Master Thesis: Guided Research Abroad and Scientific Publication (GEO4-3639)

How science park mission affects small firms' innovation performance: evidence from Indonesia

Name : Zulfika Satria Kusharsanto

Student no : 6176666

Supervisor : Dr. Andrea Morrison

Email : z.zulfikasatriakusharsanto@students.uu.nl; zulfika.satria@gmail.com

Utrecht University

Research Master in Urban and Economic Geography

Department of Human Geography and Spatial Planning

Faculty of Geosciences

Utrecht University

2019

How science park mission affects small firms' innovation performance: evidence from Indonesia

ZULFIKA SATRIA KUSHARSANTO, ANDREA MORRISON

Department of Human Geography and Spatial Planning, Utrecht University

ABSTRACTS Despite the widespread existence of science parks (SPs) across various countries, their effectiveness in fostering innovation performance of on-park small firms is still inconclusive. One of the reasons is that SPs have always been defined uniformly in theory, while in practice, they significantly differ in many ways. This study argues that the innovation performance of on-park small firms might be moderated by the park missions. This study uses the cases of two SPs with different missions in Indonesia: the first is university-led, which is R&D oriented, while the other is government-led and focuses on entrepreneurship. Results confirm our hypotheses that if the firms' main aim is to introduce new products, located adjacent to a university-led park is more advantageous. On-park firms are likely to innovate if the park mission suits the firms' designated activities, in this case whether in R&D or business development. Results also indicate that park mission fashions the park management strategy which suits the need of their tenant. Ultimately, this study leads to better understanding of policies in SPs development, particularly in emerging countries.

1. Introduction

Although various studies have evaluated the effect of science parks to the innovation performance of on-park small firms, the result varies among them. While some studies prove that there is a correlation between the innovation of firms and their proximity to a science park (Abramovsky & Simpson, 2011; Gower et al., 1996), some other argue that the innovation performance relies more on the innovation capacity of each firm (Bakouros et al., 2002; Guadix et al., 2016). This paradox makes the effect of science parks on innovation appear to be inconclusive.

Some literature has shown that the effect of science park is contextual, depending on other variables to moderate the effect, such as absorptive capacity (Bakouros et al., 2002; Guadix et al., 2016), the age of firms (Diez-Vial & Fernández-Olmos, 2017), management type of firms (Ferguson & Olofsson, 2004), and cooperation (Díez-Vial & Fernández-Olmos, 2015). Interestingly, recent studies discover that SPs are heterogenous (Albahari et al., 2018) and have typology measured from the ability to enhance local knowledge creation (Capello & Morrison, 2009). Nonetheless, still few literatures consider one of the most fundamental variables: the main mission of science parks. Science park is not a one size fits all concept. Although every science park aims to produce the most innovative firms, they have their own main mission which diversifies the characteristics, management strategy, and focused activities.

This study intends to settle this debate by scrutinizing the effect of science parks on the innovation performance of on-park small firms and elaborating how parks distinctive mission might be worth considering. With the cases of two science parks in Indonesia—Bandung Techno Park (BTP) and Cimahi Techno Park (CTP), which have different missions on their management strategy—this study examines whether this difference can moderate the effect of science park on the innovation performance of small firms. Notwithstanding, different with abundant previous studies on SPs which have scrutinized and compared the statistical result between on-park and off-park firms, this study

assesses the performance of on-park small firms only. By doing so, this study accentuated the possibility of different performance among on-park firms.

With the case of Indonesia, which has been progressively developing SPs across country, this study may contribute new discourses on how the policy of emerging countries works to develop SPs and to encourage firms' innovation. Over the last decade, after the success story of SPs in many developed countries such as the United States, the United Kingdom, France, and so on, SPs have been of interest to many emerging countries to replicate (Sanni, Egbetokun, & Siyanbola, 2009). However, replicating the success story of science parks cannot be done easily, especially as emerging countries have their own distinctive values and characteristics. Indonesia is one of the emerging countries that is worth scrutinizing because at some parts it does not reflect what can be applied in most developed countries. For instance, business in science parks are dominated by micro and SMEs, not all parks have university nearby, and the role of university is sometimes hazy (Moeliodihardjo et al., 2012). This could be also the reason why SPs have diversified mission: in order to conform to the respective local condition (Etzkowitz & Zhou, 2018). The similar situation may also happen among other emerging countries—especially in Asia—because the culture of human resources and economy are rather similar.

This paper is presented with the structure as follows: the second section explains the definition of SPs, small firms, innovation, and park missions. Section 3 presents the methodology, explaining the sample and analysis this study uses. Section 4 discusses the findings and the result of the statistical analysis. Finally, the fifth section concludes the study as well presents recommendations for future research.

2. Literature Review

2.1. Science parks, small firms, and innovation

The literature considers science parks (SPs) as the devoted areas to foster entrepreneurship as well as commercialization of technology in certain regions. Besides *science parks*, literature also uses other similar terms such as *technology parks*, *research parks*, or *innovation center*, all of which carry comparable characteristics (Shearmur & Doloreux, 2000; Westhead & Batstone, 1998). The basic idea of science parks was derived from the success story of Stanford Research Park, or the surrounding area known as the *Silicon Valley* in the USA, which succeeded in bridging Stanford University and the industries to yield and commercialize innovative products. In the long term, the Silicon Valley has also managed to generate competitiveness in the region. Since then, many places have attempted to replicate this concept, such as Sophia Antipolis in France and Surrey Science Park in the UK, resulting in the common term & practice of SPs (Capello & Morrison, 2009; Isaak, 2009; Phillimore, 1999).

Conceptually, SPs have a basic feature to create and support small firms in exploiting high-technology business. Beside "small firms", literature also mentions the term "New Technology-Based Firms" or NTBF, casually known as "startups". Some studies define small firms based on criteria such as the age, size, independence, and technology (Ferguson & Olofsson, 2004): they must have been established not more than 25 years ago; they must not be bigger than 200 employees; they have not been founded by subsidiaries of established companies; and they must have invested in technological innovation business (Monck, 1988; Ramírez-Alesón & Fernández-Olmos, 2018).

On-park firms are targeted to perform some innovations, which means launching and injecting new products into market. Nevertheless, the definition of *innovation* is somehow confusing, usually interchangeable with *invention.* Monck (1988) explains that invention is basically an idea to create new technological knowledge, while innovation is an embodiment of that knowledge to the production process. Economically speaking, things will be defined as innovations if they meet what market needs and achieve the commercial transaction. Both inventions and innovations spotlight the novelty which is not merely on product but can also be on process, or even the system.

The fact that small firms are basically small in size, young, and lacking in finances suggests that they are prone to fail (Díez-Vial & Fernández-Olmos, 2015). That is why they need business assistance as well as affordable facilities in order to grow and survive. Belonging to an SP is the best way for small firms to thrive because then they have access to all the facilities, services, and connections provided

by SPs to help them encounter knowledge spillovers more easily on site (Diez-Vial & Fernández-Olmos, 2017; Saemundsson & Candi, 2017). Moreover, this relationship can provide recognition and better image for small firms since science parks are usually considered prestigious areas (Phillimore, 1999; Ramírez-Alesón & Fernández-Olmos, 2018). Studies by Huang, Yu, & Seetoo (2012) with the case of small firms in Taiwan also shows that small firms gain more benefit by being adjacent to the park rather than large firms.

Looking at that close association between SPs and small firms, many studies believe that the effectiveness of science parks can be investigated by looking at the innovation performance of on-park firms. The innovation performance itself can be observed from the product sales, as successful innovation are primarily driven by how many new products are accepted in the market (Löfsten & Lindelöf, 2002). To innovate, many firms can access knowledge and resources from activities which induce knowledge spillovers either from other firms or from universities. Felsenstein (1994) argues that SPs are functioning as an "enclave of innovation", meaning that knowledge spillovers are considerably prompted inside the SP.

2.2. The effect of park mission on firms' innovation: illustrations in the Asia context

Despite the uniform concept of SPs, literature has formulated that, in practice, they differ based on their main mission (Capello & Morrison, 2009; Ratinho & Henriques, 2010) or management strategy (Albahari et al., 2018; Dettwiler, Lindelöf, & Löfsten, 2006; Westhead & Batstone, 1998). The mission of SPs will always be influenced by who built them and where they were built. The founder or initiator is mostly belongs to one of the triad: university, government, or private sector (Sanni et al., 2009). The university-led SPs in general usually have mission in commercializing research into market. The government-led SPs usually aim to generate local economy by making policies focused on stimulating employment generation and wealth creation with technology and business biased programs. Meanwhile, the private-led SPs are more "profit" oriented, mainly generated from the real estate development sector of the SPs, focusing on expecting many big companies to rent the office.

It is also noteworthy that every country, either developed or developing, has their own approach in developing SPs. Many researchers believe that Silicon Valley is most likely to be the early impetus and inspiration for every SP, but it is not likely that the practice on that region is entirely duplicated. Silicon Valley was initiated by the university to collaborate with the industry to make a link between research and the market, luring the government to provide supportive infrastructure as the outcome of the interaction. Conversely, many SPs, especially in emerging countries, were built by putting "the cart before the horse" (Etzkowitz & Zhou, 2018). Initiated by the government, numerous SPs were built without university or industry involvement in the beginning. Infrastructure and incentive were then provided to entice many actors, attempting to create a magnificent area for science-based development.

For instance, Zhongguancun Science Park in Beijing, China, was fully developed by the government to be the most "prestigious" place to host high-tech industries. Although nowadays the area has evolved into an incubation site for small firms emanating from the university nearby, the role of university was nonexistent in the beginning (Tan, 2006). Likewise, Singapore Science Park and Thailand Science Park were also allocating massive investment on hard infrastructure development to lure big companies. What they expected was to trigger knowledge spillovers from foreign companies to local communities (Etzkowitz & Zhou, 2018). However, there were still criticisms, mainly because the first attempt did not successfully integrate R&D from local university with high-tech industry (Mae Phillips & Wai-chung Yeung, 2003) while the latter lacked investment on skill development e.g. entrepreneurship programs (Patthirasinsiri & Wiboonrat, 2018). In Indonesia, an SP namely PUSPIPTEK was first established in 1976 by the state government but have since functioned as "an aggregate of public research institutes" without any links to industry (Soenarso, Nugraha, & Listyaningrum, 2013). The revitalization program was then introduced in 2008 and was set to be the hub which would connect universities, industry, and entrepreneurs. After the government released "the innovation initiative program" in 2011 and strengthened it by national development plan in 2015, science/techno parks were built across the country with specific respective missions depending on the

initiator, for example Solo Techno Park for vocational training and Bandung Techno Park for university research commercialization (Asmara et al., 2016). However, another country like Taiwan has different situations. Instead of encouraging high-tech companies to be hosted in the park, Taiwanese government set out Hsinchu Science Park (HSP), the first SP in Taiwan, to be the place to develop the country's own potential (Chen & Choi, 2004) with brain-draining and maximizing the role of university.

Those cases show the different dealings of every SP, especially in developing countries. They also explain what Etzkowitz & Zhou (2018) meant by the *innovation incommensurability*. There is not any consensus to define the best way in building SPs and there never will be, because each park has their own suitable SPs model which fits their own missions.

The favorable park mission also shapes the structure and background of park managers (Monck, 1988). On most of SPs, usually led by universities, the managers are experts in science and business, assuming that they know how to give provision on research commercialization. However, on other SPs, sometimes they are recruited only to manage the park without specific expertise, leaving the provision of business advice to other partners. Eventually, this diversified mission will lead to the way SPs deliver the program and services to their tenants (Dettwiler et al., 2006). A study in China by Zhang et al. (2015) also shows that firms with clear mission statements at the first place have better innovation performance than firms without, making the mission conformity between the SP and firms critical.

2.3. Hypotheses: the moderation effect of park missions

Considering that every SP has their own mission, does every SP have the same effect on small firm' innovation performance? Similar or not, the variety of mission basically does not alter the universal function of SPs: to facilitate small firms exploiting knowledge spillovers and dynamic agglomeration economies. They may differ in how every SP performs that universal function such as developing strategies and type of services which meets the need of firms residing in the park. Ratinho & Henriques (2010) confirm that conforming the park mission to the type of the firms is fundamentally important to make SPs' function more effectively. Among several SPs and Business Incubators in their study, the ones which provides suitability of management with the need of their tenants are more likely to succeed with high satisfaction services. This also confirms Monck (1988) and Dettwiler et al. (2006) that on-park firms always call for supportive manager who not only provides infrastructures for business development, but also understands their needs.

Guadix et al. (2016) mention two essential perspectives of SPs study: *the geographical* and *the institutional* perspective. The geographical perspective considers the spatial proximity between actors in a SP and its surroundings which exhibit the agglomeration effect, while the institutional perspective stresses the role of SPs to bestow competitive advantage on on-park firms by giving supports and services. In order to investigate the relationship between SPs and small firms, this study uses both perspectives to observe how knowledge spillovers are prompted. There are 3 hypotheses we propose as depicted in the figure 1 below.

First, as defined by Ramírez-Alesón & Fernández-Olmos (2018), innovative small firms tend to have R&D activities as an endeavor to produce new technology-based products. Thus, this is one of the reasons why small firms prefer to have close proximity to SPs. All facilities needed for small firms are provided by SPs which will ease the process of producing and commercializing new products. Many studies which confirm the effect of proximity between firms and SPs as on-park firms are substantiated of having better innovation performance and better image than off-park ones (Gower et al., 1996; Ramírez-Alesón & Fernández-Olmos, 2018; Vedovello, 1997). Apparently, the specific factor of that phenomenon is found to be the existence of universities or R&D institutions on-site in SPs (Dettwiler et al., 2006; Díez-Vial & Montoro-Sánchez, 2016; Felsenstein, 1994). Universities provide a myriad of ideas and inventions which can potentially be transformed into new products. However, not much literature proves this premise by evaluating the performance between on-park firms in different mission SPs. This research therefore proposes the first hypothesis as follows:

H1: Among on-park firms, being adjacent to a SP with a university on-site maximizes the likelihood of firms to introduce new products.

Second, institutionally speaking, SPs offer great supports to on-park firms and this institutional function is the crucial benefit small firms can obtain from belonging to an SP. One of these supports is by enabling them to have R&D collaborations with external actors. R&D collaborations enable firms to share knowledge and complementary resources with other firms, making synergy creation possible to develop new products (Ramírez-Alesón & Fernández-Olmos, 2018). External collaborations also contain diverse relationships among firms (Vásquez-Urriago, Barge-Gil, & Modrego Rico, 2016) which encourage more knowledge spillovers. Therefore, by providing medium for collaborations, SPs can affect positively to the innovation performance of on-park firms.

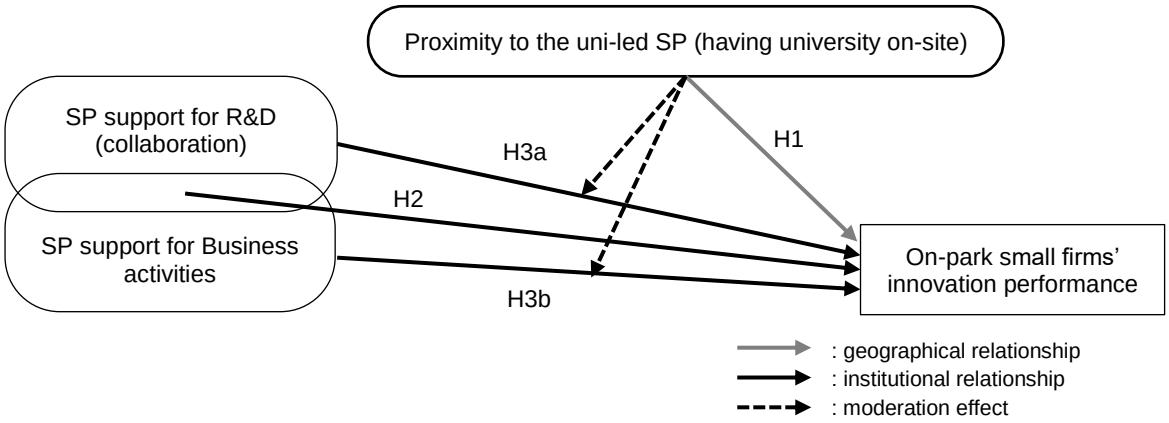


Fig. 1 Research model. Type of relationship is adapted from Guadix et al.(2016).

Besides R&D collaborations, SP should give support to small firms to improve their business. The business performance is essential to firms as an indicator of growth and sales. By having varied business activities, on-park small firms will indirectly gather lots of benefits from the interaction with significant stakeholders, possibly including the valuable tacit knowledge due to the intensive face-to-face interactions (Dettwiler et al., 2006; Díez-Vial & Montoro-Sánchez, 2016; Keeble et al., 1999). Thus, having intense and frequent business activities will positively affect the likelihood that small firms will innovate. A study by Keeble et al. (1999) shows that, using the case of Cambridge region, firms gain more benefit from opportunities to network with other firms. Based on those arguments, we offer the following hypothesis:

H2: SP supports for small firms (with respect to facilitating R&D collaborations and business activities) have positive effects on small firms' innovation performance.

Ultimately, in line with Monck's (1988) explanation, the management strategy of SPs affects the way SPs support their tenants. Ratinho & Henriques (2010) confirm that notion and suggest the conformity of park mission and the characteristic of firms to maximize the benefit of residing adjacent to the park. Therefore, SPs with their distinct mission will provide more supports related to their mission and will eventually moderate the innovation performance of their on-park small firms. In this case, university-led SPs will be beneficial to small firms focusing on R&D commercialization while government-led SPs, which are economy-oriented, will be worthwhile for small firms in business improvement focus. Based on that premise, a third hypothesis is proposed as follows:

H3a: The effect of *R&D supports* on small firms' innovation performance is moderated by missions of SPs. The moderation effect will be positive in *the university-led SP*.

H3b: The effect of *business activities* on small firms' innovation performance is moderated by missions of SPs. The moderation effect will be positive in *the government-led SP* (or negative in the university-led SP).

3. Methodology

3.1. Sample

To test the hypotheses, we examine 60 small firms who have been operating in two SPs in Indonesia, namely Bandung Techno Park (BTP) and Cimahi Techno Park (CTP)[1] which are situated in Greater Bandung. Both SPs are among the SP pilot projects in Indonesia, which have successfully realized the goals of SP issued by Ministry of Science, Technology, and Higher Education of Indonesia (Asmara et al., 2016). Although these two SPs implement the same basic features, their park missions actually differ. BTP was initiated and managed by Telkom University with strong supports from Ministry of Industry. Highly affiliated with university, BTP's main mission is to commercialize universities' research to become new products promoted by NTBFs. Its development was initially based on the concern of the university that many outstanding theses and research were merely stored in library without bringing actual marketable inventions. Originally established as a technical unit for information and communication technology (ICT) in 2007—a corporation between Telkom University and the Ministry of Industry, it has developed to finally become a techno park in 2010. Similar with other SPs, it has an incubation program for NTBFs which started in 2015 and has been fully implemented since then. The product of their tenants is limited to applied technology, especially in ICT. Since the beginning of its operation, it has become a home for a total of more than 50 firms and its current population in 2018 is 30 NTBFs.

Meanwhile, CTP was initiated and has been fully organized by the municipality of Cimahi with supports from State Agency for the Assessment and Application of Technology (BPPT) in 2015. CTP's main aim is to generate local economic development through innovative entrepreneurship in sectors such as animation, ICT, food, craft, and textile. Although various universities are involved in the park, no one is located nearby, which means that the knowledge spillovers are more triggered from firms' clusters i.e. Cimahi Creative Association. It has incubation programs since 2015 and has successfully attracted approximately 29 NTBF as incubatees until 2018. The office space is also allocated to SMEs which plan to reside within the Techno Park. Currently, there are 11 firms renting the space. Since the main park mission is on local economy sector, it also has a program called the acceleration program, aiming at training long established micro firms and SMEs throughout the city to boost their sale with innovation. Different with BTP which has full nuance of research, CTP's agendas are mostly business events and training, some of which are on international level.

Data from both SPs were collected from survey with online questionnaire to the given sample. The survey sample was drawn from a contact list owned by each park manager. The small firms were contacted mainly by personal text messages. Some of them were also called by phone and met in person. After agreed with research ethics, respondents were expected to fill in an online form questionnaire. These various approaches had to be done because entrepreneurs always seem to have tight schedules and are very busy (Li, Wang, Huang, & Bai, 2013) making the data collection should be succinct. Nonetheless, we approached some of them in person in order to build rapport (Hennink, M. Hutter, I., Baily, 2011) and gain more information which might not be covered in the questionnaire.

Although the park managers had the contact list of small firms hosted in the respective parks, both were unsure whether those small firms were still in business. In both SPs, not all on-park firms have present office on-site, but they still operate close to the park. That issue presented a considerable constraint in measuring the population of each park at the time of the survey. We eventually made contact to 68 given small firms (presumably as the current total population) and received 64 replies. Ultimately, out of the 64 firms, 4 firms in CTP were discontinued or already merged with other firms, resulting a study sample to be 60 firms, 30 in each SP.

[1] The reason why the case uses term 'techno' instead of 'science' because it refers to Indonesia national mid-term plan year 2015-2019. The term for *science park* differs in 3 layers based on the scale of park services. *Science-techno park* at national level, *science park* at provincial level, and *techno park* at municipality level (Asmara et al., 2016).

3.2. Variables

Following some previous studies on the SPs effect, innovation performance can be measured by the introduction of new products to sales (Capello & Morrison, 2009; Díez-Vial & Fernández-Olmos, 2015; Löfsten & Lindelöf, 2002). We choose to use this method because on-park firms are believed to have the ultimate goal to launch new products and market them, as the definition of what innovation is (Monck, 1988). Thus, as the dependent variable, the measurement is operationalized using a dummy where 1 means the firm produces one or more new products within the period of 2016-2018 and 0 otherwise.

For the independent variables, we select 3 variables in order to test the hypotheses. First of all, we use *Uni-led park* for being located within the SP which has a university on site as well as being managed by it. In this case, this type of SP is represented by BTP. This variable is used to test the hypothesis of H1 which stresses the benefit of university on site within the SP. This is a binary dummy which equals 1 if the premise is fulfilled, 0 otherwise. Second, *Business Activities* is being used as a variable which represents how frequently firms perform business activities in the SP, such as business meeting, business matching, market training, etc. The type of activities must not always be formal but should be designated with a particular schedule and purpose (disregarding casual encounters). This is the ordinal variable which has 3 levels in which the value equals 3 if the firm has had more than 10 activities in the past year of survey; 2 for 5 to 10 activities; 1 for less than 5 activities; and 0 otherwise. We also use *R&D supports* variable which is defined as whether the firms conduct research with the assistance of park managers, such as the help in finding partner or providing research instruments. This is a binary dummy which equals 1 if firms conduct researches involving SP managers in giving R&D supports, 0 otherwise. The second and third variables are particularly needed to test whether park missions moderate the effect of SPs to the innovation performance of small firms.

Table 1. Description of variables

Variables		Definition	References
Dependent	Innovation performance	1 if firm has a new product (either new to the firm or the market), 0 otherwise.	Capello & Morrison (2009); Löfsten & Lindelöf (2002)
Independent	Uni-led park	1 if firm is located in a university-led SP, 0 otherwise.	
	R&D supports	1 if firm conducts R&D assisted by the SP, 0 otherwise	Guadix et al. (2016); Ramírez-Alesón & Fernández-Olmos (2018)
	Business activities	3 if firm has >10 business activities, 2 if 5-10 activities, 1 if <5 activities, 0 if nothing at all (all in the past year).	
Control	R&D expenditures	Expensed money for innovation R&D in the past year	Diez-Vial & Fernández-Olmos (2017)
	Age	Natural log of the number of years since founded	Almus & Nerlinger (1999); Huergo & Jaumandreu (2004).
	Age^2	Quadratic number of age	
	Size	Natural log of the number of employees	Almus & Nerlinger (1999); Díez-Vial & Fernández-Olmos (2015).

In keeping with the existing literature, this study also uses some control variables. First, the variable of *R&D expenditures* appears as a control variable. We use this variable to measure the performance of firms in investing money for R&D of innovation products (Diez-Vial & Fernández-Olmos,

2017). To avoid error due to the large range of data e.g. million denomination in Indonesian Rupiah, we cut the last digits 3 of data. Second, we take into account the firms' age (*Age*). Small firms may perform differently due to their lifetime experiences. The rule of thumb suggests that the older the firms the better they might perform as they are presumably more experienced. Nevertheless, this premise seems to not have clear evidence because some part of literature shows positive effects while the other shows negative effects (Diez-Vial & Fernández-Olmos, 2017). We identify the age with the natural logarithm of the number of years. To avoid zero age (which is impossible to be operated by logarithm), we add 1 year to each number of years. We also operationalize the quadratic age (Age^2) to investigate the possibility of nonlinear effects (Díez-Vial & Fernández-Olmos, 2015). The firm size (*Size*) is the last control variable we use. Bigger firms usually have more resources and networks to gain more opportunity to innovate. Hence, in accordance with previous studies, we predict the size to have positive relationship with firms' innovation performance. This variable is defined with the natural logarithm of the number of employees.

This study assesses the hypotheses by using logistic regression to test the effect of Science Park on small firms' innovation performance. All hypotheses are depicted by these 2 type models respectively in which all models aim to measure the likelihood of innovation performance as the dependent variable. To test the hypotheses, this study uses model 1 and 2 which establish all variables with the differences on the interaction term. The former measures the interaction between variable *Uni-led Park* and *R&D Supports*, while the latter measures the interaction between *Uni-led Park* and *Business Activities*.

$$Innovation\ performance = \alpha + \beta_1 UniledPark + \beta_2 R\&Dsupports + \beta_3 UniledSPxR\&Dsupports + \beta_4 BusinessActivities + \beta_5 R\&DExpenditures + \beta_6 AGE + \beta_7 AGE2 + \beta_8 SIZE + \varepsilon_1 \quad (1)$$

$$Innovation\ performance = \alpha + \beta_1 UniledPark + \beta_2 R\&Dsupports + \beta_3 BusinessActivities + \beta_4 UniledSPxBusinessActivities + \beta_5 R\&DExpenditures + \beta_6 AGE + \beta_7 AGE2 + \beta_8 SIZE + \varepsilon_1 \quad (2)$$

The way this study assesses the innovation performance is conceivably open to argument, although this method is backed by previous researches. Assessing small firms is also challenging due to the poor data management the firms' early stage of business (Löfsten & Lindelöf, 2002). Endeavoring to fill the gap of study in assessing small firms' innovation performance, this study employs these phenomena between on-park firms only, to investigate why the different park mission matters.

4. Results and Discussions

4.1. Descriptive Statistics

Before looking at the effects of SPs' mission on the innovation performance, it's important to check the descriptive analysis of the sample data to learn the characteristics of each SP in number.

Table 2 shows that most sectors of the sample are dominated by science-based sector at 63.3%. This sector consists of technology-related businesses such as mobile app, software, internet-based services, and animation for film and advertisement. That situation is common because firms in SPs are always dominated by high technology sector (Capello & Morrison, 2009; Monck, 1988). Table 3 summarizes the characteristics in age, size, and innovation capacity (the percentage of innovation sale of the whole turnover in the past year) of the sample. The row of age shows that small firms in BTP appear to be younger and smaller than the ones in CTP, although the differences are statistically insignificant. Meanwhile, with respect to innovation capacity, firms in BTP have bigger value than firms in CTP.

Of the 60 firms in the sample, 48 firms (80%) were recorded to have innovated in the period of 2016-2018. Most of them come from BTP, suggesting that firms in BTP innovate more often than the ones in CTP. The differences among them in this regard is statistically significant. Meanwhile, table 4 below shows the differences between small firms in both SPs on innovation products' market coverage.

Table 5 shows that more than half of the sample admit that they innovate only in the scale of their firm. In the new market, innovation of small firms' samples from CTP is marketed dominantly in local area, while the majority of the samples from BTP are marketed nationally. Samples from both science park have reached world market, albeit in a limited quantity.

Table 2. Business sector of small firms

Sector	BTP	CTP	Total	Percentage
Science-based	18	20	38	63.3
Specialized supplier	8	1	9	15.0
Supplier dominated	4	8	12	20.0
Others	0	1	1	1.7
Total	30	30	60	100.0

Table 3. Sample characteristic of age, size, and innovation capacity

Variables	BTP			CTP		
	Mean	Median	Std Dev.	Mean	Median	Std Dev.
Age (years)	1.90	2.00	1.125	2.67	2.00	2.468
Size (persons)	7,47	6.00	5.800	8.13	6.00	6.532
Innovation Capacity* (%)	53.73	50.00	31.582	24.50	22.50	26.825

Notes: *significant difference $p < 0.01$

Table 4. Firms which innovate in the measured period

		BTP	CTP	Total
Introducing new product(s) within 2016-2018*	N =	28	20	48
	% of sample	93,3%	66,7%	80%

Notes: *significant difference $p < 0.01$

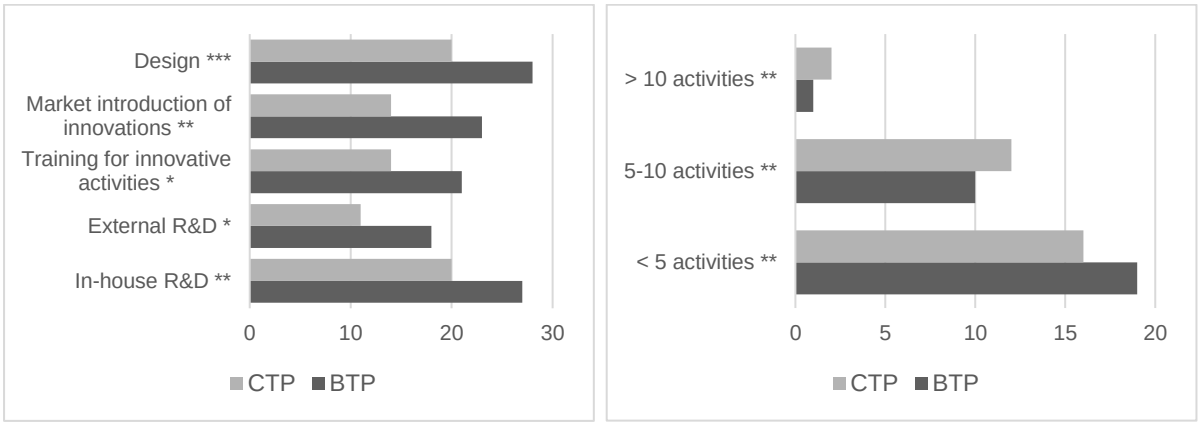
Table 5. Geographic markets of innovation products

	Of 60 firms		
Innovation coverage	**BTP**	**CTP**	**Total**
A first in the firm*	18 30%	14 23.3%	32 53.3%
A first in the market:			
A first in the city**	3 5.0%	11 18.3%	14 23.3%
A first in the country**	19 31.7%	4 6.7%	23 38.3%
A first in the world**	3 5.0%	4 6.7%	7 11.7%

Notes: * $\chi^2 = 1.071$, df = 1, significant level $p = 0.301$;
** $\chi^2 = 16.747$, df = 3, significant level $p < 0.01$

Figure 2 (left) below shows a larger proportion of small firms in BTP performing various kinds of innovation activities in the past year when compared with firms in CTP. There are 5 innovation activities as suggested by European Statistics or Eurostat in assessing innovation communities (Eurostat, 2015). While firms in BTP seem focused on innovation activities, the right graph on figure 4 shows a slightly

higher proportion of firms in CTP frequently performing business activities in the latest year. Small firms in CTP receive more systemized trainings in business (not just informal gatherings) every month, such as business meeting, training by professionals, or marketing workshop. Meanwhile, business activities in BTP were merely business training for park incubatees, informal gathering, or sharing sessions among firms which were not consistently held every month.



Notes: * significant difference p ≤ 0.1, ** p ≤ 0.05, *** p ≤ 0.01

Fig. 2 (Left) Distribution of small firms' R&D activities; (Right) Distribution of business frequencies.

Moreover, based on observations and interviews to both science park management teams, many business events were held in CTP in order to increase the market coverage and attract more talents to establish or migrate their offices into the park. These events were large scale and they were considered as part of municipality events. Conversely, firms in BTP were spurred to promote the products in similar events outside the park, but no events within the park were on the same scale as they were in CTP.

4.2. The effect of park missions

Table 6 shows the correlation test of all variables which comprises of 2 values: tolerance and variance inflations factors (VIF). As guided by Field (2013), the value of tolerance must not excess 1.00 and VIF must be between 1-10 to test the multicollinearity. The results in table below provide an evidence that no strong correlation among variables as one of the must-look assumptions in logistic regression.

Table 7 presents the result of logistic regression estimations which applies equation (1) and (2) in column 1 and 2 respectively. Every column provides Wald test to find out whether the model is significant and ensure that estimated parameters are not zero. Likewise, the pseudo R^2 is used to predict the quality of model adjustment or goodness of fit. In addition, to overcome the bias and skew due to the small amount of sample, bootstrapping method (Field, 2013) is used in equation 1 and 2.

Table 6. Value of Tolerance and VIF

Variables	Tolerance	VIF
Uni-led SP	0.368	2.716
Business activities	0.851	1.175
R&D supports	0.371	2.696
R&D expenditures	0.710	1.409
Age	0.410	2.439
Age^2	0.392	2.551
Size	0.754	1.325

Table 7. Results from logit models

Variables	Model 1 (Eq. 1)[a]	Model 2 (Eq. 2)[b]
Uni-led SP	116.361** (52.109)	64.345** (56.338)
R&D supports	112.794* (62.238)	14.692* (55.799)
Uni-led SP x R&D supports	-181.000** (84.303)	-
Business activities	75.267*** (34.032)	64.292*** (39.342)
Uni-led SP x Business acitivities	-	-64.406** (44.964)
R&D expenditures	0.001* (0.000)	0.002 (0.001)
Age	-52.557** (45.683)	-6.746 (60.555)
Age^2	1.963** (2.328)	-1.061 (3.916)
Size	-20.820** (22.137)	-14.710** (22.809)
Constant	-49.544 (58.292)	-49.535* (63.452)
Fit		
Wald Test χ^2	60.048***	60.048***
Pseudo R^2	0.632	0.632

Notes: Dependent Variable: Innovation performance; Standard error in brackets.
* Significance at 10%; ** significance at 5%; *** significance at 1%
[a] Bootstrap (BCa 95% confidence) based on 643 samples
[b] Bootstrap (BCa 95% confidence) based on 995 samples

The first row of two equations presents the logistic regression analysis with having proximity to Uni-led SP as a variable. Both models show positive and significant result. This confirms the first hypothesis (H1) that being located near the university-led SP with a university on site and an R&D oriented mission will maximize the likelihood of small firms to introduce new products, rather than if the small firms are in the government-led SP. This result is in line with studies by Felsenstein (1994) and Dettwiler et al. (2006) which pinned the important role of universities in SPs to be the source of innovation and a trigger for small firms to innovate. Therefore, if the firms are inclined to research and the main aim is to introduce new products, they will perform better in the university-led SP.

This finding confirms the study of Ramírez-Alesón & Fernández-Olmos (2018) which suggests that the benefit of science park is indirect and not due to proximity alone. This might also answer many studies which have been questioning the benefit of residing close to the park (Bakouros et al., 2002; Díez-Vial & Fernández-Olmos, 2015; Massey, Quintas, & Wield, 2003) because, as apparent in the result, the effect of spatial proximity could be influenced by park mission. Moreover, study by Mae Phillips & Wai-chung Yeung (2003: 724) found that the physical presence does not imply institutional "thickness"; instead, the coherence of vision among many actors does. In this respect, it means the mere spatial proximity between firms and park benefits nothing without the conformity of SPs mission and the need of on-park firms.

Besides the proximity, we also scrutinize the effect of SPs services on firms' innovation performance, which is presented by two variables: *R&D supports* and *Business activities*. The result of *R&D supports* variable shows positive and significant in two models. This finding exhibits the essential role of SPs in giving assistance to small firms in conducting research collaborations with other external actors. As explained by Vásquez-Urriago, Barge-Gil, & Modrego Rico (2016), more opportunities for R&D supports have positive effect on small firms' performance because those benefits create a more diverse relationship for the firms and broaden the access of knowledge spillovers to them. In the same way, the variable of *business activities* also has positive and significant result in all models. This suggests that the more the firms are leveraging the SP support in providing such business activities, the more likely small firms will innovate. Again, this finding supports the notion that to develop business, such as making networks and links, it is of critical importance for small firms to be located close to SPs. In line with a study by Keeble et al. (1999: 328) about the innovative milieu in Cambridge region, SPs are apparently considered by firms as local institutions which give supports through "interfirm networking and advice consultancy" to specifically bestow improvements on their business

developments. The positive effect of both variables on firms' innovation therefore proves the hypothesis H2.

Considering that the aim of this study is to find the role of park mission in the effect of SPs on firms' innovation performance, the interactions of *Uni-led SP x R&D supports* and *Uni-led SP x Business activities* are observed. Model 1 presents the value of interaction between *Uni-led SP* and *R&D supports* as significant but shows negative value. It means that SP support for R&D collaborations does not maximize the likelihood that small firms will innovate when they are located adjacent to the university-led SP. This study therefore cannot prove hypothesis H3a. This peculiar result might be affected by other variables which are entailed to the firms' innovation performance. One of the reasons is that many studies believe that R&D oriented SPs, usually led by university, only offer basic research which is difficult to adopt into new products (Phillimore, 1999; Quintas, Wield, & Massey, 1992) and has less effect on moderating the relationship between SPs and the innovation performance of small firms. A study by Link & Scott (2017) also finds that the benefit of interaction between universities and SPs is accrued more to universities than to the SPs and on-park firms. The study discovers that universities near SPs has easier access to patenting the research. Although location with universities or R&D institutions is theoretically necessary, this finding reaffirms that the true benefits achieved by on-park small firms are merely informal links and prestige (Vedovello, 1997; Westhead & Batstone, 1998)

Likewise, we also find a negative and significant value of the interaction variable between *Uni-led SP* and *Business activities*. However, the negative value in equation 2 is in line with our hypothesis H3b that the effect of business activities on innovation performance is attenuated when small firms inclined to business is residing near university-led SPs. We can conclude that the service for business support is seemingly less effective in the university-led SP than in the government-led SP.

The result of interactions between mission and activities confirms the studies about the importance of suitable management strategy in providing services to on-park firms (Dettwiler et al., 2006; Monck, 1988; Ratinho & Henriques, 2010; Zhang et al., 2015). Study about Singapore Science Park (Mae Phillips & Wai-chung Yeung 2003) also found that despite the sophisticated facilities provided in the park, the behavior of firms is affected by what mission the park managers is biased towards and how they promote the park. The cases of BTP and CTP exhibit this phenomenon. BTP as a university-led SP has a strong effect in bearing their tenants to introduce new products. Managed by experts with science and business background, this park might be a haven for small firms seeking for research-based innovation. Their incubation program also draws more tenant from the graduates of Telkom University nearby. What BTP has been doing appears to be quite similar with the approach used by Hsinchu Science Park in Taiwan as described by Chen & Choi (2004) and Lee & Yang (2000).

Although not necessarily contrasting, CTP as a government-led SP also aims to support their tenants to innovate. The difference is just that this park, which focuses on developing local economy and regional competitiveness, might be a better hotspot for small firms (even for micro firms) which are willing to improve their business performance. This park offers many business activities in various level for their tenants. CTP also intentionally promotes facilities and the potential of the designated area to big firms stimulate knowledge spillovers in the region. This approach is actually the most common practice of SPs development in Indonesia and in some emerging countries, such as Thailand (Patthirasinsiri & Wiboonrat, 2018) and China (Tan, 2006). How management strategies of BTP and CTP are different in this respect can be seen in Table 4, Table 5, and Figure 2 above.

Ultimately, regarding control variables, the results are in line with previous studies except for the R&D expenditure. Although R&D expenditure appears to be of importance in affecting innovation performance, we cannot confirm this correlation since the result shows insignificant estimation (it is 10% significant in Eq.1, but the estimation is too low). The variable of Age has a negative and significant value (in Eq.1) means younger firms tend to be more innovative than older firms. This could happen because of the negative effect of age on cognitive skills i.e. new skills learning or creativity. Moreover, when the firms age, they tend to abide to more rigid principles in the company, making it difficult for older firms to embody the newer knowledge (Diez-Vial & Fernández-Olmos, 2017). The value of quadratic age which is positive and significant (Eq. 1) explains the non-linear effect, meaning that although younger firms outperform older firms, at some point the effect will decline (Diez-Vial &

Fernández-Olmos, 2017). This can happen since a high probability of innovating is always presented by either very young startups or giant tech companies which are above the intermediate ages, such as Nintendo or Apple (Huergo & Jaumandreu, 2004). However, among four variables, only the variable of size is significant in both models. The value of negative and significant shows that smaller firms have a higher probability to innovate. This confirms previous studies which said that many firms prefer to stay small to maintain their innovativeness and avoid administrative rigidity, which is commonly found in firms with a large number of employees (Almus & Nerlinger, 1999).

5. Conclusions and implications

This study does not intend to compare SPs nor evaluate which approach is better. The purpose of this study is to evaluate the effect of SPs on small firms' innovation performance, measured by the likelihood of new products introduced by the firms in the parks with different missions. Although the effectiveness of SPs has been discussed in many papers, we attempt to contribute another perspective to the debate on the inconclusive effect of SPs. This study differs from the prior researches in several aspects. First, this study focuses on studying the performance of on-park firms only, attempting to discover the effect of SPs on on-park firms, which are practically diverse. Second, we contribute by looking at the specific missions of different SPs to test whether it moderates the effect of SPs on the firms' innovation performance. Finally, we empirically evaluate the innovation performance of on-park firms in Indonesia, which is quite new in the literature. This also possibly covers the pattern of SPs policy development in emerging countries, particularly in Asia. Ever since the success story of the USA's Silicon Valley, as well as the success of many developed countries in using knowledge-based economy as the generator for development, SPs has been of interest for policy makers in Indonesia. Many local authorities across the country are even allocating some budgets for SPs development in order to encourage entrepreneurship. Nonetheless, the effect of park evidently differs, as this study demonstrated with the cases of BTP and CTP in Greater Bandung.

This study supports the previous studies, such as a study by Albahari et al. (2018) who argue that SPs are heterogeneous and Capello & Morrison (2009) that SPs differ by their statutory mission. We confirm that the effect of SPs is moderated by the park mission which matches distinctive activities conducted by on-park firms. Our findings show different likelihood of small firms to innovate based on which park they reside in. Firms which prefer to launch new products are more likely to do so when they are located adjacent to university-led SPs or to parks whose mission is to commercialize research. In contrast, firms which concentrate on business, i.e. how to improve sales with innovative marketing, are seemingly more well-served in government-led SPs because their performance will be attenuated in university-led SPs. Ultimately, our analysis leads to better understanding of the reason why park mission matters in leveraging the benefit of SPs. With the cases of our study and some examples of emerging countries in previous studies, we can also corroborate that the park mission can also affect the park image, and eventually fashions the behavior patterns of their on-park tenants.

Our conclusions also raise policy implications in terms of leveraging the benefits of SPs. As we have observed that SPs have no universal effect on firms' innovation, it is better for policy makers or park managers to clearly state the specific mission of the park at the first place. This idea can filter what business sector will be well-developed and will captivate the firms and other stakeholders whose needs perfectly match the park. This will improve the efficacy of the relationship between involved actors within the park, such as park managers, local authorities, universities, big companies, and firms. It is also worth noting that geographical closeness does not guarantee a harmonious relationship and collaboration. A clear mission statement can also influence how the management should behave. Without a clearly stated mission in the beginning, managers may serve all kinds of firms but only superficially, without specific attention to their services. If this is the case, then small firms obtain no benefits from locating near the particular SP; a clear mission can help managers focus on their parks' specialty and, consequentially, offer specialized services for resident firms. Furthermore, if the mutual relationship among stakeholders are well-managed, the park and the region will have a prestigious image with distinguished specialization. As mentioned by many studies, the good image of the park will

either significantly boost the performance of existing small firms or attract new potential small firms and stakeholders into the park, both of which bring great benefits for the local economic development.

This paper has limitations which can be considered as opportunities for future research. First, this study only covers two parks, which results in a small size of population. Although this drawback can be overcome by the bootstrapping method in statistics, we suggest future studies to cover more SPs and widen the scope so that the sample size can be bigger and more appropriate. Second, although we mention an agglomeration effect, we do not cover it as a variable. It can be more interesting if future research considers agglomerated spaces such as clusters, to observe whether there are differences between agglomerated and non-agglomerated firms. However, despite those limitations, we can assure that this study offers a useful contribution to the literature about SPs and firm's innovation performance.

6. References

Abramovsky, L., & Simpson, H. (2011). Geographic proximity and firm-university innovation linkages: Evidence from Great Britain. *Journal of Economic Geography*, *11*(6), 949–977.

Albahari, A., Barge-Gil, A., Pérez-Canto, S., & Modrego, A. (2018). The influence of Science and Technology Park characteristics on firms' innovation results. *Papers in Regional Science*.

Almus, M., & Nerlinger, E. A. (1999). Growth of New Technology-Based Firms: Which Factors Matter? *Small Business Economics*, *13*(2), 141–154.

Asmara, A. Y., Oktaviyanti, D., Alamsyah, P., & Muhammad Zulhamdani. (2016). Science-Techno Park and Industrial Policy in Indonesia. *Jurnal LIPI*, 1–27.

Bakouros, Y. L., Mardas, D. C., & Varsakelis, N. C. (2002). Science park, a high tech fantasy?: An analysis of the science parks of Greece. *Technovation*, *22*(2), 123–128.

Capello, R., & Morrison, A. (2009). Science Parks and Local Knowledge Creation: A Conceptual Approach and an Empirical Analysis in Two Italian Realities. In *New Directions in Regional Economic Development* (pp. 267–290).

Chen, S., & Choi, C. (2004). Creating a knowledge-based city: The example of Hsinchu Science Park. *Journal of Knowledge Management*.

Dettwiler, P., Lindelöf, P., & Löfsten, H. (2006). Utility of location: A comparative survey between small new technology-based firms located on and off Science Parks - Implications for facilities management. *Technovation*.

Diez-Vial, I., & Fernández-Olmos, M. (2017). The effect of science and technology parks on a firm's performance: a dynamic approach over time. *Journal of Evolutionary Economics*, *27*(3), 413–434.

Díez-Vial, I., & Fernández-Olmos, M. (2015). Knowledge spillovers in science and technology parks: how can firms benefit most? *Journal of Technology Transfer*, *40*(1), 70–84.

Díez-Vial, I., & Montoro-Sánchez, Á. (2016). How knowledge links with universities may foster innovation: The case of a science park. *Technovation*.

Etzkowitz, H., & Zhou, C. (2018). Innovation incommensurability and the science park. *R and D Management*.

Eurostat. (2015). Community Innovation Survey - Eurostat. Retrieved September 30, 2018, from https://ec.europa.eu/eurostat/web/microdata/community-innovation-survey

Felsenstein, D. (1994). University-related science parks - "seedbeds" or "enclaves" of innovation? *Technovation*.

Ferguson, R., & Olofsson, C. (2004). Science Parks and the Development of NTBFs— Location, Survival and Growth. *The Journal of Technology Transfer*.

Field, A. (2013). Andy Field - Discovering Statistics Using SPSS. In *Sage*.

Gower, S. M., Harris, F. C., & Cooper, P. A. (1996). Assessing the management of science parks in the UK. *Property Management*, *14*(1), 30–38.

Guadix, J., Carrillo-Castrillo, J., Onieva, L., & Navascués, J. (2016). Success variables in science and technology parks. *Journal of Business Research*, *69*(11), 4870–4875.

Hennink, M. Hutter, I., Baily, A. (2011). Qualitative research methods. In *Sage Publications*.

Huang, K. F., Yu, C. M. J., & Seetoo, D. H. (2012). Firm innovation in policy-driven parks and spontaneous clusters: The smaller firm the better? *Journal of Technology Transfer*.

Huergo, E., & Jaumandreu, J. (2004). How Does Probability of Innovation Change with Firm Age? *Small Business Economics*, *22*(3/4), 193–207.

Isaak, R. (2009). From collective learning to Silicon Valley replication: The limits to synergistic entrepreneurship in Sophia Antipolis. *Research in International Business and Finance*, *23*(2), 134–143.

Keeble, D., Lawson, C., Moore, B., & Wilkinson, F. (1999). Collective learning processes, networking and “Institutional thickness” in the Cambridge region. *Regional Studies*.

Lee, W. H., & Yang, W. T. (2000). Cradle of Taiwan high technology industry development - Hsinchu Science Park (HSP). *Technovation*.

Li, Y., Wang, X., Huang, L., & Bai, X. (2013). How does entrepreneurs’ social capital hinder new business development? A relational embeddedness perspective. *Journal of Business Research*.

Link, A. N., & Scott, J. T. (2017). U.S. science parks: The diffusion of an innovation and its effects on the academic missions of universities. *Universities and the Entrepreneurial Ecosystem*.

Löfsten, H., & Lindelöf, P. (2002). Science Parks and the growth of new technology-based firms - Academic-industry links, innovation and markets. *Research Policy*, *31*(6), 859–876.

Mae Phillips, S.-A., & Wai-chung Yeung, H. (2003). A Place for R&D? The Singapore Science Park. *Urban Studies*, *40*(4), 707–732.

Massey, D., Quintas, P., & Wield, D. (2003). High-tech fantasies: Science parks in society, science and space. In *High-Tech Fantasies: Science Parks in Society, Science and Space*.

Moeliodihardjo, B. Y., Soemardi, B. W., Brodjonegoro, S. S., & Hatakenaka, S. (2012). University, Industry, and Government Partnership: Its Present and Future Challenges in Indonesia. *Procedia - Social and Behavioral Sciences*, *52*, 307–316.

Monck, C. S. P. (1988). *Science parks and the growth of high technology firms*. Croom Helm, in association with Peat Marwick, McLintock.

Patthirasinsiri, N., & Wiboonrat, M. (2018). Measuring intellectual capital of science park performance for newly established science parks in Thailand. *Kasetsart Journal of Social Sciences*.

Phillimore, J. (1999). Beyond the linear view of innovation in science park evaluation. An analysis of Western Australian Technology Park. *Technovation*, *19*(11), 673–680.

Quintas, P., Wield, D., & Massey, D. (1992). Academic-industry links and innovation: questioning the science park model. *Technovation*.

Ramírez-Alesón, M., & Fernández-Olmos, M. (2018). Unravelling the effects of Science Parks on the innovation performance of NTBFs. *Journal of Technology Transfer*, *43*(2), 482–505.

Ratinho, T., & Henriques, E. (2010). The role of science parks and business incubators in converging countries: Evidence from Portugal. *Technovation*.

Saemundsson, R. J., & Candi, M. (2017). Absorptive capacity and the identification of opportunities in new technology-based firms. *Technovation*, *64–65*, 43–49.

Sanni, M., Egbetokun, A. A., & Siyanbola, W. O. (2009). A model for the design and development of a Science and Technology Park in developing countries. *International Journal of Management and Enterprise Development*.

Shearmur, R., & Doloreux, D. (2000). Science Parks: Actors or Reactors? Canadian Science Parks in Their Urban Context. *Environment and Planning A*, *32*(6), 1065–1082.

Soenarso, W. S., Nugraha, D., & Listyaningrum, E. (2013). Development of Science and Technology Park (STP) in Indonesia to Support Innovation-Based Regional Economy: Concept and Early Stage Development. *World Technopolis Review*, *2*(1), 32–42.

Tan, J. (2006). Growth of industry clusters and innovation: Lessons from Beijing Zhongguancun Science Park. *Journal of Business Venturing*.

Vásquez-Urriago, Á. R., Barge-Gil, A., & Modrego Rico, A. (2016). Science and Technology Parks and cooperation for innovation: Empirical evidence from Spain. *Research Policy*.

Vedovello, C. (1997). Science parks and university-industry interaction: Geographical proximity between the agents as a driving force. *Technovation*, *17*(9), 491–531.

Westhead, P., & Batstone, S. (1998). Independent technology-based firms: The perceived benefits of a science park location. *Urban Studies*, *35*(12), 2197–2219.

Zhang, H., Garrett, T., & Liang, X. (2015). The effects of innovation-oriented mission statements on innovation performance and non-financial business performance. *Asian Journal of Technology Innovation*.

Appendix

Questions used in the survey (variables name on the right)

A. General Profile

1. Name of the respondent	
2. Name of the company	
3. Sectors of activity (choose only one)	
• Science-based (mobile application, computer software, animation)	*SECSCIE*
• Specialized supplier (innovative machine producers)	*SECSPSU*
• Supplier dominated (foods, crafts, textiles, retail services)	*SECSUPD*
• Others	*SECOTHE*
4. Market coverage (local, national, world)	*MARLOC; MARNAT; MARWOR*
5. Year of foundation	*AGE*
6. Size (number of employees in the initial year and the present)	*EMP000; EMPNOW*

B. Innovation Performance

7. New products in sale during 2016-2018 (yes/no, if *no* then jump to Q.13)	*INNO*
8. The novelty of products (new to the firm only or new to the market)	*INNONEWF; INNONEWM INNOTUR*
9. Product innovations contribution to total turnover in the past year (%)	*INNOLOC; INNONAT;*
10. Coverage of product innovations (a first in your city, in the country, or in the world)	*INNOWOR*
11. Activities for innovations in period of 2016-2018 (in-house R&D, external R&D, training, market test, design)	*RDINF; RDEXF; RDTRA; RDMAR; RDDES*
12. Innovation activities expenditure in the past year (Indonesian Rupiah)	*RDEXP*

C. The Science Park

13. Affiliation to the SP (BTP/CTP)	*UNILEDSP; GOVLEDSP*
14. Location of office to the SP (in the SP office space or around SP)	*SPLOC*
15. R&D activities with the assistance of SP managers (yes/no)	*SPRD*
16. Collaboration with universities (yes/no)	*SPUNI*
17. Frequency of business activities provided by the SP in the past year (nothing, <5, 5-10, or >10)	*SPBUS*
18. Reasons to affiliate with the SP (networking, services, affordable rent price, or/and accessible location)	*SPWHYNET; SPWHYSER; SPWHYREN; SPWHYACC*
19. Score for SP's services (1-10, from extremely unsatisfied to very satisfied)	*SPSCO*
20. Membership of any clusters or associations in the SP (yes/no)	*SPCL*