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Edited by:
Viktorie KLÍMOVÁ
Vladimír ŽÍTEK
(Masarykova univerzita / Masaryk University, Czech Republic)

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EFFECTS OF PUBLIC PROCUREMENT CONTRACT ON FIRM PRODUCT AND SERVICE INNOVATION – CASE STUDY OF CZECHIA, SLOVAKIA AND NORWAY

Motivační účinky veřejných zakázek na produkci inovovaných výrobků a služeb - případová studie ČR, SR a Norska

SOLOMON GYAMFI

HENRY JUNIOR ANDERSON

VIKTOR PROKOP

Ústav ekonomických věd | *Institute of Economic Sciences*
Fakulta ekonomicko-správní | *Faculty of Economics and Administration*
Univerzita Pardubice | *University of Pardubice*
✉ *Studentská 95, 532 10 Pardubice, Czech Republic*
E-mail: solomon.gyamfi@upce.cz, henry.anderson@upce.cz, viktor.prokop@upce.cz

Abstract
The public sector economy accounts for a large size of the National market demand for goods and services. Many scholars have tipped public procurement as an attractive measure to help boost innovation in firms for the state to achieve its innovation goals. But there has been a worrying case mainly by actors within the public sector and scholars to explore this policy instrument to support innovation. In light of the above, the research seeks to analyze the effect of public procurement contracts on the firm's product and service innovation. Using logistic Regression model for the CIS 2014 data we analyze this effect in the case of the Czech Republic, Norway and Slovakia. Our empirical results showed that, the use of this policy instrument is dependent mostly on the type of innovation. We found that firms received contracts to execute projects from the public sector for service provision in all cases but in the case of product innovation, only Czech Republic firms did receive a public contract. Nevertheless, innovation was required when firms are contracted to provide services for the public sector only in the Czech Republic and Slovakia regarding product innovation.

Key words
public sector, procurement, innovation, case study

Anotace
Veřejný sektor alokuje veřejné prostředky do produkce zboží a služeb. Mnoho ekonomů vnímá veřejné zakázky jako efektivní způsob, jak motivovat firmy, aby inovovaly svoji produkci v rámci uspokojování poptávky veřejného sektoru po určité produkci. Existují však negativní pohledy na motivační roli veřejných zakázek. Vzhledem k výše uvedenému si tento příspěvek klade za cíl analyzovat vliv veřejných zakázek (coby motivačního prvku) na ochotu firem inovovat své výrobky a služby. Pomocí modelu logistické regrese a dat CIS 2014 analyzujeme motivační efekt veřejných zakázek ve třech vybraných regionech EU: Česká republika, Norsko a Slovensko. Empirické výsledky ukázaly, že efektivita využití tohoto politického nástroje závisí především na typu inovací. Výsledky potvrdily očekávání, že firmy, které získaly veřejnou zakázku, jsou nuceny inovovat, což platí především o firmách z Česka a Slovenska.

Klíčová slova
veřejný sektor, veřejná zakázka, inovace, případová studie

***JEL classification**: P35, H57*

1. Introduction

Demand for innovation has been highlighted as a significant source in the quest to extract innovation from private sector firms. Evolving in the early 1980s, public procurement as a tool hasn't garnered much attention and application in both international and National context until the early 2000s (Edler and Georghiou 2007). Much of the support of this initiative was garnered from policy reports and expert analysis regarding how to resurrect the failing private expenditure investment for innovation. This began in early 2004 when three governments sent a position paper to the European Council with an ardent call to renew and reinvigorate innovation across the European Union (French/German/UK Governments, 2004, p.7). Even after "Kok Report" recognized procurement as a strategy of pioneering market for innovative product provision, the European Council furthered on to admonish and propose to member states to makes job provision and growth prospects their central focus openly calling on member states to focus on public procurement of innovative products in the Lisbon Strategy (European Council, 2005). This ushered in the wave of public procurement directly aimed at expediting innovation mostly in private ventures and even public ventures as well.

Various literatures have endorsed the use of public procurement as a tool in the quest to supplement innovation requests. Aschoff and Sofka (2008) researched on German firms and found heterogeneous effect of public procurement on innovation. Georghiou et al. (2014) addressed the deficiencies of effective public procurement and added that public procurement can also incentivize innovation by being responsive to innovation through the purchase of recent but recognized innovations that are new to the organization. Uyarra (2010) expressed concern that demand is very specific to local problems and issues may make procurement difficult to access to outsiders effectively deterring potential innovators and reducing the impact of market creation and even the adoption and spillover effects of the innovation. Research of Aschoff and Sofka (2008) pointed out the selective impact that public procurement could potentially be giving the impression the initiatives to utilize public procurement as a tool to spark private and public sector innovation efforts are usually tied to the economic status of a region and the firm size. Having known mass of literature expressing evidence of public procurement contracts and even differentiated impacts and barriers they face, we aim to assess the whether the provision of public procurement contracts and inclusion of the occurrence of innovation as a precondition for the contract affects product and/or service innovation. Our research will be conducted on the Czech Republic, Slovakia and Norway to capture countries with different economic performance and even different innovation performance as well on the European Innovation Scoreboard (2018).

The next section of the paper will discuss the literature on public procurement and innovation; the third section will cover the data sources and the methods used, the next will report and discus results of the research, followed by the conclusion and the list of literature.

2. Literature review

European member states have gradually and successfully ushered in public procurement in an effort to supplement the then failing and falling business investment in research and development expenditure (Edler and Georghiou 2007). Attention had been given to the prospect of public procurement in literature but little had been done to explore the influence of demand on innovation especially in the industrial revolution (Malerba 2007) Even though the concept was earlier explored and given the green light by researchers in the early 1980s, the theory only came into prominence in the late 2000s that it came into prominence (Mowery and Rosenborg, 1979; Rothwell and Zegveld, 1981). However, having found that public demand spurs on innovative dynamics and spillovers when oriented towards innovative products and solutions (Edler and Georghiou 2007), public procurement was incorporated as an element of the European Commission's Research Investment Action Plan to raise expenditure to 3% Barcelona target following the work of an expert group (Georghiou et al. 2003).

In contemporary times, practical evidence has endorsed the essence of public procurement as a policy strategy for the firm and regional innovation. The use of this tool in support of innovation have been backed by the recommendations of a number of inquiries, reports and policy documents, both at EU (Lember, Kalvet, Kattel, Penna and Suurna 2007) and National level (Stern, Hellman, Rijnders-Nagle, Terrell, Astrom 2011) Aschoff and Sofka (2008) researched on 1,100 innovative firms in Germany to assess the degree to which innovation sources including public procurement stimulates innovation. They found that public procurement and knowledge spillovers from Universities were both equally significant propellers of innovation. They also found that public procurement effect on innovation was more effective in small firms in regions under economic turmoil as in delivery and technology services. In spite of the pre-established connection of public support and innovation, Uyara and Flanagan (2009) argues that procurements that are undertaken with the sole objective of spurring innovation is likely to fail due to the fact that most efforts aimed at utilizing public procurement to generate innovation have not been an intentional or deliberately induced effort to accelerate the course of innovation but rather a by-product of

an innocent public procurement effort. He went further to imply public procurement as being of a multi-objective stature with the sole objective of ensuring the quality of government services and the use of product and services in the interest of the citizenry.

However, not all public procurement efforts can even be genuinely termed as innovative. According to Aschoff and Sofka (2008), it can only be termed as innovative when the public entity announces its intention to accelerate innovation policy instrument with public procurement as a policy tool such as the use of public technology procurement. In this regard, public procurement becomes effective in stimulating the generation and diffusion of technologies if the functional requirements of the product are only defined by the government leaving the design and achievement prescriptions. Furthermore, the creation of framework conditions, establishing organisational frameworks and developing capabilities, identifying, specifying and signalling needs, and incentivising innovative solutions are efforts needed to shape up public procurements in contributing to firm innovation (Georghiou, Edler, Uyarra and Yeow 2014). They also revealed that barriers encountered by firms were deficiencies revealed by policies but improperly addressed as a result of lack of coverage, lack of ownership by purchasers, failure to address the whole cycle of acquisition and to address risk aversion as well.

Having found that the impact of public procurement differs on country and firm basis as well, the evidence of public procurement innovative proponents in EU countries (Lember, Kalvet, Kattel, Penna and Suurna 2007) in spite of the barriers (Uyarra, Edler, Garcia- Estevez, Georghiou and Yeow 2014; Eadie, Perera and Heaney 2007) we are of the belief that public procurement proper structures have been set up in the European Union to accommodate the innovation drive of public procurement and significant factor in driving innovation. However, very little research had been done in the Czech Republic and Slovakia especially. These two countries are especially growing economies when compared with countries in the common market like Norway and Germany, economically (Eurostat 2016). Hence, we'll focus our research on the Czech Republic, Slovakia and Norway effectively considering countries at different stages of economic growth in line with findings of Aschoff and Sofka (2008) whilst focusing on product and process innovation to enable us to identify the differentiated impacts of the public procurement efforts on which particular innovation type in different countries with widely different economic performance. Therefore, based on the literature above, we create the hypothesis that,

H1a: Procurement contracts for domestic public sector organizations significantly affect product innovation
H1b: Procurement contracts for domestic public sector organizations significantly affect service innovation.
H2a: Innovation as a non – requirement of public procurements contracts does not spur product innovation
H2b: Innovation as a non – requirement of public procurements contracts does not spur service innovation.
H3a: Innovation as a requirement of public procurements contracts spurs p innovation.
H3b: Innovation as a requirement of public procurements contracts spurs service innovation.

3. Data and Methodology

The data used for the empirical analysis was sourced from the Harmonized European Union Community Innovation Survey (CIS) 2012-2014 which specifically require respondent firms to indicate within the time-space of the survey if they engaged in any procurement contracts for the domestic public sector. The survey questionnaire further asks firms to specify whether such procurement contracts demand innovation as part of the contract execution which is seen as a form of support for innovation by the public sector. In order to empirically ascertain government support for innovation through procurement contracts or otherwise, we have selected these variables as shown in the table below.

Tab. 1: Selected variables for the research

Variables	Abbrev.	Description
Dependent Variables	inpdgd	Introduced onto the market a new or significantly improved good
	inpdsv	Introduced onto the market a new or significantly improved service
Independent Variables	pubdom	Procurement contracts for domestic public sector organisations
	pbinn	Undertook innovation activities (enterprise with procurement contract)
	pbnoct	Innovation not required as part of the contract
	pbinct	Innovation required as part of the contract
	rmac	Engagement in acquisition of machinery for innovation
	rmar	Engagement in market introduction of innovation
	marnat	National market (other regions of country)
	marloc	Local/regional market (within country)

Source: CIS 2014

A logistic regression analysis was used for the empirical analysis because the CIS data provides dichotomous variables which make the analysis feasible and fit by, the use of binary logistic regression (source). The logistic model used for the model computation is given by the formula:

$$Inpdgd/\ Inpdsv = \beta 0 + \beta 1(pubdom)x + \beta 2(pbinn)x + \beta 3(pbnoct)x + \beta 4(pbinct)x + \beta 5(rmac\text{-})x + \beta 6(rmar)x + \beta 7(marnat)x + \beta 8(marloc)x + \varepsilon x \quad (1)$$

where the model is used to ascertain the influence or effect of firms dealing with procurement contracts from the domestic public sector organizations on the firm's product and service innovations.
Three European countries, the Czech Republic, Slovakia and Norway were selected for the empirical analysis. All the three countries are respondents to the CIS and are ranked as moderate innovators in the case of Czech Republic and Slovakia and Norway, a strong innovator per the European Innovation Scoreboard 2018 rankings. With the differences in innovation rankings and economic prowess determined by their public expenditure, we have the motivation to find out how these countries economically support firms for their innovation through public procurement contracts.

4. Result and discussion

The empirical model included all firms in the selected countries with the sample size amounted to 13033 large and small and medium-size firms engaged in all kinds of business activities in the selected countries The sample size included 5098, 5045 and 2790 firms for the Czech Republic, Norway and Slovakia respectively. The empirical analysis rather shows a mixed result and difference between firm product and service innovation. This could be attributed to the nature of public expenditure which is inclined to service provision than product provision. Generally, the correlation between the dependent variables and specifically procurement contract independent variables were weak signalling rather the non-usage or rather the less effective use of this support system to boost innovation in the selected countries by the public sector.

As it can be seen in table 2 below, the empirical analysis showed a negative significant effect of public sector procurement contracts on firm product innovation in the Czech Republic and Norway. This confirms H1a in both countries except Slovakia. This shows that the public sector does not engage in firm product innovation support due to barriers as found by Georghiou et al (2014) and Uyarra et al, (2014). They outlined some dificiencies UK firms experience in their procurement dealings with the public sector organisations which they noted as a key barrier, lack of expertise in some countries. The finding is consistent with Aschhoff & Sofka (2009) who found that public procurement had a significant effect on innovation success but rather through general administrative procurement (services) but not in security procurement which demands more product specification.

Tab. 2: Firm's product innovation

Independent variables	**Czech Rep. β (p-value)**	**Norway β (p-value)**	**Slovakia β (p-value)**
pbinn	0.370 (0.645)	0.096 (0.848)	-1.294(0.304)
pubdom	-0.387 (0.001)***	-0.219 (0.025)*	-0.201(0.403)
pbnoct	0.798 (0.276)	-0.058 (0.901)	0.344 (0.729)
pbinct	-0.214 (0.763)	0.582 (0.206)	2.838 (0.010)**
rmac	1.874 (0.001)***	1.620(0.001)***	2.808 (0.001) ***
rmar	2.175 (0.001) ***	1.707 (0.001)***	2.494 (0.001) ***
marnat	0.736 (0.001) ***	0.691 (0.001)***	0.360 (0.139)
marloc	-0.382 (0.001)***	-0.627 (0.001)***	0.221 (0.264)
McFadden R^2	0.322	0.287	0.390
Cronbach's α	0.608	0.667	0.565
No. of Obs.	5198	5045	2790

Note: significance* p <. 05, ** p <. 01, *** p <. 001

More so, innovation as a non – requirement for public procurement contracts had no impact on product innovation thereby rejecting H2a for all countries. However, innovation orientation of public sector procurement was found significant on product innovation only in Slovakia. This effectively accepts H3a and rejects it for the other countries.

On the other hand, regarding firm service innovation, the empirical model showed a positive significant effect of public sector procurement on the firm's service innovation in all countries. This confirms H1b in all countries. Contracts received by firms in the Czech Republic with innovation required as part of the contract had a significant effect on service innovation. This confirms that H3b was accepted in the Czech Republic and rejected for both countries. Innovation not instated as a factor for public procurement contracts was, however found to be insignificant for all countries concerned effectively rejecting H2b. For firms which engaged in innovative activities and sold goods and services within the local and national markets in the Czech Republic, the requirement for innovation rather had a negative effect on the firms' service innovations.

We infer that this negative effect may be coherent in the barriers mentioned above and also, the lack of incentive for public sector buyers to take a risk in procuring services from the firms with incremental innovation characteristics. The long term nature as well as the risk of criticism from government auditors may account for the non-requirement of innovation as a part of the innovative public sector procurement process.

Tab. 3: Firm's service innovation

Independent Variables	Czech Rep. β (p-value)	Norway β (p-value)	Slovakia β (p-value)
pbinn	1.908 (0.005) ***	0.998 (0.025)**	0.665 (0.520)
pubdom	0.629 (0.001)***	0.200 (0.038)**	0.610 (0.012)**
pbnoct	-1.025 (0.103)	-0.153 (0.711)	-0.363 (0.664)
pbinct	-1.170 (0.052)*	-0.438 (0.280)	0.131 (0.881)
rmac	1.552 (0.001)***	1.214 (0.001)***	2.644 (0.001)***
rmar	1.192 (0.001)***	1.224(0.001)***	1.373 (0.001)***
marnat	0.249 (0.043)**	0.537(0.001)***	0.457 (0.156)
marloc	0.270 (0.014)**	0.330 (0.010)**	0.010 (0.965)
McFadden R^2	0.203	0.193	0.317
Cronbach's α	0.608	0.667	0.565
No. of Obs.	5198	5045	2790

Note: significance* p <. 05, ** p <. 01, *** p <. 001

5. Conclusion

The research seeks to analyse the public sector innovation support through procurement contracts. In sum, the research sought to find out the effect of procurement contracts from the public sector on firm product and service innovation. There are challenges associated with public procurement to trigger innovation. This is because, both the demand and supply sides of innovation measures has certain inefficiencies and difficulties such as lack of understanding to assess the market opportunities by the innovative public procurement process. There is also a disincentive for the public sector to demand innovation in procurement contracts due to fear and risk associated with the product or services because the risk of the new product usage are apparent so public sector buyers would rather prefer already innovative product in the market to deliberately spurring innovation in firms. With these identified problems, we used the demand side public procurement support system to analyse the case of the Czech Republic, Norway, and Slovakia. Using the CIS 2014 data, we have identified that despite the strong campaigns and propagation for the adoption of innovative procurement processes to spur innovation, the public sector in the selected countries is not badging to the call.

The findings of the research have shown that even when the public sector of the selected countries contract firms to execute projects and programmes, there is no inclusion of strict requirement, demanding for the firms to undertake innovation. But we must hasten to add that this is the case for product innovation for two of the selected countries (the Czech Republic and Norway) which confirms H1a in two of the three countries except Slovakia. This shows that, the public sector does not engage in firm product innovation support due to some barriers in the procurement process. And for service innovation, only the Czech Republic included innovation in the procurement contract. Conversely, even when there is such requirement in place, its effect on the firm product and service innovation was negative as shown by the result. Thus, innovation as a non-requirement for public procurement contracts had no impact on product innovation thereby rejecting H2a for all countries. However, innovation orientation of public sector procurement was found to be significant on product innovation only in Slovakia. This effectively accepts H3a and rejects it for the other countries.. In the Czech Republic, public procurement contract with innovation required as part of the contract had a significant effect on service innovation. This confirms that H3b was accepted in Czech Republic but rejected for the other two countries. Innovation not included as a factor

for public procurement contracts was, however found to be insignificant for all countries concerned effectively rejecting H2b.

These worrying phenomena require pragmatic solutions and more attention if the public sector needs to encourage firm innovativeness. The overarching difficulties may be that the public sector is relying heavily on the supply side of the innovation measures, that is, overusing the finance and support instruments. We therefore urge, as a policy requirement, the selected countries to explore the deliberate linkage of both sides of the innovation policy measures or switching the attention to the demand side and joining the linkages. Exploring the intermediation of third parties in public procurement processes could be used as an alternative measure.

Literature

[1] ASCHHOFF, B., SOFKA, W., (2009). Innovation on demand—Can public procurement drive market success of innovations?. *Research policy*, vol. 38, no. 8, pp.1235-1247. DOI 10.1016/j.respol.2009.06.011.

[2] EADIE, R., PERERA, S., HEANEY, G., CARLISLE, J., (2007). Drivers and barriers to public sector e-procurement within Northern Ireland's construction industry. *Journal of Information Technology in Construction*, vol. 12, pp. 103-120. ISSN 1874-4753.

[3] EUROPEAN COUNCIL, (2005). Brussels European Council 22/23 March 2005, Presidency Conclusions. Brussels, 23 May 2005, Available from: http://ue.eu.int/ueDocs/cms Data/docs/pressdata/en/ec/84335.pdf

[4] FRENCH, GERMAN, UK GOVERNMENTS, (2004). Towards and innovative Europe. A Paper by the French, German and UK Governments, Available from: http://www.hm-treasury.gov.uk/media/C0B/BF/towards_innov_europe 200204.pdf

[5] GEORGHIOU, L., EDLER, J., UYARRA, E., YEOW, J., (2014). Policy instruments for public procurement of innovation: Choice, design and assessment. *Technological Forecasting and Social Change*, vol. 86, pp.1-12. DOI 10.1016/j.techfore.2013.09.018.

[6] LEMBER, V., KALVET, T., KATTEL, R., PENNA, C., SUURNA, M., (2007). *Public procurement for innovation in Baltic metropolises*. Tallinn: Tallinn University of Technology.

[7] MALERBA, F., (2007). Innovation and the evolution of industries. In *Innovation, Industrial Dynamics and Structural Transformation* (pp. 7-27). Berlin, Heidelberg: Springer. DOI 10.1007/978-3-540-49465-2_2.

[8] MOWERY, D., ROSENBERG, N., (1979). The influence of market demand upon innovation: a critical review of some recent empirical studies. *Research policy*, vol. 8, no. 2, pp. 102-153. DOI 10.1016/0048-7333(79)90019-2.

[9] ROTHWELL, R., & ZEGVELD, W. (1981). Government regulations and innovation—industrial Innovation and Public Policy (pp. 116-147). In: *Industrial Innovation and Public Policy.* London: Frances Pinter.

[10] STERN, P., HELLMAN, J., RIJNDERS-NAGLE, M., TERRELL, M., ASTROM, T., (2011). *How public procurement can stimulate innovative services*. Stockholm: Nordic Innovation Centre Report.

[11] UYARRA, E. (2010). *Opportunities for innovation through local government procurement*. Report No. PLG/51. London: NESTA.

[12] UYARRA, E., FLANAGAN, K., (2010). Understanding the innovation impacts of public procurement. *European Planning Studies*, vol. 18, no. 1, pp. 123-143. DOI 10.1080/09654310903343567.

[13] UYARRA, E., EDLER, J., GARCIA-ESTEVEZ, J., GEORGHIOU, L., YEOW, J., (2014). Barriers to innovation through public procurement:A supplier perspective. *Technovation*, vol. 34, no. 10, pp. 631-645. DOI 10.1016/j.technovation.2014.04.003.

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