

# The efficiency of public support of innovation activities of foreign-owned companies

Marek Vokoun<sup>1,\*</sup>

<sup>1</sup>Institute of Technology and Business in Ceske Budejovice, Department of Economics, Okruzni 517/10, 370 01 Ceske Budejovice, Czechia

**Abstract.** The analysis aims at the different innovation activities of foreign-owned enterprises in the Czech economy. Data comes from the Czech Community Innovation Surveys of 2010, 2012, and 2014. This paper evaluates new-to-the-market innovation activities at the firm level. The analyzed sample consists of observations about innovators and companies that did not engage in new-to-the-market innovation activities in the last three years. This paper explores the relationship between public support and innovation activities of multinationals. The first results suggest public support (local government funds, national government funds, EU funds, EU Framework, and Horizon funds) is not always statistically significant in terms of R&D expenditures in comparison to unsupported firms. The additional contribution of public support for innovation output is again not always statistically significant. Results suggest that local government funds (grant projects) are beneficial for foreign-owned new-to-the-market innovators. Those local government funds are contributing both to innovation input (R&D expenditures) and innovation output (sales of innovated goods and services). Other public support variables indicate a crowding-out effect of private R&D&I investment. Globalization tendencies are supported by governments and future research should aim at a more complex analysis of multinationals' behavior in this area.

## 1 Introduction

National innovation policies usually aim at all companies that are ready to innovate. Foreign-owned companies are an essential part of developed and developing economies. This paper compares the efficiency of the Czech national innovation policy which, in general, consists of indirect support for all (tax deductibles) and direct support for some companies in form of local government support (municipalities), central government support, European grants (structural funds and Horizon 2020 like programs).

The Czech economy is one of the most open economies in the world and foreign-owned companies have substantial market shares in the financial sector and manufacturing. Foreign-owned companies or multinational enterprises (MNEs) have a special place in economic theory. The theory of globalization is grounded on the ownership-specific endowments of MNEs and location-specific endowments of national markets [1]. It is a

---

\* Corresponding author: [marek.vokoun@mail.vstecb.cz](mailto:marek.vokoun@mail.vstecb.cz)

useful extension of the theory of the firm [2]. New theories are stressing the importance of knowledge exchange and interconnectedness in the globalized information age [3].

Analyses of MNEs are oriented at their characteristics like growth-dynamics, size, managerial methods, and know-how (ownership-specific endowments, firm perspective). They are also oriented at more macroeconomic topics like the dynamics of markets, industries, and institutions (location-specific endowments). These two concepts (firm and market characteristics) are intertwined and should be analyzed and interpreted together. The MNEs' plans are portfolio-like and thanks to the globalization tendencies they can be tactical (short-term, exploitation and reaping) and strategic (long-term). This paper analyses both dimensions with a particular interest in public support of innovation activities.

Current research is aimed at the barriers of entry to global markets and the internationalization of small and medium-sized enterprises (SMEs). Protectionism-oriented public interventions can deprive the confidence of small innovative enterprises to enter global markets [4]. Local public support can attract (FDI incentives and innovation policies) and discourage MNEs (protectionism, corruption, and rent-seeking). That is why we have the public support of outward FDI to overcome target market difficulties, but this support is more efficient for firms with already accumulated international experience [5].

The public support from national government funds is beneficial to the amount of research and development (R&D) expenditures. For example, supported enterprises invested 54% more in R&D than firms without public support in the Spanish food and beverage industry [6]. Another example is from seven European countries with similar results [7].

This is somehow expected and intuitive but the real issue is efficiency. How are these additional R&D expenditures translated into new-to-the-market innovations and is it profitable in the long-term? We can observe the crowding-out effect of private R&D investments (i.e. no additional effect) or the inability to introduce new-to-the-market innovation (i.e. some negative effect). Current global markets demand incremental innovations to be introduced as fast as possible (the new paradigm of agile management, total quality, talent and knowledge management, etc.) and the management of production (product life-cycle) and processes (methods) are innovated on annual basis in some of the high-tech and knowledge-intensive industries.

The level and quality of innovation activities of enterprises are crucial to distinguish. Imitation (new-to-the-firm innovation) of enterprises in form of legal conduct (acquiring ready to use knowledge and technologies that are already in the market, learning to the extent of the current technological frontier) is the most important source of productivity growth and further innovation activities. After this convergence, only new-to-the-market innovation activities can contribute to productivity growth [8].

This convergence thesis is to some extent supported by empirical research. Public support aims at less innovative firms that introduce new-to-the-firm innovation (current market-ready technologies and knowledge) and the productivity goes up. The support has then less influence when the firm is already innovative [9]. This indicates the existence of crowding-out effects and possible orientation at riskier new-to-the-market innovation projects with longer appropriability horizon (the ability to capture profits from the innovation project). Public support aims primarily at small enterprises. They increased their investments, but approximately by the amount of the subsidy they received in the case of Italy [10].

Innovation-promoting public policies are a great tool to attract good innovators and develop innovation capabilities in particular or strategic industry areas. A good example is public support aimed at domestic innovation and the inward transfer of foreign-invested technologies in the energy sector [11]. These public incentives contributed to introduction of new technologies and brought more competitors to the market.

Theoretical models work also with the issue of openness of the country. Tariffs (all kind of costs related to the international trade) can reduce the total amount of R&D expenditures and hamper innovation activities and firms are compensating to some extent this decrease with public support of innovation activities [12]. This redistribution (from tariffs to support) is thus somehow meaningless and inefficient public support scheme. Recent papers dealing with globalization and multinational issues stress the importance of network interconnectedness [13]. The public support of the cooperation activities, i.e. finding an innovation partner or creating an innovation network, should be studied using complex modeling [14].

## 2 Data and methods

In total, 3 waves (2010, 2012, and 2014) of the Czech Community Innovation Surveys (CISs) served as the dataset for the analysis. Only enterprises with foreign ownership (more than 50 %) were selected into the final sample, there are no local enterprises in the sample. Financial variables are in thousands of CZK, per one full-time employee, and are logarithmically transformed.

**Table 1.** Summary statistics of the sample of MNEs in 2010-2014.

Variable	Obs.	Mean	Std. dev.	Min	Max
MNE innovator	4805	0.24	0.43	0	1
Sales	4805	2.14*106	9.77*106	3	2.97*108
Number of employees	4805	330.50	851.01	10	24509.00

There are 24 % MNEs that innovated their goods and services in the last three years of the CIS of 2010, 2012, and 2014. The descriptive statistics about sales and the number of employees suggest a very heterogeneous sample (Table 1). In the MNE innovation sample, the financial variables are heterogeneous as well. That is why Eurostat technological and knowledge level control variables were introduced [15]. The public support comes mostly from the EU and the central government's grants.

**Table 2.** Summary statistics of the sample of MNE's new-to-the-market innovators in 2010-2014.

Variable	Obs.	Mean	Std. dev.	Min	Max
Number of employees	1104	585.50	1533.84	10	24509
R&D expenditures	1104	95398.07	617336.60	1	1.51*10 <sup>7</sup>
Public support – local government	1104	0.03	0.18	0	1
Public support – central government	1104	0.24	0.43	0	1
Public support – EU	1104	0.19	0.39	0	1
Public support – Horizon/Framework	1104	0.13	0.33	0	1
Sales of new-to-the-market innovations	1104	0.20	0.23	0	1

The innovation model used for estimation is based on Mairesse and Mohnen [16] and follows the stage logic of innovation business processes (Table 3). Innovator is rather narrowly described as a firm that is identified as “having non-zero R&D expenditures in the last three years and introduced a new-to-the-market innovation”.

**Table 3.** Innovation model used for estimation.

Dependent	Model description
MNE innovator	$r_{it}^* \begin{cases} 1 \text{ if } r_{it} = (X_{1it}\beta_1 + \varepsilon_{it_1}) > 0 \\ 0 \text{ otherwise } (r_{it} \leq 0) \end{cases}$
R&D expenditures per employee (ln)	$k_{it}^* = \ln(k_{it})   (r_{it} > 0) = X_{2it}\beta_2 + a_i + \varepsilon_{it_2}$
Sales of new-to-the-market innovations per employee (ln)	$t_i^* = \ln(t_i)   (k_i > 0) = X_{3i}\beta_3 + \alpha k_i^* + \varepsilon_3$

The innovation-decision and the intensity of innovation are estimated using the logic of the Heckman procedure. A random effect Probit estimation and general linear panel regression with Mill's ratio in the second equation is used. The  $X_{nit}\beta_n$ 's (with  $n = 1, 2$ , and  $3$ ) are vectors of explanatory variables. The  $\varepsilon_{itn}$ 's (with  $n = 1$ , and  $2$ ) are random-error terms. The vector of parameters to be estimated is denoted  $\beta_n$ 's (with  $n = 1, 2$ , and  $3$ ).

### 3 Results

Public support of enterprises is based on the need for faster technological development, more basic research and progress in terms of Industry and Society 4.0. Public support aimed at MNEs seems to be not very efficient in the Czech Republic because MNEs are not having a higher intensity of R&D expenditures or sales of innovated goods and services in comparison to unsupported MNEs.

**Table 4.** The decision to innovate, R&D expenditures and sales of innovated goods intensity.

Variable	Decision to innovate	R&D expenditures	Sales of innovated goods and services
Number of employees	0.287*** (0.03)	-0.065 (0.38)	0.595** (0.24)
Public support – local government	-	0.905** (0.42)	0.511** (0.20)
Public support – central government	-	0.505 (0.31)	-0.019 (0.18)
Public support – EU	-	0.344 (0.41)	-0.220 (0.20)
Public support – Horizon/Framework	-	-0.030 (0.42)	0.017 (0.21)
Control variables	Technological levels, knowledge level, years, market orientations, and being part of a group.	Tech.levels, knowledge level, years, market orientations, cooperation partners, Mill's ratio, and being part of a group.	Tech. levels, knowledge level, the log of R&D expenditures per employee, years, and being part of a group.
Constant	-3.470*** (0.23)	4.424** (2.23)	8.755*** (1.33)
Number of observations	4805	1104	1103

The only exception is local government grants and projects which are beneficial to R&D expenditures intensity and additionally to the appropriability (Table 4.). On average, larger MNEs have a higher probability to engage in new-to-the-market innovation and have higher sales of innovated goods and services.

The quality of estimation is satisfactory. In all the cases models were stable and provided robust standard errors in the parentheses below coefficients (Table 4.) Interesting results showed control variables, but they are not in the focus of this paper. Mill's ratio was statistically significant and it suggests that the selection bias had to be controlled for.

## 4 Conclusion

Multinationals were an important source of knowledge inflow and agents of technological spill-overs. Public support of enterprises is aiming at new-to-the-market innovations and the global competitiveness of companies. Results suggest that public support of MNEs does not contribute to the faster or broader introduction of new-to-the-market innovations. It does not matter (it is statistically not significant) if an MNE received support or not. The amount of R&D is the same for unsupported and supported MNEs. The only exception was the case of local government support. This support is not large or frequent but it contributed to the R&D intensity and sales of new-to-the-market goods and services.

Further research should look at this crowding-out effect and also research this problem at the new-to-the-firm level of innovation activities. Also, better output variables should be used, f.e. value-added, net operational profit after taxes, productivity, and etc., because sometimes innovations are aimed at costs and other strategies (talent, risky project, and etc.).

This paper is an output of the scientific work of Internal Grant Agency at the Institute of Technology and Business in České Budejovice, Czech Republic, 05IRP014 "Inovace předmětu Řízení inovací v kontextu internetu věcí".

## References

1. J. H. Dunning, trade, location of economic activity and the MNE: A search for an eclectic approach. in *The International Allocation of Economic Activity*, edited by B. Ohlin, P.-O. Hesselborn, and P. M. Wijkman (Palgrave Macmillan UK, London, 1977), pp. 395–418
2. R. H. Coase, The Nature of the Firm. *Economica* **4**, 386 (1937)
3. J. Cantwell, Innovation and international business. *Industry and Innovation* **24**, 41 (2017)
4. S. Mariotti and L. Piscitello, Localized capabilities and the internationalization of manufacturing activities by SMEs. *Entrepreneurship and Regional Development* **13**, 65 (2001)
5. M. Banno, L. Piscitello, and C. A. Varum, The impact of public support on SMEs' outward FDI: Evidence from Italy. *Journal of Small Business Management* **52**, 22 (2014)
6. M. Acosta, D. Coronado, and C. Romero, Linking public support, R&D, innovation and productivity: New evidence from the Spanish food industry. *Food Policy* **57**, 50 (2015)

7. O. A. Carboni, The effect of public support on investment and R&D: An empirical evaluation on European manufacturing firms. *Technological Forecasting and Social Change* **117**, 282 (2017)
8. F. Perez-Sebastian, Public support to innovation and imitation in a non-scale growth model. *Journal of Economic Dynamics & Control* **31**, 3791 (2007)
9. M. Cano-Kollmann, R. D. Hamilton III, and R. Mudambi, Public support for innovation and the openness of firms' innovation activities. *Industrial and Corporate Change* **26**, 421 (2017)
10. R. Bronzini and E. Iachini, Are incentives for R&D effective? Evidence from a regression discontinuity approach. *American Economic Journal: Economic Policy* **6**, 100 (2014)
11. K. R. Fabrizio, S. Poczter, and B. A. Zelner, Does innovation policy attract international competition? Evidence from energy storage. *Research Policy* **46**, 1106 (2017)
12. P. Buryi and S. Lahiri, Research and development and trade policies for product innovation in the presence of foreign competition. *Economic Modelling* **80**, 429 (2019)
13. R. Golini and J. Gualandris, An empirical examination of the relationship between globalization, integration and sustainable innovation within manufacturing networks. *International Journal of Operations & Production Management* **38**, 874 (2018)
14. S. Amoroso, Multilevel heterogeneity of R&D cooperation and innovation determinants. *Eurasian Business Review* **7**, 93 (2017)
15. Eurostat, *High-tech industry and knowledge-intensive services*, Available from: [http://ec.europa.eu/eurostat/cache/metadata/en/htec\\_esms.htm](http://ec.europa.eu/eurostat/cache/metadata/en/htec_esms.htm) (2016)
16. J. Mairesse and P. Mohnen, Chapter 26 - Using Innovation Surveys for Econometric Analysis in *Handbook of the Economics of Innovation*, edited by B. H. H. and N. Rosenberg (North-Holland, Amsterdam, 2010), pp. 1129–1155