# Monitoring industrial ecosystems

## EU MEMBER STATES FACT SHEETS

Lithuania

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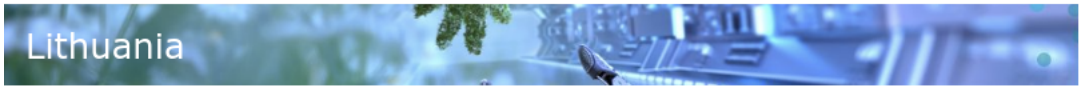
# Key Highlights

This country report has been developed as part of the '**European Monitor of Industrial Ecosystems'** project of the European Commission, Directorate General for Internal Market, Industry, Entrepreneurship and SMEs and the European Innovation Council and SMEs Executive Agency. It provides data insights into the twin transition and the technological performance of industrial ecosystems. The key findings of the report are summarised below:

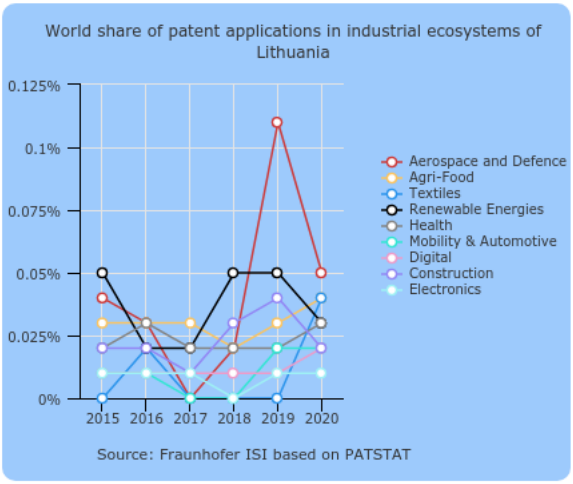



## Technological performance in industrial ecosystems:

- Regarding technology development, Lithuania had the highest share of its country patent applications in the **Agri-Food, Digital and Health** ecosystems. In a global comparison, Lithuania had some relative strengths in the Aerospace and Defence sector.

## Digital and green transition technologies:

- Among the digital technologies monitored in this project, Lithuania has been the most specialised in **Micro- and Nanoelectronics & Photonics,** where it kept stable its global share.
- Trends over time indicate an increase in the world share of Lithuania in **Digital Security and in Big Data** from 2019 to 2020.
- In the field of green technologies, Lithuania has been the most specialised in generating technologies related to **Biotechnology and Advanced Materials and Nanotechnology** ecosystems. Evolution of the world's patent applications between 2010 and 2020 shows that that Lithuania's global share in most fields followed an oscillating trend




## Capacity to produce goods based on digital and green technologies:

- Lithuania's share of production in digital technologies over global production indicates that it created the highest value by the deployment of **Digital Mobility, and Internet of Things.**
- In the field of green transition technologies, the share of production in a certain technology over Lithuania's total production indicates an increase in **Biotechnology,** where it has dynamically increased its global share from 2010 to 2020, ranking the highest among green technologies.

# 1. Introduction

This country report has been prepared within the `**European Monitor of Industrial Ecosystems' (EMI)** project, initiated by the European Commission, Directorate General for Internal Market, Industry, Entrepreneurship and SMEs and the European Innovation Council and SMEs Executive Agency (EISMEA). The overall goal of the project is to **analyse the green and digital transformation of industrial ecosystems**.

The EU's updated industrial strategy from May 2021[1] has outlined 14 industrial ecosystems that are in the focus of the project. The 14 industrial ecosystems include *aerospace and defence, agri-food, construction, cultural and creative industries, digital, electronics, energy intensive industries, energy-renewables, health, mobility – transport – automotive, proximity, social economy and civil security, retail, textile and tourism.* The industrial strategy defined industrial ecosystems as encompassing all players operating in a value chain: from the smallest startups to the largest companies, from academia to research, service providers to suppliers[2].

The objective of this report is to **present key findings from data** collected within the framework of this project at country level notably on **patent applications, production data, trade** (available only for ten industrial ecosystems)**, private equity and venture capital** investments. Nonetheless, this report does not aim to be comprehensive; the data presented here only complement other important statistics on technology development in each country.

The monitoring framework has a technological focus. Industrial transition is driven by technological, economic, and social changes, and in particular by digital technologies and the shift to a green and circular economy. The green and digital technologies that have been taken into account are presented in the table below.

*Table 1: Technologies monitored in the project by patent, trade and prodcom data*

| Green technologies |
|---|
| Advanced Materials and Nanotechnology |
| Biotechnology (for sustainability) |
| Energy Saving Technologies |
| Renewable Energy Technologies |
| Solar Power |
| Wind Power |
| other (geothermal, hydropower, biomass) |

| Digital technologies |
|---|
| Advanced Manufacturing & Robotics |
| Advanced Manufacturing |
| Robotics |
| Artificial Intelligence |
| Big Data |
| Digital Security & Networks/ Cybersecurity |
| Digital Technology for Mobility |
| Internet of Things |
| Micro- and Nanoelectronics & Photonics |
| Micro- and Nanoelectronics |
| Photonics |

*Source: Technopolis Group, IDEA Consult and Fraunhofer ISI*

The methodological report that sets the conceptual basis and explains the technical details of each indicator is available on the EMI website. This report was prepared by Orestas Strauka, Technopolis Group for the European Commission. However, it does not necessarily reflect the views of the European Commission.

[1] European Commission (2021). Communication on Updating the 2020 New Industrial Strategy, COM(2021)350 final https://commission.europa.eu/system/files/2021-05/communication-industrial-strategy-update-2020_en.pdf
[2] European Commission (2020). A New Industrial Strategy for Europe, COM/2020/102 final Commission Communication: A New Industrial Strategy for Europe | European Commission (europa.eu)

# 2. Advanced technologies fostering the green and digital transition of industrial ecosystems

## 2.1. Data sources

This chapter outlines a set of indicators that capture the capacities of EU Member States to generate technologies that foster the green and digital transformation of industrial ecosystems. Industries that are underpinned by a strong technology basis and supported by vibrant entrepreneurial communities have better conditions for success. The production of technology-based products indicates that technologies are commercialised, while a positive trade balance in technologies is a sign of international competitiveness.

**Patent analysis** is a widely used method for tracking technological development activities. With a view to industrial ecosystems under study in this project, technology generation and hence patenting takes place in a relatively limited number of ecosystems, while others mainly profit from technologies generated elsewhere. Technology development drives industrial transformation in a general way. The patent analysis is based on transnational patents, notably those filed through the WIPO PCT procedure[3] or at the European Patent Office[4] directly. They have been localised based on the address of the applicant. The different advanced technologies have been identified based on International Patent Classification (IPC) codes and keyword searches.

**Trade data**, more specifically export data, is a further relevant indicator to document industrial development at higher technology readiness levels. It informs on countries' competitive advantage in specific technology-based product areas. While somewhat simplistic, export strengths in certain technological areas still mark a specific relevance of technology relevant goods for the economy and remain among the reliable indicators of performance. The analysis focuses on trade balances based on UN Comtrade[5] statistics processed specifically for the purposes of this project. The trade balance can help reveal how nations are intricately involved in supply chains with substantial imports and relevant exports. By putting exports in relation to parallel imports, it is possible to assess whether a country displays strength in production.

**Prodcom data**[6] allows the monitoring of technology diffusion. Prodcom provides statistics on the production of manufactured goods carried out by enterprises on the national territory of the reporting countries. It helps measuring the uptake of technology through the production of manufactured goods by focusing on the specific components and elements enabled by green and digital technologies. Production data allows to measure to what extent technology-related products are being produced in the country. The production indicators are calculated based on product-level data from the Eurostat's Prodcom database.

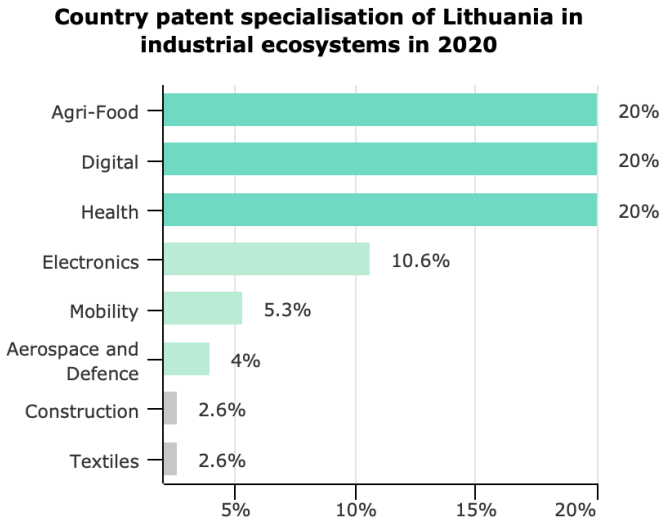
**Crunchbase data**[7] were used to analyse entrepreneurial dynamics and private equity and venture capital investment. Crunchbase is a widely trusted source of information on venture capital backed innovative companies. Technology startups represent key building blocks in the transition towards a more digital, green and resilient economic model. Entrepreneurial activity helps accelerate the diffusion of technologies in industrial ecosystems and startups that provide green and digital solutions are relevant indicators of how the industrial ecosystem is transforming itself to reach environmental sustainability objectives. More information about these data sources can be found in the methodological report of the project.

[3] World Intellectual Property Organization, WIPO Patent Cooperation Treaty (PCT) https://www.wipo.int/pct/en/
[4] European Patent Office, Supporting Innovation and Patents in Europe https://www.epo.org/en
[5] United Nations Comtrade, UN Comtrade Plus-International Trade Data Platform https://comtradeplus.un.org/
[6] Eurostat, Eurostat PRODCOM-European Union Production and Trade Statistic https://ec.europa.eu/eurostat/web/prodcom
[7] Crunchbase, Business Information and Networking Platform https://www.crunchbase.com/

## 2.2. Technology development in industrial ecosystems

Regarding technology development, Lithuania had the highest share of its country patent applications in the Agri-Food, Digital and Health ecosystems. Lithuania ranked 17th place in the Aerospace and Defence sector.

*Figure 1: Country share and world share (expressed in terms of ranking) in patent applications in industrial ecosystems related technologies*



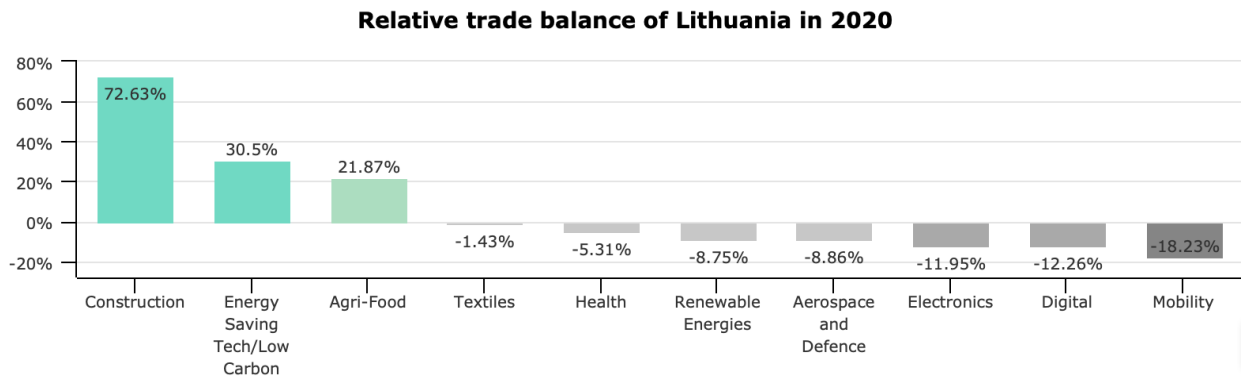

**Ranking of Lithuania within EU27 in terms of its share of global patent applications in 2020** (1 - best performer, 27 worst performer)

| | |
|---|---|
| **Aerospace and Defence** | **17** |
| Agri-Food | 21 |
| Digital | 21 |
| Health | 21 |
| Renewable Energies | 21 |
| Electronics | 23 |
| Energy Intensive Industries | 23 |
| Textiles | 23 |
| Mobility | 24 |
| Construction | 25 |

*Source: Fraunhofer ISI based on Patstat*

Trade is a common indicator of international competitiveness because it shows how attractive a country's products are outside of its domestic market. Total exports provide evidence about a country's role as a producer, and trade balance captures its sovereignty in certain areas of production. Figure 2 displays the trade balance in relation to overall trade volume by technology development in industrial ecosystems. Lithuania registered a trade surplus in technology-based products related to Construction, Energy Savaing and Agri-Food ecosystems.

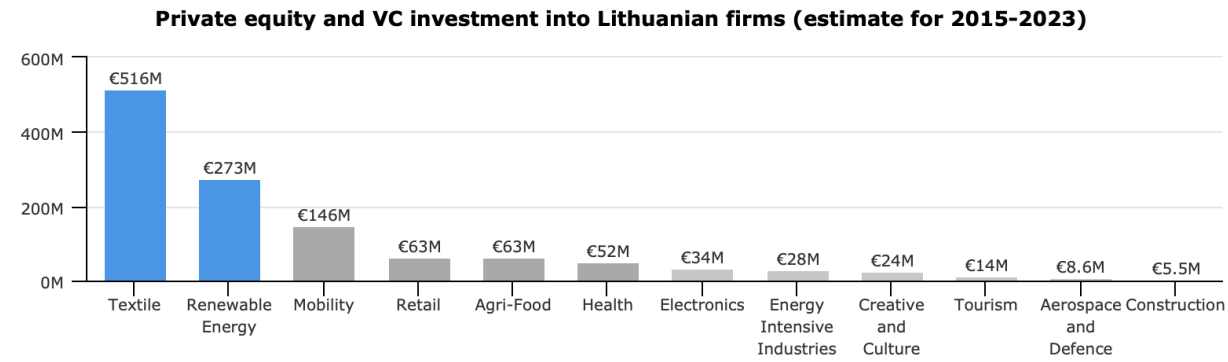
*Figure 2: Trade balance in relation to overall trade volume ((exp - imp)/(exp+imp)) (2020)*




*Source: Fraunhofer ISI based on UNCOMTRADE*

Most private equity and venture capital investment in Lithuania went into innovative companies operating in the Textile, followed by the Renewable Energy industrial ecosystem over the period from 2015 to 2023.

*Figure 3: Private equity and venture capital investment into tech companies related to industrial ecosystems in Lithuania*

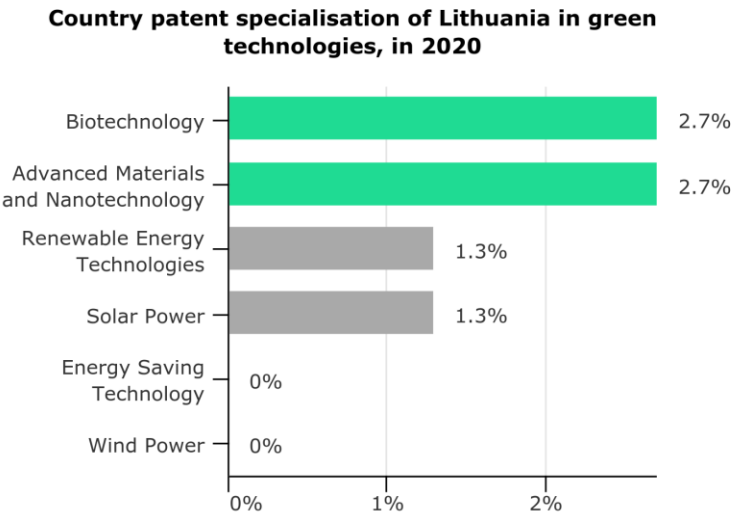



*Source: Technopolis Group based on Crunchbase*

## 2.3. Green transformation

Within the country, Lithuania has been the most specialised in generating technologies related to Biotechnology and Advanced Materials and Nanotechnology. In a global comparison, Lithuania has ranked at the 19th place among the EU27 Member States in generating Biotechnology.

*Figure 4: Country specialisation and world share (expressed in terms of ranking) in patent applications of Lithuania*



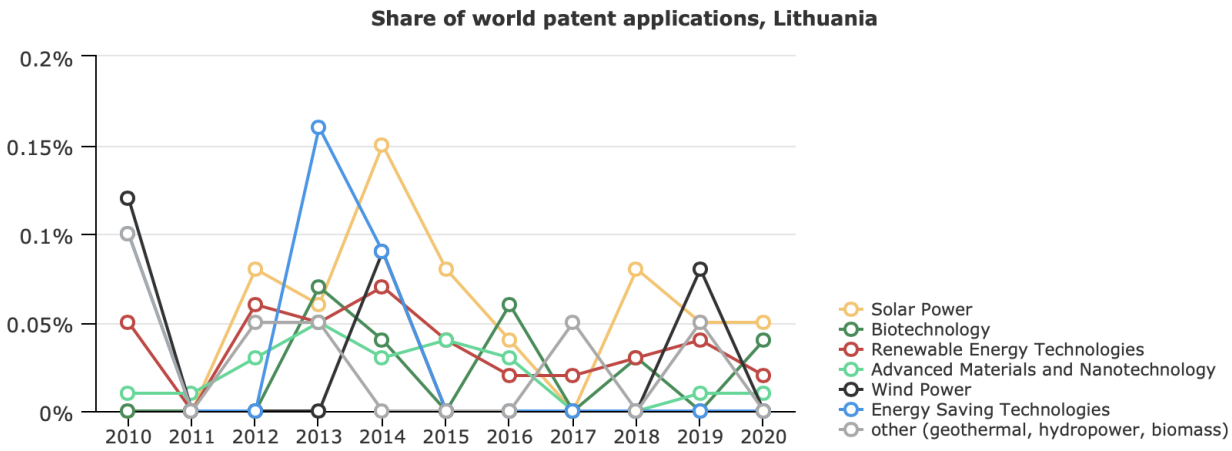

**Ranking of Lithuania within EU27 in terms of its share of global patent applications in 2020** (1 - best performer, 27 worst performer)

| | |
|---|---|
| **Biotechnology** | **19** |
| Advanced Materials and Nanotechnology | 21 |
| Renewable Energy Technologies | 23 |
| Energy Saving Technology | na |

*Source: Fraunhofer ISI based on Patstat*

Evolution of the world's patent applications between 2010 and 2020 shows that that Lithuania's global share in most fields followed an oscillating trend, especially for what concerns its share in Wind Power and Solar Power.

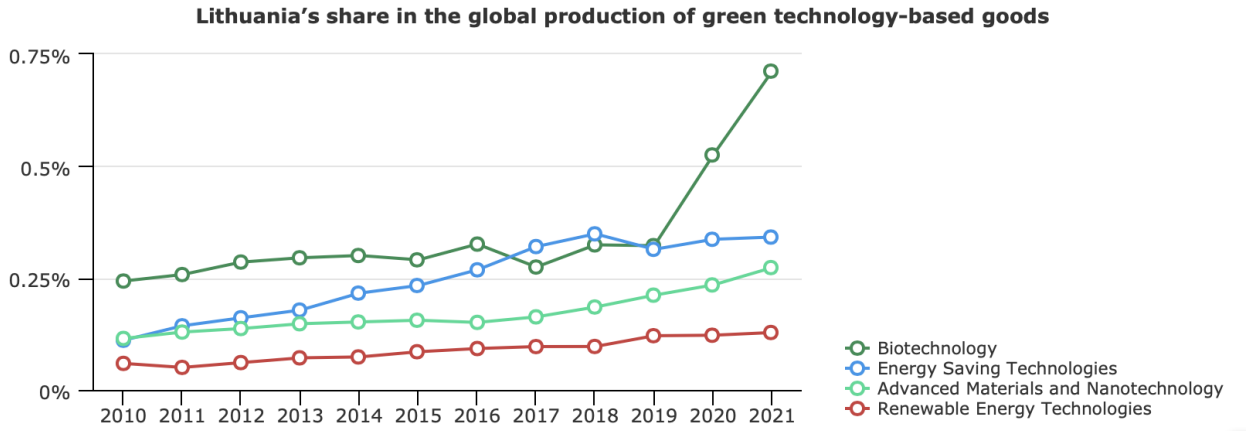
*Figure 5: Trends over time in Lithuania's share in world patent applications*




*Source: Fraunhofer ISI based on Patstat*

The Prodcom-based indicator measures the share of advanced technology-related production in Lithuania for a given year. The share of production in a certain technology over Lithuania's total production indicates an increase in Biotechnology from 2010 to 2020, ranking the highest among green technologies.

*Figure 6: Production of advanced technology-based products in Lithuania*

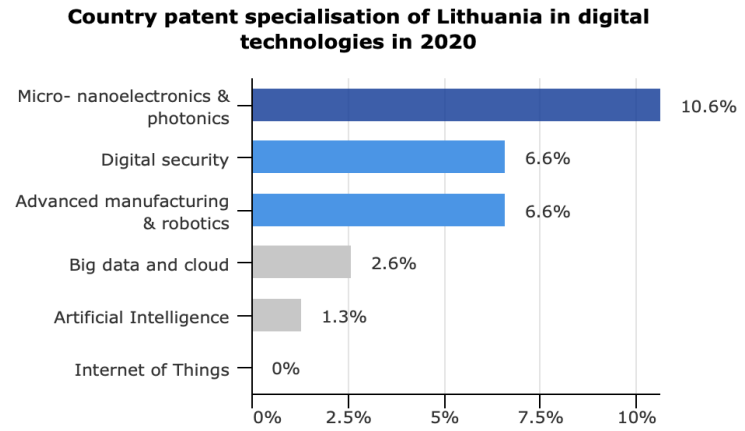



*Source: IDEA Consult based on Prodcom data*

## 2.4. Digital transformation

Among the digital technologies monitored in this project, Lithuania has been the most specialised in Micro- and Nanoelectronics & Photonics, where it ranked 16$^{th}$ place in terms of its global share in patent applications within EU27 countries in 2020.

*Figure 7: Country specialisation and world share (expressed in terms of ranking) in digital technology related patent applications of Lithuania*



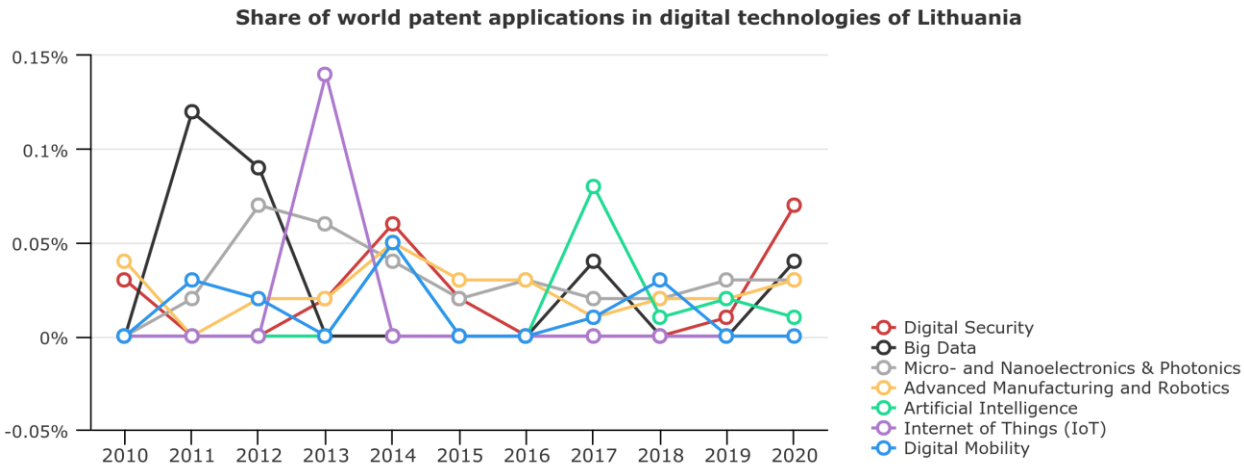

**Ranking of Lithuania within EU27 in terms of its share of global patent applications in 2020** (1 - best performer, 27 worst performer)

| | |
|---|---|
| **Micro-nanoelectronics and photonics** | **16** |
| Digital security | 19 |
| Big Data | 20 |
| Advanced manufacturing and robotics | 20 |
| Internet of Things (IoT) | 25 |
| Artificial Intelligence | 25 |
| Digital Mobility | 25 |

*Source: Fraunhofer ISI based on Patstat*

Trends over time indicate an increase in the world share of Lithuania in Digital Security and in Big Data from 2019 to 2020.

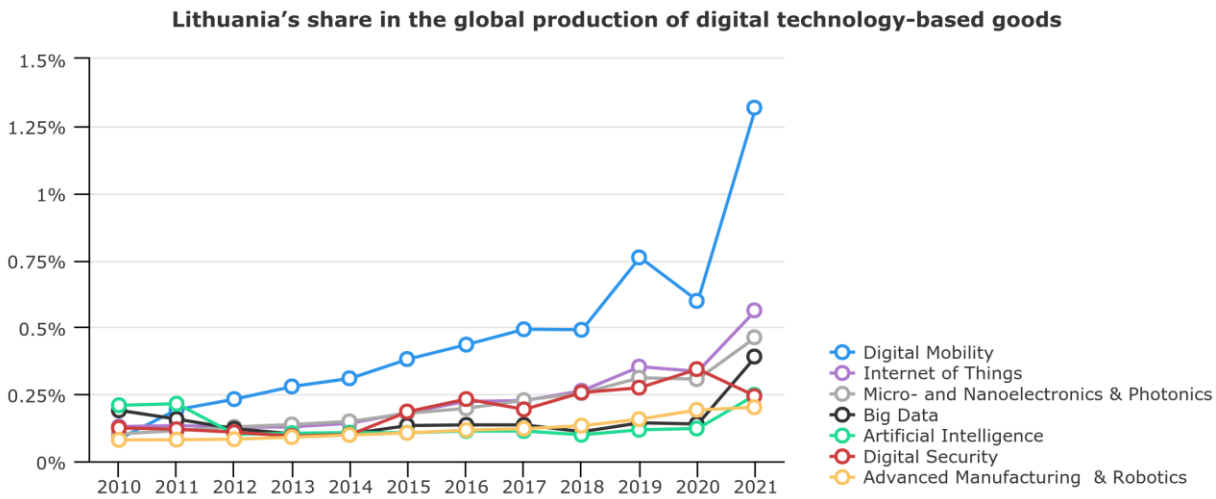
*Figure 8: Trends over time in Lithuania's share of world patent applications*




*Source: Fraunhofer ISI based on Patstat*

The Prodcom-based indicator measures the share of Lithuania in advanced technology-related production for a given year. The share of production in a particular technology over Lithuania's total production indicates that Lithuania has the largest share in the field of Digital Mobility, and Internet of Things technology-based products.

*Figure 9: Production of advanced technology-based products in Lithuania*




*Source: IDEA Consult based on Prodcom data*

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