperation needs to be strengthened. Further use of high-speed broadband and the deployment and take-up of 5G will allow businesses to face the increasing data demand in near future, stemming from the digital transformation (OECD, 2019[32]). Helping firms, especially the smaller ones, to reap the benefits of fast connection also matters. To this end, the adoption of high-speed broadband needs to be combined with complementary organisational investment (Fabling and Grimes, 2016[33]).

Improving framework conditions

A more competition-friendly regulatory framework could also foster innovation. Iceland's overall regulatory framework for product markets is as competition-friendly as the OECD average, but more stringent than those of Nordic peers (Figure 2.12). While public ownership and government involvement in business operations are low, regulatory barriers in network industries and professional services are particularly high. Administrative requirements for start-ups are burdensome (Chapter 1). Complex regulatory procedures affect many sectors of the economy, including construction and tourism, which account for almost 18% of GDP (OECD, 2020[34]). Stringent market regulation holds back innovation by hampering the entry of young firms, which are an essential part of the digital innovation landscape (OECD, 2015[35]); (OECD, 2020[2]).

Figure 2.12. The regulatory burden on businesses should be eased



Source: OECD, Product Market Regulations Statistics database; OECD, FDI regulatory restrictiveness index; and OECD, Services Trade Restrictiveness Index.

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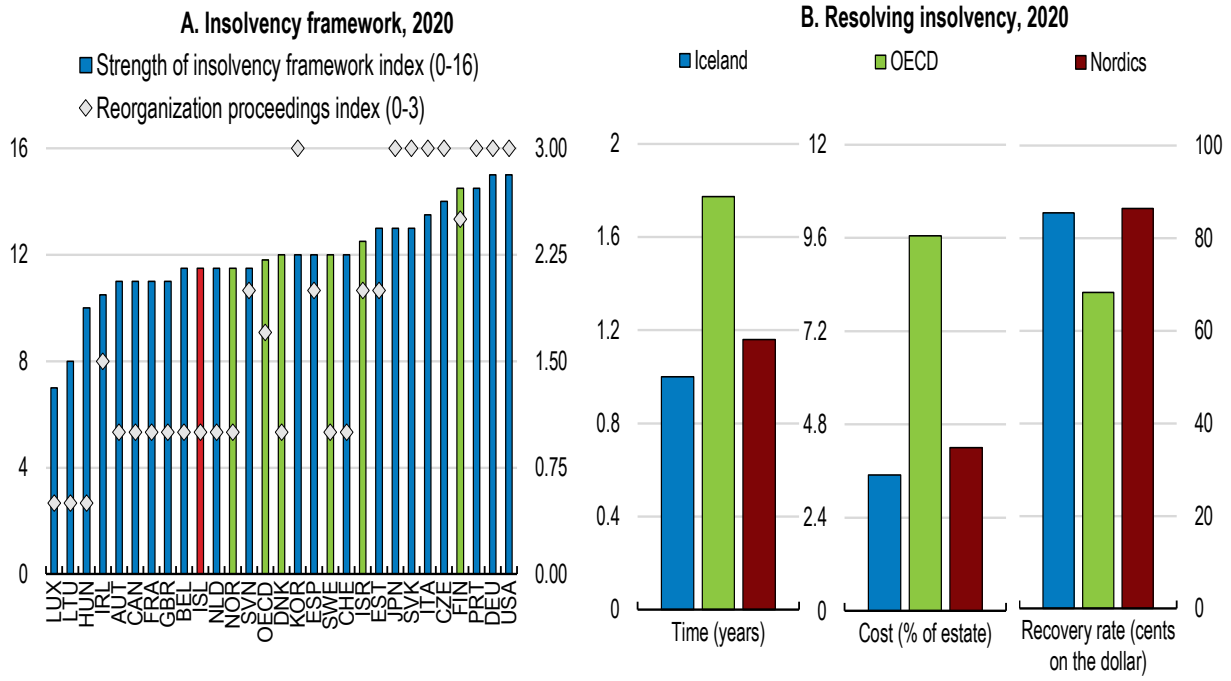
Efforts to create a more business-friendly regulatory environment should continue. The 2020 OECD *Competition Review* for construction and services points to areas of possible reform, including streamlining land-use requirements and simplifying the process for obtaining building permits and, as far as tourism is concerned, an alternative airport ownership and operating model to open a competitive tender for the management (OECD, 2020[34]). Carrying out thorough competition assessments in other sectors, particularly energy, would be advisable.

Lowering restrictions to foreign direct investment (FDI) and service trade should be a policy priority. Horizontal restrictions, including labour market tests for temporary service suppliers from countries outside the European Economic Area (EEA) and restrictions on land ownership by non-EEA residents create barriers for foreigners to do business or seek employment in Iceland, weakening international capital and knowledge transfer (OECD, 2018[36]). Moreover, half of the board members and management of corporations must be resident in Iceland or the EEA. In addition, legislation, going back to the 1990s, limits investment of foreign companies domiciled outside of the EEA in the fishing, energy and aviation industry. The government should go ahead with plans to streamline the application process for work permits for specialists from outside the EEA, meeting the set timeframe. Opening up professions is also important. Product market regulations for architects and lawyers, for instance, are more stringent than the OECD and Nordic averages (Figure 2.12). Conducting regulatory impact assessments on an ex-ante and ex-post basis to identify and remove unnecessary restrictions to competition should be a central element of regulatory reform.

The digital transformation raises new challenges for competition policy. Digitalisation promotes competition in many product and service markets through the increased use of data and cross-border mobility. This can benefit consumers through lower prices, and wider choice of products. However, the impact of technologies and data is not always evenly spread across firms, with the risk of market concentration (OECD, 2020[2]). Concerns also relate to the potential harm to firms that are reliant on digital platforms to deliver services, as the possibility to achieve scale without mass in such markets can enhance the market power of dominant firms (OECD, 2020[15]). As digitalisation continues to influence competition, it may pose some new challenges, requiring the regulatory policy framework to adapt. In the United Kingdom, for instance, a new council was introduced to advise on rules and regulations that may need to change to keep pace with technology (OECD, 2020[15]). In Spain, the new digital strategy introduces a number of initiatives to improve the business environment in the context of digital transformation, including measures relating to tax and social security aimed at both start-ups and investors (OECD, 2021[37]).

The insolvency regime can be further improved to encourage the restructuring of companies, sharpening incentives for disruptive innovation and the adoption of advanced technologies. Iceland compares favourably with other OECD countries with regard to the speed of finalising insolvency procedures and in terms of costs (Figure 2.13). Moreover, the recovery rate is relatively high, which can stimulate entrepreneurship. There is scope, however, for facilitating enterprise restructuring to reduce the cost of entrepreneurial failure (Adalet McGowan, Andrews and Millot, 2017[38]). Creditors in Iceland may file for liquidation, but for not restructuring, as opposed to debtors. Good international practice includes clear rules for the commencement of restructuring procedures by allowing creditors to initiate restructuring (World Bank, 2020[39]). A predefined period for enforcement action is important for the restructuring process to take place in a swift manner. Temporary authorisation was given to companies in operational difficulties due to the COVID19-crisis to restructure their operations through agreements with creditors. During the restructuring, the companies are in a payment shelter. These measures have been extended until end-2022.

Figure 2.13. The insolvency framework can be more innovation-friendly



Note: The strength of insolvency framework index is a composite index comprising the commencement of proceedings index, management of debtor's assets index, reorganisation proceedings index and creditor participation index. The reorganisation proceedings index has three components: (i) whether the reorganisation plan is voted on only by the creditors whose rights are modified or affected by the plan; (ii) whether creditors entitled to vote on the plan are divided into classes, each class votes separately and the creditors within each class are treated equally; and (iii) whether the insolvency framework requires that dissenting creditors receive as much under the reorganisation plan as they would have received in liquidation.
Source: World Bank, Doing Business Indicators.

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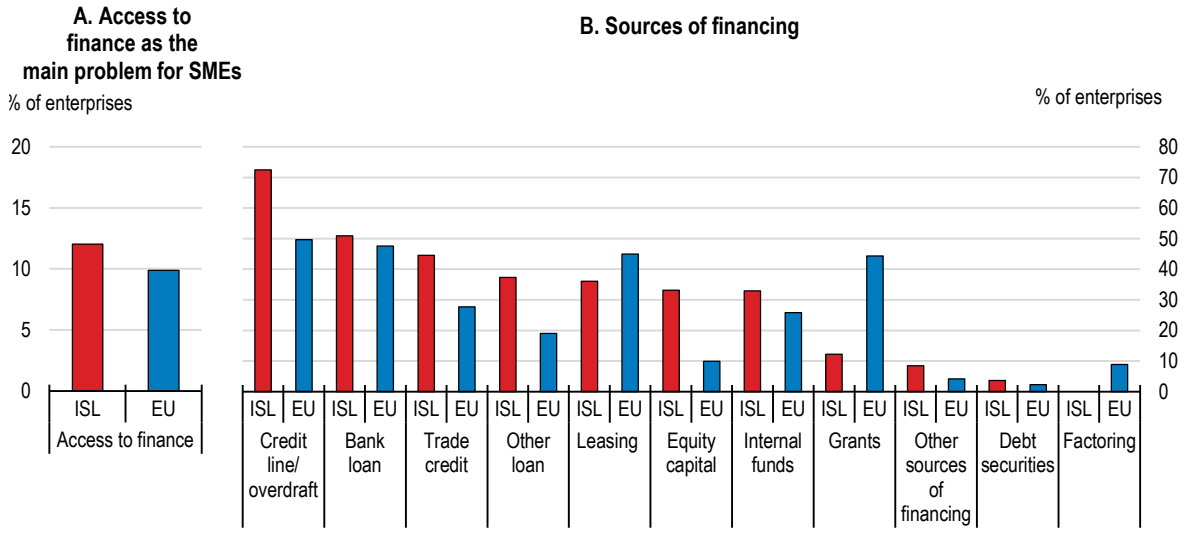
Improving access to finance for young innovative firms

Smaller firms in Iceland have alternative financing options, but many consider access to finance as an important concern (Figure 2.14). As in other countries, firms facing financial constraints are often young innovative SMEs, which lack the necessary track record to signal their prospects to potential investors. The information asymmetry problem is exacerbated by the difficulty to collateralize intangibles, whose share of assets tends to be high in innovative, digitally-intensive firms (Calvino, Criscuolo and Menon, 2016[40]); (Demmou and Franco, 2021[41]).

Figure 2.14. Bank lending is an important source of financing for smaller firms

2020



Note: EU refers to 27 EU member countries in 2020.
Source: European Commission, Survey on the Access to Finance of Enterprises (SAFE).

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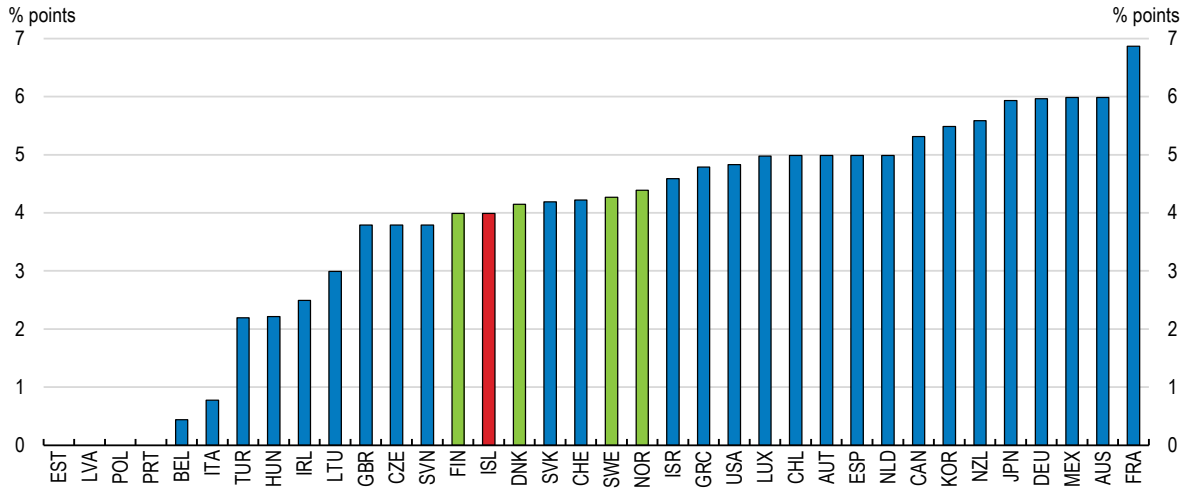
There is scope to develop equity finance for innovative firms. While many Icelandic SMEs consider equity capital to be an important source of finance, they tend to resort more to bank lending (Figure 2.14). This may reflect the more favourable treatment for tax purposes of debt, as oppose to equity, finance, like in many OECD countries (Sorbe et al., 2019[3]) (Figure 2.15). Granting an appropriate allowance for corporate equity (ACE), subject to fiscal space, could make equity finance more attractive (Demmou et al., 2021[42]). Some countries, such as Belgium and Italy, have introduced ACE and their experience is instructive (Box 2.3). Indeed, initiatives in this regard have the added advantage in the post-pandemic era to provide support for firms without creating potential debt overhang problem that can stymie the recovery (Demmou et al., 2021[42]).

Figure 2.15. The debt-bias in the Icelandic corporate tax system could be lowered

Differences in effective tax rates for equity and debt financing, 2019



Source: OECD, Corporate Tax Statistics.

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Box 2.3. Allowance for corporate equity: international experience

Corporate income tax systems generally favour debt finance over equity finance by allowing deductibility of interest expenses, while equity finance is not deductible. This makes equity financing comparatively costly. Some countries, including Belgium, Italy and Portugal, have introduced an allowance for corporate equity (ACE) to address this asymmetry, while several others countries have experimented with it in the past (Demmou et al., 2021[42]). ACE can partially or totally offset the tax advantage of debt financing, making equity financing more attractive. Implementation requires the specification of the equity base for the computation of ACE and how it evolves over time, as well as setting a "risk-free" rate of return on equity (e.g. the rate on medium-term government bonds) (OECD, 2019[43]).

Evaluations of existing systems suggest that ACE systems, if well designed, reduce leverage at the firm level. Recent empirical evidence for Italy suggests, for instance, that the introduction of incremental ACE has substantially reduced the leverage ratio of its beneficiaries, with a larger effect for smaller enterprises and for mature firms (Branzoli and Caiumi, 2020[44]). The impact of ACE was found to be higher for vulnerable and risky firms than sound ones. Evidence for other countries, including Belgium, Austria and Turkey, also suggests that ACE is associated with a significant decrease in financial leverage (Demmou et al., 2021[42]).

Addressing financing and potential abuse issues is important for the successful implementation of ACE. The design should ensure, in particular, that multinationals do not exploit ACE for tax planning (Demmou et al., 2021[42]). Coordinated ACE implementation across countries would also help to tackle the issue. Granting ACE to new equity capital only can reduce the fiscal costs of the measure.

Venture capital (VC) is growing, but not yet well developed. Iceland still scores poorly in international comparison in this regard (IDM, 2020[45]), even though the relatively small size of the market needs to be taken into account. The New Business Venture Fund, established by the government in 1997, was the main source of financing until the mid-2000s. It provides start-up capital and invests in early-stage and expanding companies in return for an ownership stake in the firm. Currently there are a few more VC funds, which are financed mainly by the pension funds. Early-stage financing is further provided in Iceland through the Technology Development Fund, the Research Fund as well as a number of other funds (of various size and scope) in the form of grants, with a variety of private funding schemes also contributing. A matching fund to protect COVID-ridden start-ups has recently been established.

A new publicly-owned VC fund, Kría, started operating in March 2021. Its purpose is to boost liquidity and activity in the VC market by investing in other, privately-owned funds to promote innovation and bring more foreign capital and expertise to the country (Iceland Chamber of Commerce, 2020[46]). The fund is expected to invest around 0.3% of GDP over the next five years. Kría will be financed by the state budget and its dividends. The government move to engage indirectly, through privately-owned venture funds, rather than directly in VC activity is in line with international experience. Most OECD countries have moved progressively towards co-investment funds and funds-of-funds that aim to leverage private investment (Demmou and Franco, 2021[41]). This is because government funding is most effective when disciplined by private management.

To be successful, Kría should invest in viable privately-owned VC funds with large potential to promote start-ups and innovation companies. Setting up the appropriate conditions for the participation of privately-owned venture is also vital. Additional incentives might be needed to attract foreign funds. International experience, such as the Yozma Initiative, can provided guidance in this regard. A regular impact assessment of the success of Kría is necessary. The authorities also need to assess carefully the benefits of operating the New Business Venture Fund in parallel with Kría. As the domestic VC market grows and matures, the government can gradually phase out its equity involvement.

Business angel investment can play a more important role to support start-ups. The creation of more formal business angel networks is important for matching supply of and demand for equity. The government could consider, in this context, providing support (logistical/and or financial) for the establishment of such networks, in line with practice in other countries (OECD, 2016[47]). Several OECD countries provide tax incentives, for instance, as preferential tax treatment or tax relief on capital gains, to promote business angel lending (Demmou and Franco, 2021[41]). As an example, the "tax shelter" scheme in Belgium provides a tax reduction of 45% in the personal income tax for investors in a start-up (OECD, 2016[48]). In Italy, capital gains realised by business angels, not engaged in a business activity to which the participations are effectively connected, are tax-exempt. The angel industry can be further shaped by crowdfunding techniques that enable business angels finding investment opportunities in wider geographical areas (Box 2.4). Crowdfunding is utilised in Iceland through platforms such as Kickstarter and Icelandic Karolina Fund (ICLG, 2020[49]).

Box 2.4. Crowdfunding: a potential financing tool for young innovative firms

Crowdfunding provides a new source of finance for business. Peer-to-peer lending can be particularly attractive for young innovative firms that lack of credit records or collateral for bank loans. In addition to addressing at least in part the financing needs of young firms, crowdfunding entails marketing advantages, as it tends to raise public attention to the company and its investment opportunities, with the potential of helping to develop the business angel industry.

There are four models of crowdfunding: i) the patronage model, i.e. financing undertaken by not-for-profits organisations; ii) the reward-based model, according to which investors receive a reward for their commitment either in the form of a donation or of preferential access to and prices for the new product; iii) the lending model, which resembles peer-to-peer lending: investors receive just a promise of repayment after a predefined period of time of the capital loaned plus interest; and iv), the equity model, in which investors receive a share of the company and become effectively shareholders.

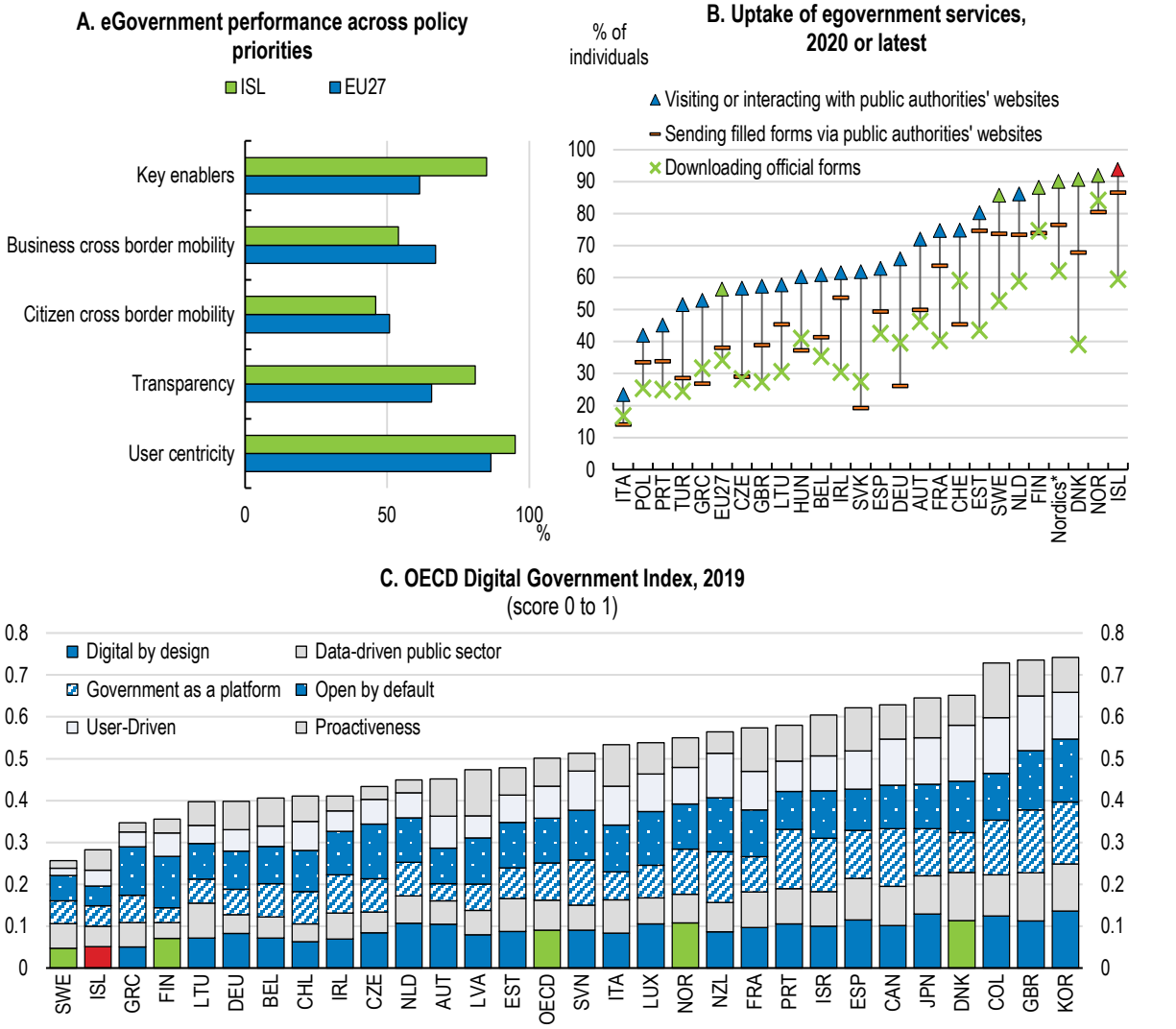
Overall, crowdfunding is still developing and is still relatively modest, and crowdfunding platforms seem to have a growing appeal among individual investors. The effectiveness of such initiatives to help firms raise funding, and the appropriate underlying procedures and employed models need to be assessed further.

Source: (Demmou and Franco, 2021[41]).

Developing digital government

Iceland has applied ICT technologies to some government operations, which is an important step towards developing e-government capabilities. However, it has yet to reap the full potential of digital government. While a relatively large share of the population uses the Internet to interact with the government and e-government services are well developed (Figure 2.16, Panels A and B), Iceland lags behind in the use of data to anticipate the needs of users and deliver better services, as well as in evaluating government's own performance based on the OECD's Digital Government Index (OECD, 2019[50]) (Figure 2.16, Panel C). Progress in this area is important to foster stronger innovation and digital transformation across the economy.

Figure 2.16. E-Government indicators fare well but there is room to improve digital government



Note: In Panel A, User Centricity, indicates the extent to which a service is provided online, its mobile friendliness and usability of the service. Transparency refers to the process of service delivery, responsibilities and performance of public organisations and personal data processed in public services. Cross-Border Mobility, indicates the extent to which users of public services from another European country can use the online services. Key Enablers indicate the extent to which technical and organisational pre-conditions for e-government service provision are in place. In Panel C, data are not available for Australia, Hungary, Mexico, Poland, Slovak Republic, Switzerland, Turkey and the United States. For detailed information on the methodology of Digital Government Index, please refer to OECD Digital Government Index (DGI): Methodology and 2019 results | en | OECD.

Source: European Commission, Digital Public Administration factsheet 2020 Iceland; OECD (2019), Going Digital: Shaping Policies, Improving Lives and OECD ICT Access and Usage by Households and Individuals Database (http://oe.cd/hhind); and OECD Survey on Digital Government 1.0.

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The initiative Digital Iceland is a positive step forward. It sets the framework for the projects carried out under the leadership of the government in cooperation with agencies, municipalities and enterprises. The Digital Iceland taskforce, under the Ministry of Finance's purview, coordinates digital matters in the public sector, manages the implementation of digital projects and provides support to public entities with regard to digital matters. Steps are under way to connect agencies to the national data exchange platform and develop service processes both for the general public and businesses.

The implementation of a national strategy on open data should be stepped up. Compared to other European countries, Iceland lags behind in this area (Open Data Maturity, 2019[51]). While a national open data portal is available, there is limited information on data use and the value it generates, as there are no monitoring mechanisms in place (European Commission, 2020[52]). The government is currently working towards a national strategy on open data (Government of Iceland, 2020[53]). At the same time, a new cyber security strategy was approved in 2019 to prepare Iceland to detect and respond to cyber threats, tackle cybercrime, and the abuse of personal and commercial data. The Cyber Security Council, established in 2015, plays a key role in implementing strategy the strategy. The Cyber Security Forum, also established in 2015, acts as a platform for cooperation between the public and private sectors.

Relevant skills are needed to foster innovation in the digital era

Boosting innovation and reaping the benefits of digitalisation hinges upon the development of relevant skills that respond to rapid technological change and evolving labour market needs. Indeed, official estimates suggest that 28% of the labour market in Iceland is likely to undergo radical changes or elimination of jobs because of automation, similar to other Nordic countries (Government of Iceland, 2019[1]). Successful adaption requires not only ICT skills, but also literacy, numeracy and problem solving competencies, as well as creative thinking and management practices (OECD, 2020[2]). However, skills and qualification mismatches, especially in occupations requiring high skills, were already present before the pandemic, as highlighted by the previous OECD *Economic Survey* (OECD, 2019[54]). While the crisis might have alleviated pressures, longer-term challenges remain to be addressed.

The education system needs to remain attuned to changing skills needs

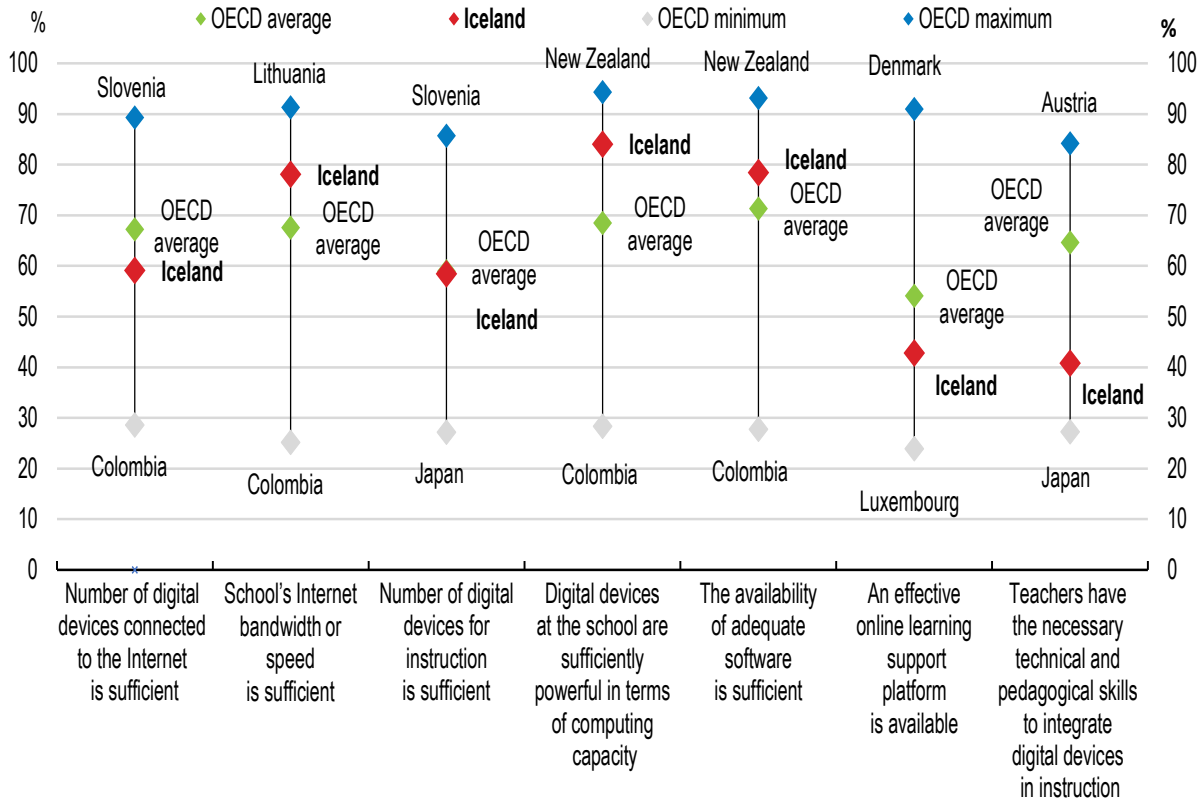
Ensuring strong foundational skills for school and VET students

Many students in Iceland lack solid core skills and competences at the end of compulsory education, according to PISA results (Chapter 1). This is especially the case of students with an immigration background. The 2018 PISA scores suggest, in particular, a performance gap in reading of 55% in favour of non-immigrant students, regardless of socio-economic background. The development of strong foundational skills should continue to be a policy priority for school education, given their importance for continuous learning. The government's focus on the reform of the school system, as one of the main pillars of its Fourth Industrial Revolution strategy, is therefore welcome (Government of Iceland, 2020[53]). The envisaged measures aim to reduce the learning gap between immigrant and native students, including through a more co-ordinated government approach, enhance the professional development of teachers and, overall, improve the capacity of schools to promote critical thinking. Reform implementation should go ahead, and outcomes be closely monitored.

Solid teacher skills in using ICT tools effectively in schools are essential for helping students to make the most of new technologies and develop skills for the future. Iceland fares better than the OECD average when it comes to the adequacy of digital devices available to schools, but the skills (technical and pedagogical) of teachers to integrate such devices in instruction are comparatively low (Figure 2.17). This is also likely to make learning from home less efficient. Teleworking and distance learning have increased with the outbreak of the COVID-19 pandemic and are expected to remain above pre-crisis levels. As education moves to a "new normal", where traditional teaching in the classroom will be complemented by some distance learning, strong teacher ICT skills become even more important (OECD, 2020[55]).

Figure 2.17. Iceland lags in teachers' ICT preparedness

Percentage of students in schools whose principal agreed or strongly agreed with statements about the school's capacity to enhance learning and teaching using digital devices, 2018



Source: OECD calculations based on PISA.

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ITC training for teachers needs to be stepped up. Adoption of innovative classroom practices by teachers depends to a large extent on the training they receive in ICT for teaching (OECD, 2020[55]). However, the 2018 TALIS survey reveals large unmet training needs in this area (OECD, 2018[56]). Novice teachers also need to be better prepared to implement innovative practices in classrooms. Only 26% of the Icelandic teachers in the survey reported to be well-prepared for the use of ICT for teaching, as against a 43% OECD average. Strengthening pre-service programmes that include ICT for teaching would therefore be advisable. Countries across the OECD have introduced a range of policies to foster teacher ICT skills, including self-assessment tools enabling teachers to assess their digital competences (Box 2.5).

Box 2.5. Policies to foster teacher ICT skills: some international practices

OECD countries have introduced various policies to foster teacher ICT skills, ranging from the development of national plans to the introduction of compulsory training, national accreditation standards and national certification for teachers. In some countries, including Chile, Korea, Italy, and Spain, ICT training for teachers constitutes a part of a broader strategy to promote ICT in schools.

Standardisation is one way OECD countries seek to improve teacher ICT skills. Denmark, for instance, has developed a voluntary Pedagogical ICT Licence that combines pedagogical knowledge of ICT and basic ICT skills training. Such an approach was first implemented for in-service training and was then expanded to initial teacher education and general upper-secondary education. Even though it is not mandatory, the licence is integrated into the curriculum of teacher education colleges.

Some countries have developed self-assessment tools. In France, for instance, teachers can assess their digital competences through an on-line tool and receive an authorised certificate. In Finland, teachers can measure and analyse their use of information and communication technologies in teaching through an online self-assessment tool which provides teachers, schools and municipalities information on their ICT usage. In the United Kingdom and Switzerland, on-line self-assessment tools were mainly designed for the identification of professional development needs for teachers and policy priorities in this area. Such tools can also help teachers to identify areas of improvement.

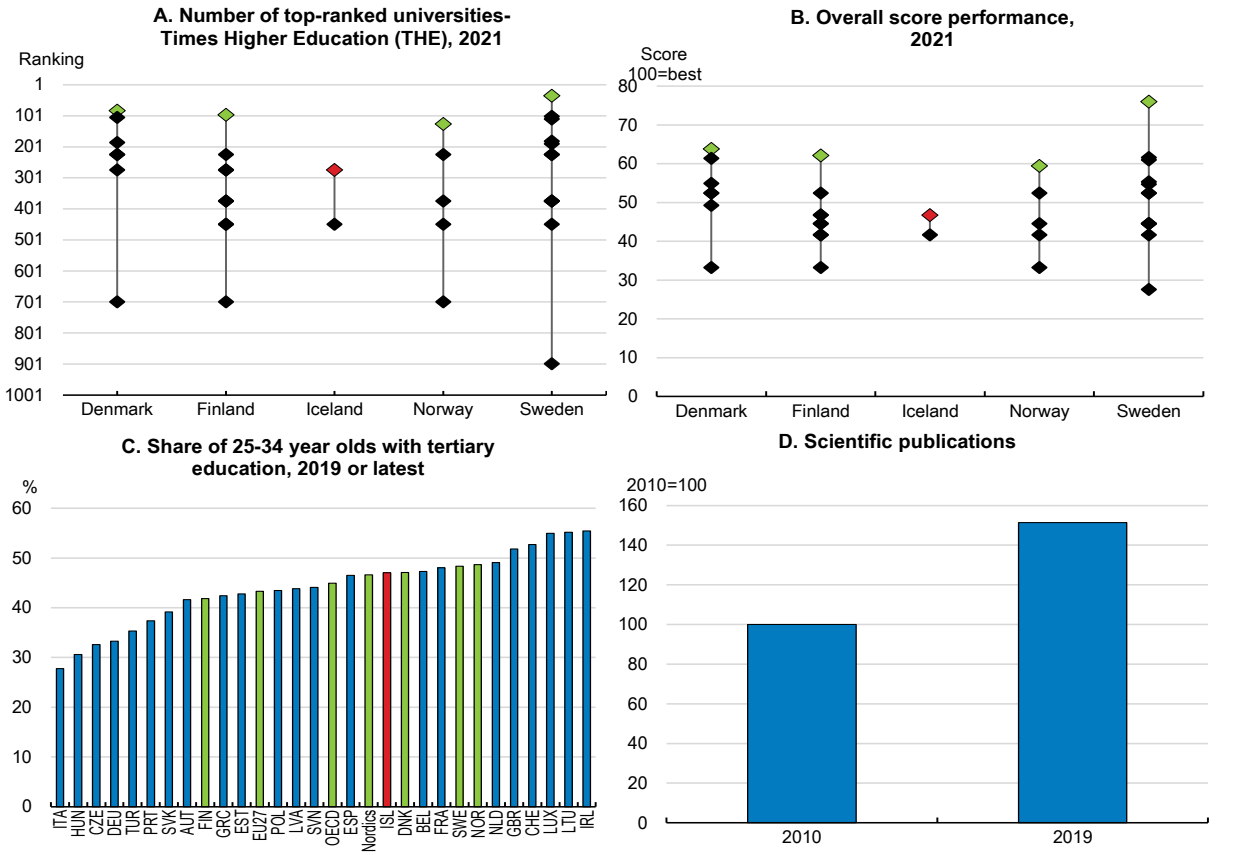
Source: (OECD, 2016[57]); (OECD, 2019[58]); (European Commission, 2019[59]).

Improvements are also needed in vocational education and training (VET). Occupation-specific skills can quickly become outdated in view of rapid technological change; as a result, VET programmes should focus on skills that are considered to be increasingly in need and are transferable across occupations. A better integration between school- and work-based learning components of VET is important to equip students with solid practical skills (Chapter 1; Economic Survey of Iceland 2019). Up until now, schools in Iceland have not provided work-based places; rather, VET students had to search for them and apply to companies. As a result, the two components of VET tended to be disconnected (Eiríksdóttir, 2020[60]). To address this issue, a regulation was adopted in early 2021 which makes schools responsible for work-based training of VET students by providing students with appropriate positions at companies and integrating the school and work-based parts of the students' training. As a positive step towards improving the quality of work-based learning, the digital logbook, under development, will entail a description of skill and competence requirements that a VET student must have acquired upon completion of training (CEDEFOP, 2020[61]).

Fostering skills for knowledge-driven innovation

Iceland's two, out of seven, domestic universities rank among the world's top 500, and almost half of the young people in the country have a tertiary degree. However, there is a need for greater focus on quality and outcomes (Figure 2.18). A planned reform of university funding, to be completed by 2025, aims to help address these challenges. This is welcome, because current funding provides an incentive for universities to focus on enrolment, rather than performance: funding is allocated across institutions on a per-student basis, prompting a bias towards inexpensive courses and popular studies (OECD, 2019[54]) (Box 2.6). The large weight attached in the funding formula to the number of students also limits differentiation of institutional profiles.

Figure 2.18. Tertiary innovation performance can improve



Note: The Times Higher Education World University Rankings are the only global performance tables that judge research-intensive universities across all their core missions: teaching, research, knowledge transfer and international outlook. In panels A and B data refer to 2021.
Source: THE 2021; OECD, Education at a Glance database, and SCImago, SCImago Journal & Country Rank Database.

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Box 2.6. Tertiary education: main features

The Icelandic tertiary education sector comprises 7 universities (4 public and 3 private) and caters to 18000 students in total. All tertiary institutions have the status of universities. There are no specialised VET institutions at the tertiary level, but some are more oriented towards VET programmes than others. Examples include the art academy and the agricultural university. The minimum requirement for admission to universities is a matriculation examination (*stúdentspróf*) or the equivalent level of study.

The main source of income for universities is public funds. Around two-thirds of the allocation is for teaching and is based on a funding model that takes into account the number of students (approximately 95%) and to a much lesser extent the number of those who graduate (approximately 5%). Both are calculated on the basis of price categories for different fields (15 categories for exams). One-third of the public funds allocated to each higher education institution is determined on a historical basis. No criteria exist for research activity.

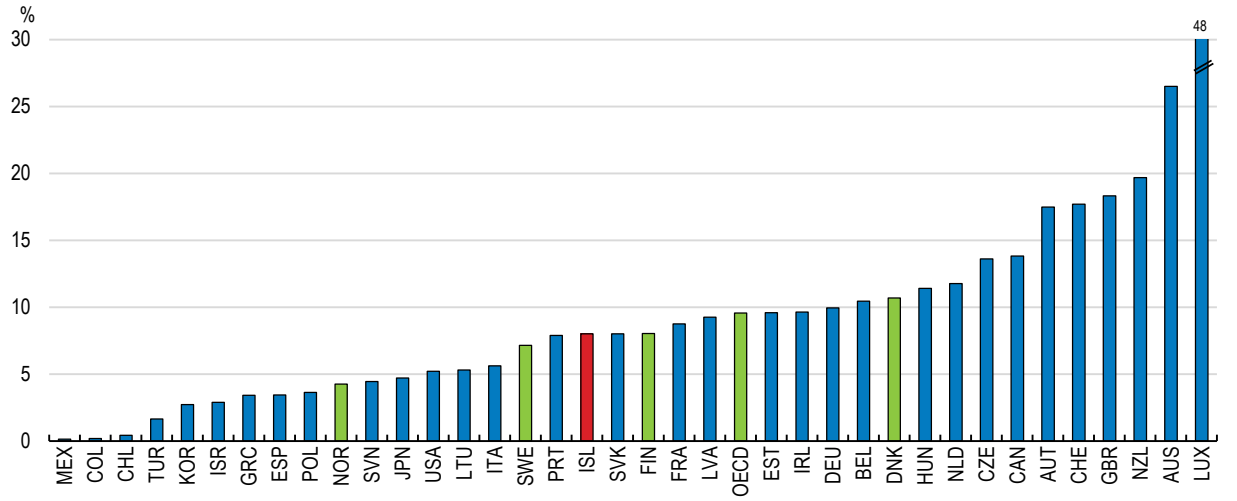
The funding system is currently under review, based on the findings of a 2019 Green Paper. Efforts focus on the development of indicators to measure the quality and efficiency of universities. The new funding system is to be introduced in 2025.

Source: Ministry of Education, Science and Culture; (Government of Iceland, 2020[53]).

To better support quality and performance, less emphasis should be placed on quantitative criteria based on enrolment in the funding mechanism for higher education. This can be done by broadening the set of indicators considered for allocating funds to institutions to include, for instance, international exchange of students, given the importance of mobility of highly educated individuals for knowledge circulation, and research performance (both in terms of outcomes and laboratory/equipment intensity) where there are currently no criteria (Box 2.6). Both Denmark and Norway include mobility indicators in their funding models. Iceland could benefit from such a reform (Figure 2.19). Gender balance objectives could also be pursued through financial incentives. Attaching a higher weight in the funding formula to the institutions' track record in graduations is also important. Official data suggest that only a third of students who entered to university in 2011 completed their undergraduate studies three years later, while 23% dropped out (Ministry of Education, Science and Culture, 2020[62]). It is essential that the set of indicators employed are clearly defined, and based on rigorous data and analysis.

Figure 2.19. The share of international students in tertiary education is low

International student enrolment as a percentage of total tertiary enrolment, 2018



Note: International students are those students who moved from their country of origin (defined as the country of prior education or of usual residence) for the purpose of study.
Source: OECD, Education at a Glance database.

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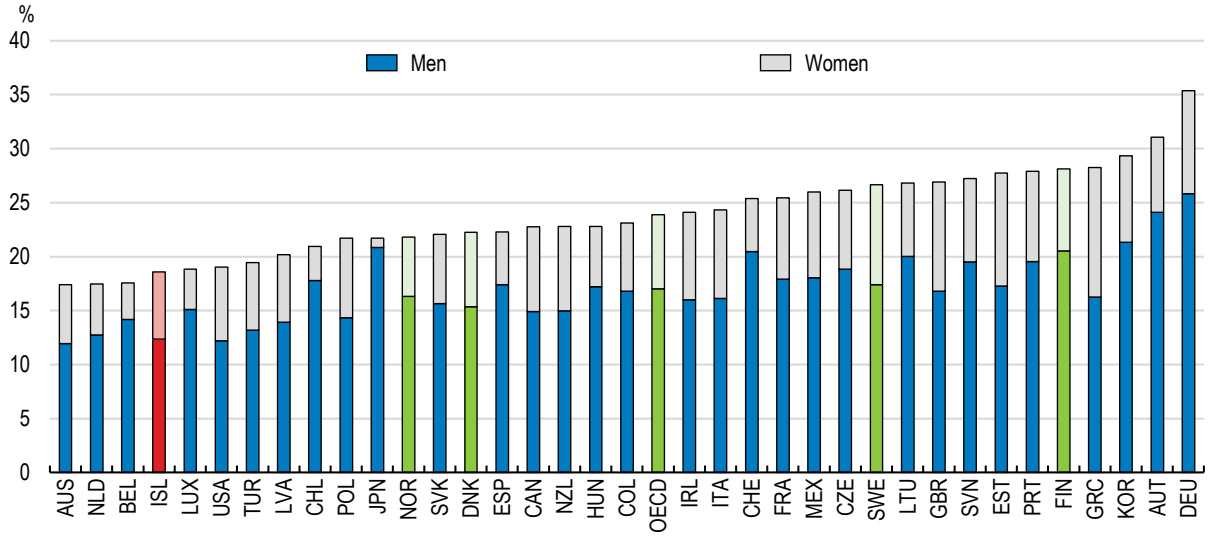
Tertiary funding should also be more tightly linked to labour market and future skill needs. Large qualification- and field-mismatches were evident before the COVID-19 crisis, indicating scope for more relevant skills (OECD, 2017[63]; OECD, 2019[54]). Labour market features, such as the compressed wage distribution in Iceland, can weaken the response of skills to labour market needs. Tertiary funding mechanisms, however, may also play an important role in this regard. The additional funding to universities for the provision of teacher qualifications at post-graduate level to address shortages is a welcome recent initiative. Introducing incentives into the funding formula by linking university funding partially to the success of tertiary courses in providing skills corresponding to labour market needs, as recommended in the previous OECD *Economic Survey* (OECD, 2019[54]), would be advisable. For example, specific courses, such as certain subjects within STEM (science, technology, engineering, and mathematics) that provide skills for innovation and are essential for embracing the digital era, could be rewarded more.

The proportion of tertiary graduates in STEM courses remains lower than the OECD average, especially among women (Figure 2.20). Policy should focus on the STEM disciplines with strong demand but also go beyond and build an innovation-rich skills base. In addition, effective career guidance in schools and

universities, quality information on graduates' labour outcomes and on the competencies of students entering universities are also important factors in improving skill matching. A national database of skills imbalances can help. Recent progress on this front is welcome, with the first set of skill forecasts due to be published in the course of 2021 (The Prime Minister's Office, 2020[21]).

Figure 2.20. Relatively few students graduate in STEM fields

STEM in % of all tertiary graduates, 2018



Source: OECD, Education at a Glance database.

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The government could also encourage collaborative research when allocating funds to tertiary institutions, to facilitate knowledge transfer (see below). Several countries, including Australia, Denmark, Estonia, Finland and Ireland, have established performance contracts between universities and ministries that put emphasis on the role of higher education institutions in supporting business innovation based on indicators such as IP licences, spin-offs and industry-funded R&D (Borowiecki and Paunov, 2018[64]). Linking university funding to collaborative activity and commercialisation of research would help to disseminate the benefits of government-funded research. Increased funding from industry through collaborative research would also provide additional revenue for universities. The experience of the United States suggests that the source of funding (public or private) of university research has important implications for how research outputs are commercialised, with public-funded research entailing larger knowledge spill-overs (Babina, 2020[65]).

The skill mix at the tertiary level should be broadened. Iceland does not have a tertiary VET sector, and instead some universities offer vocational programmes (Box 2.6). The government should go ahead with plans to strengthen the provision of VET at post-secondary/tertiary education level based on the outcomes of a pilot project. Students from tertiary VET programmes should be allowed to enter a post-graduate course, so as to make such programmes more attractive. The development of skill assessments, currently in progress, for students who have not yet passed the matriculation examination will make it easier for universities to assess the applicants (Ministry of Education, Science and Culture, 2020[62]). More solid pathways from secondary to vocational tertiary education are also necessary. The provision of entrepreneurship programmes at higher education, as well as lower levels, is important as such programmes can equip students with broader competencies (OECD, 2019[54]; OECD, 2019[66]). Efforts in this domain should continue, while ensuring an appropriately trained teaching staff.

Overall, the tertiary education system has to deliver the appropriate skills for the digital age and also adapt to it. A prerequisite, beyond a quality-oriented funding scheme, is that higher education institutions have

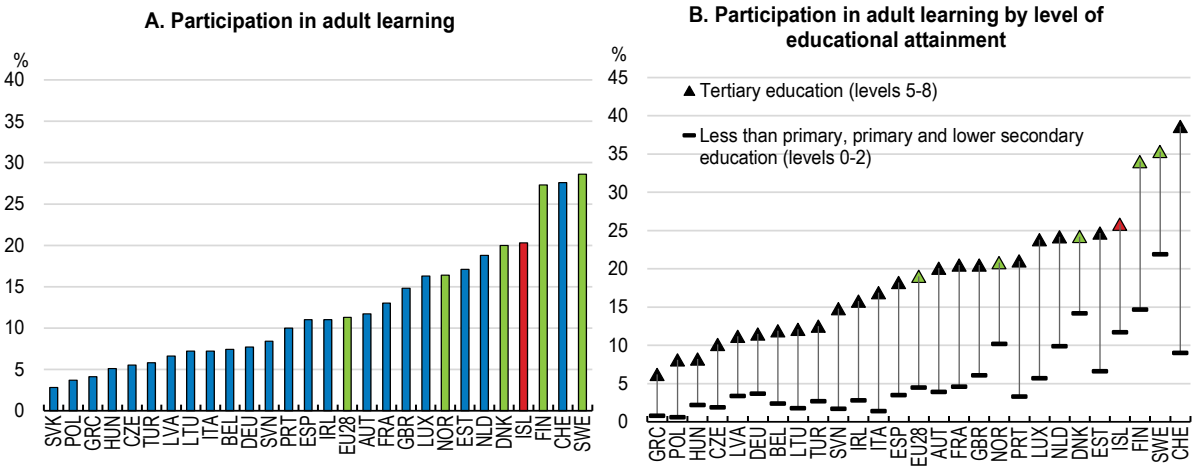
the capacity to embrace the constantly evolving ICT technologies. Moreover, students and teaching staff also need to be familiarised with digital technologies. This is even more important, as mentioned earlier, as on-line teaching, which accelerated with the COVID-19 crisis, may become more of a norm in the future. Effective mechanisms to monitor higher education outcomes and respond to poor performance are essential. As a positive move, the Quality Board safeguards the standards of Icelandic higher education, through the implementation of the Quality Enhancement Framework, conducting evaluation reviews. The second evaluation cycle is underway.

Encouraging participation in adult learning programmes

Iceland compares well internationally in terms of participation in adult learning, though it still needs to catch up with some of its Nordic peers (Figure 2.21). Around one in five adults take part in lifelong learning, access to continuing education and training is set out in collective agreements, and funding is available for those participating (Andersen, Hougaard and Ólafsson, 2011[67]); (OECD, 2019[68]). Icelandic workers have the flexibility of entering and re-entering the education and training system, which provides plentiful lifelong learning possibilities. Re-skilling and up-skilling through adult learning programmes are key to develop digitalisation further (Andrews, Nicoletti and Timiliotis, 2018[28]).

Figure 2.21. Participation in lifelong learning remains relative low for some groups

25 to 64 years, 2020 or latest



Note: Adult learning is defined as participation in education and training (last 4 weeks) of people aged between 25 and 64.
Source: Eurostat Labour Survey.

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There are gaps in participation in adult learning. Special attention is given to adults who have not finished upper-secondary education. The 2010 Adult Education Act provides a legal basis for improved financial support for programmes targeting this group and for access to study and counselling (European Commission, 2015[69]). Preparatory programmes are currently available for people to return to the educational system to complete their upper-secondary education, which are delivered throughout the country through a network of lifelong learning centres. The less educated, however, are still less likely to participate in adult learning programmes than those with tertiary education, even though they are most at the risk of seeing their prospects worsen during downturns, as evidenced by the COVID-19 crisis, and/or to suffer from shifts in demanded skills related to technological change (Figure 2.21). Moreover, adult learning has a stronger impact on digital adoption in the case of low-skilled workers compared to those who are already highly skilled (Andrews, Nicoletti and Timiliotis, 2018[28]). Lack of time due to work and

family obligations, financial constraints, lack of support by employers or limited information about lifelong learning programmes have been identified as barriers to the participation in learning of the low-skilled adults (OECD, 2017[70]).

Iceland should move towards a more comprehensive approach to lifelong training. The government Action Plan for the Fourth Industrial Revolution includes adult learning among its main pillars (Government of Iceland, 2020[53]). The plan entails, in particular, three broad objectives: a simplified system of continuing education, improving information on learning, and strengthening the links between adult learning and the education system through the development of skills assessments schemes. The strategy goes in the right direction and should be implemented swiftly. The focus on the groups most exposed to rapid technological change, namely less educated workers and immigrants, is appropriate. As a positive step, the development of skills assessment schemes is under way and can facilitate re-entry into the formal school system for workers that lack upper-secondary qualifications by evaluating work experience and acquired skills. Overall, the recognition of prior learning can help to re-engage individuals in training and limit time and costs (OECD, 2019[71]). To ensure a high take-up of the skills recognition programmes, procedures should be simple. To broaden the use of these programmes among adults with low qualifications, France and Portugal for instance have put in place guidance services that support the recognition of the skills for such groups (OECD, 2019[71]; OECD, 2019[72]). It is important that the skills assessment processes are harmonised.

Access to funding for adult learning needs to be simplified. While there is considerable funding in Iceland to support lifelong learning activities, the system is fragmented with numerous funds, reducing the ease of access. Streamlining would be advisable. In addition, financial incentives can be provided to encourage participation among under-represented groups (Box 2.7). Incentives should be carefully designed to ensure appropriate targeting and reduce deadweight costs. Encouraging participation also calls for raising awareness about lifelong opportunities and longer-term benefits from re-skilling, for example through individualised advice and guidance-counselling services, as provided by Lifelong Learning Centres (OECD, 2019[68]). A regular assessment of these services in improving the incentives for re-skilling is nevertheless needed. Overall, to be attractive to low-skilled, adult education schemes need to lead to certification and be accompanied by clearly defined career pathways.

Box 2.7. Financial incentives to boost participation in lifelong learning: international experience

To encourage participation in adult learning of under-represented groups, a variety of financial incentives are provided across OECD countries. This is justified, as workers and firms may not fully internalise the need for further investment in skills.

The financial incentives provided in OECD countries include subsidies, such as vouchers and grants, and tax incentives in the form of allowances or tax credits. In Sweden, for instance, an education entry grant was introduced in mid-2017 with a focus on the low-qualified unemployed aged 25-56. In the United Kingdom, low-skilled adults have access to digital programmes that are fully-funded. The United States grants vouchers to unemployed low-skilled adults for training programmes that respond to in-demand sectors.

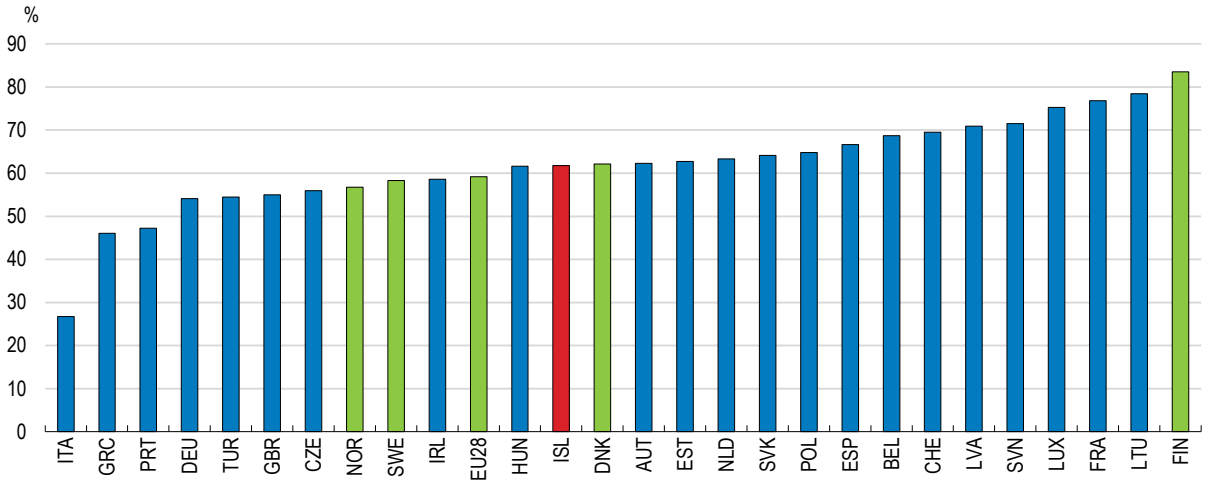
Some countries, for instance France and the Netherlands, have introduced individual learning accounts. Such schemes attach training rights to individuals, rather than jobs, to fund future education and training, and include accounts where time and/or savings for training are accumulated over time. They have received increasing attention in recent years as they allow for the portability of training rights between jobs and also employment statuses, facilitating career transitions.

Source: (OECD, 2019[71]); (OECD, 2019[73]).

Reaping the benefits of digitalisation also requires upgrading management skills. This would improve the ability of firms to develop new business models and adopt advanced technologies (Andrews, Nicoletti and Timiliotis, 2018[28]). The share of managers in Iceland with tertiary education compares well with the EU average but it falls below the best performers (Figure 2.22). Providing more entrepreneurship programmes at tertiary level (as discussed earlier) and encouraging management training would help enhance managerial skills. As a positive step, MBA programmes are organised around working students with an emphasis on innovation and digital transformation. Moreover, the Strategy for Public Leadership, implemented by the government in 2019 puts emphasis on leadership, results and communication. Innovation and foresight are among the focal points of the strategy, supporting the emphasis on knowledge and innovation among public leadership in the Innovative Iceland Policy (Box 2.1). The improvement of management skills in SMEs is also important in the digital era. The Training Action (Formação-Ação) model in Portugal is an example in this regard (OECD, 2018[74]). Training under the model focuses on areas such as boosting the efficiency of production processes and marketing and sales, with the consulting services aiming to help employers develop training plans.

Figure 2.22. Managerial skills can improve further

Share of managers with tertiary education, 2020 or latest



Note: Data refer to managers (group1) based on the International Standard Classification of Occupations 2008 (ISCO-08) and tertiary education (levels 5-8) based on the International Standard Classification of Education (ISCED 2011).
Source: Eurostat, Labour Force Survey database.

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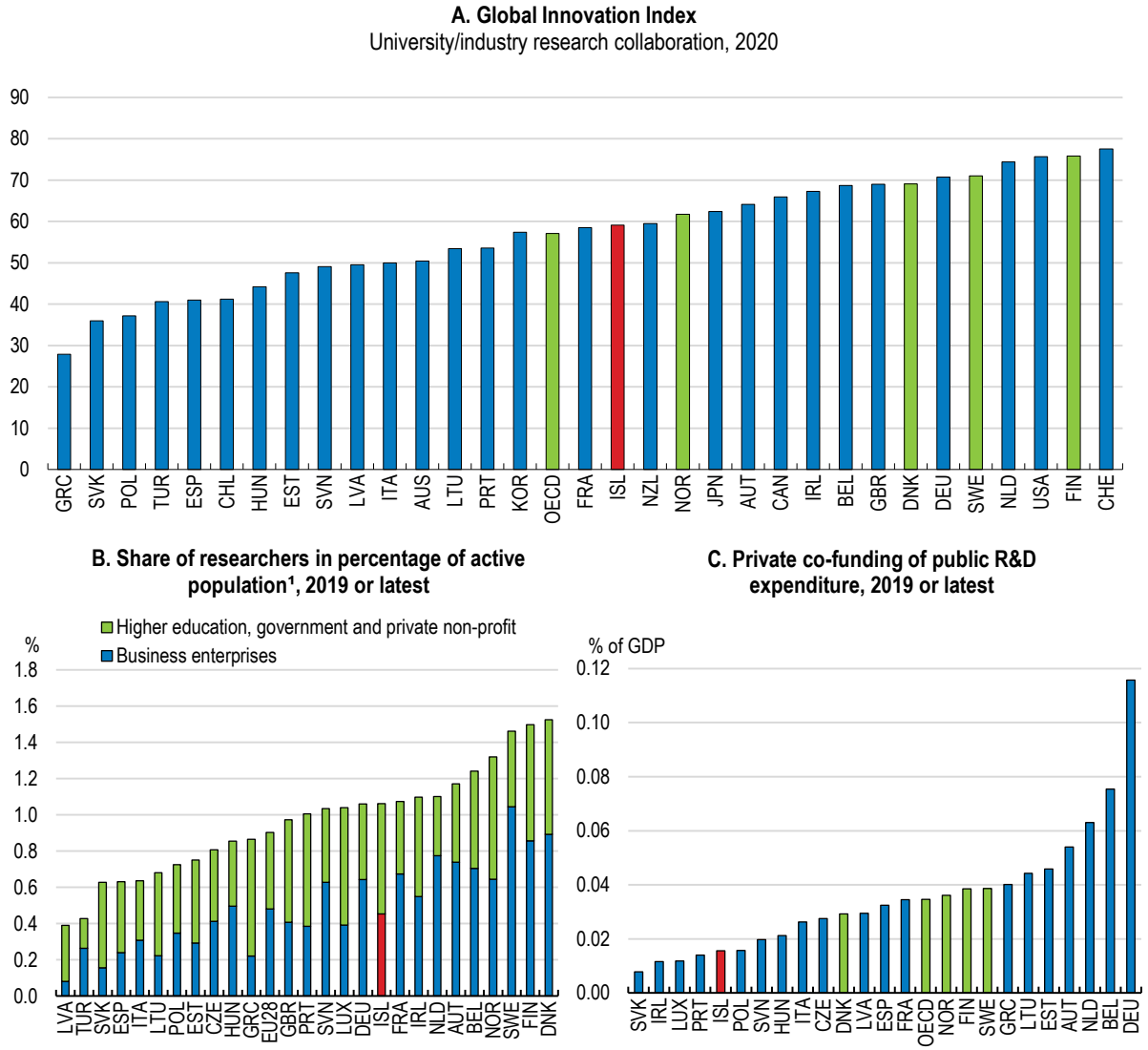
Enhancing knowledge transfer to strengthen inovation

Despite achievements, business-university collaboration remains weak

For public research outcomes to unleash their potential for innovation, business-university collaboration needs to strengthen. Such partnerships can spur innovation by facilitating knowledge transfer, which can boost firm-level productivity (Andrews, Criscuolo and Gal, 2015[75]). Business-research partnerships are especially important in the digital era, because of the need to adapt knowledge to specific applications (Guellec and Paunov, 2018[76]). Collaboration also allows research institutions and businesses to share the costs and risks of investment in digital innovation (OECD, 2019[77]), and it is particularly beneficial for small firms, as they often lack the equipment and skilled personnel needed to innovate (Hewitt-Dundas, Gkypali and Roper, 2017[78]). Moreover, business-research cooperation would help universities raise

revenue through "valorisation" activities, including commercialisation of R&D and academic entrepreneurship (University-Business Cooperation in Europe, 2017[79]). There are many examples of successful business-research collaboration in Iceland. These include the co-operation agreements between universities and various partners (for example, high-tech companies, the fishing industry, energy industry, medical industry and tourism and transportation services). However, businesses and universities in Iceland collaborate less than in several other European countries, including the Nordic peers, as is also reflected in the relatively low share of private co-funding of public R&D (Figure 2.23). Moreover, the number of researchers in the business sector is comparatively low, suggesting low mobility between the two sectors.

Figure 2.23. Collaborative research remains weak



Note: 1. Researchers are presented in full-time equivalent unit.
Source: Global Innovation Index, 2020; Eurostat; and OECD, Research and Development Statistics database.

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Obstacles to business-research collaboration are well known. They range from differing priorities and cultures in universities and businesses to more structural factors, such as the historical lack of technology transfer services and infrastructure in Iceland. Academics consider a lack of private and public funding for collaborative research, including from universities themselves, and limited awareness among businesses of university research activities as the main barriers to collaboration (University-Business Cooperation in Europe, 2017[79]). Collaboration may also be discouraged by a perception among academics that there is a trade-off between research excellence and cooperation with businesses. The comparatively low absorptive capacity of Icelandic firms could also act as a barrier to collaboration (Cornell University, INSEAD, and WIPO, 2020[80]).

Policy levers for strengthening business-research collaboration

Iceland would benefit from a more comprehensive approach to business-research collaboration. Research partnerships rely mainly on informal linkages rather than formalised programmes (The Prime Minister's Office, 2020[21]). The introduction of carefully-designed policy initiatives that encourage business and academic partnerships, based on international experience (OECD, 2019[77]), should be considered, while making sure that existing measures, such as tax incentives for collaboration under the R&D tax credit scheme, are effective. As discussed earlier, the programme's outcomes have not met expectations, and a close monitoring and regular evaluation of the collaboration-enhancing schemes is crucial.

Innovation vouchers is a promising policy tool that the government could explore. These are small lines of credit to SMEs to purchase services from public knowledge providers, with a view to introducing innovations in their business operations. Innovation vouchers are currently used in several OECD countries (OECD, 2019[77]; Backer-Gonzalez-Salido, 2019[81]); for example, the experience of the Netherlands shows that innovation vouchers can have an impact over time as they change firms' behaviour and business strategy towards collaborative research (Roelandt and van der Wiel, 2020[82]). Innovation vouchers also tend to encourage output additionality, given that beneficiary businesses would not undertake innovation projects without public support (The Innovation Policy Platform, 2010[83]). Administrative simplicity, continuity, regular evaluation and clearly defined eligibility criteria are vital for innovation voucher schemes to succeed.

Dissemination of information also helps to raise awareness among eligible businesses and ensure high take-up rates. Likewise, it is important to develop a network of services to assist firms to reach into the right expertise in the research sector, while strengthening incentives for engagement. The Technology Transfer Office in Iceland (discussed below) is tasked to help the industry find required expertise within the scientific community, facilitating interactions between academia, industries and investors. The innovation incubators, through which the government supports the creation of small firms, also play a role in this area (OECD, 2015[84]). An additional initiative towards strengthening university-business collaboration involves the establishment of the University of Iceland Science Park. This also aims to create facilities for innovators. Moreover, a new Technical Centre has been established, as part of the governmental Innovation Policy (Box 2.1), to support and stimulate university-business collaboration in high-tech innovation. These initiatives are welcome. The authorities should also consider boosting collaboration through specific programmes that connect SMEs with researchers, based on the experience of other OECD countries (Box 2.8).

Box 2.8. Connecting businesses with researchers: international practices

To facilitate collaborative research, some countries have introduced initiatives to connect SMEs with research and talent in post-secondary institutions. Examples include:

- Australia's Innovation Connections. The programme involves a network of research facilitators who provide practical advice and mentorship to SMEs, assess their research needs and direct them to research expertise. It also provides funding for collaborative projects through grants (CSIRO, 2020[85]). The duration of Innovation Connections projects ranges between two and 12 months. An eligible firm can: i) place up to two of its own research employees in a publicly-funded research organisation or an Australian university, to work collaboratively on a project and/or access specialised equipment and research infrastructure; ii) employ a graduate or postgraduate student to undertake a research project for 6-12 months; or iii) place a researcher in the firm to work collaboratively on a project to develop and implement a new idea with commercial potential. Evidence suggests the programme tends to encourage longer-term partnerships between SMEs and research institutions (Watt, 2015[86]).
- The Canadian Technology Access Centres (TAC) Grant programme focusses on enhancing the innovative capacity of SMEs through collaborative access to specialised talent, expertise, equipment and technology from Canadian colleges (OECD, 2019[77]). The programme provides financial support to a network of 30 TACs throughout the country. TACs are specialised, applied R&D centres affiliated with publicly-funded colleges located across Canada (Hampel and Doyle, 2019[87]). Each TAC focuses on strengthening an industrial sector of significance to that region but they are networked with one another.
- The Patent Commercialisation Platform (PCP) in Korea connects researchers from 24 universities and more than 8 000 SMEs, with its experts providing advice to SMEs and matching SMEs with university technologies to support technology transfer (OECD, 2019[77]). It also provides follow-up financing for commercialisation of these technologies by SMEs.

Collaborative research could also be encouraged by the university funding system, which is under review. In particular, as discussed above, more weight could be attached to collaborative research. Greater recognition of collaborative activities with industry in other funding parameters, notably the appointment and promotion of academics, could also provide incentives for mobility. As in other countries, teaching experience and publications tend be the dominant criteria for tenure and promotion, rather than engagement in business-research cooperation. Mobility is indeed important, and the government provides short-term grants for summer internships to university students to work in R&D projects undertaken by businesses or universities/research institutes. Options for enhancing mobility could focus on higher-degree research students and longer-term financial support for firms to strengthen incentives for them to hire students. Canada's Mitacs-Elevate is instructive in this regard. The programme consists of a two-year research management training scheme for postdoctoral students that deploys leading talent into the private sector, where they have the opportunity to lead industrial R&D projects and gain business experience. The programme subsidises more than 80% of the salary (OECD, 2019[77]).

The transfer of public sector knowledge is improving

In 2018, Iceland established a technology transfer office (Aunda TTO) to facilitate the commercialisation of public research. The main roles of TTO include the analysis and support of IP rights, as well as mentoring and advising on spin-off creation. It also seeks to improve IP awareness and value creation of scientific research. The digital era reinforces the need for effective IP management as the IP system is confronted with new challenges related to the importance of data as input and output of digital innovation and AI created patentable inventions (Guellec and Paunov, 2018[76]). At the same time, it is important to ensure

simplified IP licensing processes to promote collaborative research. It is still early to assess the effectiveness of TTO, but it is important that TTO is well resourced, and its staff has strong skills and expertise in the management of IP. The receptiveness of university departments to TTO services and business-oriented management of TTO are important determinants of success (Muscio, 2009[88]).

Current efforts focus on open access policies. The aim is to promote access to public data from universities, research institutions and data generated through grants in the field of research and innovation (Government of Iceland, 2020[5]). This is welcome, given the benefits of opening up access to public data to encourage research in institutions and companies, as well as increasing the social returns of public investment in this area (OECD, 2007[89]). Open access data also poses challenges, including those related to incentives for making research data available openly and the necessary digital infrastructure to make it accessible (OECD, 2015[90]). Privacy and enforcement of IP rights are other important considerations. The government should go ahead with its plans to conduct a detailed analysis of the barriers and costs in opening access and develop an action plan for implementation. The OECD principles for access to research data from public funding (OECD, 2007[89]), and updated guidelines (OECD, 2021[91]) in terms of scope and areas that are crucial for enhancing access to research data, provide an overarching framework for policy in this area.

International research collaboration is another important channel of knowledge transfer. Iceland participates in a number European cooperation programmes, such as Horizon 2020 and Erasmus+, outperforming its Nordic peers in terms of EU grants received (Government of Iceland, 2020[5]). It also ranks highly in terms of international scientific co-publications (Figure 2.2, Panel A). The government is currently working on a roadmap for research infrastructure. This is welcome and essential for deepening the benefits of international collaboration in terms of knowledge flow and access to quality infrastructure in all fields, especially for a small country like Iceland.

Table 2.1. Recommendations for fostering innovation for the digital era

Improving R&D support for businesses	
Business R&D intensity does not match the rapid increase in tax support for R&D in recent years and innovation outcomes of smaller firms, which are the main beneficiaries of such support, are relatively weak.	**Ensure that R&D tax-incentives better target smaller innovative firms.**
The tax credit scheme has not been evaluated since its introduction in 2011, with the first evaluation set to be completed by 2023.	Regularly assess the cost-effectiveness of R&D tax incentives to inform policy choices and further reform.
Tax-incentive support for business R&D grew faster in recent years than direct support.	Continue to boost direct funding to business R&D, ensuring a balanced mix of support.
The science and innovation system is fragmented and solid evidence-based policy-making is lacking in this area.	Move to a new organisational structure of the innovation system that ensures greater policy co-ordination. Develop a comprehensive database for analysis and policy evaluation.
Encouraging firms to adopt new technologies	
Restrictions to foreign direct investment are high, holding back innovation.	Proceed with plans to streamline the application process for work permits for foreign specialists.
The insolvency framework ranks below the OECD average in terms of re-organisation proceedings, weakening the incentives for disruptive innovation and adoption of new technologies.	Reform the insolvency regime to facilitate further enterprise restructuring, including through clear rules for the commencement of the procedures by allowing creditors to initiate restructuring and a predefined period for enforcement action.
Venture capital, an important source of financing for young and innovative firms without collateral, is not yet well developed.	**Ensure that the new publicly-owned venture capital fund invests in privately-owned venture capital funds with large potential to promote start-ups and innovation companies.**
Developing digital government	
The Administration lags behind in the use of data to anticipate the needs of users and deliver better services, as well as to evaluate government's own performance.	Accelerate progress towards digital government and a data-driven public sector.
Relevant skills for fostering innovation in the digital era	
School teachers lack solid skills to integrate ICT tools in instruction.	Increase in-service and pre-service training in ICT for teachers.
The funding system for tertiary education provides an incentive for universities to focus on enrolment, rather than performance, and it is not linked to labour market needs. The tertiary system does not provide sufficiently broad skills.	Proceed with the reform of the tertiary funding system, broadening the set of indicators considered for allocating funds to institutions. Link university funding partially to the success of tertiary courses in providing skills corresponding to labour market needs. **Increase the provision of vocational education programmes at the tertiary level and of entrepreneurship programmes.**
Workers with a lower education level participate less in adult training programmes.	Encourage participation in lifelong training of under-represented groups, including through carefully-designed financial incentives and simple procedures for skills recognition programmes.
Enhancing knowledge transfer to strengthen innovation	
Collaboration between research institutions and the business sector is weak, limiting knowledge transfer. Open access to public data created by universities and research institutions, including in the field of research and innovation, is still constrained.	**Introduce carefully-designed policy initiatives to encourage business-research collaboration on innovation, including specific programmes that connect smaller firms with researchers.** Conduct a detailed analysis of the barriers to, and costs of, in opening access to public data and develop an action plan for implementation.

Note: Key recommendations are in bold and feature in the executive summary.

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3 Addressing climate change

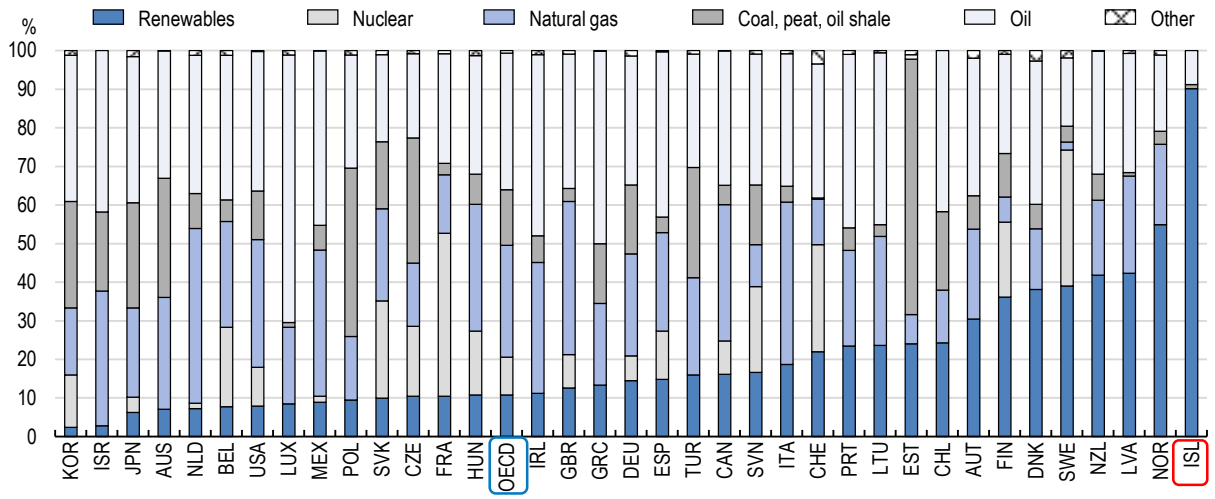
Iceland relies far more on renewable geothermal and hydropower energy than any other OECD country. Even so, the country's per capita carbon (or greenhouse gas) emissions remain above the OECD average, partly because of emission-intensive aluminium smeltering. The government committed to reduce emissions from their 2005 level by 40% by 2030 and in 2020 updated its climate action plan covering 48 individual policy measures. This chapter presents a policy framework to reach the climate targets in a sustainable, cost-efficient and inclusive way. Climate action should first and foremost rely on comprehensive carbon pricing, via a carbon tax or an emission trading system. All sectors and carbon emission sources should be covered, and the government should commit to a gradual increase of the carbon tax rate. The government should support innovation and investment in green infrastructure, particularly in carbon capture technology, low-carbon fishing vessels and soil conservation. To ease the transition to a low-carbon economy, Iceland should remove entry barriers for new and innovative firms, foster the creation of green jobs, and invest in adequate skills. To garner political support, proceeds from carbon pricing could be redistributed to households and firms, at least partly.

Iceland's impact on the world climate

At first glance, Iceland's impact on climate change may look insignificant. The country produces around 0.01% of worldwide greenhouse gases, less than a mid-sized city anywhere on the globe. Iceland is thinly populated, boasts pristine wilderness, and enjoys excellent air and water quality. At around 90%, Iceland relies far more on renewable energy sources than any other OECD country, with hydropower and geothermal energy warming up houses and fuelling energy-intensive industries (Figure 3.1.). Fossil fuels are mostly used for land transport and the fishing fleet. This is why relative to GDP, energy-related CO_2 emissions are lower than elsewhere in the OECD and declining.

Figure 3.1. Iceland relies mostly on renewable energy

Primary energy supply, % of total supply, 2019



Note: Total primary energy supply (TPES) is made up of production + imports - exports - international marine bunkers - international aviation bunkers ± stock changes. Primary energy comprises coal, peat and peat products, oil shale, natural gas, crude oil products, nuclear, and renewable energy (bioenergy, geothermal, hydropower, ocean, solar and wind). Electricity trade is included in total energy supply, but excluded from the calculation of the breakdown by source.
Source: OECD Environment at a Glance database.

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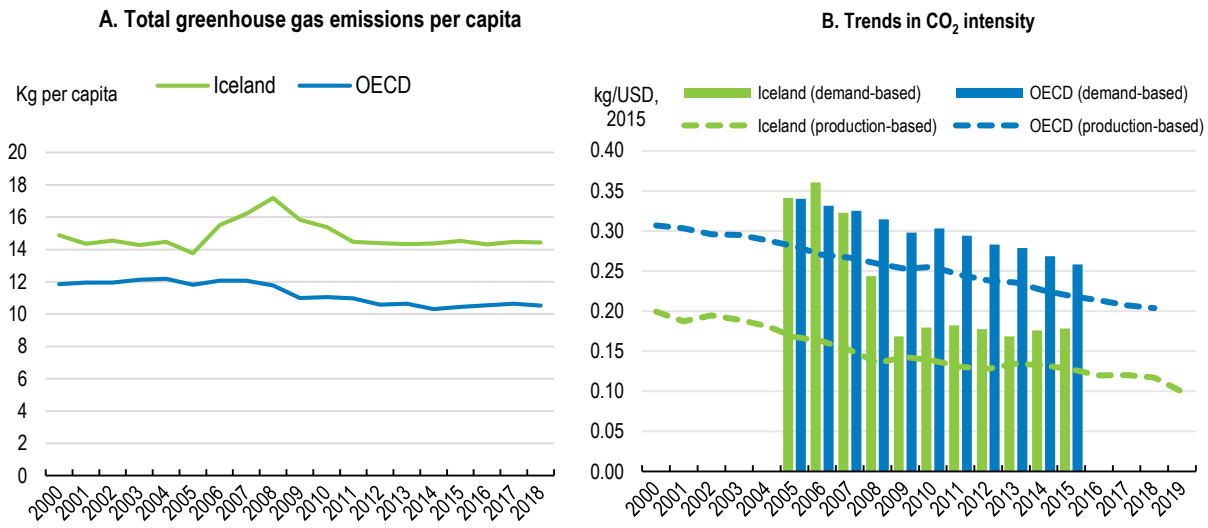
Even so, Iceland's role in climate change is not negligible. Abundant low-cost energy has given Iceland a comparative advantage in energy-intensive aluminium smeltering, which (although overall being less carbon-intensive than in other countries thanks to the recourse to renewable energy) contributes substantially to greenhouse gas emissions. Per capita greenhouse gas emissions – often referred to as "carbon emissions" and excluding emissions from land use, land use change and deforestation - remain above the OECD average, with the gap higher than before the recession of 2009/10 (Figure 3.2 A). CO_2 intensity is below the OECD average and declining, mainly because of the important role of hydro for electricity generation and of geothermal water for heating. The data also suggest that like other OECD countries Iceland produces many "clean" goods while importing the "dirtier" variants (Figure 3.2 B).

Figure 3.2. Overall carbon emissions are above the OECD average



Source: OECD Green Growth Indicators; OECD Environment Statistics database; and OECD National Accounts database.

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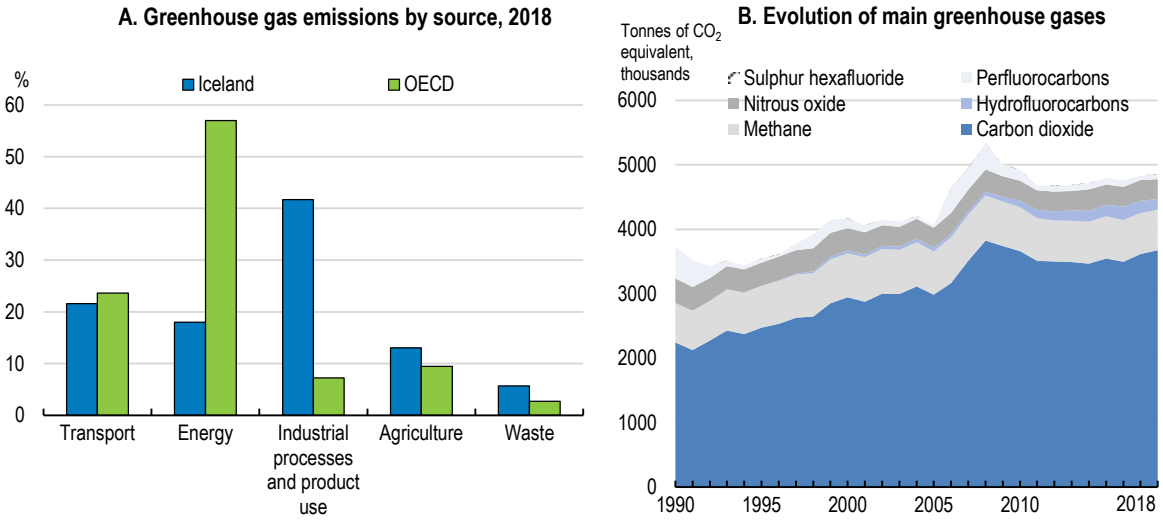
Iceland's emission profile is unique both in terms of contributing sectors and the composition of greenhouse gases (Figure 3.3). Industry makes up for an outsized share of emissions given the activities of three large aluminium smelters and the fossil fuel-based fishing fleet, while emissions from energy production – mainly carbon leakage from geothermal harnessing - are small. Carbon emissions of land transport remain close to the OECD average. Agricultural emissions, mostly methane and nitrous oxides, are above OECD average, reflecting the importance of sheep and cattle raising.

Figure 3.3. Industry contributes most to carbon emissions



Source: OECD Environment Statistics database.

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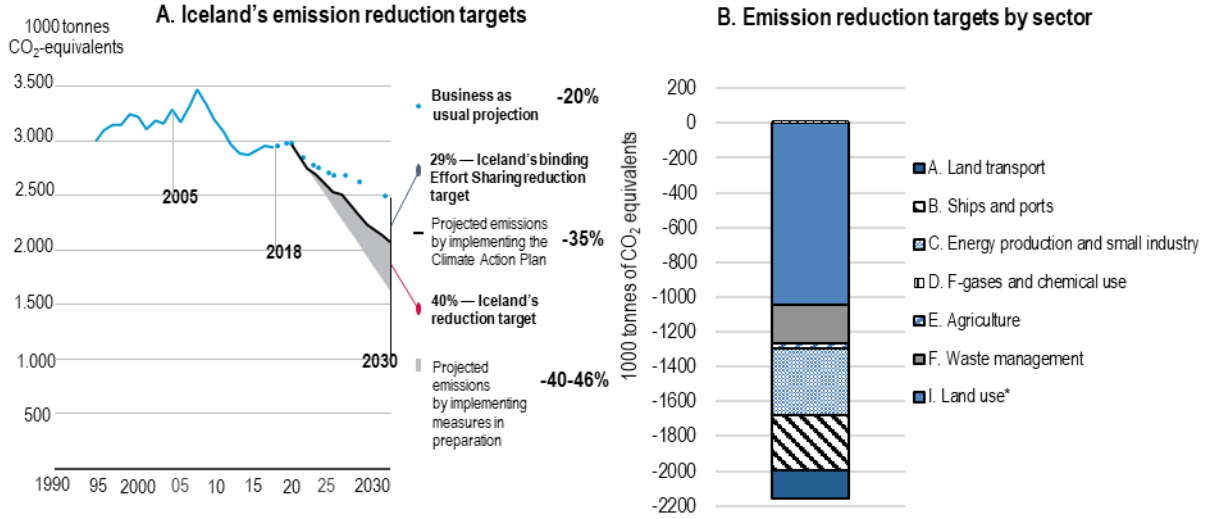
The government's climate policies

Iceland signed the UN convention on climate change in 1993 and adopted a climate law in 2012 (Government of Iceland, 2019[1]). The climate law requires the government to regularly publish a climate action plan and to provide information on policies and measures to reduce greenhouse gas emissions (Ministry for the Environment and Natural Resources, 2018[2]). The 2018 climate action plan lists 34 individual measures to reach "carbon neutrality" – or zero net emissions – by 2040. In 2020, the government published an updated version of the climate action plan, adding 15 measures and bringing the total to 48. The plan relies on extensive consultation with stakeholders and civil society, suggesting that targets and policies have broad political support. In April 2021, the parliament passed legislation to allow companies additional depreciation of assets that qualify as green, reducing the cost of green investment.

The climate action plan presents targets and measures in considerable detail. In the baseline scenario, Iceland aims to reduce emissions by 35% in 2030 compared to 2005, as against a "business as usual and no measures" scenario with emissions declining by 20% (Figure 3.4A). The strongest contributions to carbon neutrality are projected in the area of land use and land use change – in particular carbon sequestration through reforestation and restoration of wetlands – followed by energy production, the maritime sector, waste management and land transport (Figure 3.4B). Households are not listed, because the climate action plan's classification is production- rather than consumption-based and because emission-free geothermal water heats most dwellings. The 48 measures cover all sectors but with a focus on cross-sectoral measures and land transport.

Figure 3.4. Iceland wants to reduce carbon emissions by 40%



Note: * Land Use, Land-Use Change, and Forestry.
Source: Ministry of Environment and Natural Resources, Iceland's 2020 Climate Action Plan.

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In 2019 Iceland together with Norway agreed with the European Union to jointly reduce emissions by at least 40% between 1990 and 2030 (Norwegian Ministry of Climate and Environment, 2019[3]). In 2020 the government established a working group to explore funding needs for green investment. The group's main objective is to select green projects, develop a sustainable investment funding framework and the conditions needed for green bond issuance (Government of Iceland, 2021[4]). In the wake of the COVID-19 crisis, the government established a five-year investment initiative, including additional investment in

energy transition and other climate-related projects to reach around 0.5% of annual GDP (OECD, 2020[5]). In 2020 Iceland's central bank became a member of the Network of Central Banks and Supervisors for Greening the Financial System (NGFS), whose aim is to highlight the macroeconomic and financial stability impacts of climate change and to develop frameworks for addressing climate-related risks. Finally, the Ministry of Finance was one of the founding members of the Coalition of Finance Ministers for Climate Action.

Despite the recent burst of activity, Iceland could do more to develop effective climate policies. Iceland's climate action lacks prioritisation and sequencing and builds largely on a set of technical measures in the various sectors. While the environmental agency carried out a few rough cost-benefit-analyses in the land transport sector, assessment and evaluation of the measures should be improved, to clarify their true emission reduction potential and their potential cost. Finally, effective climate action needs tight integration in the wider policy framework, with economic and fiscal policies supporting sustainable productivity and employment along the low-carbon transition. Against this background, this chapter presents a policy framework that could help achieve climate targets in a cost-efficient, sustainable and inclusive manner.

Pricing carbon can help reach climate targets in a cost-efficient manner

The transition towards a low-carbon economy should rely on a consistent policy framework that guides scope, priorities, and sequencing of actions and measures. Carbon pricing can help reach climate targets in a cost-efficient manner, aided by support of innovative green technology and public infrastructure. In some cases subsidies and regulation to foster climate-friendly activities might have to be included. As such, the policy framework can be divided into for main areas (OECD, 2020[6]); (de Serres, Murtin and Nicoletti, 2010[7]):

- *Carbon pricing*: a carbon tax or emission trading system covering all carbon (or greenhouse gas) emissions across all or most economic sectors.
- *Spending support framework*: investment in research and development and in green infrastructure, especially those subject to market externalities or high risks. Spending support includes the development of green finance frameworks and green budgeting.
- *Financial support to households and firms to accelerate green transition*: subsidies and tax incentives for the adoption of green technology, justified by path-dependency, learning effects or market externalities such as network effects, or considerations of inclusiveness.
- *Regulation*: appropriate regulation and environmental standard setting can help benefit from policy complementarities and overcome political economy obstacles

Policies to reduce carbon interact. Acting in one area may require less action in the other. For example, bold carbon pricing increases the effect of public investment or subsidies for clean technologies as private actors invest in their own interest. In turn, broad-based public spending on low-carbon infrastructure can dampen the need for carbon tax increases. Finally, implementation should be adequately sequenced, to reduce overall abatement cost and avoid rebound effects (e.g. electrification of transport could entail additional emissions from power generation). Against this background, assessing interactions in a low-carbon policy framework is crucial.

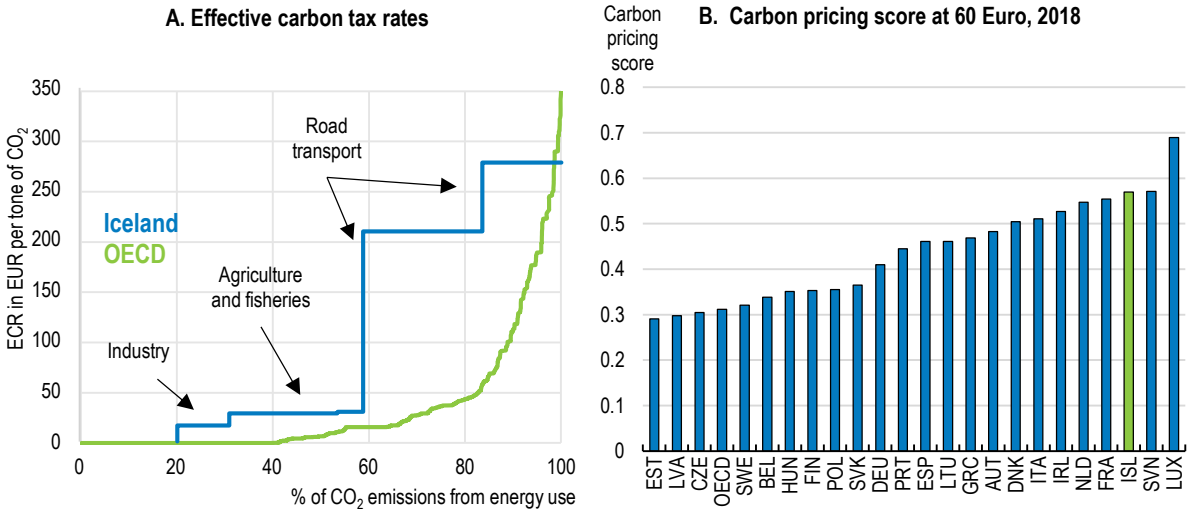
Designing Iceland's carbon pricing path

Pricing carbon is a cost-effective policy measure to reach emission targets and steer the economy towards and along carbon neutrality (Nordhaus, 2019[8]). A price on carbon fosters emission abatement where it is cheapest and helps detect the low-hanging carbon fruits. It reduces the need for regulation and standard setting since it changes households' and firms' behaviour towards low-carbon activities. In a dynamic perspective, pricing carbon encourages green innovation and adoption of green technologies. The

revenues from carbon pricing can be redistributed to make the low-carbon transition more inclusive. There are basically two pricing models: a carbon tax and an emission trading system. Trading systems directly address the emission target to be achieved, but tend to be associated with carbon price volatility facing households and firms (Flues and van Dender, 2020[9]).

Iceland introduced a tax on CO_2 embedded in fossil fuel taxation in 2010 at around 7 Euro/tonne, rising to 13 Euro/tonne in 2012 and 15 Euro/tonne in 2015. Starting from 2018 the tax was increased in three steps to reach around 30 Euro/tonne in 2021. In 2020 taxation was extended to include fluor-carbonates. In 2008, Iceland joined the European Emission Trading System (EU-ETS), thus subjecting greenhouse-gas-intensive aluminium smelters to carbon pricing; initial emission allowances were allocated for free. Among non-ETS emissions, agriculture, the main producer of methane, is not taxed, like geothermal energy and waste. Low-carbon vehicles are temporarily exempt from the value-added tax, and the government plans to introduce a distance-based car tax. Overall, with 57% of carbon taxed at 60 Euro/tonne or more through the combined effect of the trading system, the carbon tax and excise taxes on energy use, Iceland boasts one of the boldest pricing regimes OECD-wide (Figure 3.5).

Figure 3.5. Iceland prices carbon above the OECD average



Note: Panel A: the effective carbon tax rate consists of permit prices from the EU ETS, explicit carbon taxes on fossil fuels and specific taxes on energy. Iceland priced around 80% of its carbon emissions from energy use, with 41% priced at more than EUR 60/tonne, mainly in the road transport sector. Emissions cover all sectors and include biofuels. Panel B: the carbon score reflects the share of emissions that are taxed at 60 Euro/tonne of CO_2 or above. A score of 1 means that all carbon is taxed at 60 Euro/tonne or more.
Source: OECD, Effective Carbon Rates 2021, https://doi.org/10.1787/0e8e24f5-en.

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Iceland should continue raising carbon prices consistent with reaching climate targets. Appropriate design helps achieve targets better while avoiding excessive cost to households and firms:

- *Broad coverage*: carbon pricing should be applied to a broad base (Flues and van Dender, 2020[9]). The more emission sources they cover, the better they are at reducing emissions cost-effectively. The government should extend carbon pricing to all carbon emissions including methane and nitrous oxide, and it should include energy production and agriculture.
- *Carbon tax versus tradeable emission permits*: carbon taxes should apply to all sectors not covered by an emission trading system and vice versa in general. Since the two systems interact, they should be well-coordinated. Some activities may be put under either system. Iceland may consider

replacing the carbon tax by a tradeable permits in the fisheries sector, given that a tradeable quota system for fishing rights is already in place (Haraldsson and Carey, 2011[10]). Pricing methane in agriculture may also work through a permit system or taxation.

- *Commitment to a gradual phasing in*: committing to gradually phasing in higher carbon prices raises investor confidence and fosters investment to adapt to a low-carbon environment (Agrawala, Dussaux and Monti, 2020[11]). Higher environmental policy uncertainty is associated with lower investment, especially in capital-intensive and high-productivity firms ((Dechezleprêtre and Kruse, forthcoming[12])). A gradual approach is also needed to avoid running down "dirty" capital too fast, ending up with stranded assets, and stifling investment (Jin, van der Ploeg and Zhang, 2020[13]). To reduce uncertainty for firms and households and to unlock investment in green capital, the government should commit to a gradual and politically well-supported carbon tax increase trajectory (Box 3.1).

Box 3.1. Determining credible carbon price trajectories: country experiences

The credibility of carbon price trajectories is key to enabling long-term investment in low-carbon assets, Enshrining a carbon price trajectory into law creates credibility and reassures investors. To avoid that laws are changed after a new government is taking over, efforts to build a broad based consensus around carbon pricing will be important.

Several countries have committed to carbon price increases including price trajectories:

Canada

The Pan-Canadian Pricing on Carbon Pollution guarantees a coherent carbon price ambition across Canadian provinces, but leaves the choice to provinces whether to implement a tax or trading system. Provinces implementing a carbon levy should start at a minimum price level of CAD 20/tonne in 2019 that increases over time by CAD 10/tonne annually to reach CAD 50/tonne per tonne in 2022, when a review of the overall pricing approach is scheduled.

Germany

Germany decided to implement national carbon pricing in sectors that are not covered by the EU ETS, in particular heating and transport. The national trading system will enter into force in 2021 with a fixed price of EUR 25/tonne. Prices will rise subsequently according to a predefined corridor, reaching EUR 55-65 per tonne in 2026.

The Netherlands

The Dutch government proposed a national carbon levy for industry, taking the form of a floor price to the EU ETS price for emissions that exceed a tax-free base per facility. The total carbon levy includes a price trajectory set to start at EUR 30/tonne in 2021 and to rise in a straight line to EUR 125-150/tonne in 2030.

Source: (OECD, 2020[14]).

The carbon price level needed to reach emission targets depends on the reaction of households and firms to carbon price increases (Dechezleprêtre, Nachtigall and Venmans, 2018[15]). Since such elasticities are country-, sector- and even firm-specific and depend on policies, few general conclusions on their size can be made. Case studies suggest a tax elasticity of between -0.3 and -0.7 (i.e. a 10% increase in carbon prices entails a 3% to 7% percent reduction in carbon emissions (Sen and Vollebergh, 2019[16]). A preliminary study of the University of Iceland suggests that tax elasticity of fuel consumption is around -0.35 for Icelandic households and -0.30 for most sectors except maritime transport where elasticities are

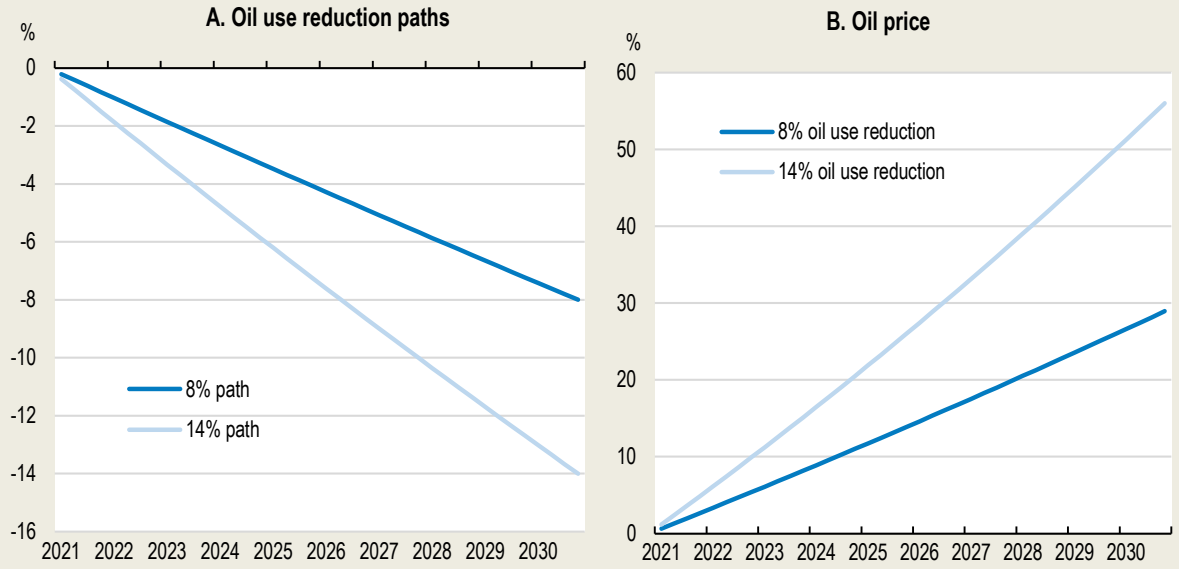
estimated at -0.90 (Institute of Economics at the University of Iceland, 2020[17]). Based on these elasticities, a modelling exercise for this *Survey* assumes that a carbon tax consistent with 2030 emission targets would have to reach between 30% and 60% of the current fuel price (Box 3.2).

Box 3.2. What level should an Icelandic carbon tax reach?

The government's baseline scenario is to reduce carbon emission by 40% between 2005 and 2030 in areas not covered by the European Union emission trading system (EU-ETS). Between 30% and 35% are projected to be brought about by implementing the measures included in the climate action plan, depending on the speed of the transition to electric cars. As such, additional measures such as a rise of the carbon tax would be needed to reach the government's target (i.e. to go from a 30-35% to a 40% cut).

Against this background, the Economics Institute of the University of Iceland carried out an analysis of the carbon tax increases needed to reach the climate target. Two scenarios relative to business-as-usual are estimated, achieving an additional reduction of fuel consumption by 8% and 14% respectively. The fuel price elasticity is estimated at 0.27, obtained from earlier Icelandic research. To reach the respective reduction of fuel consumption, the fuel price would have to rise gradually by between 30% and 55% (Figure 3.6), implying a petrol price hike from currently around 1.65 EUR/litre to between 2.15 EUR and 2.60 EUR/litre. The carbon price would be between 230 EUR/tonne and 420 EUR/tonne. Since the carbon price is based on the carbon content of fuels, it will be different for different fuel types.

Figure 3.6. Fuel consumption and fuel price trajectories



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The analysis assumes that fuel price elasticities remain constant over the entire period, i.e. businesses will react in the same way to price increases as in the past. The share of green infrastructure spending in GDP remains constant, as well as the capital depreciation rate. The pattern of technological innovations is also assumed to remain constant. The analysis excludes households.

Source: (Institute of Economics at the University of Iceland, 2021[18]); (Institute of Economics at the University of Iceland, 2020[17]).

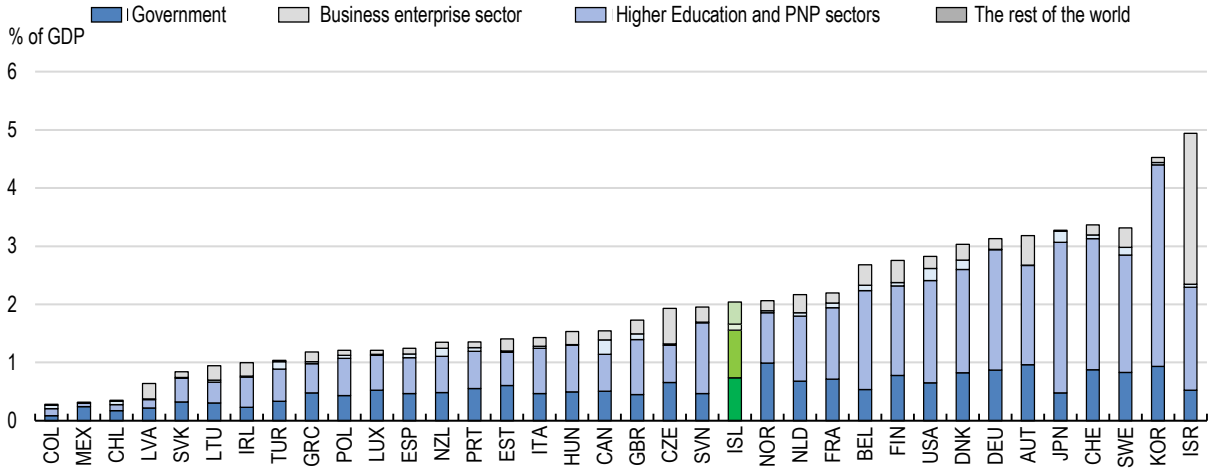
Investing in green capital

Investing in "green capital" covers a range of support policies such as research and development, innovation in and deployment of green technology as well as the set-up and support of low-carbon infrastructure. Public investment in network infrastructures such as energy or transport could also be included as well as policies that help reduce the financial barriers that households and small businesses may face in acquiring green equipment or technology (de Serres, Murtin and Nicoletti, 2010[7]). Backing innovation efforts can be justified on the grounds of positive externalities of green technologies, particularly when combined with commitments to a strong carbon price.

Iceland's research and development spending is close to the OECD average, although recent data on "green" R&D is not available (Figure 3.7). Investment in intangibles has declined in recent years, patents and trademark applications rank below the EU average, and the share of knowledge-intensive services in exports is below the OECD-average (see chapter on innovation). This can be explained, to an extent, by the structure of the economy and the importance of imported innovation in Iceland. Still the government could increase spending on green research and development in some niche areas such as geothermal carbon capture or low-carbon fishing vessels. To benefit from scale, Iceland should participate in international research consortia and strengthen research collaboration between the business sector and higher education.

Figure 3.7. Iceland spends less on research and development than its Nordic peers

Gross Expenditure on Research and Development as a percentage of GDP, 2018 or latest



Source: OECD, Main Science and Technology Indicators; and OECD, Research and Development statistics.

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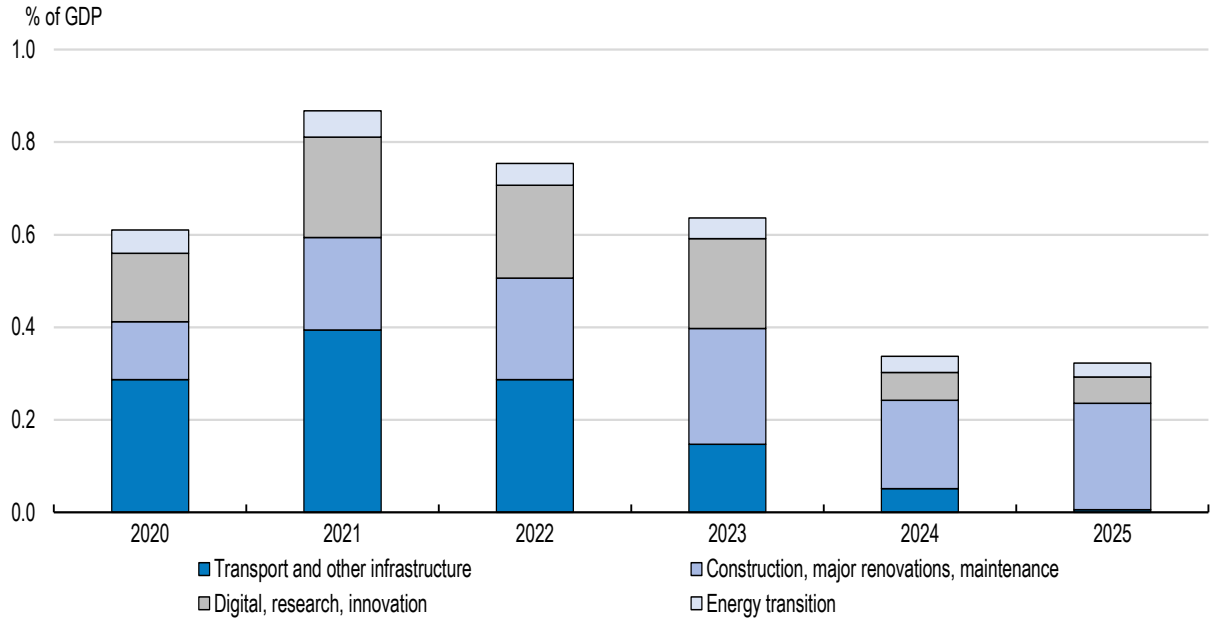
The government plans to considerably step up spending on green infrastructure such as a low-carbon transport infrastructure, energy transition and digital transformation (Figure 3.8). To increase spending efficiency and quality, Iceland needs to evaluate investment projects comprehensively and apply thorough cost-benefit analysis, as noted in previous *Surveys* (OECD, 2019[19]). Cost-benefit-analysis should cover all public investment including small-scale investment and help assess where the emission reduction potential is largest for a given amount of investment. Systematic cost-benefit analysis may help to estimate the overall costs of the transition towards a low-carbon economy, building on comprehensive carbon "shadow-pricing" and other methods (Box 3.3).

Figure 3.8. Public investment in green infrastructure will rise

Spending composition of public investment, in percent of GDP



Source: Ministry of Finance and Economy.

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Box 3.3. Evaluating costs and benefits of carbon abatement

A shadow price, or shadow price trajectory, puts a monetary value on the future emissions of an activity, providing information on where the emission reduction potential of a policy is the greatest. In 2019, the French "Quinet Commission II" published the "Value for Climate Action" report to guide socio-economic analysis of public policies and investment choices by the government. It sets out a trajectory for shadow carbon prices to ensure the country reaches carbon neutrality in 2050, updating the results of a previous commission in 2009. The United Kingdom Treasury regularly publishes an updated set of carbon values for policy appraisal and evaluation. Through a review in 2009, the government moved away from applying values based on the damage associated with carbon emissions towards using carbon values that are consistent with the government's greenhouse gas emissions targets.

Shadow-pricing is graphically represented by so-called Marginal abatement cost curves (MACs). MACs show the cost associated with each emission reduction measure in ascending order of cost per tonne of carbon cut. By linking all measures together, MACs show the overall cost to reach a specific emission reduction target. MACs can be constructed for a single firm, for an industrial sector or for an entire economy. Since MACs are context-specific and do not take interactions between different policies and technologies into account, researchers have started to use more sophisticated approaches such as scenario analysis or "energy-system-modelling", which operate using an array of assumptions including those for price developments. All approaches should use a uniform carbon shadow price.

Source: (OECD, 2020[14]); (Agrawala, Dussaux and Monti, 2020[11]) (Johnsson, Normann and Svensson, 2020[20]), (Goldmann Sachs, 2020[21]).

Reducing carbon emissions abroad

Carbon has a worldwide impact, no matter where it is released, hence it makes sense to reduce emissions where that is least costly. The Paris Agreement allows countries to invest in foreign emission cuts and credit them against their own emission targets (OECD/IEA, 2019[22]). Similarly, the European Effort Sharing Regulation (ESR) allows countries to credit their participation in joint emission reduction against their national targets. Well-designed internationally transferred mitigation projects have the additional advantage of fostering innovation and green technology transfer, underpinning local environmental and health benefits, and providing government revenue (OECD/IEA, 2012[23]).

Given its peculiar economic structure and energy production profile, carbon reduction is likely more expensive in Iceland than elsewhere. Iceland should consider participating in international carbon mitigation and abatement projects. This would help the country to accelerate emission cuts, reduce the overall cost of reaching emission targets and strengthen innovation and technology transfer to emerging market economies. Iceland could collaborate with other countries in planning and implementing international abatement projects. For instance, Iceland could use the flexibility offered by the ESR to finance emission reductions in other countries, e.g. transition economies in Eastern Europe (European Commission, 2013[24]).

Border carbon adjustment

Border carbon adjustment (BCA) is a policy to tax imports according to their carbon content. Border carbon adjustment is thought to address adverse competitiveness effects for domestic carbon-intensive sectors and to avoid emission leakage to economies with lower carbon prices (OECD, 2020[25]). The effectiveness of a BCA in a small open economy like Iceland is debated: while it might help contain emission leakage, it could adversely affect the domestic economy since firms would on aggregate face higher costs for imported intermediate goods (Burniaux, Château and Duval, 2010[26]). Some research suggests that overall environmental and economic effects of BCA are small (Koźluk and Timiliotis, 2016[27]). In view of its small size and the political economy obstacles to unilateral measures, Iceland should closely align BCAs with the European Union, its main trading partner.

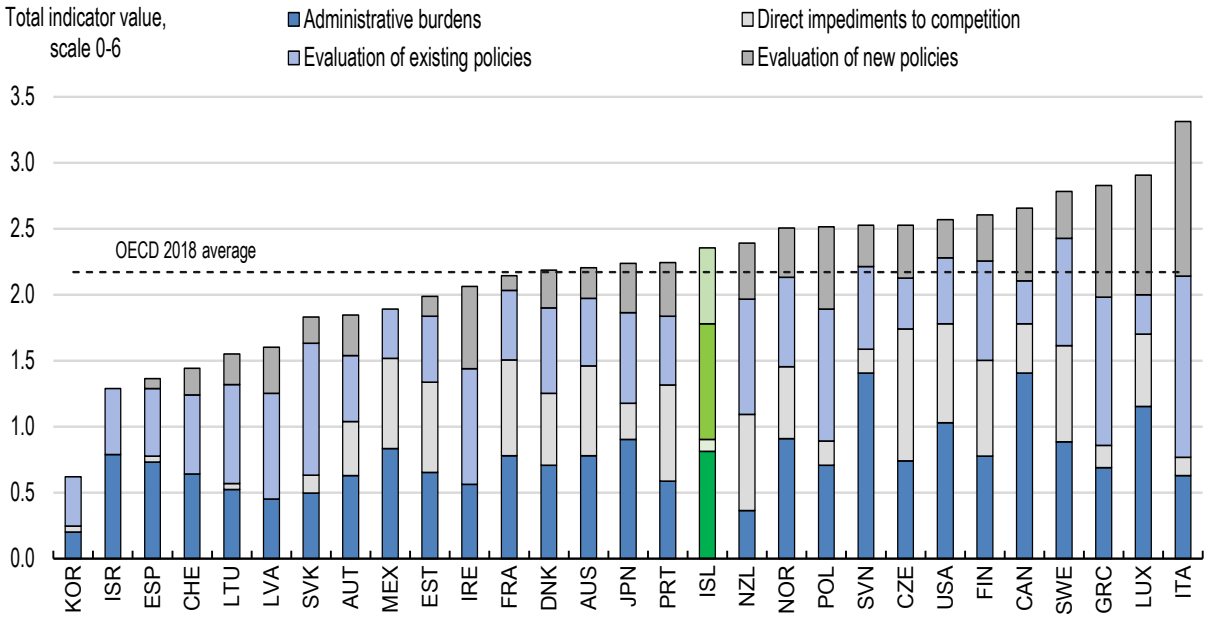
Improving environmental regulation

Regulation of carbon-emitting activities - such as technology and performance standards or bans on certain products – might be necessary for a green transition. However, regulation imposes a burden on firms and households, notably by increasing barriers to entry, distorting competition or raising costs related to permits and licenses. Some regulations may even prevent the development of efficient low-carbon technologies. Well-designed environmental regulation can help reduce the burden on the economy. Environmental targets need not suffer from lighter regulation: OECD research suggests that more stringent environmental objectives can be reached without imposing a higher regulatory burden on the economy (Berestycki and Dechezleprêtre, 2020[28]).

Iceland's environmental regulation stringency is slightly above the OECD average (Berestycki and Dechezleprêtre, 2020[28])). The regulatory impact on competition and firm entry is small, while the administrative burden to cope with complex regulation is large (Figure 3.9). The quality of environmental policy evaluation is average. Against this background, Iceland should carefully evaluate the need for new environmental regulation and remove those elements that impose disproportionate costs on firms and households. Since uncertainty about new environmental regulation is associated with lower investment, the government should also increase transparency and predictability of environmental policy-making (Dechezleprêtre and Kruse, forthcoming[12])].

Figure 3.9. The burden of environmental regulation is slightly above the OECD average

Design and Evaluation of Environmental Policies values, 0 (best) to 6 (worst), 2018



Note: A higher indicator value means higher environmental regulation stringency.
Source: OECD, Design and Evaluation of Environmental Policies indicators.

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Easing the transition towards a low-carbon economy

A successful transition towards a low-carbon economy should be facilitated by a supporting economic and fiscal policy framework. Policies to improve the business climate, build up new skills, strengthen resilience of firms, and support digital access will help underpin the deep structural transformation needed to reach carbon-neutrality. Some sectors such as the fisheries, transport or agriculture could undergo considerable changes, hence supporting resource reallocation will be a central driver of decarbonisation. As such, policies that reduce entry barriers for new firms, strengthen competition, and facilitate access to new occupations and jobs will help the economy to move towards the new low-carbon normal.

The impact on productivity and employment is likely small

The views on the impact of a low-carbon transition on productivity, employment and growth are contrasted. Some see the transition as a burden on economic activity, raising costs and reducing asset values without increasing output and restricting the set of consumption choices and production technologies. Competitiveness might decline as some activity will move to countries with more lenient climate policies. Others instead argue that well-designed environmental policies can encourage innovation, bring about gains in profitability and productivity that outweigh the costs of the transition. The current empirical results suggest that overall effects are relatively small, especially relative to other changes in the economy, although results are driven by a few sectors and firms and there have been few bold policy reforms so far (Box 3.4).

Box 3.4. Carbon pricing and economic performance: a summary of recent OECD research

The OECD has carried out many studies on decarbonisation and economic performance. Most conclude that the economic impact of more stringent decarbonisation policies is small, although evidence is limited because bold policy reforms have been limited to a few countries so far. Design matters, with structural reforms such as a carbon tax or the removal of harmful subsidies being more beneficial than regulation and standard setting.

- *Productivity*: environmental policy tightening has no impact on productivity growth, positive or negative. Tightening of environmental policies is followed by a temporary increase in productivity, fading within less than five years. The temporary productivity effect is stronger for market-based than for regulatory instruments (Albrizio et al., 2014[29]). Withdrawal of harmful subsidies and a price on CO2 emissions would raise productivity and strengthen natural capital (Brandt, Schreyer and Zipperer, 2014[30]).
- *Competitiveness*: carbon prices cause emissions to decline, but seem to have no significant competitiveness effects (Flues and van Dender, 2020[9]). The policy framework matters, with market-based instruments being more favourable. Firms benefitting from preferential treatment do not fare better (Arlinghaus, 2015[31]). Superior economic performance, as measured by stock market returns, is associated with better environmental performance. Greener firms seem to be able to attract more productive employees and face smaller capital costs, and introducing green products enhances firms' profitability (Dechezleprêtre and Kruse, 2018[32]). Finally, higher domestic energy prices have a significant but small negative effect on foreign direct investment (Garsous and Kozluk, 2017[33]).
- *Investment*: higher energy prices are associated with a small but statistically significant decrease in total investment across firms. In energy-intensive sectors, total investment actually increases following rising energy prices. Domestic investment declines following higher energy prices, in line with the pollution haven hypothesis (Dlugosch and Kozluk, 2017[34]).
- *Employment*: a study on French firms suggests that the impact of a carbon tax rise on employment is negligible. Yet higher carbon taxes cause around 0.25% of overall jobs in the manufacturing sector to move from energy-intensive to less energy-intensive firms (Dussaux, 2020[35]).
- *Trade and global value chains*: environmental policies are not found to be a major driver of international trade patterns, but have some significant effects on specialisation. More stringent domestic policies are linked to a comparative disadvantage in "dirty" industries, and a corresponding advantage in "cleaner" industries. The effects are stronger for the domestic component of exports than for gross exports, yet notably smaller than the effects of trade liberalisation for example (Koźluk and Timiliotis, 2016[27]).
- *Inequality*: the distributional effects of higher energy prices on household income differ by energy carrier. On average, taxes on transport fuels are not regressive. Taxes on heating are slightly regressive, and taxes on electricity are more regressive than taxes on heating fuels. However, there is considerable heterogeneity across countries given varying tax design and household spending composition (Flues and Thomas, 2015[36]).

Source: as cited.

The impact of a sizeable carbon tax rise on the Icelandic economy seems to be slightly negative but small (see Box 3.5). The result relies on a number of assumptions about developments in trade-exposed sectors such as aluminium and fisheries. Energy-intensive aluminium smelting is integrated into the European Union's ETS, sheltering it partly from domestic policy shocks. The fisheries sector is subject to a domestic quota system, suggesting that higher carbon pricing would reduce profits rather than labour productivity and employment, although engagement in export markets makes the sector highly sensitive to domestic price developments.

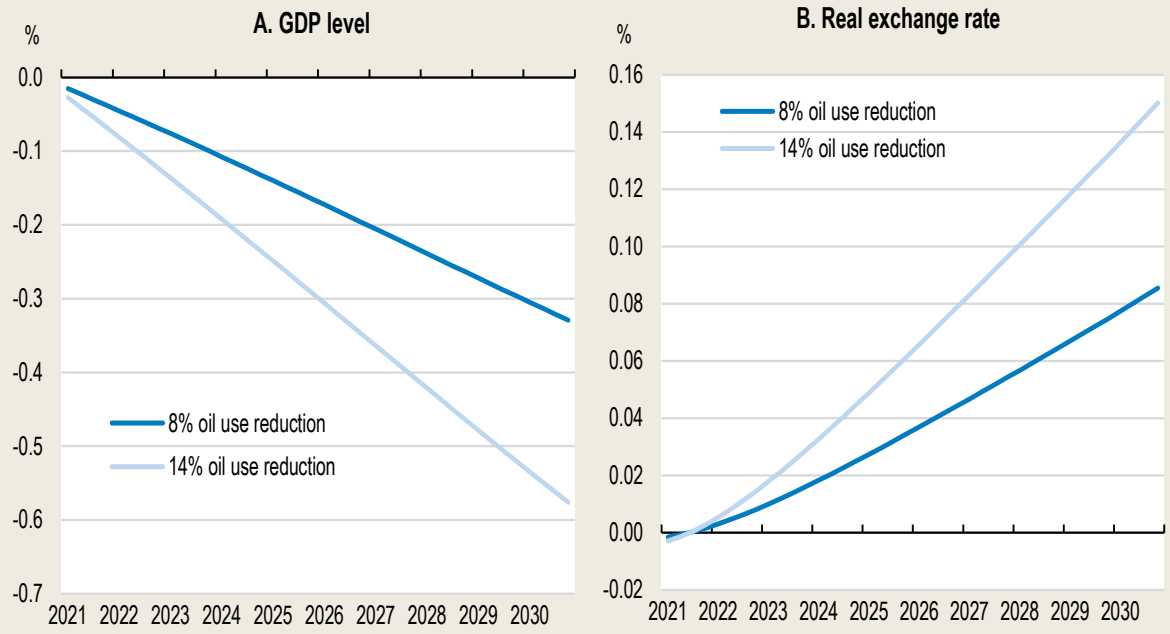
Box 3.5. What impact does a carbon tax rise have on the Icelandic economy?

A carbon price increase is likely to have an impact on the domestic economy. Comprehensive carbon pricing will affect household income and consumption, business investment, exports and imports. Firms adapt their capital stock and consumption of fuel. Given Iceland's exposure to international trade and capital markets, interest rates and exchange rates are also likely to adapt.

To assess the economic impact of a carbon tax rise, the Economics Institute of the University of Iceland ran a dynamic stochastic general equilibrium (DSGE) model of the Icelandic economy. The analysis includes the external sector and real exchange rate developments. Model runs suggest that a rise in the carbon tax as estimated in Box 3.2 would imply a reduction in the level of GDP of 0.3% to 0.6% by 2030 as a result of rising factor cost. The króna would depreciate a bit in real terms, reflecting the relative rise of import prices.

Figure 3.10. The economic impact of a sizeable carbon tax increase would be small

Impact of a 30% to 60% carbon tax increase on overall activity and the real exchange rate



Source: Calculations by (Institute of Economics at the University of Iceland, 2021[18])

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It should be noted that the assumptions underlying the model runs are similar to those for the carbon tax rise estimations: behavioural responses to carbon price changes are assumed to remain the same as in the past, and so are the productivity increases through green and other innovation. Even a small acceleration in the pace of technological progress could turn the GDP effect positive. Structural factors such as the regulatory framework, government spending or else the EU's climate policy are also assumed to remain unchanged.

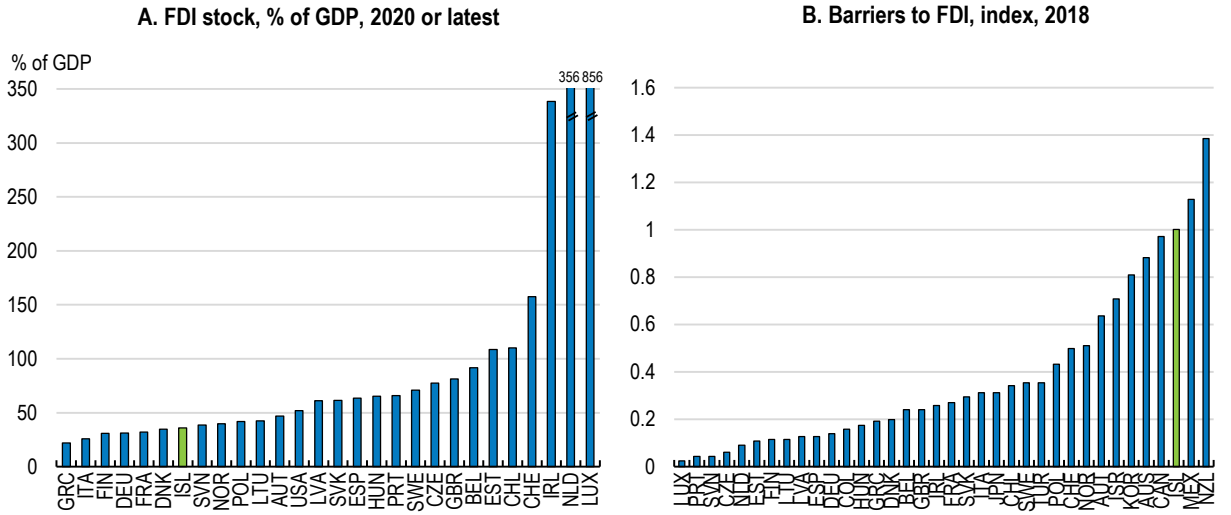
Source: (Thorarinsson, 2020[37]), (Institute of Economics at the University of Iceland, 2021[18]).

Increasing openness could ease the green transition

The transition to a low-carbon economy, the diffusion of new technologies and the associated know-how can be facilitated by a business-friendly climate. Radical innovations often come from new firms, in particular those that challenge the business models of incumbents, hence barriers to entry should be low (OECD, 2015[38]). Competitive pressures tend to stimulate technology adoption and innovation; and more competition is associated with stronger capital formation, technology adoption and productivity growth (Andrews, Criscuolo and Gal, 2016[39]). Strengthening competition to facilitate the entry of "clean" firms and the exit of "dirty" firms will help to move towards a low-carbon economy. Against this background, Iceland should adopt the policy recommendations of the recent OECD competition assessment (OECD, 2020[40]).

Foreign direct investment (FDI) could also help ease the green transition, e.g. in energy generation. Iceland is less exposed to international trade and capital flows than other small economies, and its FDI stock is comparatively small (see chapter 1). A higher share of FDI could help diffuse green innovation and contribute to reaching Iceland's emission targets faster.. To encourage the diffusion of new technologies and the associated know-how, especially in capital-intensive industries, Iceland should remove barriers to FDI to the largest extent possible.

Figure 3.11. Foreign direct investment is constrained



Note: Panel A. FDI statistics refer to the Benchmark definition 4th edition. Panel B, a higher index values reflects more stringent barriers to foreign direct investment.
Source: OECD, FDI Statistics; and OECD, Product Market Regulation database.

StatLink https://stat.link/gu4bdx

Fostering green jobs and skills is key

Fostering skills and worker reallocation is essential to move towards a low-carbon economy. Due to labour cost and technology characteristics, clean energy development in Iceland tends to be capital-intensive and relies on skilled, well compensated jobs. Labour shortages could become a major issue as green job creation could represent up to 5% of the total labour force (International Energy Agency, 2020[41]).

Against this background, Iceland should strive to (see also chapter 1):

- *Foster green skills*. The transition towards a low-carbon economy requires skills that respond to rapidly changing labour markets. Policies to foster green skills should include: investment in tertiary education, especially in technological areas; stronger vocational education and training, in

particular stronger firm-based learning in firms adopting green technologies; and stronger life-long and adult learning programmes on the green transition.

- *Remove regulatory barriers*. Regulation of the service sector and occupational licencing are tighter than in most OECD countries, stifling the transition towards greener jobs and employment, especially in the construction sector (see chapter 1). Removing these barriers could facilitate the reallocation of workers and help affected sectors and professions to adapt more rapidly to a greener economy.
- *Promote public-private collaboration in tertiary education*. Iceland's corporate sector contributes little to research and development in universities (OECD, 2019[19]). More green finance from the private sector, including from abroad, and better public-private collaboration could foster tertiary education and strengthen ties between research institutions and businesses in sectors with a large greening potential.

Garnering political support for low-carbon policies

The benefits and costs of a low-carbon transition centred on carbon pricing do not accrue to all households and firms alike. Higher carbon taxation may have disproportionate impacts on some social groups, certain jurisdictions, and individual economic sectors. Moreover, the cost of the transition tend to become apparent immediately, while the benefits are uncertain and accrue in the future. As such, political resistance to bold environmental policy reform may be considerable, with a high risk that planned reform is aborted (OECD, 2010[42]). One possible way forward to address resistance to higher carbon pricing is to redistribute a large part of the proceeds to households and firms, as is done in Switzerland (Box 3.6). Currently, carbon tax receipts enter Iceland's central government budget and are neither redistributed nor earmarked for low-carbon purposes.

Box 3.6. Redistributing the proceeds of a carbon tax: the Swiss approach

In 2008, Switzerland introduced a CO_2 tax on heating fuels, which is currently set at CHF 96 (around USD 105) per tonne. The measure triggered an intense debate. Many households and businesses saw this tax as regressive, as affecting competitiveness and as an unwarranted increase in tax pressure. To take account of these concerns, the government adopted a mechanism to redistribute the proceeds as follows:

- Two-thirds of the total proceeds are directly redistributed to households and firms relative to the tax receipts from each sector. Each person is reimbursed *via* a reduction in social security contributions, while firms are reimbursed according to their wage bill.
- One third of the total proceeds are earmarked for investment in federal and cantonal (state-level) energy savings and buildings retrofitting programmes. Some 2% to 3% of total tax receipts are allocated to a technology fund to promote innovative firms.

In 2019, each person was reimbursed around CHF 100, while each firm received around 1% of its wage bill. Overall CO_2 tax receipts make up 0.2% of GDP. In a legislative vote in June 2021, the population rejected a broadening of the tax base to include transport fuels and a gradual increase of the tax rate up to 210 EUR/tonne.

Source: (Office fédéral (suisse) de l'environnement, 2020[43]).

Against this background, one option for making the transition to a low-carbon economy palatable for Icelandic voters could be to redistribute – at least partly - carbon pricing proceeds without undermining the low-carbon objective. The redistribution might address distributional issues by favouring poorer over wealthier households. Redistribution may also take regional aspects into account, as households living in remote areas may be more affected by a rise of fuel prices than those living in urban agglomerations. The

scope for redistribution is substantial as a uniform Icelandic carbon tax of at least 60 Euro/tonne could yield revenues of around 0.5% of GDP. Another option is to reduce economically distorting taxes. Redistributing carbon tax proceeds or tax reform is more effective than loading carbon pricing with special exemptions, differentiated rates or complex compensation mechanisms which raise administrative and enforcement costs, while potentially undermining their environmental effectiveness (Antosiewicz et al., 2020[44]).

Carbon pricing faces additional political barriers, even if proceeds are redistributed. The costs of a carbon tax are more visible than those indirectly passed on to consumers under more stringent regulation. This visibility is compounded by the psychological phenomenon of loss aversion which suggests that households' appreciation of any reimbursement is unlikely to match their resentment of new taxes, even when the two are of the same magnitude (Kahnemann, Knetsch and Thaler, 1991[45]). More bluntly, perceptions do not necessarily match the actual effects. Still perceptions may change if a carbon tax reform is considered "fair" (Harrison, 2013[46]). As such, a well-managed reform process, in particular wide and open communication of the long-term benefits of carbon pricing, without concealing the negative effects for some groups, can help garner political support (OECD, 2010[47]).

Low-carbon policies in individual sectors

Iceland's peculiar economic structure and carbon emission profile warrant a closer look into a few individual sectors. Industry including fisheries accounts for a share in both exports and emissions widely above the OECD average, while cuts seem to be available at below-average cost in land transport and agriculture, including changes to land use. The following sections will take a closer look at selected activities. Still the government should aim for well-coordinated policies across sectors, avoid setting overly stringent sectoral emission targets and allow for an integrated, effective and cost-efficient approach towards carbon cuts.

Energy generation

Iceland's energy generation relies almost fully on renewables, with hydropower accounting for around 70% and geothermal energy for 30% of total electricity production. Yet while hydropower is carbon-neutral, geothermal power is not. Carbon and other gases leak into the atmosphere when the magma chambers below the exploited area are harnessed. Hence the climate action plan foresees further support to technical measures to capture and re-inject the gases discharged during the production process. Geothermal carbon capture is assumed to contribute more than any other sector to emissions reduction, with around 40% of the total reduction projected in the climate action plan. Iceland has developed cutting-edge carbon capture technology and should enhance investment in research and development, implement new technologies at home and help disseminate them abroad.

Energy markets are prone to considerable cost pass-through of carbon pricing (Fabra, 2021[48]). Depending on technology and market structure, it tends to be substantial in the European power sector, reaching between 60% and over 100% (Arlinghaus, 2015[31]). Iceland's electricity generation is separated from European or North American transmission networks, handing over considerable market power to domestic providers (although taken alone a connection to Europe's networks would likely *raise* domestic energy prices given low production cost, thereby creating additional rents to energy producers). While Iceland follows European Union regulation by separating production, transmission and distribution of electricity since 2003, the market remains dominated by a few mostly public players, either state- or municipally-owned. Against this background, the government should strengthen competitive forces in power generation and ensure that carbon price hikes are not unduly passed onto consumers.

Finally, the low-carbon transition might require an increase in electricity production. Electrification of all road transport including buses and trucks would require 500-700 MW of additional electricity, corresponding to around three mid-sized hydro-electric power plants (Landsnet, 2016[49]). The government published a long-term sustainable energy strategy assuming an extension of power production, with one

option being a stronger reliance on wind farms (Government of Iceland, 2020[50]). Given some resistance against new wind and hydro projects on the grounds of nature and landscape protection, a part of new electricity demand might have to be covered by increasing the efficiency of existing plants, transmission networks and, finally, electricity-consuming devices.

Fisheries and port infrastructure

Iceland's fisheries sector represents around 28% of total exports, making it the country's largest export sector. The sector is highly productive and internationally competitive, but might be sensitive to price developments such as a rising carbon tax. Carbon emissions from fishing vessels and coastal shipping have fallen sharply since peaking in the mid-1990, partly because of lower catch and the use of larger, more efficient vessels (Working Group on the Fisheries, 2021[51]). The quota system, developed in the 1990s, has supported the sustainability of fishing practices and helped develop cutting-edge technologies to save on fuel. Quotas are basically transferable between fishing entities of different size, with a few limitations. Since smaller ships run shorter distances closer to the coast than the large high-sea trawlers, the relative effect of a higher carbon tax on the cost per catch for different types of vessel remains unclear.

The climate action plan projects a decline in emissions from ships and ports by around 20% between 2018 and 2030. Reductions are to be achieved through technological innovations such as the electrification of ports, including support services to harbouring ships, and the introduction of electrical ferries. Further actions include a ban on heavy fuel and further energy savings in state-owned ships. The plan remains vague about whether reduction objectives can be achieved by technological innovation of vessels alone, admitting that they are less rapidly developed than, e.g., for land transport. An empirical investigation suggests that a tax rise to cut emissions by 10% would have little impact on the industry's competitiveness, while a 20% cut could inflict some harm (Box 3.7). Given the strong international exposure of Iceland's fishing industry, the government should step up investment in research and development of efficient low-carbon ship propulsion technologies.

Box 3.7. Carbon taxation in Iceland's fisheries industry: an impact assessment

Between 2005 and 2019 overall fuel consumption of fishing vessels in Iceland fell by almost 35%, mainly because of technological innovations, the use of larger ships, and a smaller catch. The total number of vessels went down by around 11%. The government plans to cut emissions from the fisheries sector further, by another 10% to 30%. Fishing vessels are currently around 30 years old on average, suggesting that further savings could be achieved by renewing the fleet in the coming years.

To assess the impact of a carbon tax rise on the fishing industry, the University of Iceland ran an empirical estimation (translog cost function) based on panel data for six different types of vessels. The overall long run elasticity is estimated at a bit less than -0.3, meaning that a 10% rise in the price of fuel would induce around 3% less consumption. This estimate is close to recent estimates for the fishing industry in other countries.

The minimum 10% emission cut as planned by government is estimated to induce around 5% higher total factor cost for fishing companies, assuming no change of productivity and innovation patterns. The rents created by the current fishing quota system are expected to absorb such a cost increase, with little impact on competitiveness. However, a carbon tax increase consistent with a 20% emission cut could harm the industry unless more rapid technological innovations provide for considerably cheaper abatement.

Source: (Institute of Economics at the University of Iceland, 2021[18]); (OECD, 2018[52])

Aquaculture is complementary to coastal and high-sea fishing and could actually help reduce carbon emissions from the fisheries sector. It has been the world's fastest growing food production method in recent decades, giving some indication of the potential of the industry. Aquaculture's share in Iceland's

exports is raising rapidly, from 0.5% in 2013 to 2% in 2020. Its carbon intensity depends on production practices, essentially on how the different species are fed. Extensive practices are less carbon-emitting than intensive ones, but they use more other resources such as land and water (Asche, 2012[53]). Also, wild fish populations are threatened by lice infections from aquaculture. The government should provide a regulatory framework for aquaculture to prosper, subject to maintaining standards for water quality and biodiversity.

Land transport

Land transport is the largest source of greenhouse gases under Iceland's direct policy responsibility (Figure 3.3), accounting for around 30% of non-EU-ETS regulated emissions. The climate action plan provides for a large number of carbon abatement measures, including the provision of low-carbon transport infrastructure (e.g. charging stations), financial incentives for low-emission cars, fostering public transport and a ban on new diesel and fuel cars from 2030. The government should carefully evaluate the extent to which it co-funds low-carbon infrastructure and ensure neutrality between different low-carbon technologies such as electric, fuel cell or hybrid cars. Moreover, Norway's experience suggests that granting tax exemptions for low-carbon vehicles can be costly in terms of foregone fiscal revenues, implying high abatement costs (OECD, 2019[54]). The government should phase tax exemptions out as planned.

The transition towards low-carbon vehicles will require Iceland to rethink transport pricing more broadly. As in most OECD countries, revenues from diesel and gasoline taxation are set to decline with the advent of low-carbon vehicles (Box 3.8). In 2019 the government tasked a working group to develop proposals for use- or distance-based vehicle taxation. Reforming transport pricing could also help address rising congestion and infrastructure shortages in the capital area (OECD, 2019[19]). To help reduce emissions and fund infrastructure, the Norwegian government introduced road-pricing schemes in medium-sized cities such as Bergen or Trondheim as early as the 1980s (International Transport Forum, 2010[55]). In this vein Iceland should aim for a transport pricing reform that helps reduce environmental damage, manage transport demand, and provides funding for new infrastructure across the country.

Box 3.8. Declining fuel tax revenues: the case of Slovenia

Transport fuel duties represent a significant share of tax revenue in most OECD countries. This revenue base will shrink as fuel efficiency improves and the electrification of the transport sector progresses. Against this background, the OECD has analysed the implications of declining fossil fuel consumption and investigated potential policy options in the case of Slovenia, finding that:

- With fuel-efficiency improving in line with European standards and with alternative technologies accounting for roughly 60% of new cars in 2050, total fuel tax revenues will drop by more than 50% by 2050.
- Modest, gradually rising distance-based pricing on motorways may cover the revenue loss from fuel taxation. Assuming motorway use evolves as expected, this charge would start at a level of EUR 0.007 per kilometre in 2020 and increase to EUR 0.046 per kilometre in 2050.
- The existing distance-based pricing systems for trucks can be improved to manage demand and external costs more efficiently, by differentiating rates by time and place to account for congestion and pollution.
- Complementary measures can encourage alternative travel modes such as public transport, or support households that are disproportionally affected by the reform.

Maintaining total transport tax revenue is not considered to be the foremost objective of a sustainable transport pricing strategy.

Source: (OECD/ITF, 2019[56]).

Agriculture

Agriculture produces around 13% of Iceland's carbon emissions, mostly methane following enteric fermentation (burps and farts) of ruminant animals, reflecting the important role of livestock raising. There are currently few technologies to reduce methane emissions from sheep and cattle, and those that exist are costly (Henderson, Frezal and Flynn, 2020[57]). Greater use of nitrification inhibitors is assumed to both reduce nitrous oxide emissions and increase farm profitability, but this has not materialised yet (Bibbee, 2011[58]). Iceland's climate action plan projects modest emission cuts of around 5%, mainly relying on measures such as higher production of vegetables, improved use of fertilizers and feeding of livestock to reduce the effects of fermentation. The sector is not subject to methane taxation, although methane is the second greenhouse gas after carbon dioxide.

More generally, Iceland's above-average agricultural emissions are partly the result of a highly subsidised and protected sector. Much agricultural support continues to be provided through price support, which belongs to the economically most distorting and environmentally most damaging types of policy (OECD, 2014[59]). Market price support is complemented with a payment entitlements system, which is directly or indirectly coupled with production factors. Support to producers is only partly conditional on meeting environmental performance standards. Beyond carbon emissions, overgrazing contributes to soil erosion on half of the country's surface, damaging biodiversity and weakening flood control. Agricultural research as a share of total agricultural spending has declined over the past few years. Overall, policy ambition is out of step with the agricultural sector's potential to address climate change (OECD, 2019[60]).

Against this background, Iceland should follow a two-pronged approach to reduce emissions in agriculture. *First*, the government should introduce a methane emission pricing system as proposed in New Zealand (Box 3.9). Also, spending on agricultural research, especially on a more environmental-friendly agriculture, should be considerably increased. *Second*, the government should cut agricultural subsidies and couple the remaining ones to sustainable land management and to the production and preservation of amenities, thereby discouraging carbon-intensive production (Lankoski et al., 2018[61]). Supporting land conversion – e.g. reforestation, restoration of wetlands or highland pastures – could also foster the sector's low-carbon transition at low economic cost. Iceland should continue to collaborate in international projects in these areas.

Box 3.9. New Zealand's plan to price agricultural carbon emissions

New Zealand's agricultural sector and its carbon impact is in some respects comparable to Iceland's. Livestock such as sheep and cattle accounts for a large part of agricultural production. Ruminants account for most of the sector's 18% of total carbon and 90% of methane emissions, a higher share than in most OECD countries. Over the past years agriculture, one of the country's main export sectors and, unlike Iceland's, receiving little public support, has focused on improving productivity while abating carbon emissions. Innovative practices to cope with water shortages are also helping. Yet overall agricultural carbon emissions are declining only slowly.

Against this background New Zealand's draft climate action plan, published in February 2021, devotes a considerable part to agriculture. It plans to reduce methane emissions by 20% from 2005 levels to reach the sector's emission targets by 2030. The core instrument the climate commission proposes is a pricing mechanism, either a special methane levy or inclusion of agricultural emissions into New Zealand's existing emission trading system (ETS), to take effect by 2022. Farm-level emission reporting will become compulsory in 2024. In addition, the climate commission suggests setting up a long-term plan for targeted research and development of technologies and practices to cut agricultural carbon, including genetic research and vaccines.

Modelling exercises suggest little impact on agricultural production, productivity and employment. Emissions are supposed to decline mainly because of less intensive farming methods such as a lower livestock, less fertilizing, and fewer breeding animals. Moving away from animal production towards vegetables would also reduce methane emissions. New technologies to capture methane are not assumed to be commercially available before 2035, so the impact on production beyond that date would depend on the viability of technologies such as a methane inhibitor or vaccine. Modelling also suggests that a bolder carbon policy would actually result in fewer agricultural job losses than in the no-action scenario, because it implies less land use change from animal farming to forestry.

Source: (Climate Change Commission (New Zealand), 2021[62]), (Bibbee, 2011[58]).

Industry

Iceland's stationary industry is subject to the European Union emission trading system (EU-ETS) since 2008, leaving the country no direct policy lever over industrial carbon emissions, although a public company is active in developing innovative carbon capture technologies. EU-ETS is the Union's main instrument for the transition towards a low-carbon economy and should deliver a 43% reduction in European-wide emissions by 2030 compared to 2005. Iceland plans to participate in the international flight emission reduction scheme and to align it with the EU-ETS, which is welcome. In contrast, sectors regulated by the EU-ETS should be exempted from domestic emission pricing such as a carbon tax.

Table 3.1. Recommendations for a successful transition to a low-carbon economy

Climate action policies	
Climate policies lack prioritisation and sequencing and rely mostly on technical measures.	**Develop a consistent climate policy framework to guide scope, priorities, and sequencing of actions and measures.**
Planned policy action lacks assessment and evaluation.	Carry out comprehensive cost-benefit analysis of planned climate actions, using a common carbon shadow price.
In recent years, Iceland has not invested in emission cuts abroad, to be credited against domestic emission targets.	Participate in international carbon abatement, to reduce emission reduction costs and to foster technology transfer.
Carbon pricing	
Geothermal energy, waste management and agriculture are not subject to carbon pricing.	**Submit all sectors to carbon pricing, taking into account interactions between carbon taxes and emissions trading systems**
There is no timeframe for carbon price increases.	Commit to a gradual phase-in of higher carbon prices for sectors not covered by the EU emissions trading scheme, consistent with reaching climate targets.
Methane and nitrous oxides are not priced.	Include methane and nitrous oxides in the carbon pricing base.
Agricultural production is carbon-intensive.	Cut agricultural subsidies andcouple the remaining ones to sustainable land management and less carbon-intensive production.
Public investment, research and innovation	
There is room for further investment in low-carbon infrastructure.	**Step up spending on low-carbon transport infrastructure, energy transition and digital transformation.**
Spending on research and development is below the OECD average.	Increase research and development in the area of carbon capture technologies, clean vessel propulsion and soil conservation, including by stepping up international cooperation in these areas.
Collaboration between research institutions and the business sector is weak.	Strengthen collaboration between universities and firms, and participate in international research consortia for green innovation.
Supporting the transition to a low-carbon economy	
Barriers to foreign direct investment are high, slowing the inflow of foreign green capital.	Remove barriers to foreign direct investment to the extent possible.
Green skills could be in short supply, slowing transition and reallocation to green jobs.	Invest in tertiary education, especially in STEM areas. Ease occupational licencing in the construction sector.
Administrative burdens to cope with environmental regulation are large, slowing investment.	Assess the need for regulatory requirements.

Note: Key recommendations are in bold and feature in the executive summary.

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Iceland's economy is recovering from a deep COVID-19 recession. Fisheries and intellectual services exports are on the rise and foreign tourists are starting to come back as travel restrictions are gradually eased. The health crisis has been relatively mild so far, thanks to a smart testing and tracking strategy and a well-functioning health system. After a sharp rise during the pandemic, unemployment is declining fast, and inflation hovers above target. Appropriate macroeconomic policy coupled with structural reforms are needed for a sound recovery and sustainable growth. The central bank should remain vigilant and fiscal support should continue to target vulnerable groups. Reducing stringent regulation, especially in tourism and construction, would help shift resources to more productive firms and jobs. Strengthening vocational education and training, and linking part of university funding to labour market outcomes would reduce labour shortages and skills mismatch. Offering better-targeted support for business R&D, encouraging the adoption of digital technologies and facilitating knowledge transfer would boost innovation and productivity. Submitting all economic sectors to carbon pricing – either a carbon tax or an emission trading system – while redistributing the proceeds to households and firms will be key for a cost-efficient and equitable transition to a low-carbon economy.

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