Monitoring industrial ecosystems

EU MEMBER STATES FACT SHEETS

Austria

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Key Highlights

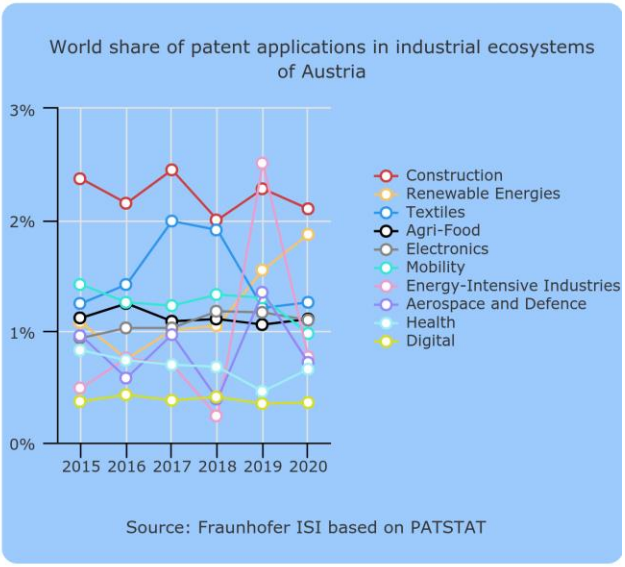
This country report has been developed as part of the '**European Monitor of Industrial Ecosystems'** project of the European Commission, Directorate General for Internal Market, Industry, Entrepreneurship and SMEs and the European Innovation Council and SMEs Executive Agency. It provides data insights 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:

- In a global comparison, Austria has been among the top countries within the EU27 to generate technologies relevant for the **Construction, Renewable Energies and Textiles ecosystems** based on patent data. Trends over time show an increase in particular in the field of Renewable Energies.

Digital and green transition technologies:

- Among the digital technologies monitored in this project, Austria had the highest country share of patent applications in **Advanced Manufacturing and Robotics, and Micro- and Nanoelectronics,** where it also exhibits relative strengths globally.
- Trends over time shows that Austria maintained its global position in the fields of Internet of Things, Micro- and Nanoelectronics and Advanced Manufacturing technologies over the period from 2010 to 2020.
- Austria has also increased its share in world patent applications in **Big Data and Artificial Intelligence** from 2019 to 2020.
- In a global comparison, Austria ranked among the top EU27 Member States that generate technologies related to **Advanced Materials**.



Capacity to produce goods based on digital and green technologies:

- Austria's production share in digital technologies globally shows that it has created significant value by implementing **Digital Security** in manufacturing goods. This has led to a notable increase in its production of technology-based products over time.
- There has been an increase in production also in the fields of **Micro- and Nanoelectronics, Artificial Intelligence, and the Internet of Things** over the period from 2010 to 2021. Nonetheless, the share in the global production of Big Data and Cloud computing technology related goods has decreased over the same period.
- In the field of green transition technologies, Austria's global share in **Energy Saving, Advanced Materials and Biotechnologies** has increased, however, it has decreased in Renewable Energy technologies since 2019.

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 Gabriel Däßler, Sven Wydra from Fraunhofer ISI 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.

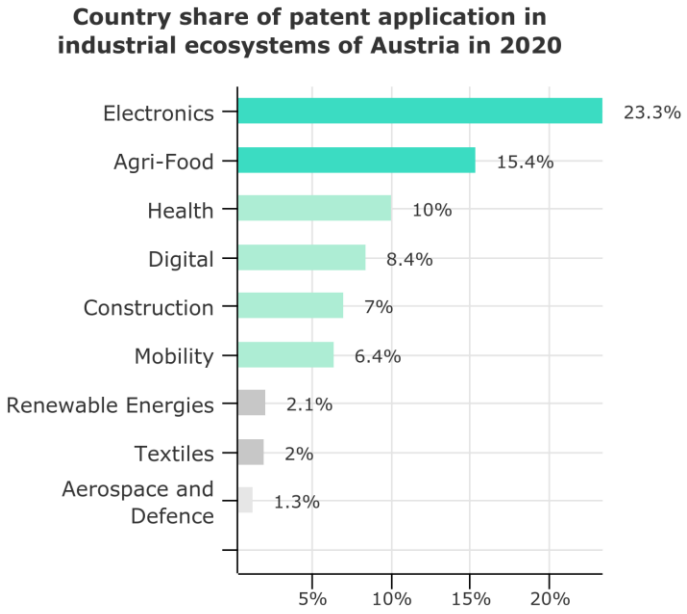
Crunchbase data[7] were used to analyse entrepreneurial dynamics and private equity and venture capital investment. Crunchbase is a widely trusted source of information on venture capital backed innovative companies. Technology startups represent key building blocks in the transition towards a more digital, 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 Statistics 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, Austria had the highest share of its country patent applications in the Electronics, Agri-Food and Health industrial ecosystems in 2020, as captured by patent data. In a global comparison, it ranked at the fifth place within the EU27 countries in Electronics, Mobility, Transport and Automotive, Construction and Textiles. This points to a strong technological competitiveness especially given the size of Austria in terms of population.

Figure 1: Austria's country share and world share (expressed in terms of ranking) in EU patent applications in industrial ecosystems related technologies



Ranking of Austria within EU27 in terms of its share of global patent applications in 2020

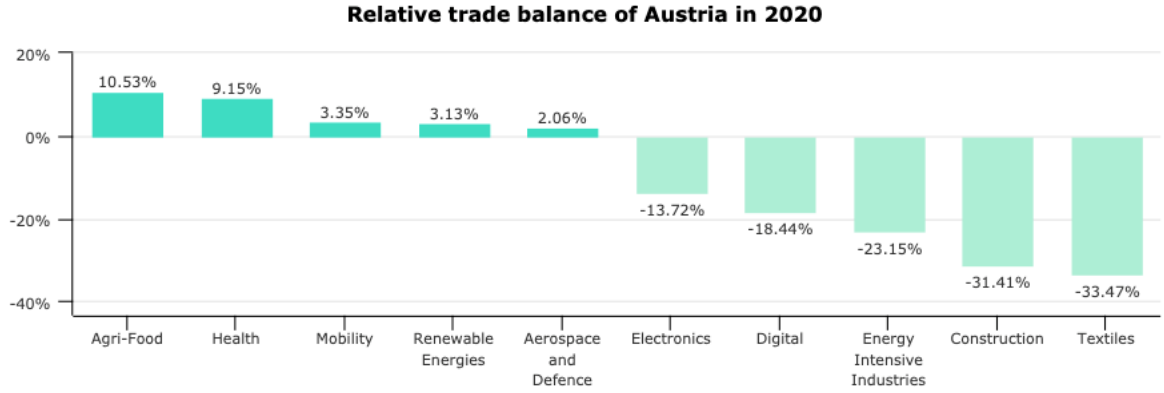
(1 - best performer, 27 worst performer)

Construction	**5**
Textiles	**5**
Electronics	**5**
Mobility	**5**
Aerospace and Defence	7
Renewable Energies	7
Agri-Food	9
Digital	9
Energy-Intensive Industries	9
Health	10

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. Austria registered a trade surplus in technology-based products related to Agri-food, Healthcare, Mobility, Renewable energies and Aerospace and Defence.

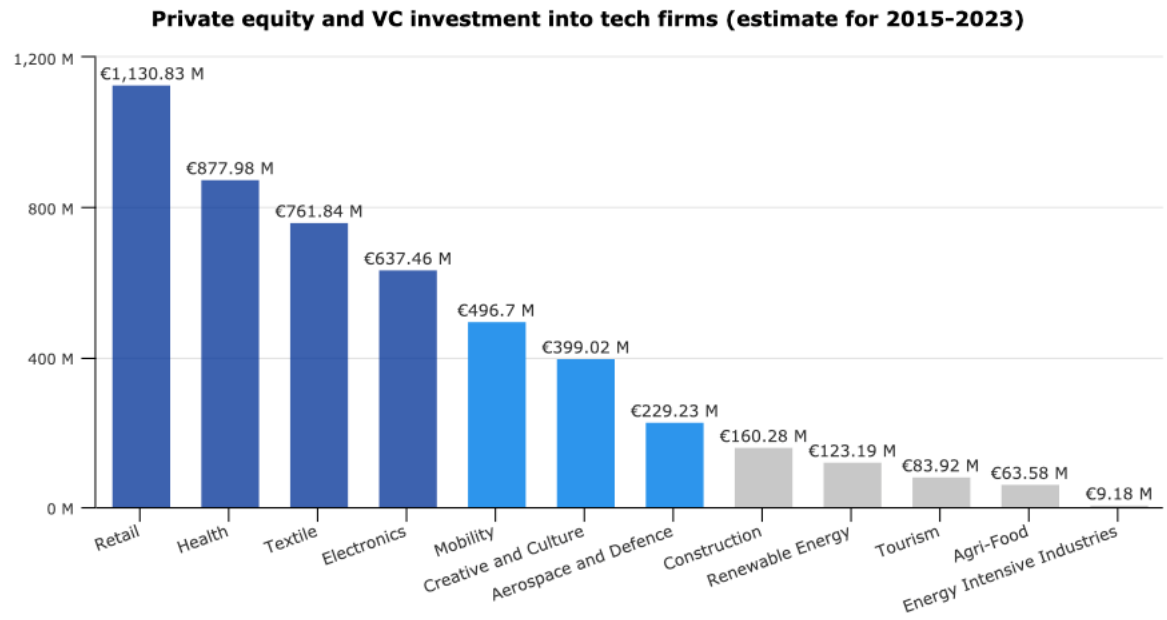
Figure 2: Trade balance in relation to overall trade volume ((exp - imp)/(exp+imp)) (2020)



Source: Fraunhofer ISI based on UNCOMTRADE

Most private equity and venture capital investment went into innovative Austrian tech companies operating in the field of Retail, Healthcare, Textiles and Electronics over the period from 2015 to 2023.

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

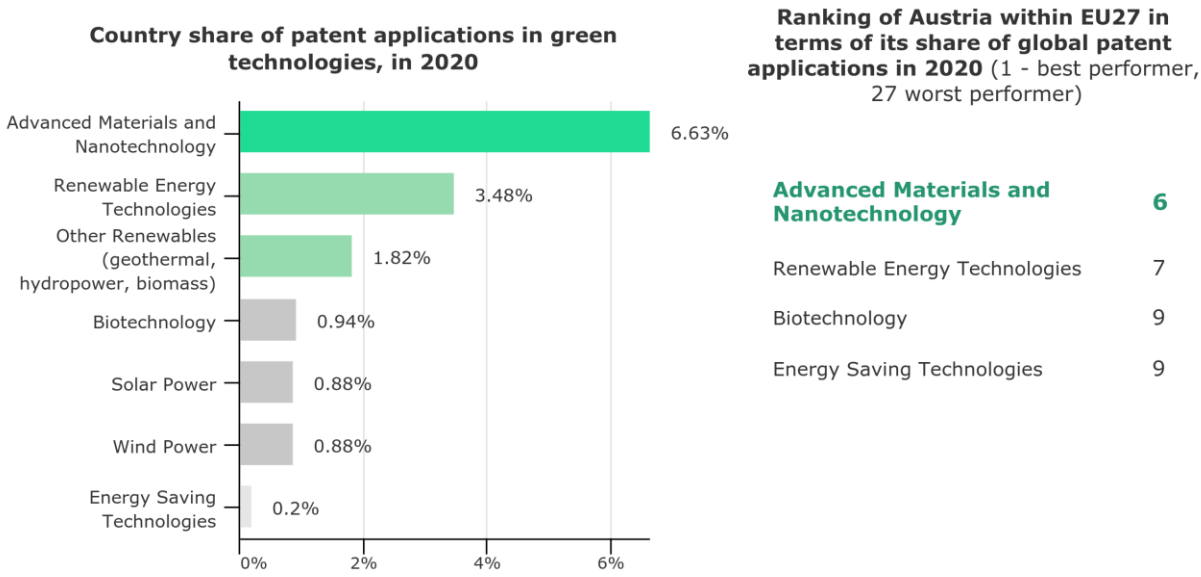


Source: Technopolis Group based on Crunchbase

2.3. Green transformation

Within the country, Austria had the highest share of its patent applications in the field of Advanced Materials and Renewable Energy Technologies, which have the potential to drive the green transformation of its industries. In a global comparison, Austria ranked at the sixth place among the EU27 Member States in generating technologies related to Advanced Materials.

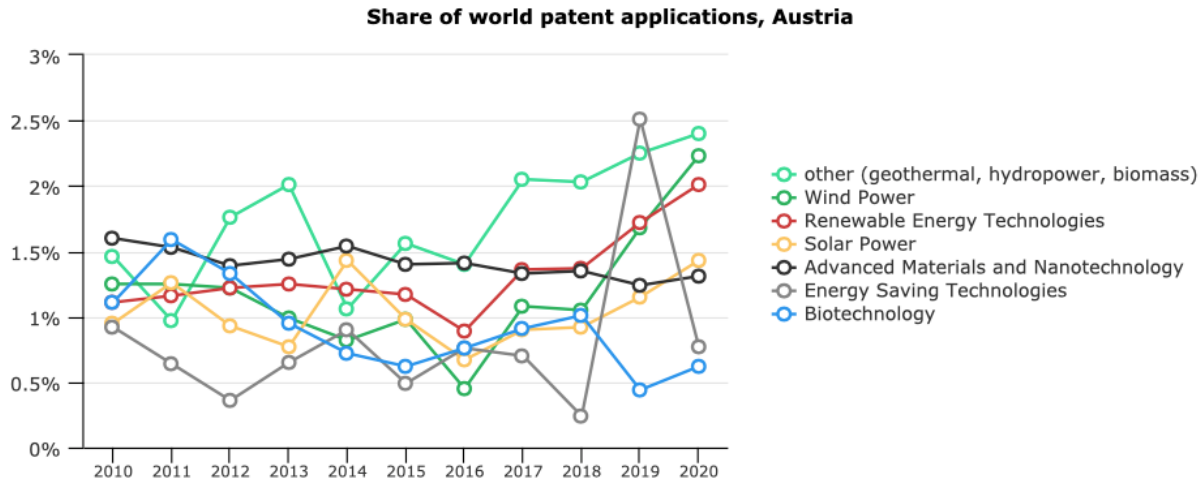
Figure 4: Austria's country share and world share (expressed in terms of ranking) in EU patent applications in green technologies



Source: Fraunhofer ISI based on Patstat

Trends in the world's patent applications show that Austria increased its global share in various fields within Renewable Energies, including Other Renewable Energies such as geothermal, hydropower and biomass, in Wind Power and in Solar Power. In the field of Energy-Saving Technologies, the results of the analysis show a decreasing trend in Austria's global position.

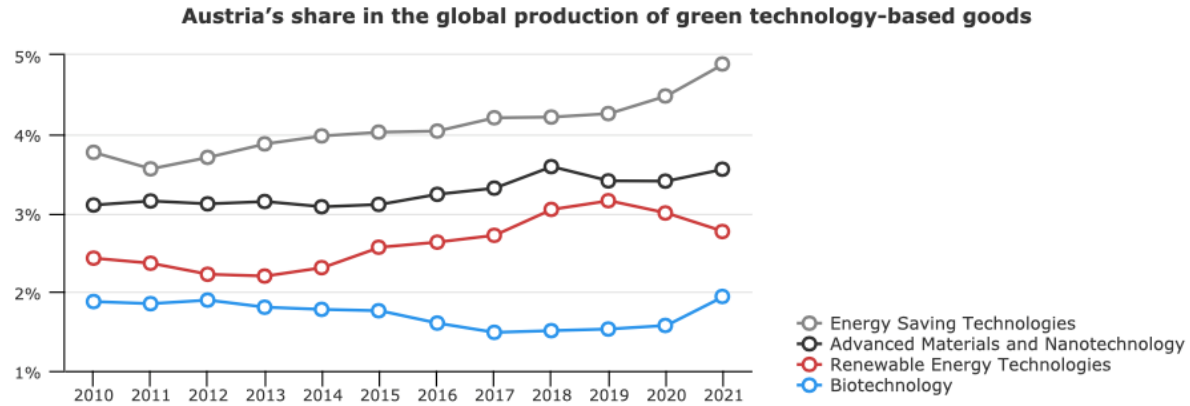
Figure 5: Trends over time in Austria's share in world patent applications



Source: Fraunhofer ISI based on Patstat

The indicator based on Prodcom data measures the share of advanced technology-related production in Austria for a given year. Austria's share of production in a particular technology over global production indicates that it created the highest value by the deployment of Energy Saving Technologies across manufacturing goods. Over the period from 2010 to 2021 Austria's global share in Energy Saving, Advanced Materials and Biotechnologies has increased, however, it has decreased in Renewable Energy technologies since 2019. The country share in the global production of green technology-based products is depicted in Figure 6 below.

Figure 6: Production of advanced technology-based products in Austria

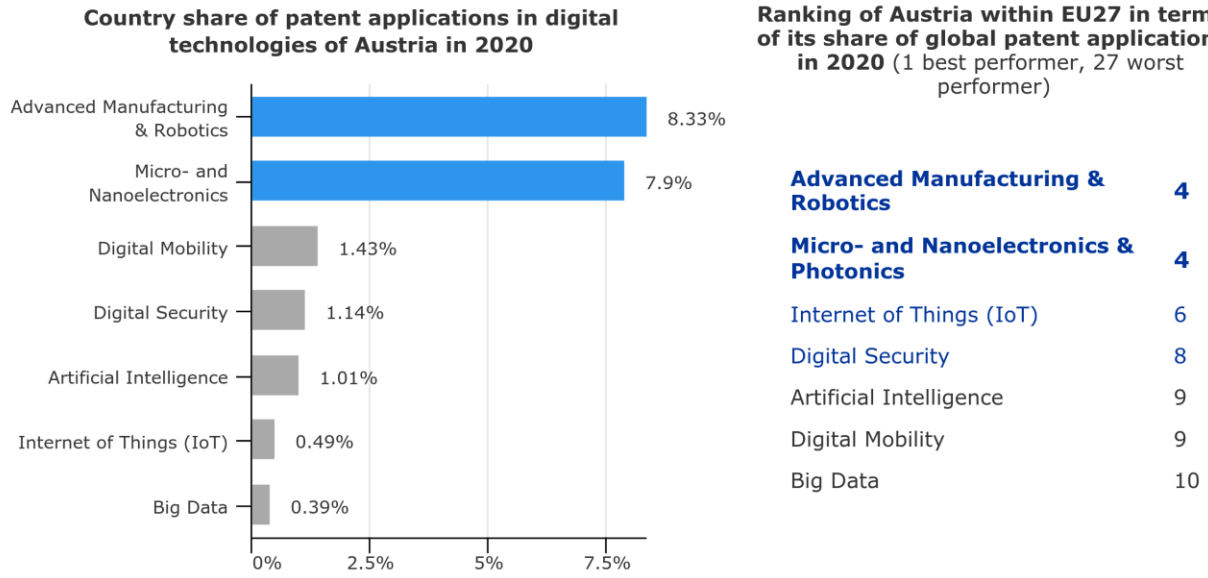


Source: IDEA Consult based on Prodcom data

2.4. Digital transformation

Among the digital technologies monitored in this project, Austria had the highest country share of its patent applications in Advanced Manufacturing and Robotics, and Micro- and Nanoelectronics, which are key technological fields relevant for its industrial structure. In terms of the global share of patent applications, Austria ranked at the fourth place in the same technologies among the EU27 Member States. In the field of the Internet of Things it ranked at the 6th position.

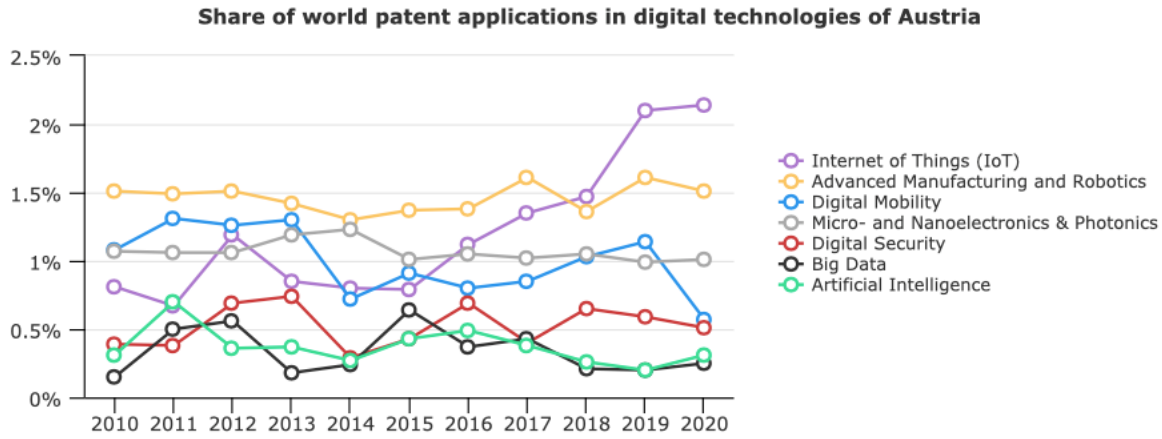
Figure 7: Austria's country share and world share (expressed in terms of ranking) in EU patent applications in green technologies



Source: Fraunhofer ISI based on Patstat

Trends over time indicate an increase or at least stability of Austria's global position in the fields of Internet of Things, Micro- and Nanoelectronics and Advanced Manufacturing technologies over the period from 2010 to 2020. Austria has also increased its share in world patent applications in Big Data and Artificial Intelligence from 2019 to 2020. Nevertheless, it has decreased its world share in the field of Digital technologies for Mobility and a decreasing trend can be observed also for Digital Security.

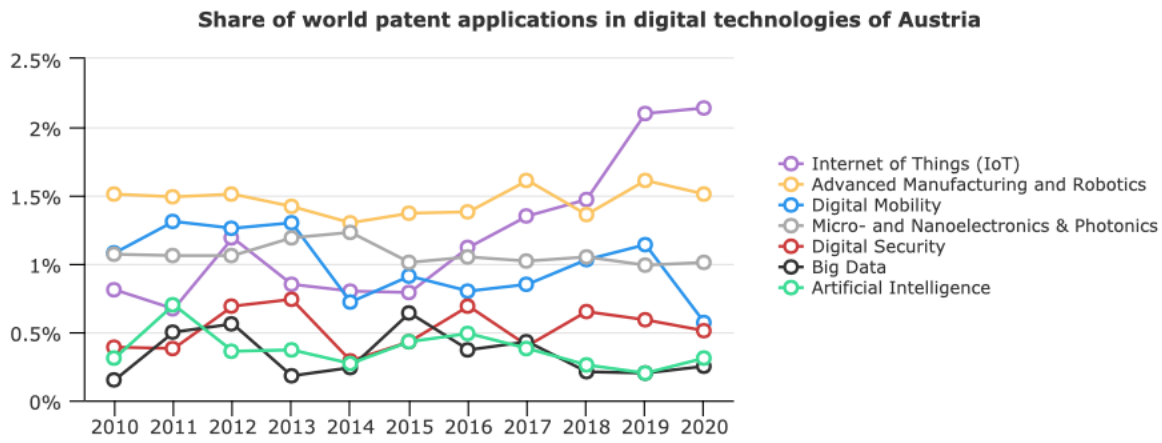
Figure 8: Trends over time in Austria's share of world patent applications



Source: Fraunhofer ISI based on Patstat

The Prodcom-based indicator measures the share of Austria in advanced technology-related production for a given year. Austria's share of production in a particular technology over global production indicates that it created the highest value by the deployment of Digital Security in manufacturing goods, where it has increased remarkably its production of the related technology-based products over time. There has been an increase in production also in the fields of Micro- and Nanoelectronics, Artificial Intelligence, and the Internet of Things over the period from 2010 to 2020. Nonetheless, the share in the global production of Big Data and Cloud computing technology related goods has decreased over the same period.

Figure 9: Production of advanced technology-based products in Austria



Source: IDEA Consult based on Prodcom data

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