Chapter 5

Capacity building and public services in Estonia

Capacity building, including provision of essential public services, is one of the main channels or incentive areas to support innovation and sustainable development. This chapter concerns three relevant policy areas: infrastructure and rural development policy; labour market policy; and education and skills policy.

5.1. Infrastructure and rural development policy

Investments in physical and knowledge infrastructures, from Information and Communications Technology (ICT) to transportation facilities, are important for overall growth and development. They are vital to the delivery of, and access to, important services and play a critical role in linking farmers and related businesses to markets, reducing food waste, boosting agriculture productivity, raising profits, and encouraging investment in innovative techniques and products. Productive and profitable enterprises may have higher incentives to invest in sustainable practices that yield long-term benefits.

Broader rural development measures also affect sustainable agricultural development and structural adjustment. Increased off-farm income and employment opportunities mitigate farm household income risks, facilitate farm investment, and enable a wider range of farm production choices. Improved rural services, from banking to ICT, are important to ensure needed connectivity to suppliers, customers, and collaborators. Rural policy can also attract innovative upstream and downstream industries, with possible spill-over effects locally. By reducing inequalities in economic development and access to services across regions, rural development policies improve the diffusion of innovation (OECD, 2015).

In a country like Estonia, where the density of population is low and the population is concentrated in main urban centres, the provision of infrastructure and services presents specific challenges. In remote rural areas with sparse population in particular, connecting people to markets and providing information and services requires innovative solutions.

Quality of physical infrastructure

According to the World Economic Forum's Global Competitiveness Report (WEF, 2016), the business community considers the quality of the overall transport infrastructure in Estonia close to the average of OECD countries (Figure 5.1.A). There are, however, large differences between means of transport and within each transport network. The quality of the port infrastructure ranks highest, with a quality close to the OECD top 5 average. But the quality of railroad and air transport infrastructures ranks very low. The small number of connections between Estonia and Europe and other continents, as well as the constantly varying destinations, possibly explain the low score of the air transport infrastructure. While the impact on the Estonian agri-food sector is likely to be limited, better international connections could help strengthen international business with other continents, including in the agri-food sector, and raise awareness of Estonian products abroad.

Rail transport also suffers from the scarcity of international connections and the limited speed of passenger train traffic. While most main-line railways have been upgraded to enable passenger trains to run at up to 120 kilometres per hour (km/h), the renovation is still incomplete with some sections remaining where trains cannot go faster than 80 or 100 km/h. The situation is, however, improving gradually. Although passenger trains purchased in 2013 can reach up to 160 km/h, the current railway infrastructure in Estonia is not ready for such high speeds (MEAC, 2013a). Higher speed would reduce travel times and shorten the distance between rural regions and consumers or tourists. Higher capacity would be needed to respond to the growing number of passengers on some lines, such as Tallinn-Tartu. However, the fleet of trains is currently too small to increase the frequency of trains or the number of carriages per train, when needed. More frequent and faster trains would increase opportunities for diversified marketing of agri-food products and tourism activities.

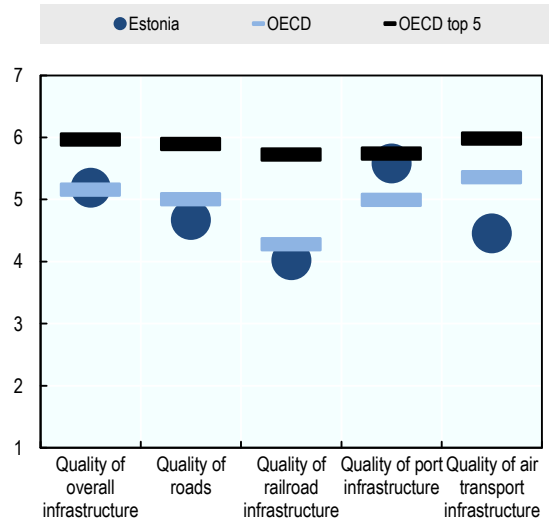
The business community considers the overall road infrastructure in Estonia to be below the OECD average, reflecting problems with the availability and quality of infrastructure, especially in rural areas. A 2013 government report on a road network development plan for 2014-2020 (MEAC, 2013a) acknowledges that while main roads are mostly in a good or very good condition, basic roads in a satisfactory condition, the secondary and local roads are in a rather poor condition. In 2015, 68.2% of the national roads (main, basic and secondary roads) were paved (Road Administration, 2016). The rest of the state roads are gravel or earth roads. Local roads (except streets) are mostly unpaved, or light-surfaced roads (MEAC, 2013a). The low quality of roads is related to the scarcity of funding.

The business community considers the overall electricity and telephony infrastructure in Estonia to be among the OECD average, but very unequal across components (Figure 5.1.B). On the one hand, with 1.6 mobile telephone subscriptions per person, Estonia has the highest score in the OECD area. Internet use is relatively widespread: 80% of individuals use internet, compared to 81% in high income OECD countries. On the other hand, the number of fixed telephone lines per inhabitant is below the OECD average, and the quality of electricity supply ranks below the OECD average, although it enjoys a relatively high score.

Figure 5.1. Global Competitiveness Index: Quality of infrastructure, 2016-17

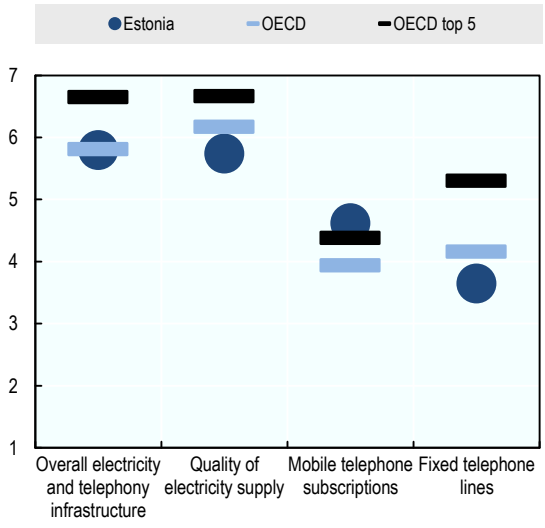
Scale 1 to 7 (best)

A. Transport infrastructure



OECD top 5 refers to the average of the scores for the top 5 performers among OECD countries (Netherlands, Japan, France, United States and Germany).
The OECD index is the simple average of member-country indices.

B. Electricity and telephony infrastructure



OECD top 5 refers to the average of the scores for the top 5 performers among OECD countries (Switzerland, Luxembourg, Austria, United Kingdom and Japan).

Source: World Economic Forum (2016), *The Global Competitiveness Report 2016-2017: Full data Edition*, Geneva 2016. http://reports.weforum.org/global-competitiveness-index/.

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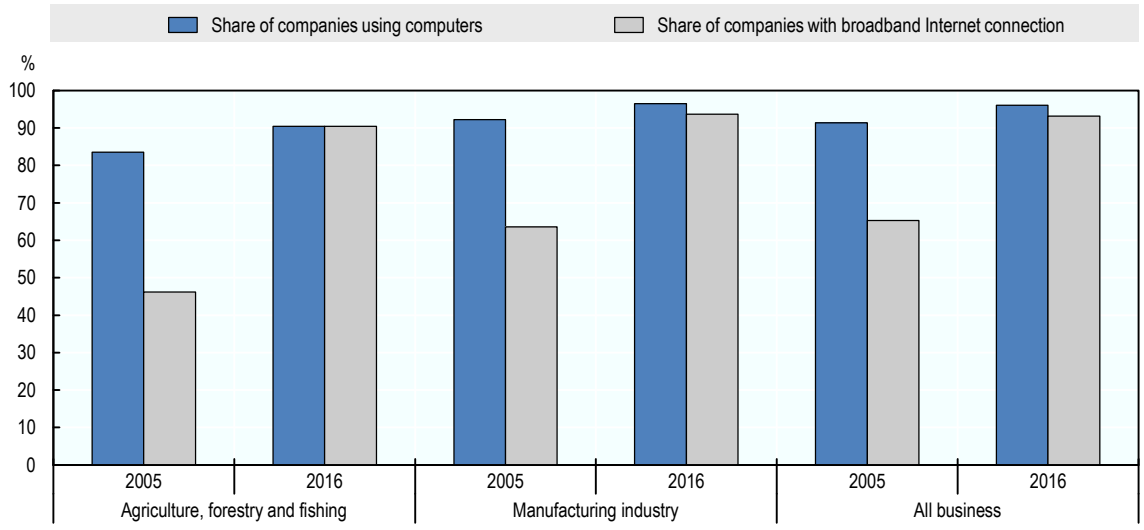
Almost all companies use computers and almost all have broadband Internet connection (Figure 5.2). In 2005, the share of companies using computers and broadband Internet access in the agricultural sector was slightly lower than in other sectors, but by 2016 these differences became non-existent. In the manufacturing industry (including the food industry), the use of computers and fixed broadband access has always been higher than the average of all sectors. In 2016, 79% of agricultural enterprises had Digital Subscriber Line (DSL) technology (ADSL, SDSL, etc.) installed, which enables to provide high-speed internet services over a telephone line. Almost 45% of agricultural enterprises had available a rate of information transfer of 10-30 Megabits per second (Mbit/s), and about 40% a rate of up to 10 Mbit/s. The websites of agricultural enterprises included product catalogues or price lists (99%), as well as information about job vacancies (17%), and links or references to the company's social media profile (15%).

Figure 5.2. Share of companies with computers and a broadband Internet connection, 2005 and 2016



Source: Statistics Estonia (2017), [IT004], www.stat.ee/en.

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Since 2010, Estonia has been rapidly developing the basic broadband infrastructure (passive optical network) with EU support with a view that around 98% of residences and businesses are within 1.5 km of the nearest connection point (MEAC, 2013a). By winter 2017, 4 162 km of EstWin broadband network had been installed (ELASA, 2017). This has contributed to the development of 4G Internet and will support the development of 5G Internet in the future. However, the development of basic broadband infrastructure has not significantly increased the number of users. In Estonia, people are using fast and ultra-fast Internet through fixed network. The problem is that communications operators do not have an economic interest in developing local high-speed broadband access for all end users. In order to achieve broader access, the government plan was to develop a Network based on contemporary fibre optic cables connecting the broadband network to the end users in sparsely populated areas with a limited number of end users (see funding section). As of autumn 2016, only 10% of the fibre optic capacity of basic broadband infrastructure was exploited (it is possible to use Optical Carrier (OC)24 or OC48 throughout the entire passive optical network). Telecommunications companies investing in the development of mobile Internet and offering their clients 4G Internet have benefited the most from the development of the basic broadband network. It is not an equivalent replacement for cable connections, but has still offered a partial solution to the problem (National Audit Office, 2014).

ICT development and everyday use of ICT technology have enabled most farmers and food processors to have very good access to information concerning market developments, technological options and weather forecasts. For example, one of the services on offer is field-based weather forecast, which enables the farmers to plan their fieldwork according to the weather conditions and thus increase their operational efficiency (Vitalfields). Farmers also receive a lot of information (on the equipment, technology, etc.) from vendors and distributors. Information on market developments can be obtained from seminars and panels organised by producer organisations. Improving broadband Internet services in remote areas would provide local farmers and agri-food companies with better access to inputs, technologies, advice, and consumers, allowing them to take advantage of market opportunities.

The electricity and gas supply interconnections in Estonia are, first and foremost, linked with the connections with the Russian Federation, other Baltic countries and Finland (only electrical connection). Connections with the other EU member states are not available (MEAC, 2013a). There are no nuclear power plants in Estonia, and 85% of the electricity is produced from oil shale. Some small islands like Ruhnu and Naissaare are not connected to the electricity grid, and rely on off-grid solutions such as a renewable power

plant, a storage battery and an inverter that changes the direct current (DC) power to alternative current (AC) energy. The electricity network company is considering expanding the same solution to sparsely populated areas to reduce costs (Timm, 2016). In this context, agricultural land and activities may provide viable opportunities for generating electricity and energy, such as windmills.

While rural users consider the condition of local roads to be the main deficiency of rural infrastructure, rural entrepreneurs and local authorities also consider the electricity supply to be inadequate and that capacity needs upgrading (Box 5.1).

Box 5.1. Technical infrastructure through the eyes of rural entrepreneurs and local authorities

A well-developed infrastructure in rural areas helps to compensate for the distance between rural areas and major attraction centres. Entrepreneurs consider the availability (with sufficient capacity) and fault tolerance of the energy, availability and quality (speed) of communications infrastructure, water quality and the state of the roads, the most essential factors of the business environment.

The condition of infrastructure in rural areas of Estonia varies considerably. Entrepreneurs rank the condition of local roads as the worst of the technical infrastructure elements. The representatives of the processing industry estimated the condition of roads to be better than the entrepreneurs from the primary sector.

According to local authorities, the biggest problem is the poor technical quality of the electricity supply network and the excessive pricing of grid connection and electricity capacity upgrading. The state of the roads and the availability of adequate electric power supply was rated the worst by the entrepreneurs in South Estonia.

Source: EMÜ (2012), The study, "The situation of rural enterprises, their development trends and the need to support", Final report, Tartu.

Regarding agricultural-specific infrastructure, land improvement directly affects farm productivity and sustainability. Estonia is located in a temperate climate zone, where the amount of precipitation significantly exceeds total evaporation. Humid climate, flat terrain, unevenly distributed natural hydrological network and soils with poor permeability contribute to widespread paludification. As a result, land needs to be drained to improve productivity and 55% of the utilised agricultural area (UAA) is covered by land drainage systems. Most of the drainage systems are over thirty years old and need reconstruction. In 2005, 26% of the draining systems were in poor condition. EU support for investment in land improvements received over the period 2004-13 allowed the reconstruction of about 15%, and the renovation of about 25%, of the drainage systems in need of repair on agricultural land. Support for the reconstruction and renewal of land drainage systems is continued over the programming period 2014-20. According to the Register of Land Improvement Systems, irrigated areas make up 0.03% of the total agricultural land in Estonia. The construction of combined drainage irrigation systems (double-duty systems) is gaining more and more popularity. Such systems secure a sufficient amount of water for plants in dry periods, ensuring at the same time that water is not wasted (MRA, 2016a). They are thus expected to further improve productivity of agriculture, sustainably.

Priorities for infrastructure development

The priorities for the development of infrastructure are reflected in a number of development documents, for which the preparation and implementation is primarily the responsibility of the MEAC. All documents are, to a greater or lesser extent, related to the development of agricultural and food sectors. The development and reconstruction of the technical infrastructure in Estonia are carried out in line with the environmental legislation, and development plans pursue both efficiency and environmental sustainability. As summarised in Box 5.2, infrastructure development plans aim to respond to identified needs such as the improvement of secondary roads, more reliable and diversified energy sources, and more operational ICT connections reaching end-users. Development plans for energy in particular offer opportunities for agriculture to contribute to renewable energy supply and use.

Box 5.2. Estonian priorities for infrastructure development

The **Estonian Transport Development Plan 2014-20**, adopted in 2013, highlights efficiency and environmental sustainability. It emphasises the maintenance of the conditions of main roads and the improvement of secondary and side roads (including paving all major state gravel roads, where frequency exceeds 50 cars a day, by 2030). Reducing car use in towns, increasing the number of train connections and train speed, increasing traffic safety, and raising the share of economic vehicles and cars running on renewable energy are considered as the highest priorities. The main alternative type of fuel would include biomethane produced from domestic waste or biomass, and compressed gas (MEAC, 2016).

Digital Agenda 2020 for Estonia is the key instrument in the field of ICT. The development plan provides guidance for creating a well-operating national ICT environment. The main goals include an ICT structure that fosters economic growth, national development and the welfare of its population, increased number of jobs with higher added value, improved international competitiveness and a higher quality of life, smarter governance and increased awareness of e-governance in the world (MEAC, 2013b).

The **Estonian National Development Plan of the Energy Sector Until 2020** was established to guide the development of agricultural and food sector as well as other sectors. The principal goal of the Plan is to make energy production more environmentally-friendly and the energy portfolio more diversified (MEAC, 2013c). The Plan includes the **Estonian National Renewable Energy Action Plan Until 2020**, which endeavours to reach a level where the energy produced from renewable energy sources would account for 25% of the gross final energy consumption (MEAC, 2010). The same document contains measures that are aimed at increasing biomass availability, taking into account other biomass users (including agriculture).

The **Estonian Energy Sector Development Plan Until 2018** is linked to the Energy Sector National Development Plan and its objective is to ensure a consistent and sustainable supply of electricity at a justified price in Estonia. At present, the MEAC is working on the elaboration of a new Estonian National Development Plan of the Energy Sector Until 2030, which is aimed at ensuring an energy supply that is available to consumers at a reasonable price and effort, with an acceptable environmental impact, while observing the terms and conditions established in the long-term energy and climate policy of the EU. The most beneficial economic competitiveness aspects must be observed for the purposes of the implementation of the National Development Plan of the Energy Sector Until 2030. The new plan also drafts the benchmarks for renewable energy, energy efficiency operational programmes and the vision for the renovation of buildings (MEAC, 2016).

Funding of infrastructure development

Infrastructure development in Estonia relies heavily on EU funding. Since joining the European Union, the following EU Structural Funds have contributed to the development of transport infrastructure:

- The Cohesion Fund (CF) is used to finance major transport and environmental infrastructure projects that cost over EUR 10 million. In the transport sector, grants covering up to 85% of the total project costs are available for roads, which belong to the pan-European transport network TEN-T (Road Administration, 2016).
- The European Regional Development Fund (ERDF) supports infrastructure projects that contribute significantly to innovation, telecommunications, environment, energy economy and transport (EUSAE, 2016). In infrastructure projects, the EU contribution rate is 75% of the project cost, plus 25% of the national co-financing.

In Estonia, PPPs are generally not used for road construction. An analysis of the application of PPP in road construction, conducted in 2011, concluded that considering the size of Estonia, it is cheaper for the government to invest in road construction directly than do it within the framework of PPP.

Energy operators are granted support for the application of renewable energy sources on the basis of the Electricity Market Act, liquid fuel producers on the basis of the Alcohol, Tobacco, Fuel and Electricity Excise Duty Act, and in district heating economy from the ERDF, as well as from other sources. Electricity infrastructure is financed from electricity transmission fees or tariffs (MEAC, 2010).

During the period 2012-20 investments in port infrastructure are expected to account for more than half of the total cost of maritime activities (EUR 534 million). The investments are co-financed by EU funds, including the European Maritime and Fisheries Fund (MEAC, 2012).

High-speed broadband access and greater usability is supported by the ERDF, the European Agricultural Fund for Rural Development (EAFRD), and by the state, in areas such as South Estonia where the construction of access networks to broadband telecommunications network is not profitable for operators.

The Estonian Rural Development Programme (RDP) 2014-20 allows funding access to broadband telecommunications networks. Such investments are eligible in the framework of the LEADER programme and other investment measures targeted at agricultural producers and food processers. As part of different *ad hoc* investments, the Estonian RDP 2014-20 can also be used to fund electric, water supply and sewerage systems and connect users to these systems. In the case of investment measures targeted at agricultural producers and food processers, investments are eligible expenses (MRA, 2016a).

Cost and management of services

Regarding transport infrastructure, road use is free of charge in Estonia. Different levels of government are responsible for road construction and maintenance depending on the type of road. Rail users pay when they use the service. A state company manages the services and the development of railways infrastructure.

Electricity is primarily distributed by one network operator, whose operations and service costs are under the state control (Electricity Distribution, 2016). Fees for the connection to the electricity network for business customers depend largely on the chosen amperage and on the distance of the consumption point from the nearest substation. The results of the survey have shown that the most problematic issue for companies in rural areas is the electricity network connection fee and the high cost for increasing the capacity. Local authorities believe this cost can become a major obstacle to the development of companies (Box 5.1). Natural gas is mainly consumed by industrial companies and distributed by a distribution system operator, whose activities and service fees (including connection fees) are under the state control.

The operations of public water and sanitation service suppliers are managed at the municipal level. Connection fees to the public water supply and sewerage systems are established by the local council that has the power to impose a capping rate on the connection fee. The water company is responsible for calculating the connection fee to public water and sewerage systems. Service suppliers may also offer a connection to the systems at a preferential rate if the construction and restoration of these systems has been funded by the EU Cohesion Fund.

Public services in rural areas

Estonia is highly urbanised: 63% of the population lives in urban areas, of which 40% is concentrated in the capital city and its suburbs. This has led to growing regional imbalance with public and private services aggregated around regional centres, while accessibility to rural areas and services in rural municipality and county centres worsened. At the same time, with the spread of Internet, the improvement of computer skills and the development of public e-services, the volume of some public services has decreased.

Estonia stands out for the use of electronic ID, which can make administration practically paper free, fast and flexible. The development of the e-government, especially the elaboration of e-services for the public sector and their application by citizens and enterprises has so far been the strength of the national ICT policy. It includes distributed services-based architecture, web-based/online services, and orientation towards e-services. The basic or service infrastructure of the state information system (X-way, public key infrastructure, e-ID, document exchange centre, information gateway eesti.ee) has over the years supported the development of public services quickly and flexibly through ICT solutions (MEAC, 2013a). This has the potential to reduce the rural-urban gap and increase the accessibility of e-services for both the residents and entrepreneurs in rural areas, but as noted above, problems remain with modern Internet connection in sparsely populated rural areas and Digital Agenda 2020 aims to tackle this market failure.

Non-governmental organisations (NGOs) and local authorities in Estonia co-operate to offer public services to the population. The public services most delegated to the NGOs are in the fields of culture, leisure, sports and the promotion of regional life (Uus et al., 2014). It is a new phenomenon in rural areas for community members to offer community services for a nominal charge.

5.2. Labour market policy

Labour market policy influences employment composition and labour mobility, in particular by facilitating (or discouraging) labour to adapt to new circumstances. It can play an important role in facilitating structural adjustment, including farm consolidation, by assisting excess labour in farming to exploit more remunerative non-farm income and employment opportunities. Policies on skills improvement and on international mobility of human resources can also help to better match labour supply with demand, and can affect innovation and knowledge transfer through exchange of skills and skilled labour. Structural adjustment allowing younger and better educated farmers to enter the sector, and skills improvement policies are expected to improve the adoption of sustainable practices (OECD, 2015).

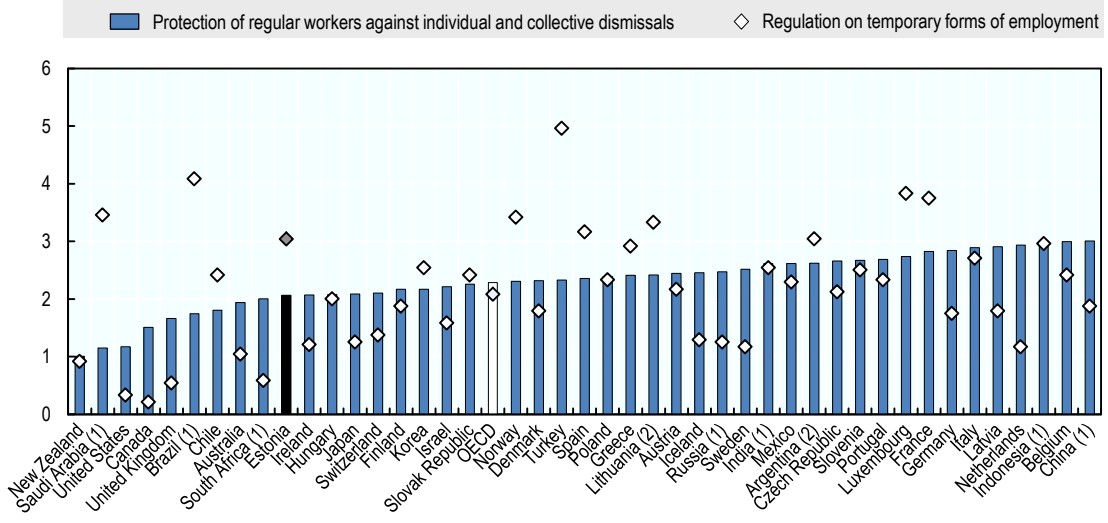
Labour market legislation

Estonia is the only Baltic state, where employment protection was significantly relaxed in the last decade. The 2009 Employment Contracts Act (Soosaar, 2015) aimed to increase employment flexibility, with labour regulation allowing the parties to agree on the conditions of industrial relations that would recognise the needs and interests of the contracting parties in the best possible way. At the same time, the act aimed to ensure the protection of the social partners by laying down the minimum conditions. The implementation of the 2009 Act allowed employers to cut salaries or leave them unchanged in the changing economic environment, which supports the view that wages are flexible (Masso et al., 2013).

The new law allows employers to manage the risks associated with the costs of training staff by concluding an agreement for the reimbursement of training expenditure. According to statistics, the proportion of employees involved in formal education and professional training has, however, not changed in conjunction with the changes in business environment after the adoption of the Act. The Act also reorganised the regulation of working time with the purpose of protecting the workers' health. However, the proportion of employees working overtime, as well as the average amount of weekly overtime, has remained the same.

Figure 5.3. OECD Indicators of Employment Protection Legislation, 2013

Index from 0 (least) to 6 (most) restrictive



Countries are ranked according to "Protection of regular workers against individual and collective dismissals" levels.
1. Data for Brazil, China, India, Indonesia, Russian Federation, Saudi Arabia and South Africa refer to year 2012.
2. Data for Argentina and Lithuania refer to year 2014.

Source: OECD (2016a), Employment Protection Database. www.oecd.org/employment/protection.

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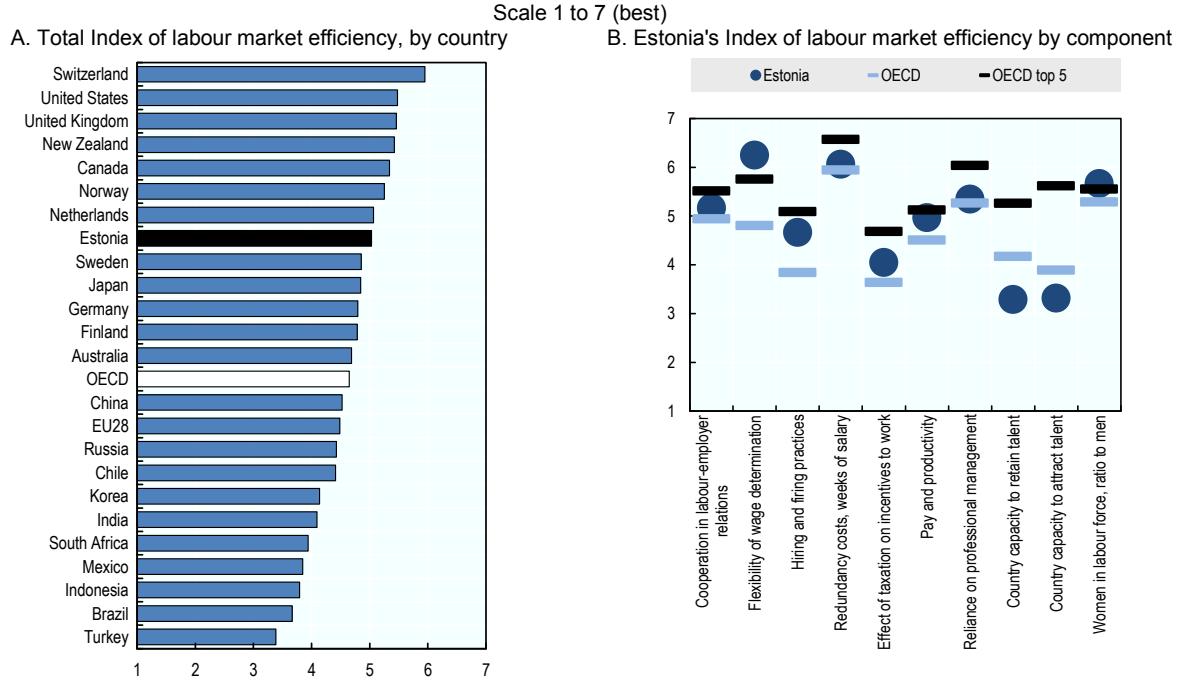
While Estonian legislation does not overly protect regular workers against dismissal compared to the OECD average, the regulation on temporary forms of employment is one of the most protective in Europe, after Luxembourg, France, Spain and Lithuania (Figure 5.3). Among Estonia's neighbours, the regulations in Finland, Sweden and Latvia give much more flexibility to employers regarding temporary forms of employment, thus facilitating the use of seasonal labour much needed in agriculture.

Labour market efficiency

Most employers in Estonia see the labour market as flexible. In spring 2014, the Bank of Estonia and TNS Emor carried out a survey of Estonian employers on how Estonia adjusts to economic changes in comparison to other countries, how flexible is wage-setting in Estonia, and what is the effect of the major labour market reforms passed during the crisis. One of the objectives of the survey was to identify the barriers to the recruitment of new employees. The biggest barrier to recruitment was the shortage of qualified labour, which was considered serious by 90% of the employers. High labour taxes and high wages were also considered as significant obstacles to recruitment. But only 36% of employers considered the costs of firing and hiring to be a barrier (Soosaar, 2015).

According to the WEF Global Competitiveness Index, business leaders rank the Estonian labour market among the most efficient of OECD countries, below the United States, Canada or Norway, but slightly above Sweden and the Netherlands (Figure 5.4A). This overall evaluation hides differences in performance by components of labour market efficiency (Figure 5.4B). In summary, the Estonian labour market stands out primarily by the flexibility of wage determination and employment practices, and a high proportion of women in the labour market. The main weakness is the low capacity to retain and attract talents, which has social consequences and affects the long-term competitiveness of the economy. The extent to which taxation reduces the incentive to work is considered as lower than the OECD average, but the Estonian score is low, indicating the effect is significant.

Figure 5.4. Global Competitiveness Index: Labour market efficiency, 2016-17



Indices for EU28 and OECD are the simple average of member-country indices.

OECD top 5 refers to the average of the scores for the top 5 performers among OECD countries (Switzerland, United States, United Kingdom, New Zealand and Canada).

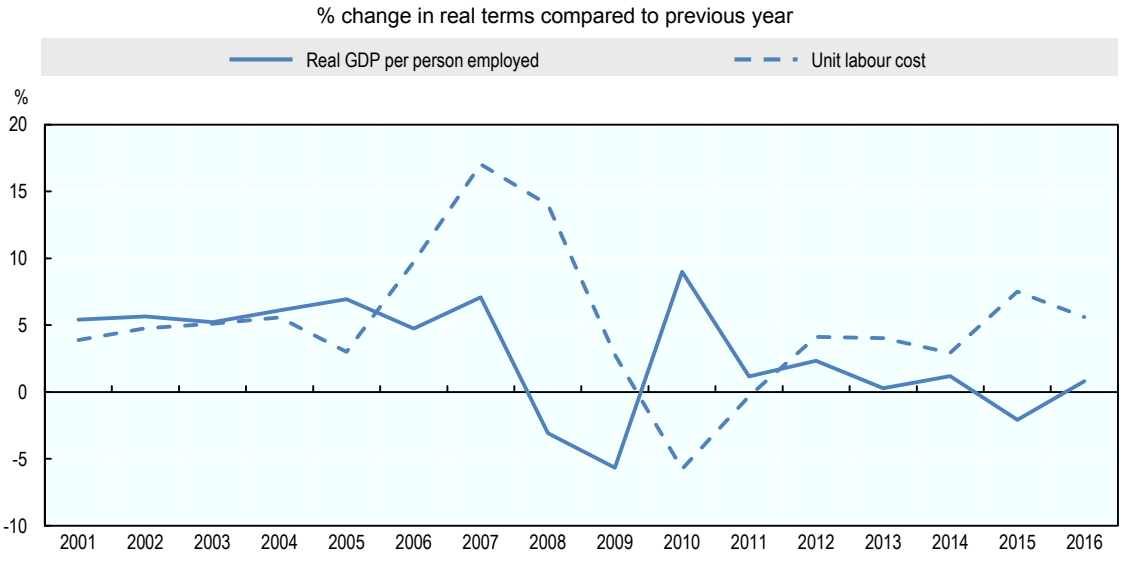
Source: World Economic Forum (2016), *The Global Competitiveness Report 2016-2017: Full data Edition*, Geneva 2016. http://reports.weforum.org/global-competitiveness-index/.

StatLink http://dx.doi.org/10.1787/888933654465

Business leaders consider the extent to which labour costs are related to productivity is slightly above the OECD average, but as the pressure on salaries is growing rapidly, and wages have increased faster than productivity, this indicator is expected to deteriorate in the future. If labour productivity does not increase as fast, the competitiveness of companies decreases and economic growth slows down (Mertsina and Jänes, 2012). A sharp increase in the unit labour cost may create unemployment as companies absorb high unit costs by reducing the number of staff. At the same time, while cheap labour attracts new companies, it does not provide incentives to technology-intensive investments and the creation of smart jobs, and may delay innovation.

Estonia's unit labour costs[1] more than tripled since 2000, with a sharp increase over the period 2006-08, reflecting the overall rapid growth of the economy. Unit labour costs in Estonia have increased faster than labour productivity during the period 2012-16 (Figure 5.5). The decrease in labour productivity, however, is related to labour in Estonia being cheaper than in neighbouring countries. Box 5.3 illustrates developments in unit labour costs and labour productivity in Estonia and partner countries since 2000.

Figure 5.5. Annual change in labour productivity and unit labour costs in Estonia, 2001 to 2016

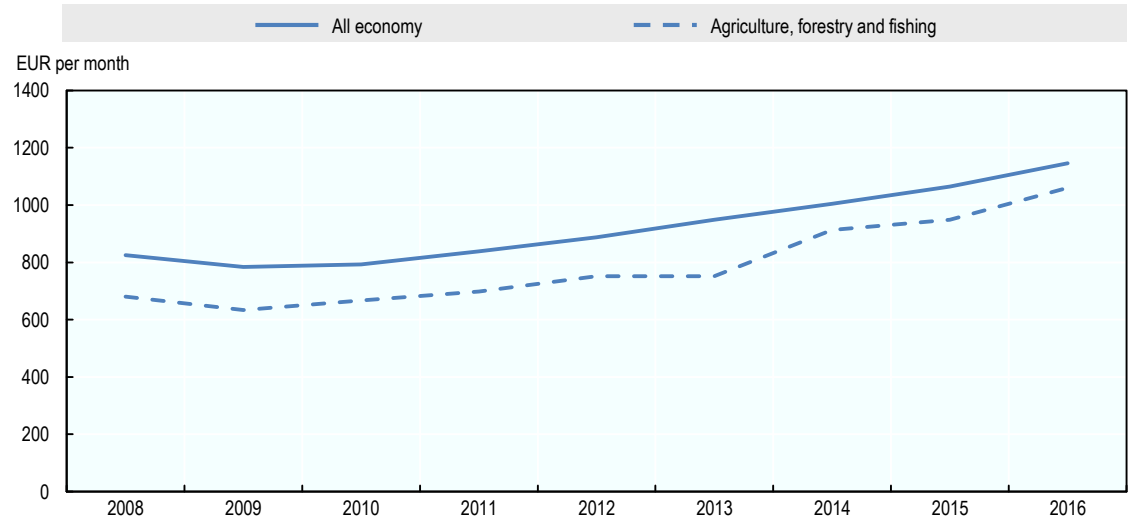


Source: OECD (2017a), Productivity and unit labour cost by main economic activity (ISIC Rev 4), http://dotstat.oecd.org/?lang=en.

StatLink http://dx.doi.org/10.1787/888933654484

Labour costs moved at the same pace across all fields of activity between 2001 and 2014. The average gross monthly wage has generally followed an upward trend, and although there was a slight setback in 2009, the average monthly gross wages began to rise in 2010 and increased to EUR 1 146 by 2016 (Figure 5.6). Wages in agriculture, forestry, and fishing have remained below average gross wages in the economy, but the gap has narrowed as they represented 82% of the average in 2008 and 92% in 2016. This suggests that the difference between the labour productivity in agriculture and the economy is decreasing.

Figure 5.6. Estonian average monthly wages, all economy and agriculture, forestry and fishery, 2008 to 2016



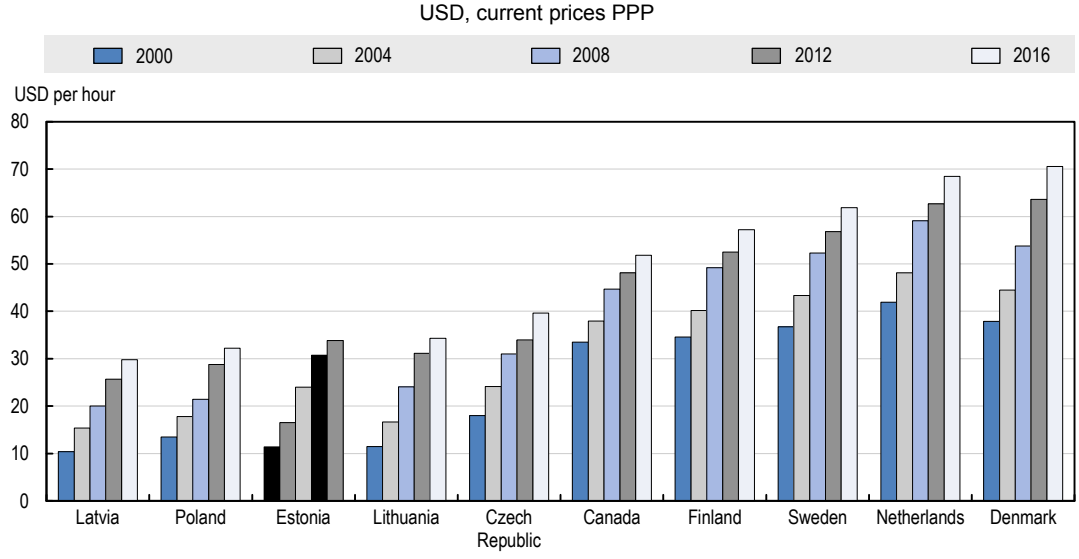
Source: Statistics Estonia (2017), [PA5211], www.stat.ee.

StatLink http://dx.doi.org/10.1787/888933654503

Box 5.3. Cross-country developments in labour costs and productivity

Labour productivity in Estonia, as measured by GDP per worked hour, has increased steadily — doubling since EU accession in 2004 and tripling during the period 2000-16. It reached around USD 30 of GDP per hour worked in 2012 and continued to increase to USD 34 in 2016, as in Poland, and Lithuania, but it remains lower than in older members of the OECD and the European Union (Figure 5.7).

Figure 5.7. GDP per hour worked in selected countries, selected years



Countries are ranked according to 2016 levels.

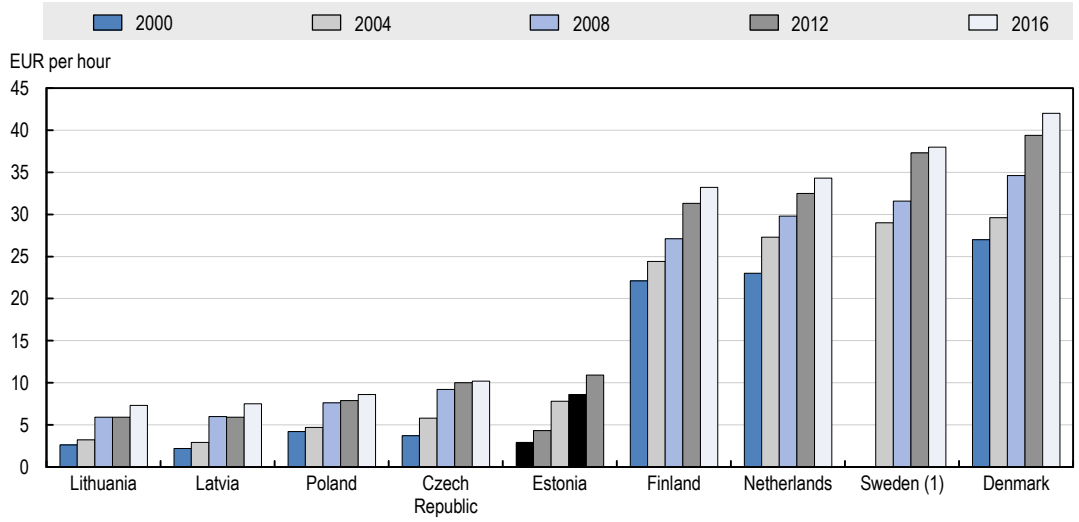
Source: OECD (2017a), Productivity statistics, http://dotstat.oecd.org/?lang=en (accessed 30 June 2017).

StatLink http://dx.doi.org/10.1787/888933654522

Box 5.3. Cross-country developments in labour costs and productivity (cont.)

Unit labour costs also increased during the period 2000-16 in Estonia, faster than in other Baltic countries, and faster than labour productivity in Estonia. They almost quadrupled since 2000 and were multiplied by 2.5 since EU accession in 2004 to reach about EUR 11 per hour in 2016 (Figure 5.8). Estonia's unit labour costs are similar to those in the Czech Republic and higher than those in Latvia, Lithuania and Poland. However, they remain much lower than in Scandinavian countries or the Netherlands.

Figure 5.8. Hourly labour cost in selected countries, selected years



Countries are ranked according to 2016 levels.
1. For Sweden, 2000 data are not available.

Source: Eurostat (2017), Labour cost levels by NACE Rev. 2 activity, http://ec.europa.eu/eurostat/data/database (accessed 30 June 2017).

StatLink http://dx.doi.org/10.1787/888933654541

The annual growth in Estonia's unit labour cost varied during the period 2000-16. It was steady at about 5% before EU accession, and increased sharply over the period 2006-08, peaking to 17% in 2007. This peak was also registered in Latvia, to an even larger extent, but not in other Nordic countries. After a period of negative or slow growth, annual growth in Estonia's unit labour costs stabilised after 2012 around 4-6%, most years.

Initiatives to create new jobs and assist labour adjustment

A number of programmes and projects are in place to facilitate labour adjustment in a more flexible environment. The Unemployment Insurance Fund encourages job creation and training for better participation in employment. For example, programmes offer training sessions for unemployed registered with the Unemployment Insurance Fund. Financial aid, of up to EUR 4 474 in 2016, is also available for start-up companies (Unemployment Insurance Fund, 2016).

Efforts are also made to attract skilled workers. For example, the Estonian Chamber of Commerce and Industry launched the “Bringing talent home” project in 2010, which endeavours to bring together employers in Estonia with talented young people who have gone abroad to study or work (Bringing talent home, 2016). In response to the difficulty of finding skilled workforce in rural areas, a citizen initiative “Come to live in the countryside” was launched. The initiative has a website that helps to find jobs and housing in the countryside, as well as opportunities for entrepreneurship. Estonian workers also take advantage of training opportunities through the formal education system to improve the adequacy of their skills set with labour market demand (see below).

Labour supply in rural areas

Estonian rural areas face labour shortages as the Estonian population is concentrated in urban areas, emigration slows down but continues,[2] and the state policy does not favour the recruitment of temporary work force from third countries. As it offers lower than national average wages, agriculture has specific difficulties attracting hired labour, in particular for seasonal tasks. Compared with other EU member states, Estonian wages are also in the low range so the scope for attracting immigrants from the European Economic Area (EEA) is limited.

Migrant workers from third countries could fill the gap but they are subject to strict rules and regulations. As a rule, third country nationals must seek a residence permit to enter the labour market in Estonia. An annual immigration quota that should not exceed 0.1% of the permanent population of Estonia per annum is set for aliens immigrating to Estonia (Aliens Act § 113). For this purpose, permission must be granted by the Estonian Unemployment Insurance Fund and a wage criterion fulfilled. This criterion requires the employer to pay a remuneration amounting to 1.24 times the average annual wage published by Statistics Estonia (Recruiting from abroad, 2016). As a result, the share of immigrant population employed in agriculture is only 1-2%, according to Statistics Estonia.

Horticultural producers, who face labour shortages during the harvest season, have been most active in arguing against the present migration conditions, which are currently forcing employers to pay migrant workers in Estonia a higher salary than seasonal workers for example in Finland. In strawberry cultivation alone, it would be possible in the peak season to offer a temporary assignment to an additional 200 temporary employees (Gardening people, 2014).

Since May 2016, however, the Government has started to take steps to abate the law. Namely, the government approved and sent to Parliament a draft decision which obliges employers to pay foreign workers wages equal to at least the average salary in Estonia. As the wage coefficient for third-country workers coming to work in Estonia has been reduced from 1.24 to 1.0 since January 2017 the situation with seasonal workers in agriculture is expected to relax, and labour market demands will be more easily met.

In addition, two EU directives will be amended into national law:[3]

- **Directive 2014/36/EU** of the European Parliament and the Council of the European Union **on establishing uniform conditions of entry and stay of third-country nationals for the purpose of employment as seasonal workers.** The directive contributes to widening the short-term employment opportunities of third-country nationals and extending the maximum duration of short-term work from six to nine months a year. It also allows foreigners temporarily staying in Estonia to be granted a long-term visa of up to one year, with the possibility of requesting an extension for short-term employment. Foreigners staying in the country with a short-term visa are granted the right to use job matching services.
- **Directive 2014/66/EU of the European Parliament and of the Council establishes the conditions of entry and residence of third-country nationals in the framework of an intra-corporate transfer from a third country to the EU country.** A new type of residence permit — an intra-corporate transferee permit — **will be established in the Aliens Act and allows the holder of this** permit from one EU member country to work in another member country. The permit will be valid for a maximum of three years in the case of managers and specialists and one year for trainee employees.

5.3. Education and skills policy

Education policy affects innovation in at least three ways: a high level of general and scientific education facilitates acceptance of technological innovation by society at large; innovation systems require well-educated researchers, teachers, extension officers, and producers to develop relevant innovations; it is generally easier for farmers and business operators with higher education and skills to adopt some technological innovations. Continuous skills development (training, re-training) is essential to improve the

matching of skills demand, in an evolving agri-food sector, which needs to adopt productivity and environmentally enhancing technologies and practices (OECD, 2015).

The Estonian education system is performing rather well, with governance mechanisms facilitating adaptation. The quality of education and training is considered slightly above the OECD average, for a lower public and private cost. The supply of education is very high, all the more as student numbers decrease reflecting lower birth rates. Educational attainment has been traditionally high and is among the highest in the OECD area, with a growing share of the population reaching tertiary education. The younger generations, however, do not seem to do as well as their elders in terms of reaching secondary education. The need for retraining is visible in the increasing share of adults in education, taking advantage of educational and training programmes and opportunities.

The general education system

Governance and funding

Estonia's education system includes basic and secondary schools, vocational educational institutions, institutions of professional education, universities, and continuing education institutions. Agricultural education is integrated into the general system and available at vocational and higher levels. Some institutions within the general system are specialised in agriculture-related fields of science (see agricultural education sub-section below).

The management of the education system is organised by the Parliament, the Government, the Ministry of Education and Research (MER) and the local authorities in accordance with their statutory competences. The governance of the education system is shared between central and local authorities, and schools have a high level of autonomy for resource allocation. The state sets national standards and establishes principles of education funding, supervision and quality assessment. Early childhood education and care is managed by local authorities, and most decisions in lower secondary education are taken at the school level (OECD, 2016c).

Schools in Estonia have a level of autonomy above the OECD average, including the capacity to make decisions on the curriculum and to hire and dismiss teaching staff. Lower secondary teachers are required to have five years of initial teacher training, including a mandatory teaching practicum, and follow continuous professional development. Primary and secondary teachers have below-average class sizes and teaching time. Their salaries are lower than the OECD average, despite a significant increase since 2000. However, the teaching profession is more valued in society than in other countries. Teacher appraisal is used for career advancement and to some extent to determine the need for professional development, but there is currently no appraisal system for school leaders. A system-level assessment of the education system is carried out yearly by the MER (OECD, 2016c).

Public expenditure on educational institutions as a percentage of GDP and annual expenditure by institutions on education per student are well below the OECD average. Education in Estonia is mainly financed by the government. While state funds cover 93% of the expenditure on basic, secondary and higher education (OECD average 83%), and 99.1% of basic and secondary education expenditure, private funding (by private bodies and households) is significant in higher education, amounting to 22% in 2012. This share is similar to the average of the 21 EU countries that are members of the OECD, but lower than the OECD average (30%). Since 2013/14, studying full-time on programmes where the tuition language is Estonian is free of charge both in state-owned institutions of higher education as well as in public universities (OECD, 2015).

The MER is responsible for ensuring the quality of the educational institutions and for external evaluation, which is preceded by internal evaluation. The staff, students and external stakeholders (e.g., alumni, employers, in the case of general education also the parents) participate in the evaluation. The experts and students involved in the process of external education, and in case of vocational training institutions, assessors and employers, are selected via a public procurement procedure. The results of the external evaluation form a basis for assessing the sustainability of the educational establishment or the curriculum. At

gymnasiums the results of the internal evaluation are taken into account in the elaboration of the development plan (MER, 2016b).

Extensive use of outcome-based principles is applied in curricula development, implementation, elaboration and evaluation. The right to provide instruction is granted to the educational establishment through the accreditation of the curriculum groups. In the course of compiling a report for the internal performance review every school analyses the sustainability of its curricula. An independent external assessment committee conducts the external evaluation or accreditation, and, based on their report, makes their proposal about the accreditation to the Estonian Quality Agency for Higher and Vocational Education (EKKA). The Assessment Council of EKKA uses this proposal for decision-making. The results of the assessment of all educational institutions and curriculum groups are available on the EKKA database (EKKA, 2016a).

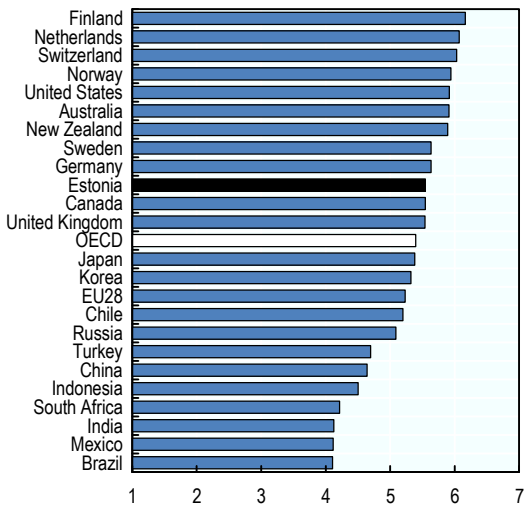
Overall performance

Business leaders rank Estonia above the OECD average in terms of the quality of higher education and on-the-job-training (Figure 5.9). The quantity of education, as measured by an index of secondary and tertiary education enrolment rates, scores very high, as in most OECD countries.

Figure 5.9. Global Competitiveness Index: Higher Education and Training, 2016-17

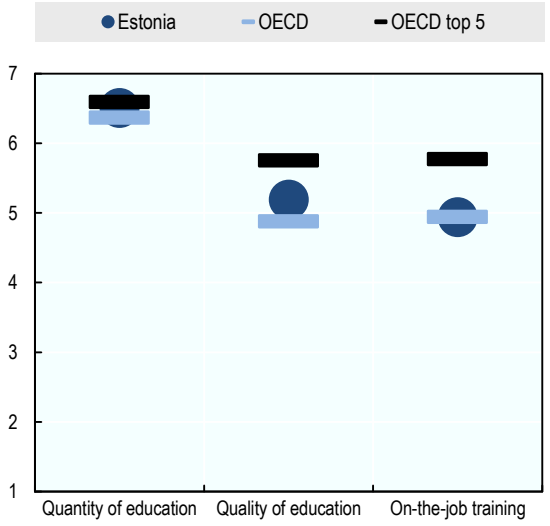
Scale 1 to 7 (best)

A. Index of higher education and training by country



Indices for EU28 and OECD are the simple average of member-country indices.

B. Estonia's index of higher education and training by component



OECD top 5 refers to the average of the scores for the top 5 performers among OECD countries (Finland, Netherlands, Switzerland, Belgium and Denmark).
The quantity of education index is based on secondary and tertiary education enrolment rates from UNESCO Institute for Statistics. The quality of education index is based on responses from a WEF Executive Opinion Survey on "How well does the educational system meet the needs of a competitive economy; Executives' assessment of the quality of math and science education in schools and the quality of business schools; and on how widespread is Internet access in schools. The on-the-job-training index is based on survey responses on the availability of high-quality, specialised training services and the extent to which companies invest in training and employee development.

Source: World Economic Forum (2016), *The Global Competitiveness Report 2016-2017: Full data Edition*, Geneva 2016. http://reports.weforum.org/global-competitiveness-index/.

StatLink http://dx.doi.org/10.1787/888933654560

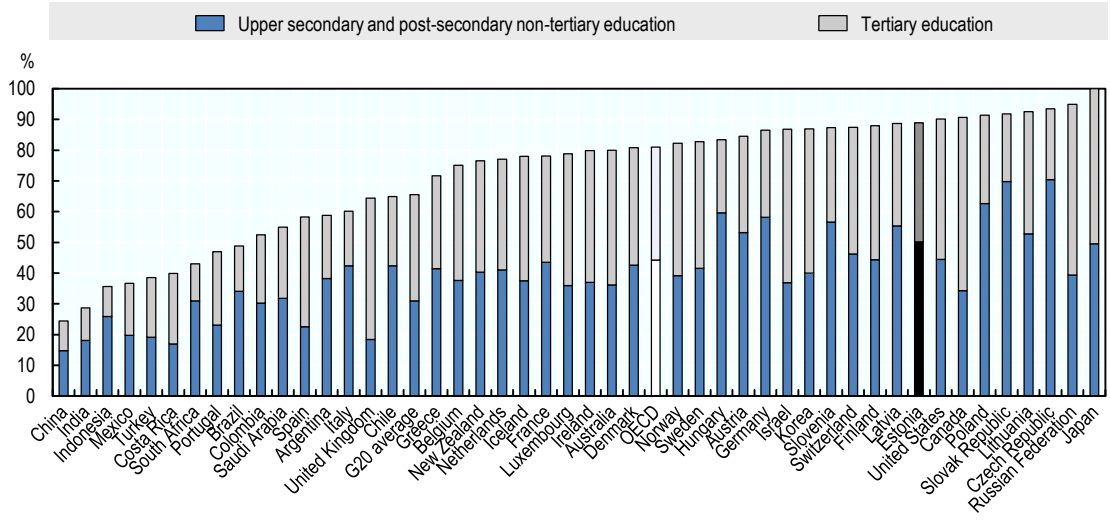
Educational attainment

Estonia has a long tradition of higher education and educational attainment is above the OECD and EU average (Figure 5.10). As in other Baltic countries, the share of the population with at least upper secondary education is among the highest in OECD countries: over 90% of 25-64 year-olds had attained at least upper secondary education in 2015, compared to the OECD average of 78%.

The shares of population with secondary and/or vocational education or second-tier education are practically equal in rural and urban settlements, whereas the proportion with only primary or basic education is higher in rural areas (EMÜ, 2011).

Figure 5.10. Upper secondary and tertiary attainment for 25-64 year-olds, 2016

Percentage of the population aged 25-64



Source: OECD (2017b), *Education at a Glance 2017: OECD Indicators*, http://dx.doi.org/10.1787/eag-2017-en.

StatLink http://dx.doi.org/10.1787/888933654579

At tertiary level, Estonia's attainment rates are below those of top OECD performers. The share of the Estonian population aged 25-64 with tertiary education has gained 9 percentage points between 2000 and 2015 to reach 38%. However, this share is above 40% in a significant number of OECD countries such as Australia, Canada, Finland, Korea, Norway, the United Kingdom and the United States.

Increasing the number of doctoral graduates remains a real challenge for research in Estonia. According to the Innovation Union Scoreboard 2013, there were 0.9 new doctorate holders per 1 000 inhabitants in the 25-34 age group in Estonia in 2010 compared to 1.5 on average in the European Union (MER, 2014a). The Innovation Union Scoreboard 2017 reports higher numbers in 2015: 1.08 and 1.8 new doctorate holders respectively in Estonia and the European Union. In 2010-15, the number of doctoral graduates fluctuated between 175 and 250, whereas the target to be reached by 2020 laid down in the Estonian Lifelong Learning Strategy is 300 graduates a year.

According to the "Study of effectiveness of doctoral programmes in Estonia" (Eamets et al., 2011), the number of applicants to doctoral studies may decrease in the coming 5-6 years, due to the demographic trends in Estonia and a decrease in the number of externally financed doctoral study places after the introduction of the requirement to pay support to all doctoral students. The analysis also revealed that the prospective career path is not an essential motivator for PhD candidates. On the one hand wages in the academic sector are no longer competitive on the labour market, and, on the other hand, employers in the private sector do not attach any value to a doctoral degree. There are not enough large companies in Estonia with the need and the opportunity to recruit PhD students and specialists with a PhD. Only 1% of the adult respondents with higher

education participating in the OECD Programme for the International Assessment of Adult Competencies (PIAAC) study said that they would have required a doctoral degree to get the job, which is two times less than the total of the 24 PIAAC participant countries and, for example, five times less than in Finland.

Education enrolment trends

The education system is faced with a long-term decline in the number of students, reflecting demographic trends depicting an ageing population and a declining number of births. In general education, the number of students has decreased by about 40% in the past 17 years. Over the last decade, the number of students enrolled in full-time general education has dropped by approximately 14%, and the number of schools by 11%.

Despite the overall decrease in the number of students, the number of adult learners (30 years and older) in higher education has remained relatively stable, and the number of adult learners in vocational education has increased, reflecting their willingness to upgrade practical skills and increase their competitiveness in the labour market. As a result, close to half of students in vocational education were over 20 years old in 20013/14, compared to less than 40% in 2009/10. Similar trends are found in universities. They pose challenges to study programmes and teaching methods, as mature students have very different backgrounds and expect a more individual approach from teachers.

There is a significant proportion of adults in Estonia who continue acquiring basic or secondary education in different flexible forms of non-stationary programmes, where they can study single specific subjects or take the final exams as external students. The share of adults participating in formal education or training in Estonia has doubled between 2005 and 2011 to reach about 12%, while in the European Union, it has fluctuated around 10% between 2005 and 2014.

Skills and competences

The quality of education in Estonia is reflected in the high scores obtained by students and adults for their skills and competences in international surveys. Two OECD programmes, the PISA (Programme for International Student Assessment) and the PIAAC (Programme for the International Assessment of Adult Competencies), include surveys measuring basic competences. Estonia participated in the PISA survey four times (in 2006, 2009, 2012 and 2015), and in the PIAAC survey for the first time in 2011/12. The results of the study showed that Estonia was among the top performers in reading, mathematics and science in PISA 2015.[4] Performance in mathematics and science has been stable since 2006, and has improved in reading. The impact of socio-economic status on student performance is below the OECD average. At the same time, equity between boys and girls is greater than the OECD average, and stable since 2006.

According to the PIAAC survey, Estonian adults (16-65 year-olds) performed well above the OECD average in literacy and numeracy, but below the average in problem solving in technology-rich environments (OECD, 2016b, Table 1.1). However, the problem-solving performance of young adults (16-29 year-olds) reaches the average.

The Estonian population is also highly skilled in languages. This facilitates cross-country co-operation and social innovation. According to an EU survey of Europeans and their languages, 87% of Estonian respondents said they were able to speak at least one other language besides their mother tongue (compared to 54% at the EU level), and 52% have practical skills in at least two foreign languages (25% at the EU level). Russian was the most commonly spoken of these foreign languages (by 56% of respondent) but has lost of lot of ground. English is increasingly used, every or almost every day by 28% of Estonian respondents (European Commission, 2012).

PIAAC and other surveys outline the discrepancy between supply and demand for skills in the Estonian labour market. In particular, a significant share of employees is overqualified and underemployed (Box 5.4).

Box 5.4. Unbalance between supply and demand for skills

The Estonian labour market does not offer enough jobs to match the qualification of the labour force. According to the last PIAAC survey, 26.5% of employees in the sample were overeducated and 12.2% underemployed, compared to 21.5% and 12.8% respectively for the OECD average (OECD, 2016c).[1] In addition, 35.3% of Estonian surveyed employees reported a field of-study mismatch, which is slightly lower than the OECD average of 39.6%.[2]

The likelihood of over-education is greater among the elderly and those with higher education. As to the fields of activity concerning over-education, agriculture, hunting, forestry and fishing, manufacturing, construction, accommodation and catering are affected the most. Those in the fields of education, professional education, research and technological activities, public administration and defence, health- and social care activities, are less affected. Underemployment is lowest among graduates of agriculture, engineering, manufacturing and construction, and services, as well as graduates of higher education institutions (MER, 2015b). Field-of-study mismatch appeared particularly high in agriculture and veterinary, compared with other fields, with 75.8% of Estonian employees reporting mismatch, and higher than the average of country covered in the survey for this field (70.9%) (OECD, 2016c).

A survey carried out among the alumni in Estonia in 2015 showed that only 50% of respondents felt that their current position required higher education, 11% thought that their job required professional education, 11% thought secondary education was sufficient and 15% of the respondents stated that the level of education was not important in their profession. This can partly be attributed to not being able to find a professional job (Laan et al., 2015).

Since 1989, considerable changes can be identified in the structure of employment: the share of skill-intensive positions has increased from 35% to 42.7% in 2014, and the trend towards more complex positions continues. However, Estonian entrepreneurs and foreign investors consider the shortage of adequately trained personnel a key challenge in the local economic development.

In Estonia, graduates' skills in the fields of teacher training, engineering, manufacturing and construction present the biggest problems, while those in the fields of natural science and engineering, as well as humanities and social sciences are at a higher level. In comparison with other EU countries, the problem-solving skills of Estonians employed in the manufacturing and processing industry are by far the weakest, and the use of computers at their workplace the second weakest. In Estonia both the levels of computer skills and the frequency of computer use are comparatively low, the exception being in the agricultural sector, where skilled workers use computers at work and in quite a number of different ways. For example, 37% of Estonian skilled workers in the sector use computers for work-related purposes, whereas the number of such users in Finland is 24%, in the Czech Republic 23% and for other countries this figure is even smaller (MER, 2015b).

PIACC results show that computer literacy is often required in some occupations in Estonia, but the computer skills of the employees do not meet the contemporary requirements and are limited to specific activities only. In this regard the personnel at Estonian educational institutions stand out. Their problem-solving skills in technology-rich environments are almost the lowest, while the frequency of computer use at work is still among the average. The survey also revealed that a significant number of young people (up to 24 years of age), who have good computer and problem-solving skills and use computers in everyday life are currently holding such jobs where computer skills are not needed (mainly in hotel and catering services) (Pruulmann-Vengerfeldt et al., 2015).

1. All those whose highest level of education attained exceeds the level that would be required for their employment are considered overeducated and those whose highest educational attainment is below the level of education that would require them to obtain work are underemployed.

2. Field-of-study mismatch occurs when a worker has a qualification in a different field than required for his/her job.

At the same time, a low level of education and lack of professional skills are the main obstacles to finding a job, both in urban and rural areas. The unemployment rate is highest among adults without secondary education (13.3% of the 15-74 year-olds in 2015) and their wages are also the lowest. In 2015, only a third of people with basic education had a job, whereas the employment rate for people with higher education was 78% and for vocational education 67-72% (MRA, 2016b). The employment rate in rural areas has grown annually from 53.7% in 2009 to 65.3% in 2015, but the problem lies in the lower level of education of the rural working age population, which considerably limits their competitiveness in the labour market.

Programmes promoting life-long skills development and re-training

At the European level the strategic objectives of co-operation in education and training have been laid down in the Education and Training 2010 work programme. At the national level, the Estonian Lifelong Learning Strategy 2014-20 is the key strategy guiding the most important developments in the educational sector. Several sub-programmes have been devised for 2016-19 to implement the strategy, including: general, vocational, higher education and adult education programmes; competent and motivated teachers and school

leadership education programme; digital turn programme; study and career counselling programme; labour market and education co-operation programme; and school network programme.

Each programme has its objective and as a rule the objectives are intertwined. To achieve the objectives, specific activities have been planned and respective indicators and targets set. The objectives set for 2020 are close to being achieved in a number of areas (Box 5.5).

Box 5.5. Estonian Lifelong Learning Strategy 2014-20 achievements by 2016

- The share of 30-34 year-olds with higher education has increased, exceeding 40% of this age group, the target of Estonia 2020 and Europe 2020.
- The share of graduates from higher educational institutions in natural and exact sciences, technology, engineering, manufacturing and construction in 2013-14 has been above 24%, which is close to the 2020 target of 25%.
- The unemployment rate among young people, aged 15-24 years, has more than halved (from 33% to 15%) in the past five years (2009-14), which is mainly attributable to an improved labour market situation. The target for 2020 is 10%. In 2014, the difference between the employment rate of young adults, aged 15-26, in urban and rural settlement differed by 7.8 percentage points (in urban settlements 50.3% and in rural settlements 42.3%), and has shown a slow but steady decline over the past 10 years from 11.5 percentage points in 2005 (Eesti Noorsootöö Keskus, 2016). In 2010-13 the employment rate was lowest in the rural population with basic education (23.2%, 26.2% and 28.2% and 32%, respectively), followed by those with secondary education (58.4%, 63%, 64.9% and 64.9%). Rural population with tertiary education had the highest employment rate (75.4%, 77.6%, 77.7% and 77.2%) (MRA, 2014a).
- The share of adults (aged 25-64) with no professional or vocational training was less than 30% in 2014, which is one of the goals of Estonia 2020.
- The proportion of 25 year-olds and older learners has increased in vocational education.
- The share of youth with a lower level of education and not involved in education (18-24 year-olds) dropped below 10% for the first time in 2013, however, by 2014 it was back to 11.6%. The target of the lifelong learning strategy is to decrease this figure to under 9%. The percentage of people with a lower level of education among the working-age population in rural settlements was higher than that in towns (e.g., 13.7% of the working age population in 2011 and 13.2% in 2013) (MRA, 2014a). The education level of the working age population in Estonia differs also by regions (e.g., 7.9% in North-Estonia and 16% in Central Estonia, in 2011) (MRA, 2014b).

A number of activities have been planned within the education system (MER, 2015b):

- In 2015, a total of 56 accreditations were carried out in 13 study programme groups.
- A network of communication specialists in vocational education has been launched to raise the reputation of vocational education. It offers training to that regard. A collection of success stories and study opportunities in vocational education "Help for decision-making-Vocational Training Opportunities in 2016/2017" has been published. In order to work out a practical training system in vocational education, a network of traineeship co-ordinators has been set up. Several network meetings and information days have been organised.
- A number of new curricula that could not have been opened at this level have been launched. For example, it is at present possible to acquire vocational secondary education in the fields of dairy, meat, fish, vegetables and beverages technology. Basic education grants access to food processing studies, which last for 3-4 years. Students are admitted to specific training in food technology on the basis of secondary education which last for 2-2.5 years. The qualifications can be acquired in two vocational education centres — the Olustvere School of Service and Rural Economics (www.olustvere.edu.ee) and the Tartu Vocational Education Centre (www.khk.ee).
- The number of interruption cases or early leaving of studies has generally declined, especially in vocational secondary education. The employment indicator of vocational school graduates is also on the rise.
- In recent years, the number of dropout cases in full-time general education has decreased and stabilised at a relatively low level of 0.5-0.6% in the third level of basic school and 0.9-1.1% in the

first year of secondary school. One of the expected results of the general education programme is a decline in the proportion of non-studying young people with a low level of education.

- There are advisory panels offering career guidance in all counties and a nationwide vocational counselling and placement centre.
- The number of young people registered as unemployed in the course of the 12 months following graduation has dropped, whereas the income earned by young people who earned income was higher than the median income or return from business activities.
- The programme called OSKA, "A system of labour market monitoring and future skills forecasting", which is funded by the European Social Fund, has been launched. The programme includes applied research surveys on sectoral needs for labour and skills necessary for the economic development of Estonia. The results of the analyses and forecasts feed the qualification and career guidance systems, curriculum development at educational institutions, and provide input to different agencies and authorities. The analysis of forestry and the timber industry was performed in 2016, and that of agriculture and the food industry sector will be performed in 2017, with a report published in November 2017. The programme aims to build platforms of co-operation between employers and education providers, analyse the development opportunities and needs of different sectors of the Estonian economy, prepare labour market training requirements based on various activities or professions to facilitate the planning of education provision at different levels of education and by types of school as well as in the fields of retraining and in-service training (OSKA, 2016).

Agricultural education

Availability of agriculture-related education programmes

Agricultural education is available in Estonia both through higher and vocational education programmes. Four higher educational institutions (among 24 in 2015/16) and 14 vocational education establishments (among 39) teach agricultural and food processing. There is only one higher educational institution specialising directly in agriculture (the Estonian University of Life Sciences, EMÜ) and three vocational education institutions, including one specialised in horticulture (Chapter 7).

EMÜ is specialised in agricultural higher education and research. The University promotes six focal areas – agriculture, environment, forestry, food and health, technology and engineering, and rural economy. It plays a key role in providing qualified workforce with the necessary competencies in the use of sustainable technologies and improves attitudes towards more sustainable professional work that is less harmful to the environment (EMÜ, 2016a). According to QS World University Rankings by Subject (2016), the Estonian University of Life Sciences is one of the top 100 universities in the world in the field of agriculture and forestry, ranked 51st. The university also belongs to the top 1% most cited research facilities in the world.

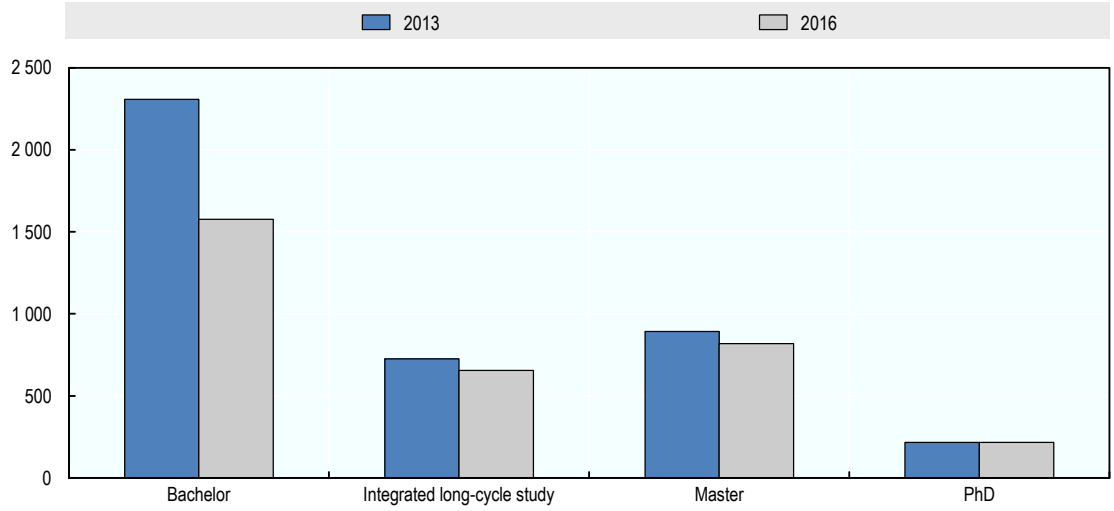
It is also possible to study agriculture, fisheries, forestry, life sciences, manufacturing and processing, and environmental sciences at the University of Tartu (TU), Tallinn University and Tallinn Technical University (TUT). At the vocational education level, however, only two vocational education institutions specialise directly in agriculture, most of the other twelve offer courses in food processing. In addition, the use of natural resources, sustainable agriculture, environmental protection and climate change-related disciplines are taught at Bachelor, Master and Doctoral levels.

Agriculture enrolment trends

As in the whole education system, the number of students enrolled at the EMÜ has decreased between 2013 and 2016, in particular at Bachelor level (-32%) (Figure 5.11). The number of students studying biosciences, environmental sciences and veterinary medicine has remained comparatively stable or even grown a little. The largest fall in student numbers can be observed in the fields of agriculture, forestry and fishery, and engineering, manufacturing and technology (Figure 5.12).

Overall, the number of university students enrolled in the curricula in veterinary medicine, engineering, manufacturing and technology has remained relatively stable in recent years, while the decline has been the steepest in the study programme group "business and administration", where EMÜ has one bachelor level curriculum — Agricultural Economics and Rural Entrepreneurship, and two master level curricula — Accounting and Financial Management; and Economics and Entrepreneurship.

Figure 5.11. Number of students at the EMÜ[1], by education level, 2013 and 2016

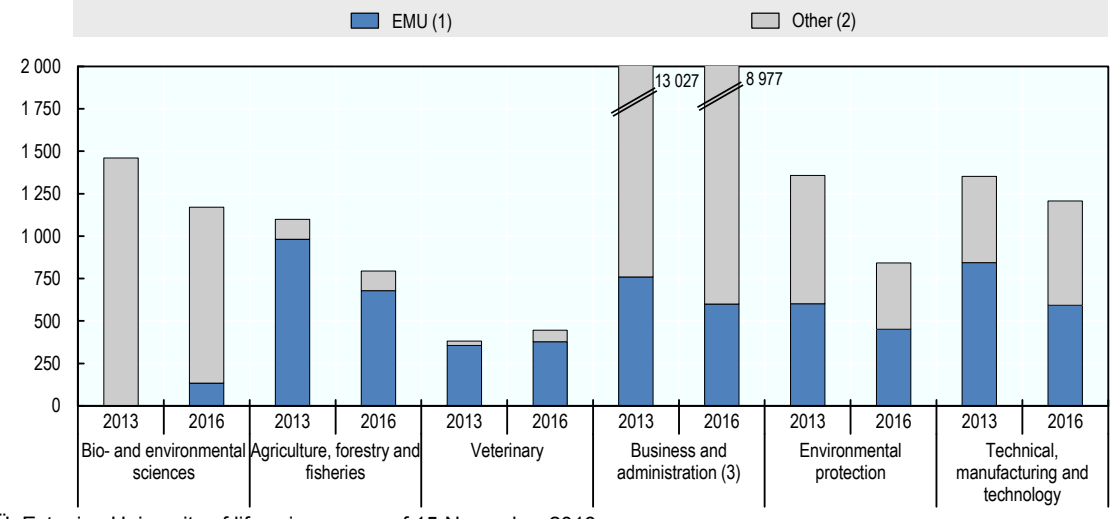


1. EMÜ: Estonian University of Life Sciences, as of 2 June 2016.

Source: EMÜ (2016b), http://stats.emu.ee/ (accessed 18 October 2016).

StatLink http://dx.doi.org/10.1787/888933654598

Figure 5.12. Number of university students, by field of study, 2013 and 2016



1. EMÜ: Estonian University of life sciences, as of 15 November 2016.
2. 2013 refers to 2012/13; 2016 refers to 2015/16.
3. Curricula in agricultural economics and rural entrepreneurship are taught at the EMÜ only.

Source: EMÜ (2016b), http://stats.emu.ee/ (accessed 18 October 2016); EHIS (2016a), www.hm.ee/ehis/statistika.html.

StatLink http://dx.doi.org/10.1787/888933654617

In vocational education, students' interest in agricultural specialties has increased over the past decade. Over the period 2004-14, the number of students on agriculture-related curricula increased by approximately 8%, while the total number of students in vocational education decreased by about 14% and the number of students in social sciences, business and law, engineering, manufacturing and building dropped by about 30% (EHIS, 2016a). Among agriculture-related curricula, the number of students in environment, agriculture, veterinary medicine, and manufacturing and processing has remained relatively stable. An increase can be observed in the fields of agriculture, forestry and fishery, whereas the number of students in manufacturing and processing suffered a marginal decline. In 2012, a new specialty – veterinary assistant – was opened in professional education, which has positively affected the total number of students in the fields of study analysed.

Meeting labour market needs in the food and agriculture sector

The needs of the labour market are taken into account when preparing and developing the curricula in the field of agriculture, in particular reflecting EKKA assessments. Employers are involved in curriculum development, both through the curriculum boards convened specifically for curriculum development, as well as through alumni and employer surveys. In the evaluation of the study programme groups in higher education, and curricula groups in vocational education, co-operation with stakeholders is one of the criteria taken into account when assessing the quality of the curricula. Thus, bringing the study programmes into line with labour market relevance is mandatory in curriculum development (EKKA, 2012, 2016b). From 2017, universities and vocational schools have to consider the recommendations of the OSKA programme, resulting from the analyses of the labour and skills requirements of agriculture and the food industry. Better knowledge of future requirements will help institutions adapt the supply of education and training services (OSKA, 2016).

In quantitative terms, the main challenges are to meet an increasing demand for agricultural specialists in a context of a decreasing number of students, attract students in vocational education where unfilled demand is greater, and retain workers in the sector. In qualitative terms, evaluations point to the need to develop student social skills and practical training in curricula (Box 5.6).

Box 5.6. Practical training in agricultural education

Concerning higher education in rural economics, the importance of practical work experience in student development has been stressed, especially by the employers. Graduates of the higher educational institutions of 2009 and 2012 identified the low amount of practical training as a deficiency. Only 56% of the 2009 graduates said that practical training had been a mandatory part of the curriculum, 9% of the respondents had done their practical training in the framework of an optional or elective course, and 35% of the respondents pointed out that they did not do any practical training within the curriculum (Eamets et al., 2011). Only 31% of the respondents of 2012 graduates claimed that the curriculum contained a sufficient amount of practical training in the workplace (Laan et al., 2015).

As a measure for improving students' practical skills, a system of practical training support was introduced in 2005. The support is specifically meant for such entrepreneurs who take on a pupil or student studying full time and whose main occupation is studying. The introduction of this system has generated interest among entrepreneurs to offer placements. As a result, the number of opportunities for students to find up-to-date practical training will increase, which in turn will raise the quality of training (MRA, 2016c). In 2013, practical training support was allocated to 115 entrepreneurs engaged in agricultural production or the processing of agricultural products. The respective figure in 2014 was 111 and 145 in 2015. Enterprises submit applications for practical training support to the Estonian Agricultural Registers and Information Board (ARIB) every year (in September-October). In 2013 and 2014, EUR 200 000 was earmarked for agriculture-related practice payments, the budget for 2015 was EUR 150 000 and EUR 160 000 for 2016. The number of trainees is not limited, but the supervisor is allowed to simultaneously oversee two trainees (ARIB, 2016).

New initiatives aiming to increase the importance of practical training and to help students find practical training positions in companies started in 2017. They are implemented in cooperation with the Estonian Chamber of Agriculture and Commerce.

Vocational schools and higher education institutions have difficulties attracting enough students to meet labour market expectations. Since 2003, one of the measures for increasing the number of applicants for agriculture and rural economics related curricula was the introduction of study allowances for the respective students at vocational education institutes.

The "Survey on Competence Level and Educational Development Needs in Agricultural Food and Forestry Sectors" commissioned by the Ministry of Agriculture in 2010 showed that regardless of the size of the company, the demand for skilled staff (in 50% of the enterprises) and managers/specialists (in 17% of the enterprises) in the canvassed sectors will increase. In the food industry, 60% of the respondents pointed out that they would require almost all specialists with professional higher or vocational education, whereas the need for unskilled labour and "all-in-one" staff is anticipated to decline. The biggest problem in the rural sector in Estonia, however, is the ageing of the work-force. The study also revealed that a significant number of posts are unoccupied in the agricultural sector, mainly for agronomists, mechanics, livestock engineers, veterinarians and milkers. As to food industry, the positions of technologists, product developers, but also skilled and unskilled jobs, as well as management positions were mentioned as having vacant positions. Most respondents expressed their concern about the shortage of skilled workers (automatician, technician), product developers, technologists and masters. The biggest problems in finding skilled staff included the attitude of the candidates, qualifications and salary expectations (Jalak, 2010).

Jalak (2010) found that agricultural and horticultural enterprises would like to recruit people with vocational education, but often they are not to found. This sector is not very attractive for young people, and many of the employers are located in rural areas, which makes finding suitable people even more difficult. That is why enterprises have been training their workforce themselves. In contrast to agricultural and horticultural enterprises, forestry companies hold vocational training in high esteem because the machine fleet of logging enterprises is very expensive and handling the machinery needs good training.

The survey conducted in 2016 exposed similar problems in the agricultural sector, which still suffers from the shortage of professionals and skilled workers. The migration of young people, in the age range of 25-29, from rural areas also causes problems (Kurvits, 2016).

The survey conducted among the alumni of the Estonian universities in 2015 showed that in 2012 about 48% of graduates in agriculture related specialties did not practice their profession, which is about 17% more than in 2009. Nearly 25% continued their formal studies and another 11% combined work and study. In 2012, the number of unemployed graduates was about 2%. (Laan et al., 2015). According to the alumni survey carried out in 2011, about 28% of the 2009 graduates of agricultural curricula did not work in their acquired specialty. Approximately 80% of the Bachelor-level graduates continued their studies at the Master level and 15% of Master graduates continued on to doctoral level. In 2009, the number of unemployed graduates was about 7% (Eamets et al., 2011). According to findings of the 2011 and 2015 surveys, the main reason for the graduates of agricultural higher education to continue their studies was to pursue an academic career, earn a better salary or get an appropriate job (alumni who graduated from the higher education institution three years previously constituted the sample).

The reasons for not practising their profession were not finding a professional job, including not finding a professional job in the region of residence, and giving preference to the salary and working conditions in other fields. The employer survey gave the same reasons for the shortage of skilled workers in the agricultural sector (Jalak, 2010). Average gross wages in the agriculture, forestry and fishing sectors are smaller than the average gross salary (Figure 5.6). At the same time, the average wages in agriculture grew faster than the national average (9.3% and 5.9% in 2013-14, 7.1% and 6.9% in 2014-15 and 10.5% and 7.6% in 2015-16, respectively). Wages in Estonia are also lower in rural areas.

The survey carried out among Estonian vocational school graduates in 2012 (the survey covered the 2008-10 graduates, who were interviewed half a year after their graduation) shows that the employment rate of graduates in the field of agriculture is higher than that of vocational school graduates from other areas. Analysts explain the higher employment rate by the graduates' age, which is on average higher (30+) than that of other graduates and the fact that many graduates of agriculture were already working during their studies. According to the survey, 72% of the 2008 and 2010 graduates worked during their studies. Unlike graduates from higher education institutions, vocational graduates in the field of agriculture were more satisfied with the profession acquired, ranking their satisfaction rate higher (4.8 points out of 5) (Nestor, 2012). In the survey of higher education graduates of 2012 and 2009, on average about only 50% of respondents admitted that the studies met their expectations (mainly on the grounds that the objectives and learning outcomes of the

curricula were not clear and the graduates were dissatisfied with the volume of practical training in the curriculum) (Eamets et al., 2011).

According to a survey of vocational school alumni, graduates of agricultural specialties acknowledge the benefits of their acquired knowledge in the field of entrepreneurship, i.e. almost as highly as graduates of the business and management curriculum group (3.6 and 3.9 points in the 5-point system). At the same time, similarly to graduates of higher agricultural institutions, the share of vocational education graduates not practising their profession was the highest compared to graduates of other curricula. The 2015 survey revealed that the proportion of such university graduates was about 48%, and the number of vocational school graduates even lower at 30%. The given result cannot, however, be regarded as statistically reliable as the number of respondents to this question was too small. However, graduates of vocational education considered their professional prospects truly viable (4.2 points on a 5-point scale) (Nestor, 2012).

In addition to general mechanisms, agriculture-specific measures are available to support agricultural education and training:

- To increase the number of applicants for agricultural curricula, vocational education students on the curricula related to agriculture and rural economy are paid a study allowance from the education allowance measure by the Estonian Rural Development Foundation (MRA, 2016c).
- In order to improve the practical skills of agricultural students, practice support measures are implemented. They partly compensate for the supervision and organisation costs related to the practical training of students specialising in agriculture and rural economy, incurred by the farmers or processors of agricultural products.
- The Estonian RDP 2014-20 supports farmers' access to training and advisory services (See Chapters 6 and 7).

Science and environment awareness in education and society

Education has an important role in spreading awareness of the potential benefits of innovation in enhancing productivity and sustainability, and promoting sustainable development. A high level of general and scientific education facilitates acceptance of technological innovation by society. Popularising science in education is to generate interest towards research and technology, improve the attractiveness of research and engineering careers, and ensure the spread of a scientific world-view in the society. Environmental education is expected, in the long term, to lead to sustainable use of natural resources, lower pollution and reduced environment-related health risks, by influencing the impact of human activities on the environment through behavioural changes. In addition, these fields of science affect the ability of the agricultural sector to innovate, through the generation of new technologies with agriculture and food related applications.

Science

The fields of science and engineering have progressed the most in Estonian higher education, presenting, unlike for the OECD average, an equal interest to both male and female students. In Estonia, on average every third, and in the OECD countries every fifth, graduate obtained their Master's degrees in science or engineering, manufacturing and construction, and more than a half of doctoral graduates acquired their degree in science and engineering (OECD, 2015). There might, however, be an issue at earlier stages of education.

Experts think that Estonia lacks a system for the fruitful introduction of science into formal education (Kirss et al., 2013). The survey carried out by the Centre for Policy Studies Praxis in 2013 “Study on various activities for popularising science and technology” outlined, among other things, that the present formal education system does not help link knowledge and life, and does not show the necessity of science and technology in social development. Science popularisation activities are started too late, when most of the students have made their (professional) choices for the future already. The lack of co-operation between the people involved in the popularisation of science and relying only on their personal experience may also cause a problem.

Environment

Environment has been an integral theme of the Estonian national curriculum for the last two decades. First incorporated into the national curriculum in 1996, the environment theme was extended in 2002 to cover sustainable development issues. Sustainable development was also one of the eight themes of the new national curricula for basic and secondary schools adopted in 2011. Environmental issues are also addressed at the pre-school level in Estonia: the national pre-school curriculum includes the topic "Me and the environment" to help develop children's cognitive skills (such as the ability to watch nature), as well as their practical skills and values (for example, giving value to a healthy and safe way of life) (Aria et al., 2012).

The Ministry of the Environment, together with the Environmental Board, the State Forest Management Centre and the Estonian Museum of Natural History that are under its governance, are responsible for raising the environmental awareness of the Estonian population. Their action lines are the following (MoE, 2015):

- **Supporting the inclusion of environmental education in the national curricula, primarily in general education (including pre-school) programmes.** The themes of the study programmes include Estonian nature, nature conservation, forestry, water management, waste management, use of mineral resources, etc. Environment and sustainable development are set out as a recurring theme in the national curricula on the primary, basic and secondary school levels.
- **Developing specific awareness-raising and outreach activities**. Such activities aim to support the objectives of environmental and nature conservation, and typically target specific groups. For example, programmes include informing land owners of protected areas about nature conservation principles and practices, communicating environmental requirements to entrepreneurs, informing visitors of protected areas of the natural values, explaining rules on movement in nature, spreading public information on sustainable consumption, and informing private forest owners about sustainable forest management and forest heritage objects, etc.
- **Organising passive environmental education to support independent learning about nature and the environment.** This includes putting up information boards for hikers and travellers in nature, marking hiking and study trails and building resting places and camp sites, promoting hiking in nature and presenting good practices in hiking, and presenting natural values on the internet, online and through other e-solutions, etc.

Information on climate change and its impact is shared by a broad range of institutions. The Development Plan on Adaptation to Climate Change 2030 aims to raise the willingness and ability of society to adapt to the impacts of climate change at the national, regional and local levels. To this end, support is provided to pre-school, general education establishments and hobby groups, environmental education centres and vocational training institutions in adapting to the impacts of climate change. The availability of up-to-date and comprehensive information on climate change to these institutions is ensured by supporting the development of training materials, capacity building activities for teachers and educational specialists on climate and climate change adaptation; the development and implementation of climate change-related study programmes; climate research; and the participation of Estonian scientists in international climate change-related research programmes and co-operation initiatives (MoE, 2016a).

The Environmental Awareness Index, based on a biennial survey, indicates a growing awareness about environmental issues among Estonians. Carried out since 2010, these studies focus on Estonia's current environmental status and main challenges; reliability of environmental institutions and the image of the Ministry of the Environment; perceptions of environmental protection in Estonia; attitudes towards different energy sources; environmentally friendly behaviour; environmental awareness and sources of information; awareness about eco-labels and attitudes towards climate change. The Environmental Awareness Index was higher in 2016 (42.0 points) than in 2014 (37.5 points) and 2012 (37.9 points). The attitudes of the respondents from Ida-Viru County differed from the others, standing out for their markedly pessimistic undertone. They rated the status of the environment in Estonia as a whole, as well as the situation in individual areas, lower than the average. Availability of environmental information also causes problems, which might also explain the lower confidence of the inhabitants in the opinion leaders and in different

environmental institutions in the region. Research has shown that young people aged 15-19 are the best informed about the topic of climate change. Over the four-year period (2012-16) the views on certain sectors have generally improved. Considerable improvement is founded in reducing industrial pollution from large enterprises, eco-friendly construction, mining, ambient air quality and accessibility to clean drinking water (MoE, 2016b).

The Environmental Board (EB) also promotes environmental education for school children. EB has developed more than 100 different environmental academic programmes, which help to tie in the knowledge and skills acquired at school. These programmes are in line with most of the topics in the natural sciences curricula and are built on the principles of active learning – the students gain knowledge and experience through practice. To this end, the EB maintains nature centres and environmental education support points all over Estonia. There are nine nature centres with comprehensive permanent exhibitions introducing the nature and cultural heritage of the area and facilities for carrying out environmental education programmes. The mobile centre - in the form of an environmental education bus - offers additional possibilities for environmental training in the Harju, Järva and Rapla counties. Moreover, the EB is currently developing programmes that can be carried out in schools, in the vicinity of schools or at environment-related enterprises (waste collection points, landfills, water treatment plants). These programmes will focus on issues such as waste management, mining, fishing, hunting, water protection, air protection, and protection from radiation) (Environmental Board, 2016).

According to a 2012 study "Education for Sustainable Development and Its Promotion", sustainable development is well covered in the Estonian national curriculum for basic education, though certain related issues remain wanting. In particular, sustainability, sustainable development and the stock of natural resources are covered extensively in the curriculum. Some attention is also paid to biodiversity. Less consideration is devoted, however, to agriculture, natural disasters, climate change, air quality, development of rural areas and exhaustion of the planet's natural resources. Moreover, the approach to sustainable development in the national curricula is relatively one-sided, without facilitating a comprehensive understanding. The skills and values promoting sustainable development in the curricula are not addressed in an integrated way; only a few key aspects (such as understanding the complexity of the world, respect and responsibility) are highlighted, while change management, co-operation skills and basic science skills are ignored (Aria et al., 2012).

5.4. Summary

- The physical infrastructure in Estonia is comparable to the average of all OECD countries, with significant differences among type of infrastructure and in some cases regions. There are in particular some problems with the availability and quality of transport infrastructure in rural areas, where agricultural and agri-food activities are located to a large extent.
- High prices for grid connection and electricity capacity upgrading are the main general problems. Since electricity grid connection is expensive, the Estonian electricity network company considers using off-grid solutions or stand-alone power systems for sparsely populated regions.
- Among transportation modes, port infrastructure is considered very good, thus facilitating international trade. Limited capacity of air and rail transport infrastructure mainly affects passengers, not freight. Most main-line railways have been upgraded to enable faster speed, and renovation is progressing. More frequent and faster trains would increase opportunities for diversified marketing of agri-food products and tourism activities. The quality of road infrastructure is unequal: main roads are mostly in a good or very good condition, and basic roads in a satisfactory condition, but the secondary and local roads need improvement as acknowledged in the Transport Development Plan 2014-2020, which aims at reducing the proportion of secondary and local roads in poor and very poor condition.
- Agricultural land improvement infrastructure in Estonia mainly consists in drainage systems that cover more than half of the utilised agricultural area. Upgrading the drainage systems, which are mostly over thirty years old, would raise agricultural productivity and sustainability.

- Estonia invested successfully in ICT and continues to do so: scores for mobile telephone subscriptions are very high and for internet use relatively high (80% of individuals use internet). Almost all companies use computers and almost all enterprises have broadband Internet connections. Since 2010, Estonia has been rapidly developing the basic broadband infrastructure (passive optical network) with the EU support. The problem lies in making high-speed broadband access to the Internet network accessible to the end users, resulting in low use of capacity (10%).
- To develop the technical infrastructure EU structural funds support is used, with the exception of electrical grid infrastructure, which is financed from electricity transmission charges. PPP is not applied in the development of technical infrastructure.
- Urbanisation and population concentration in Tallinn and the surrounding municipalities has led to the aggregation of public and private services to the regional centres, leading to a deterioration of the physical accessibility and the quality of services in rural areas, with adverse consequences on the labour market. On the other hand, the volume of certain physical public services has decreased with the spread of internet, improvement of computer skills and the development of public e-services.
- Despite this constraint, the Estonian labour market is considered as one of the most efficient among OECD countries. It stands out for employment flexibility and the high proportion of women in the labour market, but attracting and retaining talent is a serious issue as salaries are relatively low. A significant share of employees is considered overqualified or underemployed.
- The extent to which labour costs reflect labour productivity, a determinant of companies' competitiveness, places Estonia around the average of OECD countries. Unit labour costs increased faster than labour productivity, in particular during the periods of high economic growth 2006-08 and 2012-16.
- The quality of the Estonian education and training system is reflected in the high scores of students and adults in international surveys. Strengths include high educational attainment, interest in sciences and technology, and gender equity.
- A challenge is the decline in the number of students related to demographic trends. At the same time, the share of adult learners entering vocational education is increasing, reflecting their willingness to adapt their skills to market requirements.
- Estonian rural areas face labour shortages, in particular in agriculture. Estonian agriculture offers seasonal jobs, which could attract workers from non-EU countries given the remuneration is relatively low for Estonians and other EU citizens. However, the terms for recruiting temporary seasonal workers from non-EU countries are very restrictive, creating competitiveness problems, in particular for horticulture, which is a very labour intensive branch of agriculture. Regulatory changes recently implemented are expected to facilitate non-EU employment.
- Meeting the growing labour market demand for agricultural specialists is a challenge for the education system in a context of an overall decreasing number of students. In higher education, the number of students enrolled in agriculture has declined over the past decade. In vocational education, however, the decline does not affect agricultural sciences, in which student enrolment has increased in recent years. Another challenge is retaining workers in the sector — a growing share of the university graduates of agriculture-related specialties (almost half in 2015) do not practice their profession, either because they continue their studies or because they find employment in other sectors.
- To increase motivation, study allowances are paid to students on the agriculture-related curricula in vocational education and specialisation scholarships are available for students in higher education while practical training support helps to improve students' practical skills. More general efforts to

guide skills development include the establishment of a system to monitor and forecast labour market future skills requirements, using the information to adapt curriculum development.

- Science and engineering attract an increasing share of students in higher education, both male and female, but science and technology is not introduced early enough in general education.
- A number of actions promote environmental and sustainable development education at every level, and measures have been recently introduced to raise awareness of climate change.

Notes

1. Labour costs consist of wage and non-wage costs, such as employers' social contributions. In Estonia, wage costs make up about three-quarters of labour costs, as they do on average in the EU28 and the OECD area.

2. In 2015 and 2016, the migration balance has been slightly positive, but it is too early to identify a change in trend.

3. The periods prescribed for their implementation are not over yet, thus their impact cannot be assessed. The transposition date for the 2014/36 is 30 September 2016 and for 2014/66 29 November 2016.

4. PISA website: www.compareyourcountry.org/pisa/country/EST.

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