Polish Economic Institute

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CEE Economic Monthly

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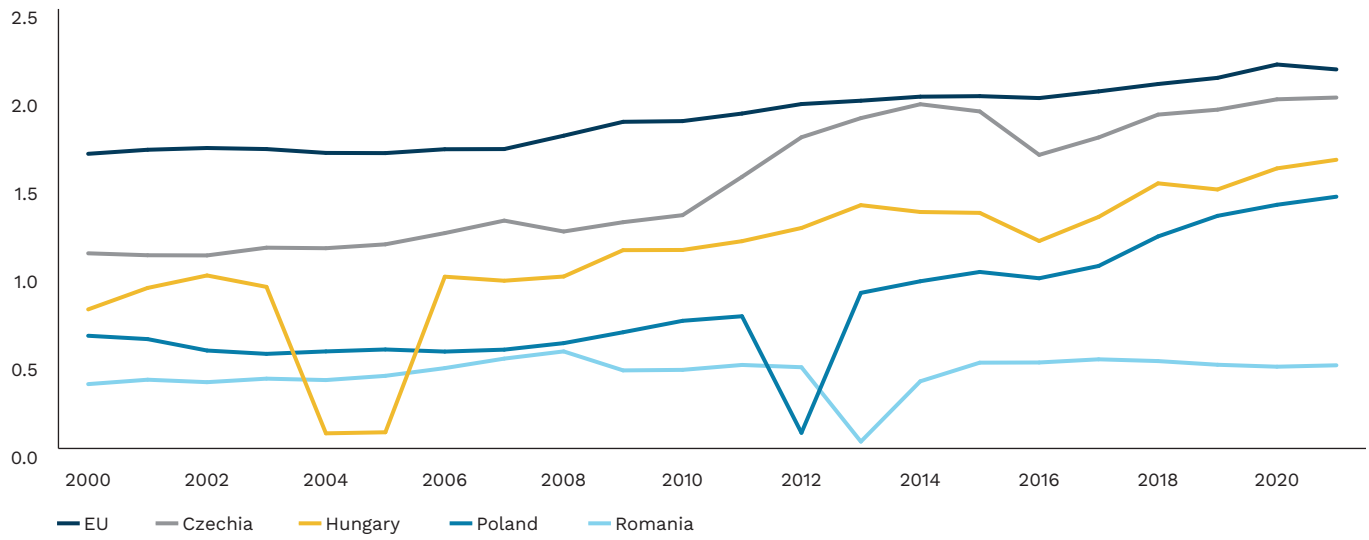
Gross domestic spending on R&D (% GDP)



Source: OECD.

CEE pharmaceutical companies not innovative enough

10.6%

Share of CEE pharmaceutical market compared to the EU total

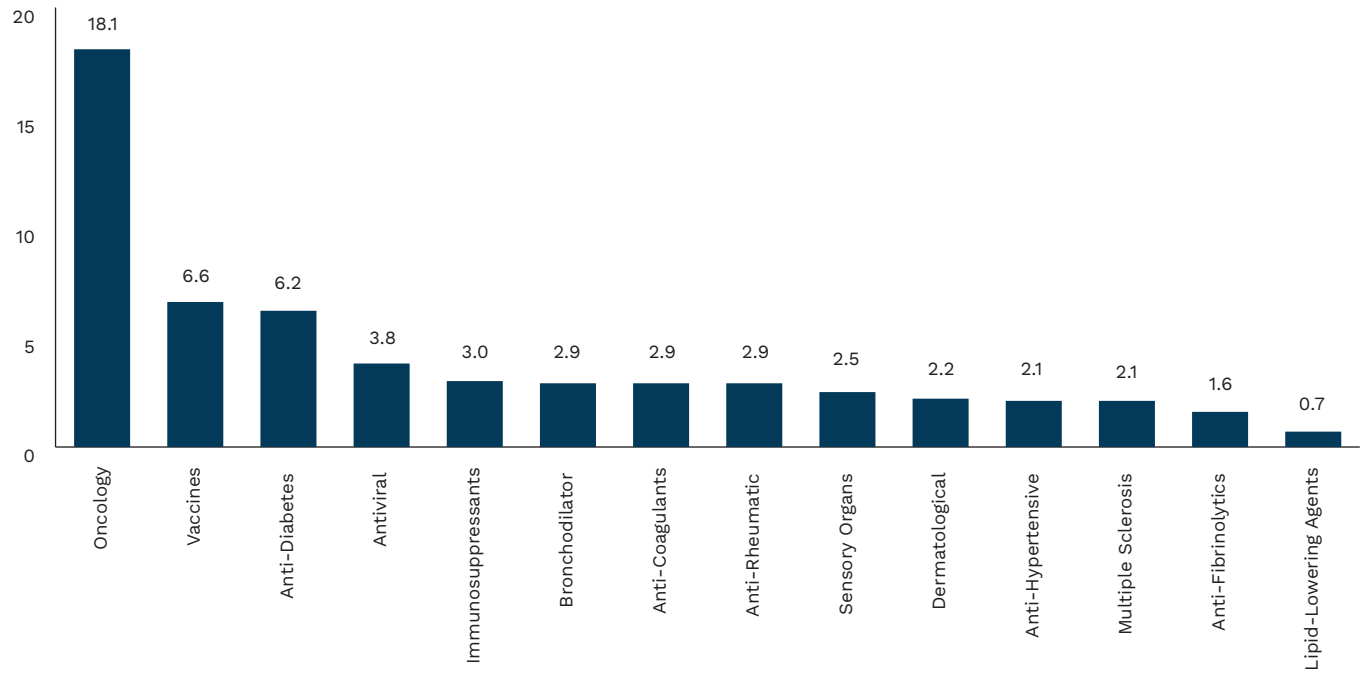
2.65%

Share of CEE R&D expenditures in total European outlays

▶ The CEE pharmaceutics industries have opportunities to expand in the next years given increasing healthcare spending. The major obstacles are related to the focus on production of generics and biosimilars and lower R&D spending.

▶ **The pharmaceutical sector has expanded faster than European GDP in the last years.** The European Federation of Pharmaceutical Industries and Associations (EFPIA) estimates that production in the European medical sector in 2023 was close to EUR 340 billion. Production is mainly intended for export, in particular to the USA and Japan. The agency estimates that consumption on European markets will reach approximately EUR 255 billion, slightly higher compared to Statista (EUR 200 billion) or German BPI (EUR 220 billion). The three biggest markets are related to oncological drugs, vaccines, and anti-diabetes drugs. Statista research estimates the market shares to be 18.1%, 6.6%, and 6.2% respectively.

Figure 1.1. Market revenues from sales to Europe by product type (%)



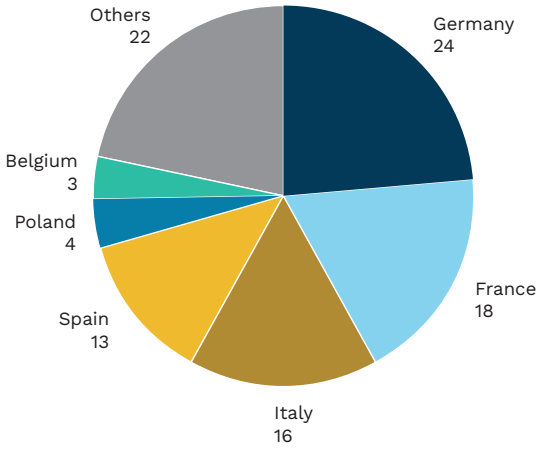
Source: Statista Market Insight.

▶ **The European markets are predominantly oriented towards Western Europe.** The four biggest economies i.e. Germany, France, Italy, and Spain are generating approximately 70% of revenues in Europe. The total market share of CEE countries amounts to approximately 10.6% with the biggest share falling to Poland (4%) and Czechia (1.8%). However, these nations should increase their market share in the coming years given the convergence and the aging of population in the CEE region.

▶ **European production is strongly concentrated in just a few countries.** Pharmexec reports that Swiss Novartis and Roche generated EUR 98 billion revenues in 2022 – approximately 30% of the total European market size. A further EUR 80 billion in revenue came from British AstraZeneca and GSK (c. 24% of the total market). The companies, whose revenues exceeded 20 billion, also

include French Sanofi (43 billion) and Danish Novo Nordisk (25 billion). The bigger CEE entities are Czech Scimed, Polish Neuca, Polpharma and Adamed and Hungarian Gedeon Richter.

Figure 1.2. Market revenues from sales to Europe by country (%)

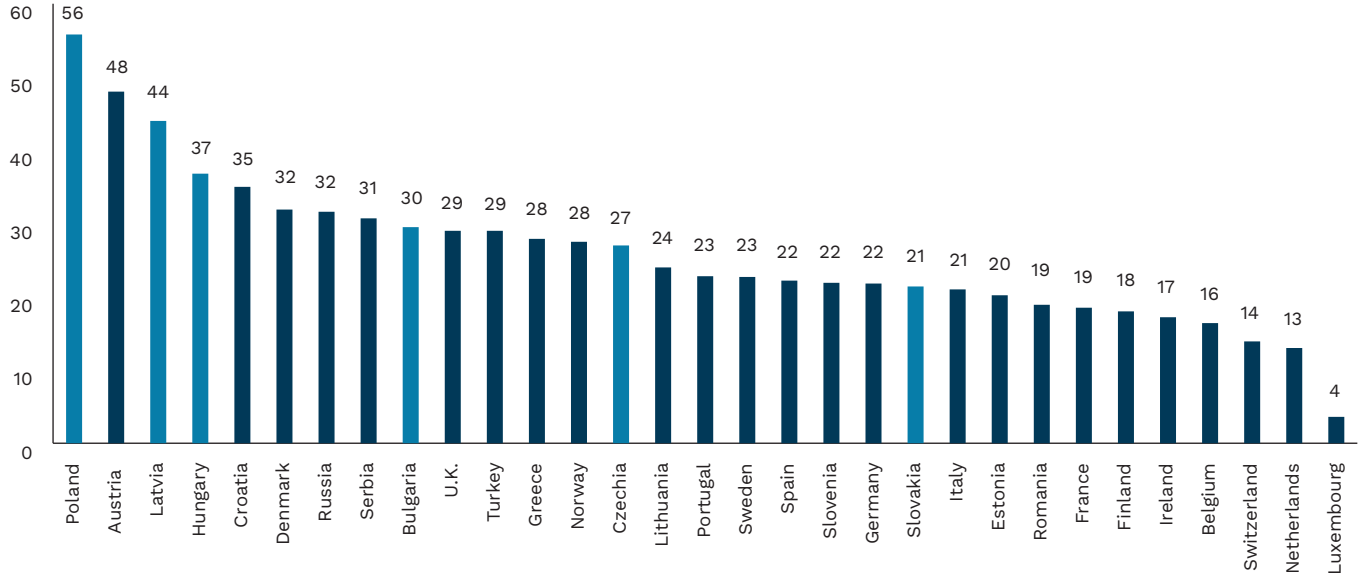


Source: BPI.

▶ **The CEE pharmaceutical industry is strongly focused on production of generics and biosimilars.** These are drugs which were not invented by their producer. They can be produced after the expiry of intellectual property rights. The biggest share of generics (56%) in Europe is visible in Poland. Amongst Visegrad countries a strong share of generics is visible also in Hungary (37%) and Czechia (27%).

▶ **Such a structure of the market results in weak R&D spending.** EFPIA reports that CEE countries alone represented 2.65% of total expenditure in Europe. The biggest contributors were Poland (0.75%) and Hungary (0.7%). Germany (20%) and Switzerland (19.3%) accounted for the largest share of outlays.

Figure 1.3. Share of revenues generated by producers of generics and biosimilars (% of total revenues)



Source: EFPIA.

Space sector constrained with low funding

Over 80%

US share in space launches

Almost 25 times cheaper

cargo delivered by Falcon Heavy relative to the 1960s technology

▶ The space sector is one of the fastest growing sectors of the new economy. European companies generally remain competitive therein, however, the problem is the commercialisation of projects and the creation of entire value chains. One of the obstacles to development is the limited funding of the European Space Agency and, as a result, it cannot act as a stable end user.

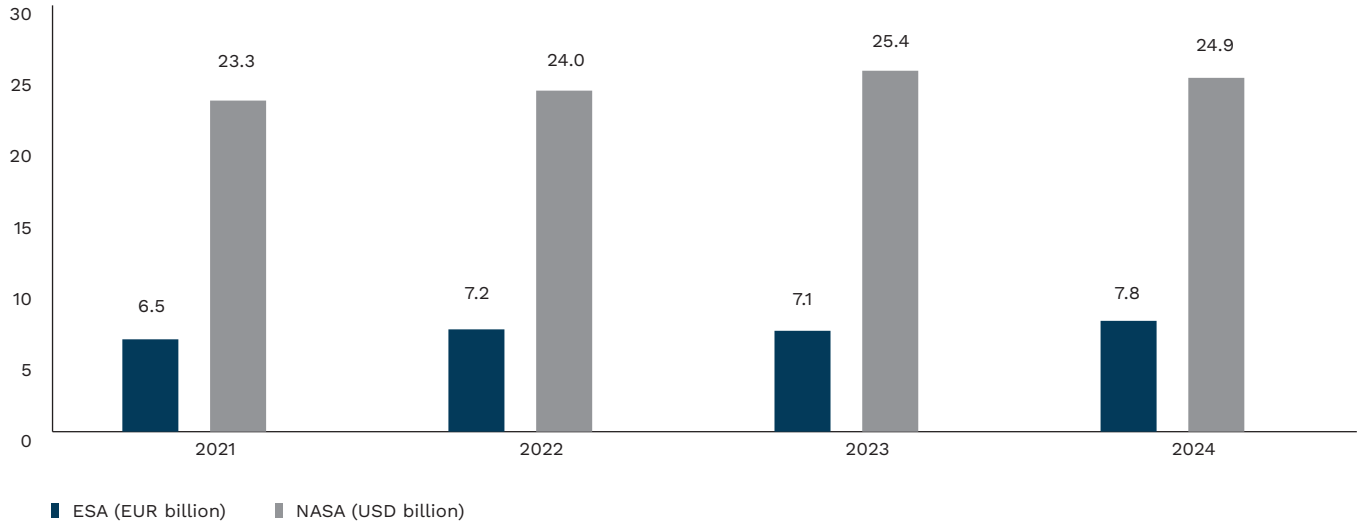
▶ **The space sector is a dynamic industry.** Back in 2019, the European Investment Bank (EIB) indicated that the global space sector was growing almost twice as fast as the average of economies (6.7% vs. 3.5% per year). Thus, it was among the emerging sectors – gaining an edge in it today should translate into maintaining a leadership position for decades to come. The bank pointed out that European companies are very competitive in space technologies – these include Airbus (satellites), Safran (Ariane rocket propulsion), TransDigm Group (components), BAE Systems PLC (electronics and information systems), and Thales SA (satellite communications). However, this advantage has not translated into business use and commercialization. The EIB pointed to three reasons:

— Legal and regulatory uncertainty encourages easier and less risky investments in services rather than "hard" technology development activities.

— Lack of large European companies involved in upstream (i.e., end-use applications of technology – sold directly to consumers). As a result, European companies have remained subcontractors to the US.

— Limited financing for business ventures. The capital market for the space economy itself is in its infancy. The structure of European markets with a limited role for private markets further exacerbates the problem.

Figure 2.1. Budgets of NASA and European Space Agency (billions in respective currencies)

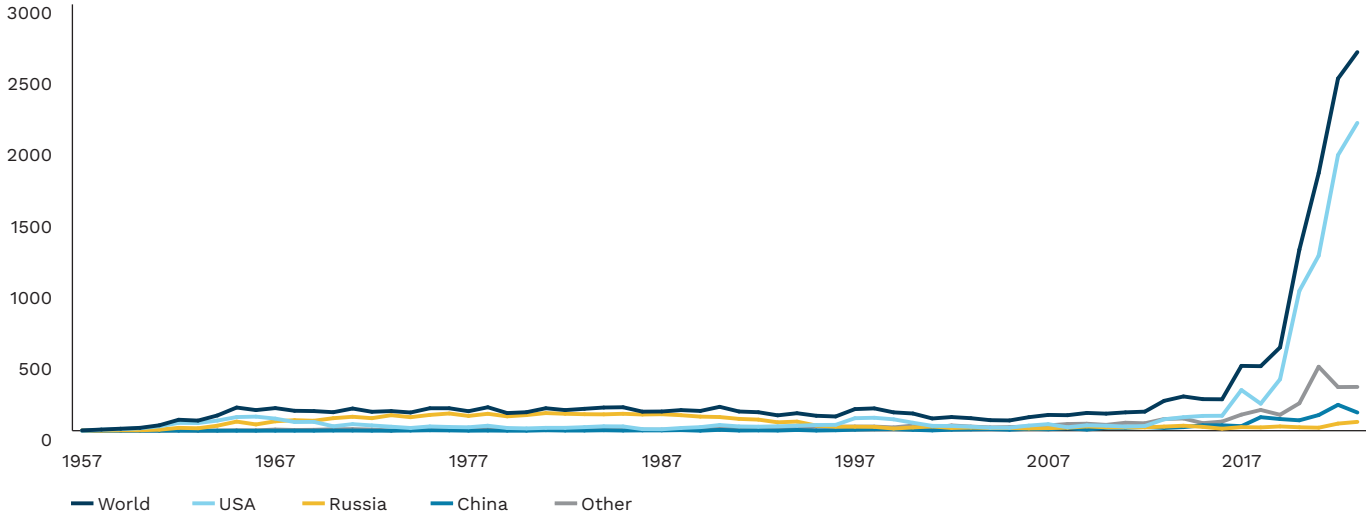


Note: in case of NASA budget approved by the Congress.
Source: ESA and NASA.

▶ **COTS has helped the US dominate the space race.** Back in 2006, NASA announced COTS, a programme of cooperation with private companies (including SpaceX). Its goal was to ensure low-cost and commercial delivery of cargo to the International Space Station (ISS, for example, through multiple rockets). Public funding acted as an "innovation incentive" and guaranteed

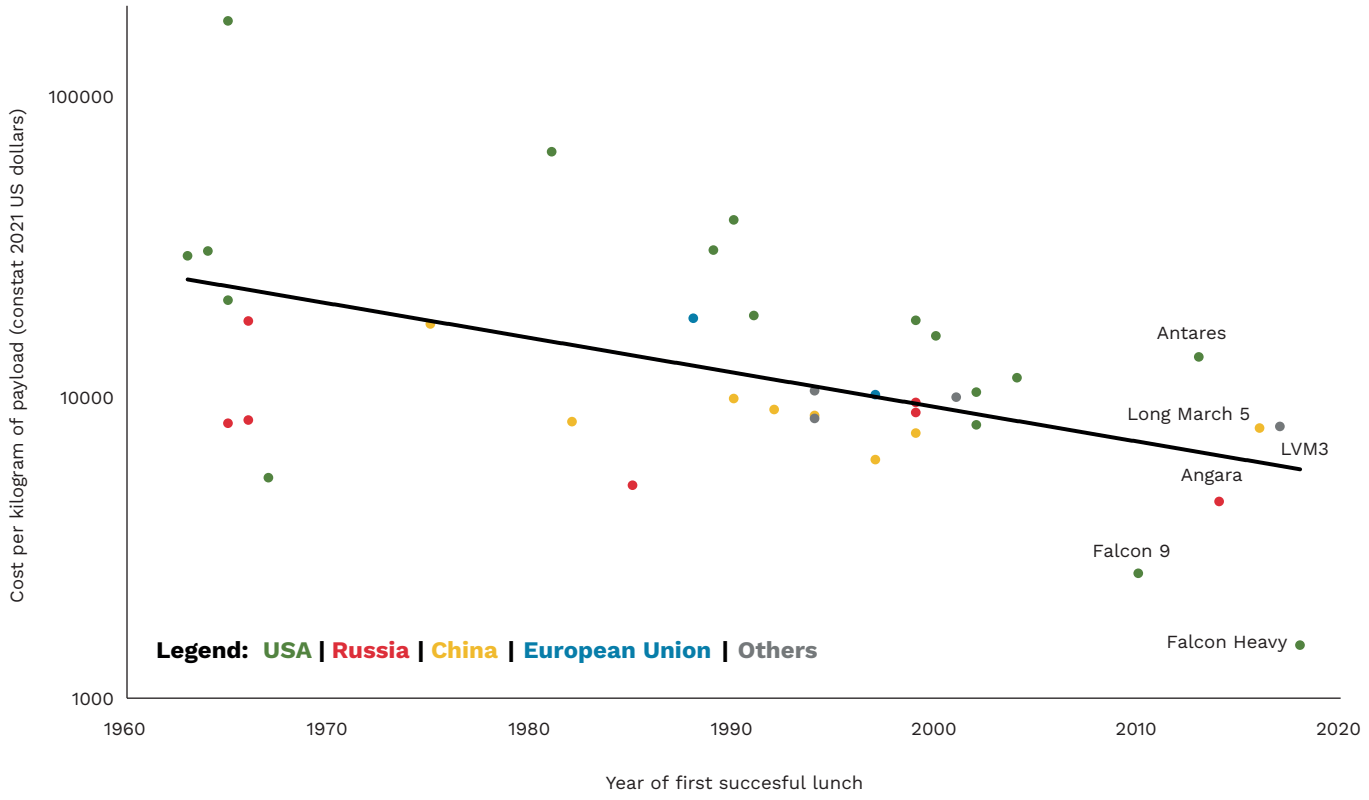
demand for the services being developed (no company would undertake such complex R&D without the certainty that new solutions could be sold in the future). Falcon rockets, developed in the wake of COTS. are many times cheaper to operate than earlier rockets, including the European Ariane. The effects of the COTS programme were later applied directly to CRS, that is, commercial cargo deliveries to the International Space Station. As a result, the United States became a leading player in the space economy.

Figure 2.2. Annual number of objects (satellites, probes, etc.) launched into space



Source: United Nations Office for Outer Space Affairs via Our World in Data.

Figure 2.3. Cost of space launches into low Earth orbit (LEO) is declining



Note: only medium and heavy-lift launch vehicles.
Source: CCIS Aerospace Security Project via Our World in Data.

▶ Europe wants to repeat the success of COTS. This is to be achieved by the CCTI programme, whose goal is to develop and use low-cost commercialized technologies in the space economy (i.e. for satellite launches, deliveries to the ISS or for scientific purposes. However, the project faces a number of challenges. First of all, the budget of the European Space Agency (ESA) is approx. 2.5 times smaller than NASA's, which automatically limits the EU's capabilities. Bruegel points out that a further problem is the instability of the scarce funding. The funds allocated to CCTI are currently unknown. Therefore, the private sector has no confidence that today's investments will translate into contracts in future years.

▶ What does Europe need to become a leader in the space industry?

— Firstly, the willingness to spend money. During the space race in the 1960s, NASA's budget was as high as 0.7-0.8% of US GDP. This money was spent every year on basic research and pushing the boundaries of our knowledge, giving room for commercialization or wider use of projects later. To make up for the lost decades, Europe will be required to invest more than its competitors, and currently the agency's funding is only around 0.03% of the GDP of its 22 member countries. Increasing ESA's budget above US levels would require the agency's budget to triple.

— Stable and predictable regulatory framework and funding. The space sector is still subject to enormous regulatory uncertainty. Hypothetical bans in the future could mean that years of work dedicated to R&D could never be commercialized. Stronger regulation or, for example, greater climate sensitivity are firmly in the European spirit, but they must be reconciled with regulatory predictability.

The significant role of Polish industries in the EU energy transition process

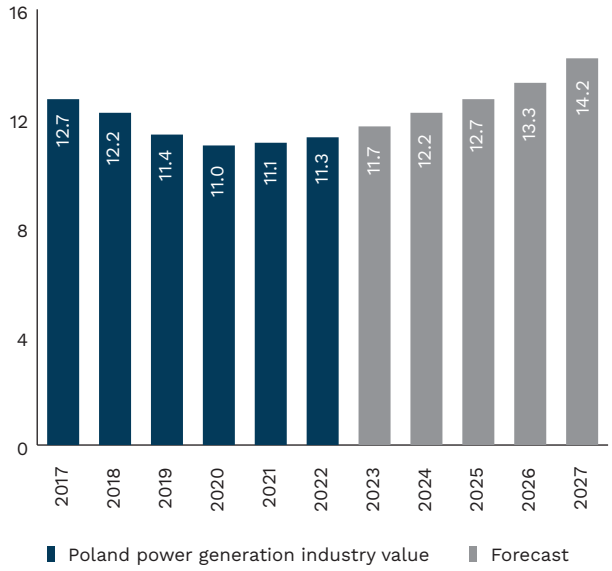
4.7%

forecasted compound annual growth rate of the Polish energy sector in 2022-2027

▶ **The Polish energy market and electrification of transport will expand significantly due to the growing economy and accelerating transition.** In order to implement decarbonization policy, it will be necessary to provide enough commodity supplies, not only for Poland, but also for the whole of the EU. Polish industry and mining can seize the opportunity to become an important and secure supplier of critical raw materials and products necessary for the EU's energy transition.

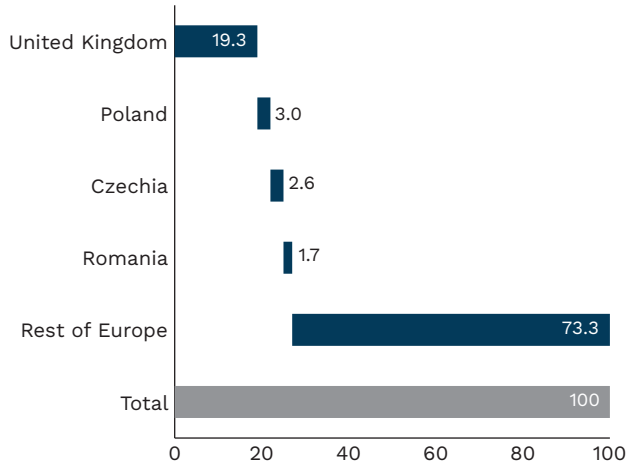
▶ **The Polish energy industry reached a value of USD 11.3 billion in 2022 and is expected to grow.** In 2017-2022, we observed a negative compound annual rate (CAGR) of 2.2% in Poland, but it was slightly higher than in the Romanian (-4.2%) and Czech (-2.6%) industries. The industry growth over the forecast period will be driven by an increasing demand for electricity due to growing manufacturing activities and a focus on decarbonization. In 2027, the Polish power generation industry is forecast to reach a value of USD 14.2 billion, an increase of 25.7% since 2022 and a 4.7% CAGR. This means that the Polish market can be potentially more important on the European level – Poland accounted for 3% of the European power generation industry in 2022.

Figure 3.1. Value of the energy sector in Poland (USD billion)



Source: Marketline.

Figure 3.2. Geographical segmentation of the Polish energy sector in 2022 (%)



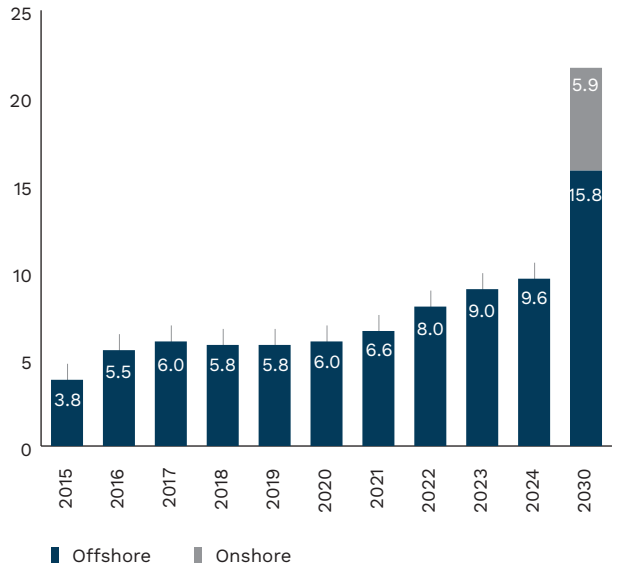
Source: Marketline.

28%

EU demand for coking coal in 2022 that was met by Polish production

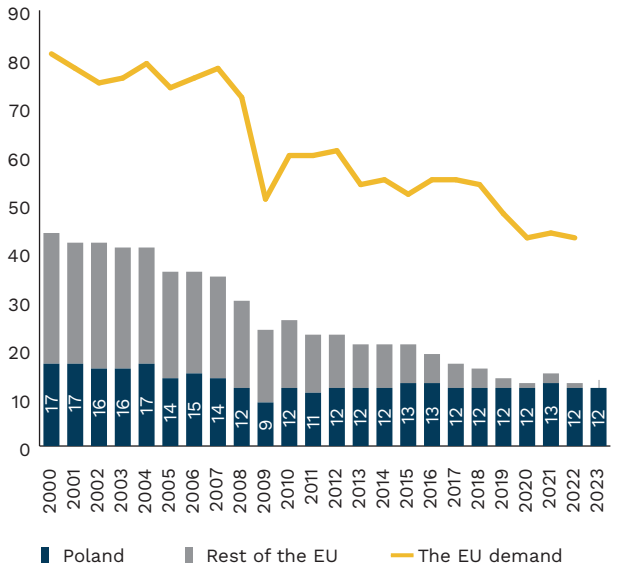
▶ **From 2015 to March 2024, Poland increased its wind power capacity by 156% from 3.8 GW to 9.6 GW.** According to the draft of the National Energy and Climate Plan (NECP), we can expect 15.8 GW offshore capacity and 5.9 GW onshore capacity in 2030, which in total will increase wind power capacity by 125% from March 2024 to 2030. It takes almost 5 tonnes of copper to produce a wind turbine of about 3 MW or more than 200 tonnes of coking coal to make 360 tonnes of steel and iron. Polish coking coal production accounted for 93% of total EU production and 28% of EU demand in 2022. Polish industry produced more than 390,000 tonnes of copper in 2022, the most in the EU – it represented nearly 10% of EU demand.

Figure 3.3. Wind power capacity in Poland (GW)



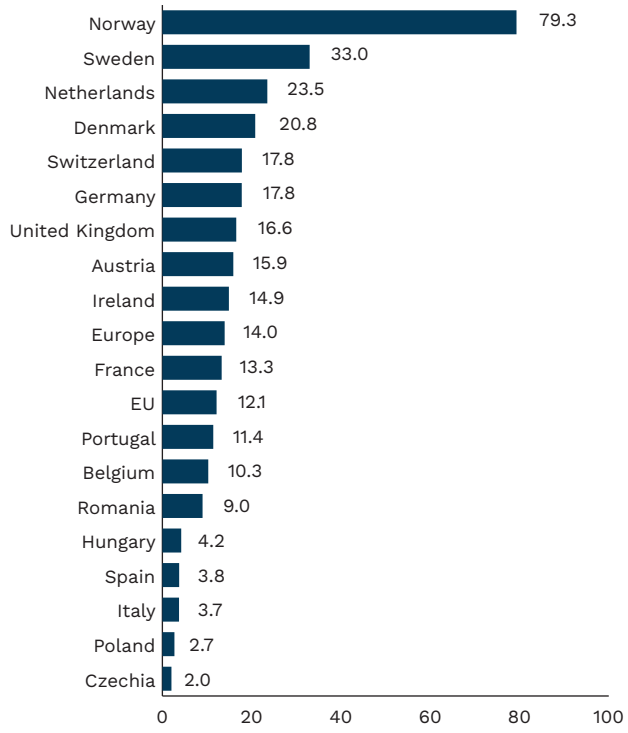
Source: ENTSO-E, PSE, KPEiK.

Figure 3.4. Coking coal production in Poland and the EU (million tonnes)



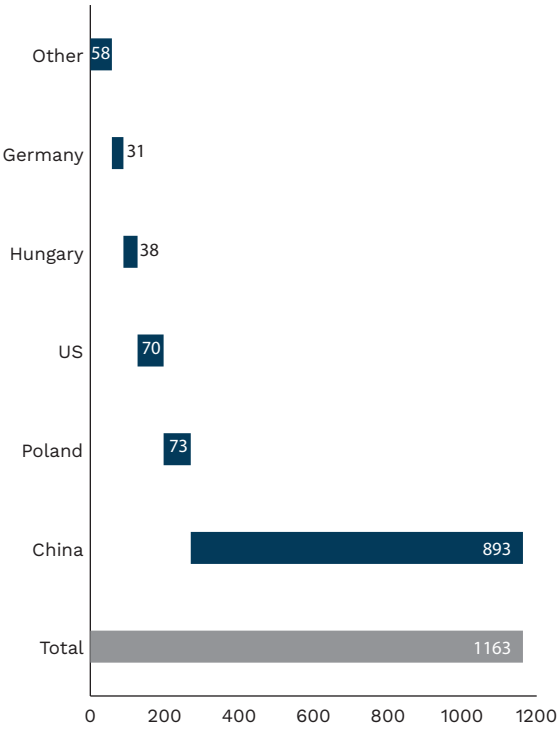
Source: Eurostat (nrg_cb_sff), ARE.

Figure 3.5. Share of BEV in new passenger cars in Europe by country 2022 (%)



Source: Statista.

Figure 3.6. Battery production capacity in 2022 (GWh)



Source: Bloomberg.

12.1%

share of battery electric vehicles (BEV) in the total sale in the EU in 2022

▶ **Transport electrification is an ongoing trend. In 2022 12.1% of new passenger cars in the EU were electric.** The key to the development of the transport sector is the battery industry. Poland was the second-biggest battery producer in the world with 73 GWh capacity, which amounted to 6.3% of the global market. According to Bloomberg, we can expect a 53% growth of the Polish production capacity, to 112 GWh, by 2027, meaning that Poland will be in the top 3 European battery producers. Meanwhile, the EU plans to ban combustion vehicle sales by 2035, which will accelerate the development of the battery sector.

Slow expansion of AI in Europe

USD 1.848 billion

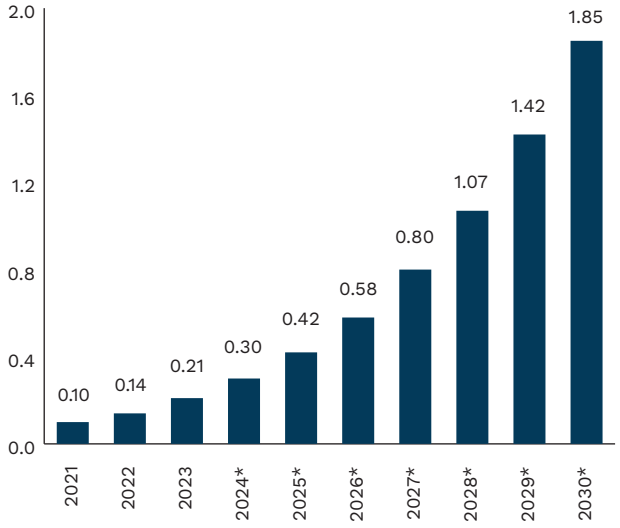
Estimated market size of AI in 2030

▶ The development of artificial intelligence has significantly accelerated and is so far dominated by the USA. Europe is trying to keep up, fighting for technological sovereignty, but the relative low level of investment and lack of effective measures to retain talent, of which there is no shortage on the old continent, remains a major challenge.

▶ A dynamic development of artificial intelligence has occurred over the last few years, translating into a rapid growth of the AI market value, as well as the emergence of innovative solutions. In this context, the United States is the undisputed leader in the development of artificial intelligence. The dominance of the USA stems from its leading position in key aspects of the sector, such as innovations, investments, and scientific research. The dominance in these key categories is confirmed by the Global AI Index. Silicon Valley is home to the world's leading technology companies, and prestigious universities, such as MIT or Stanford, are recognized as global centres in AI research, attracting talents from all over the world.

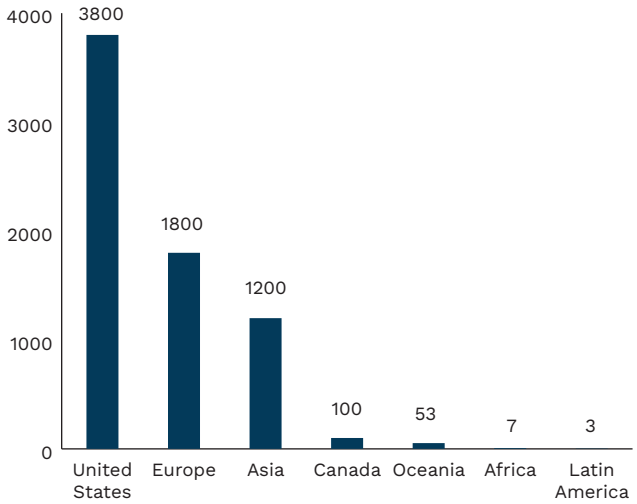
▶ **Europe remains far behind in the AI development race.** Investment outlays on the old continent are several times lower than in the USA. However, European countries demonstrate a significant potential for development. In the same ranking, the Global AI Index, the UK ranked highest among European countries, coming fourth with a score of 41.8 points. Germany, Switzerland, and Finland also made it into the top ten. Generally, the ranking is dominated by the wealthy Western European countries. Poland, being the first representative of the CEE countries in the ranking, was ranked in 27th position with a score of 24.8.

Figure 4.1. AI market size (USD billion)



Sources: Next Move Strategy Consulting.

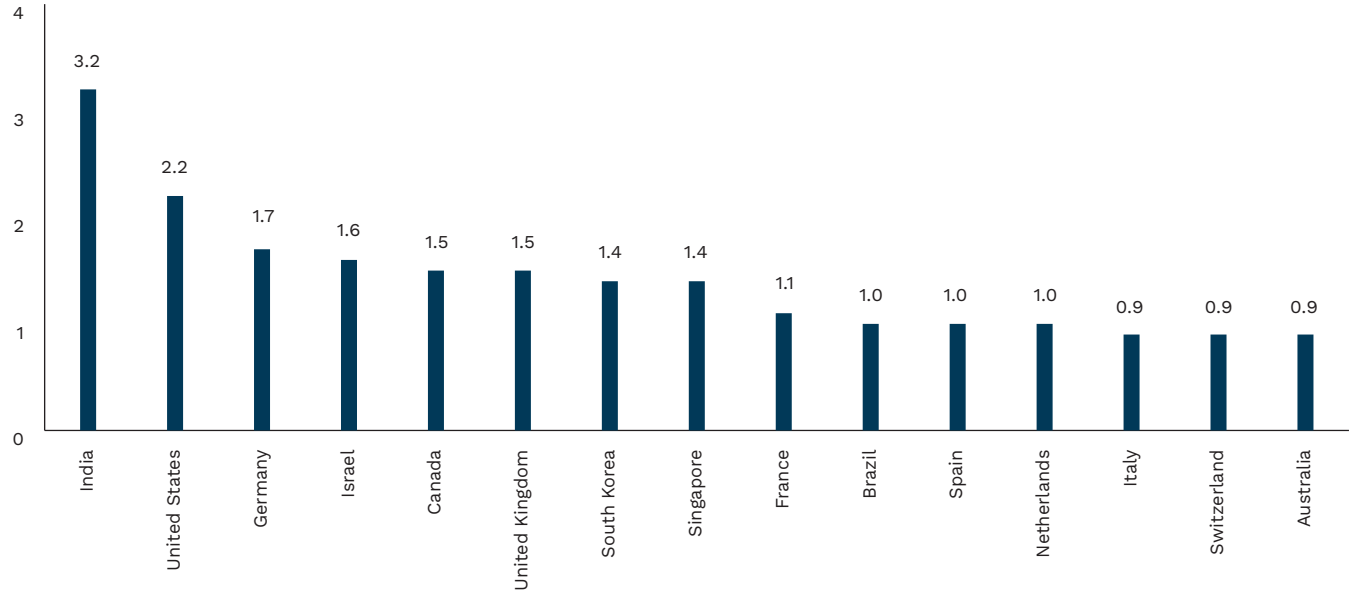
Figure 4.2. AI startup funding in Q4 2023 by region



Sources: Statista.

▶ **Attracting the best talent from around the world is crucial to advancing the field of artificial intelligence.** Analyses[1] show that Europe is home to 16% of leading AI researchers, with key centres such as ETH Zurich, demonstrating their prominent role on the global scientific map. However, the United States lead the way in attracting international talents, with only 37% of the top AI researchers (around 20%) working at US institutions coming from the USA; they mainly employ specialists from China (38%), while Europeans constitute 6%. This situation highlights the global competition for the brightest minds in the field of AI and points to the need for Europe to become a more attractive place for world-class experts. Analyses suggest that Europe is not short of talent, as confirmed by the high AI skill penetration rate. For example, in Germany, this rate is 1.7, means that the average penetration of AI skills in Germany is 1.7 times higher than the global average for the same occupations. This proves that Europe has solid foundations for attracting and retaining international talent, which is key to further development and innovation in AI.

Figure 4.3. Relative penetration rate of AI skills by geographical area



Sources: The AI Index Report.

▶ **The European Union is at the forefront of establishing legal frameworks for the development of artificial intelligence.** In February 2024, EU member states reached an agreement on a groundbreaking set of regulations governing artificial intelligence, i.e. the AI Act. The legislation sets out a framework for AI operations while addressing the related risks. The aim of the regulations is to create an environment that is conducive to companies developing AI technologies, promoting security, and innovation. Europe, known for its emphasis on regulation, is praised for setting standards. However, there are also critical voices pointing out that regulations can limit innovation, as in the case of data regulations.

▶ **Restrictive data regulations, such as the GDPR, are likely to delay progress in the AI in Europe.** Restricted access to data limits research and development activities. Data, the key fuel for AI, is essential for both research and widespread adoption of technology. Analysts at MIT point out that European companies store 26% less data on average than their US counterparts, implying significant constraints in data availability.

[1] For the purposes of the study understood as authors of articles selected for oral presentations at the prestigious NeurIPS conference, Conference on Neural Information Processing Systems (the acceptance rate of 1.8% in 2022.)

Transport still needs more investment

57%

Share of electrified railways in European Union in 2022

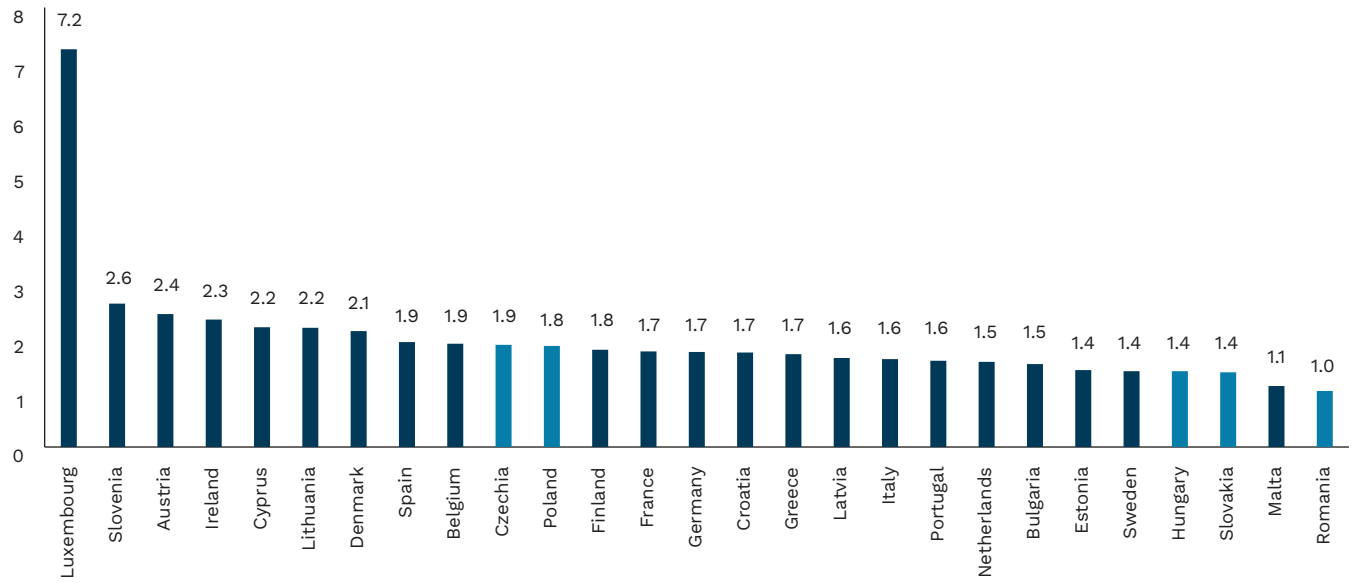
-3.1%

Production growth in land transport in European Union (YoY, end of 2023)

▶ Investment in transportation is crucial for the development and competitiveness of economies. In the context of energy transition, the development and electrification of rail transport are significant. Such investments are supported by EU policies, including the development of the Trans-European Transport Network. Transportation services experienced a slowdown in 2023, and EU air transport has yet to return to pre-pandemic levels.

▶ **The transport sector, due to its local nature, will not compete with non-EU transport in the long term but it will play a key role in increasing the efficiency of other sectors.** Miciulis et al. (2000) indicate that sustainable and efficient transport is a precondition of successful development of other branches of economy. A well-developed transport infrastructure makes it possible to exploit the competitive advantages of community countries and integrate companies that are in common value chains. However, transportation costs are a barrier to such cooperation, making it difficult to exploit advantages arising from the specialization of individual regions.

Figure 5.1. Carbon dioxide emissions per capita from the transport sector in 2022 (in metric tonnes)

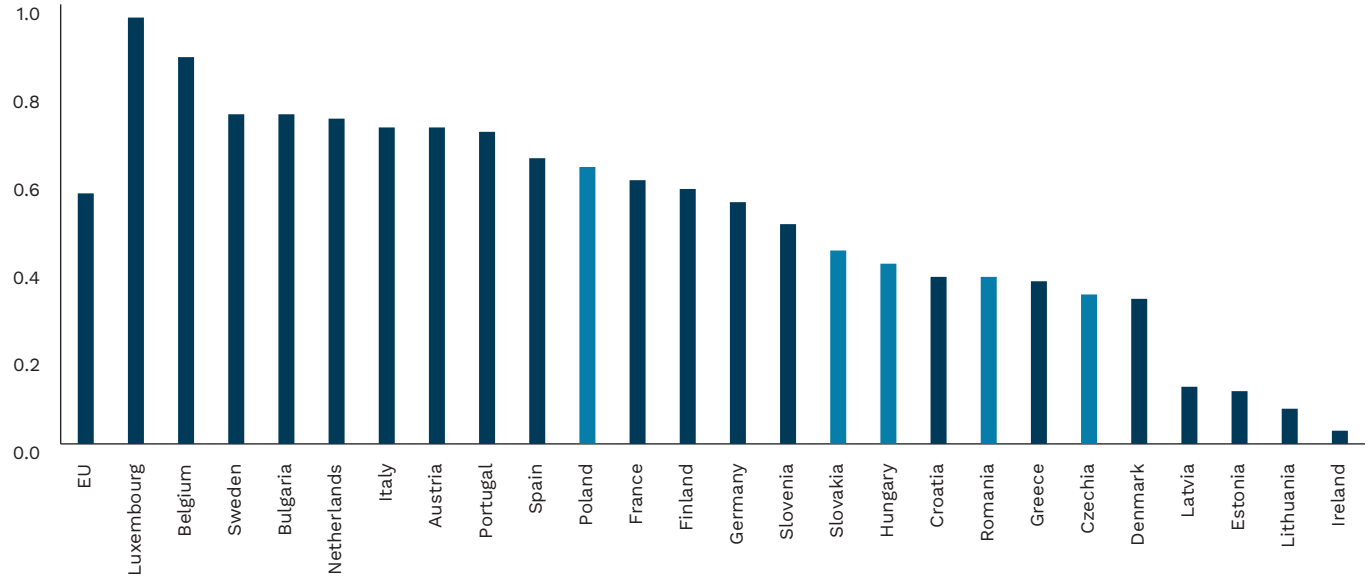


Source: Eurostat, Statista.

▶ **The European Union recognizes the importance of this sector by supporting its development.** European Commission (EC) emphasizes the role of transport in capitalising on the economic strengths of all regions of the European Union and supporting the internal market and economic growth. This sector influences the competitiveness of trade by facilitating choice of trading partners. For this reason, it is important to support transportation through measures that make it possible to increase the accessibility and quality of transportation and reduce its costs. The Trans-European Transport Network (TEN-T) program was such an investment. It assumes firstly connecting major cities and nodes must be completed by 2030 and then by 2050 linking remaining regions of the EU by comprehensive network. EU budget plans for 2021-2027 assumes that nearly 40% of Cohesion Policy funds will fuel the transport related investments.

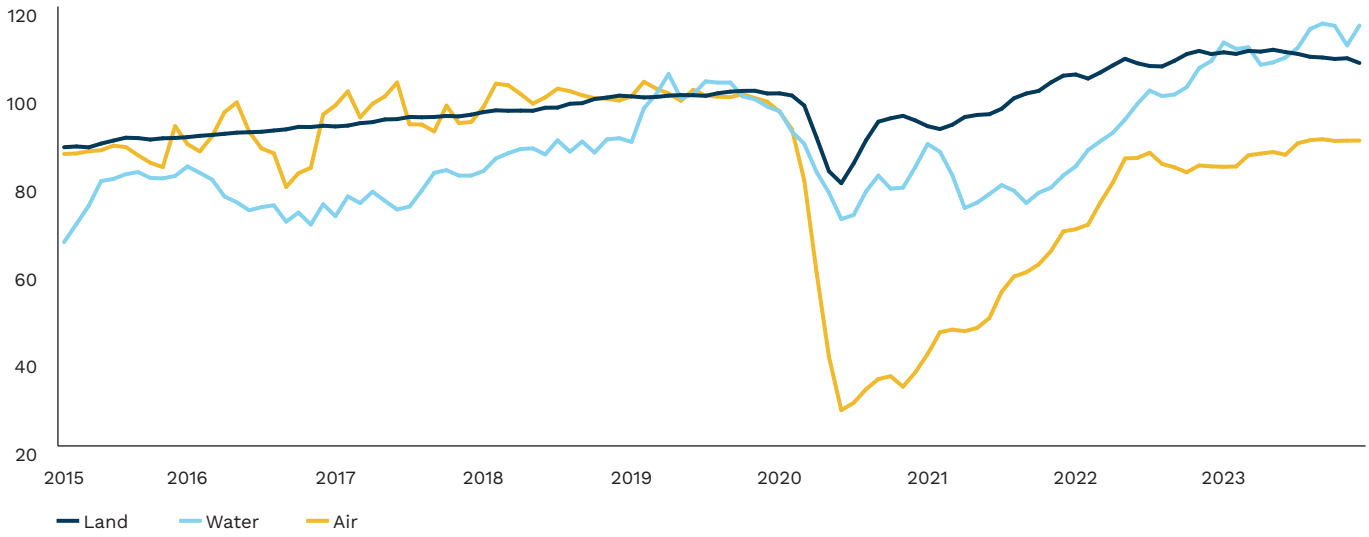
▶ **In order to maintain price competitiveness amid the energy transition, it is important to support rail transportation.** The European Rail Freight Association (ERFA) points out that this form of transport has been the only one to reduce emissions by more than 60% since 1990. Reducing emissions will be particularly important for transport costs. Beginning in 2027, the EU's Emission Trading System (ETS 2) emissions levy will also apply to transportation. ERFA indicates that the most effective way to reduce emissions by 2030 will be to increase rail transportation at the expense of road transportation – electric trucks will not be used on a larger scale until the end of the decade. In addition to building new rail links, electrification of existing ones is also important. On average in the EU, only 57% of rail links are electrified – the lowest level is in the Baltic and Balkan countries.

Figure 5.2. Share of electrified railways in EU countries in 2022 (%)



Source: Eurostat.

Figure 5.3. Production in transport services in EU (index 2019=100, 3 months average, SA)



Source: Eurostat.

▶ **2023 proved to be challenging for the transportation sector, but the outlook for 2024 appears more optimistic.** The economic slowdown in the eurozone dampened the demand for transportation services. Concurrently, higher energy prices increased the costs for transportation companies. By the end of 2023, activity in the transportation sector fallen in the EU by 0,5% year-on-year. Under these conditions, land transport struggled the most, with production declining by 3.1%. Meanwhile, the results in the air transport have yet to return to pre-pandemic levels. However, the prospects for the entire transportation industry in 2024 are brighter with the gradual recovery of whole economy.

The European Union tries to expand on semiconductors markets

9%

Share of Europe in global semiconductors market

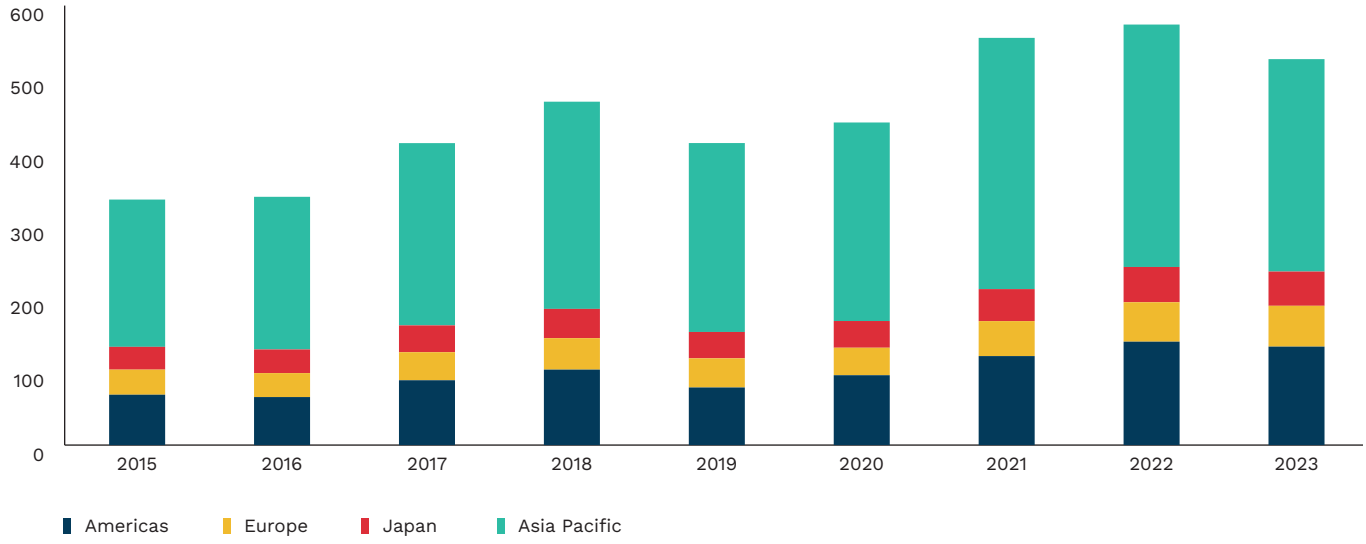
88,6%

Estimating rising of the revenue of the semiconductors industry in Europe in 2028 comparing to 2017

▶ The European Union is strategically positioning itself to expand its influence within the global semiconductor industry, underscored by the enactment of the EU Chips Act. This legislative framework aims to propel the EU's share in the global semiconductor market from its current standing to 20% by the year 2030. This ambition is underscored by the mobilization of over €43 billion in combined public and private investments.

▶ **Currently, East Asia, Taiwan and South Korea in particular, are leading the global semiconductor market, especially in the production of advanced chips.** Taiwan's TSMC alone accounts for about 54% of the global semiconductor market share and produces 86% of chips below 10 nanometers, making it a dominant player. The US, a key player in semiconductor design and innovation, is strengthening its position through significant investments, including the CHIPS and Science Act. Europe, seeking to reduce its dependence on imports and strengthen its semiconductor industry, now produces less than 10% of the global semiconductor output, a decrease from 20% in the 1990s.

Figure 6.1. Global semiconductor sales 2015-2023, by region (in USD billion)



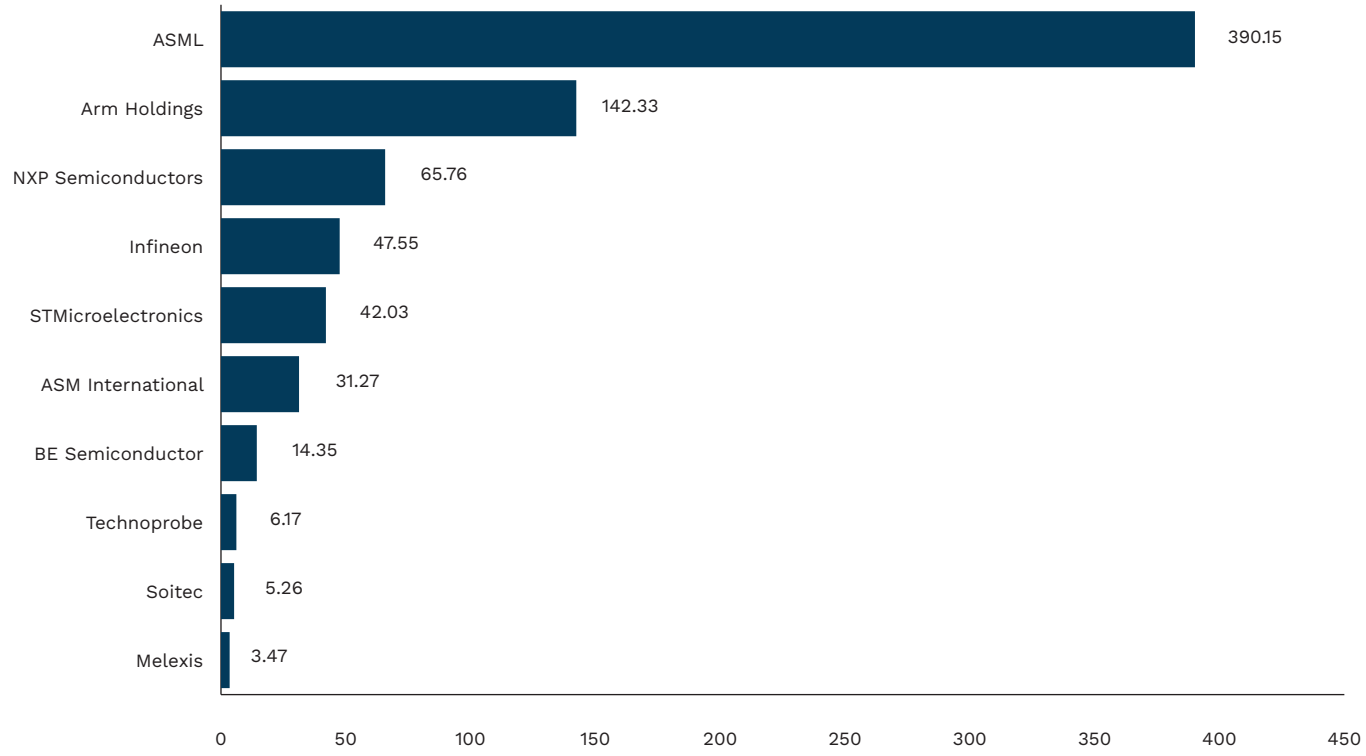
Source: Statista.

▶ **Despite the leading role of US and Asian companies in the global semiconductor market, Europe hosts several key players that contribute to its competitive edge.** Among them, NXP Semiconductors and Infineon Technologies are particularly notable in the automotive sector, with the former excelling in connectivity chips and ADAS technologies and the latter being the largest supplier of automotive chips. Additionally, ASML Holding from the Netherlands is important in the semiconductor manufacturing process, providing advanced lithography systems that are crucial for global chip production.

▶ **Financial results of major manufacturers show a positive trend.** In 2023, ASML reported a significant financial growth, with revenues reaching €27.56 billion, highlighting its leading position in

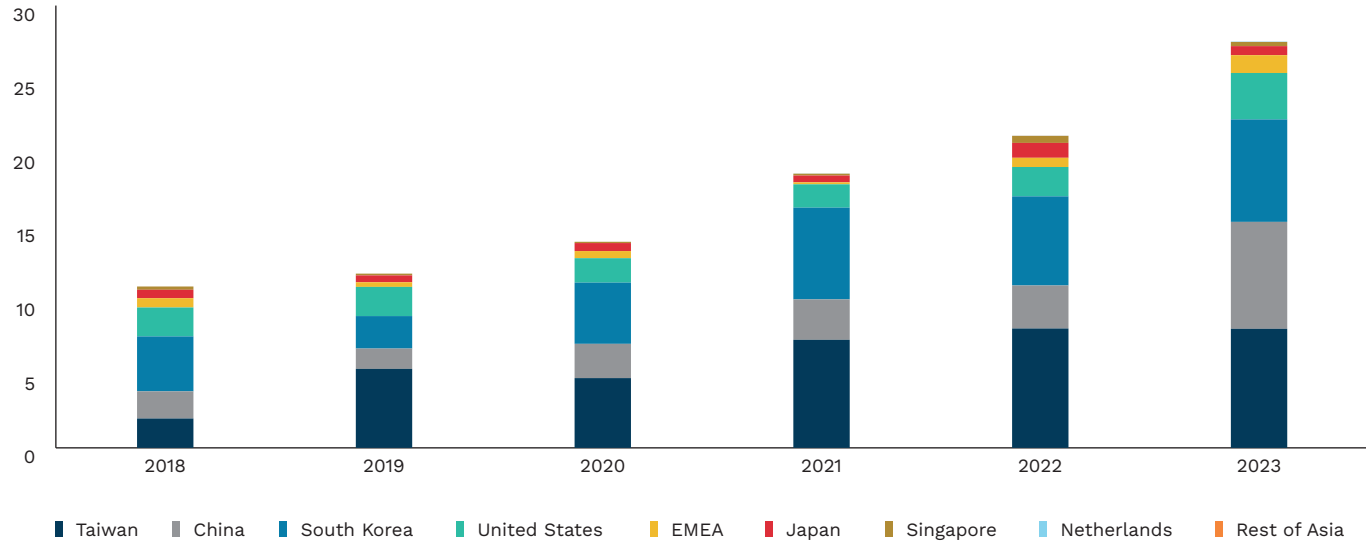
photolithography systems for the semiconductor industry. ASM International also saw a positive financial year, with revenues increasing to €2.63 billion, demonstrating its strong position in the market. NXP Semiconductors, however, experienced a downturn, with revenues decreasing to $3.422 billion, which indicates a challenging year despite its strong presence in the automotive as well as other sectors.

Figure 6.2. Leading semiconductor companies in Europe in 2024 by market capitalisation (USD billion)



Source: Statista.

Figure 6.3. ASML's worldwide revenues 2018-2023 by region (EUR billion)



Source: Statista.

▶ **Critical to the production of advanced semiconductors, ASML's EUV lithography technology has made it a key component of the global chip industry, which explains its high revenues from Asia.** The region's leading chipmakers, such as TSMC and Samsung, depend on ASML's cutting-edge machinery to produce smaller, more efficient chips essential for digital devices. ASML's monopoly on EUV technology, resulting from decades of innovation and significant investment, has made its systems indispensable to the production of leading-edge chips, driving demand from Asian semiconductor giants.

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