

Determinants of Firm Innovation¹

*Alena Zemplerová, CERGE-EI, Eva Hromádková, CNB and Marek Vokoun VSE
Prague*

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Abstract

The primary aim of the paper is to investigate the relationships between growth, market competition, subsidies and innovation based on a large firm data set 2004 - 2008. The novelty of our approach consists in linking data from two firm-level datasets collected by the Czech Statistical Office (CSO). The first dataset collects information on innovation activities undertaken by firms – Community Innovation Survey (CIS or TI form of the Czech Statistical Office), and the second gathers longitudinal firm-level data from regular surveys of the CSO, form P5-01. An advantage of using these datasets is that we are able not only to link them at the firm level but also estimate innovation and performance related variables such as productivity for each firm, their behavior, inputs, outputs, ownership, industry specifics and development trajectories. CSO also provided us with the information from the Registry of Economic subjects, containing the data on the date of enlistment of economic subject into the registry (firm enters the market), as well as possible cessation of activities (firm exists the market). Thus, we are able to identify new entrants, and also to determine whether the firm has terminate its activities during the period of interest. This is important mainly from the point of view of market dynamics and market competition. It enables us to determine the importance of competition via innovation within incumbent firms as compared to newly entering firms.

Final sample consists of 2071 firms and empirical analysis is based on the CIS data 2005 and 2006 of the firms in the Czech Republic. We have taken the subsample of firms that were surveyed both in year 2005 and 2006 and obtained a detailed description of their innovation activities, expenditures as well as outcomes of this innovation throughout the period 2004-2006. Then, we have combined the data from CIS with the information on firms size (average number of employees), revenues from own products and services (in thousands CZK) and ownership (foreign/domestic) from the Czech Statistical Office (CSO) annual report of economic subject in producing industries (P5-01), both for the initial (2004) and final (2006) year of CIS survey. This way, we are overcoming the main problem of previous studies, namely the cross-section character of the data and corresponding issue with the identification of simultaneity between R&D investment and productivity, because we analyze how the R&D investment in some period affects productivity of firm two periods after.

Inspired by CDM model (Crepon, Duguet and Mairesse, 1998) as well as its application by Hashi and Stojcic (2010) we model the innovation activities of Czech firms as a four stage model. It allows studying several interrelated questions. In the first two stages we separate

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determinants of decision to innovate and consequent innovation investment. In the third stage we link innovation input (R&D investment) to innovation output, and finally, in the fourth stage we determine how the productivity of firm is related to its innovation activities. We received following interesting however preliminary results:

- Probability that firm decides to innovate is increasing in its size. Bigger firms also invest higher amounts of money to develop innovation.
- Firms that make most of their business on international markets tend to invest more into their innovation-related processes
- Innovation input significantly increases innovation output, with increasing firm size however ceteris paribus, the innovation output is decreasing. This means that bigger firms are less efficient in transforming the innovation input into output.
- Access to subsidies at national level has significant, yet negative influence on innovation output. As these same subsidies have significantly increased the innovation activity and expenditures in the first step, this result may throw a shadow on the efficiency of supported firms.

In our article we focus on public subsidies to private R&D as one of the determinat of firm innovation activity. Large amounts of public money are spent to stimulate private innovative activities and these amounts are supposed to grow in the future. We found that although subsidies have significantly increased the innovation inputs, access to subsidies at national level has significant, yet negative influence on innovation output. In this way our analysis indicates that the failure of public R&D incentive policy is probable. We also found that the probability that firm decides to innovate is increasing in its size and bigger firms invest higher amounts of money to develop innovation. At the same time however with increasing firm size ceteris paribus, the innovation output is decreasing. This means that bigger firms are less efficient in transforming the innovation input into output. Our results are broadly consistent with previous empirical literature which also raises doubts with respect to efficiency of the public subsidies to private R&D in general and to large firms in particular.

Analysis of the effects of R&D subsidies as well as effects of the size of the firm on the production of innovation and firm productivity has important implications for competition policy. In praxis competition authorities are very strict as for cartel agreements between firms. In case of large research consortia however or large mergers that claim the necessity of R&D concentration however, the enforcement of competition policy is rather soft. As for subsidies to enterprises, they are in general prohibited by EU Treaty because they harm competition and free trade. EU and national governments of member states however continue to provide R&D subsidies to firms in order to boost innovation in the business and the competition authorities are ready to provide exemptions from the law.

At present competition authorities tend to tolerate R&D cooperation within certain bounds and approve state aid to firm R&D because it is assumed that this raises welfare. Reasons for approvals of R&D concentrations and cooperations is expectation of economies of scale in R&D, a large minimum efficient scale in R&D required to produce major innovations or efforts to eliminate parallel research - reasons which cannot be unanimously confirmed by economic literature. The risk that R&D cooperation may engender collusion in the product market is high. Subsidies to R&D imply re-distribution of resources and distort price signals. In addition a subsidy can alter behavior of firms. A recipient may be cushioned

and suffer by soft budget constraints. In addition large companies have better chances to succeed in getting subsidies due to their political power.