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Assessing the Effectiveness of Industry Parks on Innovation of Tenant Firms: Park-level Evidence from China

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ABSTRACT

One of the aims of establishing industrial parks is to nurture technology startups which are considered the engine of general economic growth. Based upon a survey analysis of 82 industrial parks located in 13 cities in Jiangsu Province of China in 2014, our research is attempted to investigate whether, and if so, how industrial parks may affect the innovativeness of tenant firms. The empirical models in this study test in which ways industry parks have impact on firm innovations by comparing the performance among various industry parks. Our empirical findings suggest that incumbent firms act as anchors creating a viable economic base for the innovation cluster to evolve. More specifically, both the ratio of piloting firms to all firms and the density of R&D facilities in a specific industrial park are positively related to the innovativeness of firms in that park. In addition, our findings also suggested that certain mechanisms within an industry park are critical in facilitating innovative activities of tenant firms. The findings of this study further supports the argument on the effectiveness of intervention program of LED – that industry park level impact is positive and critical to tenant firm success.

Key words: Industry Park, Government Intervention, Efffectiveness, Regional Innovation
JEL classification: M10, M13

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Assessing the Effectiveness of Industry Parks on Innovation of Tenant Firms: park-level evidence from China

1. INTRODUCTION

Industry and Science Parks have gained a wide attention more recently as an effective strategy on regional economic development planning. The establishment of industrial parks is mainly aimed to nurture technology startups which are considered the engine of economic growth. Industry and Science Parks are playing an important role in helping small and medium firms obtaining capital and social resources more efficiently. Younger firms, especially those that are technology intensive, show high mortality rate (Eisinger, 1988) compared with other firms. It may be explained by the fact that relatively higher capital requirement for research and development (R&D), slow and uncertain return on investment make it difficult for these firms receive necessary and effective supports from capital lenders and other public agencies. From the local government's perspective, this risky situation is considered as an impediment hindering the potential prosperity of the local economy (Bøllingtoft & Ulhøi, 2005; Colombo & Delmastro, 2002; Smilor & Gill, 1986). At this point, local investment environment factors are playing a critical role in making connections of local resources and tenant firms and consequently affects the performances of these firms.

Industrial park level attributes, therefore, are becoming particularly interesting in examining the outputs, especially innovative outputs of tenant firms. The discussion on government-led industrial parks has been centered around the legitimacy of policy change and the potential effects of local public resources on the development of an innovative local economy. In industrial parks, the public resource allocation involves the intervention of public agencies, venture capitalist, and higher education institutions (HEI). These mechanisms aim to provide an environmental infrastructure that nurtures economic agents who are less likely to survive and grow without external help (Flynn, 1993). From the public agents' perspective, such intervention provides valuable resources that the private agents are not able to have access elsewhere (Flynn, 1993), and the utilization of such resources is expected to be maximized. The question is then how the public resources may be effectively allocated or reallocated to tenant firms, especially those that are still in their infant stages, and consequently improve their innovativeness. While it is commonly accepted that geographic proximity facilitates innovations through local knowledge spillovers, large pilot firms and small start-up firms may benefit from intra-cluster knowledge flow in various ways. More specifically, firms engaged in radical innovation tend to benefit more from their location in the industrial park, especially from inter-firm knowledge spill over. It may further imply that tenants in a cluster may benefit from collaborating or simply co-locating with firms in the same cluster that are in the pursuit of radical innovations.

Based upon a survey analysis of 82 industrial parks located in 13 cities in Jiangsu Province of China in 2014, our research is attempted to investigate whether, and if so, how industrial parks may affect the innovativeness of tenant firms. Our empirical findings suggest that large firms act as anchors creating a viable economic base for the cluster to evolve. More specifically both the ratio of piloting firms to all firms in the park and the density of R&D facilities in a specific industrial park are positively related to the innovativeness of firms in that park.

In the next section, we will review literature on innovation clusters and innovation parks following by a brief introduction on the development of industrial parks in China, in which our sample was collected. In section three, we will develop our theories on the effect of industrial park attributes on firm innovative outputs. We will then present the methodology and the empirical models in section four. Conclusion and limitations will be addressed in the last section.

1.1. Industrial Clusters and Innovations

Two types of regional innovation centers have been discussed in literature. The specialized centers (Marshall, 1920, Arrow, 1962, Romer, 1986) are highly specialized in their profile of technological development, and attracting corporate activities in the same narrow range of fields. A typical case for this type of locally specialized cluster is Silicon Valley. Such industrial clusters are often referred to Marshallian or Marshall-Arrow-Romer (MAR) clusters. MAR externalities emphasize the importance of local labor markets for the swift intra-industry diffusion of extant innovations.

On the other hand, Jacobs (1969) argues that knowledge may spillover between complimentary rather than similar industries, and it is the exchange of complimentary knowledge that facilitates search and experimentation in innovation. Jacobs externalities highlight the significance of inter-industry diversity and technological complementarities for the emergence of new innovations (Jacobs, 1969; Robinson, et. Al., 2007). The Jacobian clustering theory has been linked with urbanization theory, and mainly focused on the foundation of local infrastructure systems such as transportation, communication, and education facilities. The exchange of knowledge that facilitates search and experimentation in innovation, however, has been less studied (Harrison et al., 1996). This is what we called the all-around centers in which the development efforts of firms from a broad range of sectors agglomerate.

It is widely accepted that clusters are positively associated with innovations (Baptista and Swann, 1998; Beaudry 2001). Zucker, et al. (2002) suggest that the co-located firms have statistically significantly higher levels of patents and patent citations compared with others. A common view is that knowledge spillovers increase innovation and productivity growth (Griliches, 1990; Nadiri, 1993), and that much R&D-related knowledge spills over locally (Jaffe, 1986; Pavitt, et al,, 1987; Acs, et, al., 1992; Jaffe, et al,, 1993). This is especially true in the case of industrial clusters. It is because the more similar the activities of the firms in a cluster, the more likely that relevant (and valuable) knowledge will spill over from one firm to another (Arrow, 1962; Romer, 1986). These spillovers are typically operationalized through the local labor market (i.e.: through the inter-firm mobility of skilled workers, scientists and engineers). By benefiting from each other's' research (Griliches, 1979), the spillovers may increase the stock of knowledge available for each individual firm.

While many studies has shown an increase in innovating patenting activity for firms within a cluster. Others found different results (Suarez-Villa & Walrod, 1997; Alsleben, 2005). Some potential reasons may help explain why clusters are not related to innovation. First, the geographic proximity of research team members is not conducive to all types of innovative work. New technologies created by teams that operated using face-to-face interaction have a greater chance of successful commercialization (Almeida and Kogut, 1999; Agrawal, 2000). Gittelman (2007) finds that geographically proximate R&D teams generate more commercially valuable innovations, while geographically dispersed R&D teams generate more high-impact scientific knowledge. Laursen and Salter (2006) find an inverted U-shaped relationship between search and innovative performance, suggesting that there is point beyond which the dispersal of R&D activities becomes deleterious.

In addition, clustering may increase R&D based competition for resources, suppressing innovation (Alsleben, 2005). Similarly, Pouder and St. John (1996) observe that a burst in innovative activity within clusters is often followed by spectacular collapse. They attribute this to the development of core rigidities (Leonard-Barton, 1992) within these clusters that reduce firms' ability to explore for new ideas and continue to innovate. In addition, research on oligopolistic deterrence suggests that adverse selection can operate within clusters (Oakey and Cooper, 1989; Fosfuri and Ronde, 2004). If clustering increases knowledge spillovers, intuitively we see that the most innovative firms will experience a "net loss" of knowledge while the laggard firms benefit, gaining more knowledge than they disclose. Lastly, given that newly-created knowledge can be appropriated only to a limited extent, and the technological change is cumulative and path-dependent, knowledge spillovers are believed to occur only to firms which taking similar technological activities.

Kukalis (2009)'s study further support this argument by suggesting that geographically isolated laggard firms outperform laggard firms within geographic clusters in later stages of the industry life cycle. It implies that technological lock-in and organizational inertia may begin to create detrimental effects among cluster participants, so that benefits exist by exiting a cluster during later industry life cycle stages. In other words, compared with large firms, small firms in an innovation cluster may benefit more from being geographically proximate with large firms, given that they tend to receive more technology spillovers and knowledge transfer through local learning.

2. THEORY OF THE INDUSTRY PARK

2.1.Technology-based Economic Development and Industrial Parks

The industry park is one of the models that municipal governments use to improve economic development. It is inspired by the theoretical premise on the positive role of industry cluster. Deeply rooted in economic theory of innovation, such technology-based economic development (TED) policies are legitimately supported since industrial parks help establish linkages between technology, innovation, and new industrial and economic growth (Phillips, 2003). Economic competitiveness is likely to be achieved through innovative activities (Schumpeter, 1934; Westhead & Batstone, 1998). Inspired by Schumpeter (1934), Phillips (2003) contends that an industry learns to adapt to continuously challenging market conditions by implementing new innovations into products and processes, especially in a market in which technology plays a crucial role. Because of the benefits of knowledge creation, regional economic development policy makers chose to direct their efforts towards building knowledge-based economic structure for territorial innovation (Malecki, 1997). In an effort to achieve this paramount goal, a variety of new concepts were introduced, including: innovative milieu (Aydalot, 1986), the science park (Löfsten & Lindelöf, 2003), and new industrial spaces (Soetanto & Geenhuizen, 2005). Phillips (2003) noted that competitiveness is the "ability of an industry to produce qualitatively differentiated products and respond quickly to market changes." Rothwell and Zegveld (1981) suggest that an innovative economy is an engine for a country to leverage their economic competitiveness in the international economy. In other words, high-tech firms are suggested to drive leap frog innovations based on unconventional technical approaches. Based uopon above discussion, new public intervention toward technology-based firms (NTBF) are a popular choice since it is a strategic choice of local economic development (LED) (Colombo & Delmastro, 2002).

2.1. The Roles of Industry Parks

As one of the policies which are aimed of improving small business performance, the industry parks intends not only to remedy, but also to lead local economic growth as a desirable strategy of local economic development (LED) (Esisinger 1988). In general, industry parks are external heterogeneous factors that work with the market, firms, and venture capitals with an aim to help young companies survive and succeed (Rice, 1992). The task of the industry park reflects its demand-side approach. It is mostly through real estate related projects, including providing affordable rent, shared office space and office supplies for some parks, managerial advice and legal consultation, and fostering networking between firms within the facility and within the local economy (Löfsten & Lindelöf, 2005; Löfsten & Lindelöf, 2002; Mian, 1996). The allocation of essential resources and services reflects progressive activism, which stimulates positive externalities and deter any unnecessary waste due to possible outcomes of trial and error.

Particularly, Mian (1996) puts emphasis on the role of 'networking' business, capital and social inputs. Soetano and Geehuizen (2005) also view incubator or equivalents as 'intermediary agents' and state that these programs provide favorable conditions where firms and non-corporate institutions interact (Soetanto & Geenhuizen, 2005). In addition, industry parks play a role in coordinating actions in positive directions or in discouraging any negative outcomes to be produced to enhance formation of young firms. Thirdly, industry parks change circumstances to encourage all participants to collaborate and eventually to improve their performances (Sherman, 1999). In addition, Smilor and Gill (1986) propose that industrial parks are playing a role in leveraging talent, accelerating development of new firms, and facilitating the commercialization of advanced technology depending on the attributes and missions specified by particular context.

2.2.Industry Parks in the Context of China

In East Asia, industrial parks were innovated in Taiwan and spread to Korea, China and other emerging economies. As distinct from the economic and industrial parks in developed countries such as U.S and Europe, where the industrial parks are largely led by leading firms in the sector, most industry parks and economic zones in China are planned and developed by state government. They are established by the provincial and municipal governments with an aim to promote industrial and economic development. Jiangsu Province has become one of the most industrialized and advanced regions in China since the Economic Reformation in mid 1980s, with second highest GDP in 2011 among all regions. Industrial parks in the area are managed by state provincial and municipal governments. Industrial parks are competing with each other to attract new firms, so that each administrative committee strives to distinguish its park in terms of its municipal services, the quality of its infrastructure, and its appearance and "curb appeal." Governmental supports include special incentives on land and plants, capital, tax benefits, and logistics, etc.

3. THEORETICAL DEVELOPMENT & HYPOTHESES

3.1.Density of R&D Facility

Based upon the discussion in the previous section, an industry park's primary task is to recruite most suitable tenants and further to create a tenant pool where positive externalities are expected from the interaction of all tenants. Given the cluster effect of co-located firms, the success of park also depends on creating an artificial environment that is equivalent of industry cluster. At this point, industry parks may create a pool of tenant from the same industry. More importantly, a park may take advantage of R&D facilities that the tenants bring in. The overall availability of R&D facilities in the industry park is likely to stimulate knowledge creation at the park level. The advantages of using available R&D facilities include: from financial standpoint, R&D facilities are costly for running, and they are critical for firms especially at their early stage. Therefore, the proximate R&D facilities may imply risk-mitigation for tenant firms. Secondly, park level R&D centers would provide an innovation hub in which knowledge sharing will be eased. Open innovation literature often argues that innovation tend to be more effective firms are interacting each other (Chesborough, 2006). In this sense, it is logical to extend our first set of hypotheses as below:

H1a: The density of R&D facilities in an industry park is positively related to the new product creation in the park.
H1b: The density of R&D facilities in an industry park is positively related to the radical innovations in the park.

3.2.Firms' Innovative Activities and Established Firms

In general, it is widely accepted that established firms are less motivated in engaging in radical innovation. Some of the reasons may include: 1. Radical innovation often brings in disruptive change in an industry (Rothaermal, 2000; Brown & Eisenhardt, 1997; Christensen, 2013). 2. Given that the mechanism of radical innovation is different in matured firms, radical innovation often imposes creation of an industry or revolutionary change of the existing business model. 3. The existing body of knowledge makes firms less motivated to general knowledge which is distant from the firm's core because of a lack of relevant network and information channel that transforms information and ideas of new trends (Chandy & Tellis, 1998), and the fear of potential cannibalization of existing revenue stream of incumbents (Conner, 1988). Firms rather become more interested in meeting the needs of existing customers (Allen, 2003). Finally, for incumbent firms, it is less risky when they focus on improving their existing technologies (Henderson & Clark, 1990; Utterback, 1996).

On the other hand, empirical evidence also suggests that radical innovation can be effectively achieved by incumbents under certain conditions. Most of all, established firms can leverage their advantage which comes from the capability of utilizing abundant resource. For this reason, established firms may benefit from obtaining critical human resources required for R&D activities (Kotabe & Swan, 1995). The size of these firms also allow them to exploit advantages generated from scalability. Learning curves can thus be steepened. Incumbent firms may outperform newer firms by overcoming the weakness of slow decision making process and bureaucratic organizational culture by dividing into smaller units (Maidique & Hayes, 1983). By dividing into small units, incumbents can take advantages from faster decision making, providing employees with ownership and loyalty (Zenger & Hesterly,1997). Moreover, Siegel et al (2003) proposed that firms engaged in radical innovations tend to be located in science or industry parks, with expectation of benefitting from knowledge spillover. It further implies that incumbent tenants are likely to benefit from working with small firms that are in the pursuit of radical innovation. Based upon above discussion, our second set of hypotheses is that the tenant portfolio may affect firms' innovative activities. Particularly, greater presence of incumbents would likely to lead to more success in radical innovation.

H2a: The share of established firms in an industry park is positively related to the new product creation in the park.
H2b: The share of established firms in an industry park is positively related to the radical innovations in the park.

4. DATA AND METHODOLOGY

4.1.Data

The research setting of this study is the innovative activities of industrial parks in equipment manufacturing sector located in the Jiangsu Province of China. The survey questionnaires were answered by the directors of the administration offices of 82 industrial parks which are located in 13 cities in the region and these parks host approximately 5,000 firms in the industry (Table 1).

Table 1. The distribution of industrial parks by city

City	Nanjing	Suzhou	Wuxi	Changzhou	Zhenjiang	Nantong	Taizhou
No. of parks	7	9	4	11	2	8	9
City	Yangzhou	Xuzhou	Yanchen	Lianyungang	Suqian	Huai'an	
No. of parks	9	2	13	2	4	2	

The 82 parks were in turn categorized into three industrial zones in Jiangsu Province; Southern Jiangsu Province, Mid Jiangsu Province and Northern Jiangsu Province. Among the three areas, South is the most developed areas which has been experiencing high speed economic growth since the economic reformation starting in early 1980s, and North is the newest developed area which hosts a relatively smaller number of large and matured firms in the sector (Table 2).

Table 2. The distribution of industrial parks by area

Industry park level	First level South Jiangsu	Second level Middle Jiangsu	Third level North Jiangsu
Quantity	33	26	23

The survey questionnaires were filled out by the head of administrative office in each park. The survey questionnaires include a broad range of questions on the profile, constitution, structure and performance of these industrial parks. Information on the profile of leading firms in each park such as the size, main products and market share is also included in the survey.

4.2. Sample

We removed the observations in which values are missing for key variables, and the final sample data in our empirical test consist of 74 industry parks. Missing values for count variables, such as number of patents for each category are taken as zero. However, we decided to leave missing values of other variables, such as R&D intensity, as there is no better way of replacing or estimating these missing data. The size of the park varies between a maximum 520 firms and minim 2 firms. Table 3 provides descriptive statistics of the variables used in the model.

Table 3. Description on variables

		Obs	Mean	Std. Dev.
RDINTN (control)	R&D expenditure per sales	70	.0461	.05624
RNDFACIL	R&D facilities per firm	74	.1445	.18852
PORTFOL	Ratio of well-established firms to all firms in a park	74	.1395	.47448
FIRMPERFM	Number of new products per firm for a park	74	.1387	.47600
INNVTN	Share of radical innovations per firm for a park	74	.1986	.22294
Valid N		70		

4.3. Empirical Model

The empirical model in this study is to test whether and how industry parks influence firm innovations. We compare the innovation outputs of industry parks in a specific business sector in a given region. We specify a firm's R&D performance as a function (Griliches, 1998) of the following attributes: 1. R&D intensity; availability of R&D facilities in the host park; and 3.the portfolio of constitution of firms in the park.

FIRMPERFM = f(RNDFACIL, PORTFOL, RDINTN);

FIRMPERFM denotes the number of new products per firm introduced during the period in our study. We take into consideration the park level attributes. RNDFACIL refers to the number of R&D facilities avaialbe to firms in each industrial park. We calculated the available R&D facility divided by the number of firms. This is based on the assumption that the R&D facilities which can be utilized by each individual firm, compared with the total number of facilities at park level, tend to have a more direct impact on the firm's R&D outputs. PORTFOL refers the ratio between small firms and established ones in a specific industrial park. The larger the PORTFOL value, the greater the proportion of incumbents compared to the rest.

INNVTN (Radical vs. Incremental),= f(RNDFACIL, PORTFOL, RDINTN)

Moreover, to distinguish the types of innovations (INNVTN) - in our case - radical innovation vs. incremental innovation, we first obtained the number of granted patents per firm for each category then calculated the ratio between them. Therefore, a greater INNVTN value indicates a larger share of radical innovation. RDINTN is measured by the ratio of R&D expenditure to a firm's sales revenue.

Although the dataset shows the industry park level information, but it is safe to argue that the overall innovativeness of each industrial park reflects the innovation performances of firms in that particular park. In addition, we control for RDINTN effect, the reason is because R&D intensity has been widely used as a proxy for R&D inputs, and it has some direct influence on the R&D outputs – the firm's R&D performance.

Furthermore, we also want to test whether the relationship between the industry park attributes and firm R&D performance is linear. We added two more models by including quadratic terms of independent variables and tested them separately. Adding a set of quadratic model is to reflect the reality that at some point, park attributes may become excess resource, meaning that resource is always effective only at an optimal level. Thus, the second model we used is as below:

FIRMPERFM = f(RNDFACIL, PORTFOL, RNDFACIL^2 , PORTFOL^2 , RDINTN),
INNVTN (Radical vs. Incremental),= f(RNDFACIL, PORTFOL, RNDFACIL^2 , PORTFOL^2, RDINTN)

5. RESULTS

In earlier sections, we have discussed that we have two R&D output measures: the number of new products and services, and the ratio of patents between radical and incremental innovation. We tested hypotheses to find out the mechanisms in which industry park make positive contribution to firm innovative performances. Table 4 provides a summary of the test models for the two dependent variables respectively. Panel (a) shows the econometrics model for the roles of industry park on the innovations: number of new products per firm. Panel (b) summarizes the results of the model the other dependent variable: the share of radical innovations per firm. In addition, each panel reports step wise model that tests curvilinear relationship between dependent variables and park level attributes – industry park R&D facility per firm and the ratio of incumbents to small firms.

5.1.The Density of R&D Facility and New Product Development

As shown in the panel (a), the evidence indicates that new product development is positively influenced by the density of R&D facility (β = .318, p < .01) provided by an industry park. So H1(a) is supported. The Density of R&D facility continues to demonstrate significant impact on firm R&D performance on both linear and curvelinear tests. We, however, failed to find any significant evidence to support the curvilinear relationship between the density of R&D facility and the introduction of new products. Therefore, the first set of hypotheses is only partially proven. Our result can be further studied by investigating whether the R&D facilities are focusing on development of product, rather than on the discovery of novel ideas.

5.2.The Density of R&D Facility and Innovation Activity of Tenant Firms

With H1(b), our models are to test whether the density of R&D has positive influence on innovative activity which is defined by the ratio of radical innovation. From panel (b), the result shows that our hypothesis in single regression is not supported. We did find evidence, however, to support a curvilinear relationship (β =.676, p < .01) between the density of R&D facility and the innovative activity of tenant firms. It implies that the density of R&D facility may help innovative activity to some extent but excessive increase of the density at some point may only cause negative impact on innovative activity. However, we failed to observe its positive role for firms' innovative activities.

5.3.Industry Park and New Product Development

With H2(a), the models are designed to test whether the share of incumbents would have positive impact on the tenant's performance in terms of new product development. Unfortunately, (panel (a)), unlike what we expected, H2(a) is not supported, both for linear and curvelinear relationships.

5.4.Industry Park and Innovation Activity of Tenant Firms

The results shown in Panel (b), however, suggests an evidence to support our hypothesis H2(b). According to the model, parks with a greater share of large firms (β = .250, p < .05) demonstrated a greater share of radical innovation. In the panel (b), model with quadratic terms, share of incumbents in tenant portfolio (β = .992, p < .10) stays as significantly positive. One explaination of such mixed evidences might be that the positive externality of industry park would be much more important than the performance of individual firms in the park.

Table 4. Summary of regression results using Ordinary Least Square [a]

	Panel (a): FIRMPERFM		Panel (b): INNVTN	
Independent variables				
RNDFACIL	.318(.297)**	.592(.735)*	.038(.140)	-.621(.332)*
PORTFOL	-.046 (.117)	-.368(.514)	.250(.055)*	.992(.232)+
PORTFOL^2		.315(.130)		-.725 (.059)
RNDFACIL^2		-.280(.631)		.676(.285)**
Control variable				
RDINTN	.097(1.010)	.084(1.026)	. 031 (.478)	.062 (.463)
***N* observation**	70	70	70	70
F statistics	2.760	1.893	1.545	3.787
Adjt. R Square	.071	.061	.023	.099

+p<.10 *p<.05 **p<.01 ***p<.001

a. Std. coefficient (Std. errors)

6. CONCLUSION AND LIMITATION

To summarize, most hypotheses are supported by the results in the empirical tests. More specifically, we found that the establishment of formal R&D facilities within an industrial park may help tentant firms introduce new products. Furthermore, a greater extent of participation of large established firms may facilitate the radical innovations of all firms in the park. Based on these findings, it is safe to draw the conclusion that the industrial park level attributes may have an important impact on the performance of tenant firms within the park, especially through supports on firms' innovative activities. A possible explanation is that the establishment of formal R&D facilities helps create a favorable institutional environment or the so-called regional innovation systems (Cooke, 2001; Freeman, 2002; Iammarino and McCann, 2010, 2013) in which firms are able to build local strength on innovations.

In addition, we further proposed that other mechanisms within an industry park may play a critical role in facilitating innovative activities of tenant firms. More specifically, we suggest that the establishment of formal R&D facilities within the parks leads to higher level of innovativeness of tenant firm, both on product market (new products) and technology innovations (patent inventions). Effectiveness of R&D facility was already proven by numerous evidences on the success of bio-tech incubators (WalkerPeach, 2011). On the other hand, our findings also highlighted the effectiveness of the structure of industrial parks by suggesting the positive role of large established firms. Existing studies have investigated mixture/homogeneity of companies in terms of industry sector, but very few of them have been focused on stage of development of tenant firms.

The findings from this study also contributes to the debate on the government-led vs. business-led industrial parks. Pessimism on direct intervention from public sectors has been deeply rooted in neo-classic economics theories (Rothwell & Zegveld,1981) that uncritically champions market capitalism. It further supports non-interventionism that asserts laissez-faire and free market as preconditions that are necessary for economies to function productively. From this perspective, government has long been generally considered as an ineffective producer. Such arguments have also been evolving as skepticism on public organization. The findings of this research supports the effectiveness of intervention program of LED – that industry park level impact is positive and critical to tenant firm success.

Some limitations of this study may suggest the directions of future research. First, our empirical tests are primarily based on industrial park level aggregate data with limited firm level attributes controlled in the test. At this point, a further exploration of the firm-level characteristics should yield additional insights into the interactions among tenant firms on their innovation outputs. In addition, future research might want to study park level attributes and firm outputs from different approaches, such as public vs. private investment intensity, financial performances of firms, firm growth and their scopes, etc. Last but not least, given the fact that this study relied on a cross-sectional data, a further examination using longitudinal panel data may help explain the dynamism of the development of parks and the tenant firms within them over time.

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