CHAPTER 9

FINANCING RESEARCH, DEVELOPMENT, AND INNOVATION: THE CASE OF THE CZECH REPUBLIC

Karel Havlíček, **Silvana Jirotková**, **Tomáš Holinka**, and **Martin Hronza**, Ministry of Industry and Trade, Czech Republic

Effective innovation activities are a prerequisite for long-term and sustainable economic growth and competitiveness. During times of economic crisis, innovation is considered one of the possible ways of minimizing the negative impact of the crisis. Expenditure on research, development, and innovation (R&D&I) also helps the convergence of national as well as regional economies, and so co-creates the basis for economic growth. For innovation to be successful, it is important to have a balanced system of support for innovation activities, resting on an optimal ratio of public and private investment, all underlain by the effective interconnection of the business, public, and academic sectors. The above interaction of all actors supporting research, development, and innovation is based on a quality research base, sufficient financial resources, and maximum use of the research results.

The financing of innovation in the Czech Republic has undergone many changes. A key strategy approved by the government in 2019 was the Innovation Strategy of the Czech Republic 2019–2030. It aims to support research, development, and innovation in a country that will be driven by the ambition to become one of the innovation leaders of Europe by 2030—under the motto "The Czech Republic: The Country for the Future". The Innovation Strategy of the Czech Republic contains nine pillars, the implementation of which should help to maintain performance in the face of increasing global competition. The financing of research and development is only one of the pillars, which indicates the significant complexity of providing public R&D&I support at the national level.

This chapter assesses the process of support for research, development, and innovation in the Czech Republic. The first section contains the starting points for their financing, contextualized by the process of transformation of the Czech economy. The second section analyzes the government's different R&D&I financing instruments—dividing them into national and foreign instruments—and evaluates their benefits and shortcomings. The third section describes some of the changes in R&D&I support and the persisting challenges in the financing of research, development, and innovation.

Starting points of the support for research, development, and innovation

Economic transformation in the Czech Republic in the early 1990s was accompanied by a lack of free domestic capital, even for necessary investments in tangible assets. In the beginning, the Czech Republic set out on a specific path of so-called coupon privatization; however, this did not solve the problem of lack of capital. The absence of domestic capital for the innovation of production facilities and processes or human capital was compensated for by an inflow of foreign direct investment (FDI) that became one of the main growth factors of the Czech economy. The main goal of economic policymakers was to attract capital and foreign know-how into the country to connect domestic firms to foreign production chains and increase their overall competitiveness. Since 1993, FDI inflow has steadily grown, reaching 47% of annual GDP in 2017.[1]

Thanks to inward FDI, the number of private companies under foreign control grew, and dominant sectors, such as the automotive industry, were created. Another positive aspect of these inflows was the connection of Czech firms to global value chains, as well as the sharp growth of exports and foreign trade. In contrast, to reduce their costs—such as those for labor—foreign investors mainly transferred into the Czech Republic

and other countries of the Eastern Bloc their production processes for mounting and assembly, e.g., the production of lower value-added goods. The setting of support for inward FDI did not motivate firms to invest in high-tech activities, nor did it promote the larger involvement of companies in research and development or a higher share of more qualified labor. The result is that the Czech Republic remains mainly an industrial economy with a low representation of knowledge-intensive services (KIS). In contrast, a significant portion of innovation is concentrated within knowledge-intensive services in advanced economies. Although the employment of the Czech population grew faster in the last decade in knowledge-intensive production sectors and services compared to the European Union-28 (EU28) (1.3% vs 0.9%), convergence is very slow, and the share of knowledge sectors in total employment in the Czech Republic lags the share in the EU28 (33% vs. 40%).

The initial advantage—in the form of cheap and highly qualified labor—gradually became a disadvantage because it did not place higher demands on innovation that would lead to producing goods with higher added value, and it did not secure a shift to the upper tiers of global value chains. The foreign parent companies also kept the main research centers in the countries of origin, which, to a certain extent, reduced the innovation activity in the Czech Republic. The result was also a lower patenting activity of domestic enterprises, because subsidiaries usually patent new technical solutions in the domicile of the parent company, regardless of where the knowledge was created. The insufficient emphasis on research and development and high-tech innovation could, in the long term, slow down the convergence of the Czech economy with the rest of developed Europe. Another great challenge is the low support for public R&D&I from domestic business sources that are almost exclusively used to finance research and development in the business sector. While support for the business sector from Czech public sources in 2018 reached 9.5% of the volume of funds spent by the business sector on research and development (R&D), business sources represented 5.0% of expenditure of the higher education sector on R&D and 7.3% of expenditure of the government sector. In contrast, in Germany, direct support for enterprises from domestic public sources in 2017 was only 3.2% of the business sector expenditure on R&D, while business sources provided nearly 13.4% of higher education sector expenditure and more than 10% of government sector expenditure.[2]

Various indicators are used to compare support for—and the position of—research, development, and innovation of the Czech Republic among other countries. The main innovation indices include the Global Innovation Index (GII) and the Summary Innovation Index (SII). The composite indices include various indicators of the innovation process, including R&D&I financing and its prospects and starting points. The aim is to provide a comprehensive picture of the innovation potential of countries.

In most surveys, the Czech Republic regularly ranks approximately in the middle of the evaluated countries, and its position has not changed much over the last 10 years. According to the SII,[3] the Czech Republic ranked 14th in 2018 in the EU28 ranking of moderate innovators, with its index rising by 3.5 percentage points to 89.9 between 2011 and 2018, while the European Union (EU) grew by 8.8 percentage points. In the GII 2019,[4] the Czech Republic ranked 26th among 129 countries in terms of innovation performance, moving up one place since 2010. The absolute value of the Czech score was 49.46 last year, compared to the highest-ranked score of Switzerland (67.24) and the lowest-ranked score of Yemen (14.49). In both indices, the strengths of the Czech Republic are its knowledge and technology outputs, employment in fast-growing innovative firms, a high share of medium- and high-tech products in total exports, and the in-house innovations of small and medium-sized enterprises. In contrast, the Czech Republic lags in the indicators of market sophistication, patent applications, and expenditure on venture capital.

In addition, the latest survey of innovative firms by the Czech Statistical Office in 2016 showed that lack of financial resources is considered a significant obstacle hindering innovation activities for a fifth of all firms that are mainly under domestic control.[5] The second most important barrier to innovation for companies is the difficulty encountered in obtaining public support for innovation (16.8%), and the third is the lack of qualified staff (14.1%). The results of the questionnaire survey among domestic companies support the hypothesis that problems persist in the financing of expenditure on research, development, and innovation.

Financing of research, development, and innovation in the Czech Republic

R&D expenditure is increasing. While in 2008 it comprised 1.2% of GDP, in 2018, it reached 1.9%. This dynamic increase has been driven mainly by the growing involvement of companies, which in 2018 financed 58% of R&D expenditure; in contrast, the share of funds coming from the state budget and the European funds has been decreasing over time—to 34% and 6% respectively in 2018. In the business sector, the decisive role is played by companies under foreign control. In 2018, their R&D expenditure exceeded a 66% share, and in recent years, they have gained a lead far ahead of domestic private companies. The trend in investment incentives shows that where a company under foreign control has implemented a project successfully in the manufacturing industry with a lower added value in the past, the likelihood of further follow-up investment in higher-value company functions, such as R&D, increases.

Research and development is carried out mainly in the business sector, to which 62% of R&D expenditure was directed in 2018, compared to 58% in 2008. In terms of sectoral economic activity, the largest share (54.6%) of R&D expenditure in 2018 went to the manufacturing sector. While its overall share has not changed substantially since 2008, it has undergone structural transformation. Increases were seen mainly in the automotive industry (from 14.9% in 2008 to 19.9% in 2018) and the electrical engineering industry (from 3.1% in 2008 to 7% in 2018). In contrast, the share in the production of computers, electronics, and optical apparatuses decreased from 5.6%

to 4.6%. R&D expenditure in the manufacturing sector was followed by the information and communications activities sector, whose share moved up in 2018 to 20.1% from 13.3% thanks to information technology (IT) activities.

Around 22% of total R&D expenditure was directed in 2018 into the higher education sector, compared to 19% in 2008. In contrast, a decrease in the share of R&D expenditure was recorded in the government sector, moving from 24% in 2008 to 16% in 2018. Three-quarters of the funds were spent in the workplaces of the Czech Academy of Sciences. In terms of scientific areas, funding was concentrated in the natural sciences (US$450 million or 68%), with a small percentage going to the humanities and medical sciences, which each accounted for around 1% each of the total expenditure. The rest was spent in the technical sectors. While R&D expenditure in the business sector has long been financed mainly by enterprises themselves (around 90%), R&D expenditure in the government and higher education sectors is financed largely from public sources, both Czech and foreign.

R&D&I financing in the Czech Republic from the state budget

The state budget funding for research and development has long been channeled into several main areas. Around half of all resources are distributed institutionally to secure the implementation of basic research, as set up under the Czech Academy of Sciences to support research at higher education institutions and other research organizations. Those organizations are usually subordinated to the various ministries and their policies and mainly carry out applied research and development. Competition for purpose-specific funding comes from researchers under grant projects for basic research and from beneficiaries of research organizations, enterprises, and other entities. The programs are focused predominantly on projects contributing to the concrete objectives of ministerial and inter-ministerial strategies, and on improving the systemic environment and functioning of research organizations. Last but not least, there are programs supporting industrial research—ultimately used for innovation in the business sector and for developing the competitiveness of the economy.

In 2018, the state budget provided 1.36 billion euros (EUR) to finance research, development, and innovation in the Czech Republic. The largest volume of institutional support is provided mainly by the Ministry of Education, Youth and Sports—in 2018, higher education institutions (HEIs) absorbed around EUR 261 million, while the Czech Academy of Sciences (CAS) absorbed EUR 152 million. The purpose-specific supports that have long prevailed over institutional support are provided mainly by the Grant Agency of the Czech Republic, used in particular by HEIs and CAS; the Technology Agency of the Czech Republic, whose support is intended for enterprises and HEIs; the Ministry of Industry and Trade; and the Ministry of Education, Youth and Sports, where most support is granted to HEIs. While institutional support aims at improving mainly higher education institutions, purpose-specific support is channeled into industry, the medical sciences, social sciences, humanities, and biosciences.

So, disregarding basic research, the purpose-specific support is intended to develop research activities contributing to the objectives of specific programs in the context of implementing the National Policy of Research, Development and Innovation. The programs can be divided into ministerial—such as health, culture, defense, and agriculture—and cross-cutting, specific programs—such as social sciences research, security, international cooperation, support for young scientists, and the development of key technologies. Apart from fulfilling the main objectives, most programs significantly help to develop cooperation between the research and business sectors. The success of that support is demonstrated in the deepening cooperation between scientists, who can focus on creating specific applied outputs, and entrepreneurs, who gain a source of knowledge and new ideas, in addition to technical help. Institutional support has secured the conceptual development of research organizations, by reducing the administrative burden on researchers and supporting the necessary R&D infrastructure.

Policymakers cannot do without quality evaluation. Recently, the evaluation culture has significantly improved thanks to the requirements for the evaluation of European programs. The evaluation tools then find a broader application in national support programs.

R&D&I support in the Czech Republic from European funding

Income from EU structural funds represents an important component of the financing of Czech research, development, and innovation. For the period from 2014 to 2020, the Czech Republic has been allocated funding for R&D from the European Regional Development Fund of around EUR 2.4 billion, provided through three operational programs: Operational Programmes on Research, Development and Education (OP RDE); Enterprise and Innovations for Competitiveness (OP EIC); and OP Prague—the Growth Pole of the Czech Republic. In 2018, public aid spent under OP EIC and OP RDE amounted to EUR 367 million (including state budget cofinancing), of which HEIs received 68%, CAS workplaces 21%, and enterprises 11%. The largest share of proposals and supported projects is implemented in three sectors: physical and analytical chemical sciences, computer science, and environmental biology. Charles University, Masaryk University, and the Biological Centre of the CAS are behind more than half of the supported projects and funding obtained from EU structural funds in the Czech Republic.

The evaluation of the results to date of OP EIC—the largest Czech program supporting R&D in the business sector and funded from EU funds—shows that the supported projects have had a positive impact on increasing the innovation performance of the assisted enterprises, mainly SMEs. The benefits include speeding up the innovation process, as enterprises have been able to innovate up to two years faster than if they had not received the aid. Projects were primarily intended to improve the technical infrastructure of firms for R&D. Positive evaluation was also given to cooperation between enterprises, HEIs, and research organizations. This cooperation often continued after

completion of the project. The OP EIC support has helped to improve the qualifications of the labor force and has improved the ability to implement in-house research in the future.

In recent years, the supported innovation was mostly of an average level, with a lower impact on the development of high value-added production. The supported innovation predominantly concerned product innovation (90%), while process, marketing, and organizational innovations were implemented only as complementary processes. In the case of research organizations, interest in funding is inhibited by the high rate of cofinancing as well as by the limited amount of the grants from some programs. For research organizations, it is more attractive to draw support from other public expenditure programs that offer a higher intensity of support from public sources.

An important impact can also be observed in the financing of public research from EU funds. In the 2007-2013 programming period, the majority of the Operational Programme Research and Development for Innovation—a total allocation of EUR 2.4 billion—was earmarked for extensive investment in building a new public research infrastructure. With that, eight centers of excellence and 40 regional research centers were created, and thanks to that investment, the Czech Republic reached the level of the developed states in terms of the availability of a modern research infrastructure.

The radical improvement of the infrastructure for public research should increase the quality of public research and its innovation performance. The Czech Republic should also step up its participation in the EU framework program, Horizon Europe, which is a European funded instrument for supporting R&D, where applicants face global competition. However, it appears that the effects of the improved quality of the research infrastructure on both the quality of the research itself and on innovation need more time than one or two programming periods and require further measures to support international cooperation, human resources in research, cooperation with industry, and the concentration of research capabilities.

Changes in the conditions of R&D&I support and new challenges

Experience from recent years has shown that the system of research and development financing must be consistently evaluated and adapted if it is to lead to the convergence of the national economy with the most advanced economies of the world. The Czech experience could also be a valuable source of information and inspiration for other countries in similar stages of development.

Possible changes include enhancing the financing of research and development, focusing support on projects with a higher added value, and increasing research on the benefits for society. The Czech Republic has set explicit targets for R&D expenditure up to 2.5% of GDP by 2025 and 3.0% by 2030. Efforts should continue to remove the barriers to innovation progress, including low levels of investment in venture capital. Subsequently, other forms of financial instruments should be used, including guarantees and preferential loans. Apart from direct support, more media coverage should be given to the possibility of using indirect instruments, such as more effective forms of tax support for business R&D&I. Consideration should also be given to increasing the financial ceiling for subsidies in some instruments that require reaching a certain critical value of resources.

Valuable lessons can be learned from the development of investment incentives, which have become an important tool for R&D support in the Czech Republic. To increase added value, the Act on Investment Incentives has been amended, stating that at least 80% of employees of the incentive recipient must have average gross monthly earnings at least at the level of the average wage in the region where the project is implemented. At the same time, the incentive recipient must either employ at least 2% of the total number of employees as R&D staff or spend at least 1% of the project expenditure on cooperation with research institutions, while employing 10% tertiary-educated employees or spending 10% of the project expenditure on R&D.

To target the financing of research and development more effectively, it is necessary to evaluate the provided support credibly—both purpose-specific support, such as projects, and institutional support, such as long-term development of research organizations. Research organizations should be evaluated on the basis of their performance, excellence, and societal relevance. Assuming rising budget expenditures, the results of these assessments should be strongly reflected in the financing of organizations, with the aim of developing top-level research. In program support, pressure is increasing to evaluate all standard phases—from ex ante to impact, and to leverage evaluation results in new funding programs.

It is also crucial to support promising areas of research and innovation so that public resources are not fragmented without sufficient impact on the supported projects. To attract as much EU funding as possible, the country needs to adopt the Research and Innovation Strategy for Smart Specialisation (RIS3). The fundamental idea behind this concept is that the given country identifies—based on its strengths and the entrepreneurial discovery process—the key activities, areas, and technological domains in which it has the potential to reach a competitive advantage.[6] That strategy is gradually being put into practice in the Czech Republic and priority areas of support are being established,[7] including national domains of specialization that have the greatest potential to improve competitiveness, knowledge-based growth, and innovation capacity. Examples include transport for the 21st century, advanced mechanical engineering, life sciences, nanotechnologies, AI, and cybersecurity. RIS3 also aims to exploit the potential of the country to contribute to solutions for current social and technological challenges—including environmental challenges—while possibly contributing to the current strategic plans of the European Commission in this area (Green Deal).[8]

The R&D support from operational programs should focus on currently functioning innovation networks—with the potential

to utilize existing capacities, rather than build new capacities. That measure would help to channel funding to scientists and not to further extension of infrastructure. Other objectives of the current policies include the better promotion of foreign projects for R&D support, especially among small- and medium-sized enterprises, and the provision of technical support in establishing foreign partnerships and submitting applications to European funding programs. A final aspect would be reducing the imbalance between funding that flows from enterprises to public entities and funding provided to enterprises from the state budget.

Conclusion

With the gradual convergence of the Czech economy with the advanced world economies, the competitive advantage of lower wages in the Czech Republic will gradually fade out. Domestic economic policy should, therefore, focus on supporting innovation and reducing the high burden of government regulation and the complicated system of subsidies and taxes. The Czech government is aware of these needs and seeks to increase expenditure on research, development, and innovation; to streamline the system of its use, including the evaluation of research organizations; and to motivate the business sector to cooperate more fully with public research and development. The key challenges of the government policy include both support for venture capital investment and the search for other forms of financial instruments, including tax support for research and development. The selection of promising areas of research and development must reflect national specificities as well as the overall direction of Europe.

Notes:

1 Czech National Bank, n.d.; Excluding financial and insurance activities.

2 Research, Development and Innovation Council, 2019.

3 European Commission, 2019a.

4 Cornell SC Johnson College of Business et al., 2019.

5 Czech Statistical Office, 2016.

6 Foray et al., 2012.

7 Department for Analysis and Coordination of Science, Research and Innovation, 2018.

8 European Commission, 2019b.

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