

# Digitalisation and Convergence – The Example of Estonia\*

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*Estonia achieved development while maintaining balance through comprehensive, innovative competitiveness reforms, with significant economic convergence between 2010 and 2019. The development level of the Estonian economy rose from 64.2 per cent of the EU average to 82.3 per cent during this period, the second highest change in the East-Central European region in the last decade. On the whole, the room for manoeuvre for Estonian macroeconomic policies was very limited over the past two decades as a result of the fixed exchange rate system and later introduction of the euro. As a result, the growth path that ultimately led to rapid convergence had to be pursued in the area of competitiveness and structural policies. Estonia found the opportunity to break through in digitalisation and transformed itself into the region's digital leader through symbolic gestures and practical steps, not only leading to improvement in productivity but also contributing to the creation of world-renowned companies.*

## 1. Unsustainable catching up and crisis management before 2010

Before looking back on the successful decade, let us first review the situation from which the results were achieved. After gaining independence from the Soviet Union, Estonia simplified its tax system to create a business-friendly environment by establishing a flat-rate income tax system, and the rate of the income tax was gradually reduced during the 1990s (Karsten 2004). In financing, they focused on attracting foreign investors by creating a uniquely attractive business environment. The influx of fresh working capital created new jobs, many old factories were rebuilt, and new knowledge and technology entered the economy, making the country even more modern and competitive. Similarly to the other East-Central European countries, the Baltic countries also face the challenge of current demographic trends, i.e. an ageing and shrinking population, exacerbated by the emigration of a part of the working-age population to the EU. Within 15 years of Estonia's independence, nearly 15 per cent of the population had left the country.

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\* The papers in this issue contain the views of the authors which are not necessarily the same as the official views of the Magyar Nemzeti Bank.

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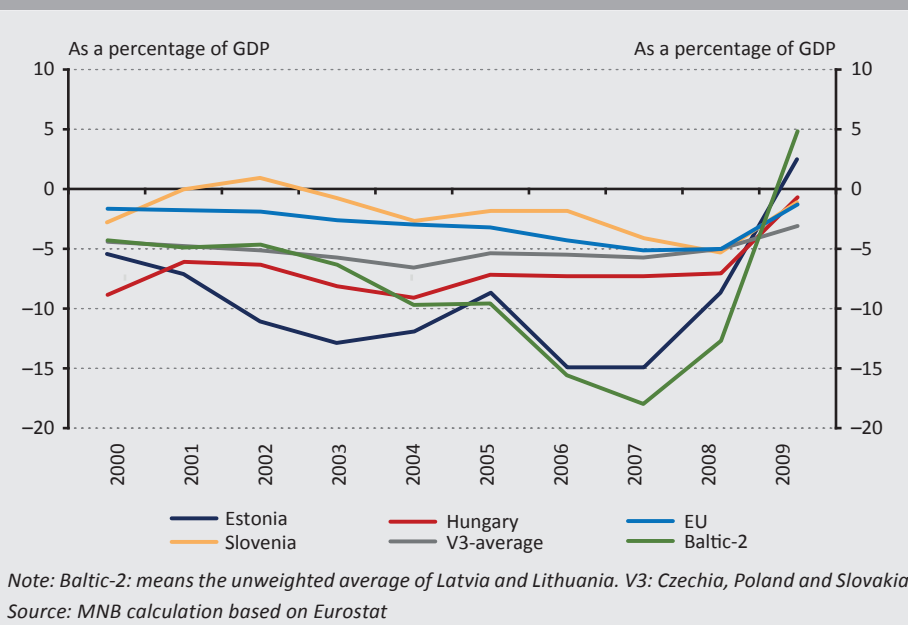
Section 3 of this article draws heavily on our earlier joint work with Alexandra Nemes, for which I thank her.

Attracting foreign capital was an important tool in Estonia's convergence process. After the change of regime in Estonia, there was significant privatization, with most companies privatized by 1995. The arrival of foreign capital and investors was crucial to the rapid transition after becoming independent. FDI-related legal provisions were favourable for foreign investors, as Estonia guaranteed the possibility to transfer profits abroad (*Angelov 2007*). In particular, close economic ties were established with the Nordic countries, allowing the flow of advanced technology and competitive economic views.

Estonia exercised a fixed exchange rate monetary policy after becoming independent and pegged its currency to the euro from 2002. Some two decades before adoption of the euro, they gave up their independent monetary policy (initially pegging their currency to the German mark and later to the euro) and the possibility of external adjustment through the exchange rate. Maintaining this required disciplined fiscal policy, which is why in the 2000s the Estonian budget was in surplus for most of the decade. In addition, Estonia inherited a very low level of government debt when it became independent, which has helped its budgetary situation considerably to date. However, this monetary policy system and the significantly liberalized money and capital markets, together with EU accession in 2004, brought significant capital inflows and a surge in lending, which led to pronounced overheating of the economy in the 2000s. Overheated lending caused excessive growth in real estate investment, wages and consumption.

The strong economic recovery and overheating that preceded the global financial crisis of 2008–2009 led to internal and external imbalances, which left Estonia with a large current account deficit (in some years exceeding 10 per cent of GDP) in the years before the crisis. By comparison, the current account deficit of the EU-27 countries averaged around 3 per cent over this period (*Figure 1*). In response to the crisis, Estonia made a significant fiscal adjustment between 2009 and 2011: all major expenditure items were cut (except social transfers to the population), the VAT rate on food was increased and the excise tax on alcohol and tobacco products as well as on fuels was increased (*Friedrich – Reiljan 2015*). As the government deficit did not exceed the 3-per cent Maastricht criterion during the crisis years, Estonia's government debt-to-GDP ratio did not increase markedly during the crisis years.

**Figure 1**  
**Current account balance in the East-Central Europe region between 2000 and 2009**












During the crisis, along with the other Baltic countries, Estonia opted for internal devaluation to address the imbalances, which meant that the pre-crisis real wage levels were only reached again in 2014. Devaluing the currency would have seriously jeopardized the objective of early euro adoption and the credibility of the currency board arrangement. Internal devaluation occurred via a reduction in nominal wages, made possible by the flexible labour market. The reduction of wages and fiscal austerity led to a dramatic, rapid improvement in the external balance, but the social costs of these measures were significant.

Partly as a result of internal devaluation, Estonian growth was slowed by the rising share of outflowing labour. According to UN data, in 2020 there were more than 200,000 Estonians living abroad, which is almost 16 per cent of the population of 1.3 million. The number of Estonians living abroad reached its current level gradually, but the period between 2010 and 2015 saw the largest increase.

Prior to the global financial crisis of 2008–2009, Estonia was characterized by an overheated economy, leading to one of the deepest economic downturns in Europe (GDP fell by 18.7 per cent compared to the same period of the previous year in the third quarter of 2009). However, the measures taken before 2010 contributed to a relatively quick recovery from the crisis, even without reaping the benefits of an independent monetary policy.

## 2. Growth while maintaining balance between 2010 and 2019

Between 2009 and 2019, Estonia achieved significant convergence with the EU average, moving from 64.2 per cent of the EU average to 82.3 per cent from 2009 to 2019 (*Table 1*). However, Estonia is notable for having achieved this in conjunction with the lowest government debt-to-GDP ratio in the EU, a position it has maintained over the past decade. In the East-Central Europe region, Estonia's development changed the second most between 2009 and 2019.

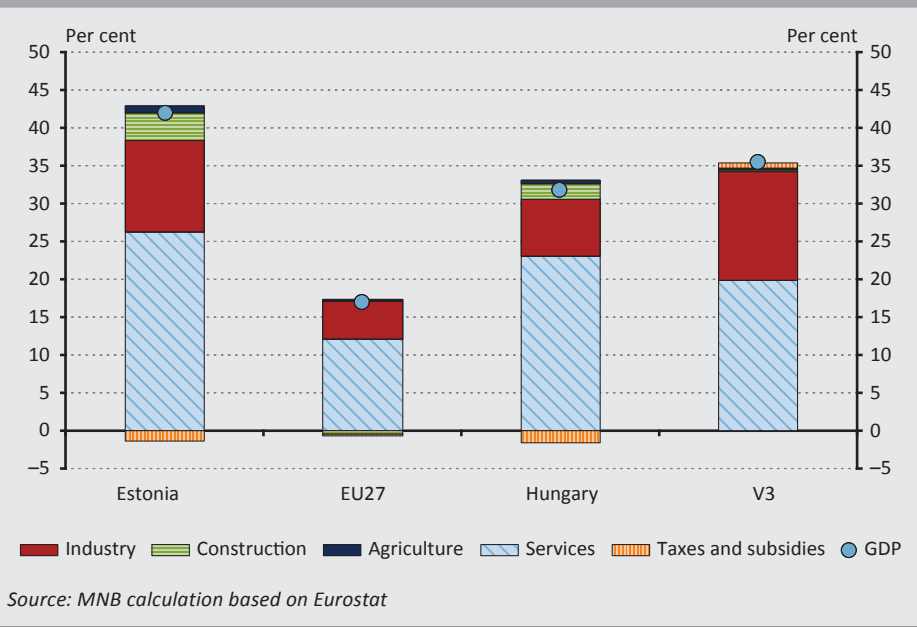
<b>Table 1</b> <b>Development of the East-Central Europe countries between 2009 and 2019</b>			
	2009	2019	Change between 2019 and 2009
 Lithuania	56.9	84.2	+27.3
 Estonia	64.2	82.3	+18.1
 Romania	52.2	69.6	+17.4
 Latvia	53.4	69.4	+16
 Poland	59.9	72.9	+13
 Hungary	65.1	73	+7.9
 Czechia	86.8	93.2	+6.4
 Slovenia	86.4	88.7	+2.3
 Slovakia	72	70.5	-1.5
Note: EU27=100			
Source: Eurostat			

Estonia's success after joining the euro area in 2011 is not a common phenomenon among euro area members. Italy and Spain, which are more developed than Estonia, have not made much progress since the introduction of the euro. Similarly, Slovakia's development even declined after the introduction of the euro between 2009 and 2019 (*Table 1*). This suggests that successful convergence is not linked to the euro in its own right, but rather to the maturity of a country to adopt the euro and to the extent to which it implements the necessary competitiveness reforms before adopting the single currency. Between 2010 and 2019, Estonia managed to put itself on a growth path where it grew at around 2 percentage points above the EU average.

On the production side, the service sector and industry were the largest contributors to cumulative GDP growth in Estonia in the past decade, accounting for more than 90 per cent of the growth between 2010 and 2019 (*Figure 2*). Estonia is a relatively resource-poor country, with the services sector accounting for nearly 70 per cent of its economy on average between 2010 and 2019. In 2019, the weight of the

services sector was nearly one and a half times higher than the Baltic average for the ICT sector and 1.7 times higher for the financial and insurance sector. Industry accounted for 21 per cent, and construction and agriculture for 6.7 and 3.2 per cent, respectively.

**Figure 2**  
**Output-side decomposition of cumulated GDP growth (2010–2019)**



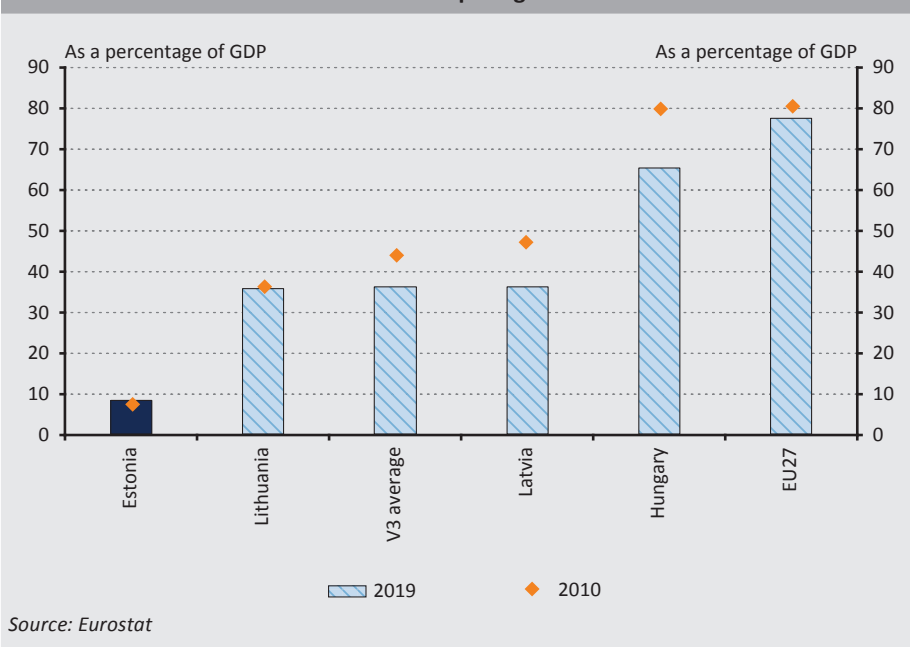
Following the financial crisis, between 2010 and 2019, Estonia's average investment rate exceeded 25 per cent. The investment rate is an essential condition and an important indicator for the success of any economy, as an adequate level of investment is essential for sustained and sustainable economic growth. Estonia's investment rate was still only marginally above the EU average in 2010, but later significantly outpaced both the EU average and the Baltic countries, thanks to a favourable macroeconomic and entrepreneurial environment. Its only challenger in the East-Central Europe region is Hungary: Estonia's investment rate for 2019 was 25.4 per cent, while Hungary's for the same period was 27.0 per cent. However, it is not just the level of the investment rate that is important. In the 21st century, its structure is the key to successful economic convergence.

Investing in smart capital offers qualitatively greater potential for economic growth than investing in construction alone. The share of investment in ICT equipment in total investment in Estonia was 6.2 per cent over the decade, compared

to an EU-27 average of 3.6 per cent (which put Estonia in 5th place in the EU ranking.)

For the period 2010–2019, Estonia’s government debt stands out in the East-Central Europe region with a single-digit value thanks to its exemplary budget policy. Estonia managed to correct the imbalances of the overheated growth of the 2000s during the crisis management and to grow with a balanced budget throughout the crisis. Even at the onset of the crisis, Estonia stuck to a tight fiscal policy and, unlike the other two Baltic countries, its government debt did not soar above 10 per cent of GDP, even after the crisis, while in Latvia and Lithuania it was around 35–45 per cent of GDP (Figure 3).

**Figure 3**  
**Government debt in the East-Central Europe region**



From 2010 to 2019, Estonia’s average current account balance surplus of 1.1 per cent of GDP was slightly above the EU average of 0.9 per cent and more favourable than the other two Baltic countries and the V3 countries. In the years following the crisis, the country restored its current account balance and the asset position could be sustained. Estonia has a high credit rating: it is currently rated A1 by Moody’s, AA– by Standard & Poor and AA– by Fitch, thanks to its favourable current account balance and disciplined budget policy.<sup>1</sup>

<sup>1</sup> <https://tradingeconomics.com/estonia/rating>. Downloaded: 11 January 2023.

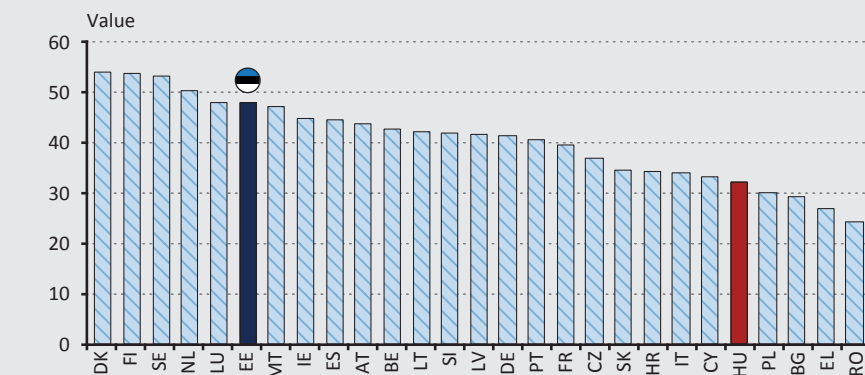
Estonia's inflation was volatile between 2010 and 2019 in the absence of an independent monetary policy. At the beginning of the decade, as the economy recovered from the global economic crisis of 2008–2009, rising domestic demand led to a sharp increase in inflation (reaching 5.2 per cent in 2011). The acceleration in inflation was halted by decreasing imported inflation as a result of the euro area sovereign debt crisis, and then Estonia's inflation fell to around 0 per cent from 2014 as world market oil prices fell. The surge in world energy prices in the second half of the decade led to a renewed rise in inflation, and from October 2019 onwards the fall in energy prices had a moderately negative impact on inflation.

As a whole, the country has made significant progress over the last decade in all macroeconomic fundamentals: it has moved significantly closer to the EU average in terms of development, has an outstanding ability to attract capital and a high investment rate, has seen marked improvements in the unemployment rate, which soared during the crisis, and has achieved these results while maintaining external and internal balance.

### 3. Competitiveness through digitalisation

Estonia has earned a global reputation for being at the forefront of digitalisation, from e-government to the use of modern blockchain-based technologies and the high degree of digitalisation of businesses and the population. In EU countries, the Digital Economy and Society Index (DESI) is used to monitor the spread of digitalisation. Estonia had the 6th highest score in the European Union in the period 2016–2019 (*Figure 4*), ranking 1st in a sub-index measuring the digitalization of the state and 7th in the index measuring the digitalisation of the population.

**Figure 4**  
**EU Digital Economy and Society Index (2016–2019 average)**

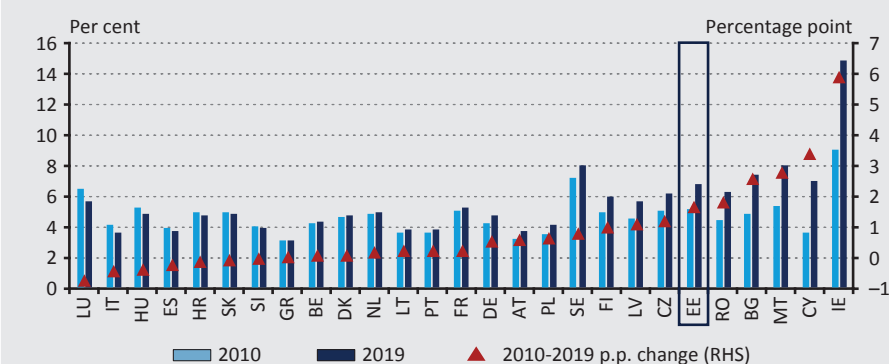


Note: Data is available from 2016 only.

Source: European Commission

In 2000, the Estonian Parliament enshrined in the Constitution that free access to the internet is a fundamental human right. In this spirit, the list of places offering wireless internet access in major cities and in the countryside, in cafés and petrol stations, has been growing steadily. Compared to other EU countries, the IT sector is among the fastest growing sectors (*Figure 5*). One component of the DESI shows the percentage of the population aged 16–74 who have never used the internet. This indicator was one of the lowest in Estonia in 2019, with only 7.25 per cent of the population never having used the internet, lower than the EU average of 10.4 per cent, and Hungary’s figure is 14.2 per cent.

**Figure 5**  
**Weight of the IT sector in EU Member States**



Note: NACE classification (Statistical classification of economic activities), branches of the national economy.

Source: MNB calculation based on Eurostat data

### 3.1. Education as the foundation for digitalisation

The Estonian education system is one of the most successful in the world according to international surveys. In 2018, Estonia was the best-performing European country in all three categories (maths, literacy and science) in the OECD’s PISA competency test. Between 2009 and 2018, Estonia improved its average PISA score the second most after Poland, overtaking Finland, which was ranked first by a large margin in 2009.<sup>2</sup> The UN Human Capital Index (HCI<sup>3</sup>) is also used as a measure of education systems: Estonia’s HCI score is outstanding (similarly to the other Baltic countries), with a score above 92 per cent, exceeding the 87 per cent average of the EU.

<sup>2</sup> PISA results. OECD, 2018. <https://www.oecd.org/pisa/>. Downloaded: 11 January 2023.

<sup>3</sup> The HCI takes into account four factors: the literacy of adults, the proportion of those remaining in the education system, the number of years of expected schooling and the average level of schooling.

The success of public education is also reflected in Estonia's high share of the population with tertiary education. The share of people with a qualification obtained in higher education is also among the highest in Europe, at 36.5 per cent for the 15–64 age group (compared to an EU average of 27.9 per cent). The high share of people with higher education also explains the high share of people with digital skills in Estonia. The proportion of the population with skills above basic digital skills in Estonia was 37 per cent in 2019, compared to the EU average of 31.1 per cent. According to the latest Times Higher Education Ranking, two Estonian universities were ranked among the world's top 1,000 higher education institutions, with the University of Tartu in the prestigious 201–250 category and TalTech in the 601–800 category. The small size of the domestic market has increased the value of foreign trade, resulting in a large proportion of the population speaking several foreign languages, and Estonia has one of the lowest proportion of those not speaking a second language. Combined with Estonia's relatively high education expenditure and the advanced digital skills of the population, supported by the legal provision of internet access, a picture of a digitally-open population is unfolding, which is an important building block for technological reform.

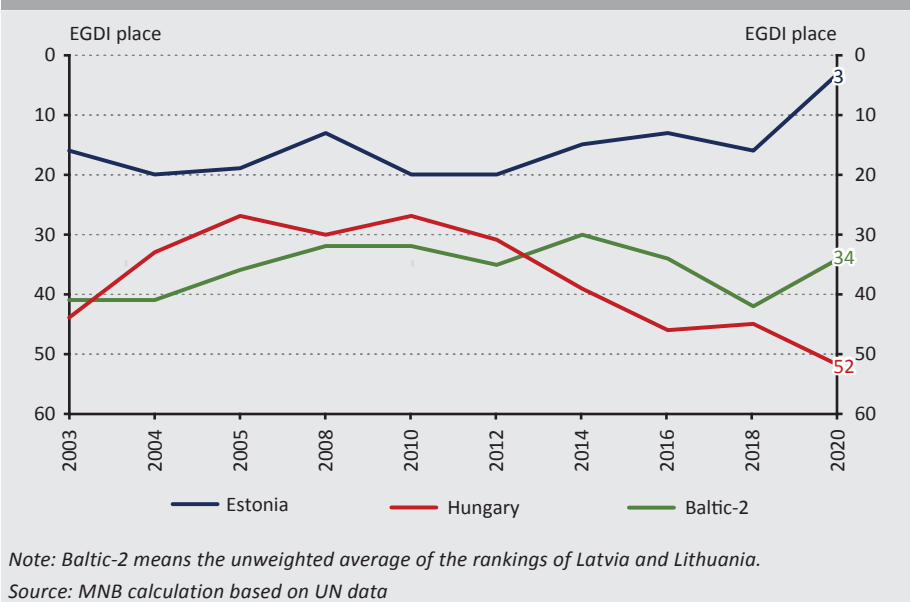
### **3.2. Digital state**

Estonia has gained an international reputation as a “digital state” with a high degree of digitalisation in public services. The term “digital state” does not mean the digitalisation of all public tasks, as some civil servant jobs cannot be replaced by computers, but it refers to the digitalisation of government operations. The e-Government Development Index (EGDI) ranks Estonia 3rd among UN Member States in 2020 (*Figure 6*), with only Denmark (1st) and South Korea (2nd) ahead of it.<sup>4</sup> In Estonia, the development of e-government already started in the 1990s, with some local banks launching internet banking services as early as 1996 (*Kitsing 2017*). The fast, affordable and quality service is catching on quickly with the public. Seeing the initial success, the government has also launched access to some public services through banking platforms. The tax authority was the first to make online tax returns available from 2000, using internet banking identification interfaces.

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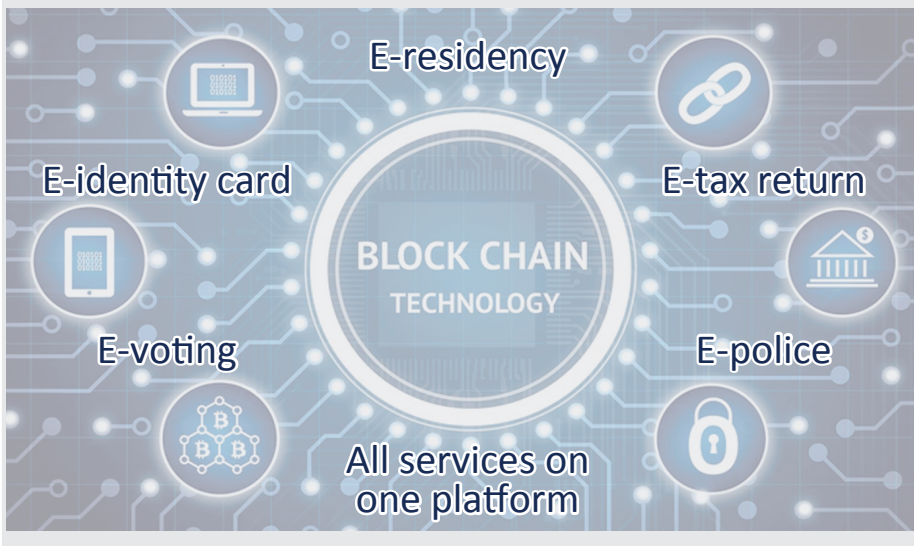
<sup>4</sup> United Nations, *E-Government Survey 2020*, [https://publicadministration.un.org/egovkb/Portals/egovkb/Documents/un/2020-Survey/2020%20UN%20E-Government%20Survey%20\(Full%20Report\).pdf](https://publicadministration.un.org/egovkb/Portals/egovkb/Documents/un/2020-Survey/2020%20UN%20E-Government%20Survey%20(Full%20Report).pdf). Downloaded: 12 January 2023.

**Figure 6**  
**E-Government Development Index (EGDI) rankings**



With the continued support of the public, Estonia has gradually implemented e-government, which now allows 99 per cent of public services to be accessed online. To meet this need, it was necessary to create a central backbone network that could manage different IT systems over the internet, transfer large amounts of data and search across disparate IT systems simultaneously (*Figure 7*). The safety of e-government is secured by blockchain-based technology: the KSI (Keyless Signature Infrastructure) system is an Estonian-designed blockchain-based technology used around the world to protect networks, systems and data (*Semenzin et al. 2022*). The advantage of blockchain is that it contains predefined rules, so no one can change them: data cannot be manipulated or stolen. For transparency, people are informed about everything, who is using their data, when and for what purpose.

**Figure 7**  
**How the Estonian digital state works**



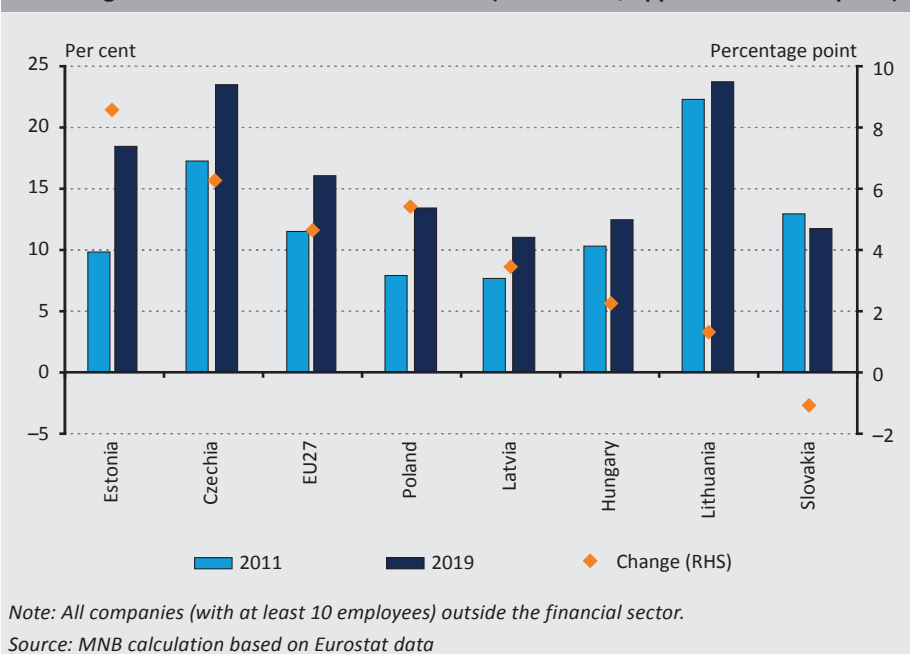
### 3.3. Corporate digitalisation

Business digitalisation in Estonia made huge strides between 2010 and 2019. The share of companies selling online almost doubled over this period (*Figure 8*). Estonia developed faster than its Baltic neighbours and the V4 countries, with 2019 data showing that the share of companies with web sales opportunities is higher than the EU average. This is also due to the fact that, as a small country, the domestic market is not sufficient for the sustained growth of companies, and foreign markets are easier to reach through digital channels. In Estonia, the efficiency of digital professionals, quantified by the ratio of companies using ERP<sup>5</sup> and CRM<sup>6</sup> software to the corporate penetration of ICT professionals, has improved tremendously since 2010. While in 2012, this efficiency indicator in Estonia stood at around 60 per cent of the EU average, by 2019 it was already almost 9 per cent above the EU average.

<sup>5</sup> The term ERP (Enterprise Resource Planning) actually stands for integrated business process management software, which optimally allows access to the recorded organizational data in real time. ERP systems support the collection, storage, management, processing and interpretation of data generated in certain areas, at company or even group level.

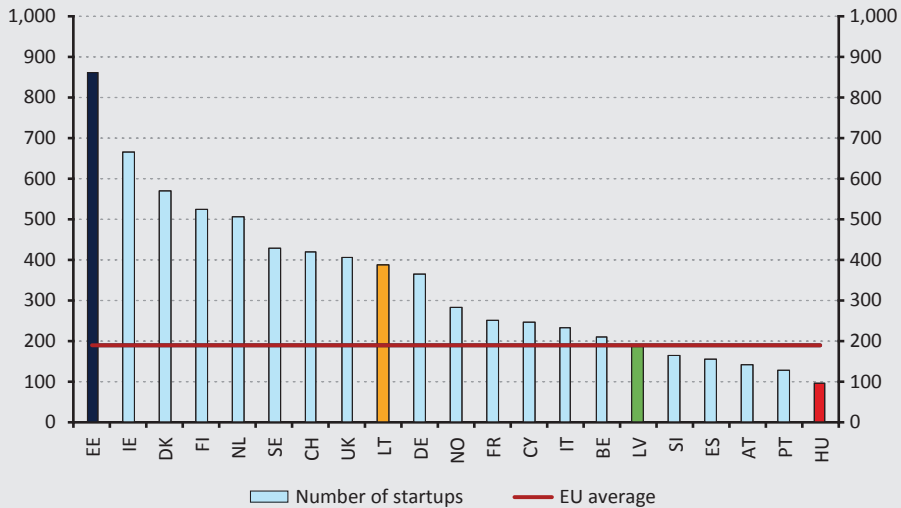
<sup>6</sup> The concept of CRM (Customer Relationship Management) refers to the description of a company's processes in relation to its partners. The purpose of CRM software is to support these processes and store information about current and potential customers.

**Figure 8**  
**Percentage of businesses with internet sales (via website, app or web marketplace)**



The number of startups registered in Estonia is outstanding. Estonia has the highest number of startups per million inhabitants in Europe, according to the 2020 *State of European Tech Report* (Figure 9). Looking at the time series, especially between 2010 and 2019, the number of new firms registered in Estonia in proportion to the population has risen sharply, which neither the region nor the EU average has been able to follow.

**Figure 9**  
**Number of startups per one million persons**



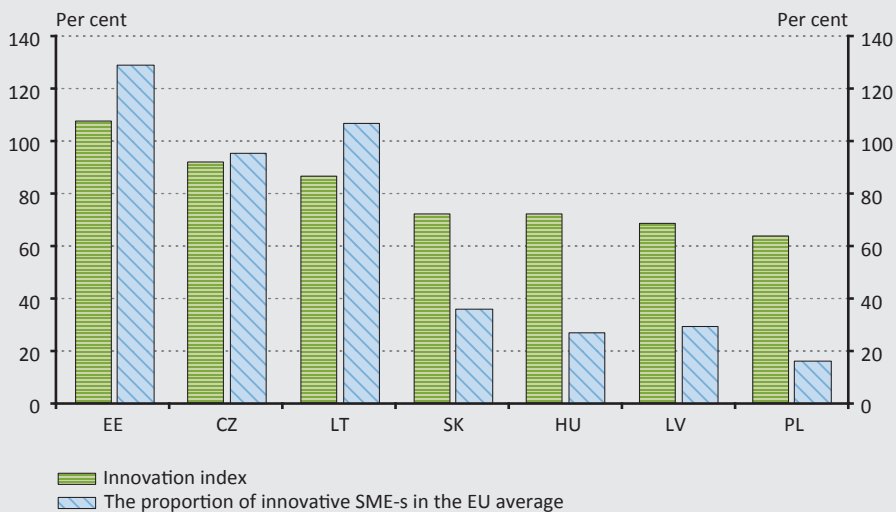
Source: State of European Tech Report 2020 (<https://2020.stateofeuropeantech.com/chapter/state-european-tech-2020/>; downloaded: 11 January 2023), TOP21

Estonia's growing startup advantage compared to the Baltic countries can be explained by its digitalisation: in a unique way in the world, fast and paperless digital government services were introduced in December 2014, making them accessible to citizens worldwide. This initiative is called "e-residency".<sup>7</sup> This has removed borders in the digital world, allowing anyone to run a company in Estonia from anywhere in the world without having to reside there or acquire citizenship. For entrepreneurs, the benefits of e-residency include, but are not limited to: setting up a company online within a day, access to business bank accounts, international payment services, digital signature of documents and contracts, online tax return preparation and a favourable corporate tax environment.

Innovation is a key driver of productivity. According to the European Innovation Scoreboard 2020,<sup>8</sup> Estonia is one of the strong innovators. Estonia is also the best performer in the East-Central European region in terms of two indicators of the strength of innovation: the innovation index and the share of innovative SMEs (Figure 10). The quality of the institutional system has a strong influence on the entrepreneurial spirit, which can be the basis for the creation of innovative businesses.

<sup>7</sup> Recommendations for making Estonia's ground-breaking e-Residency initiative more beneficial to everyone who is part of our digital nation. E-residency 2.0 White Paper. <https://s3.eu-central-1.amazonaws.com/ereswhitepaper/e-Residency+2.0+white+paper+English.pdf>. Downloaded: 11 January 2023.

<sup>8</sup> European Commission (2020)

**Figure 10****Innovation indicators for the countries in the East-Central European region**

Source: European Commission (2020)

Estonia has given world-famous companies such as Skype, Transferwise and Bolt to the digital world. Skype's founders are of Danish and Swedish origin, but the software itself was written by three Estonian programmers<sup>9</sup> and the majority of its employees are based in Tallinn and Tartu. At the beginning of the 2000s, international calls were still very expensive and roaming charges were high, so Estonian programmers developed Skype, based on peer-to-peer technology, to solve this problem. Transferwise was set up in 2011 to help people working abroad convert their earnings into another currency at lower fees, as up to 5 per cent of their earnings could be lost on the exchange. They saw the solution in the fact that there is no need for a bank currency conversion, an in-country transfer is enough, for example by connecting users who are looking for euros with those who have them. Bolt (formerly Taxify) is the brainchild of a 19-year-old Estonian high school student, an online service where you can book a taxi online quickly and easily. Since its creation in 2013, it has grown to rival Uber, expanding not only in Europe but also in Asia and Africa.

<sup>9</sup> Ahti Heinla, Priit Kasesalu, Jaan Tallinn

## 4. Conclusion

Between 2010 and 2019, Estonia made significant progress in all macroeconomic fundamentals and is at the forefront of digitalisation for government, businesses and citizens. The rapid growth that preceded the global financial crisis of 2008–2009 was achieved in an unhealthy structure, resulting in Estonia suffering the second largest decline in the European Union in 2009. In the decade that followed, however, it moved significantly closer to the EU average in terms of development, exhibited an outstanding ability to attract capital and a high investment rate, and saw a marked improvement in the unemployment rate that had surged during the financial crisis. It achieved these results while maintaining its external and internal balance. Significant progress was also made in the area of digitalisation, with a rapid transition to technological reform, driven by the openness of the population to digital technologies and supported by high quality education. Government incentives for entrepreneurship and the cross-border sharing of digital technologies in e-government have been coupled with extraordinary entrepreneurial spirit over the past 10 years. Estonia stands a good chance of becoming the Silicon Valley of the European Union in the next decade.

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