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**OPEN INNOVATION IN DEVELOPING COUNTRY SMES:  
EVIDENCE FROM TURKEY**

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***Abstract***

Earlier open innovation studies focused mainly on large enterprises. Limited number of studies on small and medium enterprises (SMEs), on the other hand, mainly focused on developed countries. Empirical studies on open innovation in developing country SMEs are still missing in the literature. This study addresses this gap by focusing on SMEs in a developing country context. To the best of our knowledge, this is the first explorative study that measures to which extent SMEs apply open innovation practices in Turkey. We draw on a survey database of 674 SMEs and found that more than two third of SMEs involve in open innovation. Among open innovation practices measured in this study, vertical collaboration (collaboration with suppliers and customers) emerged as the most common open innovation practice. We analysed the results according to the sector and found that SMEs in high technology sector involve in open innovation more than their counterparts in low technology sectors. However, more than half of low technology SMEs involve in open innovation. We also found that customers are the most preferred collaborators for SMEs, followed by suppliers and rivals. Final and the most interesting finding of this study is collaboration with suppliers yields more innovation than collaboration with customers.

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**Keywords:** Innovation, open innovation, open innovation in smes, open innovation in developing countries.



## 1. Introduction

The literature on open innovation grew and expanded enormously during the last 15 years. Initial arguments related to the shift towards a more open approach to innovation raised by Chesbrough (2006) are mostly based on LEs (large enterprises). After a couple of years after the introduction of open innovation paradigm, the number of studies on SMEs (Small and Medium Enterprises) gained moderate attention from scholars (Van de Vrande De Jong, Vanhaverbeke & De Rochemont, 2009; Lee, Park, Yoon, & Park, 2010; Hemert, Nijkamp & Masurel, 2013; Wynarczyk, Piperopoulos, & McAdam, 2013; Parida, Westerberg & Frishammar, 2012; Popa, Soto-Acosta, & Martinez-Conesa, 2017). Limited number of these empirical studies illustrate that SMEs are even more open in their innovation processes (Spithoven, Vanhaverbeke & Roijackers, 2013; Vanhaverbeke, 2017). In addition, Grimaldi, Quinto, & Rippa, (2013) argue that SMEs with strong sensing and seizing capabilities (Teece, 2007) are more inclined to adopt a more open approach. Furthermore, Ebersberger, Bloch, Herstad, & Van De Velde, (2012), Fu (2012) and Parida et al. (2012) found that open innovation has a positive influence on the innovative performance of SMEs

In addition to the impact of openness on firm performance, some scholars focused on finding to what extent SMEs adopt and apply open innovation practices. For instance, Idrissia, Amaraa, & Landrya, (2012) found that almost all SMEs involved with open innovation to some extent. Theyel (2013), on the other hand, claimed that over 50% of SMEs in USA are engaged in open innovation. Lichtenthaler (2008) found that almost one third of all medium sized enterprises in Germany, Austria and Switzerland are somehow engaged in open innovation. However, all these empirical studies are conducted in developed countries. After a systematic literature review on open innovation in SMEs, Hossain and Kauranen (2015) found that there are almost no studies in the context of developing countries.

Limited number of existing studies on open innovation in developing countries, on the other hand, raises conflicting arguments. For instance, Wang and Zhou (2012) argue that open innovation is inapplicable to emerging economies. However, Kafouros and Forsans (2012) found that firms in emerging economies that open up their boundaries to inflows of knowledge generated by firms from foreign countries are more likely to benefit from external knowledge than those that acquire knowledge from domestic organizations. Hence, there exists an urgent need for large-scale empirical studies that focus on the adoption of open innovation in developing country SMEs. This study addresses this gap by focusing on open innovation in SMEs in a developing country context. To the best of our knowledge, it is the first explorative study measuring to which extent SMEs apply open innovation practices in Turkey. The rest of this paper is organized as follows. First, we provide a brief literature review on open innovation practices, open innovation in SMEs and also open innovation in developing countries. Next section, research methodology, is followed by empirical results of the study. Finally, after the conclusion and discussion section, we presented limitations of the study and suggestions for further research.

## 2. Literature Review

### 2.1. Open Innovation

Open innovation is initially defined as ‘the use of purposive inflows and outflows of knowledge to accelerate internal innovation, and to expand the markets for external use of innovation, respectively’

(Chesbrough, 2006). Due to the significant contributions of numerous academicians, Chesbrough, Vanhaverbeke & West, (2014) updated its definition as ‘a distributed innovation process based on purposively managed knowledge flows across organizational boundaries, using pecuniary and non-pecuniary mechanisms in line with each organization’s business model’. Open innovation is a three-dimensional construct; inside-out, outside-in and coupled process (Gassmann & Enkel, 2004). Inside-out process is related to external commercialization of internal knowledge and technologies, while outside-in process is related to enriching company’s internal knowledge base by external knowledge and technology insourcing. Finally, the coupled process is defined as combining inside-out and outside-in practices by working in alliances with complementary partners (Gassmann & Enkel, 2004).

From its definition, open innovation is a very broad concept encompassing a wide range of different practices (Huizingh, 2011; Vanhaverbeke & Cloudth, 2014). These practices, primarily developed and adopted by LEs in developed countries, grew and enriched during the last fifteen years. In addition to collaboration with suppliers (Li & Vanhaverbeke, 2009), customers, universities and research institutions (Cassiman, Di Guardo, & Valentini, 2010) or competitors, firms conduct joint R&D (Enkel, Gassmann, & Chesbrough, 2009), involve in joint venture or merge with or acquire external innovators. Besides these currently existing practices, tools such as idea contests (King and Lakhani, 2013), open innovation intermediaries (innomediaries) (Jeppesen & Lakhani, 2010) or crowdsourcing (Afuah & Tucci, 2012) recently became popular after the introduction of open innovation paradigm to the management literature. Today, the number of firms getting on the open innovation train and adopting these practices is increasing not only in developed countries but also in developing countries.

## **2.2. Open Innovation in SMEs**

In today’s highly competitive global market, SMEs have been the engine of economic growth (Bruque & Moyano, 2007). They have increased their R&D budget faster than the largest firms, and now play an increasingly important role in national innovation systems (Chesbrough, 2010). For instance, in Turkey, as a developing country, SMEs accounted for 34% of R&D spending in 2016. However, these firms have some disadvantages over LEs in terms of innovation. Major issues that SMEs face in their innovation efforts are lack of resources (human and financial), lack of skills and lack of complementary assets required for commercialization of an innovation. Hence, some scholars argue that, due to resource and skill shortages, SMEs appear to have a greater concentration of open innovation than large enterprises (Spithoven et al., 2013). Consistently, earlier studies illustrate that innovation in SMEs has an external focus by nature (Brunswick & Vanhaverbeke, 2015).

Open innovation scholars have identified the motivators and barriers that affect SMEs’ involvement in open innovation (Van de Vrande et al., 2009; Abouzeedan, Klofsten, & Hedner, 2013). According to the literature, SMEs can and should overcome challenges related to innovation by embracing a more open approach to innovation. Hence, lack of resources, skills and complementary assets are commonly mentioned as factors that motivate SMEs to involve in open innovation. Laursen and Salter (2006) found that openness to external sources allow SMEs to bring ideas from outside to deepen their knowledge of the technological opportunities available to them. Moreover, related literature illustrates that SMEs involve in outside-in open innovation more than inside-out practices (Bianchi, Campodall’Orto, Frattini, & Vercesi,

2010, Spithoven et al., 2013). Hence, it is expected that inside-out practices such as spin-off and licensing-out are less used compared to outside-in and coupled processes. Finally, Theyel (2013) illustrated that SMEs are more innovative in supplier collaboration for product improvement and customer collaboration for processes development. Since most SMEs are process oriented, it is expected that customers are more preferred than suppliers for collaboration.

### **2.3. Open Innovation in Developing Country SMEs**

Certain characteristics of developing countries might play a critical role in SMEs' adoption of open innovation approach. For instance, the impact of erosion factors that undermined the logic of closed innovation (Chesbrough, 2006) is relatively low in developing countries. First, availability of venture capital, which is also related to 'external options for ideas sitting on the shelf', is limited compared to that in developed countries (Sun et al., 2018). Second, skilled employees prefer working for MNEs and are not so available for SMEs (Ang Teo & Teng Fatt Poon, 1994). Third, related studies illustrate that the capability of domestic external suppliers is still limited in developing countries (Kafouros & Forsans, 2012; Gorodnichenko, Svejnar, & Terrell, 2010). In addition, developing countries are characterised by weak IP regime (Li & Kozhikode, 2009), lack of legal stability (Gaur, Ma & Ding, 2018) and lack of transparency (Ahlstrom & Bruton, 2006). These characteristics negatively impact MNE existence as well as the availability of venture capital, which plays a significant role in firms' decision to embrace a more open approach.

On the other hand, shortages that SMEs face in innovation processes are also related to macro conditions of the economy and constraints on resources and capabilities available to SMEs vary between economies (Abouzeedan, Klofsten, & Hedner, 2013). We argue that constraints, which are identified by related studies as motivators for SMEs to open up their innovation processes, are more severe in developing countries. Hence, embracing open innovation provide developing country SMEs the opportunity to develop own innovation capabilities by using external knowledge sources. Consistently, Kafouros and Forsans (2012) found evidence that firms in emerging markets are more likely to benefit from external knowledge if they open their boundaries to inflows of knowledge and technologies created by organizations from foreign countries. We further argue that in today's global and open environment, open innovation is an inevitable trend and firms in developing countries, especially SMEs, shouldn't miss the train. Finally, as a result of survey conducted for this study, we expect that developing country SMEs involve in open innovation more than their counterparts in developed countries.

## **3. Research Methodology**

### **3.1. Sample and Data Collection**

A survey targeting developing country SMEs was conducted over a 4-month period between February and May 2017. The link of online survey was sent to the SMEs with a cover letter explaining the purpose of the study. Since most SMEs don't have job titles/functions such as R&D Manager, Open Innovation Expert etc. the business owner or general manager was asked to fill out the questionnaire. After two rounds of reminders, a total of 674 usable and complete questionnaires were received.

### 3.2. Variables

First, based on an extensive literature review, we distinguished eleven open innovation practices that are commonly used by SMEs. As illustrated in Table 1, some popular open innovation practices that are not commonly used by SMEs are excluded (e.g. open innovation platforms such as P&G's Connect and Develop) from the survey. The very first question of the survey aimed at measuring the awareness of open innovation. Therefore, the respondents were asked to provide if they have enough knowledge on open innovation or not. A time space of 3 years was used throughout the survey. Hence, the respondents were first asked if their firm had engaged in any of these open innovation practice during the past 3 years. Collaboration with customers and suppliers are merged as vertical collaboration, while collaboration with universities and research institutions are merged as scientific collaboration during the analysis.

**Table 01.** Surveyed Open Innovation Practices

Open Innovation Practice	Definition
Joint Venture	A commercial enterprise undertaken jointly by two or more parties which otherwise retain their distinct identities.
Joint R&D	Collaborative research and development conducted jointly by two or more parties.
M&A	The area of corporate finances, management and strategy dealing with purchasing and/or joining with other companies.
Spin-Off	Creation of an independent company through the sale or distribution of new shares of an existing business or division of a parent company.
License Out	Selling off own IP to third parties to gain profit from internal innovation efforts.
License In	Buying another company's IP to develop own business and products.
Innomediaries	Using service firms to connect with a wide variety of current and potential customers.
Crowdsourcing	The practice of obtaining information or input into a task or project by enlisting the services of a large number of people, either paid or unpaid, typically via the Internet.
Vertical Collaboration	Collaboration with customers and suppliers.
Horizontal Collaboration	Collaboration with rivals.
Scientific Collaboration	Collaboration with universities and research institutions.

Second, we aim to identify which external knowledge source is preferred by SMEs in developing countries. Hence, the respondents were asked to provide the number of external knowledge generators, which the firm collaborated with during the last three years. External knowledge generators listed in the survey are identified according to previous research: customers, suppliers, competitors, universities and research institutions (Leiponen & Helfat, 2010).

Finally, SMEs may exhibit different patterns of external knowledge sourcing since their access to each innovation source and the value expected can differ significantly (Brunswick & Vanhaverbeke, 2015). Therefore, we found it more interesting to investigate whether there is a difference in the success rate of external collaborations. In other words, what is the percentage of collaborations with external actors that turned into innovation? Hence, the respondents were asked to provide the number of collaborative innovations with external knowledge generators.

### 3.3. Analyses

We first inferred the number of SMEs that involve in at least one open innovation practice during the last three years. We then produced a frequency distribution of open SMEs to see how openness differs according to the sector. Next, we produced a frequency distribution of open innovation practices to determine which of them were used most and least frequently by SMEs. We further inferred the number of collaborations according to partner (customer, supplier, rival, university and research institution). Finally, we analysed the ratio of collaborations that yielded innovation to identify which external knowledge generator(s) are more promising than others.

## 4. Findings

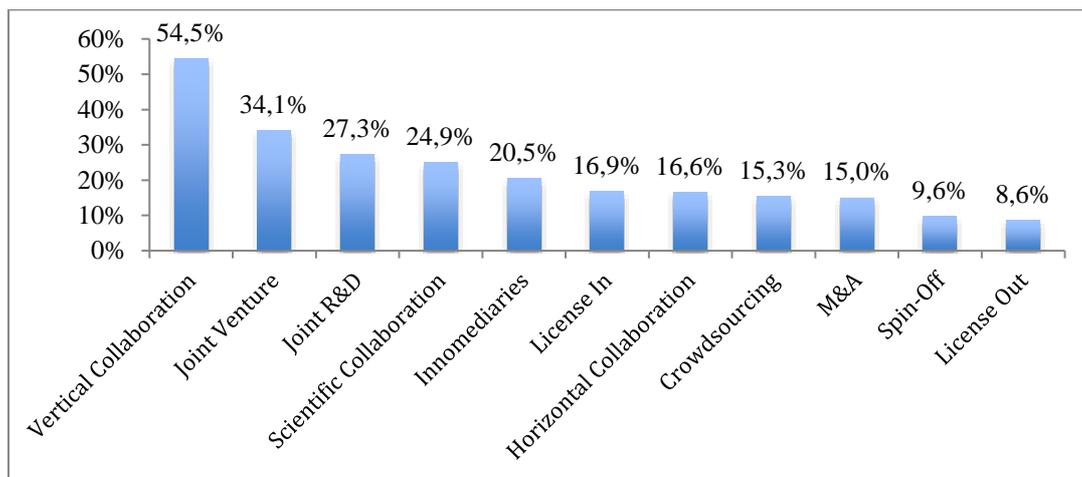
First, we found that the awareness on open innovation paradigm is very low among SMEs. Specifically, 62% of respondents admit that they don't have enough knowledge on open innovation. However, despite significantly low rate of awareness, %71,4 of SMEs in Turkey involve in open innovation to some extent. It can be inferred that even though managers don't have enough knowledge on open innovation, SMEs actively involve in open innovation. In light of these findings, we argue that opening up firm boundaries is not a conscious preference but an inevitable trend for SMEs in developing countries. We further analysed the results according to the sector and found that 87% of SMEs in health sector, 82% of SMEs in engineering and R&D, %81,8 of SMEs in defence and aviation and 80% of SMEs in energy sector adopted at least one open innovation practice during the last three years. On the other hand, a little less than half of SMEs in tourism and furniture sector involve in open innovation. Hence, this study provides evidence that although it is less common compared to SMEs in high technology sectors, almost half of SMEs operating in low technology sectors involve in open innovation.

**Table 02.** SMEs' involvement in open innovation according to the sector

Sector	Incidence*	Total	Ratio
Health	27	31	87.1%
Engineering and R&D	92	112	82.1%
Defence and Aviation	9	11	81.8%
Energy	16	20	80.0%
Information Technologies	71	89	79.8%
Education and Consulting	27	35	77.1%
Media	17	24	70.8%
Agriculture	14	20	70.0%
Construction	63	90	70.0%
Mining	7	10	70.0%
Transportation	13	19	68.4%
Automotive	21	31	67.7%
Textile	17	26	65.4%
Metal	19	31	61.3%
Chemistry	25	41	61.0%
Food	23	41	56.1%
Furniture	9	19	47.4%
Tourism	11	24	45.8%
<b>Total</b>	<b>481</b>	<b>674</b>	<b>71.4%</b>

\* Involved at least one open innovation practice during the last three years.

In addition, vertical collaboration emerged as the most common open innovation practice among those measured in this study. As illustrated in Figure 1, Almost 55% of SMEs involve in collaboration with customers and suppliers during the last three years, followed by joint venture (%34) and joint R&D (%27). One possible reason might be the reliance of SMEs on informal networks in external knowledge sourcing (van de Vrande et al., 2009). Since, informal networks and trust, which is a critical issue in collaboration, is built naturally through time between SMEs and their vertical collaborators, it is not surprising that vertical collaboration is the most common open innovation practice for SMEs.



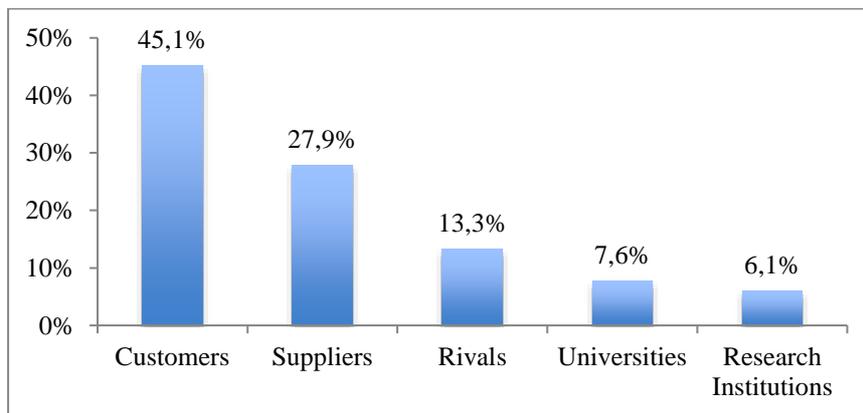
**Figure 01.** SMEs' involvement in open innovation practices.

Furthermore, licensing out and spin-off are emerged as the least common open innovation practices among SMEs in Turkey (%8,6 and %9,6 respectively). Unwillingness to reveal their technology by patenting, existence of NSH Syndrome (Chesbrough & Crowther, 2006), considering IP as a defensive tool rather than a profit gaining mechanism, lack of financial resources to hold and protect IP or lack of technical skills to generate intellectual property might be possible reasons for SMEs not involving in licensing out practices. Relatively low rate of spin-off practices, on the other hand, may be explained by lack of financial resources. Therefore, SME spin-offs mainly rely on venture capital, which is less available in developing countries compared to developed countries. Finally, less involvement in practices such as M&A is explained in previous research, which indicates that SMEs prefer non-pecuniary activities such as networking and informal knowledge sourcing to pecuniary and complex practices such as M&A or licensing in (Brunswicker & Vanhaverbeke, 2015).

Moreover, collaboration, which involves mutual exchange of knowledge, is the development of knowledge through relationships with external actors. Hence, firms collaborate with external knowledge creators such as suppliers, customers (von Hippel, 1986), rivals (Chesbrough, 2006), universities and research institutes (Balietta & Callahan, 1992; Conway, 1995). Parida et al. (2012) found that vertical collaboration (suppliers and customers) is relevant for incremental innovation while horizontal collaboration (rivals) for radical innovation. Since, most SMEs in developing countries are process oriented, they tend to collaborate with customers and suppliers. An empirical study by Laursen and Salter (2004) illustrates that suppliers and customers are the most used collaborators while collaboration with

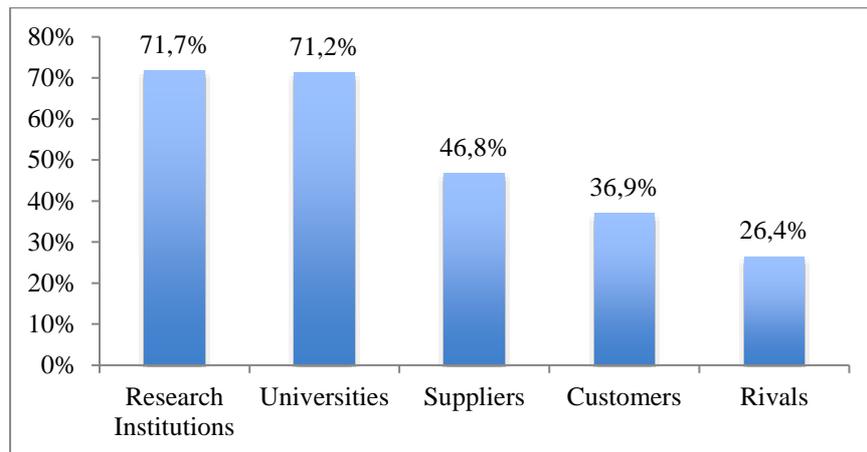
universities and research institutions remain limited to a small number of firms in UK. Furthermore, Theyel (2013) argued (found) that SMEs tend to build networks with customers over suppliers. Ebersberger, Bloch, Herstad & Van De Velde (2012) found that customers are the most common external sources of information by both LEs and SMEs in four European Countries (Austria, Belgium, Denmark and Norway), followed by suppliers, rivals, universities and research institutions respectively.

Our survey results illustrated that partner preferences of SMEs in developing countries is not different than the preference of their counterparts in developed countries. We found that the most preferred collaborators among SMEs in Turkey are customers. As seen in Figure 2, 45% of all external collaborations are with customers, followed by suppliers (%28) and rivals (%13). Even though there exist strong incentives and funding for university-industry collaboration in Turkey, universities and research institutions are the less preferred collaborators for SMEs. Because the main mission of universities is to create new knowledge and technologies for research and education purposes, while SMEs focus more on short-term profits (Wynarczyk et al., 2013; Brunswicker & Vanhaverbeke, 2015). However, unlike large enterprises, SMEs need to work closely with research institutions, state agencies and universities for effective innovation (Hemert et al., 2013; Kang, Gwon, Kim, & Cho, 2013). Hence, we argue that in addition to offering incentives, new policies are required to increase the awareness of SMEs on the benefits of collaboration with universities and research institutions (Sağ, Sezen, & Güzel, 2016).



**Figure 02.** SMEs' external collaborations.

Finally, existing studies scarcely address the fact that not all sources may be of equal value for innovation. Hence, most interesting finding of this study is that although customers are more preferred in innovation processes, collaboration with suppliers yields more innovation. According to the results, 47% of collaborations with suppliers turn out to innovation, while this rate is 36,9% for customers and 26,4% for rivals. Therefore, this study makes a significant contribution to the literature by illustrating that collaboration with suppliers are more likely to yield innovative outcomes compared to customers and rivals. More interestingly, even though they are not preferred by SMEs, collaboration with universities and research institutions are most likely to turn out to innovation. In Turkey, there exist strong financial incentives for firms collaborating with universities and research institutions. But only well documented and high potential innovation projects are eligible to get financial support. Hence, collaborations based on these formal, well-planned and high potential projects are more promising for SMEs in terms of innovation.



**Figure 03.** SMEs' external collaborations that resulted in innovation.

## 5. Conclusion and Discussions

Open innovation research has mainly focused on large and multinational enterprises (van de Vrande et al., 2009) in developed countries. Even though open innovation in SMEs recently gained moderate attention, open innovation in developing countries is still a less researched area. This is the first study that measures to which extent SMEs in developing countries use open innovation practices. In addition, this paper identifies which external knowledge generator(s) are more preferred by developing country SMEs for collaboration. Finally, the ratio of external collaboration that resulted in innovation is analysed to identify the most promising external collaborators for SMEs in developing countries. In this context, even though it is based on simple statistical analysis, this study makes significant contributions to open innovation literature.

First, this paper provides evidence that even though SMEs don't have enough knowledge on open innovation, they involve in open innovation related practices to some extent. Hence, we argue that adopting a more open approach to innovation is not a preference but an inevitable trend for SMEs in developing countries. This inevitable trend of openness might significantly increase developing country SMEs' innovation potential, if managed professionally. Hence, we argue that increasing awareness of SMEs on open innovation might result in professional management of open innovation related processes. In this context, this study provides valuable insight for policy makers and managers on actions that are needed to improve innovative performance of SMEs, which have the potential to make a great contribution to regional and national economic development.

Second, this study illustrates that more than two third of SMEs in Turkey involve in open innovation to some extent. Even though it is more common in high technology sectors, almost half of SMEs in low technology sectors involve in open innovation. One possible explanation to the high involvement of SMEs in open innovation is that recently identified factors motivating SMEs towards a more open approach are more severe in developing countries. Evaluating our findings with previous empirical studies conducted in developed countries, we claim that SMEs in developing countries are more open than their counterparts in developed countries to overcome disadvantages such as lack of resources, skills and capabilities.

Third, this study provides the frequency of open innovation practices used by SMEs in developing countries. We found that SMEs involve less in inside-out open innovation practices such as spin-off and licensing out. These findings might provide valuable insight for policy makers while defining national and/or regional innovation systems. For instance, increasing the availability of venture capital might increase the number of spin-off firms. Increasing IP awareness as well as building a strong IP regime, on the other hand, may encourage SMEs to view IP as a profit gaining mechanism rather than a defensive tool.

Fourth, recent literature illustrates that external collaborator preference doesn't differ according to firm size (Ebersberger, Bloch, Herstad, & Van De Velde, 2012). Customers are the most preferred collaborators, followed by suppliers and rivals. Empirical survey results of this study show that it is also same for SMEs in developing countries. Even though there exist strong incentives for scientific collaboration, it is relatively limited among SMEs. Hence, this study illustrates that current incentives are far from leveraging SMEs' involvement in scientific collaboration and urges policy makers on revisiting and revising current policies and/or incentives.

Fifth, this study highlights that the impact of erosion factors, initially explained in Chesbrough's seminal work, that undermined the logic of closed innovation is not same for developing countries as it is for developed countries. Evaluating this fact with our finding that two third of developing country SMEs involve in open innovation practices, help policy makers and managers on actions required to encourage SMEs in profiting more from open innovation. Therefore, this study urges increasing the availability of venture capital in developing markets, increasing incentives to leverage SMEs involvement in collaborations with universities and research institutions, revising national innovation systems that facilitate and enhance SME-MNE collaboration etc.

Finally, this study makes a significant contribution to the literature by identifying suppliers as the most promising collaborators for SMEs in developing countries. Even though related literature, consistent with the results of this study, indicates that customers are more preferred than suppliers as potential collaborators by SMEs (Theyel, 2013; Ebersberger et al., 2012), we found that collaboration with suppliers yields more innovations for SMEs. Consistently, the results of an empirical study conducted in UK by Laursen and Salter (2004) indicate that the most important external knowledge source is suppliers followed by customers. Hence, it can be inferred that this study, conducted in a developing country context, yielded similar results with previous studies conducted in developed countries.

### **5.1. Limitations of the Study and Suggestions for Further Research**

This is the first large-scale empirical study that measures the adoption of open innovation by developing country SMEs. However, it has several limitations. First, the results of this study is based on a survey conducted in a single country and cannot be generalizable to developing countries. Hence, similar empirical studies need to be conducted in other developing countries to confirm and generalize the results of. Second, collaboration with external actors is defined as 'drawing on or collaborating with external knowledge generators to support innovation processes'. Hence, the responses include both formal strategic alliances and simple knowledge sharing activities. Categorizing these practices according to the depth of collaboration might yield more accurate results on collaboration success rates.

Despite its limitations, this paper calls for future empirical studies for a better understanding of open innovation paradigm, its use and its impacts on innovative performance of SMEs in developing countries. For instance, even though recent literature indicates that open innovation improves innovative performance, different open innovation practices might have different effects on innovative performance. Hence, this study suggests conducting empirical studies to identify the relative importance of different open innovation practices. Furthermore, conducting such studies according to firm size or developing vs. developed country contexts will probably yield different outcomes.

Moreover, we found that that spin-off and licensing out practices are the least common open innovation practices in developing country SMEs and listed some possible reasons that might prevent SMEs in developing countries to involve in them. Analysing the relative effects of these factors might be an interesting research area to dive in. Finally, this study illustrated that the impact of erosion factors is limited in developing countries compared to that in developed countries. Hence, analysing the impact of erosion factors and differences between developed and developing countries might provide valuable insight for policy makers and managers in developing countries.

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