

RECIPIENTS OF THE CZECH RESEARCH AND DEVELOPMENT (R&D) AID: ON THEIR CHARACTERISTICS, MOTIVATION AND PROJECT OUTCOMES

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Abstract

This research aimed to explore the characteristics, motivation and outcomes of the publicly funded Research and Development (R&D) projects in the Czech Republic during 2008–2020. We extracted data from the Information System for Research, Development and Innovation (IS R&D&I) on the implemented projects and identified 3 489 supported business entities during the analyzed period. The methodological approach was based on a questionnaire survey, which was distributed from April to May 2021. In total, we received 295 filled-in questionnaires, accounting for a response rate of 8.4%. The obtained answers were evaluated with comparative statistical techniques, such as cross-tabulations, correlations, and chi-square association tests. Mainly, the respondents participate in the public aid schemes to decrease their R&D costs and increase the intensity and range of their R&D activities. The participating companies identify the direct effects of the implemented R&D projects most often immediately after the end of the project or within the first five years. The main identified benefits include increased competitiveness in both domestic and international markets and improved economic performance.

Key words: Research and Development (R&D), R&D support, aid recipients, the Czech Republic

JEL Code: D04, O32, O38

Introduction

Considerable amounts of public financial resources are being allocated to promote innovation activity and boost firm competitiveness. Publicly funded programmes aim to encourage innovation and research and development (R&D) activities of firms because the increased creation of knowledge and new technologies in the society results in the creation of new business opportunities, expansions to new markets, or more efficient usage of existing

resources (Pervan and Kramaric, 2020; Kostić and Květoň, 2020; Odei et al., 2021). This mechanism, motivating firms to spend more resources on innovation and R&D in addition to public funds, is known as the concept of (behavioural) additionality (Testa et al., 2019). Therefore, it is relevant to ask, who are the beneficiaries of those programmes, why they apply for public aid and what gains the supported companies observe. Although the body of international literature on this phenomenon is quite considerable, the findings from Central and Eastern Europe are relatively scarce, as noted recently by Foreman-Peck and Zhou (2020), Jašurek and Šipikal (2021) or Sidorkin and Srholec (2021). Thus this article contributes to this regional body of knowledge by surveying representatives of the companies implementing publicly funded Research and Development (R&D) projects in the Czech Republic during the years 2008–2020. The study seeks to reveal their characteristics, motivation and outcomes.

1 Empirical approach and survey distribution

To fulfil our main research objective, i.e., to explore the characteristics, motivation and outcomes of the publicly funded Research and Development (R&D) projects, we combined information from both publicly available and commercial secondary data sources. First, we extracted data from the Information System for Research, Development and Innovation – IS R & D & I (The Research, Development and Innovation Council of the Czech Government, 2021). This database contains the most complex information about the national R&D support distribution. We aimed to follow up with as many aid recipients as possible, so we obtained information about supported projects from the years 2008 to 2020. The extraction took part on 28th January 2021. Once we merged all data together, we obtained 9,432 unique identification organizational numbers (i.e., IČOs) of entities implementing one or multiple R&D projects. Using the Czech business register and commercial database Magnus Web (Bisnode, 2021), we obtained information about their main characteristics (size, legal form, regional affiliation) and contact details (e-mails). We managed to obtain contact details for 3,715 business entities that received R&D support from various public aid providers, specifically from the **Ministry of Industry and Trade** (partially programmes OP PI, OP PIK, and programmes IMPULS, TANDEM, and TIP), **Ministry of Agriculture** (programmes Research in agricultural sector, VAK and KUS), **Ministry of Education Youth and Sports** (programmes EUREKA CZ, EUREKA EU and INTER-EXCELLENCE) and the **Technology Agency of the Czech Republic** (programmes ALFA, DELTA, EPSILON, and National Competence Centres).

Given the main purpose of the study, the research team conducted primary research among aid recipients. A structured questionnaire was created with the help of established R&D and innovation literature (Archibugi, 2001; Vokoun, 2017; Testa et al., 2019) in the online application LimeSurvey. The survey was divided into two main parts. The first one focused on the firm's position in the economy and global value chains and its innovation strategy. The second concentrated on the business R&D activities. Then it was piloted among the regional community and calibrated. After that, it was distributed via e-mail, with the request to be filled by owners or managers of the supported businesses entities.

The data collection procedure started on 19th April 2021 and ended on 9th May 2021. The e-mail containing the survey was delivered to 3,489 business organizations, and in total, we received 295 filled-in questionnaires back. This accounts for a response rate of 8.4%. We further document the employment size distribution of the population of supported firms; companies invited for the survey and compare it with those delivering the completed questionnaire.

Table 1 documents that although there are considerable differences among all three groups, the overall distribution of all three groups is not that distant. It can also be clearly seen that the most frequent aid recipients are middle-sized companies (31.4%), followed by the small ones (27.8%), large firms (17.9%), and the minor representation is among micro firms (15.4%). The populational data (N=9,432) further revealed that the most frequent legal form of aid beneficiaries is limited liabilities company (61.8%), followed by the joint-stock companies (37%). The remaining supported companies operate on a self-employment basis or within other legal forms.

Tab. 1: Employment size of the aid recipients and survey distribution

Company employment size/sample	Population (%)	Received the survey (%)	Filled in the survey (%)
Micro (0–9 employees)	15.4	19.9	24.8
Small (10–49 employees)	27.8	35.2	34.0
Medium (50–249 employees)	31.4	29.0	25.5
Large (250 and more employees)	17.9	12.2	11.9
Information not available	7.5	3.7	3.8
Total N	9,432	3,489	295

Source: author's elaboration based on Bisnode's (2021) data

2 Findings and results

This section presents the main findings from the distributed survey. We evaluated the obtained responses with basic descriptive statistics and comparative statistical techniques, such as cross-tabulations, correlations, and chi-square association tests.

Inspired by the previous literature (Archibugi, 2001; Vokoun, 2017; Odei et al., 2021), we explored beneficiaries' position in the firm's hierarchy and its market and innovation strategy and interacted these two characteristics together (Table 2). More than half of the supported companies perceive themselves as innovation **pioneers**, meaning that they deliver to their customers entirely new solutions in the highly competitive market segment. The second most represented group are **followers** (26.1%) that strive for being close to innovation leaders, and they quickly and actively follow their actions. Only a few firms (4.9%) identified themselves as innovation **leaders** in the global market in their sector or business area.

As we have confirmed by the Chi-Square test of association, we observe a weakly significant relationship at the 10% level of statistical significance (Cramer's $V = 0.17$) between the market and innovation strategy and the position in the firm hierarchy. The association indicates that the innovation **pioneers** and **leaders** are most frequently operating as **independent companies with no branches**. This position in the firm hierarchy also most commonly occurred among our respondents (59.3%), followed by parent companies with foreign branches (14.6%).

Tab. 2: Association between the firm's hierarchy position, market and innovation strategy

Position in the firm hierarchy / Market and innovation strategy	Leader	Pioneer	Follower	Optimizer	Other	Total N (%)
A subsidiary of the Czech company	0	15	6	6	0	27 (10.1)
Foreign subsidiary (multinational) enterprise	1	11	4	4	0	20 (7.5)
Parent company with foreign branches	1	21	15	1	1	39 (14.6)
Parent company with only Czech branches	0	9	7	5	0	21 (7.8)
Independent company with no branches	10	92	38	16	3	159 (59.3)
Other	1	0	0	1	0	2 (0.7)
Total N (%)	13 (4.9)	148 (55.2)	70 (26.1)	33 (12.3)	4 (1.5)	268
Test of association, Chi-Square = 30.54, p-value = 0.06, Cramer's $V = 0.17$, N = 268						

Source: Primarily collected data, author's elaboration

The most important motivation for obtaining public aid is for the companies to **reduce their R&D costs**, as noted by 79.3% of the respondents. The number two main reasons firms apply for funding are the possibility of implementing R&D activities on a larger scale (75.0%) and obtaining funds to develop **their own financially demanding R&D activities** (75.0%). Least frequently, respondents mention the continuation of previously started R&D activities funded by the public resources (38%).

The participating companies identify the **direct effects** of the implemented R&D projects most often **immediately after the end of the project** (41.7%) or **within the first five years** (43.7%). The main **benefits** for participating companies are **increased competitiveness** in domestic (68%) and international (69%) markets, which is tightly linked with improved economic performance (57%). More than half of the respondents also mention an essential effect of increasing the importance of R&D for the development of their company (57%), obtaining financing for R&D activities (59%) or increasing their own research/innovation capacities (55%). On the other hand, the least frequently mentioned are benefits associated with changes in the organization and strategy of R&D activities (17%) and changes in corporate organization processes (16%).

We further explored the association between the importance of motivation for obtaining support and the identified benefits with the help of Spearman correlation coefficients. The results are presented in Table 3. There is, for example, a strong interrelation between the importance of obtaining funds for cooperation with research organizations and the identified benefit of deepening cooperation with the research organization. There is also a considerable correlation between motivation to reduce the risks associated with financing own R&D activities and obtaining funding for R&D activities.

Tab. 3: Correlations between identified benefits and motivation for obtaining support

Identified benefit / Motivation for obtaining support	Reduction of own R&D costs	Obtaining funds for development of own financially demanding R&D activities	Reducing the risks associated with financing of own R&D activities	Possibility to implement R&D activities on a larger scale	Obtaining funds for cooperation with research organizations	Continuation of previously started R&D activities funded by the public resources
Improving economic performance of the company	0.262***	0.277***	0.266***	0.275***	0.192**	0.341***
New solutions to increase environmental sustainability production or products	0.121	0.244***	0.323***	0.251***	0.310***	0.389***
Obtaining financing for R&D activities	0.277***	0.488***	0.475***	0.454***	0.390***	0.396***
Gaining access to the unique knowledge and equipment through cooperation with research organizations	0.089	0.213**	0.310***	0.292***	0.469***	0.292***
Increase of own research / innovation capacities	0.158*	0.330***	0.297***	0.423***	0.450***	0.262***
Closer links between research and production activities	0.176*	0.308***	0.361***	0.355***	0.352***	0.358***
Changes in organization and strategy of R&D activities	0.107	0.251***	0.405***	0.193**	0.325***	0.433***
Changes in corporate organization processes	0.168*	0.141	0.419***	0.091	0.222***	0.376***
Deepening cooperation with research organization	0.084	0.280***	0.238***	0.345***	0.617***	0.388***
Increasing the importance of R&D for development of the company	0.210**	0.376***	0.253***	0.368***	0.384***	0.308***
Increase of competitiveness on the foreign market	0.226***	0.210**	0.250***	0.277***	0.184*	0.197*
Increase of competitiveness on the domestic market	0.340***	0.271***	0.191**	0.324***	0.173*	0.238**

Statistical significance of Spearman correlation coefficients is reported as follows: * $p < 0.05$, ** $p < 0.01$, * $p < 0.001$.**

Source: Primarily collected data, author's elaboration

Conclusion

The article offered insights into the characteristics, motivation and outcomes identified by the recipients of the publicly funded Research and Development (R&D) projects in the Czech Republic from 2008 to 2020. Based on the insights from the 295 filled-in questionnaires, we observed that typical R&D recipients are independent companies with no branches, classified as innovation pioneers, operating most often as small- and medium-sized enterprises (SMEs). Their most important motivation for obtaining public aid is to reduce their R&D costs. The direct effects of the implemented R&D projects are identified immediately after the end of the project or within the first five years. The primary outcomes include increased competitiveness and improved economic performance. Furthermore, we found several interesting correlations between the motivations for applying for external aid and the described benefits.

With the findings of other scholars (Foreman-Peck and Zhou, 2020; Audretsch and Belitski, 2020), it can be deduced that R&D support enables companies to engage in riskier activities that would not otherwise be carried out. Furthermore, it appears that R&D funding schemes primarily finance cooperation with research organizations because we observed a strong association between the motive for securing funding for collaboration with research organizations and the benefits of gaining access to unique knowledge and facilities through collaborative support.

At the same time, we must acknowledge that the provided observations are based on the survey, so the number of participating companies decreases their validity. Second, the described aid benefits do not reflect the actual economic development of the companies. More rigorous evaluation methods need to be used to validate financial performance enhancement, such as rigorous counterfactual impact evaluation analysis (Ratinger et al., 2020; Dvouletý et al., 2021). For this quantitative assessment, there is a piece of crucial information that the effects of the implemented R&D projects are identified immediately after the end of the project or within the first five years, helping researchers set the post-treatment period correctly.

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