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BETTER POLICIES FOR BETTER LIVES

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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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BASIC STATISTICS OF ESTONIA, 2018

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

LAND, PEOPLE AND ELECTORAL CYCLE					
Population (million)	1.3		Population density per km²	30.4	(37.8)
Under 15 (%)	16.4	(17.8)	Life expectancy at birth (years, 2017)	77.6	(80.1)
Over 65 (%)	19.6	(17.1)	Men (2017)	73.3	(77.5)
Foreign born (%)	14.9		Women (2017)	82.2	(82.9)
Latest 5-year average growth (%)	0.04	(0.62)	Latest general election	March-2019	
ECONOMY					
Gross domestic product (GDP)			Value added shares (%)		
In current prices (billion USD)	30.7		Agriculture, forestry and fishing	2.6	(2.4)
In current prices (billion EUR)	26.0		Industry including construction	28.5	(27.5)
Latest 5-year average real growth (%)	3.6	(2.3)	Services	68.9	(70.1)
Per capita (000 USD PPP)	36.0	(46.6)			
GENERAL GOVERNMENT					
Per cent of GDP					
Expenditure	39.1	(41.2)	Gross financial debt (OECD: 2017)	12.7	(109.6)
Revenue	38.6	(38.2)	Net financial debt (OECD: 2017)	-26.2	(69.7)
EXTERNAL ACCOUNTS					
Exchange rate (EUR per USD)	0.85		Main exports (% of total merchandise exports)		
PPP exchange rate (USA = 1)	0.55		Machinery and transport equipment	30.8	
In per cent of GDP			Mineral fuels, lubricants and related materials	15.3	
Exports of goods and services	74.3	(55.5)	Miscellaneous manufactured articles	15.1	
Imports of goods and services	70.8	(51.3)	Main imports (% of total merchandise imports)		
Current account balance	2.0	(0.3)	Machinery and transport equipment	34.2	
Net international investment position	-25.5		Mineral fuels, lubricants and related materials	15.4	
			Manufactured goods	15.1	
LABOUR MARKET, SKILLS AND INNOVATION					
Employment rate (aged 15 and over, %)	60.4	(57.1)	Unemployment rate, Labour Force Survey (aged 15 and over, %)	5.4	(5.3)
Men	67.5	(65.3)	Youth (aged 15-24, %)	11.9	(11.1)
Women	54.4	(49.4)	Long-term unemployed (1 year and over, %)	1.3	(1.5)
Participation rate (aged 15 and over, %)	72.1	(60.5)	Tertiary educational attainment (aged 25-64, %)	41.1	(36.9)
Average hours worked per year)	1 748	(1734)	Gross domestic expenditure on R&D (% of GDP, 2017, OECD: 2016)	1.3	(2.5)
ENVIRONMENT					
Total primary energy supply per capita (toe)	4.3	(4.1)	CO2 emissions from fuel combustion per capita (tonnes)	10.3	(8.9)
Renewables (%)	19.2	(10.5)	Water abstractions per capita (1 000 m³, 2017)	1.4	
Exposure to air pollution (more than 10 µg/m³ of PM 2.5, % of population, 2017)	0.0	(58.7)	Municipal waste per capita (tonnes, 2017)	0.4	(0.5)
SOCIETY					
Income inequality (Gini coefficient, 2016)	0.314	(0.310)	Education outcomes (PISA score, 2018)		
Relative poverty rate (%, 2016)	15.7	(11.6)	Reading	523	(489)
Median disposable household income (000 USD PPP, 2016)	17.7	(23.6)	Mathematics	523	(492)
Public and private spending (% of GDP)			Science	530	(491)
Health care	6.4	(8.8)	Share of women in parliament (%)	26.7	(29.7)
Pensions (2015)	7.1	(8.5)	Net official development assistance (% of GNI, 2017)	0.2	(0.4)
Education (public, 2017)	4.9	(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, World Bank.

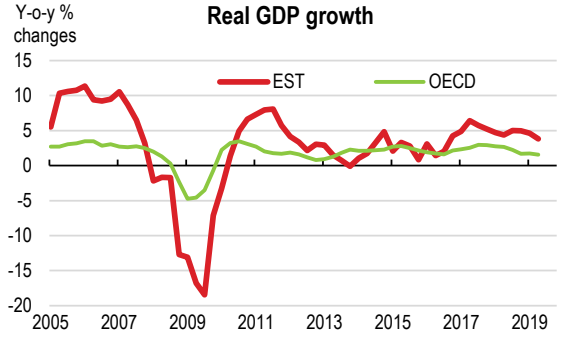
Executive summary

Growth is strong, although slowing

Estonia's economy continues to perform well, even though growth is slowing somewhat. Growth, however, could be more inclusive and there is room to boost spending in areas supporting long-term equitable growth.

Estonia has continued to enjoy a fast convergence. However, many wellbeing challenges still need to be addressed: inequalities in income, health, environmental quality and other aspects of life, which vary across regions and by level of education, between genders and urban and rural areas. How to lift productivity by embracing digital technologies for stronger and more inclusive growth is the focus of this survey.

Figure 1. Growth is strong by OECD standards



Source: OECD Analytical Database

Growth will ease going forward, moderating wages and inflation, as international demand softens and domestic pressures abate, notably in construction. The outlook is vulnerable to external events, including global trade tensions.

Table 1. Economic growth remains strong

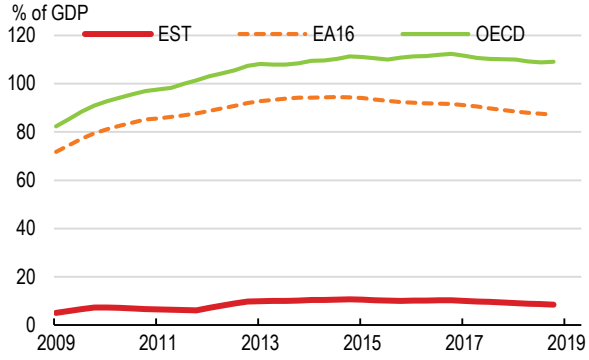
(annual growth rate unless specified)	2018	2019	2020
GDP at market prices	4.8	3.2	2.2
Private consumption	4.4	2.7	3.2
Government consumption	0.8	2.4	1.5
Gross fixed capital formation	0.9	14.1	1.7
Exports of goods and services	4.3	4	1.1
Imports of goods and services	5.7	3.8	2.2
Unemployment rate (% of labour force)	5.4	5	5.1
Harmonised index of consumer prices	3.4	2.4	2.3
Current account balance (% of GDP)	2	1.4	0.9
General government financial balance (% of GDP)	-0.6	-0.3	-0.4

Source: OECD Economic Outlook 106 database.

Fiscal policies have been mostly prudent, resulting in the lowest debt in the OECD. In the recent upturn, fiscal policy has become pro-cyclical, which should be avoided. The free play of automatic stabilisers should be allowed and in case of a strong downturn, the exemption clause used. Extending the real estate tax base to residential real estate and higher environmental taxes and fees could partly finance long-term spending needs on infrastructure, health and social security and would provide room for cuts in labour and consumption taxes. Monetary policy will be supportive as growth is slowing.

Proposed changes to the pension system pose risks. The proposal to allow opt-out of the mandatory privately-managed second pillar of the pension system and early withdrawal of funds would boost government revenues, but may threaten macroeconomic stability and future pension adequacy. Moreover, impacts of the proposed changes have not been properly assessed. Withdrawal before retirement should not be allowed and pension funds should be more transparent about their costs and better governed to achieve greater efficiency and higher returns.

Figure 2. General government debt is very low



Source: OECD Analytical Database.

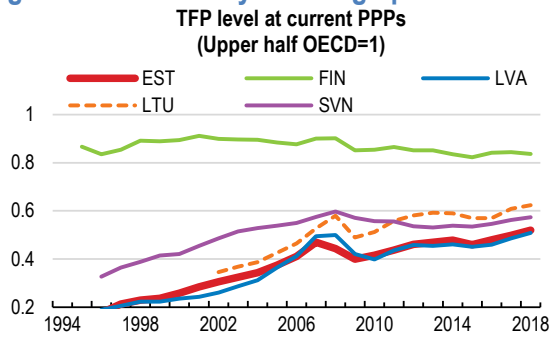
Money laundering issues are being addressed. The Financial Supervisory Authority (FSA) closed down Versobank and Danske Bank's Estonian Branch following earlier breaches of anti-money laundering rules. The FSA and financial sector cooperate to implement necessary checks and balances to prevent new incidences of money laundering. The government is addressing weaknesses of the legal framework to counter money laundering. This should include increasing fines to deterring levels and allowing the prosecutor to freeze assets on the suspicion of money laundering. Nordic-Baltic cooperation in banking supervision could be further improved.

Growth needs to be driven more by productivity

Estonia has adopted a business-friendly regulatory framework and is considering forefront

regulatory tools for artificial intelligence. However, the productivity catch-up has slowed since the global financial crisis and the gap with top performers is large. Digitalisation of businesses provides a promising avenue to lift overall productivity. Further automation is key to boost competitiveness amid rising labour costs.

Figure 3. Productivity catching up has slowed



Source: OECD Economic Outlook 106 database.

Estonia is a frontrunner in digitalising government services and boasts a number of native ICT unicorns. The country should build on these key strengths to nurture digitalisation economy wide. Industry digitalisation policies should be holistic and reflected in government documents and their implementation monitored.

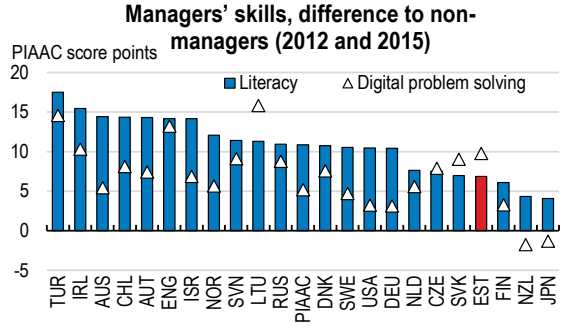
Skills are key to boost the productivity gains from digital technologies. High educational attainment and skills give solid foundations to make the most out of digitalisation. Almost half of Estonian jobs are at risk of automation or significant change. Ensuring high and up-to-date skills is central to seizing the productive potential from digital technologies and to sharing the gains equitably. Improving unemployment insurance coverage might give the unemployed with up-skilling needs stronger incentives to participate in training.

Digital user skills are improving, but quality of ICT teaching varies across compulsory schools, and many teachers feel unprepared. Adult education and training needs a boost, and employers should take more responsibility to train their employees.

ICT activities for children should be designed to appeal equally to girls' and boys' interests to boost the number of women ICT specialists. Overall supply of ICT specialists is catching up with demand, but employment is highly concentrated in the ICT sector. Traditional industries lag behind, likely slowing down their productivity-enhancing digital adoption.

Manager selection and management practices could improve. Managers are key to the digital transformation to initiate and steer product- and process innovations, and they are responsible for assigning and developing human capital. Estonian managers have a low skill premium compared to other countries, and firms make limited use of high-performing work practices known to boost productivity performance and skills use at work.

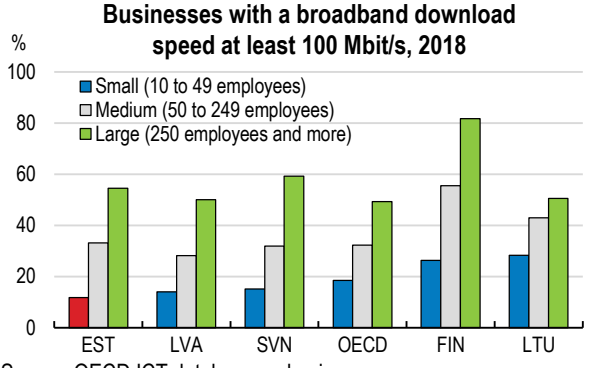
Figure 4. Managers' skill premium is low



Note: Controlling for sector composition.
Source: OECD calculations based on the OECD Survey of adult skills (2012 and 2015).

Digitalisation of industry is an imminent challenge. Access to ultra-fast broadband is one of the major bottlenecks to the adoption of digital technologies, in particular for small firms.

Figure 5. Few businesses have ultra-high speed connection, 2018



Source: OECD ICT database on business usage.

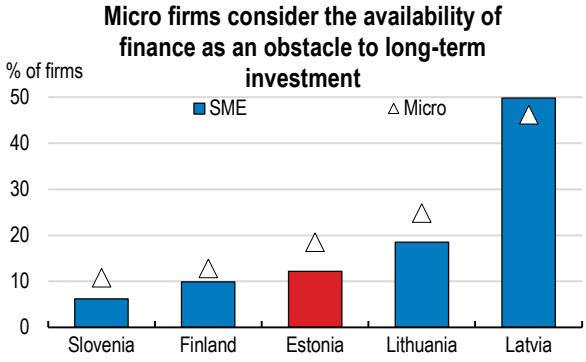
Embracing digital tools provides a leapfrogging opportunity for Estonian firms. Big data, the Internet-of-things and artificial intelligence are driving the shift to modern industry in digital frontrunner countries.

The small scale of firms inhibits boosting productivity through adopting digital tools. Most firms do not reach the threshold where fixed costs of digital tools are affordable. Digital collaboration within industry associations and ICT clusters could alleviate that issue alongside mergers and joint operations.

Lack of awareness about the potential benefits of adopting digital tools and the type of tools to adopt are bottlenecks to digital transition. Bureaucracy should be reduced for digital diagnostics and take-up rates and success stories should be better disseminated.

Lack of financing is an obstacle to long-term investments, especially the lack of collateral among new and rural firms**.** Many SMEs' loan applications are rejected and many do not apply in fear of rejection compared to other countries. Alternative financing sources should be explored.

Figure 6. Availability of finance is an obstacle to long-term investment for smaller firms, 2017



Source: EIB survey.

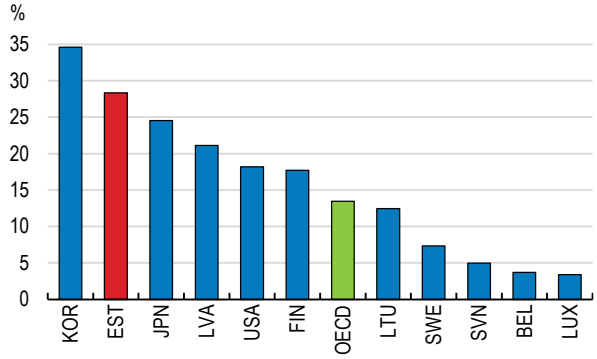
The benefits of growth need to be more equitably distributed and growth greener

Robust growth did not benefit all groups of society.

Income inequality is around the OECD average, but social disparities, including inequalities in life satisfaction or health outcomes, are high in some dimensions: between urban and rural, across regions, men and women, skilled and unskilled and citizens and non-citizens. The whole population should be covered by health insurance and non-recipients should be encouraged to enrol.

The gender wage gap is second highest in the OECD. Employers, including the private sector, should report the size of the wage gap and provide an action plan to eliminate it.

Figure 7. The gender wage gap is very high, 2018 or latest year available

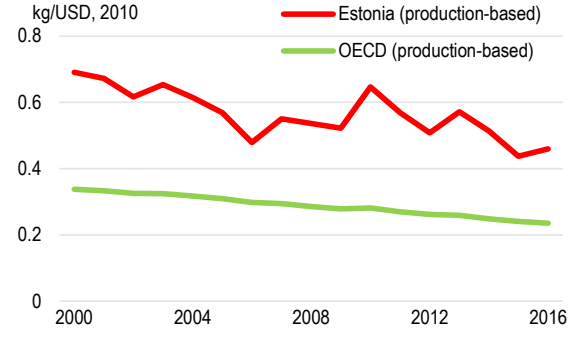


Source: OECD Labour Statistics database.

Reducing dependence on oil shale is a key environmental, social and strategic challenge. Estonia is the most carbon intensive and third most energy-intensive economy in the OECD, due to its heavy reliance on oil shale. The industry meets a dominant share of Estonia's energy needs, it accounts for 4% of GDP, it is a key employer in the northeast of the country, where unemployment and poverty rates are high, and it is seen as key to the country's energy security. Efforts towards increased refining improves resource efficiency, but the industry remains polluting and vulnerable to international prices of oil and CO_2 emissions.

The amount of household waste has increased with rising incomes in recent years and recycling is low, which calls for better infrastructure and incentives to reduce waste and recycle.

Figure 8. CO_2 intensity is high



Source: OECD Green Indicators database.

MAIN FINDINGS	KEY RECOMMENDATIONS
Creating macroeconomic conditions conducive to growth and well-being	
In the recent cyclical upturn, windfall revenues have been spent, making fiscal policy pro-cyclical.	Avoid pro-cyclical fiscal policy and allow the free play of automatic stabilisers. In case of a strong downturn, fully use the exemption clause built in the existing fiscal rule.
Productivity growth has been sluggish. The overall level of subjective well-being is low by OECD standards.	Increase spending on measures boosting the long-term growth potential and inclusiveness such as infrastructure connectivity, innovation and education.
Real-estate related tax revenues are low, as the tax base does not include residential housing. Consumption taxes are high.	Introduce a recurrent tax on the ownership of residential real estate. Reduce labour and consumption taxes.
A previous proposal to strengthen the legal framework to prevent money laundering and financing of terrorism was not passed by the parliament due to the election cycle. Anti-money-laundering measures have been strengthened considerably, and the Government is preparing a new proposal to Parliament.	Continue strengthening regulations and allow the freezing of assets by the regulator in the case of suspected money laundering and increase fines to deterring levels. Continue to strengthen Baltic-Nordic coordination in the fields of financial sector supervision and anti-money laundering.
Seizing the productive potential of digital change	
The large number of planning documents at the national and sectoral levels contain overlap and industry digitalisation is not sufficiently emphasised.	Formulate policies for industry digitalisation in a holistic way as a means of productivity catch-up and reflect those in government planning documents. Monitor implementation.
Estonian companies are little involved in vocational education and training and the continuous training of own employees.	Strengthen cooperation between the public sector, labour unions and employers to boost their engagement in skill supply, including vocational education and training and continuous learning.
High-performance work practices boost individuals' skill use at work, digital adoption and productivity performance. Their use in Estonia is around the OECD average.	Implement a programme to improve managerial practices and organisational performance of firms with a strong element of network-building to disseminate good practice and mutual learning.
The organisation, content and quality of the teaching of digital skills varies between schools, and teachers do not feel sufficiently prepared to teach digital skills and use digital tools.	Strengthen the quality and relevance of teachers' training and professional development in teaching digital skills.
Access to finance is an obstacle to long-term investment for smaller firms and they are rejected or do not apply for loans in fear of rejection.	Promote alternative financing to fill the funding gap for SMEs.
Sharing the benefits of growth in a more equitable way and providing a greener environment	
The second pillar pension funds have charged high fees and returns have been low. The proposed changes to allow withdrawal of funds would generate extra short-term public revenues but would risk pension adequacy and aggravate old-age poverty in the longer term. The impacts of the proposed changes have not been properly assessed, and public consultations have been limited.	Do not allow withdrawal from the second pillar of the pension system before retirement. Assess the impacts of potential changes to the pension system, including on pension adequacy and macroeconomic stability. Enhance competition in pension markets, and make all costs transparent.
Health insurance coverage is incomplete and out-of-pocket costs are high. The way to extend coverage to all is being explored.	Extend health insurance coverage for the entire population. Encourage the inactive non-recipients to obtain health insurance.
The gender wage gap is high.	Require the reporting of the gender wage gap and action plans to reduce it, including in the private sector. Hold companies accountable for their actions, by for instance requiring explanation for slow progress.
An overwhelming majority of ICT specialists are men, reflecting early educational choices.	Tailor ICT classes and voluntary ICT hobby activities to better match the interests of both girls and boys from the early stages of compulsory school and in early childhood education and care.
Many unemployed are not covered by unemployment insurance owing to its stringent conditions and hence cannot benefit from active labour market programmes.	Relax eligibility conditions for unemployment insurance.
People with low education and skills are more likely to work in jobs more vulnerable to automation and digitalisation.	Continue to scale up and improve access to active labour market policies, notably up-skilling activities for the unemployed, the disabled and those in high risk of unemployment.
The oil shale industry is very CO_2 intensive. The industry is highly sensitive to international prices on oil and CO_2 emissions in the EU Emissions Trading Scheme (ETS).	Review taxes and charges on oil shale mining and use to reflect costs and externalities, while addressing social welfare and energy security concerns.
The amount of household waste has increased sharply in recent years and recycling is low.	Improve waste collection infrastructure and raise fees on domestic mixed waste going to incineration or landfills to incentivise recycling and waste prevention.

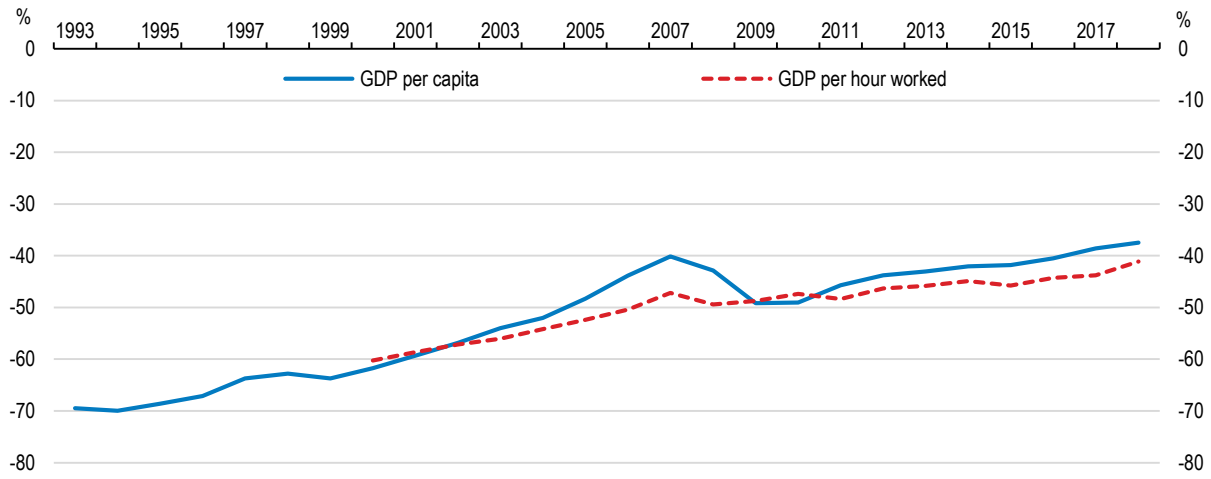
1 Key Policy Insights

Estonia's economic growth performance has been a success story following its independence. It continues to be robust, albeit slowing somewhat. The benefits of growth, however, need to be more equitably distributed across regions, genders, people with different education levels and urban and rural areas. Inequalities in income, health outcomes and other areas are large in those dimensions. Channelling funds for infrastructure, social protection, health and care-taking would help improve wellbeing of all, while also lifting the growth potential. This chapter provides an overview of growth and wellbeing issues Estonia faces in the short- to medium term.

Introduction

Estonia has continued to narrow the income gap with the most advanced OECD economies. In 2018, the GDP per capita gap to the upper half of OECD countries was 38% (Figure 1.1). The productivity gap to the same group of countries, measured as GDP per hour worked, was somewhat wider, reflecting longer hours worked and a lower capital stock. Massive investment in infrastructure and productive capacity, largely driven by EU funds, helped productivity convergence. Investment plans indicate that it will continue to do so in the coming years. The regulatory framework has become more business friendly. In addition, a further integration in global trade and international capital flows have brought about productivity gains. Macroeconomic stability has been achieved by prudent policies, though as a small open economy, Estonia is exposed to external shocks.

Figure 1.1. The income and productivity gaps have narrowed



Note: Percentage gap with respect to the weighted average using population weights of the highest 18 OECD countries in terms of GDP per capita (in constant 2010 PPPs). The 2018 value of the average hours worked per person employed is estimated for Australia, Canada, Finland, Israel, Mexico, Switzerland and the United States.
Source: OECD, National Accounts and Productivity Databases.

With the population shrinking as it ages rapidly, a major question is how to improve living standards rapidly. Indeed, GDP growth has been weaker in recent years and is projected to fall further, below 3% in 2020. Productivity growth has also been sluggish, making the adoption of structural reforms to reinvigorate the economy even more pressing. Recent government programmes (Box 1.1) have emphasised upgrading infrastructure and have embarked on multi-decade projects with productivity gains expected to materialise in the longer run.

Box 1.1. Recent government policies towards revitalisation of the economy and greater inclusiveness

In the past couple of years, the Estonian government adopted a series of reforms to lay the foundations for stronger growth for the coming years and to make a larger share of the population benefit from it. The new government in the spring of 2019 summarised its key priorities in the Hundred Days Plan. The five priorities include creating a family-friendly environment, a cohesive society, a knowledge-based economy, improving governance and establishing a free and protected state. In the first hundred days, major deliveries include approving an action plan for national artificial intelligence, launching a single nation-wide digital registration system for 19 hospitals, adopting an action plan for national reform to decrease bureaucracy in the public sector and to improve public service quality. A review of the state budget was also launched, and in the 2020 budget quality, volume and price goals will be set for programmes and state agencies.

The government formulated its reform strategy in the updated National Reform Programme "Estonia 2020". Broader use of the potential of creative industries, ICT and other key technologies to increase the value added of other sectors is a key objective of the programme. Public infrastructure projects, which form an important component of reigniting productivity growth, continued and new projects have been launched. As part of efforts to combat climate change, the government is set to electrify railroads, extend the tramways and manage waste better. Transport connectivity will improve due to the planned large-scale Rail Baltica. To attract more foreign talent, the government called for analysing possibilities to better support potential foreign experts in Estonia. A recently launched system will make sure that the professions taught correspond to the needs of the society and vocational education with apprenticeship opportunities will be promoted to achieve a better integration into working life upon graduation.

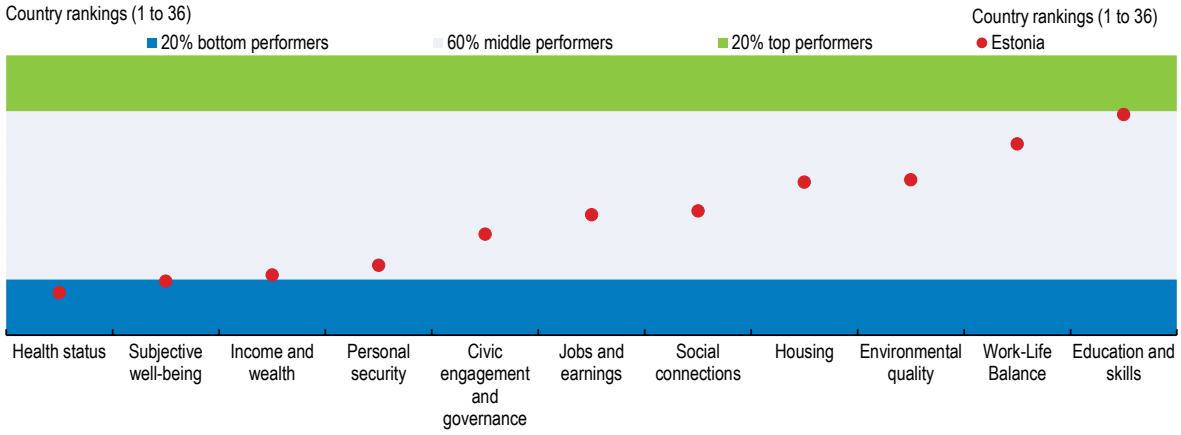
Reforms to enhance inclusiveness continued on the footsteps of the earlier round in 2016-17 by increasing the non-taxable income threshold and making its withdrawal progressive, as well as increasing family benefits. The combined effect of these reforms is roughly a percentage point reduction in the Gini index of disposable incomes. Inequalities between citizens and non-citizens will be reduced by equating the final exam in social studies at the primary school level with the Estonian citizenship exam.

Source: National Reform Programme "Estonia 2020", available at https://www.riigikantselei.ee/en/supporting-government/national-reform-programme-estonia-2020 and Hundred Days Plan, available at https://www.valitsus.ee/en/news/government-approved-hundred-days-plan.

Some aspects of subjective well-being, such as cognitive skills at age 15 or work-life balance owing to fewer people working long hours are outstanding among OECD countries. The overall level of subjective well-being, however, is low by OECD standards due to low income and wealth levels, poor health status, low housing quality and lack of personal security (Figure 1.2).

Figure 1.2. Income levels and health conditions should improve

A. Indicators of well-being



B. Estonia well-being sub-indicators selected rankings

	Dimension	Sub-indicator	Rank	Measure	Estonia	OECD average
In the top 5	Education and skills	Cognitive skills at age 15	2	PISA mean scores in reading, mathematics and science	524	486
	Housing	Houshold expenditure on housing	3	Percentage of household gross adjusted disposable income spent on housing rents and housing maintenance	18	19
	Work-Life Balance	Employees working very long hours	5	Percentage of employees who usually work 50 hours or more per week	3	13
In the bottom 10	Health status	Life expectancy at birth	30	Number of years a newborn can expect to live	77.7	80.1
	Jobs and earnings	Average annual gross earnings per full-time employee	30	USD at PPPs of the latest available year	23,621	44,290
	Health status	Perceived health status	31	Percentage of adults reporting "good" or "very good" health	51.4	68.7
	Personal security	Deaths due to assault	31	Age-standardised rate, per 100 000 population	3.1	3.6
	Income and wealth	Household net adjusted disposable income	26	USD at current PPPs, per capita	18,665	30,620
	Housing	Dwellings without basic sanitary facilities	30	Percentage of people without an indoor flushing toilet for the sole use of their household	6.9	2.2

Source: OECD Better Life Initiative 2017.

Estonia's strong GDP growth has contributed to fast convergence towards the most advanced OECD member countries. However, other indicators of well-being are still lagging behind; the government's new focus on the quality of life is thus welcome. The country faces inequality challenges: between urban and rural areas, geographical regions, men and women, skilled and unskilled, and citizens and non-citizens. Structural policies to boost productivity would go a long way towards sustaining strong growth as well as higher living standards, and providing space to address social problems. Against this backdrop, the main messages of the 2019 Survey are:

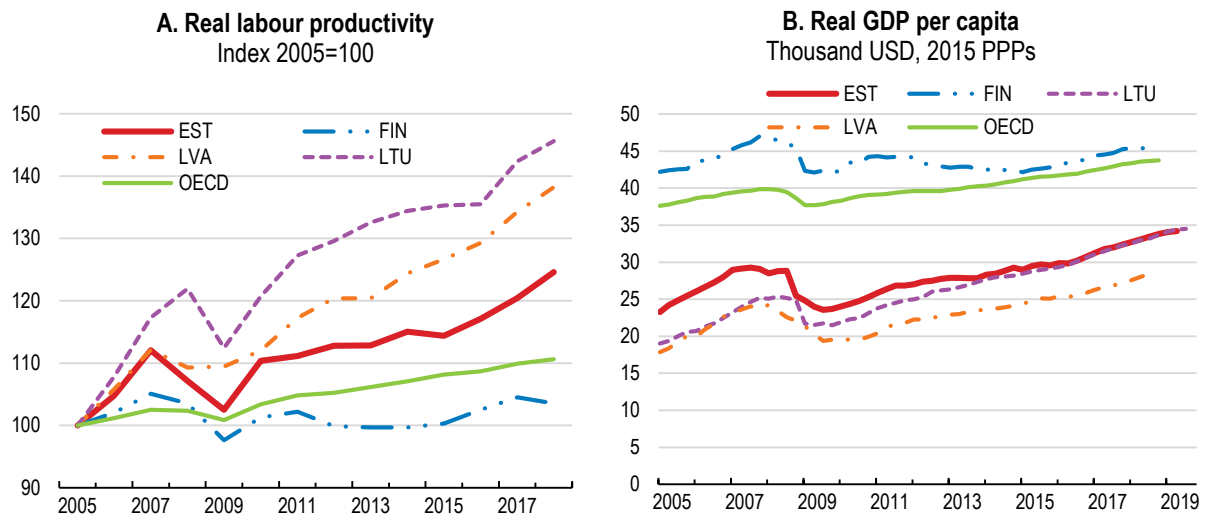
- Growth performance has been strong, but as growth slows, policies should prevent activity from falling below potential. In particular, spending on measures to lift long-term growth and enhance inclusiveness, such as infrastructure, health, education and long-term care should be prioritised.

- Estonia could build on its strong track record in deploying digital technologies in government to further advance the digitalisation of the economy, which will be key to reviving productivity growth.
- Due to the many inequality challenges that Estonia is facing, a multi-dimensional approach to reducing inequality is necessary.

A strong economy raises incomes and improves social outcomes

Estonia has seen a period of strong economic growth. Productivity growth has been stable (Figure 1.3.A), and incomes have risen over the past few decades, only interrupted by the Global Financial Crisis (Figure 1.3.B). Growth is expected to slow going forward (Table 1.1), as the global outlook softens under the negative influence of trade tensions, and political uncertainties including Brexit. Short-term indicators are mixed, with solid consumer confidence and somewhat weak business confidence. Exports will decelerate, as demand from Estonia's main trading partners slows and continued losses in cost competitiveness prevent Estonia from gaining market share. Private non-residential investment growth is set to increase somewhat from a low base despite trade uncertainties, while slowing demand for new housing will hold back housing investments. Household real wages continue growing, but increasing uncertainties will encourage precautionary savings and thus weigh on consumption.

Figure 1.3. Solid growth boosts living standards



Source: OECD Economic Outlook database.

Table 1.1. Macroeconomic indicators and projections

Annual percentage change, volume, unless otherwise specified

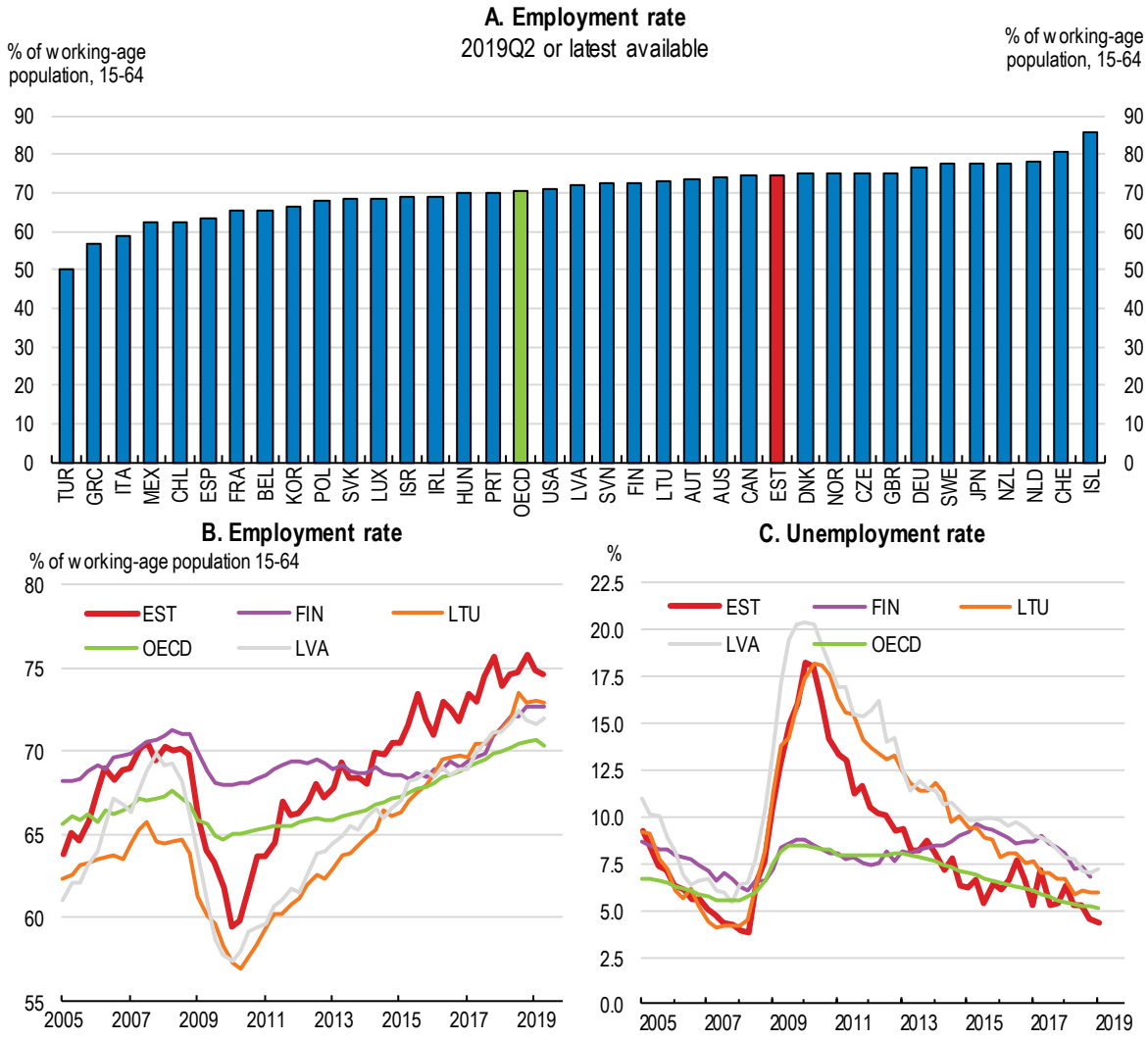
	2016	2017	2018	2019	2020	2021
	Current prices EUR billion	Percentage changes, volume (2010 prices)				
GDP at market prices	21.7	5.6	4.8	3.2	2.2	2.2
Private consumption	11.2	2.8	4.4	2.7	3.2	3.1
Government consumption	4.4	1	0.8	2.4	1.5	2
Gross fixed capital formation	5.1	12.7	0.9	14.1	1.7	2.5
Final domestic demand	20.8	5	2.8	5.6	2.4	2.7
Stockbuilding[1]	0.1	-0.5	1	-0.5	0	0
Total domestic demand	20.8	4.3	3.8	4.8	2.4	2.7
Exports of goods and services	16.8	3.8	4.3	4	1.1	2.1
Imports of goods and services	16	4.2	5.7	3.8	2.2	2.7
Net exports[1]	0.9	-0.1	-0.8	0.2	-0.7	-0.4
Memorandum items						
GDP deflator	_	3.8	4.5	3.4	2.3	2.6
Harmonised index of consumer prices	_	3.7	3.4	2.2	2.3	2.2
Harmonised index of core inflation[2]	_	2	1.7	2.3	2.5	2.2
Unemployment rate (% of labour force)	_	5.8	5.4	5	5.1	5.2
Household saving ratio, net(% of disposable income)	_	7.9	8.2	9.6	7.7	6.8
General government financial balance(% of GDP)	_	-0.8	-0.6	-0.3	-0.4	-0.8
General government gross debt, Maastricht definition (% of GDP)	_	9.3	8.4	8.5	7.7	7.6
Current account balance (% of GDP)		2.7	2	1.4	0.9	0.5

1. Contributions to changes in real GDP, actual amount in the first column.
2. Harmonised index of consumer prices excluding food, energy, alcohol and tobacco.

Source: OECD Economic Outlook 106 database.

The employment rate is well above the OECD average (Figure 1.4.A), and has surpassed the pre-crisis peak after a protracted period of strong employment growth since 2010 (Figure 1.4.B). The composition of employment has shifted lately, with employment increasing in services relatively to manufacturing. The number of part-time workers has increased, while the number of full-time workers has stayed the same. This has led to a slight drop in the number of hours worked per employee (Eesti Pank, 2019a). Unemployment has fallen, and long-term unemployment is at record-low levels (Figure 1.4C).

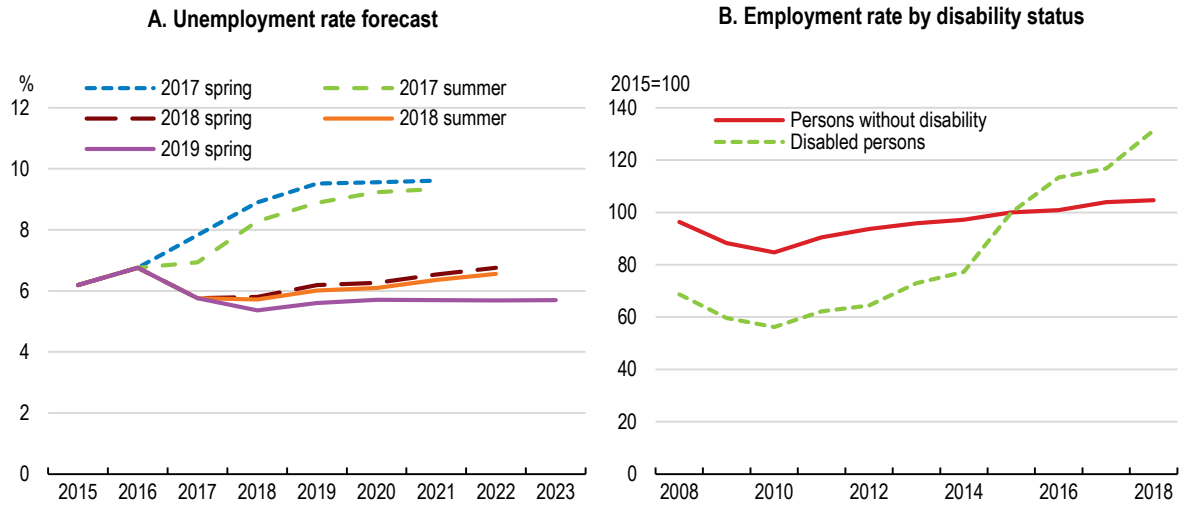
Figure 1.4. Employment is high, and unemployment is low



Source: OECD Economic Outlook database.

The Work Ability reform, a reform to re-assess the work ability of disability claimants and bring individuals with a partial ability to work into the labour force has so far exceeded expectations. The reform was expected to inflate unemployment (Figure 1.5.A), but so far unemployment has fallen and people diagnosed with disabilities increasingly find employment (Figure 1.5.B). However, the implementation of the reform has benefitted from cyclically strong labour demand. Furthermore, disability claimants have been sequenced so that those assumed to be relatively close to the labour market and having less serious disabilities had their work ability re-assessed first. The reform may therefore still increase unemployment going forward, as some of these individuals will struggle to find new employment, calling for renewed efforts to re-skill and up-skill.

Figure 1.5. Reform to re-assess disabled's work ability raised unemployment less than expected



Source: Estonian Ministry of Finance, Statistics Estonia.

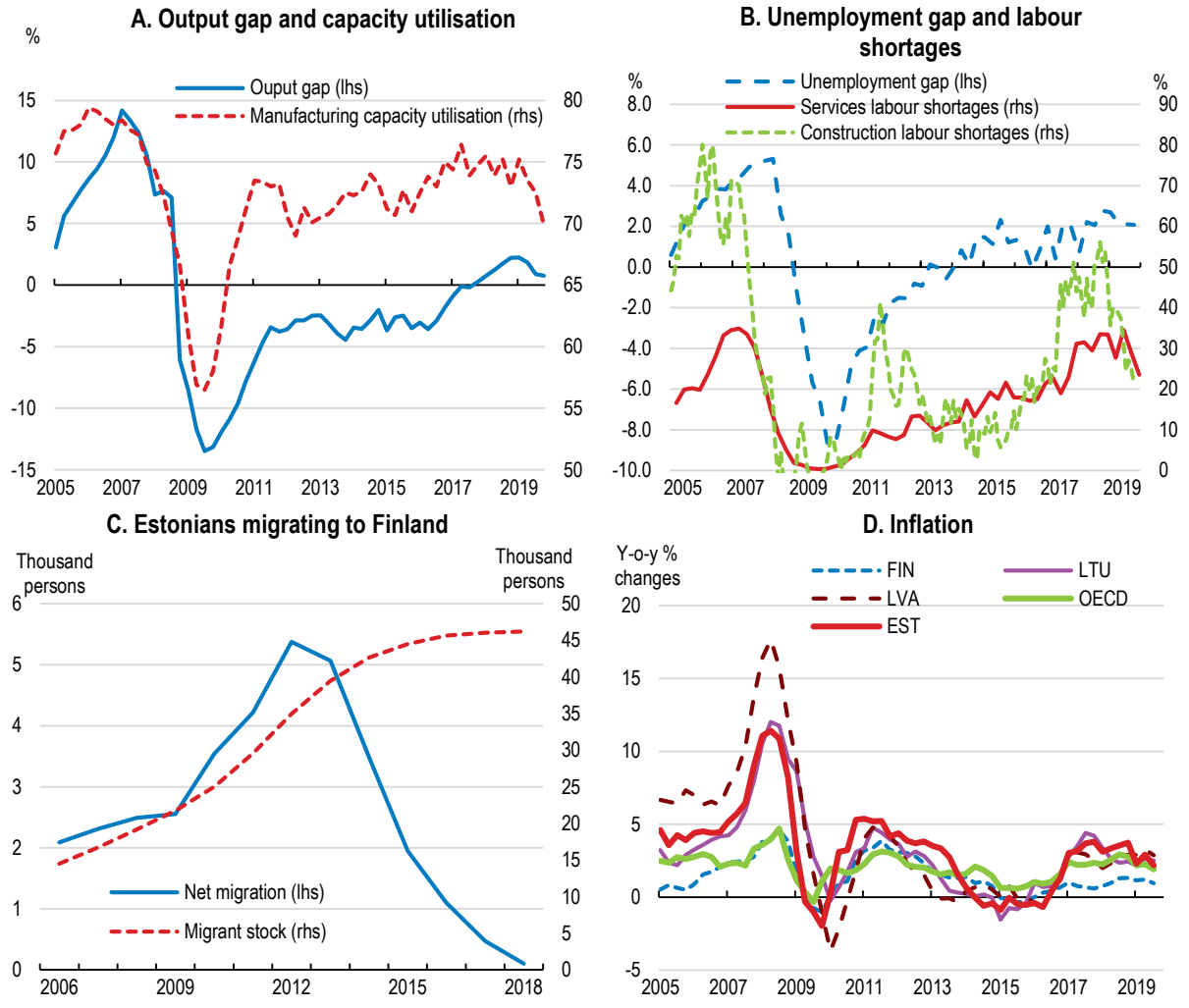
Solid labour market outcomes reflect that the economy is operating at close to full capacity, with a positive output gap, and high capacity utilisation (Figure 1.6.A). The unemployment gap is also positive. Labour shortages in the services sector are at a level close to that before the Global Financial Crisis, but seem to have stabilised. Moreover, shortages within construction, a cyclical sector central to the pre-crisis boom, have fallen back from high levels in 2017 and 2018 to well below pre-crisis levels (Figure 1.6.B). Labour market pressures have led to solid nominal wage growth, at around 7% a year.

Considerable migration flows help contain pressures in the Estonian labour market, but there is scope to open up for more non-EU immigration to fill skills shortages, discussed further in Chapter 2, and counter the demographic pressures outlined below. Net migration turned from negative to positive in 2015, but is still modest. Short-term work migration under the "D-visa" scheme adds welcome flexibility, but incurs cost to employers, notably time costs of training new arrivals and associated management costs. Non-EU long-term residence- and work permits to Estonia are restricted by an annual quota of 0.01% of the population, or 1315 people in 2019, despite strong demand from businesses and potential immigrants of various backgrounds and skills, notably from Ukraine and Russia. Exceptions exist, notably for those receiving at least double the national average gross salary, but a more flexible approach, taking various measures of skills into account or lowering the wage threshold, should be considered.

Closeness to Finland, both geographically and in terms of language, has added considerable flexibility to the labour market since 1990. Net migration from Estonia to Finland went from a peak of 5400 persons in 2012 to balance in 2018, likely as a result of the strong Estonian labour market and associated wage growth reducing the income gap between the two countries. 46 000 Estonians, or approximately 3.5% of the current Estonian population, lived in Finland in 2018. Furthermore, many Estonians domiciled in the Tallinn area work in the Helsinki area (Figure 1.6.C).

Households have increased savings, and high wage growth has only passed through to price inflation to a limited extent so far. Headline inflation has fallen back to slightly above 2% after hovering around 3.4% in 2017 and 2018 (Figure 1.6.D). High inflation in 2018 was partly due to rises in excise duties, and the current slowdown is partly due to reversals of excise duties on alcoholic beverages taking effect from July 2019.

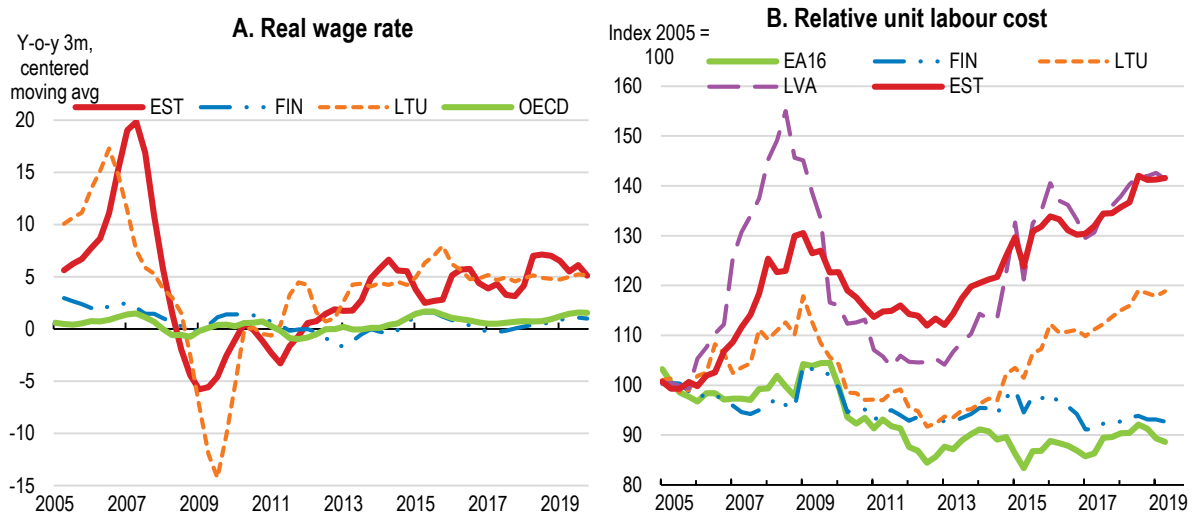
Figure 1.6. The economy is operating close to full capacity, but not overheating



Source: OECD Economic Outlook database ; and Statistics Finland Population statistics database.

Solid wage growth (Figure 1.7.A) has recently taken place, but Estonian incomes are significantly lower than the OECD average. Wages in Estonia are responsive to market forces, and nominal wage growth on average is a welcome sign of sectoral shifts towards activities with higher value-added, and re-adjustments of relative wages. However, wages growing faster than productivity reduces cost competitiveness in the long term, and can damage exporting industries. Estonia's cost competitiveness decreased, notably based on relative unit labour costs, over the past few years compared to Euro area countries (Figure 1.7.B).

Figure 1.7. High wage growth challenges competitiveness

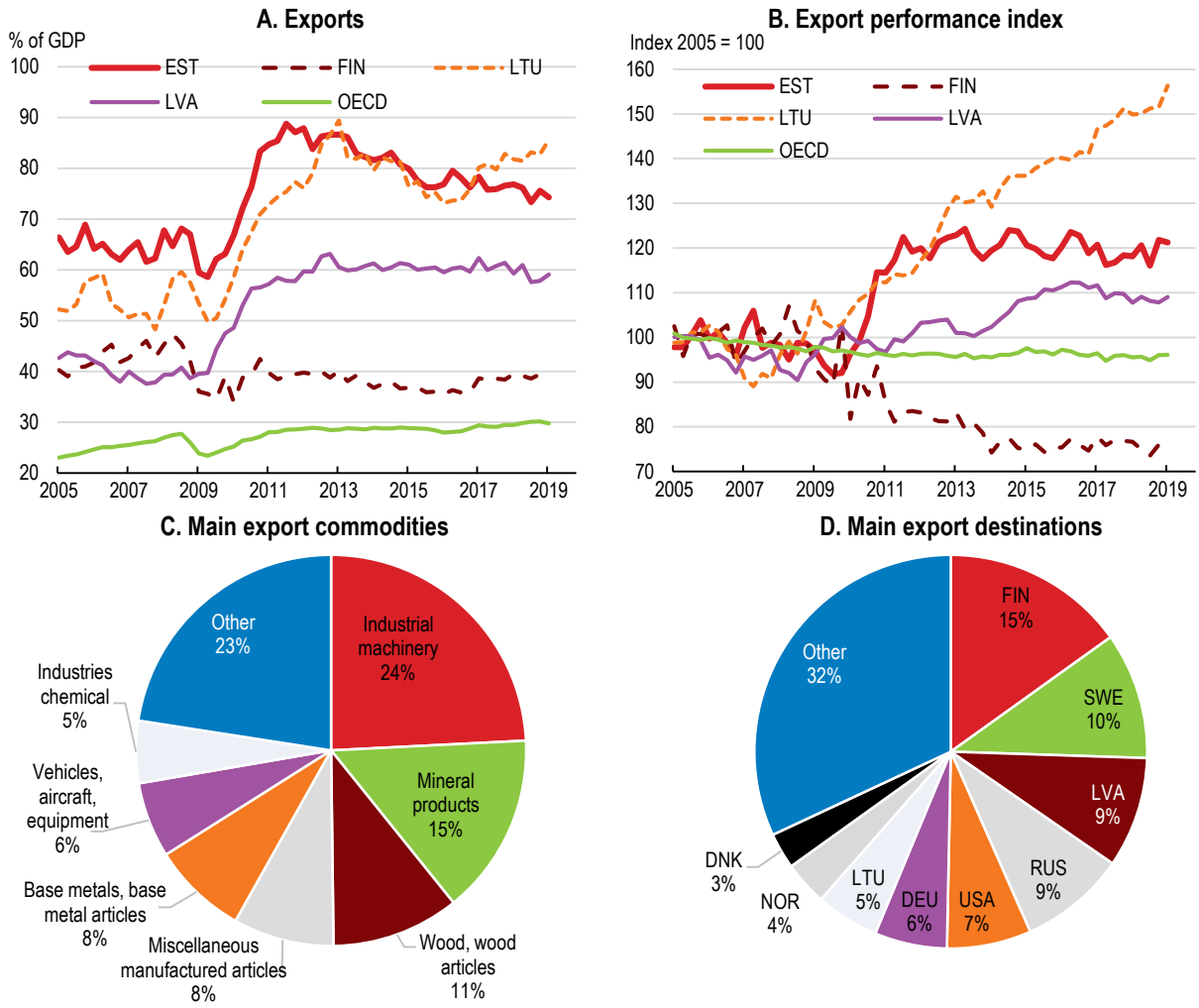


Source: OECD Economic Outlook database.

However, declining cost competitiveness has had limited impact on export performance so far. Exports received a boost, both as a share of domestic GDP (Figure 1.8.A) and as a share of total imports from Estonia's trading partners (Figure 1.8.B), when Estonia joined the Euro area in 2010. The non-traded sector has grown faster than the exporting sector since, resulting in a falling share of exports to GDP. Even so, export performance has been stable, despite higher unit labour cost and muted export price growth. Exporting companies stayed profitable by increasing volumes and improving non-cost competitiveness. Estonia has notably gained market share in exports of services of high quality, complexity and value, for which domestic price pressures can be passed on to the buyer. At the same time price pressures have led producers in traditional manufacturing, notably textiles, to outsource low value-added production and move up value chains to focus on higher value-added activities such as design and marketing (Eesti Pank, 2019b and c). Steady growth in domestic demand outpaced export performance, widening the trade deficit and narrowing the current account surplus to 1.7% of GDP in 2018 from 3.2% of GDP in 2017.

With a large share of exports in industrial machinery, Estonia is vulnerable to investment demand fluctuations in export destinations. Sizeable exports of mineral products are linked to re-exports of fuels imported from Russia (Figure 1.8.C). Estonia is also vulnerable to increasing trade barriers, and economic developments among main trading partners in the Nordics, fellow Baltics, Russia and the United States (Figure 1.8.D). Direct exposure to Brexit is limited, as exports to the United Kingdom only accounts for 2.2% of total exports, and imports from the United Kingdom account for 2.7% of total imports. Shocks that could affect Estonia's economic performance are listed in Table 1.2.

Figure 1.8. Exports are holding up



Source: OECD Analytical database ; and Statistics Estonia.

Table 1.2. Vulnerabilities that could lead to major changes in the outlook

Vulnerability	Possible outcome
Global or regional crisis contagion	The two largest Estonian banks are either subsidiaries of- or owned by large Nordic banking groups. Even though parent funding of Estonian subsidiaries is limited, a Nordic credit squeeze would impact their liquidity situation and there would be spill-over effects from lower export demand from the Nordics.
Escalating global trade tensions	As a small, open economy, Estonia is exposed to weaknesses in world trade, notably against the backdrop of falling cost competitiveness.
Geopolitical tensions	Geopolitical tensions, notably in eastern parts of Europe, could hamper trade and investment.
Rising prices on carbon emissions	The oil-shale industry produces energy and mineral products at a relatively high cost and with high carbon emissions. Unexpected sharp rises in emission prices may make activities in the sector unviable.

Public finances are in good shape

The state of Estonia's public finances is among the most enviable in the OECD. Thanks to fiscal prudence stemming from a fiscal rule requiring the budget to remain balanced in structural terms, it has very low debt

and large parts of spending are directed to infrastructure investment, which supports long-term growth. The country's tax structure is also relatively growth-friendly and it has adopted best public finance management practices. Going forward, spending pressures on long-term needs are increasing. Estonia's population is ageing and shrinking rapidly, the average pension benefit ratio is relatively low and set to slide further without reforms, aggravating the problem of old-age poverty. Health insurance coverage is not complete and out-of-pocket payments are high. Unmet healthcare needs are also sizeable. Spending on research, innovation and education also needs to rise. Furthermore, connectivity is to be improved to reap the benefits of economic integration. To meet those challenges, adjustments in the current institutional system could be considered. Low interest rates set by the European Central bank and low real rates due to mild inflation will be supportive of growth in Estonia.

Pro-cyclicality in fiscal policy should be avoided

The fiscal framework is designed to conduct neutral fiscal policy, but changes in the fiscal rule, statistical revisions or misjudgement of the economy's cyclical position can result in deviation from the neutral stance. The State Budget Act of 2014 aims to ensure that the deficit remains under tight control. The fiscal rule enshrined in the Act implies that the budget must be balanced in structural terms, though past surpluses can be used to finance deficits not exceeding 0.5% of GDP per year (Box 1.2). Notwithstanding the strong rules, the budget has been in deficit both in nominal and structural terms for four years (Figure 1.9). Fiscal expansion fuelled growth in 2018-19 as windfall revenues were spent instead of creating fiscal space to use in future downturns. This was possible thanks to changing the fiscal rule in 2017 to allow planning structural deficits to the extent of cumulative past surpluses and up to 0.5% of GDP per year. However, the structural fiscal deficit of 1.7% of GDP in 2018 was much larger than planned, which is related to the realisation of negative risks related to new tax measures and higher spending in some areas. Underestimation of the (positive) output gap can also result in larger-than-planned deficits. The draft 2020 budget envisages consolidation, reducing the structural deficit to 1.2%, 0.7% and 0.2% of GDP in 2019, 2020 and 2021, respectively, with the budget balancing in 2022 in structural terms and remaining balanced thereafter onto 2023. As the Fiscal Council pointed out, however, this pro-cyclical policy is in breach of the fiscal rule, which requires planning structural surpluses after reaching a budget balance to offset past deficits.

Box 1.2. The fiscal rule in Estonia

Estonia's fiscal rule is enshrined in the State Budget Act of 2014. It implies that the general government budget must be balanced in structural terms, though past surpluses can be used to finance deficits to the extent of the cumulative structural surplus, but not exceeding 0.5% of GDP per year (due to an amendment in 2017). Prior to the amendment, unforeseen deficits had to be offset by surpluses in the following years, while unforeseen surpluses could not be used for future deficits. In this sense, the 2017 amendment made the fiscal rule more symmetric.

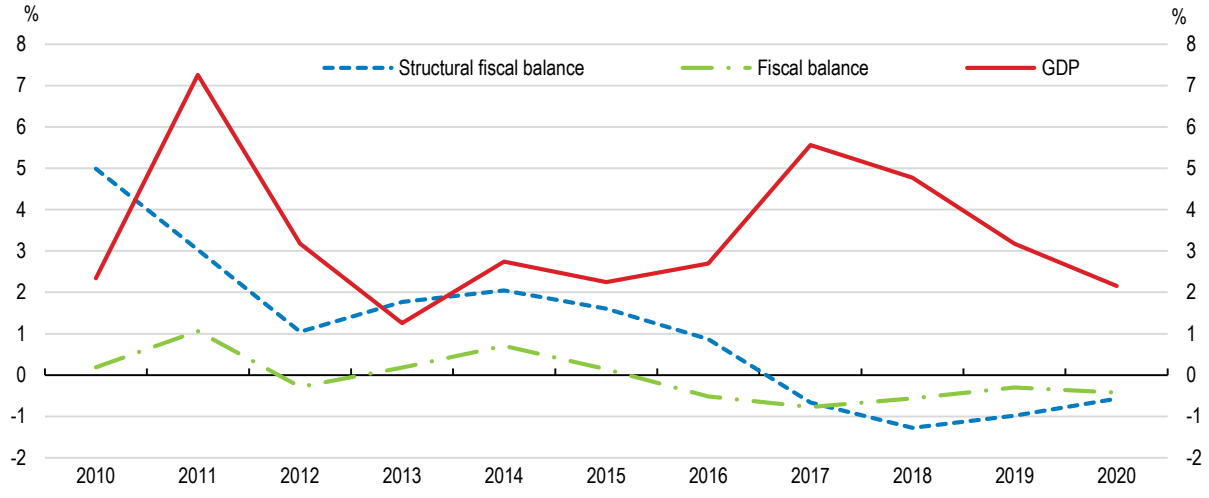
A compensation mechanism ensures that the general government budget returns to cumulated balance in structural terms following a greater-than allowed deficit. If there is structural deficit when the structural budget should have balanced (i.e. if there were no previously accumulated surpluses) or if the structural deficit exceeds what is allowed based on earlier surpluses (with a maximum of 0.5% of GDP), in the following years at least 0.5% of structural surplus needs to be planned per year until a surplus equivalent to the deficit is achieved.

The State Budget Act also includes and exemption clause. The implementation of the compensation mechanism measures may be postponed in case of extraordinary circumstances pursuant to the Stability and Growth Pact.

Source: State Budget Act available at https://www.riigiteataja.ee/en/eli/50804201911/consolide.

Figure 1.9. The fiscal balance has slipped into deficit

Government net lending as a percentage of GDP



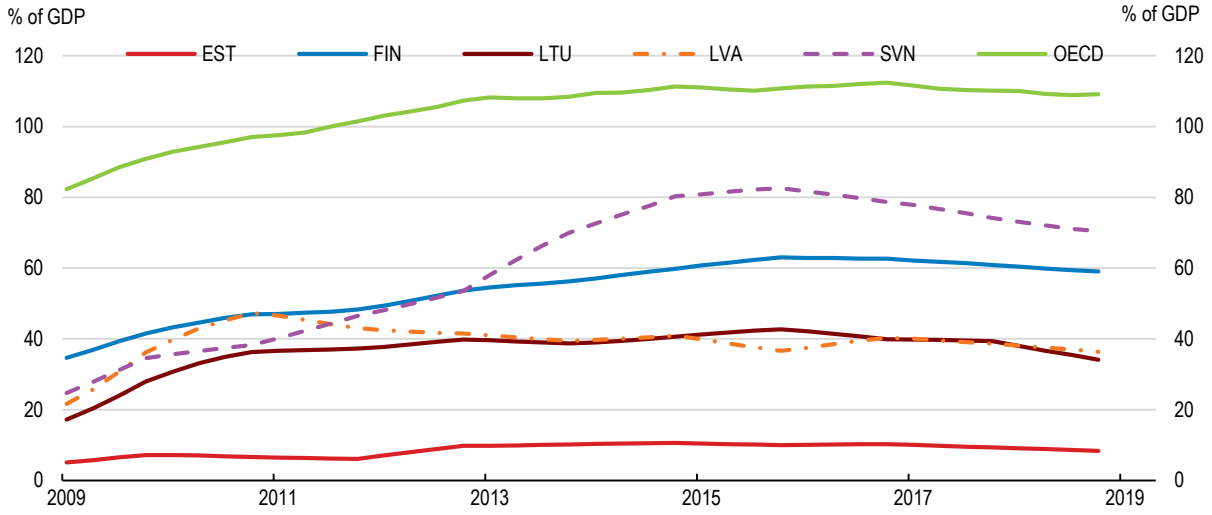
Note: The structural fiscal balance is expressed in per cent of potential GDP and GDP is real GDP growth.
Source: OECD Economic Outlook database.

In the current low-interest rate and high growth environment and amidst long-term spending needs on infrastructure, education and innovation, the fiscal rule appears restrictive. Thus, the government proposal to scrap the requirement to accumulate surpluses equivalent to the cumulative deficit prior to reaching a balanced budget may appear reasonable. However, too frequent changes to the fiscal rule make it less credible. Enshrining the rule in the constitution would help avoiding frequent changes, though it can also

prevent desirable changes to the rule. Fine-tuning the fiscal rule would likely not work, as Estonia's potential output is surrounded by one of the highest levels of uncertainty in the European Union and is subject to frequent revisions. A combination of the balanced budget rule with an expenditure rule could make sure that extra revenues in good times are not spent right away in case the positive output gap is underestimated. At present, Estonia's public debt record is enviable: the country is not saddled with debt as many OECD members; in fact, its public debt-to-GDP ratio was the lowest in OECD at around 8% in 2018 (Figure 1.10).

Figure 1.10. General government debt is very low

General government debt as a percentage of GDP



Note: Using the general government debt Maastricht criterion, with the exception of the OECD average.
Source: OECD Economic Outlook database.

Estonia was a frontrunner in institutional reform of the fiscal management system (OECD, 2019a). The State Budget Strategy presents projections and targets for the main aggregates of government finances and serves as a guide for annual budgets. It also states spending priorities and plans to fund them. The Fiscal Council, attached to the central bank, assesses the government's forecast, medium-term budget strategy and achievement of the structural budget balance objective. However, medium and long term plans, both overarching and sectoral ones, are not linked to the State Budget Strategy. Clearer links of objectives and funding would increase credibility and feasibility of such plans and would also make spending more efficient.

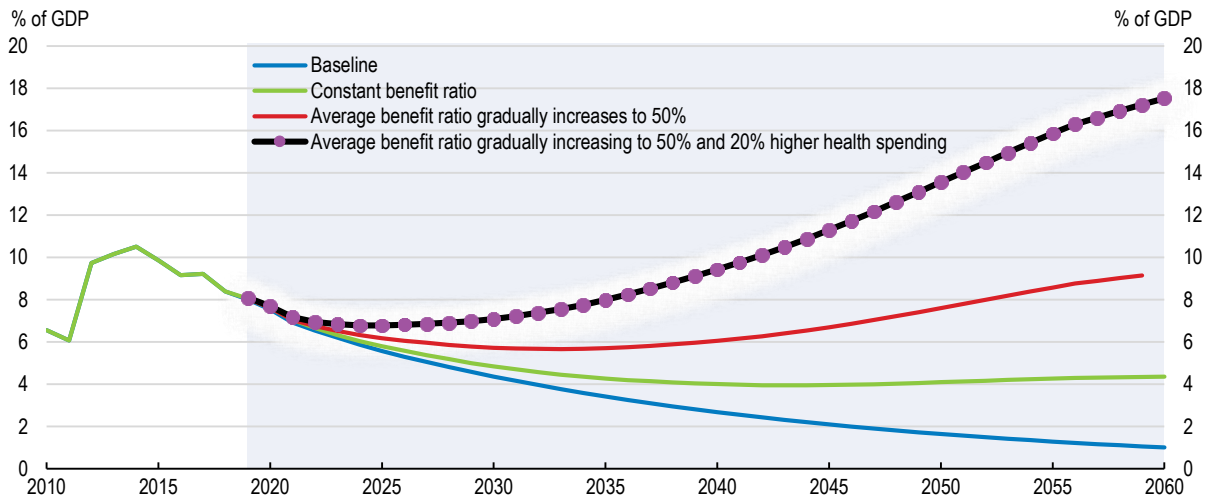
The launching of the review of spending and the budget process in late 2019 will make spending more efficient. From the 2020 budget onwards, quality, volume and price goals will be introduced for programmes and state agencies and performance-based budgeting will be adopted. Efficiency savings could be channelled to finance long-term spending needs.

With such favourable debt and future deficits under control, debt sustainability is not as big an issue in Estonia (Figure 1.11) as in most other countries. With the current pension indexation (Box 1.3), pension-related spending pressures are mild as current average benefit ratios (the ratio of average pension benefits to average wages) in the public pension system are low and are projected to decline *ceteris paribus*. Assuming current wage and CPI inflation and unchanged pension indexation rules, the average benefit ratio could decline by about ten percentage points by 2060. Lower ratios, however, are not socially sustainable. Keeping the average benefit ratio stable or, as incomes converge to more advanced OECD countries, allowing it also to converge to ratios in those countries would imply additional spending. Ageing costs will also weigh on the health budget. While fiscal prudence is necessary to maintain macroeconomic

stability and sustainability, in the longer term amending the fiscal rule to allow for small deficits within the limits of EU rules could cover spending in areas necessary for long-term growth. These include social security, infrastructure, research and development, health and education, all necessary to revive the productivity engine and ensure inclusiveness.

Figure 1.11. Moderate deficits could be sustainable

Public debt path scenarios for general government debt, Maastricht definition, as a percentage of GDP



Note: The baseline scenario incorporates actual outcomes until 2018 and OECD projections until 2020. Thereafter, the draft budget plan targets are used until 2023, after which it is assumed that GDP converges to its long-term rate of 2.5% by 2060, interest rates to 3% and inflation to 2.5%. In the baseline scenario ageing (healthcare and pension) costs are included, but following the current pension indexation rule, the average benefit ratio, i.e. the ratio of the average pension to the average wage, decreases sharply and conforming the current budget balance rule, ageing-related spending does not create debt. The constant benefit ratio scenario assumes that the average benefit ratio stays at the current 35% and the balanced budget rule is relaxed to accommodate age-related spending. Another scenario assumes that the average benefit ratio gradually increases to 50% and a further scenario that in addition to that, health spending also increased by 20%.
Source: OECD Economic Outlook database and OECD calculations based on OECD long-term projections.

Savings should be kept in the second pillar of the pension fund but with higher returns

Current proposals to allow the withdrawing of funds from the second pillar (i.e. the mandatory private individual accounts) before the retirement age threaten long-term sustainability and would exacerbate old-age poverty, which is already high in Estonia. The intention behind the proposals is to allow more freedom in pension savings investment decisions, following a 5.5% real annual loss made on average by second pillar pension funds in 2018, on top of a slight loss in real terms a year earlier (and a 0.2% average loss over the preceding 15 years). OECD data confirm that Estonian pension funds returns were among the lowest in the entire OECD area over a 15-year horizon. The lack of sufficiently high financial literacy may prevent people from identifying better opportunities and many may choose to withdraw in light of the other alternative of uncertain future returns. According to opinion polls, roughly 25-30% of accumulated pension assets are expected to be withdrawn, equivalent to 5% of GDP. Small savers are more likely to withdraw and many plan to deposit the withdrawn funds in banks. Moreover, this move could exacerbate income inequalities, as less financially literate people are less likely to identify high-return investment opportunities.

Therefore, withdrawal should not be allowed before the retirement age, but instead pension funds should be better governed and supervised. Cost efficiency of pension funds is at the heart of pension adequacy and Estonia is not the only country with perceived high fees. A combination of lower fees, greater competition and less restrictions on pension funds' investments could make them profitable. Recent

adjustments point in this direction: maximum basic management fees are being lowered from 2% to 1.2% and performance-based fees are allowed if returns exceed the benchmark index. Furthermore, the 75% limit on equity-based investments has been abolished and the investment limit in derivatives increased from 10% to 50%, in unquoted securities from 30% to 50% and in a single property from 5% to 10%. Pension funds are now able to lend up to 10% of their assets. A good example of intense competition and an efficient pension fund market is that of Australia, where fees have come down sharply and funds invest also in real estate and infrastructure assets, which promise high returns.

People with second pillar savings between 50 and 700 times of the national pension are obliged to collect their benefits via insurance contracts, which are provided by three insurance companies whose cost structure is not fully transparent. Fees of the second pillar annuities are not regulated, but insurance companies are obliged to share at least 50% of their second pillar profits on an annual basis. Moreover, once the insurance contract is signed, savings are not inheritable, except when it is an annuity with a guaranteed period, an option chosen by 90% of pensioners. In contrast, before the insurance contract is signed or in the case of funds in the second pillar below or above the threshold of the mandatory insurance contract (i.e. below 50 times and above 700 times of the national pension) are inheritable. In addition to requiring insurance companies to disclose their fees and provide comprehensive information about future benefits and fees for those wishing to choose insurance contracts over direct payment from the pension fund, people should be allowed to get their benefits paid directly from pension funds.

In a rapidly ageing country like Estonia, the second pillar provides old-age security when the contributor-beneficiary ratio keeps decreasing. Maintaining such a mandatory pillar is even more important where voluntary savings do not appear to be very popular (less than a fifth of contributors choose to invest in the third pillar). If an insurance contract is chosen for voluntary savings, charges are not disclosed, therefore reducing the pillar's attractiveness in particular for people with higher financial literacy. Greater transparency about fees and other conditions would encourage more savings through this channel.

Box 1.3. The Estonian pension system

Estonia has a three-pillar pension system: a mandatory state pension as the first pillar, mandatory private accounts as the second pillar and voluntary savings accounts as the third pillar. The state pension is a pay-as-you-go system entirely financed from the social tax contributions of 20% or 16% of gross wages of current taxpayers (paid by the employer), respectively, depending on whether the person has joined the second pillar. Since 1999, pension benefits depend not only on the number of contribution years but also on the size of contributions.

The second pillar has been mandatory since 2002 for everyone born since 1983, older people were allowed to join this pillar up until 2010. Under this pillar, individuals contribute 2% of their gross wages, while an additional 4% comes from the 20% social tax paid by the employer. Individuals can make voluntary supplementary contributions to their retirement savings under the third pillar in the form of an insurance contract or a supplementary pension fund.

The retirement age will be 65 by 2026, thanks to annual increases in the retirement age by three months for every cohort. The replacement rate is 42% and many pensioners are at risk of poverty. In 2017, 47.5% of persons aged 65 and above were at risk of poverty.

Pensions are indexed annually to consumer prices (with a weight of 20%) and to the increase of the pension part of the social tax revenues (with a weight of 80%). The Pension Insurance Act requires the government to evaluate the impact of pension increases on financial and social sustainability, and propose changes to the indexation if necessary.

Pension payments from savings in the second pillar are made in three forms: (i) withdrawal as a lump sum upon retirement if the funds do not exceed 10 times the national pension rate (average monthly pension), (ii) regular payments from the pension fund if the funds are 10-50 times or above 700 times of the national pension rate and (iii) lifetime payments by insurance companies if funds are 50-700 times of the national pension rate. Currently savings can be transferred and split across pension funds.

Source: PensioniKeskus available at https://www.pensionikeskus.ee/en/estonian-pension-system/pension-system/.

The revenue and spending structures are relatively growth friendly

The tax burden is around 33% in 2019, slightly below the OECD average of 34.2% in 2018, and the tax structure is relatively growth friendly. Indirect taxes are the major source of government revenue at around 14% of GDP, while the combined share of personal and corporate income taxes are only slightly above the half of that (Table 1.3). Personal income taxes have a low degree of progressivity (due to the flat-rate personal income tax). Most assets and savings are taxed at a flat rate and as in other countries. Private pension savings are tax-favoured.

The tax system could be even more inclusive and environment- and growth-friendly if it relied more on tax types that are less harmful to growth such as property taxes or taxes correcting for externalities and less on labour and consumption taxes. Property taxes could reduce inequalities as most of household wealth is held in the form of real estate. As the 2017 Survey pointed out, there is ample room to increase taxes on immovable property, in particular by extending the tax base to residential property and using market values for the tax base. The tax should be designed in a way so that it does not constitute too much of a burden for less wealthy households. This could be done by introducing a threshold, below which property is taxed at a very low rate. The current government is considering taxing agricultural and forest land if in economic use, which would also be growth friendly. Environmental taxes are already above the OECD average, but could be an even more important source of revenue, given high pollution in international

comparison (discussed later on in this chapter). Real estate and environmental taxes could provide a relatively stable source of revenues in the longer term (Box 5) and would allow for a reduction in labour and consumption taxes.

Table 1.3. Fiscal indicators appear healthy

Percentage of GDP

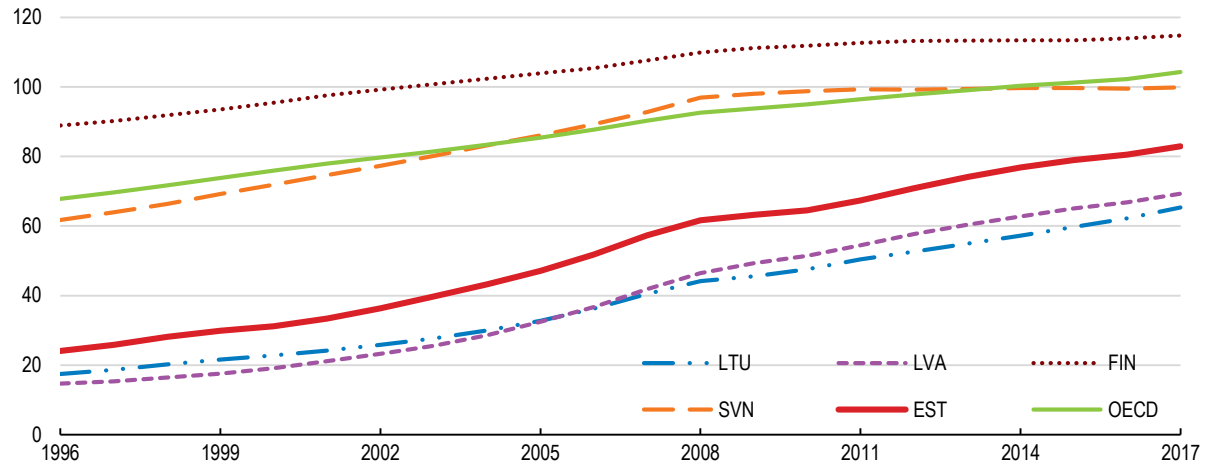
	2015	2016	2017	2018	OECD 2018
Total disbursements	39.3	39.5	39.4	39.1	41.9
Government final consumption expenditure, GDP expenditure approach	20	20.4	19.9	19.6	19.2
Social security benefiits	11.3	11.6	11.3	11.4	12.4
Current disbursements	36.6	37.4	36.2	36.3	40.1
Capital Transfers paid and other capital payments	0.7	0.6	0.5	0.5	0.9
Government fixed capital formation, appropriation account	5.2	4.7	5.7	5.3	3.5
Net capital outlays of the government	1.5	1.7	2.3	1.8	1.1
Gross government interest payments	0.1	0	0	0	1.6
Total receipts	39.4	39	38.6	38.6	41.7
Direct taxes on households	5.8	6	5.8	5.4	9.2
Direct taxes on business	1.9	1.5	1.4	2	3.4
Social security contribution received	11.3	11.5	11.4	11.7	10
Taxes on production and imports	14.1	14.7	14.1	13.7	12.8
Property income received by government	1.1	0.8	0.9	0.6	1.6
Current receipts	38.3	38.5	37.7	37.5	41
Capital tax and transfers receipts	1.1	0.4	0.9	1	0.7
Government net lending	0.1	-0.5	-0.8	-0.6	-2.9
Government primary balance, as a percentage of GDP	0.1	-0.6	-0.8	-0.6	-1.1
Cyclically adjusted government net lending, as a percentage of potential GDP	1.6	0.9	-0.7	-1.3	-2.7
Cyclically adjusted government primary balance, as a percentage of potential GDP	1.6	0.8	-0.7	-1.3	-0.9
Underlying government net lending	2.1	1.1	-0.3	-1.2	-2.6
Underlying government primary balance	2	1.1	-0.3	-1.2	-0.9
Gross public debt, Maastricht criterion (EU countries only)	10	10.2	9.3	8.4	67.5
Tax-to-GDP	33.3	33.7	33	33.3	34.2

Source: OECD Economic Outlook database.

Investment growth has been robust, resulting in a quadrupling of the per capita capital stock in just two decades. The capital stock, however, is still somewhat below the OECD average (Figure 1.12). Notwithstanding the large number of infrastructure projects undertaken in recent years, the length of highways is relatively low and that of railways is not high, either. Going forward, infrastructure investment may need to be financed from alternative sources in case of decreasing EU funding. Currently public-private partnerships are considered, which can potentially be a way of enhancing efficiency and involving private providers in infrastructure, but a solid legal framework is needed and its use to hide government debt should be avoided (Box 1.4). Contingent liabilities including those related to PPPs should at the minimum be disclosed (even if not recognised as liabilities) in notes to financial statements as in Australia or New Zealand or in a separate report as in Chile. In general, investment projects should be subject to rigorous cost-benefit analysis *ex ante* and should only go ahead if there are clear net benefits.

Figure 1.12. The capital stock has quadrupled in two decades, but is lower than the OECD average

Real capital stock per capita (at 2015 PPP, thousands USD)



Source: OECD Economic Outlook database.

Box 1.4. PPPs for better infrastructure outcomes

Public-private partnerships' potential to enhance efficiency of infrastructure investments through greater competition and innovation and to reduce public spending is appealing to many countries. PPPs, however, are not without risks, which should be mitigated by an effective framework with a proper classification and accounting system and a clear risk sharing scheme, among other ingredients. The World Bank and the OECD published a joint checklist for PPPs in 2015 for the G20 Investment and Infrastructure Working Group. The Global Infrastructure Hub, brought into life by G20 economies, advocates sustainable infrastructure and engages in a range of activities such as promoting best practices in preparation of projects and creating an enabling environment for infrastructure investment.

Australia, hosting the headquarter of the Global Infrastructure Hub, is a frontrunner in implementing PPPs. Its national guidelines for infrastructure delivery include PPPs. Those guidelines aim at enhancing efficiency, reducing procurement costs and removing disincentives to participation in infrastructure investment. They define PPPs as a long-term contract where the government pays the private sector to deliver infrastructure and related services that would otherwise be undertaken by the government. PPPs typically make the private sector parties responsible for the condition and performance of the infrastructure they built on a whole-of-life basis. The value-for-money principle is at the heart of PPP projects and it can be ensured by allocating risks to whoever can manage it best. The public sector comparator is the financial benchmark in the quantitative assessment of value for money at the earlier stage of the process. Australia discloses contingent liabilities including to PPPs in notes to financial statements available online.

Source: Australian Government: National Guidelines for Infrastructure Project Delivery, available at https://www.infrastructure.gov.au/infrastructure/ngpd/index.aspx#anc_public-private.

Public investment has been robust, but the public capital stock is relatively low (Roehler et al. 2019). Local governments carry out about a quarter of public investment, funded by capital grants from the EU and national schemes. The approval of projects is not linked to the budget calendar and local budgets are not subject to central approval, instead the central government uses earmarked grants to guide priorities.

Moreover, the National Audit Office only audits the central government budgets, while local budgets are dealt with by private auditors and are not subject to performance audits. Consistent standards for project approval, ex post evaluation and auditing procedures across government levels would improve overall efficiency of public investment. As many infrastructure projects are likely to have large spill-over effects on neighbouring regions, such effects should be taken into consideration when approving such projects. To avoid foregoing infrastructure projects with large positive externalities such as building roads and other transport infrastructure from cities to its surrounding areas, greater coordination across regions (for instance in the form of joint project applications) and greater central involvement would be more effective.

Box 1.5. Quantifying the fiscal impact of selected reforms

The table below (Table 4) quantifies the fiscal impact of selected recommendations in the Survey. The estimates are the direct impacts of the respective fiscal measures and are based on the latest publicly available data. They are based on costs in other countries and hence serve only an illustrative purpose.

Some of the measures are one-off expenditures, others involve continuous disbursement of public funds. Rollout of fast broadband is a one-off measure, which could possibly be carried out over multiple years. Here it is assumed that it takes two years, and the table shows the proportionate spending for a single year. Similarly, offering government services through mobile applications could also be introduced over a longer time than one year, as assumed in the below table. A potential measure to improve health outcomes is free screening for diseases with increasing mortality rates. Offering free blood test to all above 50 and colonoscopy to patients at risk with the objective of prevention and early stage detection of colon cancer could also be phased in over several years. All these items involve recurring costs, which are significantly lower than the below initial costs. In contrast, environmental taxes and real estate taxes on the ownership of residential real estate would bring about continuous revenues.

It is assumed that the below spending measures could to a large extent be financed from efficiency savings stemming from the planned expenditure review.

Table 1.4. Estimated fiscal impact of selected recommended reforms

Reform measure	Impact on the fiscal balance, % of GDP
Deficit-increasing measures	
Fast internet broadband rollout to rural areas[1]	1.9
Mobile app for the 400 most important government services[2]	0.16
Free blood test for all above 50 and free colonoscopy for residents at risk[3]	0.09
Increase active labour market spending to the level of the OECD upper half	0.5
A combination of spending efficiency measures to offset the above spending increases	-2.65
Total	0
Deficit-reducing measures	
Introduce a recurrent tax on owning real estate[4]	1
Raise environmental taxes[5]	1.3
A combination of labour and consumption tax cuts to keep the above tax measures budget neutral	-2.3
Total	0

1. Assuming that rollout costs are proportionate with the size of the area and based on EUR 14 billion estimated costs for rural area coverage.
2. Assuming EUR 100 000 cost per app with high security, one off, maintenance not included.
3. Assuming EUR 500 cost per examination, 516 761 people aged 50 and above and 10% at risk.
4. Assuming that real-estate related taxes will be in the same magnitude (as a ratio to GDP) as in other OECD countries.
5. Assuming that environmental taxes will increase from the current 2.7% of GDP to Denmark's level of 4%.

Source: OECD calculations.

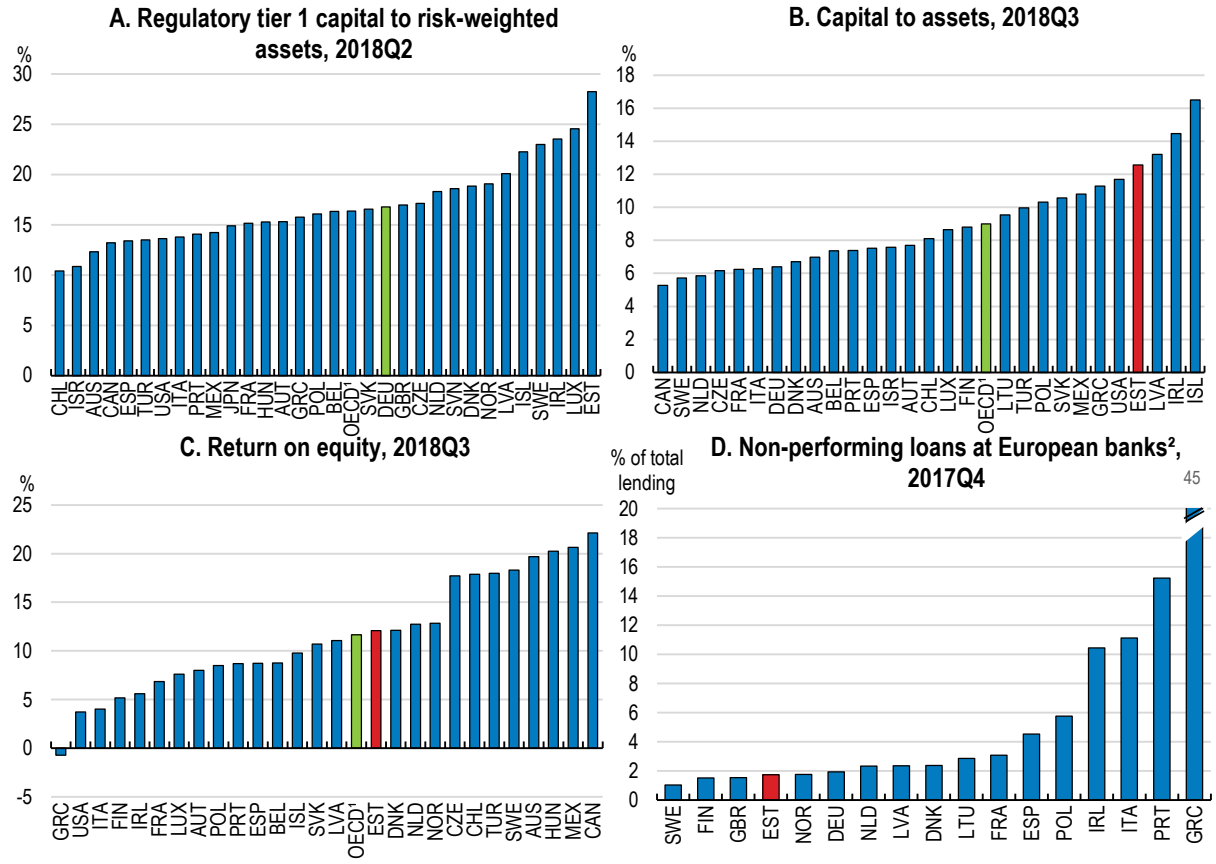
Table 1.5. Past OECD recommendations to improve fiscal policy

Main recommendations from the 2017 Survey	Actions taken since the 2017 Survey
Increase spending on measures that boost growth potential and welfare. Consider allowing a small deficit in the government budget rule in the longer term.	Large infrastructure projects continue. In addition, spending in areas such as education and health have been prioritised. As a result, the deficit was authorised to increase 0.5%.
Extend the tax base for the tax on immovable property to residential property.	No action taken.

The banking sector is well capitalised

The two largest lenders in Estonia, SEB and Swedbank, are branches of Nordic banking groups. Luminor, Estonia's third-biggest lender, springs out from a joint venture of two Nordic banking groups, although the investment fund Blackstone gained majority ownership in 2019. The Estonian banking system appears to be well capitalised, with the highest risk-weighted capital ratio in the OECD and one of the highest capital-to-asset ratios. Estonian banks are profitable and have a low share of non-performing loans (Figure 1.13). Luminor recently merged and converted into branches its Latvian and Lithuanian subsidiaries, with the head office in Estonia. This increased the total assets of the Estonian banking sector by some 40% and created some new risks by increasing exposure to economic developments in Latvia and Lithuania. Micro- and macroprudential supervisory authority falls to Estonia, as does responsibility for liquidity assistance. A large share of Luminor's funding is for the moment coming from its Nordic parent banks, contrary to SEB and Swedbank, that are largely financed by deposits. The reorganisation therefore increases Estonia's exposure to the interconnected Nordic financial market (Eesti Pank, 2019c). Continuing strong cooperation between financial regulators in the region is key to address risks efficiently and maintain a high level of crisis preparedness.

Figure 1.13. The banking sector appears solid



Note: 1. OECD averages exclude countries not shown in the figure. 2. Non-performing loans are defined as loans in which the borrower has paid neither interest nor amortisations in the last 90 days.
Source: BIS; IMF Financial Soundness Indicators database.

A large share of the loan portfolios of the banks operating in Estonia is composed of loans to real estate and construction companies, but there seem to be no immediate financial stability concerns. Housing is affordable. Housing prices grew 5.7% year-on-year in the second quarter of 2019, but wage growth has been strong for some time, and the average price-to-income ratio has been stable for a decade. Likewise, the price-to-rent ratio and household liabilities remain stable after having fallen back in the aftermath of the financial crisis. A broader index suggests that housing affordability has been fairly stable following the price correction in 2008 and 2009. The number of housing transactions and new permits are both slowing, and labour shortages in the sector are easing (Swedbank, 2019).

The favourable economic environment has over time allowed those banks using internal risk models to assess mortgages to reduce their capital requirements, and Eesti Pank therefore introduced a 15% minimum risk weight for mortgages in September 2019 as a precaution to prevent financial stability risks from reduced capital buffers in the future. Minimum risk weights are a useful back-stop to prevent tail-end risks to the Estonian financial system, and complement the current macro-prudential arsenal which includes a maximum loan-to-value ratio of 85%, a debt-service-to-income limit of 50% and a maximum loan maturity of 30 years. As internal risk weights have fallen, Swedbank and SEB, those banks use internal risk models, have gained market share and now control 75% of the mortgage market. Minimum risk weights could contribute to level competition between banks as a useful side-effect to increased financial resilience.

The money laundering scandal involving amongst others Danske Bank's Estonian branch over the period 2007-2015 has had some, but relatively limited, adverse impacts on the Estonian financial system. Funding costs for Nordic parent banks have at times faced slightly elevated spreads, but loans from Nordic banking groups made up less than a fifth of the liabilities of the banks operating in Estonia at the end of 2018, as their Estonian subsidiaries are largely funded by domestic deposits. The Financial Supervisory Authority (FSA) closed down the operations of Versobank and Danske Bank's Estonian Branch following long-term breaches of the anti-money laundering rules (Eesti Pank, 2019c). This temporarily reduced competition in financial services, but the situation is set to normalise going forward, when Estonian financial group LHV finalises the take-over of Danske's portfolio, and Luminor, the third-biggest lender, finalises current re-organisations.

Shortcomings revealed by the money-laundering scandal are being addressed, but a tightened legal framework was delayed by the Riigikogu (parliament). The Council of Europe pointed in 2014 to deficiencies in the legal framework for monitoring complex, unusual large transactions and transactions with persons from or in countries that do not or insufficiently apply the FATF recommendations (Moneyval, 2014). An anti-money laundering commission led the government to propose several amendments to the law in November 2018. The Riigikogu postponed the passing of the law until after the March 2019 elections, notably on the issue of turning the burden of evidence around so that assets can be frozen if owners cannot prove their legal origin. Consequently, a new proposal is being prepared by the government. While waiting for a strengthened legal framework, the FSA has strengthened their supervisory activities, and are cooperating with the financial sector to implement necessary checks and balances. Systems to prevent money laundering seem to function well today, but a timely strengthening of the legal framework, including fines set at a deterring level and the option to freeze suspect assets temporarily should remain a key priority for the Government.

Table 1.6. Past OECD recommendations on financial stability

Main recommendations from the 2017 Survey	Actions taken since the 2017 Survey
To foster competition in the financial sector, create a centralised credit bureau that will collect both positive and negative information on creditors.	No action taken.

Nine wellbeing challenges for the coming decade

The government of Estonia engaged in a large-scale public consultation process to define nine major development needs for the next decade and a half in the context of formulating the "Estonia 2035" strategy. The public had a chance to vote for the policy areas they consider most important and were asked to rank them according to their own priorities. This way, the nine development needs were identified: (i) demographic challenges, (ii) smart business growth, (iii) infrastructure, (iv) social inequalities, (v) health, (vi) life-long learning, (vii) green environment, (viii) security and (ix) governance. The indicators with a social focus have a considerable overlap with the OECD Wellbeing indicators. Reforms in those areas could bring about significant gains in per capita GDP, in particular in the longer term. The impacts of selected proposed reforms in this Survey are quantified in Box 1.6.

Medium and long-term planning documents are common in Estonia and aim at communicating government goals and bringing in the whole population. Estonia 2035 provides a somewhat longer-term vision. Those documents can also create national unity to work toward a shared goal and enhance transparency and accountability. For such documents, however, to have a significant impact, a better link to the funding is needed. Currently, such links are being discussed. Also, greater consistency across the documents would make priority setting and policy formulation easier. Currently there are 47 sectoral strategies (to be cut down to 20 during the next planning cycle) in addition to the national-level documents. Streamlining them and linking their major objectives to funding would make them effective tools for creating the conditions for

long-term sustainable and inclusive development. Among others, Singapore and Malaysia, with long histories of economic planning, have relatively consistent sets of planning documents.

Box 1.6. Quantifying selected structural reforms

The table below (Table 1.7) quantifies selected structural reforms proposed in the Survey. Most of the estimates are based on empirical modelling of the relationship between the reform measure and total factor productivity, capital deepening and the employment rate.

The sample of countries includes OECD members (Égert, 2018). Where possible, the table uses the time or "within" estimate to assess the impact of the change over time.

Table 1.7. Estimated impact of structural reform on per capita GDP

Impact on average per capita GDP

	Immediate effect	10-year effect	Long-term effect
Reform measure			
Increase active labour market spending to the average of the upper half of OECD	0.283%	1.046%	5.440%
Reduction of government shares to below 50% in the largest firm			
Electricity generation	-0.002%	0.016%	0.056%
Electricity sector (generation, import, transmission, distribution and supply)	0.010%	0.033%	0.080%
Courier	0.003%	0.010%	0.026%
All postal services (courier, letter and basic parcel)	0.010%	0.033%	0.080%
Air transport	0.009%	0.030%	0.072%
Rail freight	0.003%	0.009%	0.022%
Rail freight & infrastructure	0.007%	0.024%	0.058%
All the above related to reduction of government share	0.036%	0.118%	0.286%
Boosting digital skill use in the private sector by 10 percentage points	0.109%	1.09%	2.18%
Assess alternative policy instruments before adopting new regulation	0.019%	0.063%	0.152%
Also guidance on alternative instruments	0.039%	0.125%	0.304%

Note: State shares of the largest firm in the sector make up 97.3% in air transport and 100% in the other sectors listed in this table.
Source: OECD calculations based on Égert (2018).

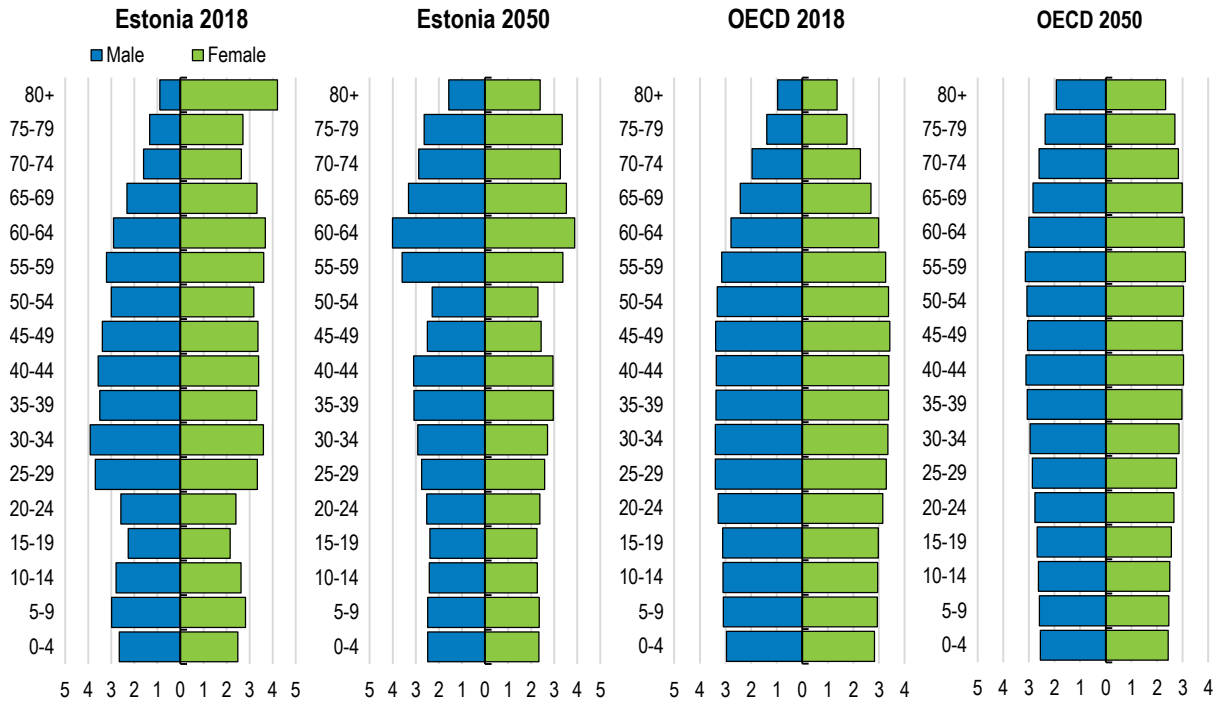
The demographic clock is ticking

Successfully adjusting to demographic challenges is identified as one of the major development needs owing to the extent and the speed of population ageing. Estonia's population has been falling for decades, partly due to low fertility rates, partly due to emigration. By 2050, the population pyramid will be even slimmer (Figure 1.14). The top will be thicker for some age groups than it is now and the bottom will be thinner than in an average OECD country, reflecting the ageing of baby boomers who are in their 20-30s now. Although the gender imbalance will still be stark in older age groups, especially in comparison with the OECD average, it will be smaller than it is now as men live longer. In the future, emigration will play a less important role in shaping population dynamics than it did in the past. Natural decrease will continue as fertility rates are below the replacement rate. Natural shrinking of the population will only partially be made up by migration, given the current quota system allowing somewhat over 1000 newcomers a year. Thus, the population fall will still imply rapid ageing. During the span of the National Development Plan (till

2035), the median Estonian resident will grow about five years older; though will be still younger than in several OECD members.

Figure 1.14. The population pyramid will become slimmer, reflecting rapid ageing

% of total population



Note: Momentum variant (instant-replacement-fertility, constant-mortality and zero-migration).
Source: United Nations World Population Prospects 2019 database.

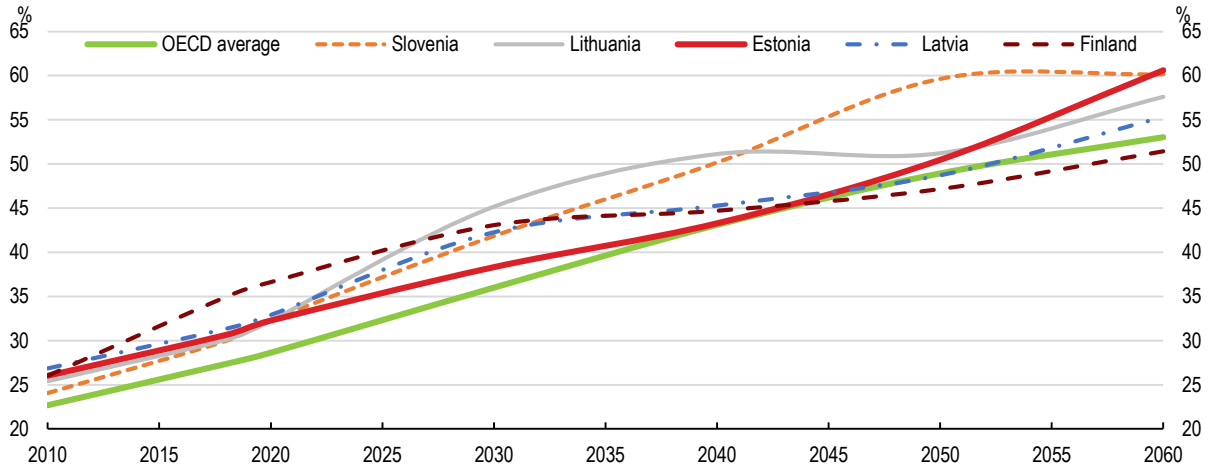
The old-age dependency ratio (the ratio of the population aged 65 and above to those aged 15-64) at around 31% in 2018 was higher than the OECD average (at slightly above 27%), lower than in many advanced economies such as Finland, but on par with other transition economies such as Latvia and Slovenia (Figure 1.15). It is, however, projected to sharply increase in the coming decades. The population is already shrinking, but the ageing of the baby-boomers who are now in their 20-30s will exacerbate the burden on both public finances and the society. The number of returning emigrants, who left for other countries to work in the past, is increasing as they are attracted by higher wages and wellbeing. This trend alone, even though expected to continue, will not solve the ageing problem. Relaxing restrictions on immigration from non-EU countries, in particular on temporary workers and on people with skills in high need in Estonia could be the way forward.

Investments, both in physical capital and in the areas of social security, healthcare and old-age care need to be made in time to prepare for the challenges of rapid population ageing. This could be areas to channel additional spending to. Demand for old-age care could be a driver of digitalisation and innovation. As in Japan, parts of health and old-age care services could be automated. Artificial intelligence would similarly help serving the greying society by analysing risk profiles and identifying solutions for daily challenges. The current focus of the government is on easing the burden of caretakers. Since July 2018, caretakers can get an extra five-day leave, new places have been created in care homes for the elderly with dementia and a Competence Centre for Dementia has been set up. Material compensation for caretaking could also be considered as relatives are proved to be able to provide a more secure and supportive environment. Several OECD countries provide compensation for informal caretaking by family members, in England, for

instance, the family decides how much caretaking it can provide, which is compensated, and the remaining needs are met by professional caretaking services. Furthermore, the system of professional caretakers in Estonia should be further developed, as such systems are able to cater to needs more effectively. This would not hinder labour force participation of family members, who tend to be women. Japan has a comprehensive system of professional home care.

Figure 1.15. The old-age dependency ratio is sharply increasing

Ratio of population aged 65 and above to the working-age population aged 15-64

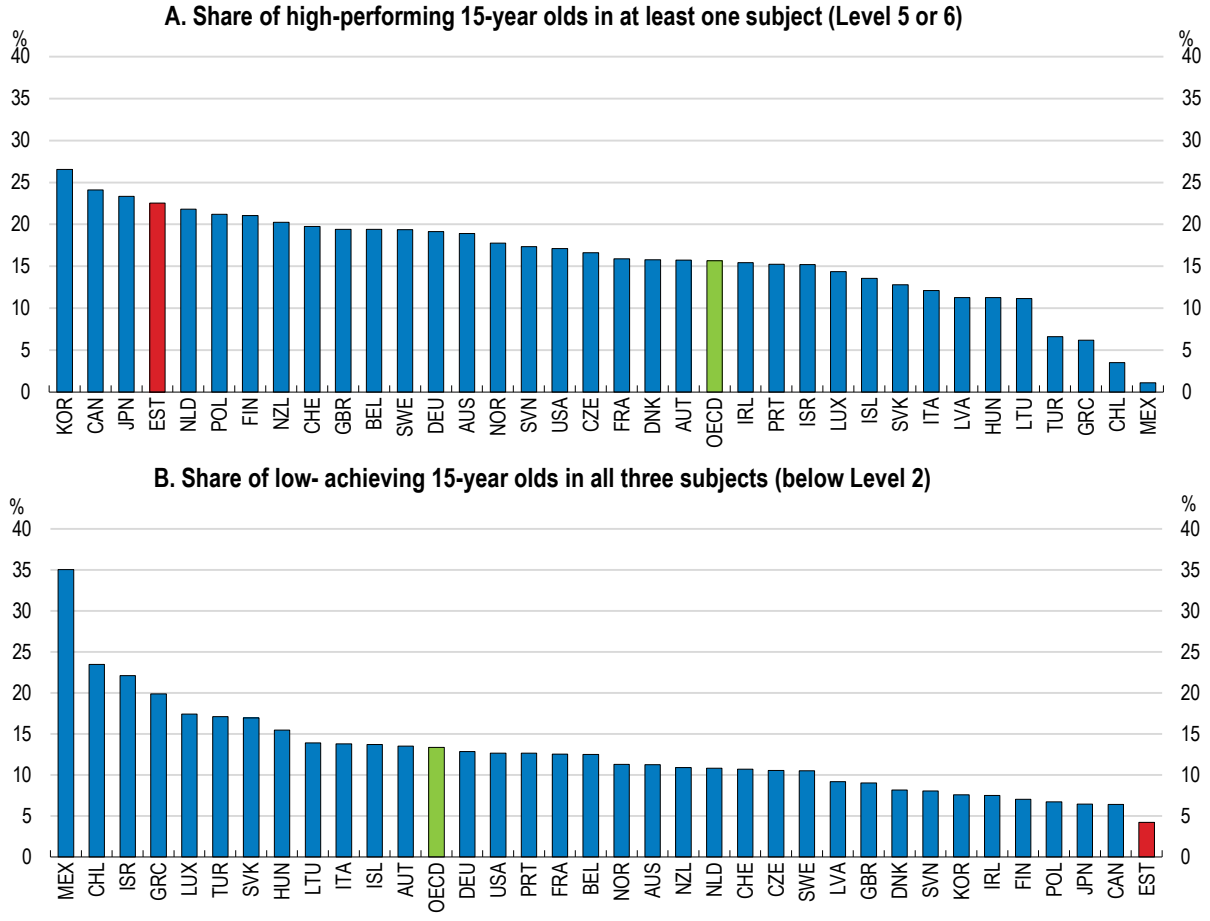


Note: Medium fertility variant (instant-replacement-fertility, constant-mortality and zero-migration).
Source: United Nations World Population Prospects 2019 database.

Flexible life-long learning should be based on people's needs

Educational attainment and skills are high in Estonia. Estonian 15-year-olds are among the top performers in the OECD's Programme for International Student Assessment (PISA), finishing first of OECD countries in reading and science and third in Mathematics in the 2018 PISA Survey. Furthermore, the country has a high share of high performers and the lowest share of low performers in the OECD (Figure 1.16). Adult skills are well above the PIAAC average in both literacy and numeracy. Education and skills serve as a foundation to obtain new skills, and enable individuals to perform more diverse and complex digital tasks, necessary to thrive in increasingly digital-intensive workplaces and adapt to changing skills requirements (OECD, 2019c; OECD, 2019e).

Figure 1.16. Basic skills are high

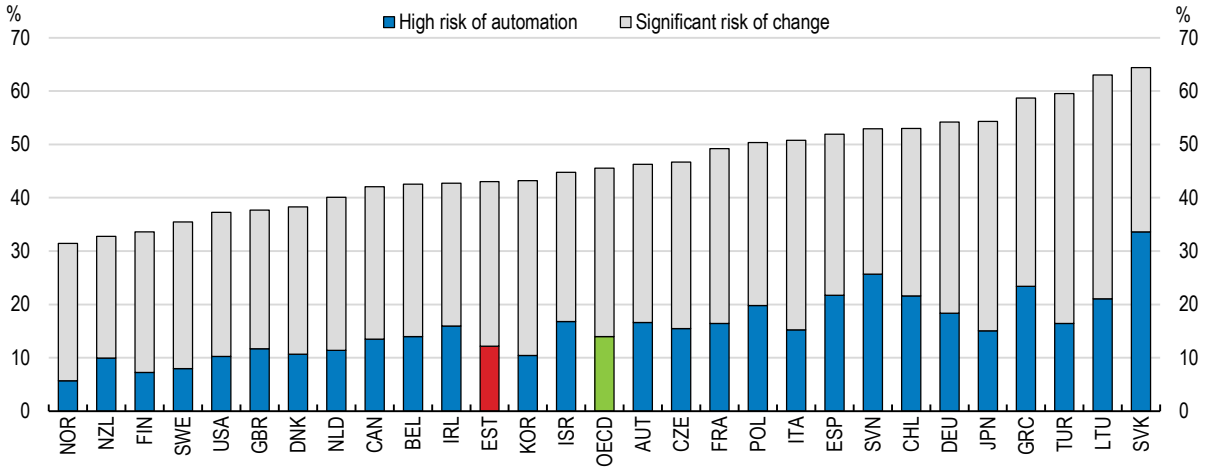


Note: The three PISA subjects are reading, mathematics and science.
Source: OECD, PISA 2018 Database.

Indeed, the digital transformation implies vast shifts in skill demand (Grundke et al., 2018; OECD, 2019a). Certain jobs will change significantly and some jobs may disappear altogether, notably those involving tasks that are easy to substitute with digital technologies. Nedelkoska and Quintini (2018) assess that 14% of jobs in OECD countries are highly automatable, and that another 32% may undergo significant changes due to automation. Estonia is not shielded against these developments, with 12% of jobs highly automatable, and an additional 31% at risk of significant change (Figure 1.17). Ensuring high and up-to-date skills, notably management skills and practices, specialist ICT skills and digital user skills is central to seize the potential to automate and boost productivity. As an illustration, firms with a 10% higher share of employees using computers for work purposes see 1.5% higher productivity growth than the average firm. Furhtermore, spill-over effects, notably in manufacturing, boosts the productivity of other firms in the sector (Pareliussen and Mosiashvili, 2019; Chapter 1 of this Survey).

Figure 1.17. Almost half of Estonian jobs are at risk of automation or significant change

Share of jobs which are at a high risk of automation or a risk of significant change (%)



Note: Jobs are at high risk of automation if the likelihood of their job being automated is at least 70%. Jobs at risk of significant change are those with the likelihood of their job being automated estimated at between 50 and 70%. Data for Belgium correspond to Flanders and data for the United Kingdom to England and Northern Ireland.
Source: OECD Employment Outlook 2019.

Digital user skills could improve

Digital user skills are central to reaping this productivity potential, and they become increasingly important to participate in the labour market and social life. However, a quarter of Estonian adults lacked basic computer skills at the time of the PIAAC survey, a share three times higher than in top performing countries.

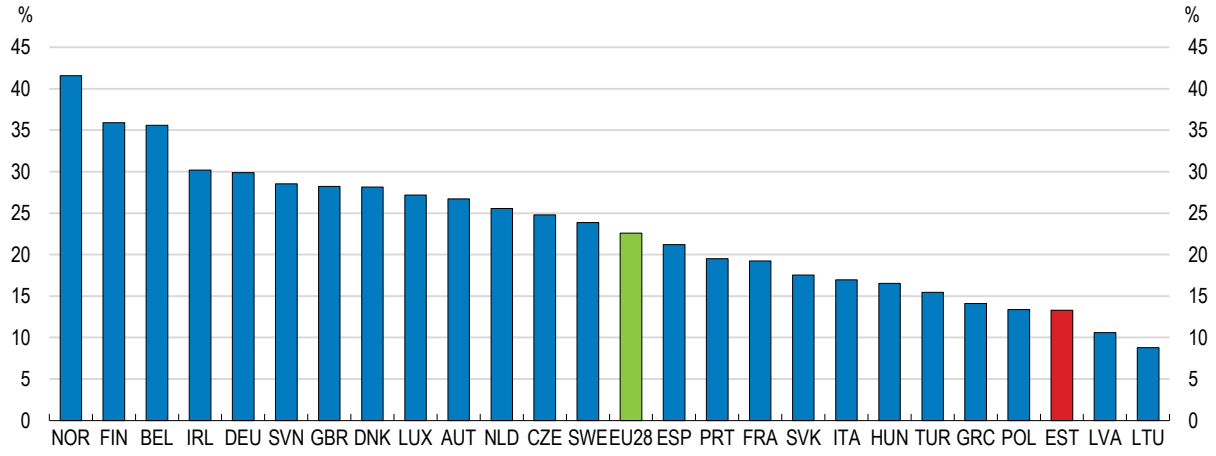
Younger generations perform somewhat better relative to other countries, but only around the PIAAC average. Estonian schools have high autonomy to define curricula (OECD, 2016a), and the organisation, content and quality of the teaching of digital skills varies between schools. Furthermore, teachers' digital skills and their preparedness to teach digital skills should be strengthened by intensifying and increasing the quality of their professional development in the subject.

Boosting adult education and training and increasing business participation

Existing skills gaps and growing needs to re-skill and up-skill parts of the population call for concerted efforts to boost adult education and training. Participation has increased considerably from 10% of the population in 2008 to 19% in 2018 (European Commission, 2019). However, as pointed out in the 2017 OECD Economic Survey of Estonia, businesses are little involved in the provision of both upper secondary vocational education and adult education and training. Estonian companies are among the least inclined in Europe to provide training to their employees (Figure 1.18). Recent initiatives, such as DigiABC and Choose IT provide models for how to improve the relevance of training initiatives through cooperation and dialogue between the government and employers' and labour unions.

Figure 1.18. Businesses could be more involved in training their employees

Percentage of businesses providing ICT training to their employees, 2018

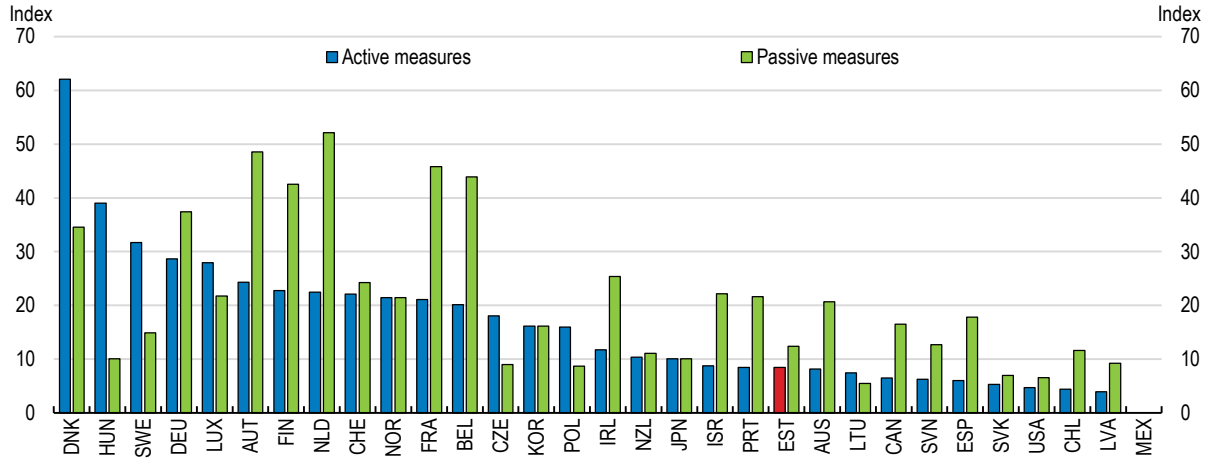


Note: Data refer to businesses with 10 or more employees that provided any type of training to develop the ICT related skills of their employees within the last 12 months.
Source: OECD ICT Access and Usage by Businesses Database.

Labour market policies are key to reduce the burden for those who lose out from structural change and to adapt and upgrade their skills, and net social benefits from training and other activation policies are high in Estonia (Praxis, 2003). However, both active and passive support to the unemployed in Estonia are relatively weak (Figure 1.19). Only 47% of the registered unemployed are covered by unemployment benefits, notably because of stringent eligibility criteria (Praxis, 2019), and the Work Ability reform will increase retraining needs going forward. The situation is improving, with increased active labour market policies (ALMP) spending the past few years, and training increasingly made available to individuals at risk of unemployment, for example in traditional industries in Estonia's north-east. Spending is still low compared to other OECD countries and further ramping up training activities for the unemployed and those at risk of unemployment is warranted. Improving unemployment insurance coverage could give the unemployed better access to training and stronger incentives to participate (OECD Economic Survey, 2017).

Figure 1.19. Spending on the unemployed is low

Labour market policy (LMP) spending per unemployed scaled by GDP per capita (2016)



Source: Author's calculations based on OECD Labour market programmes database, OECD Labour force statistics database and OECD National accounts database (accessed 25 July 2019).

Table 1.8. Past OECD recommendations to improve the education system and upgrade skills

Main recommendations from the 2017 Survey	Actions taken since the 2017 Survey
Relax annual immigration quotas, and simplify conditions for work permits of skilled workers.	No action taken.
Strengthen the monitoring of training courses, by using ex post evaluation of training including labour market outcomes of participants.	No action taken.
Extend the accreditation system to all publicly funded learning programmes to signal and improve their quality	No action taken.

Smart businesses should become new drivers of growth

Estonia's productivity growth has been weak in recent years, but digitisation could provide new avenues to unleash the country's productivity potential. Estonia has successfully embarked on the digitalisation of government services and is now a global frontrunner, ranking second, only behind Austria in terms of online availability of government services in 2017 according to the European Commission's e-government benchmark index. It is relatively easy to find information online on government services and now services are also available cross border. As the swift digitisation of government services shows, efficiency gains are sizeable and a considerable potential is still to be reaped in the business sector. Compared to the globally excelling e-government services, digitalisation is still to be embraced by the non-ICT enterprise sector, in particular in manufacturing.

The ICT sector needs to be strengthened

A key factor affecting the potential of the digital economy is the state of the ICT sector. The ICT sector is a big employer in Estonia and it contributes 0.25% to growth, but its labour productivity is lower than in many other transition economies, let alone digital frontrunners such as Finland or Korea. The extent of trade in digitally deliverable services, another measure of ICT-sector competitiveness, is relatively low, notwithstanding low barriers to digital services trade (Ferencz, 2019). Greater demand from the domestic business sector for ICT services could also create competition and boost efficiency.

Estonia has not been earning much IPR-related revenues from overseas, and ICT-related patents are only a fraction of all patents notwithstanding its large number of successful ICT start-ups and its high global

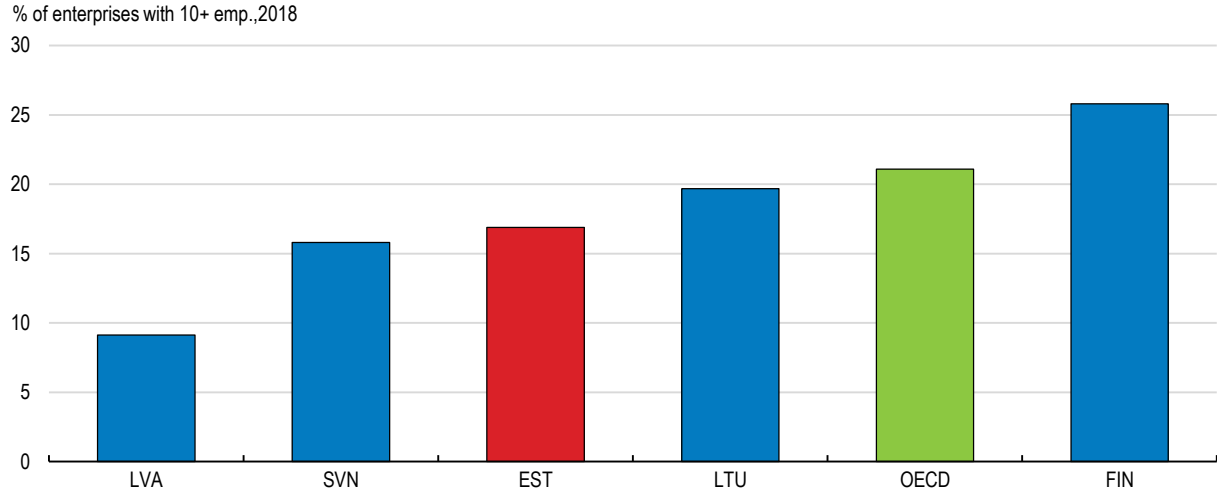
ranking of creative apps. Limited spill-overs of those start-ups to the domestic economy may constrain productivity gains in the sector. In contrast, Estonia ranks quite high in the global scale in trademarks and industrial designs. Greater orientation of research, in particular government-sponsored research, towards applications would help raising intangible capital. The share of intangible capital is relatively low. Even in industries such as publishing activities or telecommunications it was just above 8%, while in other industries it is even lower. In addition, allowing inventors to reap personal benefits from their patents would encourage more patenting.

The right framework conditions, regulations and incentives would spur digitalisation

To spur diffusion of digital technologies in production, framework conditions need to facilitate the creation as well as the scaling up of firms. Product market regulations in Estonia appear to be business friendly, though the business community complains about excessive state intervention in operations, in particular of state-owned enterprises in the energy sector. Indeed, the government owns the largest firm in many services such as electricity, posts, railways and air transport. While in many network industries several competitors could hardly survive in a small market like Estonia, private shareholders could exert pressure to improve efficiency. Also, at least some segments in certain network industries could have more competition, for instance in electricity generation. Multiple railway operators may also be feasible. Greater competition in those industries would lift overall productivity. Where competition or other private participation is not feasible, better governance of the incumbent public enterprise could also bring about efficiency gains. In addition, before adopting a regulation, regulators should be required to assess alternative policy instruments and the government should issue guidance on using alternatives to traditional regulation.

Conditions for smart business growth are being improved, an increasing number of companies is using e-invoicing or other digitally-enabled services. In international comparison, although many companies have websites, only a few are equipped with the functions of online ordering and booking (Figure 1.20). State-of-the-art digital tools including big data, artificial intelligence (AI) and internet-of-things (IoT) are the driving forces of productivity upgrading in digital front-running countries, and Estonia too could benefit from the leapfrogging opportunities those tools provide. Estonia is striving to be a frontrunner in setting up regulatory systems for future production. It is now preparing a bill to allow the use of fully autonomous information systems in all areas of life and is working on its AI strategy.

Figure 1.20. Few business websites are used for ordering or booking

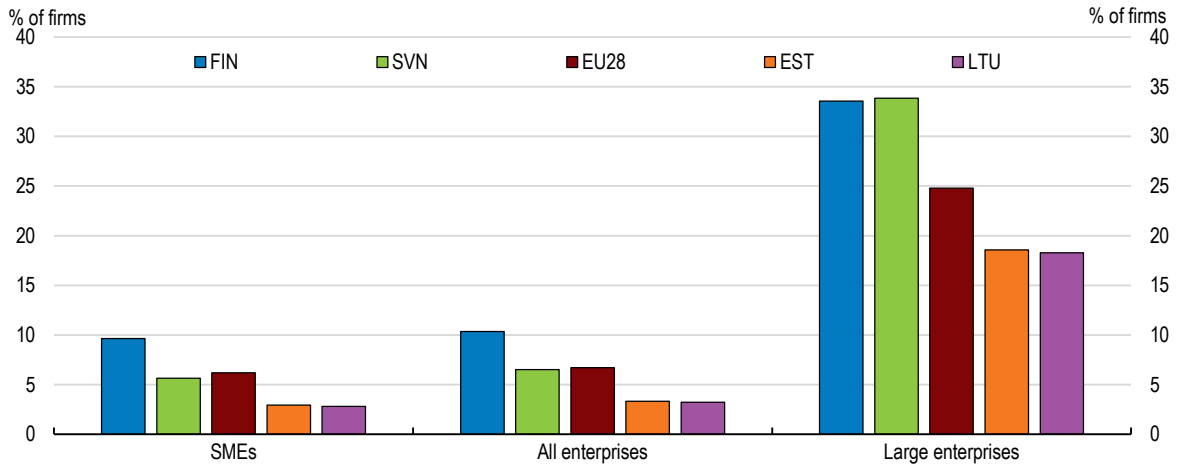


Source: OECD ICT database on business usage.

Business enterprises, in particular the smaller ones are not fully aware of the productivity gains digitalisation could potentially bring about. The digital diagnostics tool, an exercise to determine digital needs of companies, could be made more easily available in terms of bureaucracy and its take-up and successful cases better disseminated.

In manufacturing, most firms are small and micro firms, below the threshold where some digital investments are considered profitable. Automation is low, not only among smaller but also large firms (Figure 1.21). Mergers and joint operations to reach the critical threshold are possible ways to overcome the scale issue. Furthermore, supporting industrial associations in providing platforms and developing affordable smart solutions in areas such as joint marketing, supplier interactions and customer support would also work to that end. China and Singapore, for instance, have such programmes in place, as discussed in Chapter 1 of this Survey.

Figure 1.21. The use of robots is particularly low among SMEs



Note: Firms with at least 10 employees.
Source: OECD ICT Use by Business database.

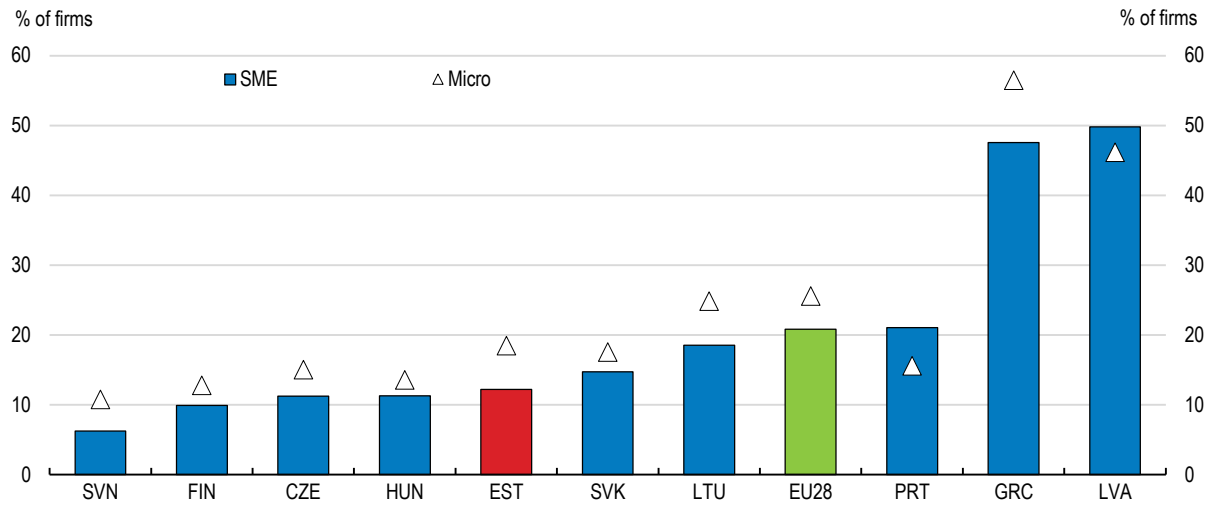
Access to finance is crucial to fund the digital transition

A relatively high share of micro firms and SMEs consider the lack of financing as an obstacle to long-term investment (Figure 1.22). The rejection rate of loan applications by SMEs, a more meaningful indicator of access to finance, is more than double the EU average (11% vs. 5%) and so is the share of SMEs that do not apply for bank loans in the first place in fear of rejection (also 11% vs. 5% in the European Union). The lack of fixed assets, in particular in services industries, is a major constraint to borrowing. Alternative financing methods are gaining space in Estonia to fill in for demand unmet by banks. Factoring has become the most important source of financing for SMEs, followed by bank loans and internal funds (European Commission, 2018b). The Green Paper on Industrial Policy recognises that in order to make investments, industrial companies need long-term financing opportunities.

Alternative financing, including FinTech, should be promoted to fill the funding gap for SMEs, while keeping safe standards regarding consumer protection and predatory lending. More complete documentation on the borrower side and better risk assessment by lenders would also work to that end. To overcome the lack of fixed assets, a system and standards to accept intangible assets as collateral could be established. Given the strong performance in registering trademarks and industrial design by Estonian companies, collateralising those could ease borrowing constraints. Korea has an effective system providing loans for purchasing, commercialising and collateralising intellectual property under the “Techno Banking” initiative by the Korean Development Bank.

Figure 1.22. Smaller firms consider the availability of finance as an obstacle to long-term investment

% of firms reporting availability of finance as a major obstacle to long-term investment, 2017



Source: EIB Survey.

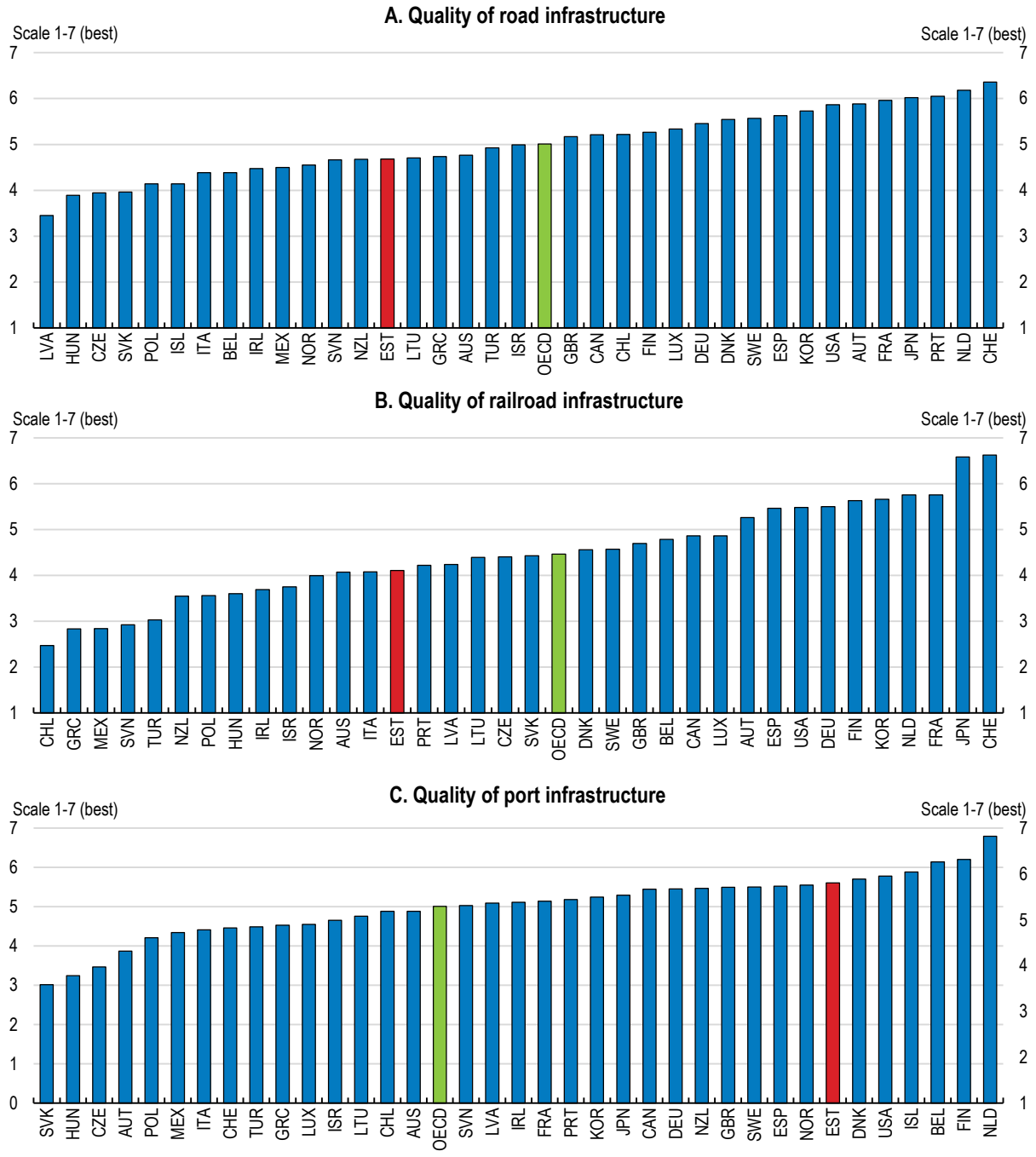
Table 1.9. Past OECD recommendations to improve the business environment

Main recommendations from the 2017 Survey	Actions taken since the 2017 Survey
Give more weight to co-operation with the private sector when allocating funds to public R&D institutions.	Two activities were launched in 2016 ("Supporting applied research in smart specialisation growth areas" and "Strengthening sectorial research and development") where the funding formula was amended so that business contracts are assigned a coefficient of 2.
Establish an independent body to advise on policies to raise productivity.	No action taken.

Infrastructure investment is crucial for future productivity growth

Robust investment in infrastructure would help reinvigorating productivity convergence. Notwithstanding heavy investment in infrastructure in the past couple of decades, largely using EU funds, infrastructure quality is not particularly high (Figure 1.23). The share of road transport in total freight transport is among the highest in the OECD, implying heavy road traffic in vehicle-km per unit of GDP. A lack of motorways implies lower speed and hence lower efficiency of transport services. Moreover, Estonia's ranking on the quality of roads sub-index of the infrastructure component of the Global Competitiveness Index is not very high. In contrast, rail infrastructure quality seems much better and in port infrastructure quality, Estonia ranks among the top ten economies globally. Improving road infrastructure, in particular building key motorways would improve connectivity as well as boost transport service efficiency. The International Transport Forum at the OECD is currently undertaking a comprehensive assessment of Estonia's transport development needs based on economic modelling, the results of which will be available in 2020 (ITF, 2020).

Figure 1.23. Perceived infrastructure quality is close to the OECD average



Source: WEF Global competitiveness 2017-2018.

Connectivity by air and sea are particularly weak, as the sub-indices of the Global Competitiveness Index indicate. From Tallinn, there are no direct daily flight to many major European cities. The small size and the geographical location of the country explain that. In addition, all neighbouring countries have a large city not far from the Estonian border, thereby reducing potential air or maritime transit traffic. Connectivity will greatly improve once the high-speed Rail Baltica link is completed. Rail Baltica plans to launch its high-speed rail shortening the travel from Tallinn to Riga to an hour and 40 minutes, passing through Pärnu, by 2026. The network will reach Warsaw and Berlin as well (3 Seas Initiatives Summit, 2018). Rail Baltica

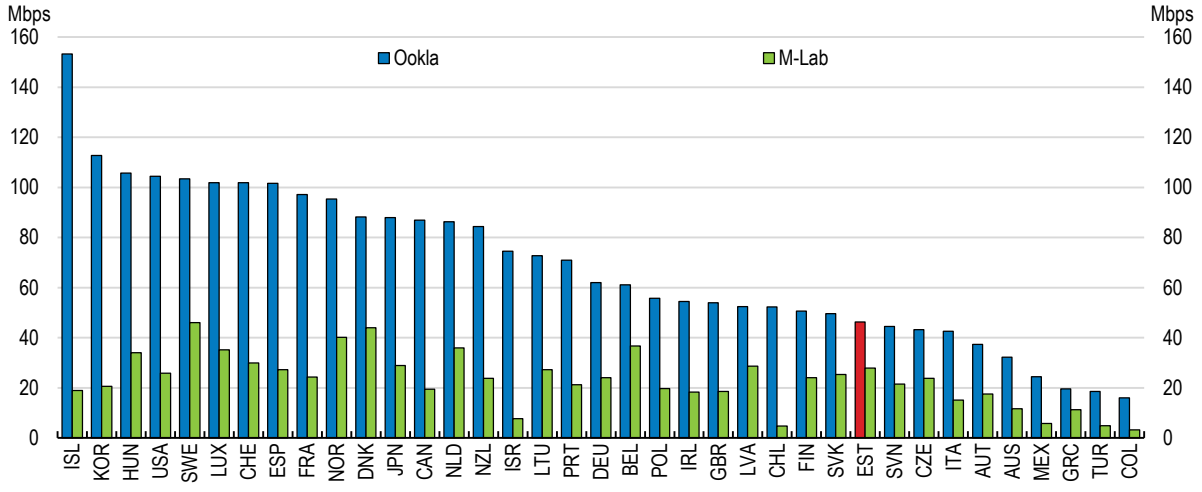
could potentially relieve traffic on Via Baltica, which is currently the major transport route for freight between the Baltics and the rest of continental European Union. Via Baltica itself is being modernised also with the aim to strengthen road safety and reduce accidents. Energy connectivity will also improve once the interconnection of the electricity system with that of the European Union will materialise in 2025.

The government plans to invest EUR 1.3 billion to reach a -13% CO2 emission target by 2030. The three major areas targeted are transport, agriculture and waste management. The major contributor will be public transportation through the electrification of railways and better connection and extension of tramways. Indeed, the level of railway electrification at 11% in 2016 was the third lowest among OECD countries for which data are available, next to Ireland and Lithuania. Increasing diesel emission standards by the European Union will imply switching from diesel to electric locomotives. Alternative technologies to electrification could also be considered, for instance using fuel charge and hydrogen technology (Ruf et al., 2019).

More importantly, digital infrastructure needs to be revamped to make digitisation a new driver of business growth. Although mobile network coverage is 100% like in most advanced economies, in terms of bandwidth, Estonia ranks only 78th in the world. Fixed broadband coverage is lower than in the EU average and download speed of fixed broadband connection is low (Figure 1.24). The government is investing in the extension of the infrastructure during the current budget plan.

Figure 1.24. Download speed of fixed broadband connections is low

Average experienced download speed of fixed broadband connections, Ookla and M-Lab measures, 2018



Note: The Ookla measure reflects wired or wireless broadband speed achievable 'on-net', while the M-Lab Network Diagnostic test is primarily for identifying Internet bottlenecks rather than computing averages of upload and download speeds from different user populations.
Source: OECD (2019), Measuring the Digital Transformation: A Roadmap for the Future, OECD Publishing, Paris, https://doi.org/10.1787/9789264311992-en.

Infrastructure-related investment is to a large part co-financed by EU structural funds, and so far there have been no plans to make up for a potential future reduction of such funds. Cost-benefit analysis for infrastructure projects is common now, which is a positive development, but spill-overs are currently not considered in either feasibility studies or ex-post. Given the large potential spill-over effects of several infrastructure projects, including roads, railways and bridges on the surrounding areas, such effects should be incorporated in feasibility studies.

Table 1.10. Past OECD recommendations to improve infrastructure

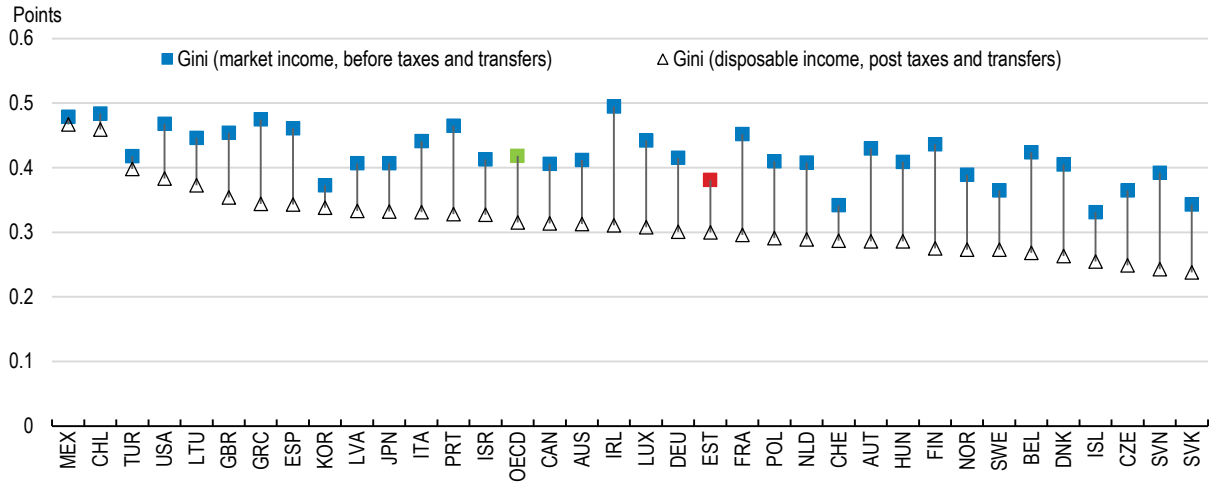
Main recommendations from the 2017 Survey	Actions taken since the 2017 Survey
Carry out ex ante cost-benefit analysis for all large-scale infrastructure projects based on a uniform methodology.	Cost-benefit analyses are applied in most but not all cases.

Inequalities have multiple dimensions

Inequalities in both market and disposable incomes are in line with the OECD average (Figure 1.25). Reforms of the personal income tax system in 2018 (i.e. increase of non-taxable income and the introduction of progressivity in the withdrawal of the income tax allowance) reduced the Gini coefficient for disposable incomes by 0.8 percentage points, and reforms of the family benefit system in the same year (i.e. increase of the child allowance and the parental allowance and the extension of the latter to families with 3-6 children) by another 0.2 percentage points (Paulus and Klein, 2019). Inequalities in health outcomes are sizeable (see health section below), partly related to incomes, partly to education level.

Figure 1.25. Inequalities in both market and disposable incomes are in line with the OECD average

Working-age population (aged 18-65), 2017 or latest year available



Source: OECD Income Distribution Database (IDD).

Inequalities have multiple dimensions. Notwithstanding the small size of the country, regional disparities are sizeable, with Tallinn and the western areas doing better and the eastern and southern worse. The urban-rural divide is also significant. The regional divide to some extent reflects the divide between Estonian speakers and Russian speakers with many of the latter living in the eastern regions. Estonian speakers are more satisfied with life in general than minorities. While Russian-speaking Estonian citizens on average have the same satisfaction level, the downward dispersion for this indicator is much greater. People not holding Estonian citizenship, be it people holding other citizenship or none, are on average much less satisfied with life. This divide between Estonian speakers and minorities would also be apparent if asking them about their satisfaction with the economic or the political situation of the country or the education or health systems.

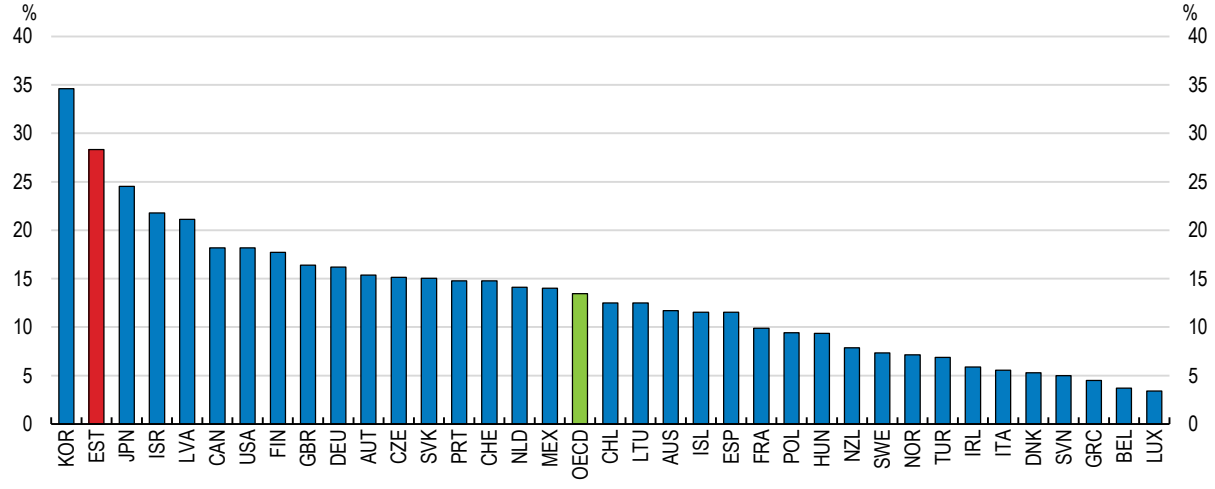
In a small country like Estonia, better connectivity across the region and across the national borders with other EU and non-EU economies can be a powerful tool to reduce regional and urban-rural inequalities. In particular, having branded itself as an ICT leader in some aspects, the country could exploit its state-of-the-art digital ID system and digital tracking of interactions with government to better target the people left

behind. For instance, people eligible for social assistance, could be automatically notified to increase take-up rates. For ethnic minorities, a more embracing education system with opportunities to acquire Estonian language skills in any part of the country could help. Estonian language teachers could be attracted to minority areas by improving benefits and incentives.

Men have greater earnings opportunities thanks to the construction boom, even though on average they have lower education attainment than women. The combination of inequalities in multiple dimensions makes Russian-speaking women in the East of the country have the lowest chance to find a job. The gender pay gap is apparent, at 25.6% it is among the highest in OECD (Figure 1.26). When decomposing this measure, the major factors behind the gap are men working in better-paying occupations and sectors than women. At the same time, the unexplained part of the gap is large, meaning it is not related to personal, job or enterprise characteristics. The gap is slowly narrowing as a result of new measures. Employers should be required to report the size of the pay gap, including in the private sector, and explain the reasons for it and provide an action plan to eliminate it. In France, for instance, the relatively low gender wage gap is ensured by a reporting requirement and fines for firms employing at least 50 people.

Figure 1.26. The gender wage gap is high

Full-time employees, 2018 or latest available



Note: The gender wage gap is unadjusted and defined as the difference between median wages of men and women relative to the median wages of men. For Estonia, latest available data are as of 2014.
Source: OECD Labour Force Statistics database.

Table 1.11. Past OECD recommendations to make growth more inclusive

Main recommendations from the 2017 Survey	Actions taken since the 2017 Survey
Relax eligibility conditions for unemployment benefits, not least to improve participation in active labour market measures.	No action taken.
Extend the share of parental leave reserved for fathers.	Paternity leave rights have been extended to 30 days, effective from July 2020.

Health is a top development need

Relatively low outcomes by different health indicators explain the inclusion of health among the top nine development needs. Life expectancy at birth since 2000 increased more in Estonia than in any other OECD country, with the increase being greater for men than women, thereby reducing the gender gap by two full

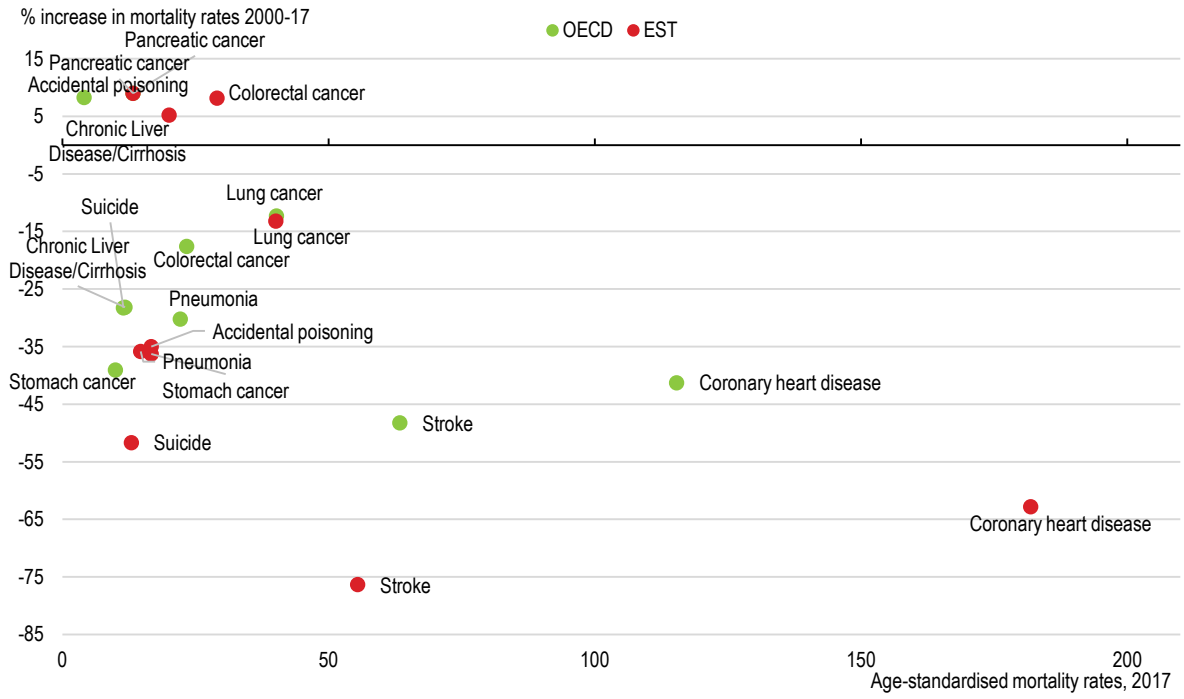
years by 2017. However, the gap at 8.8 years in 2017 remains the third largest in the OECD (next to Latvia and Lithuania).

Despite some improvement, Estonia also still ranks rather poorly on alcohol consumption and smoking -- two important behavioural risk factors. Together, they account for around a quarter of deaths (OECD/European Observatory on Health Systems and Policies, 2019). This is nearly the same as dietary risk, the number one behavioural risk factor at 26%, in particular related to high sugar and salt and low fruit and vegetable consumption. Average alcohol consumption per capita is not different from those in other Central-Eastern or large European economies, but episodic heavy alcohol consumption (binge drinking), in particular among men, is high (OECD/European Observatory on Health Systems and Policies, 2019). A new regulation bars the open display of alcoholic beverages and tobacco from the second half of 2019 and advertisements are banned, including at point of sale displays. In addition to barring open display and advertisements of alcohol per se, banning those for materials that could serve as a base for producing alcohol should also be considered given that the death rate related to accidental poisoning is second only to the United States in the OECD. Rules for handling poisonous materials (e.g. methanol) should be made more rigorous and fines for non-observance deterring.

The mortality rate from ischaemic heart disease, the number one cause of death, has fallen as people, especially men, have started to smoke less, but is still the fifth highest in the OECD. Lung cancer, the most common form of cancer, has also decreased. In contrast, chronic liver disease and pancreatic and colorectal cancer are on the rise (Figure 1.27). Low screening among high-risk population groups results in late detection rates. Earlier treatment carries significant benefits in terms of lower treatment costs and reduced mortality, but screening programmes also incur costs, and should only be implemented following thorough cost-benefit analyses. Raising awareness of screening programmes and covering a greater proportion of the costs by insurance would help getting diseases on the rise under control. It is shown that, for instance, colonoscopy reduces mortality from colorectal cancer by curbing the incidence of late-stage cancers (Jacob et al. 2012). Given that colorectal cancer affects a relatively large number of people, it is on the rise and it is generally curable at earlier stages, free screening of people at risk should be considered. For instance, offering a one-off free screening of blood in stool, and free colorectal screening (colonoscopy) to those who test positive, could effectively curb future treatment and opportunity costs. For people at risk aged 50 and above, it would cost roughly 0.09% of 2018 GDP, which is an upper limit as it could be phased in over several years. Infectious diseases, such as HIV and tuberculosis are also common, with HIV incidence ranking seventh in OECD, but decreasing over the past decade.

Figure 1.27. Ischaemic heart disease tops the causes of death and colorectal cancer and liver diseases are on the rise

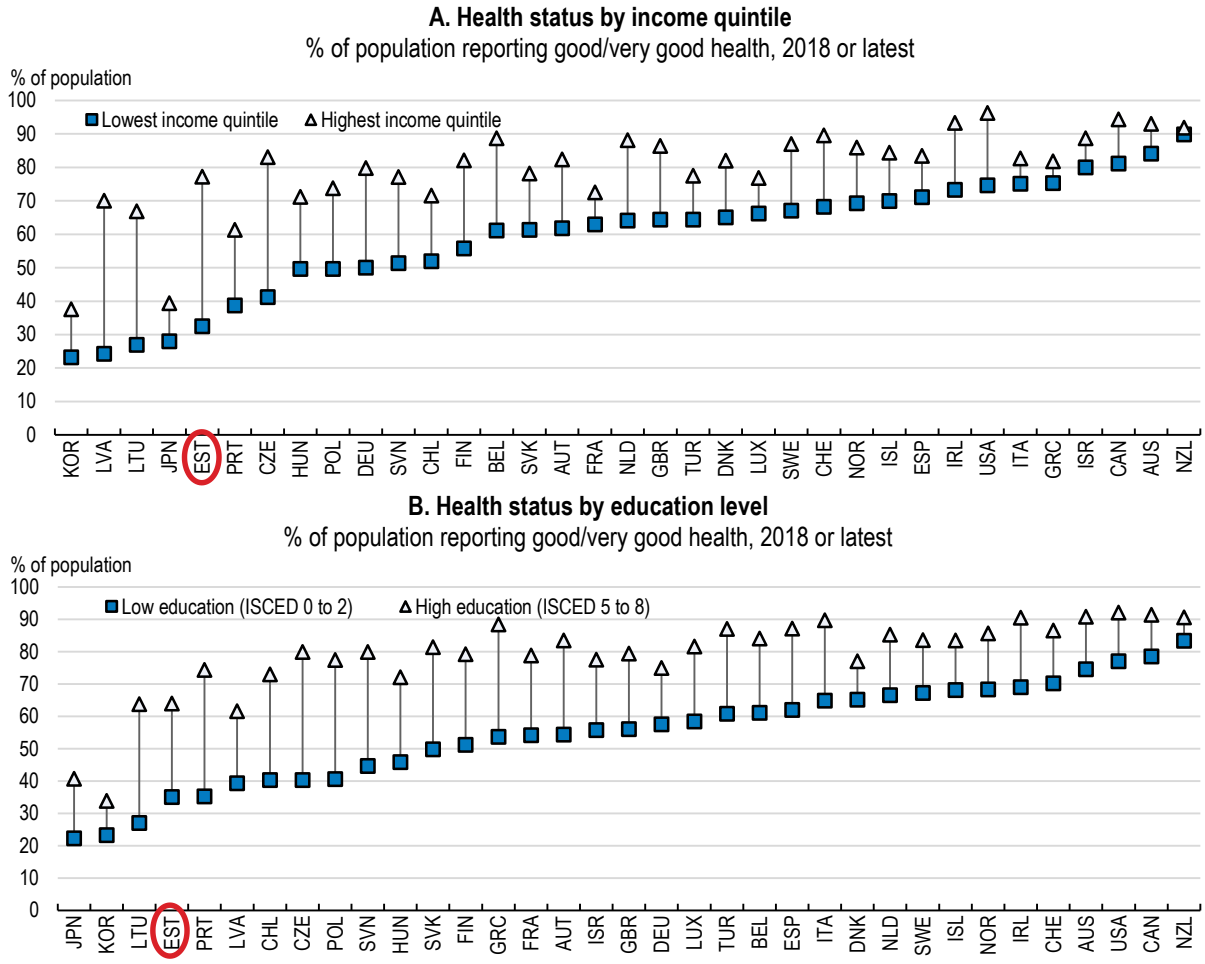
Deaths per 100 000 population (standardised rates)



Note: Red is for Estonia and green for the OECD average.
Source: OECD Health data.

Health outcomes vary strongly also with income and education. The perceived health status differs greatly between people in the top and bottom income quintiles and between those with high and low level of education (Figure 1.28). Those gaps are among the highest in the OECD. The gaps may partially reflect actual differences in health status related to more hazardous workplace conditions in mines and construction where part of the low-skilled and low-income people work. Another factor is differences in the exposure to behavioural risk factors, notably higher obesity and smoking rates among low-income people. In addition, it may also reflect those people's perceived ability to improve their health, which stems from high out-of-pocket payments and low coverage of reimbursed preventive measures. High out-of-pocket payments prompt patients to skip consultations and prescribed medicines, exacerbating the health outcome divide related to income disparities. Furthermore, the share of the population not having access to specialised medical care and dental care is bigger in lower income quintiles (Statistics Estonia, 2018). Reduction of income inequalities and higher insurance coverage of health services and medicine are thus both conducive to narrowing the gap in health outcomes.

Figure 1.28. Perceived health varies widely with income and education levels



Note: Data were not available for Mexico.
Source: OECD Health database.

Estonia has very high levels of unmet healthcare needs, which is largely related to long waiting lists. Insufficient gatekeeping, limited services by primary care and a lack and uneven distribution of specialists contribute to long waiting times. Among OECD countries for which data are available, Estonia's share of patients with over 3 months of waiting for various interventions is the highest. Notwithstanding the maximum target waiting times set by the health insurance fund, people find themselves waiting well beyond those targets.

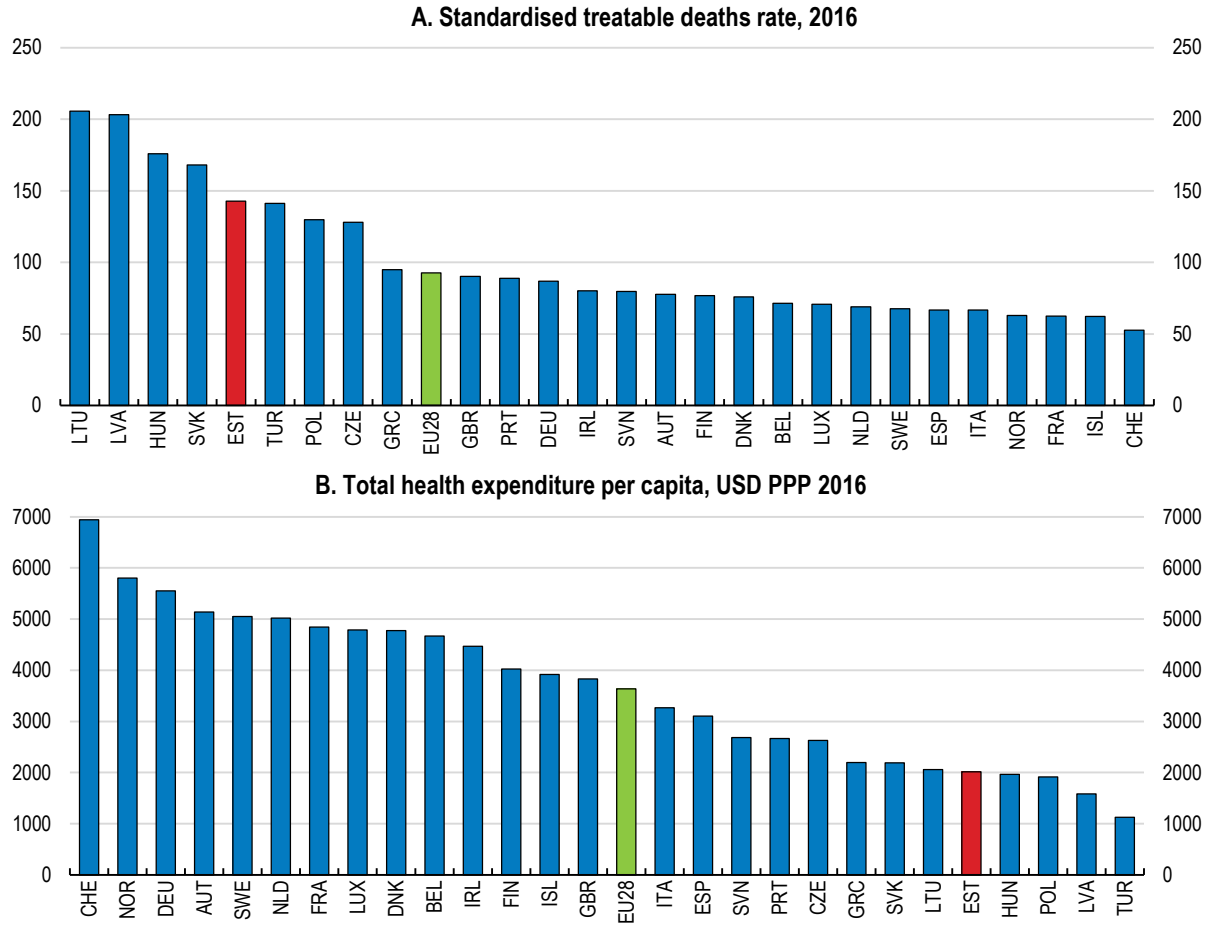
Regional disparities compound the gender, income and education divide across health outcomes. For instance, people in Tartu have 4.5 years longer life expectancy than those in Ida-Viru. Furthermore, people in Lääne and Saare counties in the western part of the country have eight years of disability-free life expectancy at age 65, in contrast to residents in Võru County, in the south-east, who live only 1.7 years without disability (OECD/European Observatory on Health Systems and Policies, 2019). The distribution of health resources plays a role in regional disparities in health outcomes. The two largest hospitals, for example, located in Tallinn and Tartu, account for half of specialist services countrywide. Incentives for medical personnel to move to rural areas are limited. As a result, unmet healthcare needs due to distance are high.

The Estonian Health Insurance Fund covers only 94% of the population. A 2017 reform instituted a government transfer to the Health Insurance Fund on behalf of pensioners from 2018, which will improve

the finances of the Fund. In that year, it stood at 7% with an objective to increase it to 13% in 2022, the same as the employer contribution rate. The scope of services financed by health insurance were also raised, including emergency care, tuberculosis and HIV treatment for the uninsured, and ambulance care. The health insurance will also coordinate preventive services. The uninsured, many of whom are unemployed, have access only to emergency care, not to preventive services, primary care or other specialist care. Covering all residents by health insurance would relieve pressure from emergency services and would allow for better health outcomes through focusing more on prevention. The inactive should be encouraged to obtain basic health insurance, for instance at the level of social tax paid by minimum wage earners for health insurance purposes.

Healthcare spending efficiency is not particularly low, but there are a number of OECD countries, including in Central and Eastern Europe, that achieve lower death rates from treatable diseases from similar expenditures (Figure 1.29).

Figure 1.29. Some countries achieve lower treatable death rates from similar expenditures



Source: OECD Health Data.

Ensuring safety and security

Security aspects encompass personal security as well as elements that are critical to the effective functioning of a state, in particular energy. Public security in Estonia is on par with the OECD average, but due to the gaps in the social protection system, income security is an issue. Health-environment and safety regulations and their enforcement need improvement, calling for more resources to the labour inspectorate

and incentives to report work sickness and work injuries as such. Occupational risks are relatively common, and fines are low. Work-related injuries are not reported in Estonia and hence are not addressed. While occupational diseases are reported, diagnosis appears lengthy. Compensation at EUR 500 per month in the case of long-term injuries is relatively low and in-kind assistance, for instance transportation, is not sufficient.

Digital security is increasingly important in peoples' everyday lives, as vital services like rescue, electricity and water supply, phone and data communication, currency circulation, payment services and personal identity management increasingly rest on digital foundations. Estonia's critical digital infrastructure is well protected, but many Estonian companies lag behind in digital security, and a large share of internet users are either unaware or passive towards issues of digital security and data privacy (See Chapter 2).

Oil shale is at present key to Estonia's energy security. It is exploited in few countries other than Estonia, and the largest mining and processing company is government-owned. It is more CO2-intensive than coal and is contributing to diverse environment- and health issues. However, it meets around 70% of Estonia's energy needs, mostly through electricity generation and heat, and is seen as key to the country's energy security. Furthermore, the sector accounts for 4% of GDP and 1.5% of employment and is a key employer in the northeast of the country, where unemployment and poverty rates are high (OECD Economic Survey, 2017). Reducing the dependence of oil shale mining and use is thus a key economic, environmental, social and strategic challenge (OECD, 2017c).

Connectivity in the area of energy will improve, and this could help mitigate energy security concerns. The Balticconnector gas pipeline between Finland and Estonia already exists and a planned regional LNG terminal adjacent to it in Paldiski (North-western Estonia) is to be built to ensure long-term security and diversification of gas supply. Interconnection of the electricity system with that of the European Union is another task ahead. Currently the Baltic States are still linked to the BRELL (Belarus, Russia, Estonia, Latvia and Lithuania) electricity system, where Russia provides stability. Baltic States decided as early as in 2007 to synchronise their grids with the European Union, and synchronisation is expected to be completed by 2025 via Poland. This will allow system operation according to EU standards and eliminate technical dependency for operational planning on third countries (3 Seas Initiatives Summit, 2018).

Table 1.12. Past OECD recommendations on safety and security

Main recommendations in past *Surveys*	Action taken since the previous *Survey*
Increase subsistence benefits.	No action taken on subsistence benefits, but a significant strengthening of child benefits has reduced child poverty.
Increase sanctions for breaches of health and safety regulations.	No action taken.
Require that employers purchase occupational accident and disease insurance.	No action taken.

Keeping a clean natural environment

The natural environment in Estonia is for the most part clean, with low built-up surfaces per capita and very good air quality (Figure 1.30.A and B), although there are pockets of pollution around the capital Tallinn and in the northeast, where oil shale is exploited. However, progress with decoupling CO2 emissions from GDP growth has been limited over the past 10 years (Figure 1.30.C and D), and Estonia is projected to miss its 2030 target to reduce greenhouse gas emissions outside the EU-ETS. There are also issues regarding municipal waste.

The exploitation of oil shale is the main culprit behind Estonia's high greenhouse gas emissions. Oil shale mining has in the past generated large volumes of waste and polluted ground water and soil. Remediation of old contaminated sites is costly but is not the responsibility of the mining companies, since most of the pollution originates from Soviet times. However, the sector brings incomes, it is a large employer in the

North-East, and key to energy security. Furthermore, new research and technology development indicates that health risks from mining waste is lower than previously thought, and the residues have alternative uses, for example as a substitute for gravel in road and rail construction. To reflect these findings and facilitate a better use of the resource, shale ash will be reclassified as non-hazardous waste as of 2020.

Environmental tax revenues are high, mostly from the taxation of oil shale (Figure 1.30.E). Nonetheless, Estonia's CO_2 emissions are largely priced below the low-end estimate of the climate cost of carbon of EUR 30 (Figure 1.30.F) mostly because prices in the European Union's emission trading scheme (ETS), which covers most of Estonia's oil-shale related emissions, are still lower. Double taxation of emissions should be avoided, but ETS prices may rise further: The supply of emission permits will be scaled back more strongly starting in 2021. Moreover, a large majority of EU countries, including Estonia, now support a target of reaching net zero emissions by 2050. Estonia's economy could be vulnerable to substantially higher ETS prices.

Reducing the dependency on oil shale while minimising social impacts and energy security concerns is a key challenge going forward, and a broad policy response is needed to successfully support regions undergoing industrial transition (Box 1.7). The National Development Plan (NDP) for Oil Shale Use for 2016-2030 aims at increasing mining efficiency while minimising the environmental impact. The government plans to shift oil shale use towards the production and export of oil and other chemical products. This would avoid CO_2 emissions domestically but still generate local environmental impacts from mining and processing. A focus on technological solutions to environmental challenges, shown in a high share of environmentally related inventions (Figure 1.30.G), is positive, but not sufficient. Low oil prices have posed risks for the viability of this business model in the past (OECD, 2017c), and rising prices on emissions quotas has rendered parts of the sector unprofitable lately. The sector could end up as a liability in the future, notably if decisive climate mitigation action by oil-consuming countries depresses oil prices, crowding out production at relatively high cost (Mercure et al., 2018).

Box 1.7. Policy responses to regional industrial transition

Globalisation, technological progress, and the transition to a climate-neutral and circular economy are transforming OECD and European regions. Regions undergoing industrial transition often have a strong legacy in manufacturing and sophisticated innovation activities, well-trained workers and strong social capital. At the same time, a skills base concentrated in declining sectors with a potential overspecialisation in mature technologies and industries in decline make these regions vulnerable to higher unemployment from concentrated deindustrialisation. Successful industrial transition will depend on these regions' ability to foster innovation-led growth and ensure that the benefits from growth are widely shared.

Regions in industrial transition should use a variety of policies and instruments to support their transition processes, calling for a coordinated effort including different levels of government, social partners and the private sector. These policy instruments are usually not new, but a successful industrial transition may call for improved, intensified and place-based implementation of existing policies within areas such as skills provision, entrepreneurship, research, development and investment support.

Finland's foresight co-ordination for Northern and Eastern regions is an example of coordination between relevant actors at the regional level. Headed by regional councils, it monitors the regional operating environment and changes in industry, and analyses current and future skills needs. A key success factor of regional foresight in Finland is close cooperation among different foresight actors in order to create a shared understanding of future challenges in the region, a shared vision around future development objectives and means to reach set targets. Each region has launched place-specific regional foresight models and produced local analysis reports feeding into the support of regional policy strategies and programmes.

The **Norwegian** Innovation Clusters programme is an example of network-based approaches, supporting industry-science ties and fostering cross-sectoral links to boost innovation-led transitions. The programme is a government-supported cluster programme organised by Innovation Norway in a joint effort with Norway's Industrial Development Corporation and the Norwegian Research Council. The programme's objectives are to increase the innovation capability and value creation in different clusters and to support cross-fertilisation between clusters. Through annual open calls, clusters compete to be part of the programme. Criteria for participation include cluster resources, potential for growth and position in the industry, and that the wish to build a financially supported cluster is based on the commitment and leadership of the companies forming the cluster.

Skills and labour market policies are key to share the benefits and burdens of industrial transition. **Saxony's** "We Need All Talents" initiative takes a multi-stakeholder approach to improve transitions from compulsory school to education to employment, to prevent dropouts and youth unemployment and help youth overcome personal crises. The initiative focuses on improved cooperation among existing authorities such as the Youth Employment Agency, the Youth Welfare Office and schools in order to offer coordinated assistance in one-stop-shops based on the individual's needs.

Source: OECD (2019), Regions in Industrial Transition: Policies for People and Places, OECD Publishing, Paris, https://doi.org/10.1787/c76ec2a1-en.

Renewable energy could help provide energy security, but without CO_2 emissions and considerably less environmental impact than the oil shale sector. Renewable energy generation has increased markedly (Figure 30.H). Renewable capacity consists mostly of burning biomass from by-products of the wood industry. Wind and solar energy contribute little. However, forests are used intensively, and logging increased over the past decade. Estonia has put in place several financial and institutional measures to

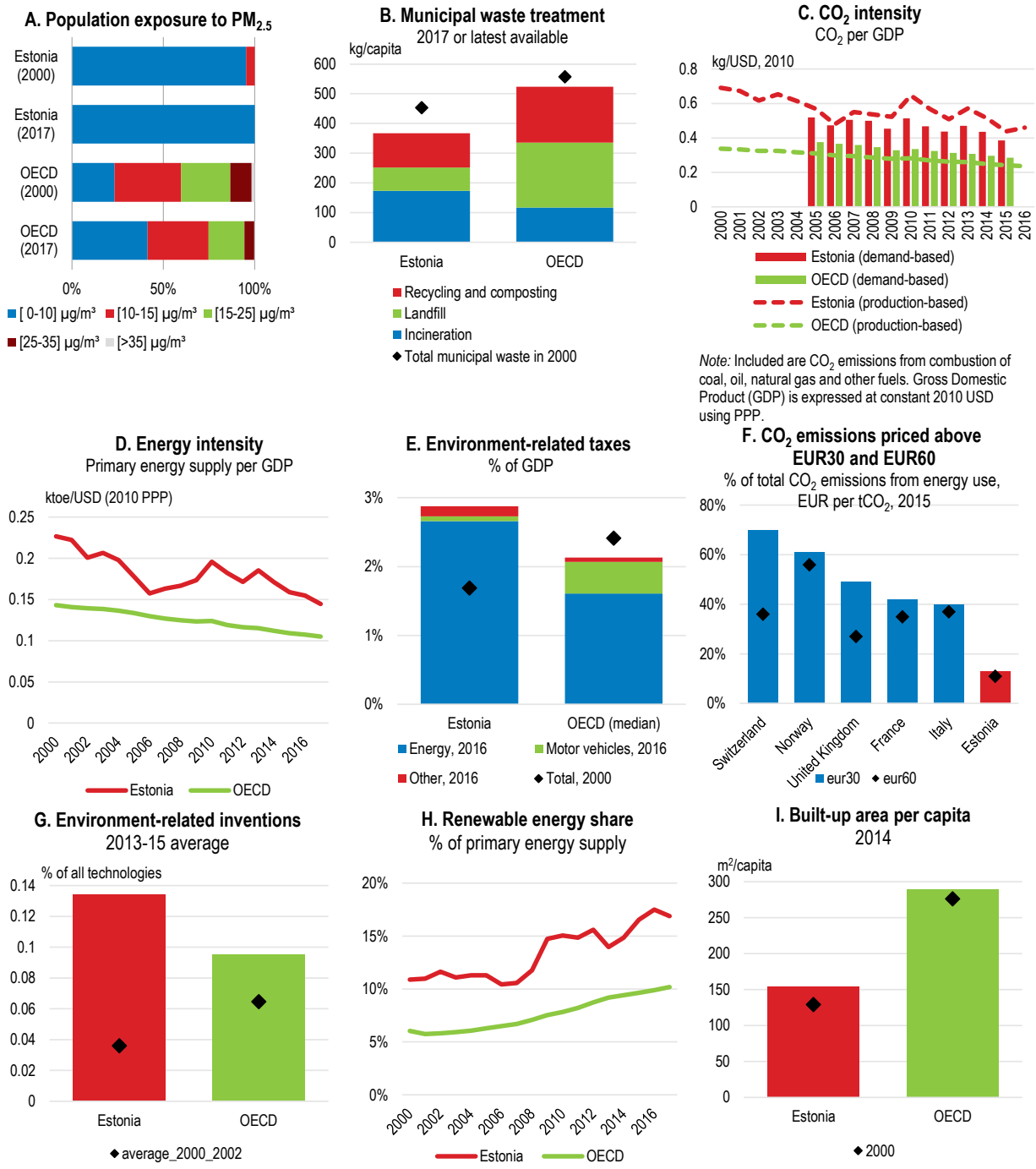
promote sustainable forestry over the past two decades, including an advisory system for private forest owners, support to compile forest management plans, public campaigns and easy access to forestry data. However, the 2017 Environmental Performance Review (OECD, 2017c) highlights that Estonia needs to further promote sustainable forestry practices through better co-operation and dissemination of knowledge among private forest owners.

Estonia liberalised its retail electricity market in 2013, and has completed the roll-out of smart meters. Dynamic pricing contracts help to match demand and supply of electricity in real-time. Such contracts are available, and used by approximately one-third of the population. Additional measures to boost the use of dynamic pricing contracts would help adjust consumption to more volatile production from renewable sources, with the added benefits of making demand more robust to supply disruptions and reducing the dominant position of the incumbent (European Commission, 2019).

Transport is a key sector, as in most EU countries (European Commission, 2019). Average CO2 emissions from new cars in Estonia are the highest among EU countries (European Environment Agency, 2018). The government is investing in the electrification of railways and extension of tramways. The 2017 Environmental Performance review recommends introducing a road pricing system or taxes on motor vehicles adjusted to reflect the environmental characteristics of the vehicle, including CO2 emissions. Such steps would help Estonia integrate incentives for the purchase of zero-carbon vehicles without budgetary cost and prepare the pricing of road transport to the future low-fossil-fuel world. More generally, for cost-effective public investment, it is key to plan long-lived infrastructure in a way that is consistent with decarbonisation (OECD, 2018c; OECD/The World Bank/UN Environment, 2018).

Estonia has reduced household waste over the past 15 years (Figure 30.I). This trend has however reversed sharply with rising incomes in recent years, and recycling is low. Improving waste collection infrastructure and increasing fees on domestic mixed waste going to incineration or other treatment, as recommended in the 2017 Environmental Performance Review, would reflect the higher environmental cost of incineration and could strengthen incentives to improve recycling and waste prevention.

Figure 1.30. A clean environment, but more needs to be done to curb greenhouse gas emissions



Source: OECD Green Growth Indicators database.

Table 1.13. Past OECD recommendations on keeping a clean natural environment

Main recommendations in past *Surveys*	Action taken since the previous *Survey*
Set tax rates on oil shale, vehicle and energy use at a level that better reflects the environmental damage they generate.	No action taken.
Strengthen incentives for operators of heating networks to improve efficiency.	No action taken.
Strengthen incentives to invest in energy efficiency of buildings.	No action taken.

Smart public governance in cooperation with people

Being a small country with a relatively small public sector demands high public sector efficiency to deliver high-quality public services to equal standards across the country. Estonia's comprehensive push towards e-Government is important in this respect, and the country has spearheaded innovative approaches, such as e-elections and using artificial intelligence to judge minor offences (e-Estonia, 2019).The move towards performance-based budgeting and a stronger link to long-term objectives set in the "Estonia 2035" strategy, from 2020, is set to improve horizontal coordination.

A major step towards improving administrative capacity in larger administrative units, and hence deliver better local public services, was taken with the landmark 2017 territorial reform. The reform reduced the number of municipalities from 213 to 79 through a combination of financial incentives and a threat of forced merger for municipalities with less than 5000 inhabitants failing to present a voluntary merger proposal. The third elected level of government (county) was suppressed and their tasks transferred to ministries and already existing agencies (European Commission, 2018).

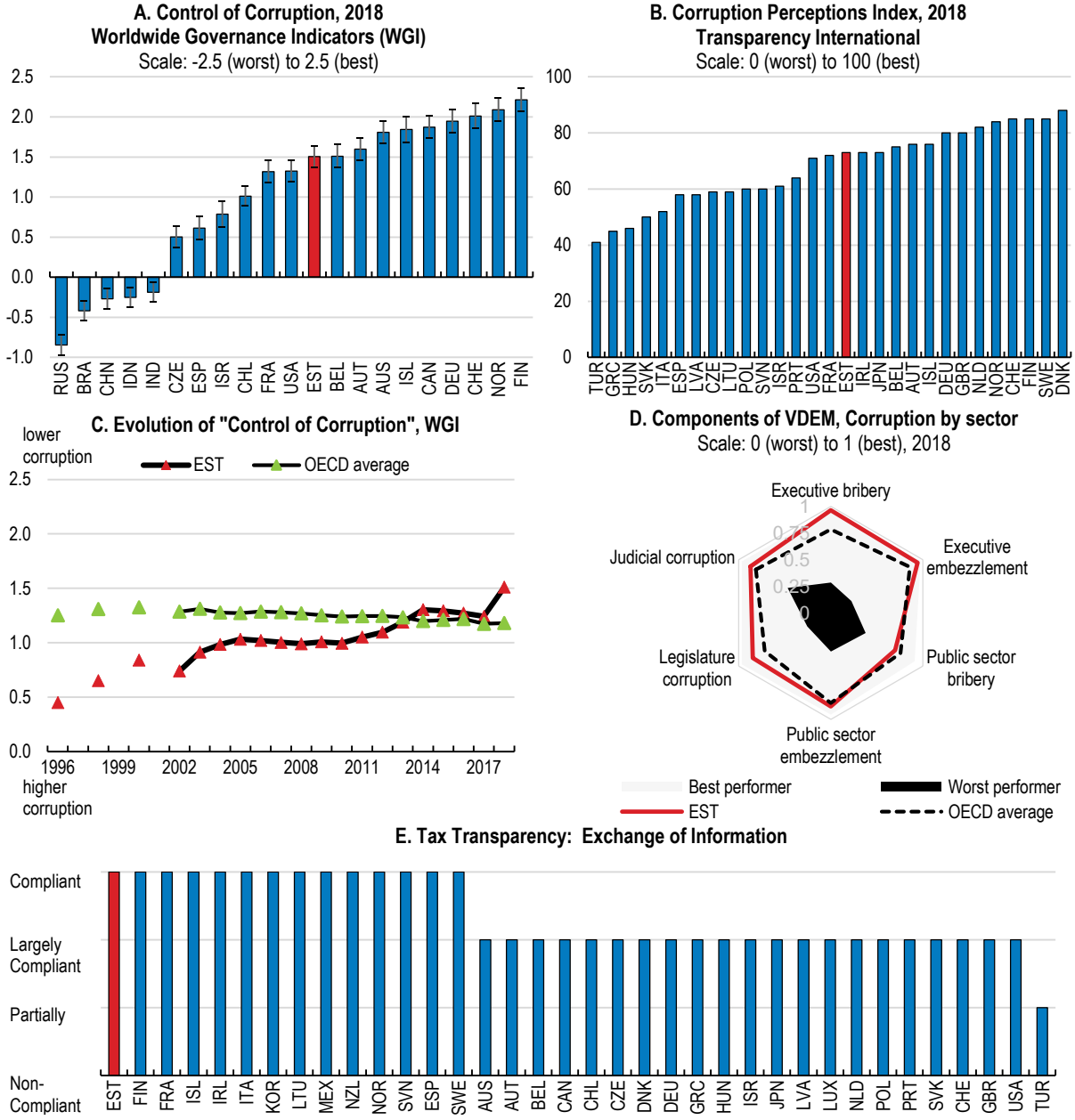
Fighting corruption is important for ethical and economic reasons, as it harms the business climate, distorts competition and diverts public resources into overpriced or worthless projects, and generates mistrust in institutions and corrodes the social fabric. Estonia ranks slightly worse than the OECD median in both the World Bank's Worldwide Governance Indicators (Figure 1.31.A) Transparency International's Corruption Perceptions Index (Transparency International, 2018), designating the country as the least corrupt of Eastern Europe (Figure 1.31.B). Estonia has improved its ranking considerably since the early 2000s (Figure 1.31.C), and it scores at or above the OECD average for each sub-component of the Varieties of Democracy index (Figure 1.31.D). Estonia is compliant with the standards set by the Global Forum on Transparency and Exchange of Information for Tax Purposes (Figure 1.31.E).

More than two-thirds of Estonian respondents to the 2017 Eurobarometer survey on corruption considered that corruption was widespread in their country, placing the country at the European Union average. However, only a tenth of respondents in Estonia report being affected by corruption in their daily lives. This is a lower share than in the European Union (25%), the United Kingdom (14%) and Sweden (11%) and not far below Finland (5%) and Denmark, the best performing country of the European Union. Furthermore, just 5% report personal experience with corruption. Also, a relatively high share find that there are enough successful prosecutions to deter people from corrupt practices. Corruption is seen as more widespread among political parties, politicians and officials issuing building permits, public tenders and business permits, in particular at the local level. Banks and public service providers enjoy relatively high levels of trust (European Commission, 2017).

As illustrated by the Danske Bank money-laundering scandal discussed earlier in this chapter, Estonian companies face challenges when conducting business abroad in high-risk jurisdictions and sectors. The OECD Working Group on Foreign Bribery points to several improvements to Estonia's legislative framework, including in clarifying corruption-related offences in the Criminal Code, allowing surveillance activities to counter corruption and adopting legislation guaranteeing confidentiality to private sector whistle-blowers. Also, to meet the requirements of the OECD Anti-Bribery Convention, Estonia should amend its legislation to waive the statute of limitations following a mutual legal assistance request, expand the scope of its false accounting offences and increase the corresponding sanctions. More should also be

done to improve systems and routines and train officials in the judiciary system and front-line agencies, such as the tax agency and the export credit agency, and to engage more effectively with stakeholders from the financial sector, the accounting and auditing professions, and the private sector (OECD, 2016b).

Figure 1.31. Perceived corruption is declining



Note: Panel A: the "Control of corruption" a composite indicator of the World Bank Worldwide Governance Indicators (WGI). For details, see Kaufmann et al., (2010); the chart shows both the point estimate and the margin of error. Panel B: the "Corruption Perceptions Index" by Transparency International subsumes several sub-indicators. Panel D: the corruption indicator by the Varieties of Democracy Project ("VDEM") is one of the subcomponents of the World Bank "Control of Corruption" indicator. Panel E summarises the overall assessment on the exchange of information in practice from the Phase 2 peer reviews by the Global Forum on Transparency and Exchange of Information for Tax Purposes. Peer reviews assess member jurisdictions' ability to ensure the transparency of their legal entities and arrangements to cooperate with other tax administrations in accordance with internationally agreed standards. The panel shows first round results (a second round is ongoing).

Source: World Bank; Transparency International; Varieties of Democracy Institute, University of Gothenburg, and University of Notre Dame; OECD Secretariat's own calculation based on the materials from the Global Forum on Transparency and Exchange of Information for Tax Purposes, OECD; Financial Action Task Force (FATF).

Table 1.14. Recommendations to enhance macroeconomic stability, inclusiveness and sustainability

MAIN FINDINGS (key findings in bold)	RECOMMENDATIONS (key recommendations in bold)
Creating macroeconomic conditions conducive to growth and well-being	
In the recent cyclical upturn, windfall revenues have been spent, making fiscal policy pro-cyclical.	**Avoid pro-cyclical fiscal policy, and allow the free play of automatic stabilisers. In case of a strong downturn, fully use the exemption clause built in the existing fiscal rule. .**
Productivity growth has been sluggish. The overall level of subjective well-being is low by OECD standards.	**Increase spending on measures boosting the long-term growth potential and inclusiveness such as infrastructure connectivity, innovation and education.**
Real-estate related tax revenues are low, as the tax base does not include residential housing. Consumption taxes are high.	**Introduce a recurrent tax on the ownership of residential real estate. Reduce labour and consumption taxes.**
Local governments provide a quarter of public investment and their budgets are not approved by the central government. This risks foregoing projects with large positive externalities.	Require the assessment of spillover effects of infrastructure projects at the feasibility phase.
Government spending by functional classification is not publicly available.	Publish government spending by functional classification.
As Estonia rapidly catches up with more advanced EU countries, it will be less eligible for EU funds.	Prepare an exit plan for infrastructure spending envisaging decreasing EU funding. Set up a robust legal framework before implementing PPPs.
A previous proposal to strengthen the legal framework to prevent money laundering and financing of terrorism was not passed by the parliament due to the election cycle. Anti-money-laundering measures have been strengthened considerably, and the Government is preparing a new proposal to Parliament.	**Continue strengthening regulations and allow the freezing of assets by the regulator in the case of suspected money laundering and increase fines to deterring levels.** **Continue to strengthen Baltic-Nordic coordination in the fields of financial sector supervision and anti-money laundering.**
Collateral in the form of fixed assets is usually required when borrowing from banks, but other assets, such as intellectual property, are not accepted as collateral.	Establish a system and standards to accept intangible assets as collateral.
Product market and governance reforms for greater productivity	
Estonia liberalised its retail electricity market in 2013, and has completed the roll-out of smart meters. Dynamic pricing contracts are available, but only used by approximately one-third of the population.	Introduce additional measures to increase consumer engagement to reduce the dominant position of the incumbent electricity provider and boost the use of dynamic pricing contracts.
User satisfaction with public services is below the OECD average and collection and use of user feedback is wanting.	Increase collection and use of feedback by public service providers to increase service quality.
The OECD Anti-Bribery Convention points to unresolved weaknesses in anti-bribery legislation, including a statute of limitations following a mutual legal assistance request, a narrow scope of false accounting offences and low corresponding sanctions.	To meet the requirements of the OECD Anti-Bribery Convention, amend legislation to waive the statute of limitations following a mutual legal assistance request, expand the scope of false accounting offences and increase the corresponding sanctions.
Sharing the benefits of growth in a more equitable way and providing a greener environment	
Health insurance coverage is incomplete and out-of-pocket costs are high. The way to extend coverage to all is being explored.	**Extend health insurance coverage for the entire population. Encourage the inactive non-recipients to obtain health insurance.**
Death rates from several diseases are on the rise, part of which could be prevented by early screening.	Provide free screening of diseases on the rise for people at risk to economise on future treatment costs.
The death rate from accidental poisoning is one of the highest in the OECD.	Make rules for handling poisonous materials more rigorous and fines for non-observance deterring to reduce deaths related to accidental poisoning.
The gender wage gap is high.	**Require the reporting of the wage gap and action plans to reduce it, including in the private sector. Hold companies accountable for their action by for instance, requiring explanation for slow progress.**
The second pillar pension funds charge high fees and returns have been low. The proposed reform to allow withdrawal of funds would generate extra short-term public revenues but would risk pension adequacy and aggravate old-age poverty in the longer term. The impacts of the proposed changes have not been properly assessed, and public consultations have been limited.	**Do not allow withdrawal from the second pillar of the pension system before retirement. Assess the impacts of potential changes to the pension system, including on pension adequacy and macroeconomic stability. Enhance competition in pension markets, and make all costs transparent.**
Regional disparities are high in multiple dimensions.	Improve connectivity across regions to reduce disparities.

Poverty is persistent among certain groups, for instance, the old.	Better exploit digitally available information to target the left behind.
Proficiency in the Estonian language is key to obtaining citizenship for residents, but not all have the chance to receive such training.	Ensure that all people have the chance to acquire proficiency in the Estonian language. Provide sufficient incentives to Estonian language teachers to move to ethnic minority areas or dispatch them as part of their career requirement.
The oil shale industry is very CO_2 intensive. The industry is highly sensitive to international prices on oil and CO_2 emissions in the EU Emissions Trading Scheme (ETS).	**Review taxes and charges to reflect costs and externalities associated with oil shale mining and use.**
The amount of household waste has increased sharply in recent years and recycling is low.	**Improve waste collection infrastructure and raise fees on domestic mixed waste going to incineration or landfills to incentivise recycling and waste prevention.**
Logging has increased over the past few years.	Promote sustainable forestry practices through better coordination and dissemination of knowledge among private forest owners.

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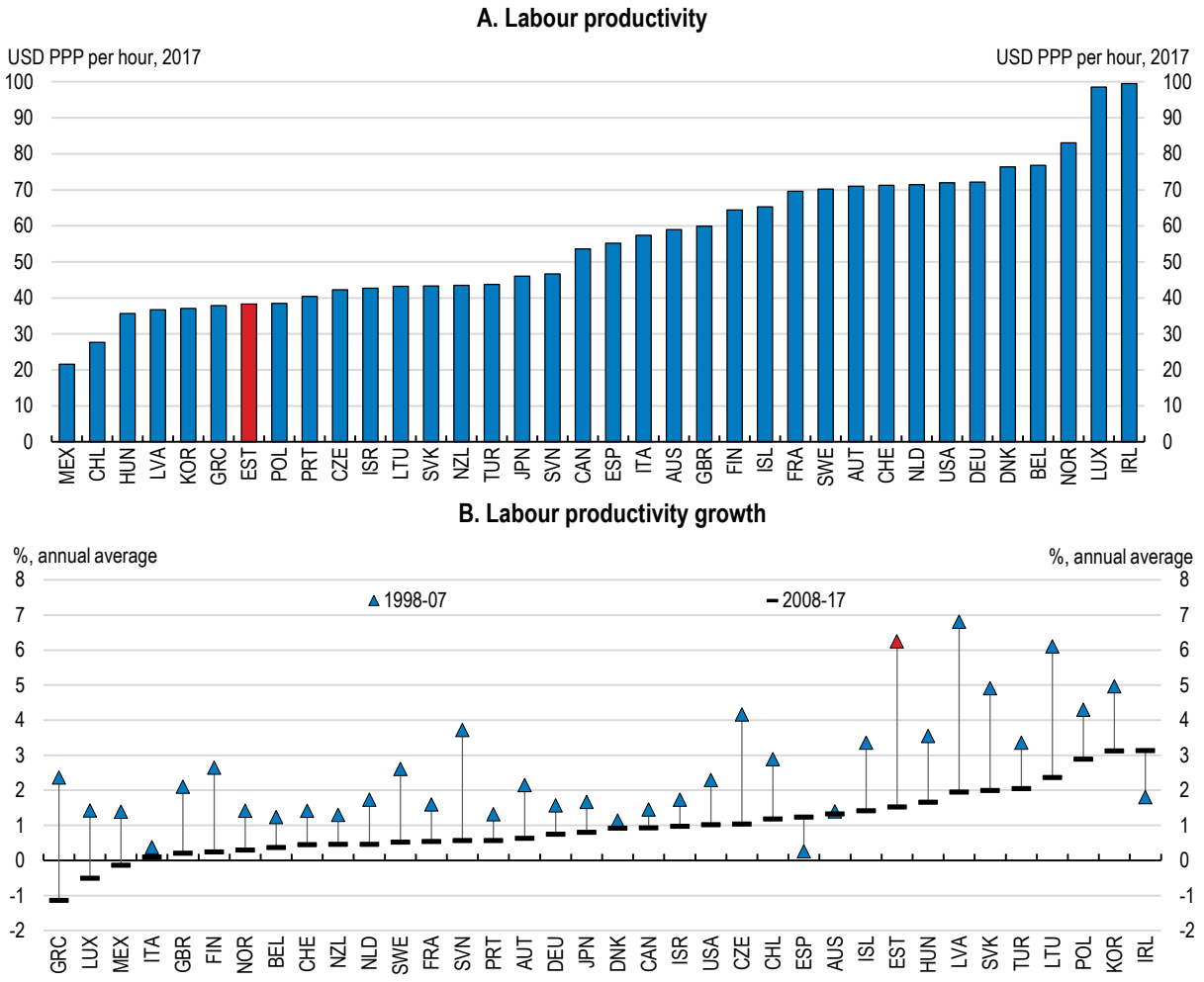
2 Seizing the productive potential of digital change

Technologies such as cloud computing, software to automate supplier- and customer relations, online platforms and artificial intelligence seem to offer a vast potential to boost productivity and living standards. However, aggregate productivity growth has declined sharply across the OECD over the past decades. Estonia is no exception, though it is well placed to gain from digital technology diffusion, with strong digital foundations, including advanced and secure physical and digital infrastructure and world-leading e-government services. Turning this potential into a productivity boost necessitates speeding up digital take-up also outside of the ICT sector and fostering the complementarities between digital technologies, skills and policies. Skills are high in general, and the supply of ICT specialists is picking up. There is still potential to improve digital user skills, and notably to put skills to better use by improving management skills and practices. Business-friendly regulations in general and pioneering attempts in some areas will likely spur the adoption of digital technologies. However, insolvencies are too slow and costly, command-and-control regulations relatively frequent and public ownership in network industries is high. Strengthening collaboration between industry associations, labour unions and industry clusters within technology investments, internationalisation, skill supply and management practices could help the country better realise complementarities between technologies, skills and policies, and thereby tap deeper into the productivity potential offered by digital technologies.

Productivity needs a boost, and digital technologies can help

Digital technologies change the fabric of our economies. Governments have new ways to interact with and provide services to citizens and firms. Firms have new tools to design, produce and market goods and services, and to interact with other firms, workers, consumers and governments. Individuals have new tools for social and economic interactions. Technologies such as cloud computing, software to automate supplier- and customer relations, online platforms and artificial intelligence seem to offer a vast potential to boost productivity and living standards, but aggregate productivity growth has on the contrary declined sharply across the OECD the past decades. Estonia is no exception. Labour productivity growth was impressive from the 1990s, following independence from the Soviet Union, but has slowed since the Global Financial Crisis (Figure 2.1; OECD, 2019a).

Figure 2.1. Productivity growth has declined sharply in many countries, including Estonia

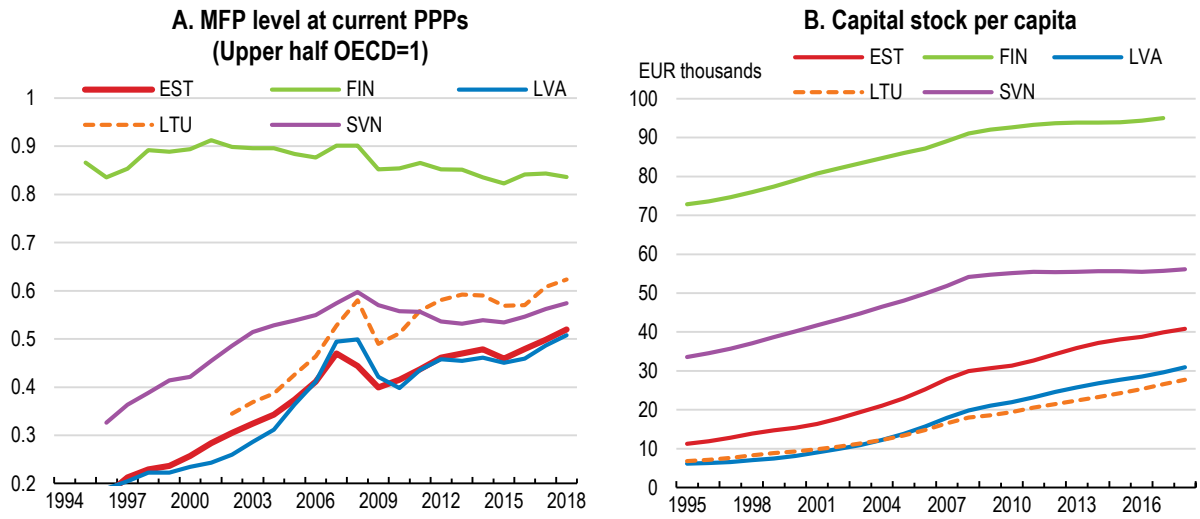


Note: Labour productivity is measured as GDP per hour worked. For Ireland, the data on productivity growth (Panels B and C) exclude the foreign-owned multinational enterprise dominated sector and cover 2000-16 (source: Irish Central Statistics Office).
Source: OECD Economic Outlook 105.

Estonia has considerable potential to gain from adopting efficient technologies, as the multi-factor productivity (MFP) gap remains wide, not only compared to the United States and advanced EU

economies, but also compared to many Central and Eastern European countries (Figure 2.2, Panel A). On the other hand, stable investment growth has steadily increased the per capita capital stock, even though the level of capital per capita is still to catch up with high-income OECD countries and some advanced Central and Eastern European economies, such as Slovenia (Panel B).

Figure 2.2. Weak multifactor productivity growth contrasts relatively strong capital accumulation

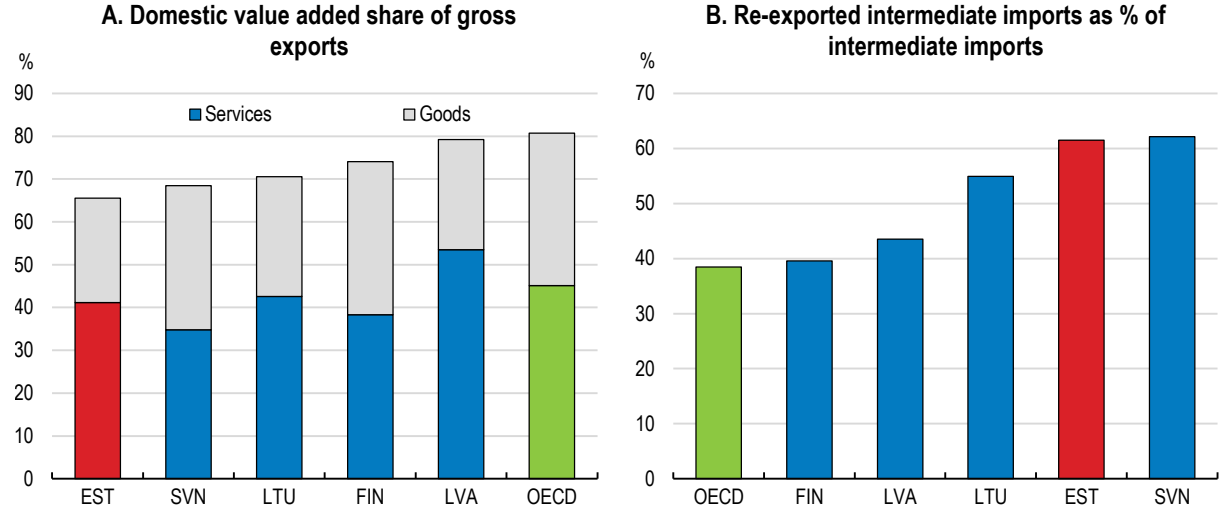


Source: OECD Economic Outlook database.

Low productivity is related to Estonia's very low share of domestic value added in final demand at just over 58%, the fifth lowest in the OECD. Exports, similarly, have a high share of foreign value added, and a great deal of intermediate imports are re-exported (Figure 2.3), reflecting that Estonian production is often situated in low value-added mid-stream activities of global value chains (GVCs), such as manufacturing and assembly (Ali-Yrkkö et al., 2017).

Benkovskis et al. (2017) show that Estonian companies who export are more productive than those who do not. High-performing firms are more likely to start exporting, but non-exporting firms who start to export see a significant productivity boost on average, driven by those entering high-value-added upstream activities in GVCs. Nonetheless, widespread foreign ownership of companies may be an impediment to local product development and thus capturing more lucrative up-stream and down-stream activities such as research, design and marketing (Valdani Vicari and Associates and Wik Consult, 2018). Indeed, foreign firms appear attracted by Estonia's natural endowments (wood, oil, etc.) and relatively cheap labour, and consider the country as a production base. However, with wages catching up, higher value-added activities need to be captured to ensure stable productivity gains in the longer run, and there are signs that this process has gathered pace lately (Eesti Pank, 2019).

Figure 2.3. Exporters are heavily relying on foreign inputs



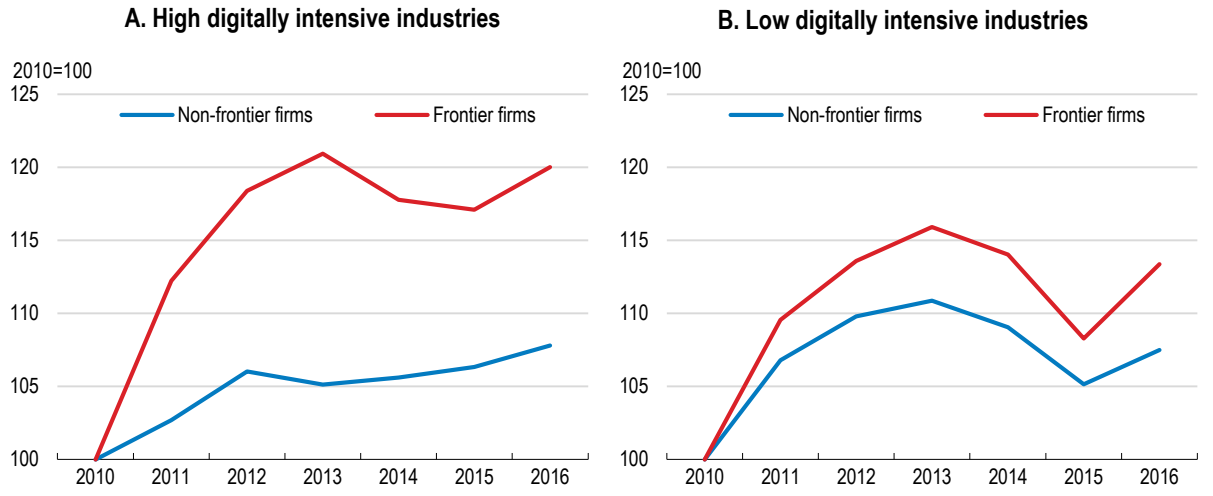
Source: OECD TiVA database.

The productivity slowdown across the OECD has multiple and partly interlinked reasons, some related to the legacy of the global financial crisis, for example that spare capacity have been high and access to finance difficult in a protracted cyclical downturn, holding back investments in tangible and intangible capital in some countries and industries. However, productivity growth started slowing down before the crisis in most OECD countries and remains weak to date, suggesting an important role for structural factors.

Previous OECD research indicates that productivity performance of the best performing firms ("the productivity frontier") has continued to grow at least as fast as before, while the divergence between the frontier and the rest has increased, holding back aggregate productivity (Andrews et al., 2016). This pattern also holds for Estonia, and divergence is particularly strong in digitally intensive industries (Figure 2.4).

Figure 2.4. Productivity dispersion has increased in Estonia, especially in digital intensive industries

Labour productivity at the frontier and for the average non-frontier firm



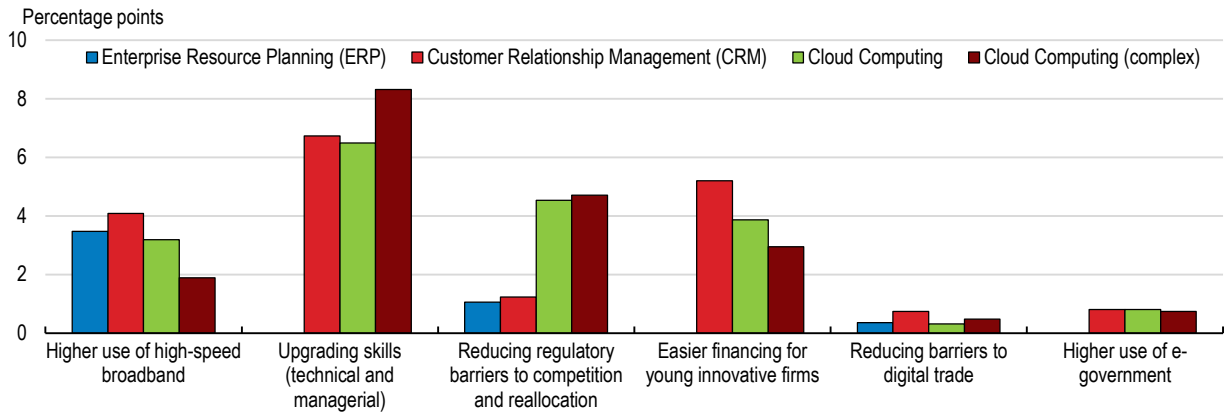
Note: "Frontier firms" is measured by the average of log labour productivity for the top 5% of companies with the highest productivity levels in each 2-digit industry and year. The "Non-frontier firms" lines capture the averages of the log-productivity distribution in each industry and year (excluding the top 5%). The values obtained for the detailed 2-digit industries are averaged to industry groups that are classified either as having "high" or "low" digital intensities according to the methodology in Calvino et al. (2018).

Source: Pareliussen and Mosiashvili (2020), based on Statistics Estonia annual bookkeeping reports database.

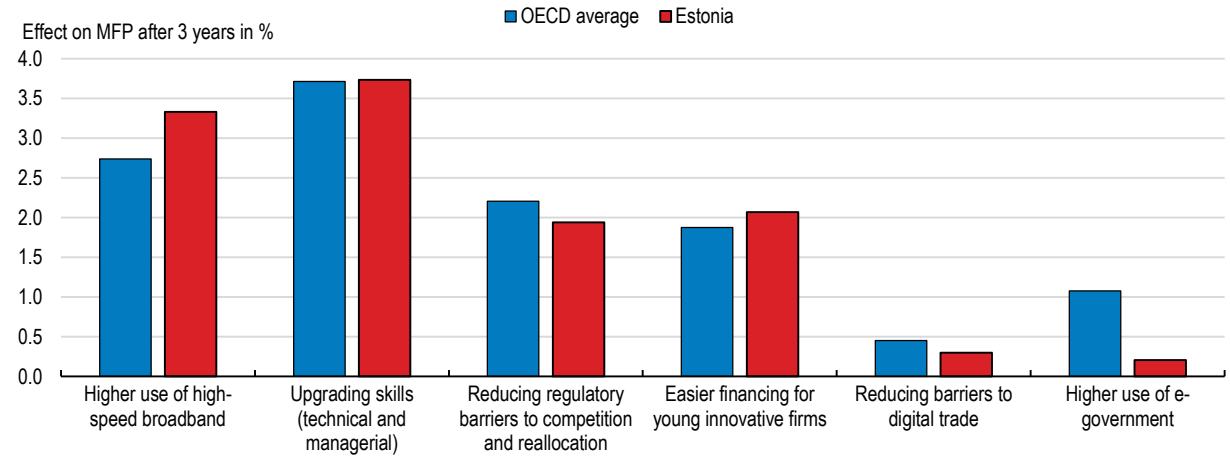
A previous wave of digitalisation, associated with the diffusion of personal computers, boosted productivity growth in the late 1990s. However, the current wave of digitalisation has not boosted productivity sufficiently to offset the cyclical- and structural headwinds to productivity mentioned above. Recent OECD work argues that digitalisation has supported productivity growth, but that the remaining potential to use digital technologies to boost productivity further is vast, notably by moving digital adoption rates in laggard firms closer to those of frontier firms. Increasing the up-take of high-speed broadband, upgrading skills, reducing regulatory barriers and easing financing are all associated with higher use of digital technologies, which is in turn associated with substantial productivity gains (Figure 2.5; OECD, 2019a; Sorbe, et al., 2019 Pareliussen and Mosiashvili, 2020).

Figure 2.5. The productivity potential from digital adoption is substantial

A. Association between policy factors and digital adoption in Estonia



B. Subsequent association with productivity



Note: Estimated association between 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 (see Box 1 in Sorbe et al., 2019). The effect of "Higher use of high-speed broadband" on productivity combines direct and indirect effects. "Upgrading skills" covers participation in training (for both high and low-skilled), quality of management schools and adoption of High Performance Work Practices (HPWP). "Reducing regulatory barriers to competition and reallocation" includes lowering administrative barriers to start-ups, relaxing labour protection on regular contracts and enhancing insolvency regimes. "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 and that policy factors in each group are largely independent from each other.
Source: Sorbe et al. (2019).

Estonia has sizeable digital strengths. It is a world leader of e-government, and the birthplace of a number of successful ICT start-ups, many of them now internationally renowned companies, such as Skype, Bolt (Taxify), FunderBeam and TransferWise. In contrast to the large number of world-class players in the ICT

sector, traditional companies lag behind in the adoption of digital technologies. This chapter argues that the potential of speeding up digital take-up outside of the ICT sector to boost productivity growth is considerable, and that the government can do more to facilitate a change of pace. First, supporting access to high-speed broadband and the stable and secure functioning of vital digital services and infrastructure lays the foundations for digitalisation in terms of physical access and trust among users. Second, ensuring high, up-to-date and equitably distributed skills and an adequate social safety net are central to both seizing the potential to automate, and to minimise the burden for those who are negatively affected. Third, the public sector is instrumental in creating a business-friendly environment, with regulations supporting business dynamism that allows human resources, capital and technology to find their most productive use as well as experimentation with new technologies and business models. Finally, realising the potential to boost productivity by means of digital technology adoption depends on the successful exploitation of complementarities; between different digital technologies; with firms' capabilities and assets, notably different types of skills; and with policies facilitating digitalisation and an efficient allocation of resources in society (OECD, 2019a; Sorbe, et al., 2019).

Better utilising productivity potential of advanced digital technologies

The productivity potential of embracing digitalisation is substantial in Estonia and elsewhere, and goes well beyond the productivity potential of adopting any single currently available technology. However, studies of existing technologies can illustrate potential gains. For example, increasing the sector-level adoption rate of Customer Relationship Management (CRM) front-office software by 10 percentage points is associated with a 1.7% productivity increase in the average EU firm. Cloud computing and Enterprise Resource Planning (ERP) back-office software each adds an average of approximately 1%, when implemented in isolation (OECD, 2019a; Gal et al., 2019).

However, digital technologies are complementary to each other. Cross-country regressions indicate that boosting high-speed Internet connections (30Mbit/s) by 10% would boost productivity directly by 2% in Estonia, while indirect effects from increased adoption of cloud computing, ERP and CRM would add another 1.5% to the productivity increase (Sorbe et al., 2019). Combining different digital technologies, for example back-office and front- office automation, can also yield considerable gains. In addition, complementarities with other firm assets, such as skills and organisational practices, are illustrated by the finding that those firms who were most productive in the outset were also those gaining the most from adopting new digital tools (Gal et al., 2019).

Finally, in addition to boosting productivity in adopting firms, the adoption of digital technologies and digital skill use generate sizeable spill-over effects in Estonia. For example, increasing the share of employees using computers for work purposes by 10 percentage points is associated with 1.4% higher annual productivity growth in the adopting firm. However, if the average firm in the sector increases its level of digitalisation by a standard deviation, the average productivity gain increases to 2.9% (Box 2.1).

Box 2.1. Firm- and sector-level productivity gains from digital technology adoption in Estonia

Recent OECD work, notably Gal et al. (2019) and Sorbe et al. (2019), have shown substantial firm-level productivity gains associated with higher average rates of digital adoption in the sector to which the firm belongs. The structure of the data did not allow these studies to disentangle direct effects on the firms actually adopting the technologies from indirect effects of belonging to a sector with high digital intensity. New OECD research, resting on a unique firm-level dataset combining various survey- and registry data from Statistics Estonia covering 2700 firms in 10400 observations, sheds new light on this question. Each firm-level variable measuring digital technology adoption, digital skill use and training are decomposed into sector averages and individual firms' difference to their respective sector averages. The former measures between-sector associations with productivity growth, while the latter measures within-sector (between-firm) associations. Assuming causality, within-sector effects can be interpreted as the direct productivity boost from adopting firms, while sector effects can be interpreted as sectoral spill-overs linked to growth at the sectoral productivity frontier and non-frontier firms learning from the innovations and good practices of frontier firms. The results show that the firm-level productivity growth premium of being an adopting firm is consistently positive and sizeable across different digital technologies and measures of skill intensity. The overall productivity growth of the private sector is on the other hand dominated by positive spill-over effects of digitalisation, concentrated to manufacturing industries (Table 2.1).

Table 2.1. The productivity premiums from digital adoption and skill use are substantial

Percent difference in annual labour productivity growth associated with digital adoption/ digital skill use

	High-speed broadband	ERP software	CRM software	Digital skill use intensity	ICT training
Adopting firm perspective					
Direct effect	2.90	3.80	4.50	4.62	5.00
Sector perspective					
Direct effect	0.29	0.38	0.45	1.44	0.50
Sector spill-overs	0.83	1.04	1.58	1.47	2.22
Sector total	1.12	1.42	2.03	2.91	2.72

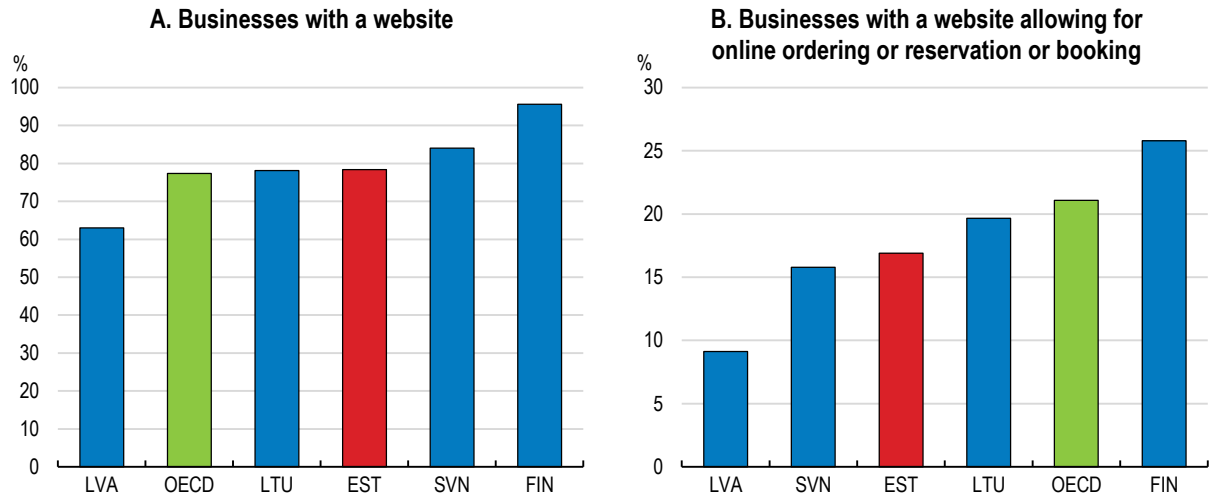
Note: The data and methodology do not allow a causal interpretation of the results. The results are calculated in seven individual regressions because of high correlations between the different digital adoption and skill-related variables. The results are therefore not cumulative. Adopting firm perspective: For digital skill use intensity (the share of employees using computers for work purposes), the adopting firm is assumed to increase adoption/skill use with one standard deviation (within sector). For ICT training, broadband, ERP and CRM, which are all binary variables, firms are either adopters or non-adopters. Sector perspective: The sector average and spill-over effects are calculated for a 10 percentage points increase and scaled by manufacturing's share of total net profits in the sample (approximately 47%) to arrive at an estimate of the average effect for the total sample. The columns show (re-scaled) results for firm-level dummy variables of the adoption of broadband (>30Mbit/s), ERP software, CRM software and the provision of ICT training to employees, as well as the share of employees using computers for work purposes. Calculations are based on regression coefficients from Pareliussen and Mosiashvili (2020), all of which are significant at least at the 95% level. Data cover the years 2011-2016.

Source: Pareliussen, J. and N. Mosiashvili (2020), *"Digital technology adoption, productivity gains in adopting firms and sectoral spill-overs – Firm-level evidence from Estonia"*, OECD Economics Department Working Papers, OECD Publishing, Paris, forthcoming.

Estonian companies lag behind the OECD average in realising the productivity potential from using advanced digital tools. For example, most have their own website, as in the average OECD country (Figure 2.6, Panel A), but they use websites mainly to disseminate information about the firm, not for uses with the potential of enhancing productivity further, such as interacting with customers. Fewer firms have

websites equipped with functions for online ordering or booking than in the average OECD country, let alone high-performers, such as Finland (Panel B).

Figure 2.6. Many firms have own websites, but their functionality is rather limited



Note: % of enterprises with 10+ employees, 2018.
Source: OECD ICT database on business usage.

Digital foundations are strong

The relative weakness in digitalisation of the non-ICT businesses sectors contrasts with an ICT sector with considerable strengths, and Estonia's reputation as a front-runner in e-government. Solid digital foundations, notably physical access to high-speed broadband and trust among users nurtured by stable and secure vital digital services and infrastructure, are necessary enablers for digital technology diffusion (OECD, 2019c).

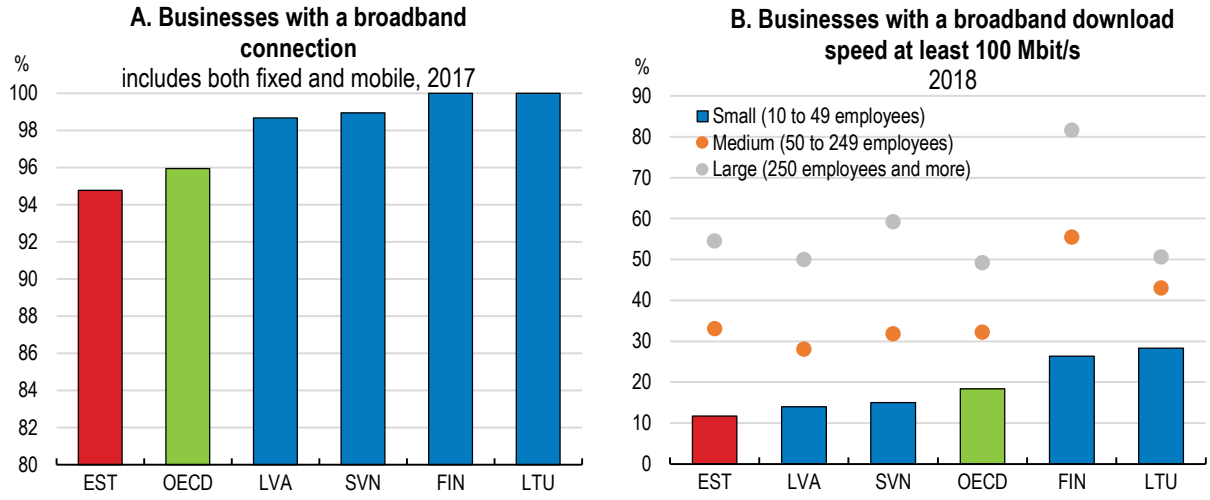
Broadband infrastructure is of high quality, but under-utilised by companies

Infrastructure, in particular businesses' access to high-speed broadband, is a prerequisite to the adoption of digital technologies. In Estonia, companies using high-speed broadband connections (30Mbit/s or higher) see 3.7% higher productivity growth than others (Pareliussen and Mosiashvili, 2020). The Estonian backbone broadband network is of high quality, and current efforts to complete the deployment of the middle-mile network of fibre-optic cables will see 98% of all residential buildings, companies, and public authorities located within 1.5 km of at least one fibre-optic network access point with speeds of at least 100Mbit/s by 2020 (Government of Estonia, 2018). This effort also raises broadband coverage in Estonia at any speed, which was lower than the European Union average in 2018. The last-mile network may still hold back connection speeds in some locations, despite on-going efforts to connect at least 100 000 additional addresses, 40 000 of which with government support (European Commission, 2019a). Therefore, government subsidies for last-mile connection, in particular for small and medium-size enterprises are justified. Such subsidies should be based on thorough cost-benefit analysis.

Take-up of high-speed broadband is relatively low in Estonia despite high-quality infrastructure. In 2018, 83% of households were covered by broadband connections of 100Mbit/s or faster, considerably above the EU average of 60%, but the take-up was only 11% (European Commission, 2019a). Most companies have a broadband connection (Figure 2.7, Panel A), but few have ultra-fast connections of at least 100Mbit/s, especially among small- and medium-sized firms (Panel B). Realising a productivity boost from high-speed broadband access depends on firms actually connecting at higher speeds, but firms'

connection speeds lag well behind the potential. Making small- and medium-sized companies realise the benefits of a fast connection matters, since small firms (10-49 employees) in the manufacturing sector have a joint turnover about triple that of big firms (250 employees or more). However, benefits can only be fully realised when combined with investment in digital technologies and organisational capital (Fabling and Grimes, 2016).

Figure 2.7. Most firms have a broadband connection, but not ultra-high speed



Note: (Panel A) % of enterprises with 10+ employees.
Source: OECD ICT database on business usage.

E-government and core digital infrastructure excel globally

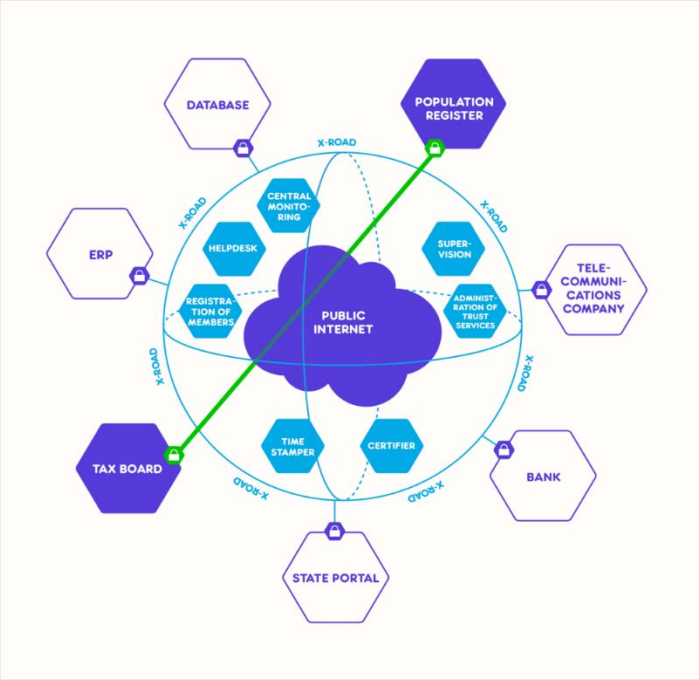
Estonia has been a frontrunner in digitising government services and by now all but three public services (marriage, divorce and real estate transactions) are securely delivered online (Box 2.2). Digitalisation of public services has been an important tool to build trust in the public sector after a tumultuous period following re-gained independence in 1991. The X-road, the communication- and encryption protocol at the centre of Estonia's e-government, in combination with the Estonian digital ID, provide secure, transparent and traceable encrypted communication between public and private service providers and individuals.

Online availability of government services in Estonia ranked second in the European Commission's e-government benchmark after Austria in 2017, exceeding even Finland (Figure 2.9, Panel A). Mobile applications, however, lag behind top performing countries (Panel B), and take-up is low. Greater availability of government services on mobile phones would probably increase uptake rates.

Box 2.2. E-Estonia

The building of e-Estonia started soon after the country's independence. Estonia's success in e-government depends crucially on two features, which to this day are missing in some OECD countries: One (or more) secure digital ID(s), commonly accepted by service providers, and a secure, commonly accepted communication protocol, such as Estonia's X-Road (Figure 2.8). In 1994 the Information Policy Law was passed and the Data Protection Department created. A following major milestone was the Digital Signatures Act in 2000, which allowed a number of government services requiring signature to go online. The same year marked the start of digital tax filing and paperless cabinet meetings. E-filing of personal income tax returns reached 95% as early as in 2013, ranking among the top third in the OECD. An even greater share of corporate income taxes and VAT were filed online and by now all those have gone paperless. In 2002 the e-ID card was introduced, which considerably simplified the way Estonians interact with the government. The e-health system was established in 2008, two years later e-prescriptions became available.

Figure 2.8. The X-Road platform for secure data sharing



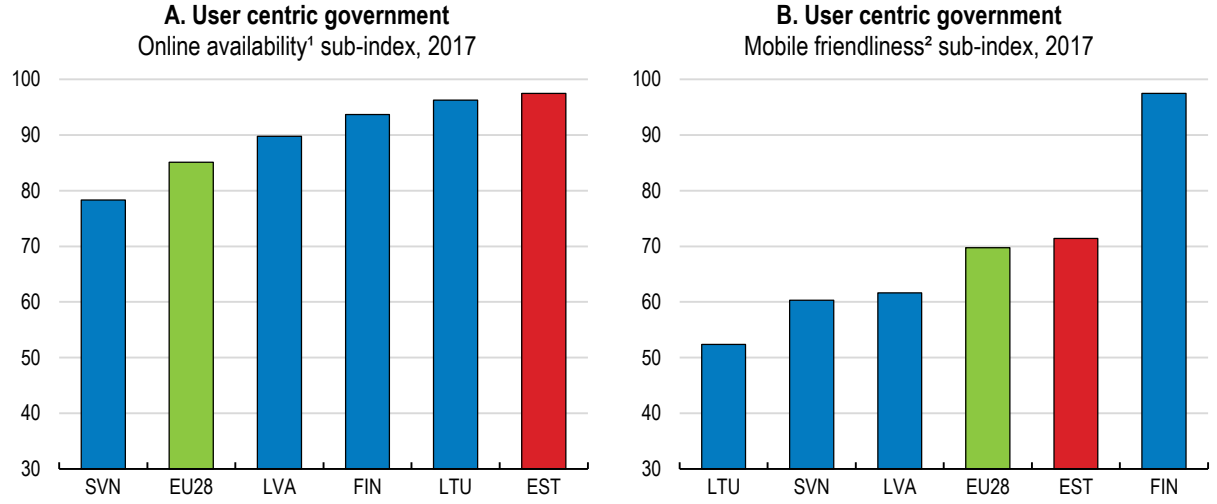
Source: X-Road (website, x-road.global) Nordic institute for interoperability services.

Data security is achieved by state-of-the-art technologies outsourced to the private sector through procurement contracts. Personal data in Estonia are not stored on a single server but at various data registry points, interlinked through the X-Road (introduced in 2001), a platform for secure data sharing, with all incoming and outgoing transactions authenticated and encrypted. X-Road does not build on blockchain technology, but similar to blockchain it secures traceability through a distributed ledger, meaning that any transaction or information access will be recorded in several places. Citizens can monitor the time and access point of their data files through the government service portal www.esti.ee.

A major principle of the system is single sourcing of data, for instance, the population registry is in charge of recording home addresses and all such queries will end up there. The use of digital signatures in Estonia is estimated to save 2% of GDP every year. The cost of e-voting, for instance is a mere 2 euros per vote, versus 6 euros in the case of paper-based voting.

Source: E-Estonia Guide (2018) and OECD (2015).

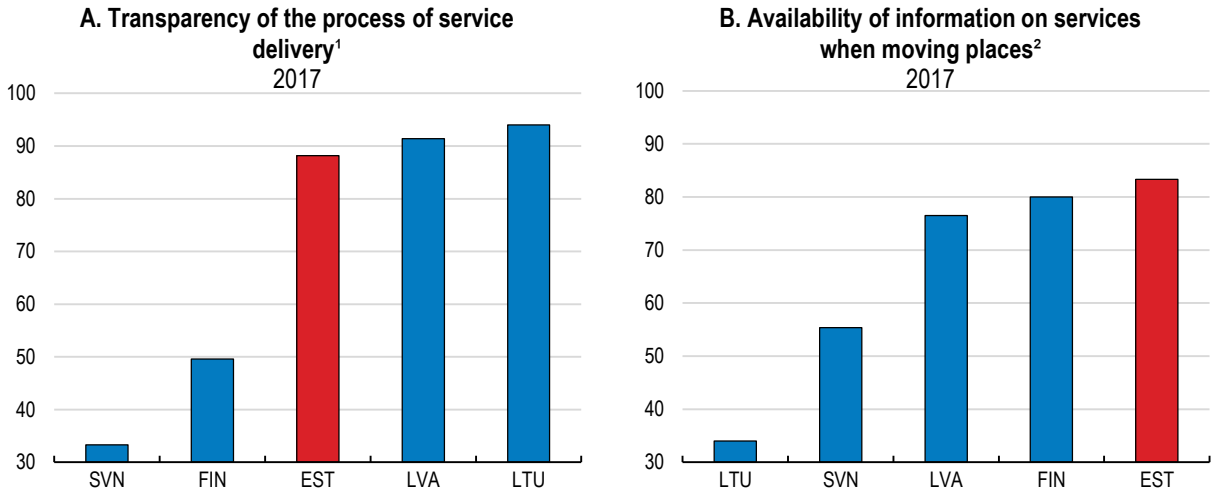
Figure 2.9. Online availability of government services is high, but could be more mobile friendly



Note: 1. The top-level benchmark user centricity (to which both the online availability and the mobile friendliness sub-index belong) indicates to what extent (information about) a service is provided online. Online availability: indicates if a service is online. Ranging from offline (0%), only information online (50%), fully online (100%).
2. Mobile friendliness: indicates if the website provides a service through a mobile-friendly interface, an interface that is 'adopted' to the mobile device.
Source: European Commission eGovernment Benchmark 2018.

Government e-transparency is high. It is relatively easy to find information on government services and on how the government is organised (Figure 2.10, Panel A). Estonia also scores high on the access to online information in case, for instance, of moving places (Panel B). Furthermore, it is a frontrunner in cross-border availability of online services, thereby contributing to the creation of the European Single Digital Market. Estonia also collaborates with Finland in the form of automated exchange of information about citizens moving from one country to the other. This prevents double payment of social security contributions and the mutual use of health care systems.

Figure 2.10. Government services are transparent and cover a wide range



Note: 1. The top-level benchmark Transparency indicates to what extent governments are transparent. Transparency of service delivery: indicates to what extent governments are transparent as regards the process of service delivery.
2. The top-level benchmarks for Citizen and Business Cross-border mobility indicates to what extent EU citizens can use online services in another country. Online availability: indicates if a service is online. Ranging from offline (0%), only information online (50%), fully online (100%).
Source: European Commission eGovernment Benchmark 2018.

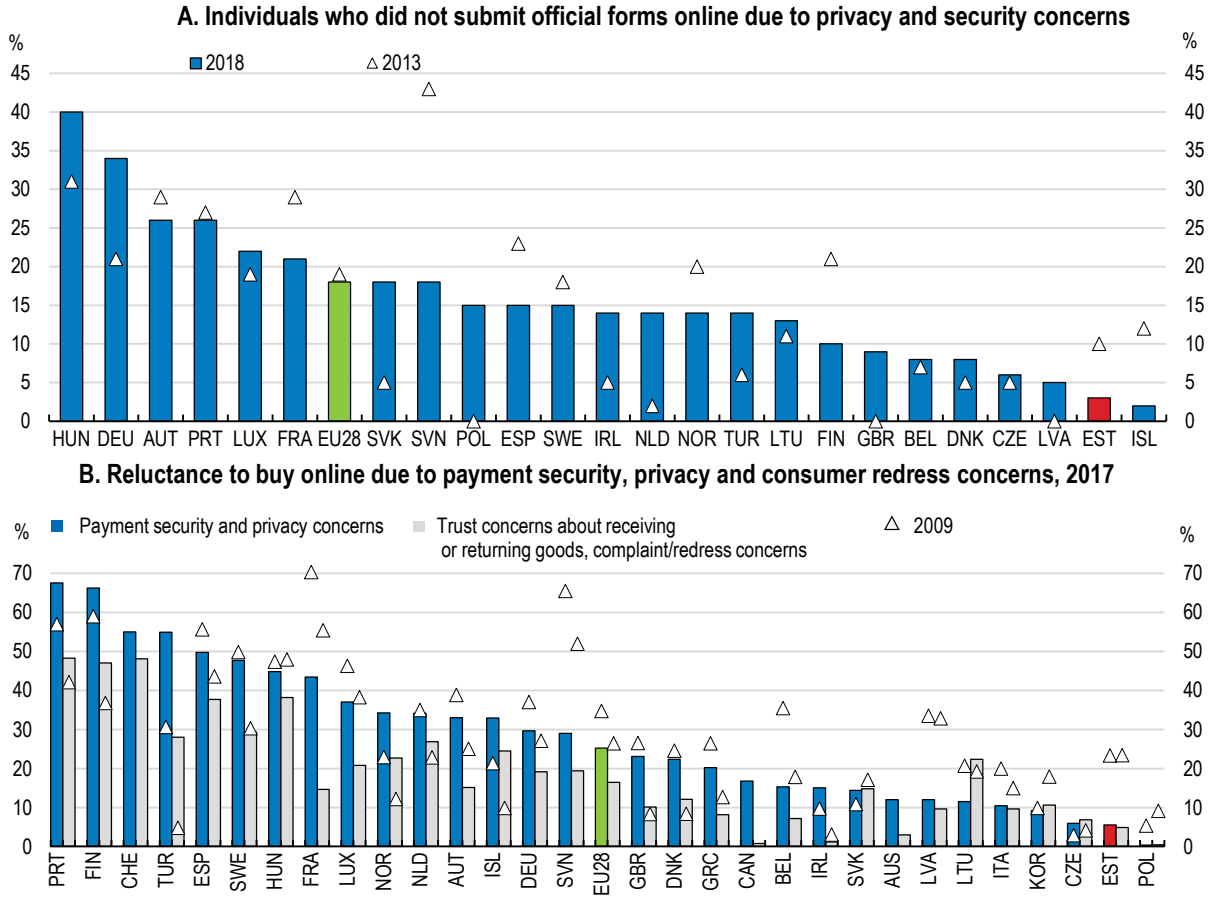
Security in key digital systems is high, but users should be more aware

A high level of digital security helps build the trust necessary for individuals, firms and the public sector to fully embrace digital solutions, and thus unleash their full productivity potential. Keeping the digital infrastructure and digital services secure becomes increasingly important, as an increasing share of service delivery and communication happening online raises the potential costs of security breaches. Vital services like rescue, electricity and water supply, phone and data communication, currency circulation, payment services and personal identity management increasingly rest on digital foundations (Praxis, 2019b), and adverse events to critical digital infrastructure can potentially have significant economic and social consequences.

Estonians have high trust in digital public services, and they trust key infrastructure to access private services online, such as payment solutions (Figure 2.11). Their trust is to a large extent warranted, as the country is a forerunner in the field of digital security, with a high level of expertise and good systems for coordination within different arms of government and key actors in the private sector (Box 2.3).

Figure 2.11. Estonians trust key online services

Individuals who did not submit official forms online due to privacy and security concerns, 2018



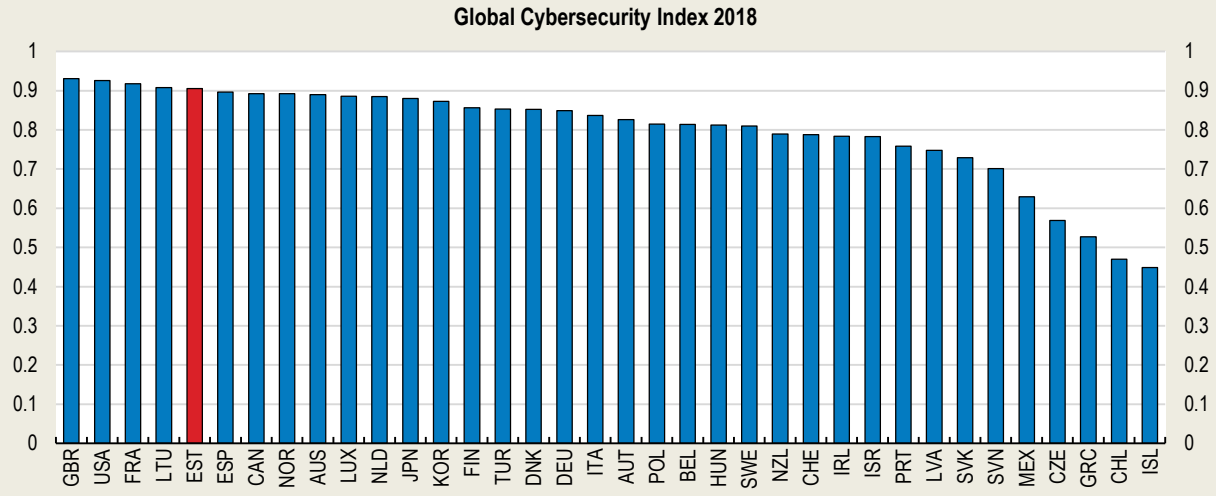
Note: The share of individuals who did not submit official forms online due to privacy and security concerns is calculated as a share of individuals who chose not to submit official forms online for any reason.

Source: OECD (2019e), Measuring the Digital Transformation: A Roadmap for the Future.

Box 2.3. Estonia – a Digital Security forerunner

Estonia is a forerunner in the field of digital security, ranking 5th in the Global Cyber Security Index 2018 (Figure 2.12). Estonia's cyber security capabilities, built up in parallel with its push for e-government, was put to the test during a massive cyber-attack targeting critical digital infrastructure in 2007. Except from approximately one and a half hour downtime on a number of public and private services, the integrity of the system was not compromised. The incident led to a renewed effort to secure the digital infrastructure, and in 2008 Estonia was one of the first countries in the world to issue a national cyber security strategy that recognised the interdisciplinary nature of cybersecurity and the need for coordinated action in the area. (Ministry of Economic Affairs and Communications, 2019).

Figure 2.12. The security of vital digital services is high



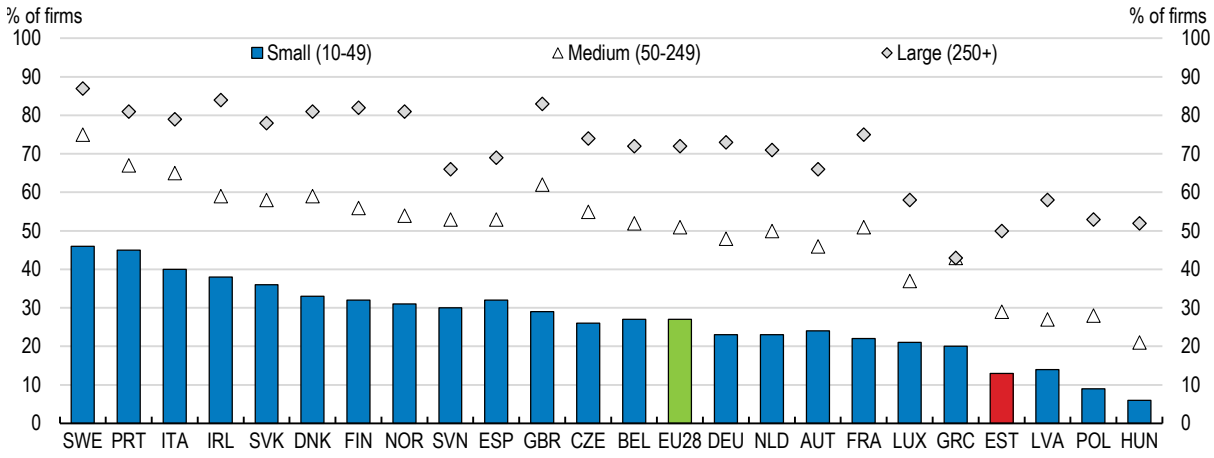
Source: International Telecommunication Union (2019), Global Cybersecurity Index 2018.

Estonia has a well-developed system to coordinate cyber-security across government and with the private sector. The civilian arm of digital security is organised under the Ministry of Economy and Communications, with the operational responsibility to maintain the civilian digital infrastructure delegated to the Estonian Information System's Authority. The Authority maintains close coordination with the Estonian Foreign Intelligence Service (under the Ministry of Defence) and the Estonian Internal Security Service (under the Ministry of the Interior) through the national Cyber Security Council, chaired by the Secretary General of the Ministry of Economic Affairs and Communications. The Council reports directly to The Government Security Committee, chaired by the Prime Minister. The Cyber Security Council coordinates with all relevant ministries, and maintains a network of Chief Information Security Officers from companies and state agencies that provide or oversee critical services. Estonia also plays a central role in international cooperation in the area, as host to the NATO Cooperative Cyber Defence Centre of Excellence in Tallinn (Ministry of Economic Affairs and Communications, 2019).

Even though the digital infrastructure and critical public and private services are well-protected, managing digital security risks is not just a matter for the public sector and private providers of vital services. It is the responsibility of everyone online, and there are still gaps among firms and individuals. Having a formally defined digital security policy is a sign of taking a pro-active approach to digital security. However, the average Estonian company lags behind the average country also in digital security, regardless of firm size (Figure 2.13).

Figure 2.13. Digital security lags behind in many companies

Enterprises having a formally defined security policy, by size, 2015

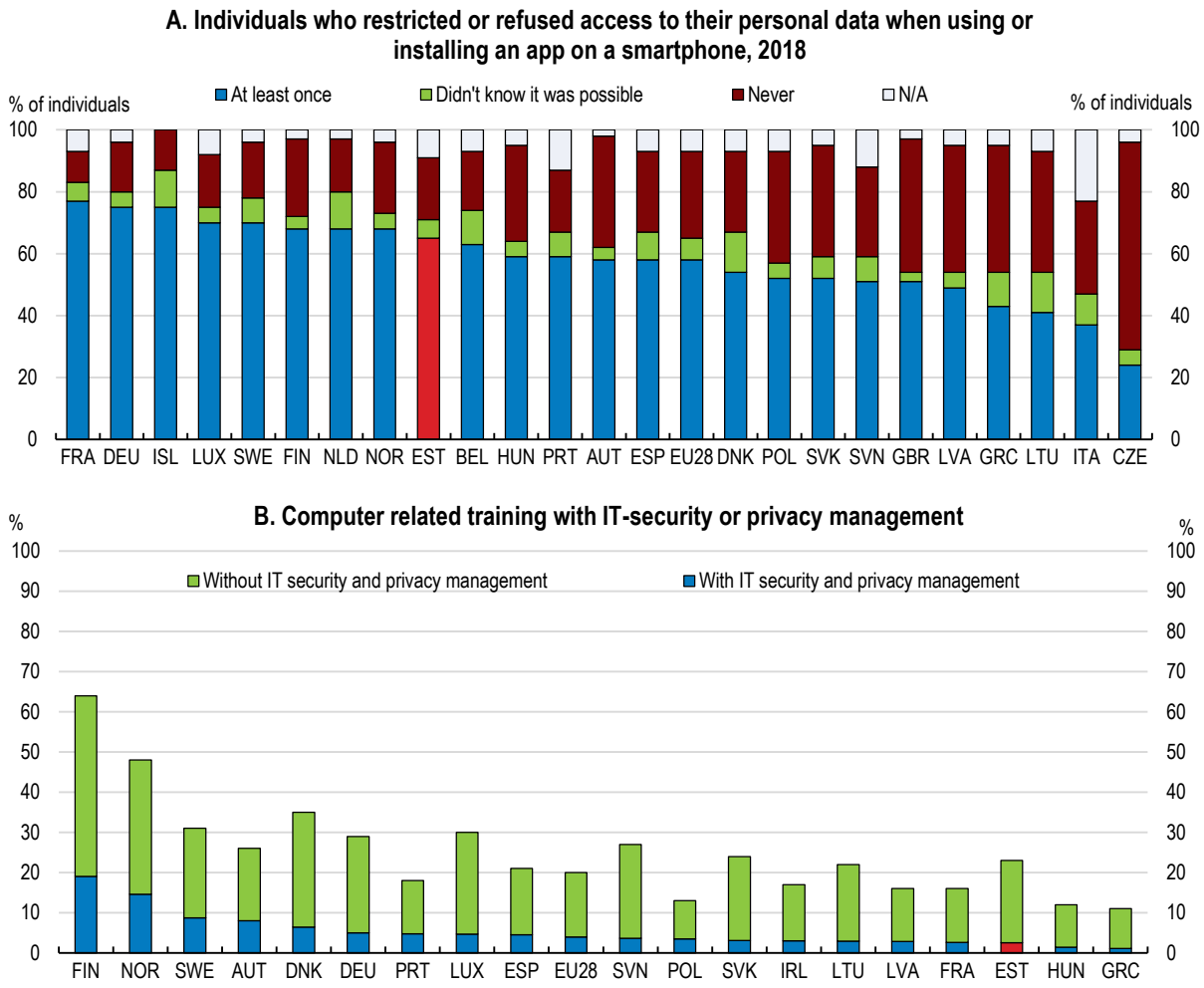


Source: OECD (2019f), Measuring the Digital Transformation: A Roadmap for the Future.

The incidence of having restricted access to personal data when using or installing an app is a measure of peoples' awareness over IT security and privacy issues. Estonia is doing better than the EU average, but a large share of internet users are still either unaware or passive (Figure 2.14, Panel A). This points to the need to raise skills and knowledge on cyber security beyond public and private providers of critical infrastructure and services, both by boosting the number of cyber security specialists and by increasing skills and awareness in the general population.

In order to meet demand, cyber security should increasingly be offered in universities and vocational schools, both as part of the curriculum in ICT specialist education, but also in free-standing courses available to non-specialists. Digital security and privacy risk management in cyber space should also be included in teacher training together with elementary digital skills, and integrated in compulsory education (Praxis, 2019b). Including security and privacy issues in existing digital training initiatives should also be prioritised, as the share of internet users who have received such training is low, both in absolute terms, and as a share of those attending any ICT related training (Panel B). These issues are on the government's agenda. The Lifelong Learning Strategy 2014-2020 stipulates that competences pertaining to digital skills should also include cybersecurity, and that besides digital technology, elementary knowledge related to cybersecurity should be integrated into curricula (Ministry of Economic Affairs and Communications, 2019).

Figure 2.14. Individuals' digital security awareness and skills need further strengthening



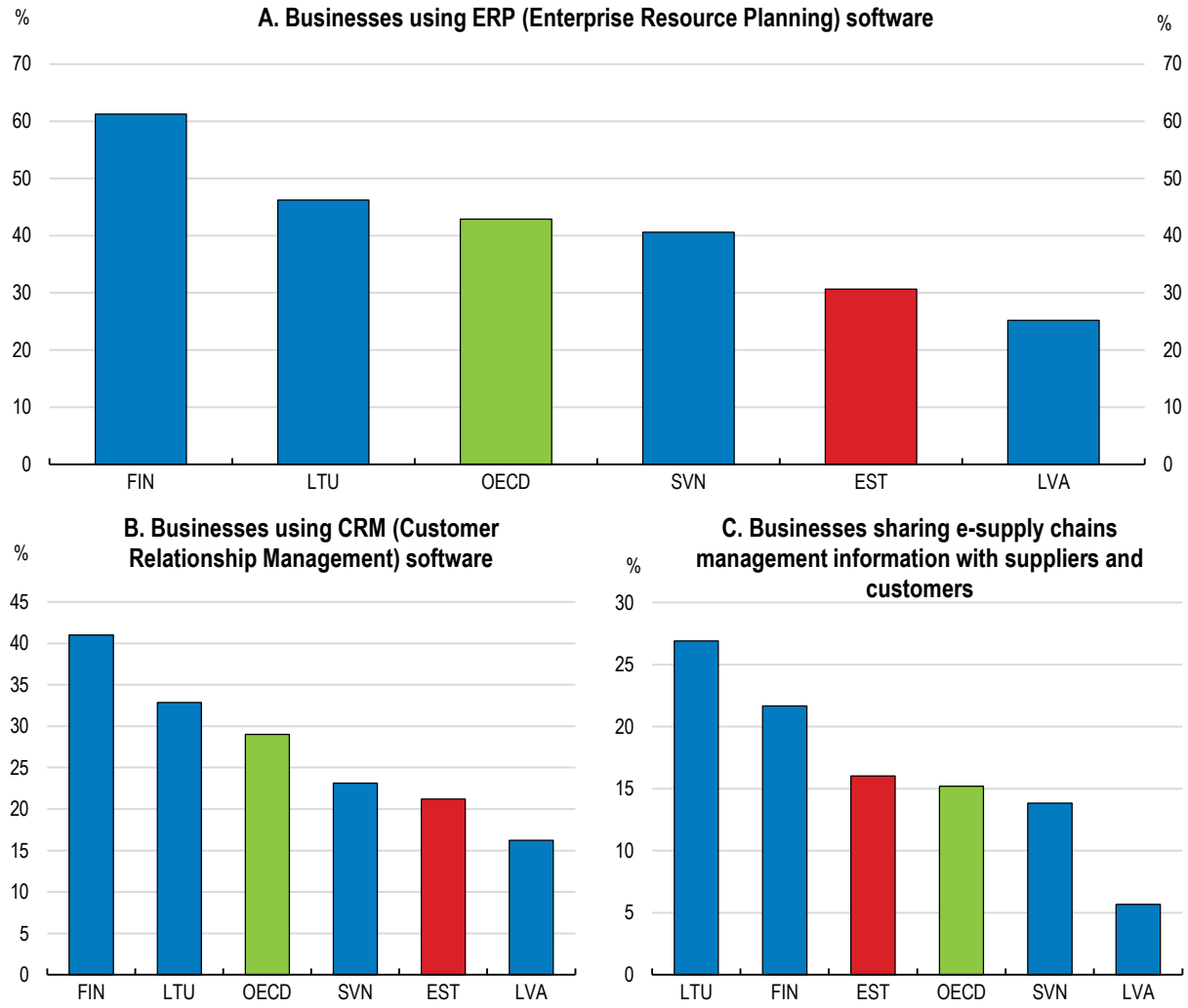
Source: OECD (2019f), Measuring the Digital Transformation: A Roadmap for the Future; Eurostat, Digital Economy and Society Statistics, Comprehensive Database.

Estonian companies lag behind peers in the adoption of digital technologies

Despite solid and secure digital infrastructure, world-leading e-government and high levels of trust among users of digital services, Estonian companies lag behind companies in other OECD countries, also Central and Eastern European economies such as Slovenia or Lithuania, in the use of several digital technologies, such as ERP and CRM software (Figure 2.15), Panels A and B). Estonian manufacturers are slightly more frequent users of supply-chain management software than the OECD average, but well behind their Lithuanian counterparts (Panel C). Roughly 20% of Estonian firms use e-sales, on par with the EU average. Approximately one-third of Estonian companies with 10 employees or more use cloud computing. This is also around the OECD average, with small companies doing relatively better and bigger ones relatively worse compared to the OECD average. Estonian companies tend to use cloud computing for back-office functions such as accounting and office services, rather than for customer-oriented services, such as customer relationship management, which is considered a major bottleneck of Estonian firms by business associations.

Figure 2.15. Estonian enterprises need to adopt more digital tools

Manufacturing, 2017 or latest available

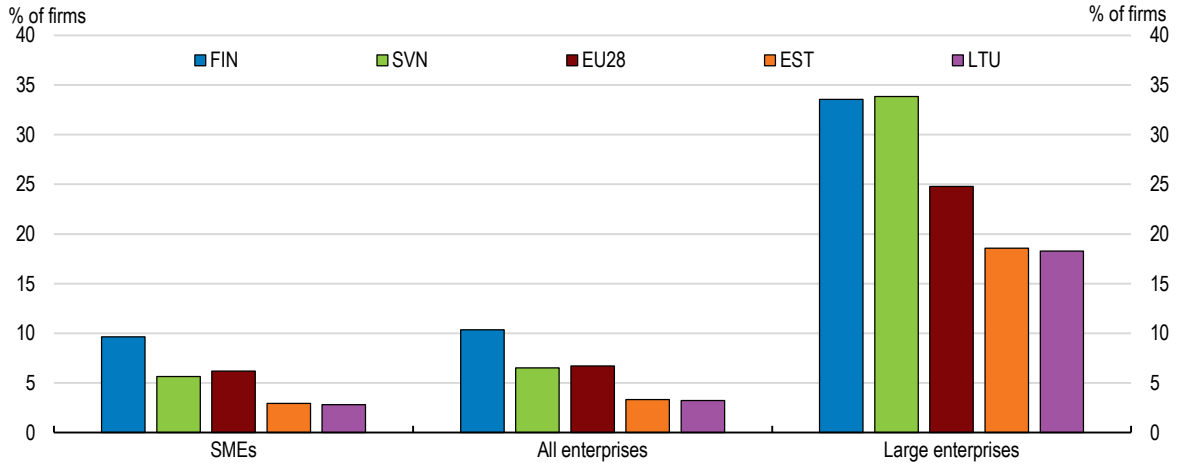


Note: OECD average is the simple average of 29 members not including Australia, Chile, Israel, Japan, Mexico and the United States, for which data were not available. Firms with at least 10 employees.
Source: OECD ICT Use by Business database.

These are only a sub-set of available technologies, and emerging digital solutions will improve, complement and in some cases replace existing ones. ERP for example, has brought considerable efficiency gains by automating many back office functions related to technology, services and human resources, and is associated with high productivity growth in Estonian firms (Pareliussen and Mosiashvili, 2020). However, automation and digitalisation of processes beyond ERP are now being implemented. For instance, feed-in of customer data changes or planned delivery time adjustments are now simpler owing to new ICT solutions. Since the technology frontier is shifting constantly, it is important to embrace new digital technologies, such as the Internet-of-things, big data and artificial intelligence (AI). These technologies use data to enable more nimble, customer-centric and hence productive business models. The share of firms with at least 10 employees using big data is slightly over 10%, somewhat lower than the OECD average. It is, however, higher than any other Central and Eastern European OECD country, except Lithuania.

Automation is key to boost productivity, but less than 5% of Estonian firms use industrial or service robots, and less than 20% of firms with over 250 employees automated their production (Figure 2.16), which is among the lowest shares in the European Union. This may be related to the relatively low share in Estonia of vehicles and electronics industries, which tend to be highly automated elsewhere.

Figure 2.16. The use of robots is particularly low among SMEs



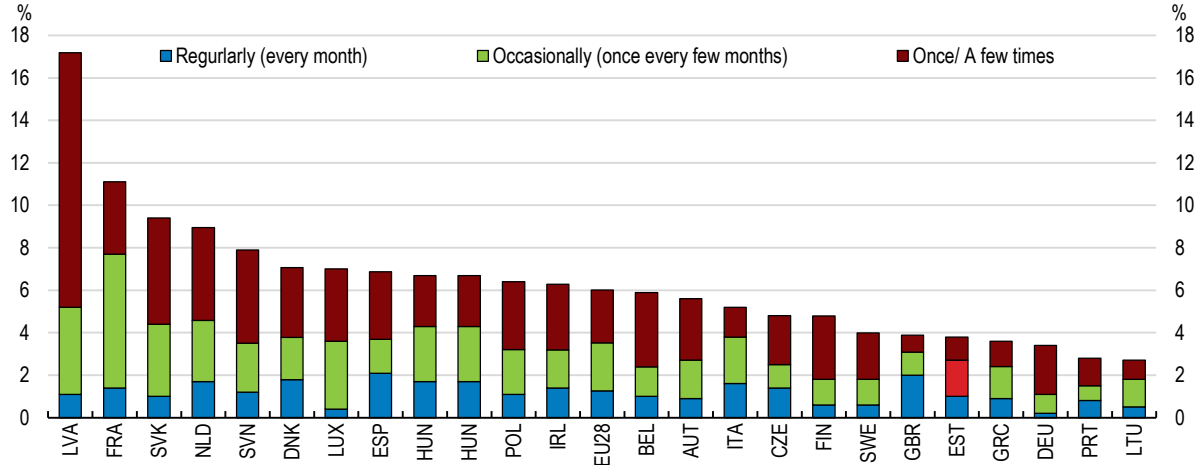
Note: Firms with at least 10 employees.
Source: OECD ICT Use by Business database.

Digital aggregator platforms can increase productivity for other firms, including low-tech ones. Platforms can for example reduce information asymmetries between service firms and consumers, with user ratings and reviews, incentivising service providers to offer better value for money. They can widen market access, thus giving productive firms more opportunities to grow. Furthermore, platforms can bring efficiency gains to service providers by taking care of and rationalising side-activities, such as managing bookings and processing payments. They can enhance capacity utilisation (e.g. hotel occupancy rates) by improving matching efficiency and making the real-time availability of services easily visible online (OECD, 2019a). Cross-country empirical analysis in four industries (hotels, restaurants, retail trade and taxis) suggests that platform development has enhanced the productivity of existing service firms over the past decade. Platforms were found to boost productivity in existing service firms in these industries by about 0.4% every year over 2011-17 for the average firm in France, Italy, Spain, the United Kingdom and the United States, countries experiencing relatively fast platform development (Schwellnius et al., 2019).

On the other hand, platform workers may be classified as self-employed and/or work irregular hours, and potentially leading to gaps in social protection coverage. This can be mitigated by including workers that sit on the border between dependent and independent forms of work in the standard social protection scheme and by increasing income security for those working flexible hours (OECD 2019d; OECD, 2018c). Making the most of platforms can also be a way to ease social strain, since platforms offer flexible work with low entry thresholds (OECD, 2019a). In general, individuals connected to the internet and with higher digital skills are less likely to be unemployed, as digital technologies improve matching between employers and workers (Männasoo et al., 2020). The use of platforms is low in Estonia, albeit increasing, indicating that there is a considerable untapped potential (Figure 2.17). Regulations should be conducive to platform work and allow experimental business models, for example with regulatory sandboxes, while also addressing potential negative effects on platform workers.

Figure 2.17. A low but increasing share of the population participates in platform work

Share of individuals aged 15 and over having ever offered services on platforms in the EU in 2018.



Source: The use of collaborative platforms, Flash Eurobarometer No. 467, September 2018.

Catching up with the OECD frontier is one way to reap productivity gains through digitalisation, however, there are also leapfrogging opportunities to exploit by embracing new digital industries. In general, Estonian firms seem to have been slower to adopt the most recent wave of digital technologies, which enable data-intensive e-services. To jump on the digitalisation bandwagon and leapfrog ahead others, the experience of some economies outside of Europe may serve more as a model. Some latecomers, for example China, have successfully embraced new digital industries by creating an enabling environment for new industries and heavily investing in digital infrastructure and by now have become global frontrunners.

In AI patent applications, three Asian economies and the United States are the leaders (Cornell University et al., 2019). While the size of the country matters for the absolute size of digital industries, adoption rates of new technologies can leap ahead of others if boosted by supportive policies. The relative ease of access to data for research purposes in Estonia should foster the adoption of AI. Estonia ranks above the average EU member in McKinsey's AI readiness index, which measures where countries stand across a range of AI enablers, including the number of AI start-ups per capita, automation potential of job activities, digital maturity, the availability of scientists and engineers, ICT business model creation, R&D expenditure, and ICT connectedness (McKinsey Global Institute, 2019).

The ICT sector is dynamic, but has room for improvement

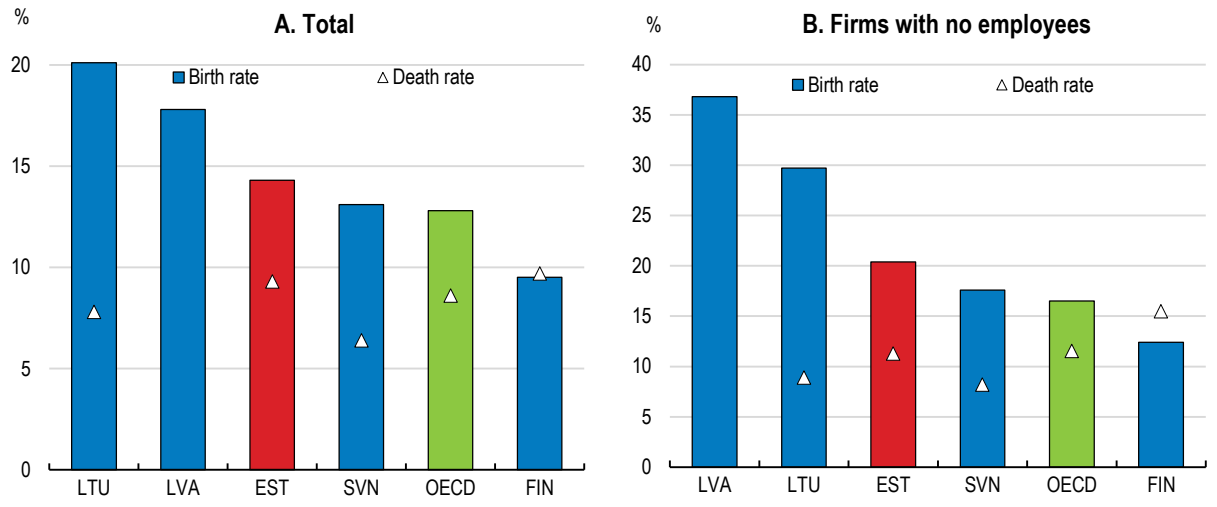
While several measurement issues surround the digital economy, a key indicator affecting its potential is the state of the ICT sector. Estonia's ICT sector has several strengths, although there is room for improvement along some dimensions.

A major strength of the Estonian ICT sector is its creativity (which does not show up in its patenting output as most of its innovations are not patentable), which should be a building block for future digitalisation. Estonia is home to a number of successful ICT start-ups, many of them are now internationally renowned companies. Several of those digital native companies have achieved unicorn (i.e. a privately held start-up company valued at over USD 1 billion) status and there are three Estonian companies in the Financial Times 2019 list of Europe's fastest growing 1000 companies. One of the two technology companies in the list (the third belonging to chemicals) ranks third with an over 12 000% revenue growth. These companies

tend to operate on a global scale, with head offices overseas and likely with limited spill-over effects on the Estonian economy.

The ICT sector is dynamic in general, with high firm creation rates in ICT services coupled with high destruction rates (Figure 2.18, Panel A). Sole proprietorships (firms with no employees) in the sector are popping up at high rates and they are similarly disappearing fast (Panel B). The creation of micro firms (with 1-9 employees) in ICT services, however, is just above the OECD average and well below not only the United Kingdom, but also several Central Eastern European economies, such as Hungary or Poland.

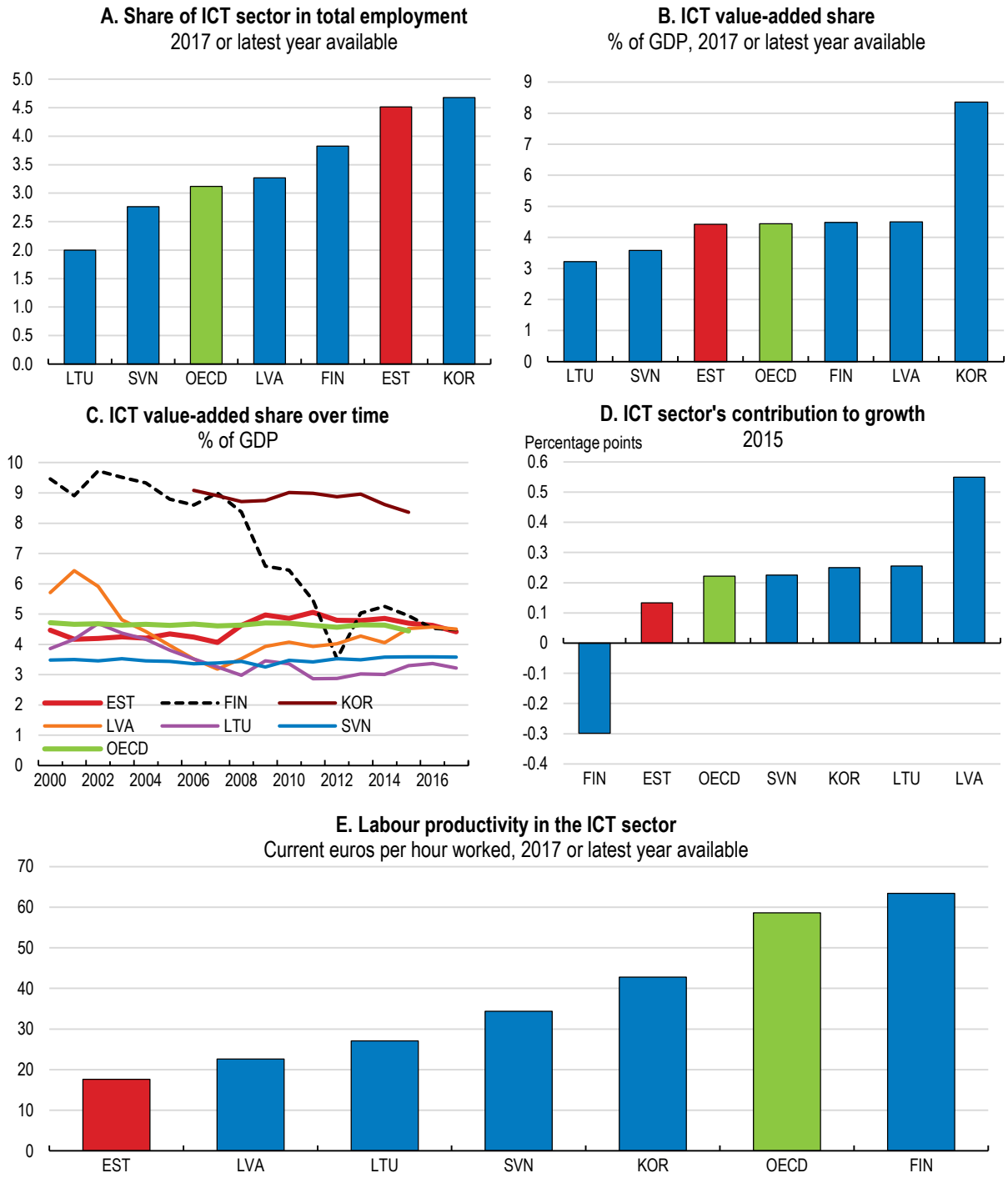
Figure 2.18. Business dynamics in ICT services are strong, 2016



Note: ICT services are produced in sectors 58-63: Information and communications according to the ISIC Rev.4 classification. The OECD average is without Canada, Chile, Colombia, Japan, New Zealand, Mexico and the United States, for which no comparable data were available. The birth rate is the ratio of newly created firms in the given year to the number of already existing firms, while the death rate is the ratio of firm closures in a given year to the number of existing firms.
Source: OECD SDBS Business Demography Indicators (ISIC Rev. 4)

However, on a number of measures, the Estonian ICT sector lags behind frontrunners, especially if looking on a global scale. The ICT sector (comprising both manufacturing and service industries) is a relatively big employer in Estonia, just like in Korea, a global digitalisation frontrunner (Figure 2.19, Panel A). High employment in the ICT sector has the potential of skills spill-overs to other sectors through job changes, but currently few ICT staff look for opportunities in other sectors. The ICT sector's value added share is about the half of Korea's (Panel B). As Estonia has already branded itself as highly digitalised in government services, when setting objectives for the business sector, it is more useful to look at global frontrunners, such as Korea. Moreover, the ICT value added share has been slightly shrinking since the Global Financial Crisis (Panel C). The ICT sector in Estonia contributes to growth less than in an average OECD country (Panel D). Furthermore, labour productivity, which is an important measure of its competitiveness, is not particularly high in the ICT sector, not only compared to advanced, but also to several Central and Eastern European economies (Panel E).

Figure 2.19. ICT sector performance is comparable to that in peers



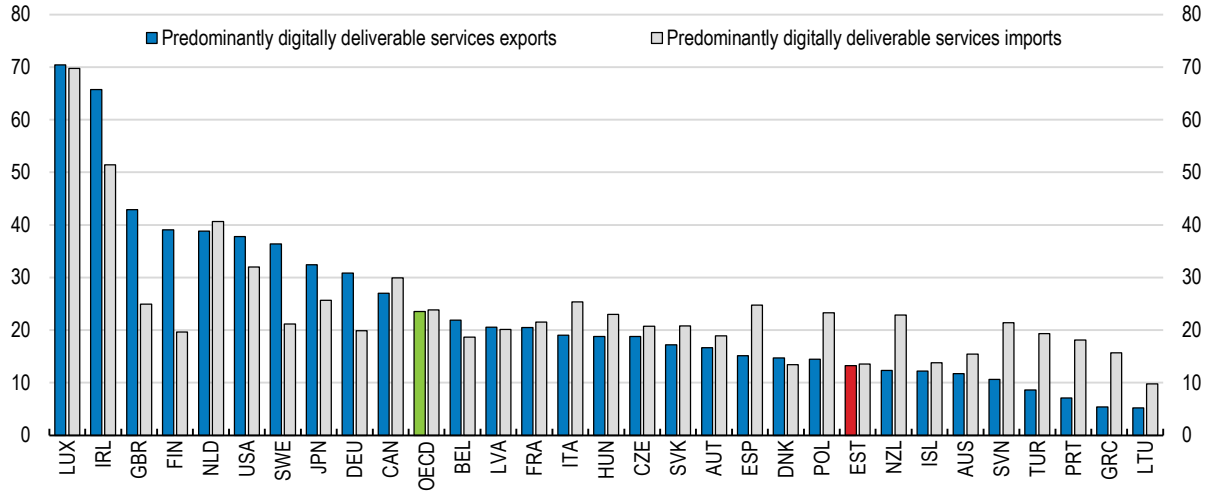
Source: European Commission 2018 PREDICT Dataset.

ICT-sector competiveness can also be measured by the extent of digital trade, where Estonia's performance could improve (Figure 2.20). The low extent of trading in digitally deliverable services is surprising as Estonia has the lowest barriers in OECD to services trade, alongside Norway, Australia and Switzerland (Ferencz, 2019). Telecommunications, computer and information services make up most of Estonia's exports and imports in digitally deliverable services. While financial, insurance and pension

services are not a competitive edge of other catching-up economies either, some other countries such as Hungary have been more successful in earning IPR-related revenues from overseas. Low revenues from exporting IPR are related to relatively low patenting activity in general.

Figure 2.20. Trade in digitally deliverable services is low

Trade in predominantly digitally deliverable services as a percentage of services exports and imports, respectively

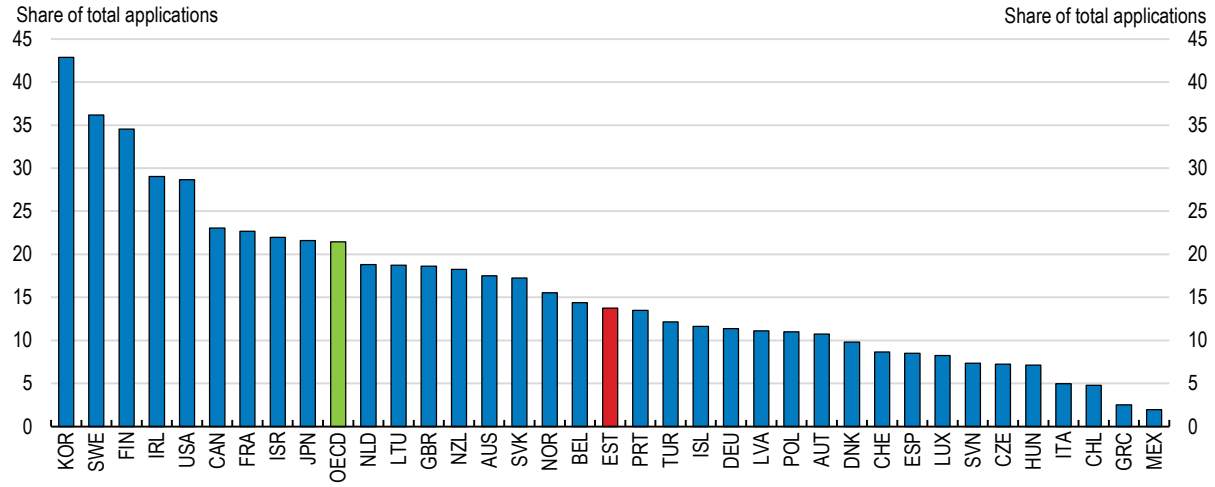


Note: OECD average is the simple average of 29 members not including Chile, Israel, Korea, Norway and Switzerland, for which data were not available. Digitally deliverable services include financial services, insurance and pensions, telecommunications, computer and information, audio-visual services and charges for intellectual property use.
Source: OECD (2019), Measuring the Digital Transformation: A Roadmap for the Future, OECD Publishing, Paris, https://doi.org/10.1787/9789264311992-en.

When it comes to innovation performance of the ICT sector, Estonia lags behind the OECD average in the share of ICT-related patents (Figure 2.21). This gap is related to the very strong output by a few countries including Korea, some Scandinavian countries, Ireland and the United States. Among the Central and Eastern European economies, only Lithuania and Slovakia fare better. In general, Estonia fares better in trademarks and industrial design compared to patents. Low patenting activity in the ICT sector in Estonia may be related to the small size of firms in the sector, with most newly created businesses without employees, while patenting is research- and labour intensive. Planned increases in government spending on research and development are expected to boost innovation economy-wide.

Figure 2.21. The share of ICT-related patents is low

ICT patent applications as a share of total patent applications to the European Patent Office, 2016



Source: Eurostat.

The government's ICT Vision 2020 has set ambitious objectives for the ICT sector: a doubling of the sector's share in GDP between 2013-20, labour productivity in the sector reaching two-thirds of that in Nordic countries and employing 50 000 additional workers with ICT practitioner skills. While this last objective is hard but not impossible to attain, the first two will likely remain a far reach with the recent stalling of the ICT share in value added and with ICT labour productivity below a third of that in Finland. The ICT Development Programme gives a more medium-term perspective, with industry development proposals until 2030. In the coming decade, greater attention needs to be paid to enhance innovation in the sector, which could contribute to raising the sector's productivity and hence also its international competitiveness. In addition, successful home-bred start-ups should be encouraged to interact more with the domestic economy. As discussed below, ICT skills are highly concentrated in the ICT sector in Estonia. Plans to boost the ICT sector are thus welcome, but should not take focus off efforts to leverage the considerable capabilities embedded in the ICT sector to disseminate digital technologies in the business sector. Digitalisation of the business sector would also boost demand for ICT services and competition in the sector.

Making the most out of skills

Firms have different abilities to push productivity growth, under similar conditions, with similar technological solutions available, within the same sector, and even with the same owners (Bloom et al., 2019). Humans are at the centre of such differences. Owners, managers and workers come with different backgrounds, incentives and abilities, affecting the firm's ability to innovate and boost performance. The knowledge of what is going on inside firms, driving their different abilities, is still limited (OECD, 2019b). What is known, is that a wide set of skills are essential to support adoption and effective use of digital technologies, and maximise their productivity impact. These skills can be divided into three main categories: specialised skills of ICT professionals, ICT user skills for other workers and other, complementary skills. The latter group includes notably general cognitive skills and managerial and organisational skills, but also other skills, such as social- and interpersonal skills. Skill shortages can reduce the benefits from digitalisation, especially among less-productive firms, as it is more difficult for them to attract skilled workers than for more productive firms (Sorbe et al., 2019; Grundke et al., 2018; OECD, 2019a, Mosiashvili, 2019).

The benefits from boosting skills and utilising existing skills better in Estonian firms are clear. Firms with a 10% higher than average share of employees using computers for work purposes are estimated to have 1.5% higher annual productivity growth, and positive spill-overs to other firms are sizeable, notably in manufacturing sectors. Providing ICT training to employees also boost productivity growth considerably (Pareliussen and Mosiashvili, 2020).

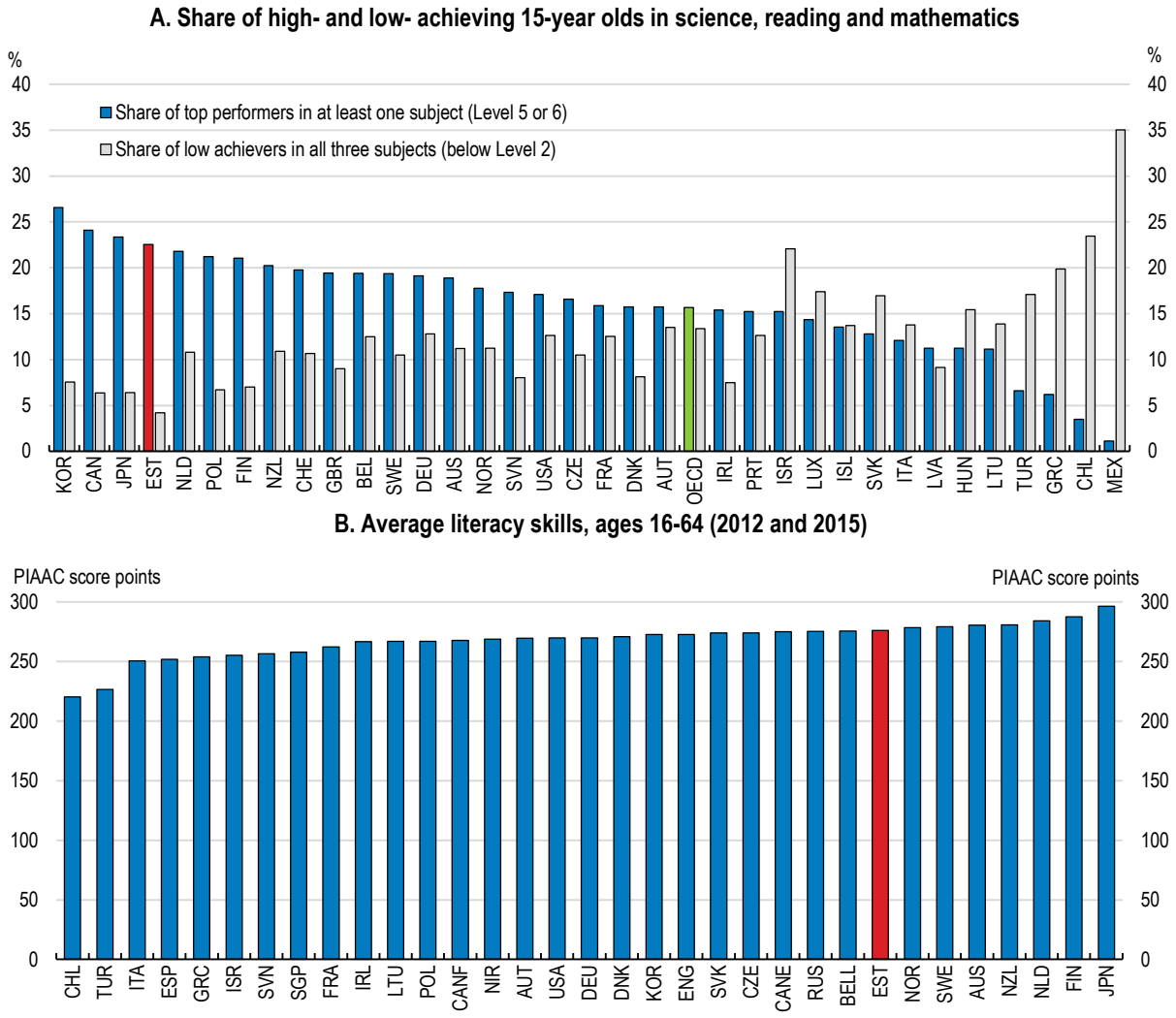
Strong basic skills in literacy, numeracy and science is a major strength for the Estonian economy, but successfully implementing digital technologies to increase productivity takes more. Specialised ICT skills and ICT user skills in the workforce are associated with higher up-take of digital technologies in companies. Management skills- and practices are keystones in digital transformation, since managers have a key role in product- and process innovations exploiting complementarities between digital technologies.

Basic skills form the foundation for the effective use of digital tools

A minimum level of proficiency in reading and numeracy as measured by the OECD Survey of Adult Skills (PIAAC) serves as a basis for using digital technologies. Higher levels of such cognitive skills enable individuals to perform more diverse and complex digital tasks, necessary to thrive in digital-intensive workplaces, rather than just using the Internet for information and communication. Furthermore, skills in science, literacy and numeracy serves as a foundation to obtain new skills, which can help individuals adapt to a fast-moving digital landscape (OECD, 2019c; OECD, 2019d).

Estonian 15-year-olds are among the top performers in the OECD's Programme for International Student Assessment (PISA), ranking finished first of OECD countries in reading and science and third in mathematics in 2018. The country also has a high share of high achievers and the lowest share of low achievers in the OECD (Figure 2.22, Panel A). Adult skills are well above the PIAAC average in both literacy and numeracy (Panel B).

Figure 2.22. Basic skills are high



Note: The second round of the PIAAC Survey (2015) added Chile, Greece, Indonesia, Israel, Lithuania, New Zealand, Singapore, Slovenia and Turkey.
Source: OECD, PISA 2018 Database; OECD Survey of Adult Skills Database (2012 and 2015).

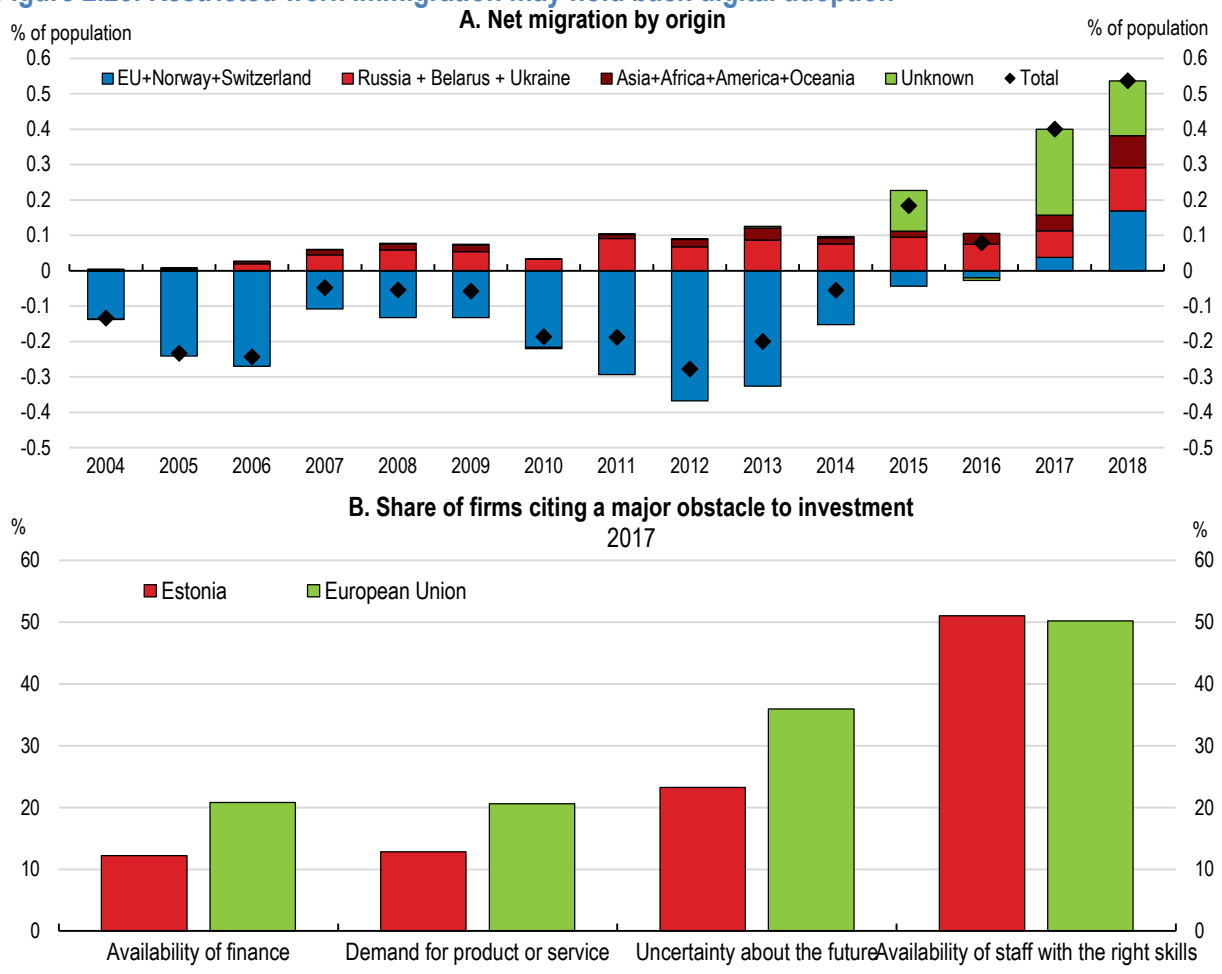
Notwithstanding a high overall performance, the education system is under pressure to adapt to demographic headwinds, with a shrinking of the prime working-age population going forward. Reducing the rate of early leavers, which at 10.8% stands above the EU average (European Commission, 2019b) is a challenge. The share of young adults not in employment, education or training (NEETs), is at 12%, approximately at the OECD (and EU) average (OECD, 2018a).

Tertiary educational attainment increased from 34% in 2007 to 43% in 2017, which is approximately at the OECD average (44% in 2017). However, there is a significant gender gap, with 53% of women having a degree, compared to 34% of men. The proportion of graduates in science, technology, engineering and mathematics (STEM) is increasing, but their share of the young population (aged 25-34) is only 12.2%, lower than the EU average of 15.5%. Estonia's forecasting system for future labour and skills needs OSKA is useful in addressing skills needs and shortages. It analyses and forecasts sectoral needs for labour and skills with a combination of qualitative and quantitative research methods, and reviews professional qualifications across all levels of education.

Adult education and training (AET) is important to address changing skill needs against the background of higher life expectancy and rapid structural change. Participation in AET increased considerably from 10% in 2008 to 19% in 2018 (European Commission, 2019b), which places its target to reach 20% in 2020 within reach. However, as pointed out in the 2017 OECD Economic Survey of Estonia and further discussed below, businesses are little involved in the provision of both adult education and vocational education and training.

Access to the right skills, digital and complementary, is often a prerequisite to invest in productivity-enhancing technologies. There is scope to enhance the skill supply from non-EU immigration to fill skills shortages. Net migration was negative until 2015, and is still modest, while employers cite the lack of staff with the right skills as their biggest obstacle to investment (Figure 2.23). Skills shortages in Estonia are generally not filled by free labour movement through immigration, as the income level is considerably lower than in nearby EU countries, notably Finland. Non-EU work immigration to Estonia is relatively restricted, despite strong demand from businesses and potential immigrants of various backgrounds and skills, notably from Ukraine and Russia. An annual quota for long-term residence- and work permits of 0.01% of the population, or 1315 people in 2019, was oversubscribed already in December 2018. Exceptions do exist, however. Those receiving at least double the national average gross salary are exempt, and there are general exemptions for ICT specialists, recruitments to start-ups, citizens of the United States and Japan, as well as international students.

Figure 2.23. Restricted work immigration may hold back digital adoption

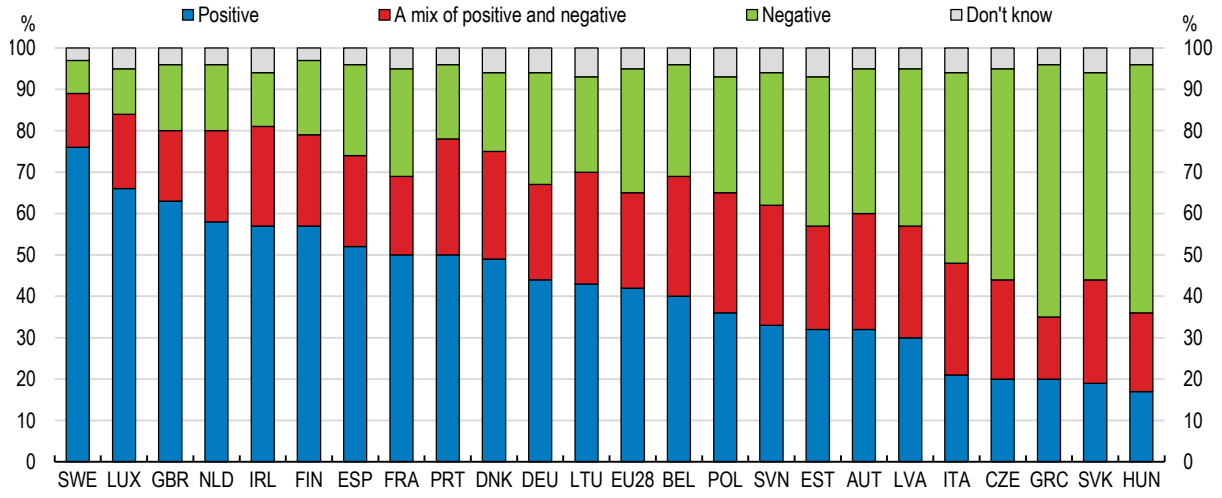


Note: Firm responses to the question: "Thinking about your investment activities in your country, to what extent is each of the following an obstacle? Is it a major obstacle, a minor obstacle or not at all an obstacle?"
Source: Statistics Estonia; European Investment Bank: EIBIS, the EIB Investment Survey.

From a political economy point of view, restrictions reflect relatively negative attitudes to immigration (Figure 2.24). Looking at the economic side, however, Estonia would likely benefit from loosening restrictions on work immigration. It could help alleviate demographic headwinds expected to shrink Estonia's working-age population (15-64 year-olds) by close to 8% and increase the dependency ratio from 57% to 66% from 2019 to 2040 (Statistics Estonia, 2019). Immigrants tend to be young, economically active and mobile, they arrive with skills, often complementary to those of the receiving country, contributing to human capital and technological progress (OECD, 2014; Boubetane and Dumont, 2013). The blanket exemption for ICT specialists is notably helpful in the context of digitalisation, but restrictions on complementary skills may still limit digital adoption, notably outside of the ICT sector. 12-month work visa ("D-visa") are available upon application without quantitative limitations (Work in Estonia, 2019) and provide some welcome flexibility. However, their usefulness to employers are limited by costs incurred, notably time costs of training new arrivals, but also associated management costs. The threshold of two times the average wage may still be too high to attract highly qualified workers, notably young workers in entry-level positions. A more flexible approach, taking various measures of skills into account, or lowering the wage threshold should be considered.

Figure 2.24. Many perceive the impact of immigrants in society as negative

Perceptions regarding the impact of immigration on society (2017)

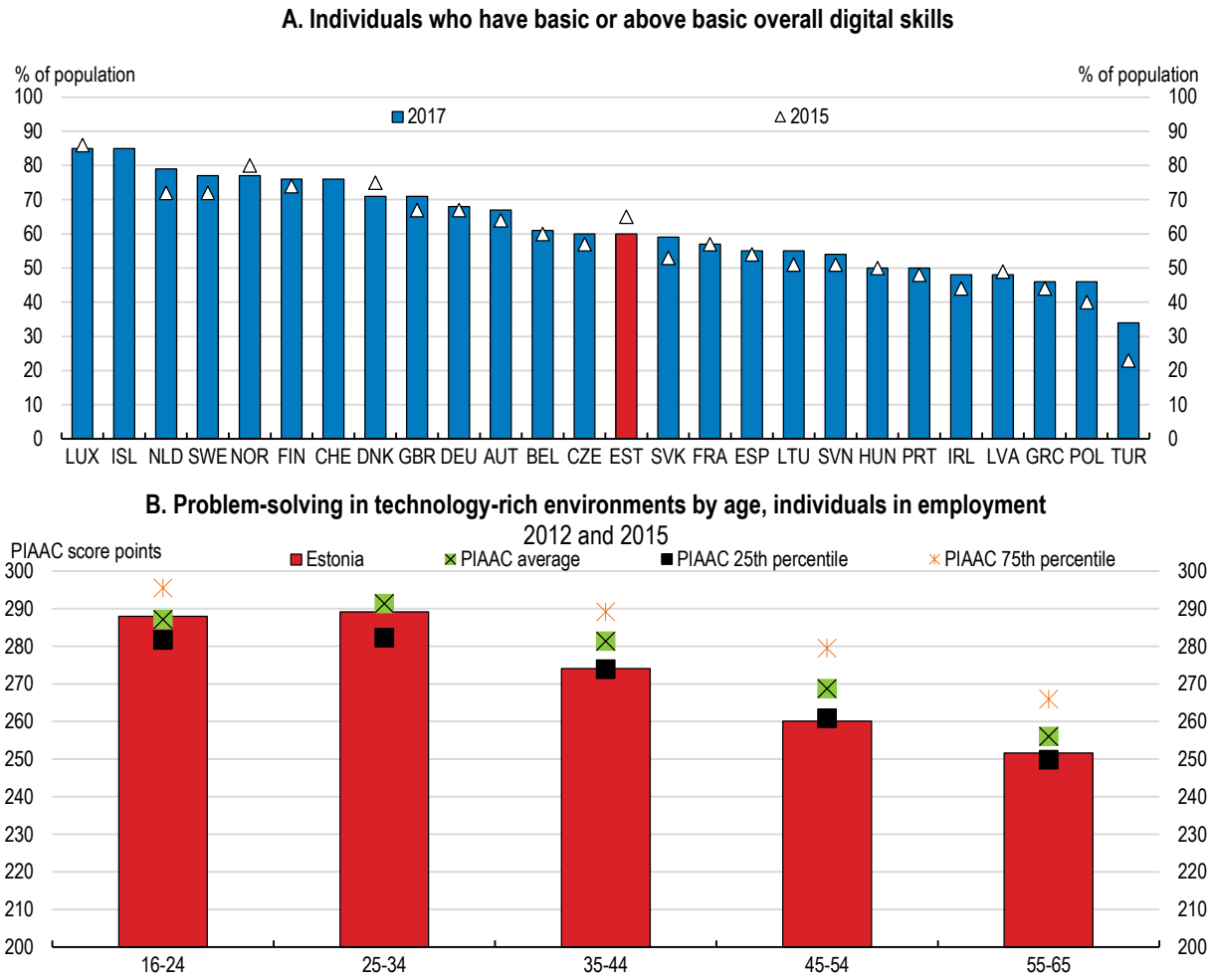


Source: European Commission, 2018a.

Digital user skills could be improved

Higher digital user skills are associated with higher productivity at the EU regional level, and the share of workers using computers for work purposes is associated with a sizeable productivity premium at the firm level and spill-over effects, translating into sectoral productivity gains (Männasoo et al., 2020; Pareliussen and Mosiashvili, 2020). The share of individuals who use various digital tools is above the EU average and fellow Baltics Latvia and Lithuania, but well behind the best performing countries, Finland and the other Nordics (Figure 2.25, Panel A; European Commission, 2018b). However, the PIAAC Survey, which measures digital problem-solving skills more directly, shows that Estonia lags well behind the average country. Many adults (about 25%) lacked basic computer skills at the time of the survey, a share three times higher than in top performing countries. Younger generations of adults are more digitally proficient than older ones both in absolute terms and relative to peer countries, although performance also in these age groups is only around the PIAAC average (Panel B). Boosting digital skills calls for concerted efforts in schools, universities and adult education and training.

Figure 2.25. Adult digital skills are below average in international comparison



Note: Panel A: % of individuals aged 16-74. The basic or above basic overall digital skills represent the two highest levels of the overall digital skills indicator, which is a composite indicator based on selected activities performed by individuals aged 16-74 on the internet in the four specific areas of information, communication, problem solving, content creation. Panel B: The second round of the PIAAC Survey (2015) added Chile, Greece, Indonesia, Israel, Lithuania, New Zealand, Singapore, Slovenia and Turkey.
Source: OECD Survey of Adult skills (2012 and 2015).

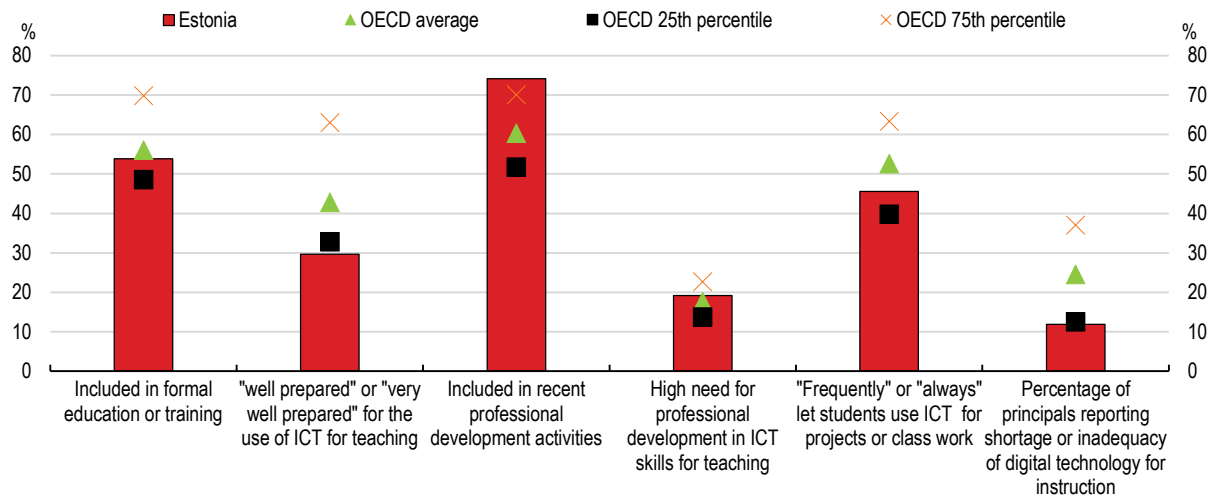
Digital competence is one of eight compulsory competences defined in the national curriculum in compulsory school. Estonian schools have high autonomy to implement curricula and learning outcomes (OECD, 2016a). As outlined above, this model serves Estonian children well, but in lack of coordination there is a risk that pupils in some schools do not get the opportunity to attain an acceptable level of relevant ICT skills. In response to this challenge, the government has developed additional guidelines, trained teachers and distributed guidelines and learning materials. National tests indicate that 83% of 9th grade students fulfilled criteria for basic ICT skills set in Estonia's Lifelong Learning Strategy 2020.

Teachers' digital skills and their preparedness to teach digital skills should be strengthened by intensifying and increasing the quality of their professional development in the subject. Estonian teachers' digital problem-solving skills rank the same as the total population in comparison to other PIAAC countries. Nonetheless, teachers do not feel sufficiently prepared to teach digital skills and use digital tools, even though a majority has received recent training in the use of ICT for teaching. The access to and quality of digital devices, environments, software and digital study materials is adequate in most schools (Figure 2.26). The support programme ProgeTiger has played an important role in integrating technology

education into the curriculum, offering teachers educational resources and training opportunities and co-financing equipment and software in preschool, primary and vocational education. The Information Technology Foundation for Education (HITSA) runs the programme in partnership with the Ministry of Education and Research, financed by the European Social Fund.

Figure 2.26. Teachers' preparedness to use ICT for teaching could improve

Percentage of teachers reporting about the "use of ICT for teaching"



Source: OECD, TALIS 2018 Database, Table I.4.13, Table I.4.13, Table I.5.18, Table I.5.21, Table I.2.1 and Table I.3.63.

Estonian businesses are little involved in the provision of both upper secondary vocational education and adult education and training. On the other hand, there is a clear link between productivity growth and employees participating in ICT training (Pareliussen and Mosiashvili, 2020). Furthermore, the successful digitalisation of processes will in many cases depend on providing complementary training to employees.

A lack of size is often cited as an obstacle to investing in digital technologies and skills. More than 90% of Estonian companies had less than 10 employees in 2016, and 0.24% of companies have 250 or more employees. Indeed, small companies provide less training to their employees than larger ones in general, and in the field of ICT. However, this challenge is not unique to Estonia, and the share of small companies is not a function of the size of the population. The EU average country has 94% companies with less than 10 employees and 0.19% large companies. Both small countries such as neighbouring Latvia and Lithuania and large countries, such as France and Italy have higher shares of small companies and lower shares of large companies than Estonia (Eurostat, 2019). However, Estonian companies within each firm-size group are among the least inclined to provide ICT training to their employees. They do slightly better than companies in the other Baltics, but lag significantly behind the Nordics and other high performers (Figure 2.27). There may be scope to better incentivise companies to train their staff, notably smaller companies, as current grants and incentives are mostly directed to medium- and large-sized businesses, and several OECD countries have programmes to this end (Box 2.4; European Commission, 2019b).

Box 2.4. Examples of programmes to develop companies' training of personnel

Authorities develop companies' capacity to provide relevant training in various ways, but such programmes typically involve one or more of the three following elements:

- Targeted coaching to help companies identify their skill needs and develop an appropriate training offer.
- Providing financial incentives for SMEs, along with advice and guidance.
- Facilitating networks of firms within and across sectors for peer learning.

Finland provides financial incentives along with capacity building to identify companies' training needs and deliver training through the "Joint Purchase Training" (Yhteishankintakoulutus) programme, offered by the Public Employment Service (PES). The programme offers different types of training ranging from 10 days to two years. Training responds to different needs, for example re-training of employees affected by technological change or redundancies, or training new hires in specific skill-sets not available among job-seekers.

The Korean Subsidies for Learning Organisations helps build the capacity of SMEs to develop their staff through various subsidies. Support is available to hire external consultants to analyse the company's training needs, to build the capacity of the CEO, managers and staff responsible for learning activities, and facilitate the systematic integration of learning in the organisation. In addition, subsidies are available for peer-learning activities.

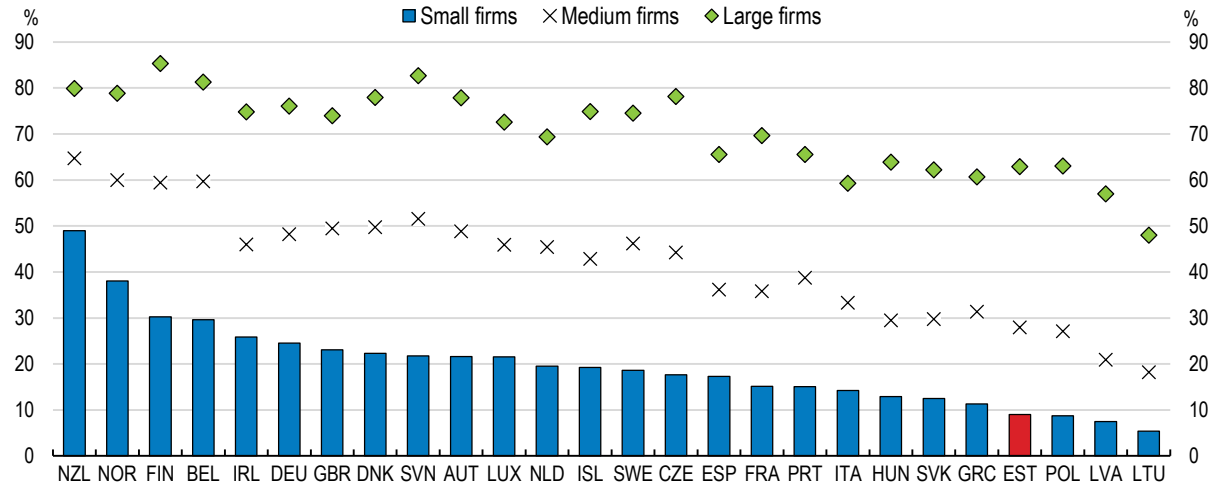
Social partners can play a key role in programmes to help build employers' capacity to train their staff for the future. In Germany, the initiative "Securing the skilled labour base: vocational education and training (VET) and gender equality" (Fachkräfte sichern: weiterbilden und Gleichstellung fördern) funds 93 projects implemented by social partners to increase adult learning participation and gender equality at work. Funding is provided for five types of activities: i) building staff development and training structures, particularly for skill upgrading; ii) creating interlinked VET structures for SMEs; iii) initiating networks and peer learning across branches of industry; iv) strengthening the ability of business stakeholders to promote equality of opportunity; v) developing work time models and career pathways adapted to phases in a worker's life. As an example, one project helps utility companies in the three German cities of Coburg, Kronach and Lichtenfels to implement staff development and training structures, including coaching and training for key staff on analysing their skill and training needs and working with partners.

Source: OECD (2019), Getting Skills Right: Engaging low-skilled adults in learning, (www.oecd.org/employment/emp/ adult-learning-systems-2019.pdf).

Estonia pursues a number of policies to cover parts of the training costs for people already in employment. Together with Estonian IT companies, the government has launched the adult education project Choose IT, further described below. Cooperation and dialogue between the government and employers' and labour unions is likely part of the reason why this scheme has already had some success. The government and manufacturing industry has also recently launched a digital skills training project called DigiABC for unskilled workers, targeting the workers through their workplaces. These programmes may serve as inspiration on how to involve businesses more in adult education and training in cooperation with employers and labour unions.

Figure 2.27. Small firms provide less ICT training than larger ones

Percentage of businesses providing ICT training to their employees by size class (2015)



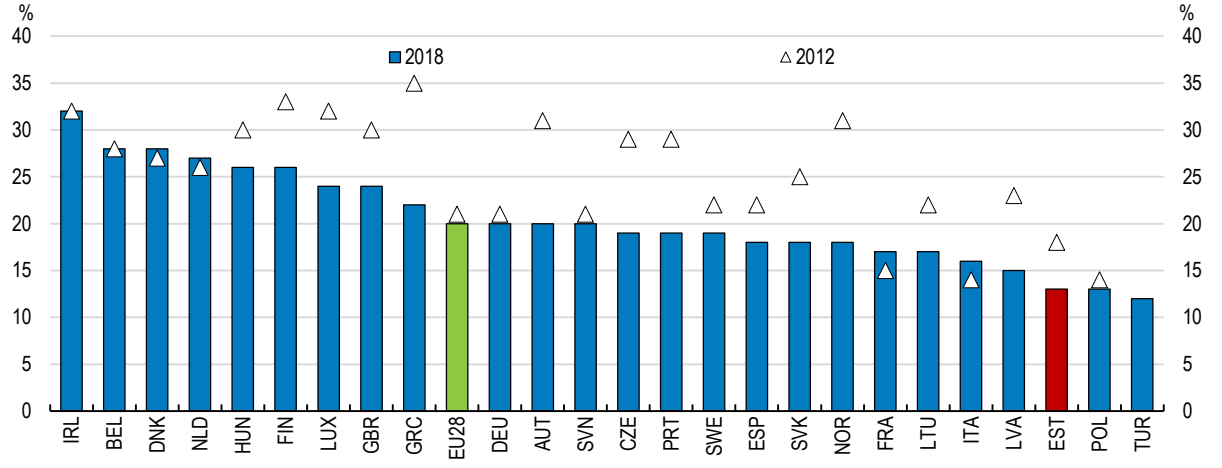
Note: Data refer to businesses with 10 or more employees that provided any type of training to develop the ICT related skills of their employees within the last 12 months. Data for New Zealand refer to 2016 and Iceland to 2014. Data for medium-sized firms in Portugal refer to 2017. Businesses with 10-49, 50-249 and 250 or more employees are defined as small, medium and large, respectively.
Source: OECD (2017) ICT Access and Usage by Businesses Database (http://dx.doi.org/10.1787/58897a61-en).

Specialised ICT skills are concentrated in a small number of companies

Estonia has a successful cluster of ICT companies, helped to grow and deepen by the country's long-standing commitment to e-government. ICT specialists constituted 5.3% of total employment in 2016, well above the EU average of 3.7%. However, ICT specialist employment is highly concentrated in relatively few companies (Figure 2.28), underlining Estonia's challenges in leveraging its sizeable ICT specialist workforce and significant know-how in the ICT sector to boost productivity-enhancing digital adoption in the non-ICT business sectors.

Figure 2.28. Employment of specialised ICT personnel is highly concentrated

Share of enterprises that employ ICT specialists

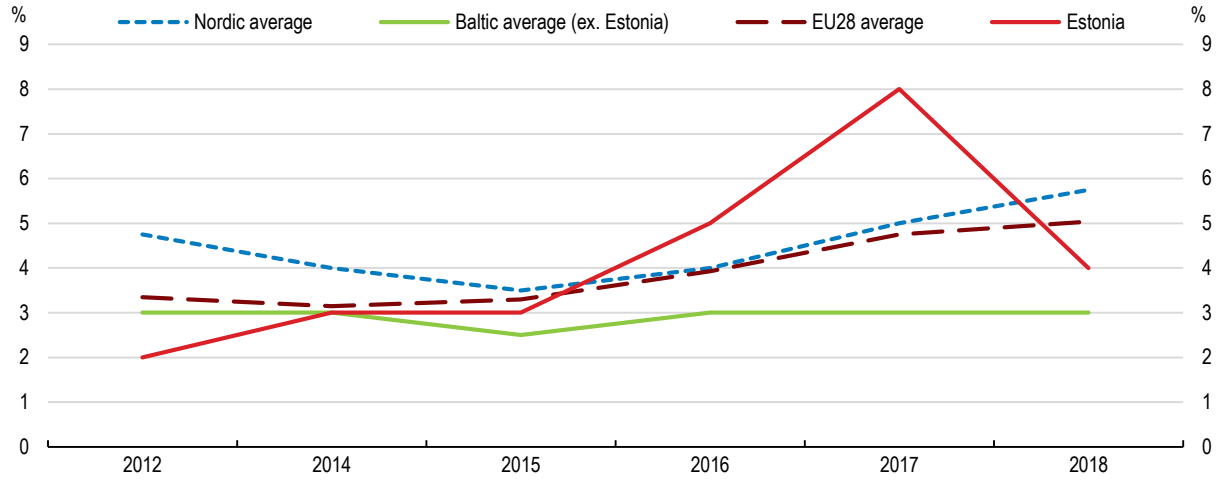


Source: Eurostat Digital economy and society database (accessed 25 July 2019).

Shortages of ICT specialists have been found to reduce firm-level productivity in Estonia (Mosiashvili, 2019). Recent shortages of specialised ICT personnel were considerable, but seem to be abating (Figure 2.29) as the supply of ICT personnel is increasing. The share of tertiary education graduates specialised in ICT increased from 5.3% in 2013 to 7.4% in 2017, more than double the EU average (3.6% in 2017), considerably higher than Latvia (2.7%), Lithuania (5.0%) and somewhat higher than Finland (6.3%). The expansion of ICT graduates from upper secondary vocational education has been even stronger, increasing from 4.8% in 2013 to 13.6% in 2017, one of the highest shares in the EU, and well above the levels in Latvia (7.0%), Lithuania (2.0%) and Finland (3.6%). Supply of ICT professionals is further boosted by the Choose IT programme, funded by the European Social Fund and launched in 2017, aiming to let 500 postgraduates attend a six-month software developer programme resulting in a bachelor degree in programming by the end of 2020. This approach holds promise, as it equips people holding valuable prior experience and knowledge with digital knowhow. Such multidisciplinary skills may be valuable both to the ICT sector and traditional sectors, and may help build better understanding and better links between the two.

Figure 2.29. Shortages of ICT specialists are easing

Share of enterprises with hard-to-fill vacancies for jobs requiring ICT specialist skills



Source: Eurostat digital economy and society database (accessed 26 June 2019).

As in most OECD countries, an overwhelming majority (83%) of people employed as ICT specialists are men. Young men (16-24 year-olds) are more likely than young women to have programming skills, in Estonia and elsewhere (OECD, 2019d). This gender imbalance reflects educational choices. Only 11% of upper secondary vocational ICT graduates, and 28% of tertiary education ICT graduates were women in 2017. EU averages were 11% and 19%, respectively (Eurostat, 2019b). At the same time, women tend to use ICT more intensively at work (OECD, 2019d). In order to ensure a more diverse pool of talent in specialised ICT positions, and to counteract gender divides in ICT skills, consorted efforts should be carried out to remove gender biases in how ICT is perceived and taught, to increase girls' interest in ICT from a young age. Providing high-quality ICT education with uniform quality from a young age, with content designed to appeal equally to girls' and boys' interests across Estonia's compulsory schools is important in this respect. Furthermore, the voluntary ICT hobby activities currently organised by 68% of Estonian schools should actively promote a range of activities equally appealing to girls as to boys. Participation in these hobby activities is often stated as a main motivation for choosing an education within ICT later in life.

Management skills and high-performing work practices

The evidence of the importance of management to productivity has grown since Bloom and Van Reenen (2007) started measuring management practices. Higher managerial quality improves firm and aggregate productivity. The benefits of superior management practices on productivity are largely realised through within-firm effects, such as the use of high-performing work practices and organisational restructuring to promote more efficient technological adoption, as opposed to higher allocative efficiency. Managers are responsible for assigning human capital to its best use, and to contribute to up-skilling and re-skilling employees to maximise complementarities between digital technologies and skills (OECD, 2019a; Andrews et al., 2018; Pellegrino and Zingales, 2017; Bloom et al., 2019; 2012c and d).

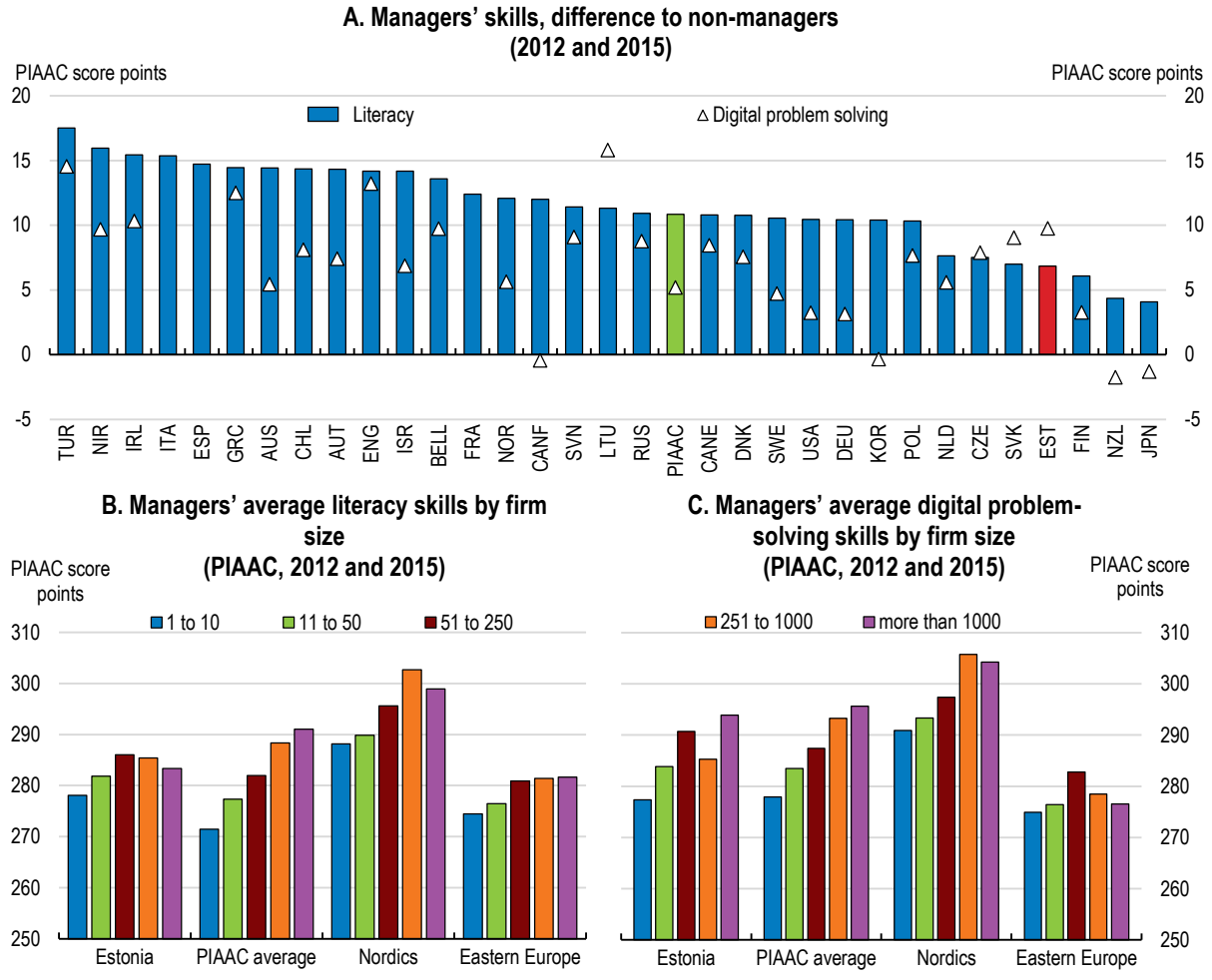
Good management- and organisational skills are keystones in digital transformation, since reaping the full productivity potential of technological change requires product- and process innovations, getting the most out of complementary skills and complementary technologies, for example between front- and back-office management software (OECD, 2019a; Andrews et al., 2018; Pellegrino and Zingales, 2017; Bloom et al., 2012). Such innovations range from using digital tools to incremental optimisation of current practices to re-defining a company's purpose and business model.

A good manager needs a wide range of skills, and a key question to ask is whether those with the highest skills choose to- and are selected to become managers. Language- and processing skills, as measured by the PIAAC survey, where the respondent needs to read a text, understand it and process it to answer one or more questions is a useful indicator of managers' capabilities. Literacy skills are closely correlated with numeracy skills and digital problem solving skills and is associated with flexibility to learn new tasks. Contrasting high literacy skills in the Estonian population, which ranks eight compared to the other countries and regions participating in PIAAC, Estonian managers' skills are around the OECD median. Moreover, the skill level of managers is on average only slightly above the average skill level of non-managers (Figure 2.30, Panel A).

Higher quality of management can improve productivity within firms, but from the perspective of the economy as a whole, these gains will be maximised when the most effective managers command a larger share of the economy's resources (Adalet McGovan and Andrews, 2015 and 2017). This is the case on average across OECD countries, with larger firms tending to have better managers than smaller firms. To some extent, this is also the case in Estonia, where firms with more than 50 employees attract the highest-skilled managers. However, skills of managers in the largest Estonian firms are no higher than in medium-sized ones (Figure 2.30, Panel B). There are multiple possible reason for this apparent deviation from efficient allocation of managers (further discussed later in the chapter), including lack of competition; cumbersome regulations affecting product and labour markets, and; an inefficient ownership structure (for example, managerial quality is highest in multinational enterprises and lowest in family managed firms).

As part of a diverse skill-set, and notably in the adoption of digital technologies, managers need digital skills. Digital problem solving skills in the population, as measured by PIAAC, places Estonia in the bottom quartile of participating countries and regions. Managers are however considerably more digitally proficient than Estonians without management responsibilities (Figure 2.30, Panel A), and the most digitally proficient managers are found in the biggest companies (Panel C).

Figure 2.30. Managers' skills could be higher and utilised more efficiently

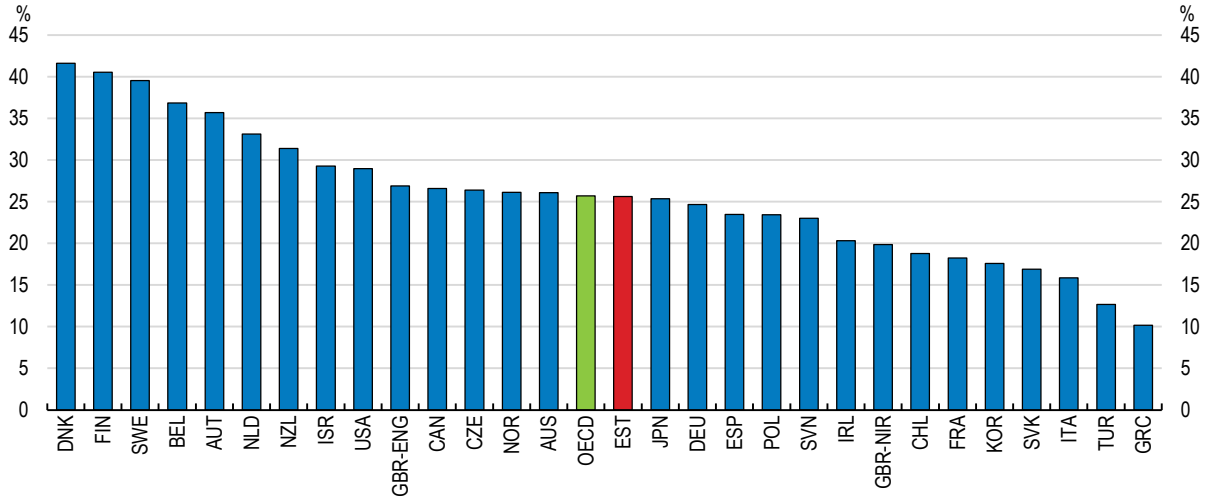


Note: Managers are defined as personnel managing at least one colleague. The second round of the PIAAC Survey (2015) added Chile, Greece, Indonesia, Israel, Lithuania, New Zealand, Singapore, Slovenia and Turkey. The skill difference between managers and non-managers presented in Panel A is the coefficient of a dummy variable taking the value one for managers in an OLS regression controlling for sector composition.
Source: Author's calculations based on OECD Survey of adult skills (2012 and 2015).

An alternative way of investigating the quality of management is through the lens of high-performing work practices (HPWP). HPWPs include both aspects of work organisation, such as teamwork, autonomy, task discretion, mentoring, job rotation, applying new learning, and management practices such as employee participation, incentive pay, training practices and flexibility in working hours. Studies have shown strong links between HPWPs and productivity performance. There is a strong relationship between HPWPs and individuals' skill use at work. Workers who benefit from any degree of HPWPs make greater use of numeracy, writing, reading, ICT and problem-solving skills than those who do not, and skill use increases with the intensity of HPWP use (OECD, 2016b). The use of HPWPs in Estonia is around the PIAAC average and lags well behind best performers (Figure 2.31).

Figure 2.31. The use of high-performing work practices is around average

Percentage of jobs with High-Performance Work Practices (2012 and 2015)



Note: Data collected in 2012, except for Chile, Greece, Indonesia, Israel, Lithuania, New Zealand, Singapore, Slovenia and Turkey, for which data were collected in 2015 in the second round of the PIAAC Survey. BELL refers to Belgium (Flanders), GBR-ENG to United Kingdom (England), and GBR-NIR to United Kingdom (Northern Ireland).
Source: OECD Employment Outlook 2016 fig 2.10A, calculations based on the OECD Survey of Adult Skills (PIAAC) 2012 and 2015,

The government can play a role in disseminating high-performing organisational- and management practices. The government can adopt such practices in public administrations and government-owned enterprises, with spill-overs to the private sector over time. Lean regulations in product-and labour markets is a strength in Estonia, encouraging firms to improve their management practices and contributing to the exit or restructuring of poorly managed firms. Plans to reform a relatively strict insolvency regime are welcome. Estonia's openness to trade and foreign investment can also be beneficial for management practices since multinationals are, on average, better managed than other firms (OECD, 2019a). Finally, family-owned firms run by family members are in general badly managed compared with similar family-owned firms run by external CEOs (Bloom et al., 2012a). Managers of Estonian family-owned companies tend to value the satisfaction of family members and continuity of family business traditions over profits and expansion (Kirsipuu, 2013), indicating that family ownership may have negative productivity effects in Estonia. Avoiding tax rules overly favourable to family transmission of firms may help. There is no inheritance tax in Estonia, but the gains from the transfer of property received as a gift or inheritance are taxed as income.

Several OECD countries, including Australia, the Netherlands, New Zealand and Sweden have implemented programmes to improve managerial and organisational performance of firms. For example, the Finnish Workplace Development Programme (TYKE from 1996 to 2003, TYKES from 2004 to 2010, thereafter Liideri) aimed to disseminate new work, organisational and management practices, models and tools, and to develop a "learning organisation" culture to counter sluggish productivity growth in many traditional industries. Initially it focused on individual enterprises, but networks played an increasing role and there was a strong emphasis on disseminating good practice and mutual learning. Qualitative evaluations suggest that the programmes did promote workplace innovation and productivity. Coaching, promoting best practices and disseminating these through the creation of networks of firms are also common features of other countries' programmes (OECD, 2019e).

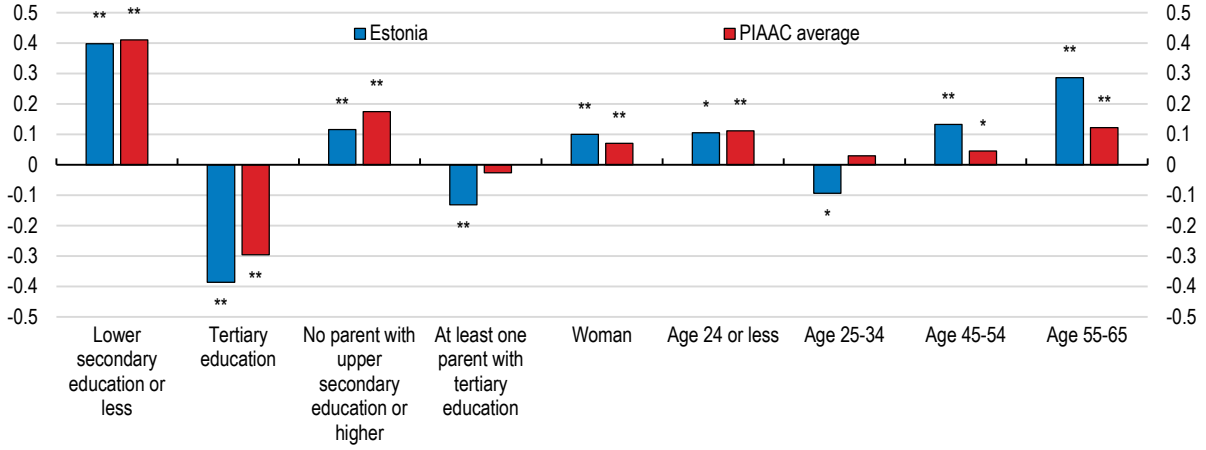
Automation and changing skill demands pose challenges

The digital transformation implies vast shifts in skill demand (Grundke et al., 2018; OECD, 2019e). The demand for skills that are easier to substitute with digital technologies has already been declining, while the demand for skills that are complementary to technologies has been increasing (OECD, 2019a, Männasoo et al., 2020). Automation started with manual routine tasks, typically in manufacturing activities, but is increasingly affecting cognitive routine tasks that are typical of service sectors. Further technological advances, for example in speech and image recognition boosted by artificial intelligence, will increase the range of tasks which can be automated, also in relatively high-skilled occupations. Certain jobs will disappear, but an overall decline in labour demand is unlikely as new tasks and new types of jobs emerge (Gregory et al., 2019). Nedelkoska and Quintini (2018) assess that 14% of jobs in OECD countries are highly automatable, and that another 32% may undergo significant changes due to automation. Estonia is not shielded against these developments, with 12% of jobs highly automatable, and an additional 31% at risk of significant change. This offers the potential to enhance productivity but will also involve transition costs, as structural shifts in labour demand will not be distributed evenly across the population (OECD, 2019a).

Those individuals most vulnerable to automation may also be those least prepared to adapt. In Estonia, as in other OECD countries, people with low education and skills, those from less favourable social backgrounds, women and older workers are more likely to work in jobs with less exposure to tasks that humans typically perform better than machines, such as using skill or accuracy with hands and fingers, instructing and advising people, negotiating, persuading and selling. Estonia differs notably from other countries in a steep age profile in the vulnerability to automation, which may in part reflect that the education older generations attained under communist rule has lost relevance more quickly than in the average country (Figure 2.32).

Figure 2.32. Vulnerability to automation depends on education, social background, gender and age

Exposure to tasks involving perception manipulation, creative- and social intelligence at work (2012 and 2015)



Note: The bars in the figure represent the regression coefficients from an OLS regression of demographic variables on an index of the vulnerability to automation. The index, ranging from 0-5, was constructed as a simple average of ten variables identified as "Engineering bottlenecks" in Nedelkoska and Quentini (2018), measuring the intensity of perception manipulation, creative- and social intelligence at work. The reference individual is a man aged 35-44 with upper secondary education and at least one parent with upper secondary education. The first round of the PIAAC Survey (2012) included Australia, Austria, Belgium (Flanders), Canada, the Czech Republic, Denmark, Estonia, Finland, France, Germany, Ireland, Italy, Japan, Korea, the Netherlands, Norway, Poland, the Russian Federation, the Slovak Republic, Spain, Sweden, the United Kingdom (England and Northern Ireland) and the United States. The second round (2015) added Chile, Greece, Indonesia, Israel, Lithuania, New Zealand, Singapore, Slovenia and Turkey. Coefficients marked with ** and * are statistically significant at the 99% and 95% level, respectively.
Source: Author's calculations based on the OECD Survey of Adult Skills, 2012 and 2015.

Ensuring that the labour force has the right skills for a changing environment, and reducing the personal costs for displaced workers to make the transition more equitable is key for Estonia going forward. However, both active and passive support to the unemployed in Estonia are relatively weak. Only 47% of the registered unemployed are covered by unemployment benefits, notably because of stringent eligibility criteria. The benefit amount is also low, in many cases below the subsistence minimum level (Praxis, 2019a). Those not covered can receive social assistance and are eligible for health insurance, which is generally conditional on employment.

Targeting resources towards up-skilling and re-skilling the unemployed, notably those unemployed with low skills or whose skills have become obsolete, is key to meet changing skill demands and reduce the social cost of the digital transformation. The low-skilled are more likely to do jobs with a high routine content, and they are typically less autonomous and able to adapt the task content of their jobs to automation. They are thus more likely to become unemployed, and they remain unemployed for longer on average. The Work ability reform, moving disability benefit claimants' from passive to active benefits based on a re-assessment of their work ability, is expected to increase unemployment numbers going forward. The focus of ALMPs has shifted towards building basic digital skills and Estonian language courses to Russian-speaking Estonians. Such training is also increasingly made available to individuals at risk of unemployment, for example in traditional industries in Estonia's North-East. Even tough spending on ALMPs has increased over the past few years, it is still low compared to other OECD countries, and a further effort to ramp up training activities for the unemployed and those in risk of unemployment is warranted. Improving unemployment insurance coverage might also help, notably to the extent it gives the unemployed with up-skilling needs better access to and stronger incentives to participate in training (OECD, 2017b).

The development of "gig economy" platforms, offers increased flexibility for workers and firms, and can provide valuable opportunities to displaced workers. However, workers in non-standard forms of employment have more difficulties accessing training compared to standard employees, and the emergence of new forms of work poses a challenge to regulations largely designed for full-time, permanent employees working for a single employer. Furthermore, the balance of power between workers and their employers can be skewed in favour of the employer or platform. Clearly defining and enforcing the employment status of workers, notably the distinction between the self-employed and employees, and minimise opportunities and incentives for the misclassification of workers are essential. Furthermore, rights and protections should be extended to workers where there is genuine ambiguity about their employment status so that these workers in the grey zone can benefit, at least partially, from fair pay, working time regulations, occupational health and safety, anti-discrimination legislation, as well as some form of employment protection (OECD, 2019a; OECD, 2019e).

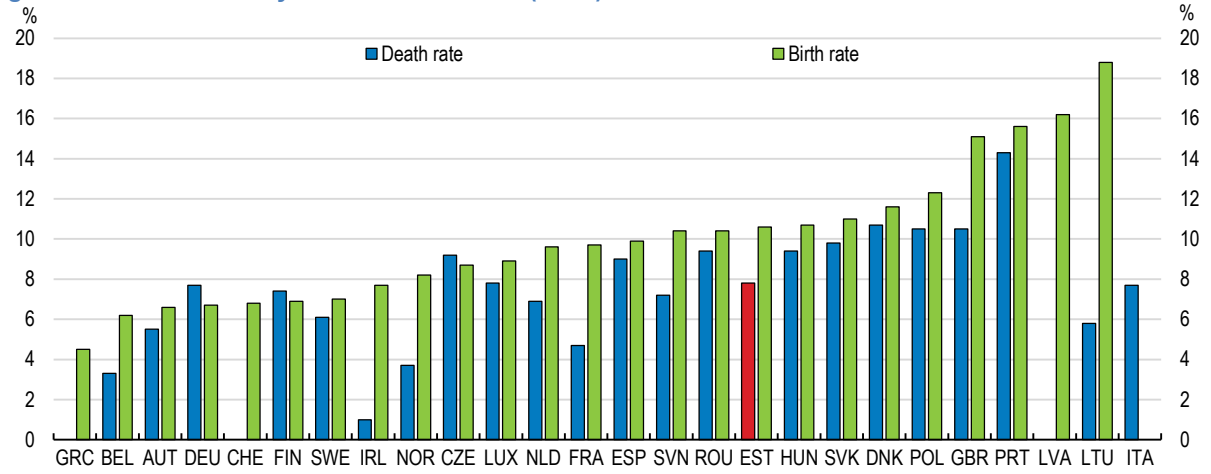
Boosting digital dissemination in a market-friendly environment

The productivity slowdown in Estonia, as in other OECD countries, is connected to and increasing divergence between the best-performing firms ("the productivity frontier"), which have seen productivity continue to grow at least as fast as in earlier periods, and the rest (Pareliussen and Mosiashvili, 2020). This result is linked to declining business dynamism, holding back the reallocation of resources towards the most productive companies and tasks. A business-friendly environment with lean regulations and access to markets, skills and capital boosts business dynamism, increases the pace of digitalisation and productivity growth.

Regulations are in general highly market-friendly in Estonia, but business dynamics are nonetheless just around the average, with rates of firm creation above the OECD median and destruction around the median (Figure 2.33). However, birth rates lag well behind neighbouring Latvia and Lithuania. Sole proprietorships (firms with no employees) appear and disappear at astonishing rates, in particular in the ICT sector. In this

size category, only Denmark and the other two Baltics countries had higher birth rates among OECD economies for which comparable data were available for 2016. Sole proprietorships are important among young manufacturing firms, making up 59% of 1-year-old firms. Skills are relatively well-matched in Estonia, a further indication that business dynamics are fairly good (Adalet McGovan and Andrews, 2015).

Figure 2.33. Business dynamics are decent (2016)

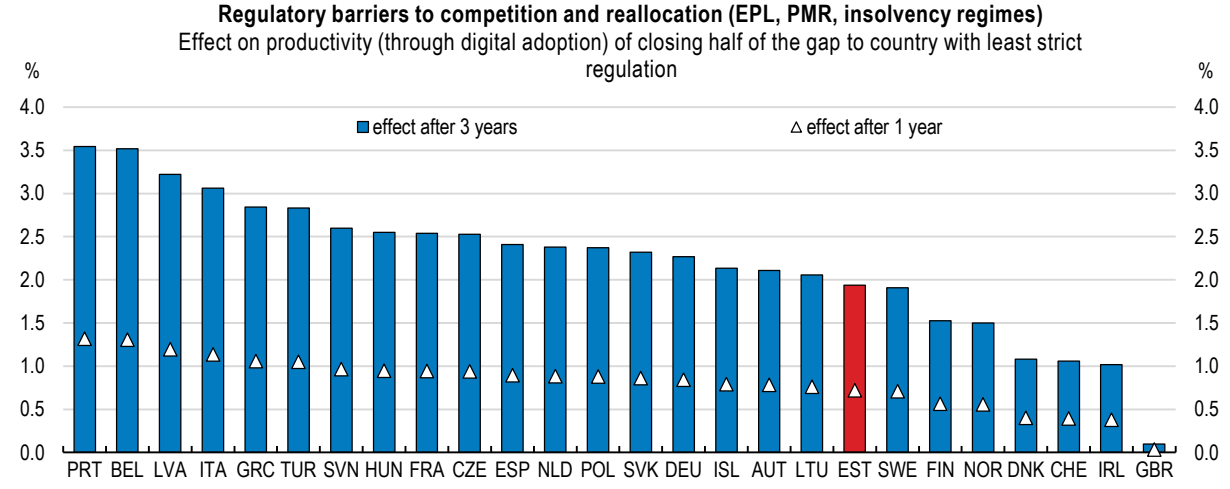


Note: The birth rate is the ratio of newly created firms in the given year to the number of already existing firms, while the death rate is the ratio of firm closures in a given year to the number of existing firms.
Source: OECD SDBS Business Demography Indicators (ISIC Rev. 4).

Regulations are lean, but with some weaknesses

Product market- and employment protection regulations are relatively lean, and Estonia is one of the countries most open to digital trade in the world (see above). However, there is room to boost productivity by streamlining regulations, notably by streamlining the insolvency regime, but also by avoiding command-and-control regulations and reducing public ownership in network sectors (Figure 2.34).

Figure 2.34. Some room to boost productivity by streamlining regulations remains



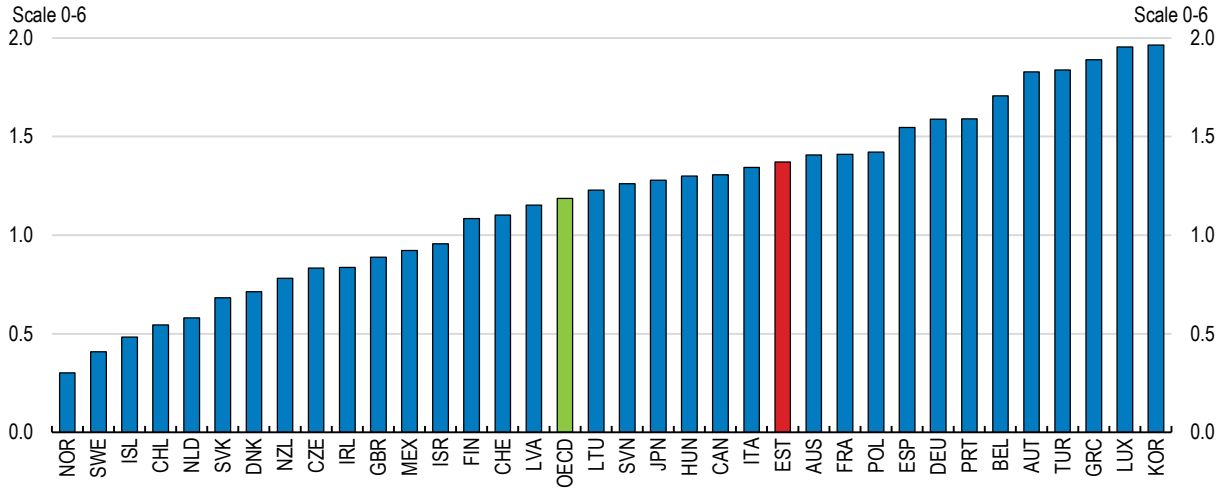
Note: Estimated effect on multi-factor productivity (MFP) of the average firm from reducing employment protection legislation (EPL) on regular contracts, reducing administrative burdens on start-ups (a subcomponent of the OECD PMR indicator) and improving the insolvency regime, as measured by the indicator in Adalet McGowan and Andrews (2017). For each of these indicators, it is assumed that half of the gap to the country with the least strict regulation in the sample is closed.
Source: Sorbe *et al.*, 2019.

Estonia's insolvency regime is quite stringent. An efficient insolvency framework supports investment and avoids that capital becomes trapped in low-productivity firms. Adalet McGovan et al. (2017) find that reforms of insolvency regimes reducing barriers to restructuring can facilitate technological diffusion, and that such reform can give a sizeable boost to productivity growth. Excessively low creditor protection could on the other hand undermine credit supply. An OECD indicator on insolvency regimes shows that Estonia has ample room for improvement in terms of the framework and outcomes of corporate insolvency proceedings. The OECD Economic Survey of Estonia 2017 outlines avenues to improve the insolvency regime. Giving creditors the right to initiate restructuring (rather than liquidation alone) would increase recovery rates and the chances of the company's survival. Early-warning mechanisms, and pre-insolvency regimes permitting swifter out-of-court settlement could be introduced. Additionally, the length of the period in insolvency during which creditors cannot continue debt collection, thereby allowing for restructuring of the business, should be shortened, like in some other OECD countries, including Germany, Ireland and the United Kingdom. Finally, to encourage capital injections required to facilitate the reorganisation of firms, international best practice suggests that new financing should have priority over unsecured creditors (OECD Economic Survey of Estonia, 2017; Adalet McGovan et al., 2017).

Overall regulations of product markets are relatively lean in Estonia, as measured by the OECD product-market regulation (PMR) indicator, but there is room for improvement in some aspects. In particular, before adopting new regulations, regulators are not required to assess alternative policy instruments (be it regulatory or non-regulatory) vis-à-vis the proposed regulation. The lack of that requirement risks the introduction of regulations that might not lead to the most favourable outcomes, thereby weighing on efficiency of the system. Similarly, no guidance has been issued on using alternatives to traditional regulation. Over two-thirds of OECD countries require the assessment of alternative instruments and issue guidance on the alternatives to traditional regulation. Reflecting this regulatory policy weakness, command and control regulation is more common in Estonia than the OECD average (Figure 2.35).

Figure 2.35. Command and control regulation is more common than in other OECD countries

Command and control sub-index of the PMR indicator, 2018



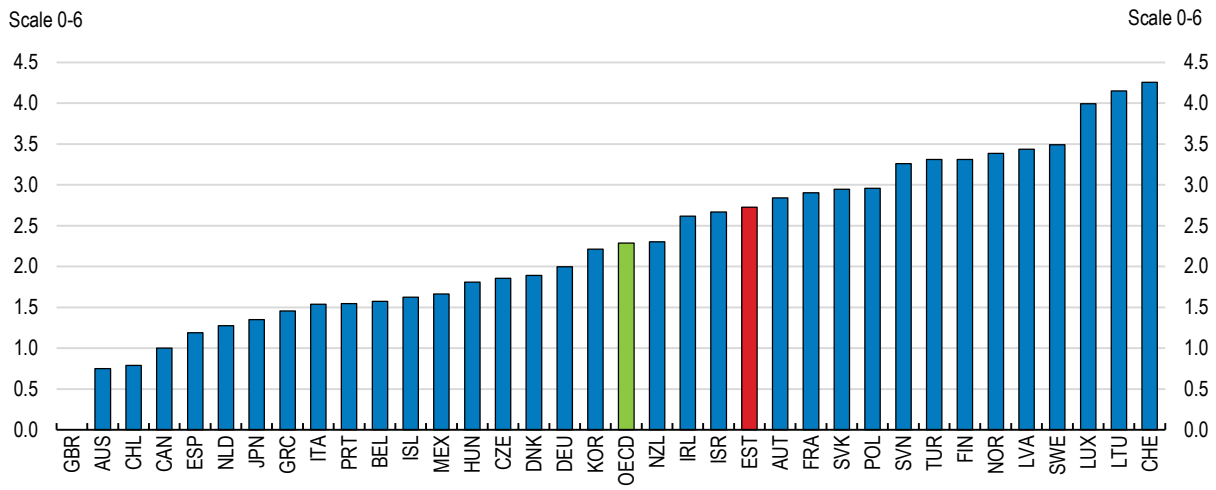
Note: The Product Market Regulation sub-indicator of command-type regulation covers various regulations of coercive type such as shop opening hours, universal service provision, backhauling, intermodal operations, advertising and restrictions on the legal form of business in eight sectors. The values of the indicator range between 0 and 6, with higher values indicating more stringent regulation.
Source: OECD Product Market Regulation database.

The Estonian government's involvement in network industries is above that of the OECD average (Figure 2.36). In particular, in the four network industries of electricity generation, post, air and rail

transport, government ownership in the largest firm is very high. In the generation, import, transmission, distribution and supply of electricity, government fully owns the largest firm. While in many network industries several competitors could hardly survive in a small market like Estonia, private shareholders could exert pressure to improve efficiency. Also, at least some segments in certain network industries could have more competition, for instance in electricity generation. Multiple railway operators may also be feasible. Greater competition in those industries would lift overall productivity. Where competition or other private participation is not feasible, better governance of the incumbent public enterprise could also bring about efficiency gains. While the lack of competition weighs on potential efficiency gains, single ownership and a single standard (instead of potentially numerous, mutually incompatible standards) provides opportunities to pursue digitalisation in those network industries. A frontier country in services digitalisation, China, for instance, is now piloting paperless railroad ticketing in certain regions. Single ownership of railways will make it easier to extend e-tickets to the whole country.

Figure 2.36. Government ownership in network sectors is high

Government involvement in network sectors sub-index of the PMR indicator, 2018



Note: The Product Market Regulation indicators takes values between 0 and 6, with higher values reflecting greater restrictiveness.
Source: OECD Product Market Regulation database.

Estonia also strives to become frontrunner in setting up regulatory systems for future production. In March 2018, Estonia announced that it will prepare a bill to allow the use of fully autonomous information systems in all areas of life. The major task is to ensure the clarity of the law around responsibility of the decisions made by such systems, as well as the mode of supervision. An expert group made up of government officials, academicians and business sector participants was launched in the same year to prepare the bill by June 2020. The national AI strategy 2019-21 has already been put in place. The Ministry of Finance and the Financial Supervisory Authority consider implementing a regulatory sandbox for the Fintech industry, where certain regulatory requirements are temporarily waived, so that enterprises can deploy their innovative solutions in real-life market conditions. This approach holds considerable promise for companies, but also for regulators, who can draw experience for future regulatory invention.

Overcoming lack of scale and increasing awareness of digital potential

Small companies can face structural impediments to adopt certain digital technologies, since some of those technologies can entail high investment costs. Indeed, the share of firms using enterprise software, cloud computing or big data increases nonlinearly in firm size. In the wood industry, which is an internationally

competitive industry in Estonia for example, the minimum threshold to invest in ICT is an annual turnover of EUR 10 million. Considering that the average annual turnover of manufacturing firms with at least 10 employees is around EUR 12 million (as of 2016) and that such firms make up only 8% of the business universe, affordability of such goods and services is the privilege of a couple of thousand firms.. Agglomeration economies might also play a role, with low population density and a lack of relevant expertise outside of the Tallinn area. However, as outlined above, the size distribution of Estonian companies is comparable to other OECD countries, and a number of small OECD countries, like Ireland, Lithuania and the Nordics face comparable structural conditions, but their non-ICT sectors are among the most digitally advanced in the OECD.

A small home market in the geographic periphery of the European Union may also pose a barrier. Home-bred companies in traditional sectors may find it challenging to build the necessary scale to take on the investment costs of expanding to other countries, and the investment cost of digitalising back- middle- and front-office functions may be perceived as daunting with a limited number of suppliers, employees and customers. A traditional dependence on cheap labour may also hold back automation. Even though high wage growth lately poses a challenge to Estonia's competitiveness, it may yet prove to be a boon to overall productivity to the extent it forces companies to seek ways to automate and digitalise to stay competitive.

Increased cooperation could be a way to overcome investment costs of adopting digital technologies and expanding beyond national borders. As an example, small-scale furniture producers who each already export to a limited set of foreign markets could share their existing networks outside of Estonia's borders and cooperate on exporting their products under common marketing- sales- and distribution platforms. Mergers and joint operations to reach critical investment thresholds are possible ways of cooperation, as is standardisation, easing communication across various software packages. Employer- and labour organisations provide platforms for networking and cooperation in countries such as the Nordics and Germany, but a weak culture of cooperation may stand in the way in Estonia, where labour unions have the lowest coverage in the OECD, and employers' organisation rate is at 25% also one of the lowest in the OECD (OECD, 2017a). Strengthening unionisation could have advantages also in other areas, such as skill supply, as discussed above.

Greater participation in the European Strategic Cluster Partnerships would provide an avenue for Estonian SMEs to interact with technology centres both within clusters and across regional and sectoral silos. Estonian industry associations could for example facilitate or provide platforms for their members with smart solutions based on machine learning and AI to efficiently leverage data in real time. These could cover joint marketing, supplier interactions and customer support. The digital manufacturing on a shoestring initiative in the United Kingdom seeks affordable smart solutions for SMEs not only for encompassing digitalisation on the factory floor, but also in office functions and supplier interactions. In Estonia, such digitalisation support could be a next step following digital diagnostics by Enterprise Estonia. Singapore's Productivity Solutions Grant, which covers up to 70% of one-off costs of IT solutions and equipment, supports companies keen on adopting IT solutions and equipment to enhance business processes.

The lack of scale is compounded by a lack of awareness of potential gains, a prerequisite to motivate firms to adopt digital technologies. The Green Paper on Industrial Policy aims to increase entrepreneurs' awareness of the positive impact of digitalisation. Enterprise Estonia offers grants to manufacturing and mining firms covering the costs of digital diagnostics, performed by private consultancies to identify areas where digitalisation could and should be implemented in the company. The grants cover most of the costs of the diagnostics exercise and range between EUR 5 000-15 000. However, there are complaints about the high degree of bureaucracy when applying, only firms with annual sales over EUR 200 000 are eligible, and take-up rates of the various tools are not published. Reducing bureaucracy of the application process, reducing the firm size threshold, publishing take-up rates and disseminating success stories would increase appetite for this service.

Easier access to capital would foster productivity growth through digitalisation

Financing is not an obstacle to long-term investments among larger firms, but 18% of micro firms (less than 10 employees) and 12% of small and medium-size enterprises (SMEs) consider it a major obstacle. One in twenty Estonian SMEs consider access to finance as the single major issue (European Commission, 2018b). Even though these shares are lower than in Baltic peers, they are higher than in other Central and Eastern European economies, let alone Nordic countries.

The rejection rate of loan applications made by SMEs, a more meaningful indicator of access to finance, is more than double the EU average (11% vs. 5%) and so is the share of SMEs that do not apply for bank loans in the first place in fear of rejection (also 11% vs. 5% in the EU). Alternative financing methods are gaining space in Estonia to fill in for demand unmet by banks. Factoring has become the most important source of financing for SMEs, followed by bank loans and internal funds (European Commission, 2018b).

To support SMEs' access to credit, the government offers credit guarantees, interest subsidies and maintains specialised financial institutions serving SMEs (OECD, 2019g). SMEs also have access to so-called industry loans for export-oriented firms in mining, processing manufacturing and electricity industries. Those loans are granted by SA KredEx, a foundation set up by the Ministry of Economic Affairs and Communications, and provided by banks. The loan can be up to 40% of the project cost and maximum EUR 2 million per project. A novelty of this measure introduced in 2018 is that it also supports investment in intangible assets, unlike the earlier so-called technology loans, which were limited to tangible assets. This change is of particular significance as investing in intangible capital is key to digitalisation (and Estonia so far have invested relatively little in intangible capital). KredEx also supports risk capital. Such government support is justified on the basis of market failures related to information asymmetry between banks and firms.

A major complaint by the business sector is the requirement of collateral for enterprise borrowing and collateral is most of the time real estate. That is why service companies, that are less likely to own fixed assets that can be collateralised, are more likely to consider financing as a major obstacle to long-term investment (12% vs. 10% in manufacturing). In particular, construction companies face difficulties in access to finance (19% of them view it as a major obstacle to long-term investment). In addition, the lack of internationally accepted collateral prevents overseas acquisitions and hence firm growth.

To overcome the lack of fixed assets to serve as collateral for borrowing from banks, a system and standards to accept intangible assets as collateral could be established. Given the strong performance in terms of registering trademarks and industrial design by Estonian companies, collateralising those could ease borrowing constraints. Korea is among the OECD countries with an effective system providing loans for purchasing, commercialising and collateralising intellectual property under the "Techno Banking" initiative by the Korean Development Bank. The Bank also established a collection fund for distressed intellectual property for the disposal of intangible assets. In additions, the government should promote alternative financing, including FinTech, to fill the funding gap, while keeping safe standards regarding consumer protection and predatory lending.

Innovation and R&D policies to foster digitalisation

Judging from internationally comparable indicators, entrepreneurial spirit is not lacking in Estonia. By the Global Entrepreneurship and Development Index, the country ranks 23rd, much higher than its ranking by per capita income. Furthermore, Estonia ranks 24th by the Global Innovation Index 2019 and even higher on innovation outputs (18th) (Cornell university, INSEAD, and WIPO, 2019). Estonia fares well in creative outputs, in particular the creation of mobile apps, where it ranks seventh. Creativity, however does not translate into intellectual property-related revenues from abroad, as they are only a negligible share of services trade exports. Indeed, ICT-related patents are only a fraction of all patents. In trademarks and

industrial design, in contrast, Estonia ranks 25th and 22nd, respectively. In general, the strictly innovation-related sub-indices appear the major weak point of the innovation ecosystem.

The Estonian Research, Development and Innovation Strategy 2014-20 set a target for R&D spending of 3% of GDP by 2020. This would not only reverse the decline in R&D spending starting in 2012, but would mean doubling of spending relative to recent years. The share of the higher education sector in R&D spending is particularly high, together with the government and non-profit sector make up over half of the total. However, many research projects are not related to real-life problems and therefore are likely to have little impact on productivity. R&D should not only be undertaken by universities but also by industries. While basic research is important and so is the freedom of researchers, part of government-sponsored research projects could be better linked to issues Estonia is facing and required to prove their role in finding solutions for major bottlenecks. A description of major benefits of the project should also be required with possibly quantification of the benefits.

A major question is how to incentivise various units to work better together. Innovation vouchers in place since 2009 help SMEs establish their first contact with universities or other experts to develop innovative solutions. Development vouchers can then be used in the next step. Currently, all patents registered by academic staff or researchers are owned by the university or research institution they work for. Patenting activity could benefit from allowing individuals to share the return on patent commercialisation.

MAIN FINDINGS (key in bold)	RECOMMENDATIONS (key in bold)
Maximising complementarities between technologies, skills and policies	
High-performance work practices boost individuals' skill use at work, digital adoption and productivity performance. Their use in Estonia is around the OECD average.	**Implement a programme to improve managerial practices and organisational performance of firms with a strong element of network-building to disseminate good practice and mutual learning.**
The small scale of firms may pose a barrier to investments in digital technologies and internationalisation.	Support industrial associations in providing platforms and developing affordable smart solutions in areas such as joint marketing, supplier interactions and customer support.
Broadband connection speed is low in international comparison.	Provide better coverage for ultra-fast broadband at an affordable cost, including subsidising last-mile rollout for smaller enterprises.
Some enterprises may not undertake digital diagnostics in fear of bureaucracy of the process. The potential benefits of the diagnostics are not well known.	Reduce bureaucracy in the application process for digital diagnostics – an exercise to determine digital needs of companies -- to increase take-up rates and publish respective statistics and success stories to make the initiative more attractive.
Making the most of skills	
The organisation, content and quality of the teaching of digital skills varies between schools, and Teachers do not feel sufficiently prepared to teach digital skills and use digital tools.	**Strengthen the quality and relevance of teachers' training and professional development in teaching digital skills.**
An overwhelming majority of ICT specialists are men, reflecting early educational choices.	**Tailor ICT classes and voluntary ICT hobby activities to better match the interests of both girls and boys from the early stages of compulsory school and in early childhood education and care.**
People with low education and skills are more likely to work in jobs more vulnerable to automation and digitalisation.	**Continue to scale up and improve access to active labour market policies, notably up-skilling activities for the unemployed, the disabled and those in high risk of unemployment.**
Many unemployed are not covered by unemployment insurance owing to its stringent conditions and hence cannot benefit of active labour market programmes.	**Relax eligibility conditions for unemployment insurance.**
Estonian companies are little involved in vocational education and training and the continuous training of own employees.	**Strengthen cooperation between the public sector, labour unions and employers to boost their engagement in skill supply, including vocational education and training and continuous learning.**
A large share of internet users are either unaware of or passive towards IT security and privacy issues.	Integrate digital security and privacy risk management and awareness throughout the educational system and in adult education activities related to digital skills.
The threshold of two times the average wage may be too high to attract highly qualified workers, notably young ones in entry-level positions.	Consider to soften rules for high-skilled immigration.
Boosting digital dissemination in a market-friendly environment	
Access to finance is an obstacle to long-term investment for smaller firms and they are rejected or do not apply for loans in fear of rejection.	**Promote alternative financing to fill the funding gap for SMEs.**
The large number of planning documents at the national and sectoral levels contain overlap and industry digitalisation is not sufficiently emphasised.	**Formulate policies for industry digitalisation in a holistic way as a means of productivity catch-up and reflect those in government planning documents. Monitor implementation.**
Costly and slow insolvency proceedings hold back business dynamics.	Reduce the time and costs associated with insolvency and develop early warning mechanisms and opportunities for out-of-court settlements.
Collateral in the form of fixed assets is usually required when borrowing from banks, but other assets, such as intellectual property, are not accepted.	Establish a system and standards to accept intangible assets as collateral.
Regulators are not required to assess alternative policy instruments before adopting new regulations.	Before adopting new regulations, require the regulators to assess alternative policy instruments.
The government fully owns or holds nearly all shares in the largest firm in electricity generation, posts, air and rail transport.	Introduce more competition into electricity generation, posts, air and rail transport where feasible.
Research funds are often used for projects without much connection with Estonia.	Direct part of government-sponsored research funds to projects finding solutions for major bottlenecks in the country.
Patents developed in universities or research institutions belong to the institutions, without material benefits for the inventors, thereby reducing patenting incentives.	Allow individual researchers to share the return on patent commercialisation.

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OECD Economic Surveys

ESTONIA

Estonia's economy continues to perform well, and growing incomes support well-being. However, the expansion has peaked, and growth is set to soften due to weak international demand. Prudent fiscal policy has resulted in low debt, but spending pressures related to meeting infrastructure needs and ageing are mounting. Old age poverty is high and the proposal to allow early withdrawal of pension funds threatens macroeconomic stability and pension adequacy. The gender wage gap is among the highest in the OECD, and inequalities in income and health are considerable, reflecting gaps in the social safety net. The oil-shale sector is highly energy-intensive and is the main culprit behind Estonia's high greenhouse gas emissions, but reducing dependence on the sector is challenging, as it is an important employer and meets a dominant share of Estonia's energy needs. Estonia is a frontrunner in digitalising government services and boasts a number of native ICT unicorns, but Estonian companies lag behind in utilising the productivity potential from adopting digital technologies.

This *Economic Survey of Estonia* assesses the country's macroeconomic performance and proposes policy measures to promote higher and more inclusive growth. Policy recommendations relate to how to achieve Estonia's nine development targets and how to embrace digitalisation by industries.

SPECIAL FEATURE: DIGITALISATION AND PRODUCTIVITY

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