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## REGIONAL DIFFERENCES IN OPEN INNOVATION PRACTICES IN SMEs

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### INTRODUCTION

Since the so-called industrial revolution, new and improved products, processes and services account for the majority of economic growth. Because innovation is seen as the engine of growth, policy makers are interested in stimulating innovation (OECD 2010; European Commission 2012). Policy measures are, however, largely confined to administrative borders; whereas the tendency towards internationalisation makes the innovation process more prone to outside influences and possible spillover effects (Spithoven and Teirlinck 2015).

Recently the claim is made that innovation enters a new “era” involving deliberate and intense knowledge exchanges of firms with other organisations (Chesbrough 2003). Chesbrough defines this emphasis on reliance of external knowledge relations as “open innovation”; summarising it as “the use of purposive inflows and outflows of knowledge to accelerate internal innovation, and expand the markets for external use of innovation, respectively” (Chesbrough 2006: 2).

Most previous studies have investigated open innovation practices in large companies (Chesbrough 2003). In contrast, small and medium-sized enterprises (SMEs) have received scant attention in the open innovation literature. Only recently a number of interesting studies have emerged that also consider open innovation (OI) practices in smaller firms (Laursen and Salter 2006; Lee *et al.* 2010; van de Vrande *et al.* 2009). At regional level, however, the empirical evidence on open innovation is still limited, opening up an avenue for research.

The aim of this contribution is twofold. First, the presence, use and appreciation of open innovation practices are captured by using five waves of the Community Innovation Survey of Belgium to develop indicators. Second, the relevance of these indicators is observed with respect to the region in which SMEs are located and the effects of open innovation practices on the innovative performance of SMEs.

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## THEORETICAL BACKGROUND

As the complexity of innovation, induced by technical and scientific progress, increases, the knowledge base adequacy of many SMEs in controlling all aspects of the innovation process can be questioned. This evolution requires boundary spanning activities, which – following Chesbrough (2003) – are referred to as OI practices. These OI practices are highly relevant for SMEs since they struggle with the liability of smallness; they face resource constraints, scale limitations, and have fewer technological assets to bargain with (Dahlander and Gann 2010; Chesbrough 2011).

OI is a broad concept: it involves a variety of innovation-related practices and processes in companies. Gassmann *et al.* (2010) take a “process perspective” by discussing these practices in terms of inbound, outbound, and coupled OI processes. Inbound OI points to the search strategy exploring external information sources to complement, strengthen, or speed up in-house R&D activities. Outbound OI describes external paths to commercialise internal innovations that are not used by the innovating company to develop new products or services. Coupled OI focuses on strategic alliances that unite both in- and outbound OI (Jacobides and Billinger 2006). Research cooperation and joint alliances might be considered as examples of this coupled process (for an overview of OI articles distinguishing different types of OI processes, see Dahlander and Gann 2010).

Inbound OI is a strategic choice (Lichtenthaler 2008). The key idea of OI is that firms do not operate in a vacuum. They are always scouting for new ideas and information in order to capture a higher market share or enter new market segments. In an era of OI it is acknowledged that firms heavily rely on external sources of information and combine it with internal sources of innovation. Search strategies have been identified as exerting an impact on the innovation activities of firms (Laursen and Salter 2006).

## DATA AND ESTIMATION STRATEGY

This paper uses five consecutive waves of the Community Innovation Survey (CIS), which is a major source for innovation studies and is used in many countries. The CIS is a self-reported survey where responding SMEs themselves evaluate their innovative activities. Because the survey follows the guidelines laid down in the Oslo manual (OECD 2005), the comparability over countries is more or less guaranteed (Spithoven 2013). As an extension, this survey can likewise be used to compare innovation activities across regions.

Interestingly, the CIS offers a way to capture three open innovation practices, ranging from search strategies, over external R&D acquisition to innovative collaboration, involving different types of information sources and partners, and focussing on different geographical dimensions. The search strategy of SMEs can be directed towards accessing any one or several of nine external information sources as captured in Table 1. The search strategy is captured by calculating the average score of the binary questionnaire items used to register the SMEs use of each of the nine information sources. This variable is rescaled so that it has a minimum value of 0 and a maximum value of 10. The CIS captures five different manners in which SMEs can gain access to external R&D activities (Table 1). Again the SMEs external knowledge acquisition strategy is captured by calculating the average score and rescaling this to include minimum values of 0 and maximum values of 10. Apart from buying external R&D performed by third parties, SMEs also have a tendency to engage in close collaboration with other organizations. In a collaborative agreement the focal firm and the external partner jointly innovate. The CIS respondents are requested to indicate whether they have engaged in collaborative innovation with a set of six potential partners (Table 1). This measure of cooperation was rescaled (minimum=0 and maximum=10). The three previous open innovation practices are all summated scales for which we have information on the variety (i.e. the number of items) and the intensity of their use (i.e. the rating on their use).

To examine whether OI practices in SMEs have a different effect on SME performance across regions, we follow Herstad *et al.* (2008) and use a composite indicator that captures a wide range of OI practices. The composite OI measure is a linear variable and is created by calculating the mean scores of respondents on the use of all OI practices. The composite indicator consequentially also ranges from 0 to 10.

**Table 1. Open innovation practices – definitions and Cronbach a for variety and intensity**

Open innovation practices	Definition
Open innovation	Average score on all OI measures of search strategy, external R&D, and innovative cooperation – Cronbach alpha = 0.87.
Search strategy	Average score of the use made of nine information sources for innovation: suppliers; clients; competitors; consultants and private R&D institutes; universities; public research organisations; conferences, trade fairs, and exhibitions; scientific journals; professional and industry associations (rescaled between 0 and 10) – Cronbach alpha = 0.95 variety; 0.65 intensity.
External R&D	Average score of the use made of five sources for external R&D: new products/services developed by others; new processes developed by others; outsourced R&D expenditures; acquisition of advanced machinery or computer hardware or software needed to innovate; acquisition of other external knowledge such as patents or licenses (rescaled between 0 and 10) – Cronbach alpha = 0.65 variety; 0.72 intensity.
Innovative cooperation	Average score of the use made of six types of collaborative innovation partners: suppliers; clients; competitors; consultants and private R&D institutes; universities; public research organisations (rescaled between 0 and 10) – Cronbach alpha = 0.86 variety; 0.81 intensity.

The CIS further contains information on the introduction of radical product innovation (i.e. goods and services that are new to the market) and the turnover generated by innovative activities. Using five waves of CIS between 2004 and 2012 form an unbalanced panel dataset. As the introduction of radical innovations is a binary variable, the estimation method required a probit analysis. The various steps in the probit analysis – screening for fixed effects, random effects and pooled models – led us eventually to opt for a pooled probit model. The use of innovative turnover is done in terms of its share in total turnover. Because of this, a generalised linear model is required.

## KEY ANALYTICAL FINDINGS

Open innovation practices are measured by calculating composite indicators for SMEs. Table 2 considers the scores of these indicators.

**Table 2. Regional differences in open innovation practices**

	Belgium	Brussels-Capital Region	Flemish Region	Walloon Region
Open innovation practices	2,83	2,65	2,99	2,52
Knowledge sources - variety	6,29	5,61	6,64	5,76
External R&D - variety	2,96	2,99	3,03	2,77
Collaboration - variety	1,96	1,64	2,20	1,48
Knowledge sources - intensity	1,24	1,19	1,31	1,11
External R&D - intensity	3,02	3,22	2,99	2,94
Collaboration - intensity	1,53	1,27	1,75	1,08

Note: the scores vary between the 0 - 10 range.

Source: Community Innovation Survey (2004-2012)

SMEs are relatively uncommitted to open innovation if we consider that the range of scores varies between 0 and 10. SMEs in the Flemish Region appear to be the most open; those in the Walloon Region are the least open. However, there are three dimensions of open innovation practices. Apart from the intensity measure in acquiring external R&D, SMEs in the Flemish Region consistently demonstrate to pursue the highest open innovation strategy; and SMEs in the Walloon Region have the lowest scores (apart from the variety of knowledge sources). Compared to the Belgian benchmark, SMEs in the Brussels-Capital Region are more directed towards acquiring external R&D (both variety and intensity). SMEs in the Flemish Region score high on all underlying dimensions except the intensity of external R&D; whereas SMEs in the Walloon Region are scoring relatively weak in innovation practices. However these scores are relatively meaningless when it comes to the effect on innovative performances: introducing radical innovations and generating turnover from innovations.

Controlling for various factors – size, R&D intensity, group affiliation, degree of internationalisation, sectors, regional funding, and wave of CIS – the probit regressions indicate some regional differences in open innovation practices with respect to the introduction of radical innovations (Table 3).

**Table 3. Introducing radical innovation – differences in estimated coefficients**

	Brussels/Flanders	Brussels/Wallonia	Flanders/Wallonia
Open innovation practices	n.s.	W > B **	W > F **
Knowledge sources - variety	n.s.	n.s.	n.s.
External R&D - variety	n.s.	W > B ***	W > F **
Collaboration - variety	n.s.	n.s.	n.s.
Knowledge sources - intensity	n.s.	n.s.	n.s.
External R&D - intensity	n.s.	W > B **	W > F **
Collaboration - intensity	n.s.	n.s.	n.s.

Note: \*\*\* p<0.01, \*\* p<0.05, \* p<0.1

In spite of the relatively weak scores of SMEs in the Walloon Region for (the dimensions of) open innovation practices, they are significantly more impactful in their effect on introducing radical innovations than in Brussels and the Flemish Region. This is especially the case where acquiring external R&D results are concerned; irrespective whether these are measured in terms of variety or intensity.

Using the same control variables as earlier, the general linear regressions on innovative turnover again point to several regional differences (Table 4).

**Table 4. Turnover from innovations - differences in estimated coefficients**

	Brussels/Flanders	Brussels/Wallonia	Flanders/Wallonia
Open innovation practices	n.s.	W > B **	W > F ***
Knowledge sources - variety	n.s.	n.s.	W > F *
External R&D - variety	n.s.	n.s.	n.s.
Collaboration - variety	n.s.	n.s.	n.s.
Knowledge sources - intensity	n.s.	n.s.	W > F ***
External R&D - intensity	n.s.	n.s.	n.s.
Collaboration - intensity	n.s.	n.s.	n.s.

Note: \*\*\* p<0.01, \*\* p<0.05, \* p<0.1

Also in terms of the turnover due to innovation, SMEs in the Walloon Region show a significant higher impact of open innovation practices than in the other regions. When looking at the underlying dimensions, however, there are no marked differences between Brussels and Walloon SMEs. But there are differences between SMEs in the Flemish and Walloon Region with respect to search strategies: both the variety of knowledge sources and the intensity of their use are more impactful in Walloon SMEs than in their Flemish counterparts.

## CONCLUSIONS

Innovative activities might be assumed to be similar for all SMEs. Yet the regional environment is deemed important to innovation and might hinder or stimulate SME innovative activities. In general regional innovation strategies are directed to initiate a regional discussion between stakeholders on innovation, accounting for regional innovation needs and capacities, aiming to select a number of priorities for innovation support (OECD 2010). In other words, the implementation of a strategy targeting innovations has to acknowledge the diversity in regional innovation systems in terms of their strengths and weaknesses. Many regional authorities have devised policy instruments that target SMEs in particular, but these policies are also not necessarily similar across regions.

Manipulating the CIS dataset gives at least partial information on three types of open innovation practices by innovative SMEs. Our results point to several regional differences in SMEs open innovation when bringing radical innovative products to market or when generating turnover from introducing innovation. Regional policies directed towards SMEs should take into account these regional particularities with respect to the open innovation practices by SMEs.

Furthermore, preliminary analysis (not reported here) would reveal differences between SMEs and the so-called “gazelles”, i.e. the top 10% of fastest growing SMEs in the region. This is an interesting avenue for further research, because these are firms that regions are trying to attract and nurture as much as possible.

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