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Direct Public Support of R&D and Innovation in Czech Firms: Unintended Consequences and Possible Peltzman Effect

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Abstract

This paper examines the complex relationship between direct public support for innovation projects, the capacity to continuously innovate, and turnover growth, with a particular emphasis on the potential for a Peltzman effect. The objective of the quantitative analysis is to ascertain whether companies that are incentivized by direct subsidies tend to favour safer projects over riskier, groundbreaking innovations. To this end, the 2014 Czech innovation dataset has been employed, together with an extensive literature review. The findings indicate a correlation between firms that receive public funding and those that engage in continuous or occasional innovation activities. However, the impact on turnover growth is not positive, implying that, on average, public subsidies do not significantly contribute to turnover growth. The study raises concerns about potential market distortions, inefficient resource allocation, and the dynamics of collaboration among large firms in publicly funded projects. While acknowledging the exploratory nature of the models, the study emphasizes the importance of ongoing scrutiny and refinement of innovation policies to ensure their effectiveness in promoting genuine innovation while mitigating unintended consequences.

Keywords

Subsidy, innovation policy, behaviour, crowding-out, efficiency, risk mitigation, continuous innovation, cooperation

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Introduction

According to endogenous economic growth models, developed countries can only achieve long-term productivity growth through innovation and acquisition (Lucas, 1988; Romer, 1986; Greenhalgh & Rogers, 2009). The prospect of economic catching-up is becoming increasingly challenging in light of the diminishing availability of lucrative profit opportunities, as measured by accumulated capital goods, which are becoming increasingly risky (Perilla Jimenez, 2019). Companies that are located in developed economies and embark on risky innovation projects with a high degree of scientific originality and/or technological novelty are the source of long-term macroeconomic productivity.

Given that knowledge spillover effects can be utilised and/or exploited by competitors (Acs et al., 2009), the central issue is the public good nature of knowledge arising from innovative activities. The public good nature of knowledge is characterised by an externality feature, whereby new technologies affect not only the consumer but also other market agents. It is incumbent upon companies to address the issue of limited appropriability (Cohen et al., 2000). Can innovation policy assist in mitigating these risks?

The objective of this study is to examine the potential for a Peltzman effect in the context of innovation policies that utilise direct subsidies (grants). The Peltzman Effect posits that individuals may alter their behaviour in response to the introduction of safety measures in ways that offset the intended safety benefits. (Peltzman, 1973). If we consider the Peltzman effect in the context of a subsidy that mitigates financial risk, it is plausible that recipients of the subsidy may alter their behaviour in response. The potential outcome of this in the context of innovation subsidies is as follows: (1) *Increased Risk-Taking* is an intended effect. Making riskier investments, expanding operations more rapidly, or engaging in practices that they might have otherwise considered too risky without the subsidy. (2) *Reduced Incentive for Risk Management* is an unintended effect. Businesses may be less motivated to implement rigorous risk management practices if they perceive a lower financial risk as a result of subsidies. This lack of incentive to carefully manage risk can lead to suboptimal decision-making and potentially reckless behaviour, or exploitation of subsidies with the minimum required risk-taking effort. (3) *Market Distortions* is a mixed effect. Subsidies have the potential to induce market distortions by encouraging overproduction or overconsumption in the subsidized sector. This may prevent underproduction of innovation; however, the process of selecting "trends" and "key industries" and subsidized companies may result in inefficiencies and resource misallocation. (4) *Dependency on Subsidies* is an unintended effect. The long-term reliance of businesses on subsidies may result in significant challenges in the event of their removal or reduction. Such a reliance can hinder the growth of a sustainable and competitive industry.

The objective of this paper is to analyse the 2014 Czech innovation dataset and provide a review of the literature on the efficiency of public support. The analysis will focus on the probability of companies receiving direct public support for their innovation projects. It is not feasible to test the Peltzman effect in an experimental setting because we cannot obtain a random sampling (random public support allocation) of innovative companies. Consequently, we can only approach the problem using rather observational and comparative tools (subsidized vs. non-subsidized).

Innovation and inspiration are business processes that are inextricably intertwined (Baregheh et al., 2009). The process of learning-by-doing is typified by the consumption of generic knowledge, as evidenced by the inspiration process. Such knowledge acquisition and comprehension aids in the emergence of new specific knowledge, innovations, or scientific inventions (Arrow, 1962). Inventive efforts, such as business research, development, and innovation projects (R&D&I), can lead to the emergence of specific knowledge, such as applied technological inventions, and should be encouraged primarily by standard intellectual and standard property rights protection, as well as other institutions that foster entrepreneurship (cf. Boettke & Coyne, 2003; Ostrom, 1990; Greenhalgh & Rogers, 2009). While basic research that leads to the emergence of generic knowledge can be encouraged by government incentives, as Arrow (1962) suggests.

In the long-term, the supply of skilled human capital, R&D tax credits, and direct public funding appear to be the most productive ways of encouraging innovative activity in the US economy (Bloom et al., 2019). That is why governments continue to develop their industrial and innovation policies with the objective of encouraging riskier innovation output while avoiding potential economic underprovision of basic research and/or technological innovation.

A number of issues remain unresolved in the research aimed at improving the efficiency of public support for innovation activities. The definition and concept of innovation, for example, can be difficult to grasp (cf. Baregheh et al., 2009; Godin, 2008; Brozen 1951). It is essential to differentiate between the two interpretations. The term "innovation" is employed to signify both the "final output" and the "act/process of achieving" that output (Godin 2008). The process (innovation activities) is intertwined with the processes of inspiration, invention, and even imitation.

The innovation process typically comprises three stages: (I) generation of ideas and thoughts, (II) experimentation and problem solving, and (III) implementation and market diffusion. In other words, it is a process that emerges from R&DI business activities, and it typically includes phases of basic research and discovery, applied research and prototyping, commercialization and diffusion, i.e. the allocation of resources, for example, to the production of the final product innovation and the subsequent market entry and market adaptation process of economic agents (Greenhalgh & Rogers, 2009). Business analysts and partitioners of innovation research define the final product, innovation, as 1) product innovation (goods and services) and 2) business process innovation (OECD & Eurostat, 2018).

These activities and outcomes can be observed within the context of innovation ecosystems. These ecosystems are, for the most part, mostly national states with mixed market economies and generous innovation policies. Because we can rather just observe this system and its evolution, the term innovation ecosystem has rather limited practical application (Vokoun & Dvouletý, 2022). Schumpeterian theories address with the concepts of evolution, market survival, and firm adaptation to everchanging environmental pressures. Potential competition, creative destruction, and uncertainty are among the fundamental principles of the evolutionary approach (Aghion & Howitt, 2005; Grossman, 1993).

Is a market equilibrium in innovation ecosystems present or is there constant adaptation towards an equilibrium that will never be achieved as a result of changing society (trends, technologies, and globalization)? According to Kirzner Izrael (1997, p. 72), the following can be observed *"(i) that continual change in tastes, resource availabilities, and known technological possibilities always prevent this equilibrative process from proceeding anywhere near to completion; and (ii) that entrepreneurial boldness and imagination can lead to pure entrepreneurial losses as well as to pure profit. Mistaken actions by entrepreneurs mean that they have misread the market, possibly pushing price and output constellations in directions not equilibrative. The entrepreneurial market process may indeed reflect a systematically equilibrative tendency, but this by no means constitutes a guaranteed unidirectional, flawlessly converging trajectory*."

It is possible to return to Schumpeterian ideas and raise many questions about competition and innovation activities that remain unanswered even after Gilbert's (1990) paper. Looking for Mr. Schumpeter: Where Do We Stand in the Innovation Debate? Gilbert (1990) concludes in his paper that the process of entrepreneurial discovery allows for nearly infinite changes in the theoretical link between competitiveness and R&D expenditures or R&D outputs. The question thus arises as to how the state can intervene in this complex process, which economists find difficult to comprehend.

The existing literature on the effectiveness of public support for R&D&I has concentrated on end-product innovation and firm-level analysis. Many papers also addressed macroeconomic issues, providing averages of industrial or national gross value-added growth and their relationship to R&D&I support (Vokoun, 2017; Bronzini & Iachini, 2014; Cano-Kollmann et al., 2017). As anticipated, public support for R&D&I increases innovation input. Nevertheless, the proxies for innovation output (patents, self-reported innovations, innovative sales shares, internal process innovation, and so forth) and productivity increase (total factor productivity including value-added, revenues, and sales per employee indicators) were not consistently statistically significant.

Current research focuses on a variety of aspects of public support for innovation. A systematic review of 121 articles yielded the following findings: 1) growing concern about the issue of government support expectation, 2) no direct support for "only" incremental innovations as they should be supported only through tax incentives, and 3) public support should be shifted to younger and smaller technologically specialized firms (high-tech and knowledge intensive) rather than large or subsidiary companies (Jugend et al., 2020). The recent research literature has devoted relatively little attention to the topic of public support for innovation. For example, public support acts as a facilitator of collaboration on R&D&I projects (Kim et al., 2020), or public support influences the innovation persistence of Italian firms (Antonioli & Montresor, 2021). R&D&I direct public support, according to most studies, increases R&D&I spending (Pisár et al., 2020;) or supplements missing financial resources, and can reduce R&D&I risks in "efficiency-driven environments" (Baday Yldz et al., 2021). It is unsurprising that there has been an increase in spending by funds. The more pressing concern is efficiency.

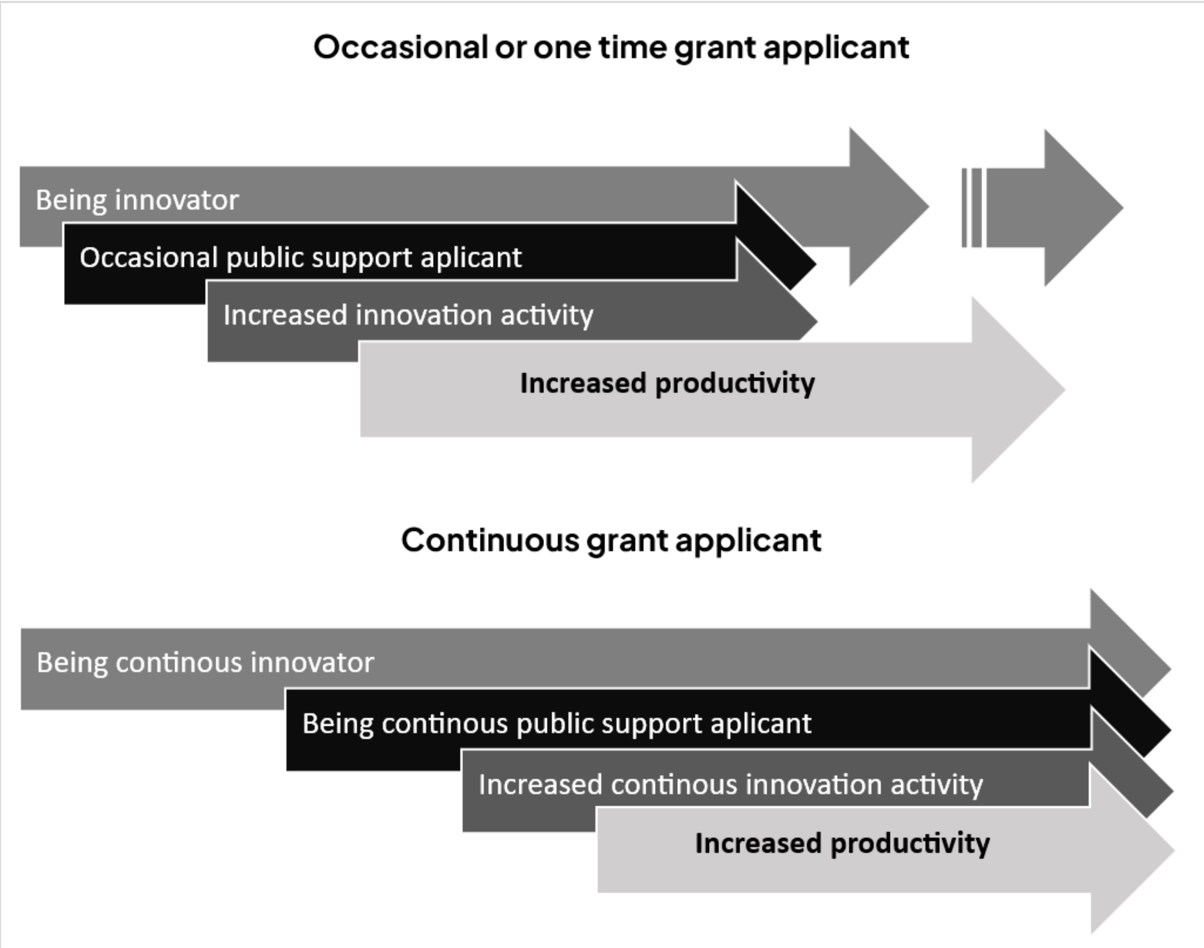
For example, the amount of support per patent output has a highly variable relationship. “*We consider five national patent applications supported by R&D grants (€189.61m; €37.92m per patent application) to be poor value for money. Azoulay et al. (2019: 119), for example, found that a $10m boost in US NIH funding led to a net increase of 2.7 USPTO patents. Bronzini and Piselli (2016: 443) showed that one additional EPO patent application required a grant of between €0.206m and €0.310m to an Italian firm.*” (Baláž & Jeck, 2022, pp. 122). It is evident that the patents must be economically exploitable for commercialisation purposes, otherwise they cannot be patented. It is therefore not possible to ascertain their potential for generating revenue. On average, we can expect these figures to be somewhat closer not far apart.

Poor use of public funds was observed in China, where politically connected enterprises were more likely to receive funding from local government R&D&I programs rather than central government programs, resulting in subsidy misuse (Ren et al., 2023). In comparison to a control group, the efficiency of R&D&I subsidies aimed at Korean SMEs in manufacturing revealed no effect on productivity and efficiency (Hwang & Oh, 2023). Although this review of recent literature is not exhaustive, it is evident that R&D&I spending and collaboration on innovation projects involving public funds can have a positive impact.

Materials and Methods

The objective of this study is to examine the potential for a Peltzman effect in the context of innovation policies that utilise direct subsidies (public grants). In order to achieve this, it is first necessary to gain an understanding of the relationship between direct state support for innovation projects and the characteristics of the companies and industries in question. Possible causal links are based on both one-time and ongoing public support (Figure 1).

Figure 1: Assumed possible causal links between public support and innovation activities



It should be noted that this assistance does not have to be provided on an annual basis, given that many small and medium-sized businesses lack the capacity to participate in multiple innovation projects simultaneously. These presumed causal links are not the only ones in the economy, as there is a mix of these two with gaps in the application process (occasional innovators) or simply a shift in corporate strategy. If the grant applicant is not a one-time, isolated event, the causal link may be obscured in the ongoing activities.

In order to gain insight into the relationship between direct public support, continuous innovators, and turnover growth, we will employ the concept of probit probability to get any direct public support (local government, central government, European Union, and Framework/Horizon projects), being a continuous or occasional innovator, and the standard ordinary least squares procedure to understand the relationship between turnover growth of innovators and being an occasional innovator and getting public support.

The first two equations will determine if there is any relationship between those two variables (Table 1). If there is endogeneity involved between these two, the third step would be biased. We can use estimated values $\hat{c}_i^*$ and $\hat{s}_i^*$ in the growth equation to control for some degree of endogeneity. This step assumes that we have good instruments and uniquely identified equations. For public support, we will use variables dealing with the types of marketing and organizational innovations. For continuous and occasional innovators, we will use the types of expenditures (fixed assets, external knowledge, and training). For the growth equation, we will use employment growth and market orientation variables (local, national, European, and world markets).

Table 1: Estimation procedure

Dependent variable	**Estimation procedure – pooled sample**
Innovation public support (s_i^*)	$\begin{cases} s_i^* = 1 \; if \; r_i = (X_{1i}\beta_1 + \varepsilon_{i_1} + \omega c_i^*) > 0 \\ s_i^* = 0 \quad\quad if \; s_i \leq 0 \end{cases}$
Continuous and occasional innovators (c_i^*)	$\begin{cases} c_i^* = 1 \; if \; c_i = (X_{2i}\beta_2 + \alpha s_i + \varepsilon_{i_2}) > 0 \\ c_i^* = 0 \quad\quad if \; c_i \leq 0 \end{cases}$
Turnover growth of innovators (g_i^*)	$g_i^* = (g_i \mid (R\&D \; expenditures > 0) =$ $= X_{3i}\beta_3 + \omega c_i + \alpha s_i + \varepsilon_{i_3}$

These three models are exploratory in nature and are subject to a number of limitations. These include the omission of key variables such as the registered number of employees and the level of fixed assets. Additionally, there is a risk of endogeneity bias, whereby the relationship between productivity growth and input factors may be distorted. Furthermore, the models may be subject to selection bias, whereby start-ups, exits and micro-companies may be underrepresented. This is due to the limited data availability. Nonetheless, we can assume some degree of possible causal links, as shown in Figure 1, with some level of imprecision in beta coefficients, and discuss these relational results. All of the models used heteroscedasticity with robust standard errors, and the probit results were interpreted as mean marginal effects. Control variables identifying the main activity (2-digit NACE code) will be added to the second model in each equation as a robustness test (Table 1). This estimation procedure made use of datasets from European Community Innovation Surveys (CIS) that are available as scientific-use files (SUF - partially anonymized data) and secure-use files from Eurostat. We specifically used a dataset from a previous study (Vokoun & Dvouletý, 2022) and limited it to a case of the Czech CIS dataset in 2014 (Table 2).

Table 2: Summary statistics

Dependent Variables	**Obs**	**Mean**	**Std. D.**	**Min**	**Max**
Public Support – Any direct support	960	.47	.499	0	1
Continuous and occasional innovators (c)	960	.429	.495	0	1
Turnover growth (thousand euros)	948	1.84	12.161	-9	242
Independent and control variables	**Obs**	**Mean**	**Std. D.**	**Min**	**Max**
Size 250 employees and more	5198	.193	.395	0	1
Size 50 to 249 employees	5198	.262	.44	0	1
Size under 50 employees	5198	.545	.498	0	1
Herfindahl index	5162	891.81	1103.04	42.49	5211.90
Employment growth	5132	.867	5.42	-9	176
Innovators with non-zero R&D expenditures	5198	.185	.388	0	1
Cooperation with a competitor	960	.075	.264	0	1
Acquisition of fixed assets in innovation project	959	.751	.433	0	1
Market orientation World	955	.103	.304	0	1
Market orientation Europe	955	.348	.476	0	1
Market orientation National	955	.453	.498	0	1
Market orientation Local	955	.096	.295	0	1
Size 250 employees	960	.355	.479	0	1
Size 50 to 249 employees	960	.311	.463	0	1
Size under 50 employees	960	.333	.472	0	1
Herfindahl index	950	871.81	1022.05	42.49	5211.90
Employment growth	948	1.271	5.961	-9	113
Marketing innovation – Pricing	960	.135	.342	0	1
Marketing innovation – Placement	960	.26	.439	0	1
Marketing innovation – Promotion	960	.409	.492	0	1
Marketing innovation – Packaging	960	.384	.487	0	1
Organizational innovation – External relations	960	.17	.376	0	1
Organizational innovation – Responsibilities	960	.422	.494	0	1
Organizational innovation – Procedures	960	.327	.469	0	1
Cooperation on innovation project	960	.542	.499	0	1
Public Support – Framework program	960	.077	.267	0	1
Public Support – EU programs	960	.257	.437	0	1
Public Support – Government programs	960	.376	.485	0	1
Public Support – Local governments	960	.077	.267	0	1

There are 5198 observations, and 18.5% (N=960) of the companies are innovators with non-zero R&D expenditures. Only about 54% of the total sample (N=5198) is comprised of small businesses, indicating that these businesses are underrepresented.

Almost half of Czech innovators (47%) received direct support, with government and EU structural development programs being the most popular. There are 42,9% continuous or occasional innovators.

Results

Table 3: Probability of getting direct public support among innovators in the Czech Republic in 2014

Public Support – Any direct support of innovation	**(1) Probit ME**	**(2) Probit ME**
Continuous and occasional innovators (c)	0.194***	0.180***
	(0.036)	(0.038)
Size 50 to 249 employees	0.195***	0.188***
	(0.043)	(0.045)
Size 250 employees and more	0.222***	0.214***
	(0.045)	(0.050)
Cooperation with a competitor	0.235***	0.198***
	(0.072)	(0.074)
Total R&D Expenditures (LN)	0.0521***	0.0474***
	(0.0095)	(0.0096)
Organizational innovation – Procedures	-0.0336	-0.0507
	(0.047)	(0.049)
Organizational innovation – Responsibilities	0.0464	0.0777*
	(0.042)	(0.043)
Organizational innovation – External relations	0.0390	0.0154
	(0.058)	(0.059)
Marketing innovation – Packaging	-0.0755*	-0.0623
	(0.039)	(0.042)
Marketing innovation – Placement	0.00656	0.0332
	(0.042)	(0.044)
Marketing innovation – Promotion	0.0318	0.0569
	(0.047)	(0.049)
Marketing innovation – Pricing	-0.0499	-0.0492
	(0.058)	(0.061)
Herfindahl index, HHI	0.0000209	0.000168**
	(0.000017)	(0.000072)
Main NACE activity – control variables	No	Yes
Observations	933	930
Pseudo R^2	10.7%	17.6%

Note: Robust standard errors in parentheses, * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

The capacity of the firm to obtain public support funding and being a continuous and occasional innovator, the size of the company, the ability to collaborate with competitors, and the extent of R&D expenditures in the innovation project all have a positive mutual relationship. Controlling for industry specifics, this probability is higher in more concentrated markets, as measured by an increase in the Herfindahl index. When we consider marginal effects at mean values and the second more efficient model (Model 2, Table 3), the likelihood of receiving direct public support is 18% higher if the company is a continuous or occasional innovator. Larger companies have an 18.8-21.4% higher chance of receiving public funding. Cooperation with a competitor increases the likelihood of receiving public funding by 19.8%.

Table 4: Probability of being continuous or occasional innovator among innovators in the Czech Republic in 2014

Continuous and occasional innovators (c)	**(3) Probit ME**	**(4) Probit ME**
Any direct public support of innovation (s)	0.197***	0.184***
	(0.036)	(0.038)
Size 50 to 249 employees	0.0125	-0.00765
	(0.046)	(0.048)
Size 250 employees and more	0.166***	0.138**
	(0.051)	(0.056)
Cooperation with a competitor	0.137**	0.140**
	(0.065)	(0.070)
Total R&D Expenditures (LN)	0.0258***	0.0326***
	(0.0085)	(0.0093)
Herfindahl index, HHI	0.00000284	-0.0000222
	(0.000017)	(0.000056)
Training for innovative activities	0.0872**	0.0978**
	(0.037)	(0.038)
Acquisition of external knowledge	0.227***	0.248***
	(0.043)	(0.045)
Acquisition of machinery, equipment and software	-0.0409	-0.0538
	(0.042)	(0.045)
Part of an enterprise group	0.0930**	0.0813*
	(0.040)	(0.043)
Main NACE activity – control variables	No	Yes
Observations	928	919
Pseudo R^2	11.9%	14.9%

Note: Robust standard errors in parentheses, * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

The capacity to innovate continuously and occasionally is associated with a number of factors, including the ability to obtain direct public funding, the capacity to collaborate with competitors, the size of the company, which should have more than 250 employees, its position within a corporate group, the extent to which innovation projects involve employee training, the acquisition of external knowledge, and the level of R&D expenditures involved in the innovation projects.

It is somewhat surprising to note that this is not related to the acquisition of long-term fixed assets such as machinery, equipment, and software in innovation projects. When we consider the marginal effects at mean values and the second more efficient model (Model 2, Table 3), the probability of being a continuous or occasional innovator is 18.4% higher if the company has the ability to get direct public support, 13.8% higher if the company is large, 14% higher if the company collaborates on innovation projects with competitors, 9.8% higher if their innovation activities include training, and 24.8% higher if it includes acquisition of external know-how.

Table 5: Turnover growth of innovators in the Czech Republic in 2014

Turnover growth in thousand euros	**(5) OLS**	**(6) OLS**	**(7) OLS**	**(8) OLS**
Any direct public support of innovation (s)	-2.431**	-1.126*	-11.52**	-2.539
	(1.13)	(0.61)	(4.67)	(1.95)
Continuous and occasional innovators (c)	-0.0282	-0.257	3.884	-0.137
	(0.96)	(0.95)	(2.77)	(3.03)
Size 50 to 249 employees	-0.219	-1.063*	1.137	-0.744
	(0.52)	(0.61)	(0.82)	(0.63)
Size 250 employees and more	1.331	-0.362	2.226	0.00439
	(1.40)	(0.87)	(1.65)	(0.92)
Acquisition of machinery,	1.530**	0.940	1.569**	1.084*
equipment and software	(0.74)	(0.59)	(0.76)	(0.60)
Employment growth	0.303**	0.324**	0.321**	0.325**
	(0.13)	(0.13)	(0.13)	(0.13)
Control variables#	Y	Y	Y	Y
Main NACE activity – control variables	No	Yes	No	Yes
Instrumentalized Support (s) and Continuous (c) variables	No	No	Yes	Yes
Constant	-1.255	-0.227	-0.347	0.128
	(1.36)	(1.50)	(1.20)	(1.63)
Observations	932	932	907	907
Adjusted R^2	3.2 %	17.4%	5.3%	17.5%

Note: Robust standard errors in parentheses, * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$, #Control variables: Market orientation variables (0/1: National, EU, World market), HHI and HHI squared, in-house R&D (0/1), being part of a group (0/1), and cooperation on innovation project (0/1).

More sophisticated models could not be used to estimate the growth or performance measured by sales per employee or rentability models could not be used due to a lack of data on detailed costs and revenues, the sum of fixed assets, or the number of registered employees. In Table 5, models 5 and 6 estimate the relationship between non-instrumentalized support (s) and continuous innovator (c) variables. Controlling for industrial effects, we find a negative relationship between public support for innovation and turnover growth (Model 6).

When the variables for support (s) and continuous innovation (c) are instrumentalized, the initial negative effect in model 7 disappears (Table 5), and there is no statistically significant relationship in model 8. Being a continuous innovator among all innovators has no effect on turnover growth on average. There is a clear relationship between employment growth and the acquisition of fixed assets in the innovation project (machinery, equipment, and software).

Discussion

The provision of direct subsidies serves to mitigate the inherent risks associated with the undertaking of innovative activities, thereby encouraging a greater propensity amongst businesses to engage in such endeavours (Vokoun, 2017; Vokoun & Dvouletý, 2022). According to the Peltzman effect, businesses can now engage in more innovative activities (financial risk reduction). If the year 2014 was not the most unsuccessful for Czech innovators, it appears that they were rather careless and wasteful in doing so, rather than engaging in riskier and daring innovation projects because public subsidies have on average no effect on turnover growth (cf. similar no effect in Korean firms Hwang & Oh, 2023).

The findings indicate that the probability of being a continuous or occasional innovator is contingent upon the receipt of direct public support, and vice versa (as in Antonioli & Montresor, 2021). The results indicate that there is no statistically significant effect on turnover growth of continuous and occasional innovators, and direct public support of innovation activities has no additional positive effect. In most of the models, public support had a negative effect on turnover growth, which became less significant when we controlled for industry specifics. Given the data limitations, the turnover growth equation is more of a proxy for performance growth or maximization of company value. To better capture the effect of subsidies, we must account also for the delays in the effects of subsidies on company performance. Dynamic panel data estimation is the way to test it in the future research.

The findings indicate that firms may favour projects that are perceived as "safe" in terms of subsidies, and that the effect on turnover growth is ultimately neutral (cf. Jugend et al., 2020). Given that nearly half of innovators (47%) received some form of direct innovation support, we can see a shift in responsibility for funding innovation to the government. The threat here is market distortions and inefficient allocation of resources.

It is possible that firms may become increasingly focused on meeting the requirements for specific announced public grants rather than on true innovation. Further research into crowding-out is required. Subsidies are received by businesses and incorporated into their investment plans and R&D budgets. Even if subsidies were not available, firms could still carry out these research projects, either with their own funds or through other sources of funding. If this is the case, there is no risk mitigation and only inefficient allocation of resources. The likelihood of being a continuous or occasional innovator, i.e. a regular innovator, is strongly dependent on adaptational activities cantered on training and acquisition of external resources. We do not observe activities related to long-term assets, such as the acquisition of machinery, equipment, and software, which may be considered more pro-growth than training and knowledge acquisition.

The findings also indicate that competitors are engaged in collaborative endeavours pertaining to publicly funded innovation projects (cf. collaboration effects in Kim et al., 2020), which is a positive indicator of the likelihood of receiving direct support for innovation activities. The Czech innovators sample comprises 66% medium and large businesses. The issue is that they may be able to collaborate not only on technological innovation but also on other strategic decisions.

It can be observed that there is a 20% increase in the probability of larger and medium-sized companies receiving direct public support for innovation activities. This state supported cooperation among large firms (they are allowed in innovation programs such as Horizon government programs in the EU) has the potential to result in a reduction in competition, which raises ethical and legal concerns. It can be difficult to distinguish legitimate research collaboration from anti-competitive efforts.

It would be beneficial to conduct further research into this topic, with a more detailed analysis. More countries and CIS waves can be included to the data pool and control for delayed effects of public support should be provided. Collaboration among large firms has the potential to exclude smaller firms from receiving R&D funding, reducing diversity and competition in the innovation landscape.

Conclusion

This study explores the intricate dynamics of innovation policies and their potential unintended consequences, with a special emphasis on the Peltzman effect in the context of direct subsidies for innovation projects. The study is based on the 2014 Czech innovation dataset and a thorough review of the literature on the efficacy of public support for innovation.

The central premise is that knowledge generated through innovation is for the public good. This leads to issues of limited appropriability and the challenge of mitigating risks associated with ambitious innovation projects. The Peltzman effect, a concept that highlights changes in behaviour in response to altered risks, serves as a lens through which the paper investigates whether companies, when incentivised by direct subsidies, opt for safer, less ambitious projects rather than riskier, ground-breaking innovations.

The findings suggest a positive correlation between firms that receive direct public support and their propensity for continuous or occasional innovation. However, the paper also reveals a more nuanced picture of the impact on turnover growth, indicating that, on average, public subsidies do not contribute significantly to increased turnover.

The study identifies potential concerns regarding market distortions and inefficient resource allocation, as firms may prioritize projects aligned with subsidy criteria over true high-risk innovation. Furthermore, collaboration among large firms in publicly funded projects may introduce ethical and legal concerns pertaining to competition.

Although the models are exploratory in nature, the study offers valuable insights into the complex dynamics of innovation ecosystems, the role of public support, and the potential trade-offs associated with policy interventions. Future research directions could include expanding the dataset, incorporating dynamic panel data estimation to account for delayed effects, and delving deeper into the dynamics of collaboration among large and small firms. This study urges continued scrutiny and refinement of innovation policies to ensure effective promotion of genuine and impactful innovation while minimising unintended consequences.

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