Development of Chip Production in the Czech Republic: Recent Developments and Trends

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Introduction

Chips are a strategic industry that generates high value added. The European Parliament (EP) and Council of Ministers (Council) reached in April 2023 a provisional political agreement on a regulation on the European Commission (EC)´s proposal for an Act to double the EU´s global market share in chips and produce the most sophisticated and energy-efficient semiconductors in Europe. *The European Chip Act* (ECHA), a legislative framework and funding program, is aimed at strengthening the Europe´s semiconductor ecosystem. It will create the conditions for the development of a European industrial base that should double the EU´s share of the global semiconductor market to 20% by 2030. In addition to this, the ECHA will reduce the EU´s vulnerability and dependence on foreign actors, strengthen the chip industrial base and seize future business opportunities. Even before the ECHA was agreed, it has generated over EUR 100 billion of announced planned private and public investments. Starting with Intel´s announcement in March 2022 of massive investment in the EU over the next decade along the entire semiconductor value chain, from R&D to manufacturing to modern packaging technologies, a leading-edge semiconductor mega-site in Germany is emerging soon.

The Czech Presidency also contributed to the agreement, as it managed to approve the Council´s general approach in 2022, which is a step towards this agreement. Cooperation then began to develop and *the Czech National Chip Cluster (CNCHC)* was established. Chips are the foundation of the digital/green economy necessary for the operation of a huge range of products. They form part of integrated circuits and are among the basic components for cars or smartphones manufacturers. Chipmakers have thus focused on the consumer electronics industry to support the rapid growth in PC and game sales. When automakers resumed production unexpectedly quickly, chipmakers were not producing enough to meet demand.

The Czech Republic (CR) has a significant history in the production of semiconductors, convenient location, and skilled workers. Onsemi (Box 1), a US company, is one of the largest chip manufacturers in the world specializing in chips in the energy and electro-mobility sectors. Onsemi, which already operates in the CR in Rožnov pod Radhoštěm (16,500 inhabitants), has made significant investments in the region over the last decade. The Czech economy has therefore great potential to become a major actor in chip production in Europe. Exploiting this potential will be the aim of *the National Semiconductor Strategy*, which the Czech Ministry of Industry and Trade (CMIT) is preparing. Onsemi is considering expanding semiconductor production in Rožnov with investments for CZK 44 billion, but there are also potential locations in other countries. Chip production is important for the development of the automotive industry, which plays an important role in the Czech economy. The company has until this autumn to decide about the investment. If Onsemi decided to invest in Rožnov, it would be in the company´s existing premises in the industrial zone and it would mean a thousand new employees. The CMIT considered such investment as very important one.

Analysis of Recent Developments and Trends

The consequences of the chip shortage are still being felt by European industry. For the CR, chips are crucial especially in the automotive industry. In addition, chips will play a big role in the fundamental changes that await the industry. The economy must therefore prepare for such changes. The ECHA, approved by the Council, can help with the chip shortage, and reduce European dependence. The Council and the EP reached a provisional agreement on its form. The ECHA contains three pillars: (1) *the Chips for Europe initiative* (CHEI) to support large-scale technological capacity building; (2) a framework to ensure security of supply and resilience by attracting investment; (3) crisis monitoring and response system to anticipate supply shortages and provide a response in the crisis. The CHEI is expected to attract EUR 43 billion of public and private investment, of which EUR 3.3 billion will come from the European budget. The measures will be implemented mainly through the *Chips Joint Undertaking*, a public-private partnership involving the EU, its Member States, and the private sector. The provisional agreement still needs to be approved. Benefits of the ECHA for the CR are:

- Inflow of funds into R&D, within the future *Chip Joint Venture*, for which, Czech entities will be able to apply.
- The establishment of a competence center, which should address the training of workers and the attraction of talents.
- The CR has a greater opportunity for the CR to attract investments in the construction of production plants.
- Investments in Europe can create opportunities for entities in the CR to cooperate, to establish value chains, cooperate in R&D, and in design of chips.
- During the Czech Presidency, cooperation began to increase and synergies were used, which resulted in the establishment *of the CNCHC*, which cooperates with major actors in this field and research institutions.

Onsemi´s investment is an important step towards strengthening the Czech chip sector, which is essential for future development in the energy and electro-mobility sectors. The development of semiconductors is a key issue for the Czech economy, thanks to which the dependence on chip imports will be reduced. This investment will open new opportunities for Czech companies, strengthen competitiveness and support innovation and technological progress. Investing in chip production in cooperation with Onsemi will enable the sharing of modern technologies and knowledge between Czech companies and Onsemi. This will lead to the creation of new jobs providing thus opportunities for local professionals and attracting talent globally to collaborate on chip development and manufacturing. Cooperation will increase industry stability and reduce the risk of chip unavailability in the event of global supply problems.

Incentives are an important factor in deciding whether Onsemi will make an investment. There are also locations in the US and the Republic of Korea. Today, semiconductors are a strategic economic area, because chips form the basis of many products. The development of chips is highly subsidized by countries. Without attractive incentives, it is practically impossible to compete with other countries bidding for investment. Countries competing with the CR support investment in this field from public sources, e.g., the US passed *the Chips Act* with a budget of USD 52 billion. The German government announced in July 2023 that it would allocate EUR 20 billion to support chip production. About three-quarters of that amount will go to the US company Intel and the Taiwanese manufacturer TSMC. In Germany, TSMC´s first European factory could open near Dresden in 2027. The company plans to invest more than ten billion euros in the plant together with Bosch, Infineon and NXP (TSMC will own 70% of

the business, while Bosch, Infineon and NXP will have ten percent stakes). About half of the investment costs will be covered by German state subsidies. TSMC plans to start construction in 2024 and around 2,000 jobs should be created at the factory. In June 2023, after signing a letter of intent agreement with the German government, the US company Intel announced that it would invest over EUR 30 billion in the microchip plant in Magdeburg, Germany. Infineon started construction of its own semiconductor factory in Dresden in the spring and plans to invest five billion euros in it. Bosch and GlobalFoundries chip firms are also located there. Intel also wants to strengthen its existing factory in Ireland, while it will set up a R&D center in France. The company should also invest in a new plant in Italy. In June 2023, Intel announced that it would build a USD 4.6 billion chip factory in Poland. By 2027, 2,000 skilled workers should be employed there. These activities suggest that non-European companies are responding to a European initiative to support chip development in the region.

Incentives are supposed to be an important factor in deciding whether an investment will be made. Onsemi is currently negotiating with the Czech government to provide an investment incentive. The company demands an incentive of 20% of the total investment. The company has received support from Škoda Auto, which is interested in having a supply chip chain close to its car production facilities. The recent global pandemic crisis has shown how difficult and expensive it is to respond to supply disruptions. Due to the recent crisis, Škoda had to shut down partially production. The CMIT is proposing an investment incentive for On Semiconductor. It proposes public support, which would include income tax relief and material support for the acquisition of tangible and intangible fixed assets. The proposed incentive amounts to 22.5% of eligible costs, i.e., CZK 546 million. This high value-added investment should bring CZK 814 million to the state budget within ten years, a value considerably higher than the costs incurred. This investment, nevertheless, should bring significantly more to the state budget within ten years. The proposal was submitted by the CMIT into the inter-ministerial comment procedure and the government will then decide it.

Those interested in state incentives complain that their approval in the CR takes longer than elsewhere. Foreign investors would invest more in the CR, but the process of processing incentives is slow. Therefore, the Czech government recently approved a new law on investment incentives. Taiwanese investors state that if there were 20 % incentives in this field, their interest would be higher.

During the Czech Presidency, a common position of the EU-27 on the draft ECHA was reached. This will help prevent chip shortages for key sectors such as automotive, healthcare and energy. The ECHA is another opportunity for companies, encouraging investment in R&D and manufacturing, and helping to attract new talent. The ECHA can help not only the CR to attract investments. It will boost Europe's technological sovereignty, competitiveness, resilience and contribute to the digital/green transitions. Chips are the building block of all electronic products playing a central role in economies. They are essential to all industries, such as the automotive industry or ICT. The recent global chips shortage has disrupted supply chains, caused product shortages ranging from cars to medical devices, and in some cases even forced factories to close.

Future Expectations and Implication

Under *the European Chip Act*, the EU wants to support the development and production of semiconductors by the end of the decade with investments worth EUR 43 billion and double the EU´s share of global chip production to 20%. Onsemi have already discussed several times with the CMIT and the Ministry supports their investment in the CR because this investment would mean the

economy´s higher self-sufficiency in this area. Onsemi has until autumn 2023 to decide, whether it will invest in the CR CZK 44 billion. If the company decided to invest in Rožnov, it would be in the existing company premises. It would mean one thousand new employees and new production could start within two years. This investment would allow a synergy effect regarding the possible construction of a battery giga-factory. Both investment projects would help to resolve the situation regarding supplies to the automotive sector. The CMIT proposes public support, which would include income tax relief and material support for the acquisition of assets. According to the CMIT, this investment could become one of the most important investments the CR has ever made, in terms of its amount and importance. Expansion of chip production in cooperation with Czech companies may further strengthen the competitiveness of Czech industry and technological development of the country. Therefore, the economy must find political support and financial resources. There would be an effort to seek support from the government. Concrete steps are yet to be negotiated. The aim is to find a mechanism for cooperation and Onsemi could be asked to submit project documentation in September/October 2023.

The CR has great potential to become a major European actor in chip production. Exploiting this potential will be the aim of *the National Semiconductor Strategy*, which the CMIT is preparing. The strategy should be ready in 2024, following the ECHA, which should help to prevent chip shortages for key sectors. The upcoming strategy will map out which types of chips the Czech industry has the greatest potential and propose what support measures, including investments, to implement. The strategy will primarily help to set up the education system correctly, because the development of the sector cannot function without enough qualified workers. The aim is to reduce the EU´s vulnerability and dependence on foreign actors, strengthen the chip industrial base and seize future business opportunities.

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Supplementary paragraph

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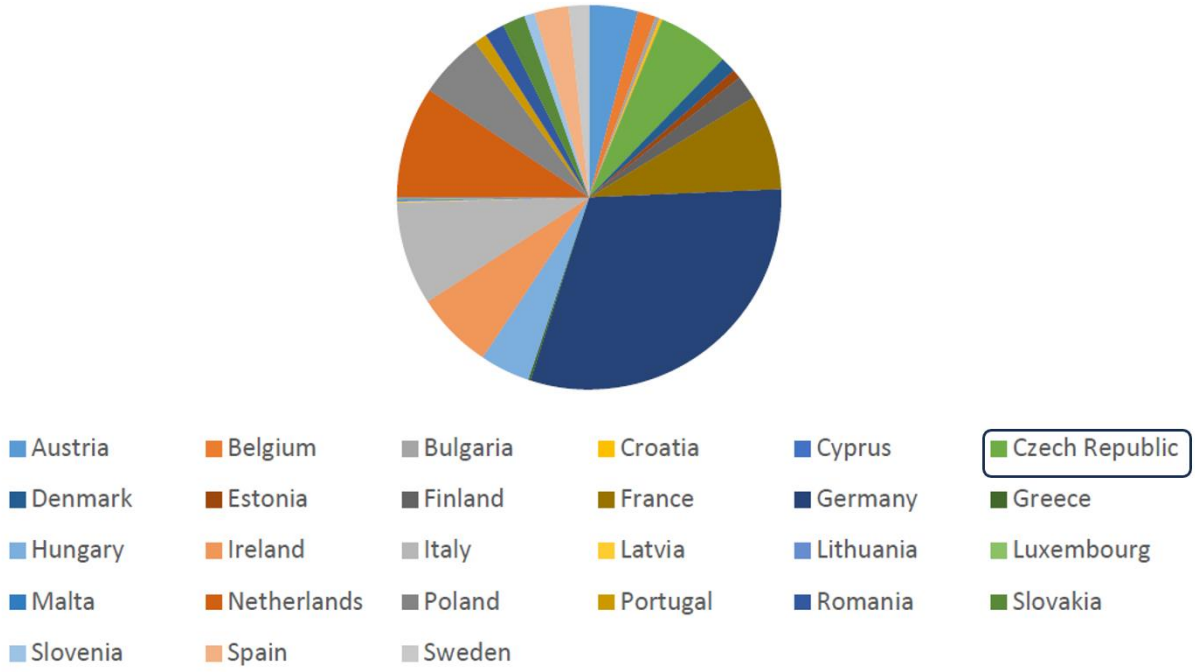
The Czech Republic´s semiconductor market reported dynamic growth during the 2017-2019 period due to growth in investment of information and communication technologies (ICTs)along with rise of main application sectors such as data processing and consumer electronics. In the same period the country increased adoption of new technologies such Internet of Things (IoT) and Artificial Intelligence (AI). In 2022, 68% of SMEs in the country had at least a basic level of digitalization, which is similar as the European average (69%), but in individual indicators such as the use of AI, the cloud and big data, the country is significantly below the average. In 2020, e.g., only nine percent of SMEs used big data (EU average 14%), and in 2021 only 40% of firms used cloud services and only five percent used AI. However, that there are already many initiatives that support the digitalization of businesses, including start-ups. There are also currently four "unicorns" in the country. Nevertheless, according to

the EC report (EC, 2023), the Czech Republic should primarily focus on supporting firms´ access to advanced technologies.

Overall, the Czech Republic has allocated 22% of its National Recovery Plan to digitalization, a large part of which will contribute precisely to achieving the goals of the Digital Decade. A large part of the investments goes to support the digitalization of businesses. The country also actively supports digital skills in education.

Figure 1 shows the position of the Czech Republic in terms of the global value chain (GVC) in "electrical and optical equipment" sector, to which the semiconductors belong, relying on 2007-2019 data. (Ciani, A., Nardo, M., 2022).

Figure 1: The Czech Republic´s and EU-27 countries' GVC participation (Electrical and Optical Equipment – 2019)



Note: The total GVC index represents how integrated is a country-industrial sector, in global value chains by computing the amount of output (in EUR million) that can be assigned to GVC linkages. For each country this index is determined by the average of pure backward GVC integration (the domestic output in the sector, in million EUR, that depends on foreign imports) and pure forward integration (the amount of domestic output exported abroad).

Source: Ciani, A., Nardo, M. (2022), the Czech Republic highlighted by DB

The semiconductor industry is concentrated in three main production areas in the Czech Republic. The Czech segment represents Prague and Northern Bohemia, the Moravian segment is represented by Brno and Rožnov pod Radhoštěm. Czech companies excel particularly at the production equipment for semiconductors manufacturing: process control tools, assembly, and packaging tools, and etch and clean tools (.

Table 1: Semiconductors Manufacturing Equipment in the Czech Republic

Equipment category	Number of manufacturers

Process control tools	10
Assembly and packaging tools	9
Etch and clean tools	6
Wafer and mask tools	5
Lithography tools	5
Failure analysis	5
Deposition tools	5
Other areas	4
Testing tools	3
Ion implanters	3

Source: Based on data from Czech Taiwanese Business Chamber (2021)

According to 6Wresearch (2022a, 2022b), the Czech Republic´s semiconductor market revenue size is projected to grow at a CAGR of 7.4% during 2022-2028. As adoption of 5G technology in the Czech Republic would increase the demand for semiconductor would also increase, with deployment of 5G technology the usage of smart devices would also surge in the forecast period in the Czech Republic. In terms of components, memory devices have captured 27.8 % of the market revenue in 2021 (6wresearch, 2022). Memory devices acquired highest share in the country´s semiconductor market in 2021 in terms of revenue owing to proceeding technological advancement such as virtual reality and cloud computing. The rise of machine learning would further drive this market in the future.

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