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Do Industrial Parks Improve the Performance of Their Tenant Firms in Korea?

- Focused on the Small and Medium-Sized Manufacturing Firms -

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Abstract

The Korean economy has maintained a rapid growth with industrial parks. Do industrial parks established by the government for political reasons improve the performance of their tenant firms? To answer this question, this paper examines whether on-park firms perform better than off-park firms do. Annual data over a 3-year-period from 2011 to 2013 are utilized for analysis using OLS and propensity score matching methods for identifying the differences between the performances of on- and off-park firms in each zone. The results of regression analysis on the location effects that are different for firms outside the industrial parks proved that the hypothesis was correct only for the number of patents (zones A and C). The hypothesis is not supported by the analysis using propensity score matching. Therefore, there is no evidence to suggest that industrial parks improve the performances of their tenant firms.

Keywords ■ Industrial Park, Manufacturing Industry, Patent Application, Propensity Score Matching

Ⅰ. Introduction

1. Backgrounds

The Korean economy has maintained its rapid growth due to 'industrial parks'. Industrial parks have been positioned as the foundation of development of local economies and key bases of the national economy in Korea. The number of industrial parks has been steadily growing since the early 2000s, and there are currently 1,082 industrial parks in operation.

The effectiveness of industrial clusters such as industrial parks and science parks is a controversial subject that has seen intense criticism and discussion. Though many studies have confirmed that industrial clusters can be effective tools for enhancing management and innovative performance of tenant firms, several other studies have found that industrial clusters have weak or insignificant impact (Massey et al., 1991; Westhead, 1997; Bakouros et al., 2002; Hansson et al., 2005).

For instance, Massey et al. (1991) described science parks as being high-tech fantasies that actually had only a marginal effect of

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promoting technology transfer, linking universities to industry, and enhancing the performance and growth of NTBFs (New Technology Based Firms). Westhead's (1997) survey on NBTFs on and off a science park concluded that there was no significant differences in terms of R&D intensity. These findings indicate the need for this study on the performance of industrial parks in Korea.

2. Purpose

Do industrial parks, which were established by the government for political reasons, improve the performance of their tenant firms? This paper answers this question by verifying if the innovative performance and management of such firms, measured in terms of their net profit, operating profit, total sales per worker, and patents, are affected by their location inside the industrial parks in Gyeonggi-do, Chungcheong-do, and Gangwon-do. There is some evidence of regional differences in the performances of park firms (Jin and Hur, 2014). The key issues are (1) whether park firms outperform off-park firms; and (2) whether the performances of park firms have a relation with the circumstances of the surrounding city (for example, administrative district and distance from Seoul).

For private and public sector bodies, a clear indication of the return on their investment is required. The demonstration of the effectiveness of industrial parks plays a key role in attracting tenants and talented people to work for the tenants, and in building local support and understanding of the park's activities (Monck and Peters, 2009). Therefore, empirically verifying if the management and innovative practices of such on-park firms are better than that of off-park firms would be a step toward the further development of industrial parks.

This paper begins by reviewing the existing literature on industrial parks. Section 3 presents the status of existing industrial parks. Based on the review of literature, hypotheses and study methods are derived, which are formally tested in Section 4. Next, the data upon which the tests were conducted are described, and the results are presented. The final section presents the conclusions and speculates on some policy implications.

Ⅱ. Literature Reviews

The ANGLE Technology (2003) breaks down the performances of the parks into two categories; the economic performance and the innovation and technology commercialization of tenant companies. Economic performance is measured by ANGLE using the following indicators: (1) the number of employees and job growth in the companies; (2) turnover and revenue; and (3) access to finance. Innovation and technology commercialization performance is assessed using the following indicators: (1) new products launched; (2) new services launched; (3) patent applications; (4) proportion of qualified scientists and engineers; and (5) intensity of investment in R&D as a proportion

of turnover.

The following studies analyze industrial parks based on firm-level data.

Ferguson and Olofsson (2004) investigate survival and growth of NTBFs located on and off two Swedish science parks. They find that firms located on SPs (Science Parks) have significantly higher survival rates than off-park firms. However, they observe insignificant differences in sales and employment. Wider variation in the growth rates of firms located on parks together with the better survival suggests that the science parks may be providing favorable locations for NTBFs in a range of development phases. The image benefit associated with a science park location is not helpful in explaining growth, whereas a location benefit associated with cooperation with universities is positively associated with the growth.

Squicciarini (2008) studies the success of SPs as seedbeds of innovation. She investigates whether SPs enhance the innovative output of their tenants and if tenants outperform comparable outside-SPs firms. She compared patenting activity over 1970-2002 of on and off-park firms to see whether science parks enhance the innovative output of their tenants. The results suggest that, given the existence of a common tendency to slow down the pace at which all firms patent during their life cycle, park tenants exhibit a comparatively better performance.

In another study, Squicciarini (2009) investigates the role of SPs as seedbeds of innovation. It aims to verify if and to what extent firms' innovative performance is affected by relocating inside a SP. The study relies on an original database regarding Finnish SPs: 252 firms that in the year 2002 were located in the parks and the firms' lifetime patenting activity, over a 33-year-period. She finds support for the existence of spillovers and for the positive role of incubators over those firms joining SPs when very young.

Kwak and Ko (2005) examine spatial labor productivity differences in manufacturing industries located in the national industrial parks. The result of estimation shows that labor productivity is positively related with the number of employees. In a spatial labor productivity, the Jeolla-do, Chungcheong-do, and Gyeongsang-do were higher than the capital region.

Choi and Kim (2010) used the Kis-Value data of manufacturing firms in Gyeonggi-do of 2008. There is no evidence that firms in industry cluster have better performances, but in PSM analysis, firms in industry cluster show less innovative performance.

Kim (2011)'s analysis results are as follows. The first, the enterprise on located TP (Techno Park) is more growth than non-located in growing (for example, average total asset growth rate, average total capital growth rate for the first 4 years of tenant ; 2006-2009). However it can't find any effectiveness in the profitable and productive growth of companies on the TP. These results implicate that TP's enterprise support services should be mediated

to increase a self-generation of enterprise as taking a view of profit and production (for example, sales and operating profit).

Ⅲ. Status

1. Definition

The industrial park refers to a parcel of land, developed and managed to be used by industries according to a comprehensive plan established for an industrial location. As a means of policy implementation, the industrial park is created to attract factories and service facilities supporting various industries, in order to foster the manufacturing industry and the knowledge-based high-tech industry(「Industrial Sites and Development Act」 article 2).

The applicable law defines an industrial park as any plot of land to be designated and developed under a comprehensive plan to collectively install factories; the facilities related to the knowledge industry, the cultural industry, the information and communications industry and the recycling industry; resources warehousing facilities; logistics facilities; and educational, research, business, support, data processing, and distribution facilities thereto; residential, cultural, environmental, and green areas and parks; and medical, tourism, sports, and welfare facilities; in order to enhance the functions.

The purpose of developing industrial parks can be summarized mainly into three categories. First, the industrial park is developed to save the expenditure (of infrastructure) required for establishment of factories by the individual firms. Second, the effect of exchanges and cooperation can be maximized through industry clustering and enterprises can save related costs. Third, the industrial park is developed to promote efficient management of the environment of the country (KICOX. 2011).

Industrial parks in Korea can be classified according to the sponsorship, the location, or the function they perform. In terms of the function, the industrial parks are divided into traditional industrial parks, science parks, and business parks. Depending on the main actor developing the industrial parks, the parks are classified into government-owned parks and private-owned parks.

Korea is mainly classifying its industrial parks into national industrial parks, local industrial parks, and urban high-tech industrial parks and agricultural industrial parks based on the 「Industrial Sites and Development Act」. The classification method reflected the main actor of development and the purpose of development on a mixed basis. Table 1 shows the authority holder and purpose of industrial parks by type.

2. State

Table 2 shows some industrial park statistics as of mid-2015. According to the latest research by KICOX, there are currently 1,082 industrial parks in Korea, which comprise 41 national industrial parks, 566 local industrial parks, 14 urban high-tech industrial parks, and

461 agricultural industrial parks. Of these, 12.2% (132), 13.31% (144), 9.89% (107), and 6.38% (69) are accounted by the Gyeonggi-do, Chungnam-do, Chungbuk-do, and Gangwon-do regions, respectively. Even though local industrial parks outnumber all other types of industrial parks, the national industrial parks accounted the largest proportion of industrial parks, occupying 57.38%.

Table 1. Types of Industrial Parks in Korea

Types	Authority Holder	Purpose of Designation
National Industrial Parks	Minister of Land, Infrastructure, and Transport	To promote the nation's key industries and high technology industries, etc. or to develop underdeveloped areas requiring promotion of development or areas where planned industrial parks are stretched over two or more of Special Metropolitan City and Metropolitan Cities
Local Industrial Parks	Head of Metropolitan Local Governments	To promote appropriate decentralization of industries and to activate local economies
Urban High-Tech Industrial Parks	Head of Metropolitan Local Governments	To foster and promote development of the knowledge industry, the cultural industry, the information and communications industry and other high-tech industries
Agri-cultural Industrial Parks	Mayors and Governors	To attract and promote industries for increasing income of farmers/fishermen in agricultural and fishing areas prescribed by Presidential Decree

Source : KICOX(2011), 「Industrial Park Development in Korea Economy」. p. 46.

Table 2. Operation Status of Industrial Parks by Region and Type

Region	Division	Number of Parks		Designated Area	
		N	%	1,000㎡	%
Nation wide	National	41	3.79	790,076	57.38
	Local	566	52.31	509,498	37.00
	Urban High	14	1.29	2,855	0.21
	Agricultural	461	42.61	74,529	5.41
	Total	1,082	100.0	1,376,958	100.0
Gyeonggi -do	National	4	9.76	179,471	22.72
	Local	125	22.08	51,717	10.15
	Urban High	2	14.29	404	14.15
	Agricultural	1	0.22	117	0.16
	Total	132	12.20	231,709	16.83
Gang won -do	National	1	2.44	4,030	0.51
	Local	23	4.06	14,433	2.83
	Urban High	3	21.43	314	11.00
	Agricultural	42	9.11	6,874	9.22
	Total	69	6.38	25,651	1.86
Chung buk -do	National	2	4.88	8,806	1.11
	Local	60	10.60	49,522	9.72
	Urban High	2	14.29	275	9.63
	Agricultural	43	9.33	6,223	8.35
	Total	107	9.89	64,826	4.71
Chung nam -do	National	5	12.20	28,073	3.55
	Local	47	8.30	63,155	12.40
	Urban High	1	7.14	39	1.37
	Agricultural	91	19.74	14,292	19.18
	Total	144	13.31	105,559	7.67

Source : KICOX(2015.03) Homepage

Table 3. Construction Completion Periods and Age of Industrial Parks by Zone

Completion periods	Zone A		Zone B		Zone C		Zone D	
	National	Local	National	Local	National	Local	National	Local
2011-2015	-	27	-	22	-	33	2	37
2006-2010	1	20	-	6	1	10	1	7
2001-2005	2	5	-	3	1	7	-	2
1996-2000	-	7	-	12	-	4	1	-
1991-1995	-	5	-	5	-	4	1	-
1960-1990	1	2	-	2	-	3	-	1
Total	4	66	-	50	2	61	5	47
Ratio of Deteriorated	25.0	17.9	-	25.0	0.00	25.0	33.3	10.0
Average Age (Age Over 5)	16.7	13.6	-	17	11.5	16	14.5	10.3

Table 3 shows the construction completion periods of the national and local industrial parks by region. In the last five years, more national and local industrial parks were developed than ever before. The number of industrial parks in 2015 doubled from that in 2011. Additionally, the average age of industrial parks decreased sharply. Excluding the industrial parks constructed in the last five years, the ratio of the deteriorated (above 20 years old) industrial parks is about 25%. The average ages of local industrial parks in zones B (17), C (16), and A (13.6) show that such parks are the oldest.

IV. Model

Do industrial parks improve the performances of their tenant firms? Choi and Kim (2010) made a valuable contribution to finding the answers for the questions posed in this study. This study followed the methods used in Choi and Kim (2010), but expanded the scope of the data handled.

First, while range of the study in Gyeonggi-do was one year (2009), this study expanded the range to three years (2011-2013) in Gyeonggi, Gangwon, and Chungcheong-do, as the widening of the temporal and spatial range of the study was necessary. The objects in the study and periods for further study were modified to determine if on-park firms in a wider spatial range perform better than off-park firms for longer periods.

Second, while the innovation performance variable in the former study is the total R&D cost, this study used the number of patent applications as the indicator of R&D cost as it measures the input (cost) of the R&D activities on technology, not the output (performance).

Finally, the former study conducted a comparative analysis of the performances of firms without considering firm size. Therefore, the results of Choi and Kim (2010) may be distorted. Large firms can have several branches in other regions, and this information cannot be manually verified from Kis-Value. Furthermore, the performances of small, medium, and large firms are likely to vary.

1. Data

This study verified whether industrial parks in different areas enhance the management and innovation performance of their tenant firms. We initially limited this study to national and local industrial parks (see Table 4).

Study areas were divided into four zones: zone A, B, C, and D to account for the fact that some study firms are affected by the degree of their agglomeration outside the park; therefore, the zones were categorized according to the degree of their agglomeration. Zones A and B in the capital regions (Gyeonggi-do) have a higher degree of agglomeration than zones C and D in the non-capital regions (Gangwon-do and Chungcheong-do).

The capital regions are large and dense and are more different from one another than they were in the past. This is true for the

non-capital regions as well. Therefore, the study areas need to be split. There are several ways of dividing the capital regions. Many capital region studies based on comparison of capital and non-capital region have been carried out based on an area classification (for example, physical geography, si · gun unit, and regulation districts). However, these authors argue that there is a need for a comprehensive reflection on this matter. Therefore, the study areas were divided into two administrative areas, and each administrative area was further divided into two parts based on the distance between Seoul City and each firm's site.

The average distance to other sites is a significant variable for analyzing the productivity of a firm (Duranton and Overman, 2005; Park et al., 2009). Additionally, Kwak and Ko (2005) showed the region-wise difference in performances of industrial parks.

2. Hypothesis

This paper incorporates further insights from the literature on management and innovative performance of on- and off-park firms. The results in the existing literature are replicated using micro-level data to determine whether tenancy in industrial parks enhances the performance of on-park firms. We also drew the variables in response to the extant studies using the micro-level data. Ferguson and Olofsson (2004), Squicciarini (2008 and 2009), Siegel et al. (2003), and Choi and Kim (2010) used micro-level data of on- and off-park firms. The extant literature suggests that industrial clusters influence various broadly defined dimensions of the performance of firms. Particularly, few studies have explained the differences in the survival, employment growth, and research and development (R&D) activity of firms located in industrial clusters and comparable firms outside the industrial clusters.

- H1: Tenant firms of industrial parks perform better than comparable firms outside the industrial parks.

3. Variables

- Study Periods : 2011, 2012, and 2013
- Study Areas : Gyeonggi-do, Chungcheong-do, and Gangwon-do
- Study Objects : Small and Medium-Sized Manufacturing Firms

This study is based on data from Kis-Value, KICOX (Korea Industrial Complex Cor.), and KIPRIS (Korea Intellectual Property Rights Information Service). The study analyzes small and medium-sized manufacturing (external auditing) firms located in the study areas between 2011 and 2013. The external audit makes the financial statements of the firms credible and reliable. The monetary unit of this study is '100 million won' (see Table 5).

The management performance is measured by the net income per worker, operating profit per worker, and total sales per worker.

Net income (NI1p) is calculated by taking revenues and adjusting for the cost of doing

business, depreciation, interest, taxes and other expenses.

Operating profit (Op1p) is the profit earned from a firm's normal core business operations. This value does not include any profit earned from the firm's investments and the effects of interest and taxes.

Total sales (Sa1p) is an important metric in analyzing a business. and is the total amount of sales in a given period. Total sales is typically formulated as total number of units sold times price per unit.

For the innovation performance results of R&D activities, a two-year lag was applied because of the time lag effects of the input and output. Thus, the number of patents was recorded from 2013 to the first half of 2015 (accumulated). This data comes from KIPRIS.

d_OnOff variables refer to the on-park sample firms inside the parks (d_OnOff=1) or outside the parks (d_OnOff=0) that began to locate in such industrial parks before each fiscal year. This data comes from KICOX.

d_Tech_i is a dummy regressor that denotes the technological industry level. It covers four categories of tech industries : high-, medium-high-, medium-low-, and low-tech (The Bank of Korea, 2012).

Age reflects the age of the firms at each fiscal year. In this study, the firms were assumed to have been established on Jan. 1 of the corresponding year, unless otherwise specified by the firm.

The LeRATE, CI1p, TanA, Oc, and Td variables refer to the labor equipment ratio, capital intensity per worker, tangible asset, owner's capital, and total debt, respectively. They control the management status and the financial structure of the firms.

Table 4. Study Regions

Capital Region	Zone A	Gyeonggi-do Suwon, Seongnam, Anyang, Gwangmyeong, Gunpo, Hanam, Uiwang, Gwacheon, Guri, Goyang, Siheung, Bucheon, Uijeongbu, Namyangju, Hwaseong, Osan, Yangju, Ansan, Gimpo, Paju, Dongducheon, Yongin, Gwangju
	Zone B	Gyeonggi-do Pyeongtaek, Anseong, Pocheon, Yeoncheon, Icheon, Yeoju, Yangpyeong, Gapyeong
Non-Capital Region	Zone C	Chungbuk-do Chungju, Jincheon, Eumseong, Chungnam-do Cheonan, Boryeong, Asan, Gangwon-do Chuncheon, Wonju, Hongcheon, Hoengseong, Hwacheon
	Zone D	Gangwon-do Yanggu, Inje,Yangyang, Pyeongchang, Yeongwol, Jeongseon, Taebaek, Samcheok, Donghae, Sokcho, Goseong, Chungnam-do Seosan, Taean, Hongseong, Yesan, Cheongyang, Gongju, Buyeo, Nonsan, Geumsan, Seocheon, Chungbuk-do Jecheon, Danyang, Cheongwon, Jeungpyeong, Goesan, Boeun, Okcheon, Yeongdong

Labor equipment ratio (LeRATE) is an index which represents how much one employee uses a company's facilities, that is, utilization of capital facilities by one employee.

Capital intensity per worker (CI1p) is the amount per one worker of fixed or real capital present in relation to other factors of production, especially labor. At the level of either a production process or the aggregate economy, it may be estimated by the capital to labor, in this study.

Tangible assets (TanA) are those that have a physical substance, such as currencies, buildings, real estate, vehicles, inventories, equipment, art collections, and precious metals.

Owner's capital (Oc) is the equity account that shows the owners' stake in the business. In other words, this account shows the how much of the company assets are owned by the owners instead of creditors.

Total debt (Td) presents the amount of money borrowed by one party from another. We could know the firms' condition that it is to be paid back at a later date, with interest.

Table 5. Using Variables

(Unit : 100 million won, Number, km)

	Variables	Descriptions
Depen-dent Variables (Perfor-mances)	NI1p	Net profit per worker
	Op1p	Operating profit per worker
	Sa1p	Total sales per worker
	Patents	Patent Application of 2 years later (from Jan. 2013 to Jul. 2015)
Study Variables	Zone A	1 if firm's in zone A, 0 otherwise.
	Zone B	1 if firm's in zone B, 0 otherwise
	Zone C	1 if firm's in zone C, 0 otherwise
	Zone D	1 if firm's in zone D, 0 otherwise
Dummy Variables	d_OnOff	1 if firm's inside of industrial park, 0 otherwise
	d_Mid High	1 if firm's in medium-high-tech industry, 0 otherwise
	d_Low	1 if firm's in low-tech industry, 0 otherwise
	d_Mid Low	1 if firm's in medium-low-tech industry, 0 otherwise
	d_High	1 if firm's in high-tech industry, 0 otherwise
In-depen-dent Variables (Control)	Age	firms' Age (fiscal year-established year)
	Distance	Shortest Distance from Seoul to firms' site
	LeRATE	Labor Equipment Ratio
	CI1p	Capital Intensity per worker
	TanA	Tangible Assets
	Oc	Owner's Capital
	Td	Total Debt

Sources : KIS-VALUE, KIPRIS, KICOX, Naver Map

4. Methods

The regression analysis and PSM (Propensity Score Matching) methods were used to verify that industrial parks in different areas enhance the management and innovation performance of their tenant firms. To achieve the objective of this study, equation (1) was estimated separately for each zone.

If industrial parks manage to successfully accomplish their supporting mission, the on-park firms should improve their performance by locating inside parks and outperforming their matched off-park firms. The determined multiple regression model can be written as follows:

$$Y=\gamma+\beta_1 d\_OnOff+\beta_2 d\_MediumHighTech+\beta_3 d\_MediumLowTech+\beta_4 d\_HighTech+\beta_5 Age+\beta_6 Distance+\beta_7 LeRATE+\beta_8 CI1p+\beta_9 TanA+\beta_{10} Oc+\beta_{11} Td+\varepsilon_i \cdots (1)$$

Matching has become a popular approach to

estimate causal treatment effects. It is widely applied when evaluating labour market policies, but empirical examples can be found in very diverse fields of study. It applies for all situations where one has a treatment, a group of treated individuals and a group of untreated individuals.

The greatest challenge in evaluating any intervention or program is obtaining a credible estimate of the counterfactual: what would have happened to participating units if they had not participated? Without a credible answer to this question, it is not possible to determine whether the intervention actually influenced participant outcomes or is merely associated with successes (or failures) that would have occurred anyway. One feasible solution to this problem is to estimate the counterfactual outcome based on a group of non-participants and calculate the impact of the intervention as the difference in mean outcomes between groups.

Of fundamental interest in all program evaluation efforts is whether a particular intervention, as designed, is effective in accomplishing its primary objectives. A well-designed intervention (or 'treatment') is typically based on theory or research evidence that articulates how the intervention's core mechanisms will work to achieve its goals and produce the desired outcomes.

The main pillars of this model are individuals, treatment and potential outcomes. In the case of a binary treatment the treatment indicator D_i equals one if individual i receives treatment and zero otherwise. The potential outcomes are then defined as $Y_i(D_i)$ for each individual i, where $i = 1, ..., N$ and N denotes the total population. The treatment effect for an individual i can be written as:

$$T_i = Y_i(1) - Y_i(0) \cdots (2)$$

The fundamental evaluation problem arises because only one of the potential outcomes is observed for each individual i. The unobserved outcome is called counterfactual outcome. Hence, estimating the individual treatment T_i is not possible and one has to concentrate on average treatment effects. The parameter that received the most attention in evaluation literature is the 'average treatment effect on the treated' (ATT), which is defined as:

$$\tau_{ATT} = E(\tau D = 1) = E[Y(1)|D = 1] - E[Y(0)|D = 1] \cdots (3)$$

ATT can be estimated by the difference between the mean observed outcomes for treated and untreated.

As the counterfactual mean for those being treated $E[Y(0)\ D=1]$ is not observed, one has to choose a proper substitute for it in order to estimate ATT. Using the mean outcome of untreated individuals $E[Y(0)\ D=0]$ is in non-experimental studies usually not a good idea, because it is most likely that components which determine the treatment decision also determine the outcome variable of interest. Thus, the outcomes of individuals from treatment and comparison group would differ

even in the absence of treatment leading to a 'self-selection bias'. For ATT it can be noted as:

$$E[Y(1)|D=1]-E[Y(0)|D=0]$$
$$=\tau_{ATT}+E[Y(0)|D=1]-E[Y(0)|D=0]\cdots(4)$$

The difference between the left hand side of equation (4) and τ_{ATT} is the so-called 'self-selection bias'. The true parameter τ_{ATT} is only identified, if :

$$E[Y(0)|D=1]-E[Y(0)|D=0]=0\cdots(5)$$

Propensity score matching methods provide a way to select control observations that are similar to individuals who received a particular treatment.

To empirically test the effects of industrial parks on management and innovative performances of their tenants, nearest neighbor matching (with replacement) were developed.

Nearest neighbor matching is one of the most straightforward matching procedures. An individual from the comparison group is chosen as a match for a treated individual in terms of the closest propensity score (or the case most similar in terms of observed characteristics). Variants of nearest neighbor matching include 'with replacement' and 'without replacement', where, in the former case, an untreated individual can be used more than once as a match and, in the latter case, is considered only once.

V. Results

1. Descriptive Statistics

Table 6 shows the descriptive statistics of firm variables by the location of the firm inside or outside industrial parks. The sample size is 3,544 (on-park: 1,120; off-park: 2,424), 3,650 (on-park: 1,203; off-park: 2,447), and 3,362 (on-park: 1,216; off-park: 2,146) in 2011, 2012, and 2013, respectively. Approximately 72% of sample firms are in the capital regions.

The on-park firms perform better than off-park firms do with regard to their net income per worker, operating profit per worker, and the number of patents in 2011, 2012, and 2013.

The off-park firms perform better than on-park firms do with regard to their total sales per worker in 2011, 2012, and 2013.

2. Regression Results

Table 7 shows the regression results of β_1 in entire study area and each zone categorized by firm location inside and outside industrial parks. The regression results show a significant difference in the performances in the net income per worker and the number of patents.

The difference in net income per worker between the on- and off-park firms in entire study area is 0.13 in 2012, and the difference in the number of patents between the on- and off-park firms is 0.71 in 2013.

Table 6. Descriptive Statistics of Variables by On/Off Park

	2011		2012		2013	
	On-Park	Off-Park	On-Park	Off-Park	On-Park	Off-Park
Obs.	1,120	2,424	1,203	2,447	1,216	2,146
NI1p	0.164	0.071	0.171	0.006	0.135	0.109
Op1p	0.148	0.135	0.173	0.048	0.206	0.063
Sa1p	4.810	5.336	4.596	5.142	4.606	5.248
Patents	1.423	1.115	1.942	1.383	2.277	1.368
A zone	0.638	0.629	0.642	0.624	0.637	0.610
B zone	0.126	0.098	0.118	0.103	0.114	0.103
C zone	0.129	0.182	0.131	0.185	0.139	0.192
D zone	0.108	0.091	0.109	0.088	0.109	0.095
Medium-High	0.450	0.376	0.441	0.369	0.374	0.397
Low	0.122	0.167	0.120	0.173	0.175	0.166
Medium-Low	0.240	0.265	0.237	0.266	0.275	0.272
High	0.188	0.193	0.202	0.192	0.176	0.165
Age	16.160	14.331	16.538	15.259	16.965	16.109
Distance	60.189	60.730	60.129	60.642	60.673	61.911
LeRATE	1.723	1.780	1.778	2.014	1.924	2.365
CI1p	4.137	4.831	4.321	5.295	4.581	5.910
TanA	97.622	82.846	100.363	85.541	112.920	101.487
Oc	102.425	85.822	112.535	93.981	118.787	104.108
Td	143.449	131.037	143.439	134.579	153.380	147.295

Table 7. On- and Off-Park Firms' Regression Results

β_1	2011				2012				2013			
	NI1p	Op1p	Sa1p	Patents	NI1p	Op1p	Sa1p	Patents	NI1p	Op1p	Sa1p	Patents
Study	0.0588	0.0134	0.1043	0.2488	0.1350*	0.0551	0.1539	0.3835	0.0426	0.1349	0.0427	0.7149***
Areas	(1.0561)	(0.1244)	(0.4090)	(1.1342)	(1.9213)	(0.4811)	(0.7054)	(1.6228)	(0.8532)	(1.0032)	(0.1946)	(3.5100)
Zone	0.0427	0.0658	0.0641	0.3072	0.1812**	0.0939	0.0484	0.4912**	0.0068	0.1707	0.1031	0.6559***
A	(0.7019)	(0.4078)	(0.2436)	(1.5073)	(2.1696)	(0.5495)	(0.1852)	(2.0464)	(0.1434)	(0.8096)	(0.3857)	(2.6372)
Zone	0.0210	-0.2123	0.3076	0.0102	-0.0114	-0.1224	0.2792	-0.1053	0.2319**	0.2724	-0.4797	0.1319
B	(0.3954)	(-1.1526)	(0.8700)	(0.0475)	(-0.1483)	(-0.8598)	(0.7756)	(-0.3533)	(2.1660)	(1.2475)	(-1.0987)	(0.4497)
Zone	0.2791	0.0075	-0.1848	1.1683*	0.2273	0.0395	0.1459	1.2924**	0.0669	-0.0116	-0.0589	1.7835***
C	(1.1737)	(0.0777)	(-0.1674)	(1.8669)	(0.8577)	(0.3794)	(0.3660)	(2.0733)	(0.6144)	(-0.096)	(-0.1389)	(2.7177)
Zone	-0.1341*	-0.3760	0.6677	-0.6020	-0.0329	-0.0728	0.7911	-0.4446	0.0059	-0.0565	0.9147	0.5667
D	(-1.8145)	(-1.5161)	(1.0052)	(-0.4013)	(-0.3749)	(-0.3113)	(1.0135)	(-0.2852)	(0.0216)	(-0.4715)	(1.2268)	(0.8149)

Note : The omitted categories are Technology levels, Distance, LeRATE, CI1p, TanA, Oc, and Td for control variables.
Numbers in parentheses are t-values. * = significant at 10% , ** = significant at 5% , *** = significant at 1%.
The mean variance inflation factor (VIF) values did not exceed 10.

Table 8. On- and Off-Park Firms' PSM Results

Differences in ATT	2011				2012				2013			
	NI1p	Op1p	Sa1p	Patents	NI1p	Op1p	Sa1p	Patents	NI1p	Op1p	Sa1p	Patents
Study Areas	0.0438	0.0284	0.2609	0.3987	0.0764	0.0134	0.2569	0.2089	0.0162	0.3229**	0.0315	0.7121**
Zone A	0.1161*	0.0558	0.2086	0.3002	0.1129	0.2482	0.2543	0.3831	-0.0062	0.0353	0.1457	0.2775
Zone B	-0.0343	-0.2296	-0.0535	-0.0082	0.0657	-0.0749	-0.6645	0.1756	0.0567	0.1379	-0.6702	-0.0229
Zone C	0.0876	-0.0818	-0.0610	1.4800	0.0253	0.0562	0.0455	1.7000*	0.1368	-0.0905	0.4445	2.0774*
Zone D	-0.1370	-0.4008	0.2658	-1.2913	-0.1464	-0.0385	0.7934	-0.4722	-0.0662	-0.0314	0.5102	0.6341

Note : * = significant at 10% , ** = significant at 5% , *** = significant at 1%.

In the regression results by zone, the difference in net income per worker between the on- and off-park firms in zone A was 0.18 in 2012 and 0.23 in zone B in 2013. This difference was the highest observed difference in performance. Therefore, on-park firms performed better than comparable firms in the above-mentioned sectors did. However, in zone D in 2011, net income per worker of off-park firms was 0.13 higher than that of on-park firms. Therefore, in terms of the number of patents, hypothesis is proved true in zones A and C.

The differences in the number of patents between on- and off-park firms in zone A were 0.49 in 2012 and 0.66 in 2013. In zone C, the differences in the number of patents between the on- and off-park firms was 1.17 in 2011, 1.29 in 2012, and 1.78 in 2013, which is consistently higher than the differences in other zones.

3. Propensity Score Matching Results

The results of the matching are interpreted with respect to the net income, operating profit, total sales per worker, and the number of patents in three years, from 2011 to 2013. The on-park firms are the treated group, and the off-park firms are the untreated group.

Table 8 presents the differences in ATT (Average Treatment Effect on the Treated) of on/off-park firms' performances.

In the entire area, on-park firms had 0.71 more patents than off-park firms did in 2013. Additionally, on-park firms had 0.32 more operating profit per worker than the off-park firms did in the same year.

In zone A in 2011, net income per worker of on-park firms was 0.12 higher than that of off-park firms.

In zone C, the difference in the number of patents between the on- and off-park firms was 1.7 in 2012, and 2.08 in 2013. In this area, patents of on-park firms was more than that of off-park firms.

However, in the PSM results by each zone, all performance is insignificant, and therefore, we cannot find any evidence that the industrial parks improve the performances of their tenant firms in each zone.

VI. Conclusions

1. Findings

This paper used the Kis-Value data of firms located in capital(Gyeonggi-do) and non-capital (Chungcheong-do and Gangwon-do) regions to analyze and identify the impact of industrial parks based on local characteristics and the performance of the park tenant firm.

The regression analysis and PSM methods were used to determine (1) whether park firms outperform off-park firms; and (2) whether performances of park firms are related to the circumstances of the surrounding city.

Contrary to expectations, there is no evidence that suggests that industrial parks improve the performance of their tenant firms.

The analysis results of the location effects, which show differences related to the external areas of the industrial parks, prove that the hypothesis is right only in patent of zones A and C. The industrial parks show only partial success in zones A and C, where the numbers of patents of the on-park firms are significantly higher than those of off-park firms.

In the results of regression analysis, zone C has large difference between on- and off-park firms in the number of patents.

In the PSM analysis, there is no significant difference between two groups. No significant difference is observed in the total sales and operating profit per worker.

Only in whole areas and zone C, the on-park firms perform better than off-park firms do in terms of patents, and operating profit per worker in the year 2013.

2. Policy Implications

The number of industrial parks in Korea has increased in the last five years, and the number of industrial parks in the study areas has doubled since 2011. Moreover, several studies that focus on the regeneration and restructuring of industrial parks have conducted by academics and the government. Current industry policy related to industrial parks is limited to providing physical locations (Kim, 2011). Central and local government could not find a motive for additional development and support of industrial parks, without reviewing the efficiency of existing parks. Before discussing the regeneration and restructuring of industrial parks, the various aspects of the performance of the tenants of the existing parks need to be evaluated.

The results of this study can be attributed to (1) the absence of differences between internal and external circumstances of industrial parks, (2) the decrease of large firms in industrial parks, and (3) small and deteriorated industrial parks.

First, the study results show no difference between internal and external circumstances of industrial parks. This is because in the capital regions, the processes of urbanization and industry agglomeration have been underway for a long time (Choi and Kim, 2010). The same is true of the non-capital regions.

Second, the number of large firms has decreased in each park in the non-capital regions, after the deregulation in the capital regions. Since 2008, the number of large firms decreased more by 4.1 firms on average as compared to small- and medium- sized firms in each park in non-capital regions (Hong, 2015). Since agglomerative spillovers exist within the parks, with information apparently flowing from big companies to the other tenants of the industrial clusters (Squicciarini, 2009), it is obvious that the performances of small and medium-sized firms in the park might be poorer than before.

Third, existing parks are very small and deteriorated because of their limited land, poor conditions, and aging infrastructure (lack of

support facilities and infrastructure). The total area of industrial parks is the statistically significant variable that represents the internal conditions of the park itself (Jin and Hur, 2014). On average, parks in the non-capital regions are approximately one-tenth the size of parks in the capital regions (see Table 2), and are limited to traditional low-tech manufacturing industries. Moreover, the percentage of deteriorated parks is high (see Table 3). This also affects the performance of the tenants off the parks and leads to decrease in firm size. The deterioration of industrial parks leads to the exit of large firms and worsen the performance of the tenant firms. The worsening performance of tenant firms is synthesized by the chain reaction of deterioration of the industrial parks and the decreasing size of the tenant firms (Jang, 2011; Chun, 2016).

The limitations of this study are as follows.

First, the results of this study are limited to Gyeonggi-do and its neighboring areas because other regions (for example, Seoul, Gyeongsang-do, and Jeolla-do) were excluded from the study areas. Therefore, zones C and D do not represent the non-capital region. The results of this study should be interpreted as being applicable to a limited area.

Second, this study was based on information from the external financial audit firms of small and medium-sized firms. Therefore, the results of this study cannot be applied to tiny or big firms, as they are likely to display different tendencies. Industrial parks should be further studied with more sample firms to check if the results of this study truly mirror the influence of industrial parks on the performance of their tenant firms.

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Appendix

Table A1a. On- and Off-Park Firms' Regression Results by Zone

Study Areas	2011				2012				2013			
	NI1p	Op1p	Sa1p	Patents	NI1p	Op1p	Sa1p	Patents	NI1p	Op1p	Sa1p	Patents
d_OnOff	0.0588	0.0134	0.1043	0.2488	0.1350*	0.0551	0.1539	0.3835	0.0426	0.1349	0.0427	0.7149***
	(1.0561)	(0.1244)	(0.4090)	(1.1342)	(1.9213)	(0.4811)	(0.7054)	(1.6228)	(0.8532)	(1.0032)	(0.1946)	(3.5100)
d_MidHigh	0.0666	0.0469	0.0634	1.3231***	-0.0636	-0.0598	-0.3542	1.6054***	-0.0050	-0.1427	0.3989	0.2692
	(0.8346)	(0.3034)	(0.1735)	(4.2121)	(-0.6290)	(-0.3632)	(-1.1281)	(4.7218)	(-0.0718)	(-0.7603)	(1.3037)	(0.9469)
d_MidLow	-0.0476	0.1588	1.4067***	0.3312	-0.1512	-0.0475	0.7804**	0.4749	-0.0608	-0.0407	0.4275	0.2102
	(-0.5575)	(0.9597)	(3.6023)	(0.9860)	(-1.3995)	(-0.2699)	(2.3262)	(1.3071)	(-0.8220)	(-0.2040)	(1.3169)	(0.6967)
d_High	-0.0429	-0.3028*	-0.3982	1.3337***	-0.1626	-0.1422	-0.4893	1.6654***	-0.0759	-0.0882	0.3101	0.3246
	(-0.4631)	(-1.6873)	(-0.9396)	(3.6588)	(-1.3885)	(-0.7462)	(-1.3461)	(4.2313)	(-0.9239)	(-0.3984)	(0.8608)	(0.9689)
Age	-0.0030	0.0000	-0.0439***	-0.0299**	-0.0075**	-0.0123**	-0.034***	-0.0354***	-0.0033	-0.0034	-0.0302***	-0.0373***
	(-1.0172)	(-0.0062)	(-3.2512)	(-2.5749)	(-1.9938)	(-2.0109)	(-2.9147)	(-2.8125)	(-1.2682)	(-0.4825)	(-2.6434)	(-3.5204)
Distance	0.0002	0.0008	-0.0039	0.0036	0.0002	-0.0007	-0.0055*	0.0029	-0.0021***	-0.0006	-0.0042	-0.0011
	(0.3174)	(0.5432)	(-1.1003)	(1.2017)	(0.2539)	(-0.4182)	(-1.8139)	(0.8809)	(-3.0478)	(-0.3196)	(-1.3660)	(-0.3772)
Obs	2,781	2,777	2,777	2,781	2,963	2,962	2,963	2,963	3,001	2,997	2,993	3,001
R2	0.0582	0.0402	0.4207	0.0192	0.1381	0.0435	0.4018	0.0255	0.1768	0.0159	0.4845	0.0204
Zone A	2011				2012				2013			
	NI1p	Op1p	Sa1p	Patents	NI1p	Op1p	Sa1p	Patents	NI1p	Op1p	Sa1p	Patents
d_OnOff	0.0427	0.0658	0.0641	0.3072	0.1812**	0.0939	0.0484	0.4912**	0.0068	0.1707	0.1031	0.6559***
	(0.7019)	(0.4078)	(0.2436)	(1.5073)	(2.1696)	(0.5495)	(0.1852)	(2.0464)	(0.1434)	(0.8096)	(0.3857)	(2.6372)
d_MidHigh	0.0173	-0.0206	0.0394	0.9326***	-0.1964	-0.1622	-0.2388	1.221***	-0.0201	-0.2265	0.5595	0.2746
	(0.1972)	(-0.0887)	(0.1039)	(3.1779)	(-1.6017)	(-0.6466)	(-0.6227)	(3.4646)	(-0.3007)	(-0.7663)	(1.4925)	(0.7873)
d_MidLow	-0.0007	0.2414	1.4835***	0.2704	-0.2165	-0.1549	1.0975***	0.5280	-0.0104	-0.0022	0.9094**	0.1138
	(-0.0077)	(0.9599)	(3.6178)	(0.8520)	(-1.6336)	(-0.5713)	(2.6480)	(1.3862)	(-0.1476)	(-0.0069)	(2.2853)	(0.3075)
d_High	-0.0079	-0.1583	-0.2856	1.3501***	-0.2683*	-0.1720	0.0288	1.8519***	-0.1321*	-0.1478	0.0807	0.1957
	(-0.0798)	(-0.6055)	(-0.6698)	(4.0898)	(-1.9555)	(-0.6129)	(0.0670)	(4.6971)	(-1.6875)	(-0.4255)	(0.1833)	(0.4780)
Age	-0.0038	0.0025	-0.0527***	-0.0306***	-0.0095**	-0.02**	-0.036***	-0.0383***	-0.0012	0.0034	-0.0413***	-0.0433***
	(-1.1791)	(0.2895)	(-3.796)	(-2.8415)	(-2.1315)	(-2.195)	(-2.6163)	(-2.9864)	(-0.4927)	(0.3057)	(-2.9352)	(-3.3115)
Distance	0.0019	0.0037	-0.0024	0.0076	0.0050	-0.0064	0.0092	0.0060	0.0010	-0.0122	0.0118	0.0045
	(0.6937)	(0.5286)	(-0.2093)	(0.8487)	(1.3460)	(-0.8497)	(0.7986)	(0.5618)	(0.4877)	(-1.3074)	(1.0038)	(0.4083)
Obs	1,734	1,732	1,734	1,734	1,839	1,839	1,839	1,839	1,843	1,842	1,843	1,843
R2	0.1156	0.0728	0.4316	0.0305	0.1739	0.1002	0.3796	0.0393	0.1592	0.0223	0.4286	0.0275
Zone B	2011				2012				2013			
	NI1p	Op1p	Sa1p	Patents	NI1p	Op1p	Sa1p	Patents	NI1p	Op1p	Sa1p	Patents
d_OnOff	0.0210	-0.2123	0.3076	0.0102	-0.0114	-0.1224	0.2792	-0.1053	0.2319**	0.2724	-0.4797	0.1319
	(0.3954)	(-1.1526)	(0.8700)	(0.0475)	(-0.1483)	(-0.8598)	(0.7756)	(-0.3533)	(2.1660)	(1.2475)	(-1.0987)	(0.4497)
d_MidHigh	0.0523	0.0068	-1.194**	0.7724**	-0.0506	-0.0957	-1.9041***	1.1225**	-0.0008	-0.2027	0.3057	0.0528
	(0.6274)	(0.0234)	(-2.1474)	(2.2777)	(-0.4456)	(-0.454)	(-3.5698)	(2.5424)	(-0.0055)	(-0.6579)	(0.4961)	(0.1275)
d_MidLow	-0.0006	-0.0606	-0.8149	0.2351	-0.1953	-0.1447	-2.0752***	0.1414	0.0533	-0.0361	0.0172	0.2449
	(-0.007)	(-0.1941)	(-1.3567)	(0.6419)	(-1.5874)	(-0.6334)	(-3.5924)	(0.2958)	(0.3362)	(-0.1115)	(0.0265)	(0.5635)
d_High	-0.2727***	-0.7109**	-1.2571*	1.0494***	-0.0904	-0.4691*	-2.5084***	0.9952*	-0.0366	0.1548	0.5001	0.5469
	(-2.7461)	(-2.063)	(-1.8973)	(2.5968)	(-0.6573)	(-1.837)	(-3.884)	(1.8616)	(-0.2061)	(0.4274)	(0.6902)	(1.1236)
Age	-0.0132***	-0.0069	-0.0348*	-0.0034	-0.0005	-0.0040	0.0033	0.0052	-0.0078	-0.0263**	-0.0209	0.0017
	(-4.9727)	(-0.7476)	(-1.9625)	(-0.3128)	(-0.1216)	(-0.5498)	(0.1830)	(0.3438)	(-1.4589)	(-2.4162)	(-0.9611)	(0.1145)
Distance	0.0014	0.0109	0.0017	-0.0399***	-0.0026	0.0038	-0.0229	-0.0685***	-0.0032	0.0142	-0.0198	-0.0485**
	(0.3739)	(0.8341)	(0.0674)	(-2.6029)	(-0.4809)	(0.3792)	(-0.9078)	(-3.2827)	(-0.4232)	(0.9307)	(-0.652)	(-2.3752)
Obs	298	297	298	298	329	329	329	329	330	329	330	330
R2	0.3068	0.0634	0.8307	0.0785	0.2353	0.0707	0.8252	0.0869	0.1300	0.0477	0.6386	0.0404

Note : * = significant at 10% , ** = significant at 5% , *** = significant at 1%.
The omitted categories are LeRATE, CI1p, TanA, Oc, and Td for control variables.

Table A1b. On- and Off-Park Firms' Regression Results by Zone

Zone C	2011				2012				2013			
	NI1p	Op1p	Sa1p	Patents	NI1p	Op1p	Sa1p	Patents	NI1p	Op1p	Sa1p	Patents
d_OnOff	0.2791	0.0075	-0.1848	1.1683*	0.2273	0.0395	0.1459	1.2924**	0.0669	-0.0116	-0.0589	1.7835***
	(1.1737)	(0.0777)	(-0.1674)	(1.8669)	(0.8577)	(0.3794)	(0.3660)	(2.0733)	(0.6144)	(-0.096)	(-0.1389)	(2.7177)
d_MidHigh	0.0437	-0.0633	0.3230	1.939**	0.3491	0.0052	-0.0687	2.0118**	0.0716	0.1669	-0.0654	0.2898
	(0.1378)	(-0.4906)	(0.2191)	(2.3220)	(0.9883)	(0.0374)	(-0.1293)	(2.4210)	(0.4997)	(1.0525)	(-0.1179)	(0.3356)
d_MidLow	-0.2246	0.0237	1.1931	0.7416	0.0992	0.2422*	0.8059	0.6323	-0.0649	-0.0142	-0.1466	-0.1291
	(-0.6832)	(0.1772)	(0.7825)	(0.8572)	(0.2675)	(1.6633)	(1.4440)	(0.7245)	(-0.4289)	(-0.0849)	(-0.2493)	(-0.1415)
d_High	-0.2479	-0.1531	-0.1767	0.8333	0.0027	-0.0256	-1.7568***	0.6360	0.0669	-0.0009	1.1037*	0.8651
	(-0.6399)	(-0.9714)	(-0.098)	(0.8173)	(0.0064)	(-0.1524)	(-2.7228)	(0.6304)	(0.4000)	(-0.0049)	(1.7032)	(0.8584)
Age	-0.0042	-0.0016	-0.0585	-0.0044	-0.0103	-0.0018	-0.0435**	-0.0152	-0.0060	-0.0096	-0.0248	-0.0319
	(-0.3489)	(-0.3241)	(-1.0499)	(-0.1391)	(-0.7763)	(-0.3414)	(-2.1846)	(-0.4887)	(-1.1075)	(-1.6094)	(-1.1777)	(-0.978)
Distance	0.0001	-0.0038	-0.0047	-0.0316	0.0048	-0.0005	-0.0007	-0.0290	-0.0048	-0.0003	-0.0013	-0.0095
	(0.0110)	(-1.2136)	(-0.1317)	(-1.5719)	(0.5427)	(-0.1347)	(-0.0518)	(-1.3882)	(-1.252)	(-0.0772)	(-0.0849)	(-0.4154)
Obs	479	478	475	479	512	511	512	512	524	522	520	524
R2	0.1380	0.2032	0.1790	0.0502	0.2354	0.1350	0.1504	0.0651	0.2874	0.0612	0.2366	0.0504
Zone D	2011				2012				2013			
	NI1p	Op1p	Sa1p	Patents	NI1p	Op1p	Sa1p	Patents	NI1p	Op1p	Sa1p	Patents
d_OnOff	-0.1341*	-0.3760	0.6677	-0.6020	-0.0329	-0.0728	0.7911	-0.4446	0.0059	-0.0565	0.9147	0.5667
	(-1.8145)	(-1.5161)	(1.0052)	(-0.4013)	(-0.3749)	(-0.3113)	(1.0135)	(-0.2852)	(0.0216)	(-0.4715)	(1.2268)	(0.8149)
d_MidHigh	0.0414	-0.0193	0.6371	3.1457	0.0689	-0.1938	-1.6125	3.9783*	0.0082	-0.0920	1.8375*	0.4843
	(0.3905)	(-0.0541)	(0.6687)	(1.4622)	(0.5548)	(-0.5842)	(-1.4571)	(1.8000)	(0.0213)	(-0.5419)	(1.7347)	(0.4917)
d_MidLow	-0.0265	-0.1570	2.4658***	-0.1119	0.0690	-0.0418	0.5989	0.1622	-0.1418	-0.2086	1.4306	1.5478
	(-0.2529)	(-0.4459)	(2.6149)	(-0.0526)	(0.5687)	(-0.1290)	(0.5543)	(0.0752)	(-0.3428)	(-1.1458)	(1.2637)	(1.4646)
d_High	-0.0649	-0.8144*	-0.2276	0.9218	0.0613	-0.3881	-1.8557	1.3699	0.0296	-0.1300	2.2534*	-0.3816
	(-0.5020)	(-1.8767)	(-0.1958)	(0.3512)	(0.4037)	(-0.9574)	(-1.3721)	(0.5072)	(0.0626)	(-0.6258)	(1.7502)	(-0.3165)
Age	0.0084*	0.0178	0.0560	-0.0890	0.0034	0.0203	-0.0068	-0.0890	-0.0054	-0.0070	0.0118	-0.0147
	(1.8939)	(1.1944)	(1.4059)	(-0.9906)	(0.6389)	(1.4396)	(-0.1447)	(-0.947)	(-0.3689)	(-1.0824)	(0.2922)	(-0.3931)
Distance	-0.0012	-0.0009	-0.0102	-0.0151	-0.0013	-0.0033	-0.0117	-0.0160	-0.0068	-0.0032*	-0.0175	-0.0114
	(-0.9873)	(-0.2093)	(-0.9252)	(-0.6059)	(-0.9114)	(-0.8671)	(-0.9099)	(-0.624)	(-1.5351)	(-1.6746)	(-1.4599)	(-1.0153)
Obs	270	270	270	270	283	283	283	283	304	304	300	304
R2	0.2305	0.1129	0.8061	0.0266	0.3630	0.2303	0.7685	0.0328	0.4682	0.2989	0.8368	0.0518

Note : * = significant at 10% , ** = significant at 5% , *** = significant at 1%.
The omitted categories are LeRATE, CI1p, TanA, Oc, and Td for control variables.

Table A2a. On- and Off-Park Firms' PSM Results of Study Areas

2011	Sample	On- Park	Off- Park	Difference	S.E.	t	p	Obs(N0/N1)
NI1p	Unmatched	0.1646	0.0705	0.0940	0.0567	1.66	0.014	N0 : 1,858
	ATT	0.1646	0.1207	0.0438	0.0351	1.25	0.483	N1 : 923
Op1p	Unmatched	0.1354	0.0836	0.0518	0.1091	0.48	0.576	N0 : 1,856
	ATT	0.1354	0.1070	0.0284	0.1801	0.16	0.851	N1 : 921
Sa1p	Unmatched	4.8135	5.3355	-0.5220	0.3312	-1.58	0.062	N0 : 1,854
	ATT	4.8135	4.5526	0.2609	0.2763	0.94	0.426	N1 : 923
Patents	Unmatched	1.5049	1.1717	0.3332	0.2189	1.52	0.172	N0 : 1,858
	ATT	1.5049	1.1062	0.3987	0.2214	1.8	0.346	N1 : 923

Note : N0 is the number of non-participants and N1 is the number of participants.

Table A2a (Continued). On- and Off-Park Firms' PSM Results of Study Areas

2012	Sample	On- Park	Off- Park	Difference	S.E.	t	p	Obs(N0/N1)
NI1p	Unmatched	0.1712	-0.0040	0.1752	0.0748	2.34	0.001	N0 : 1,934
	ATT	0.1712	0.0948	0.0764	0.0523	1.46	0.32	N1 : 1,029
Op1p	Unmatched	0.1712	0.0585	0.1127	0.1157	0.97	0.177	N0 : 1,933
	ATT	0.1712	0.1578	0.0134	0.0542	0.25	0.876	N1 : 1,029
Sa1p	Unmatched	4.6161	5.1172	-0.5011	0.2789	-1.8	0.06	N0 : 1,934
	ATT	4.6161	4.3591	0.2569	0.2280	1.13	0.268	N1 : 1,029
Patents	Unmatched	2.0214	1.4679	0.5534	0.2365	2.34	0.059	N0 : 1,934
	ATT	2.0214	1.8124	0.2089	0.3852	0.54	0.587	N1 : 1,029
2013	Sample	On- Park	Off- Park	Difference	S.E.	t	p	Obs(N0/N1)
NI1p	Unmatched	0.1355	0.1088	0.0267	0.0547	0.49	0.556	N0 : 1,893
	ATT	0.1355	0.1193	0.0162	0.0375	0.43	0.712	N1 : 1,108
Op1p	Unmatched	0.2024	0.0483	0.1541	0.1346	1.14	0.153	N0 : 1,889
	ATT	0.2024	-0.1205	0.3229	0.2802	1.15	0.05	N1 : 1,108
Sa1p	Unmatched	4.6061	5.2476	-0.6415	0.3030	-2.12	0.013	N0 : 1,888
	ATT	4.6061	4.5746	0.0315	0.2330	0.14	0.893	N1 : 1,105
Patents	Unmatched	2.2058	1.4194	0.7863	0.2038	3.86	0.001	N0 : 1,893
	ATT	2.2058	1.4937	0.7121	0.2797	2.55	0.023	N1 : 1,108

Note : N0 is the number of non-participants and N1 is the number of participants.

Table A2b. On- and Off-Park Firms' PSM Results of Zone A

2011	Sample	On- Park	Off- Park	Difference	S.E.	t	p	Obs(N0/N1)
NI1p	Unmatched	0.1650	0.0596	0.1054	0.0636	1.66	0.032	N0 : 1,161
	ATT	0.1650	0.0489	0.1161	0.0942	1.23	0.076	N1 : 573
Op1p	Unmatched	0.1882	0.0039	0.1843	0.1650	1.12	0.135	N0 : 1,160
	ATT	0.1882	0.1325	0.0558	0.0516	1.08	0.743	N1 : 572
Sa1p	Unmatched	4.8804	5.2658	-0.3853	0.3435	-1.12	0.274	N0 : 1,161
	ATT	4.8804	4.6718	0.2086	0.3684	0.57	0.542	N1 : 573
Patents	Unmatched	1.3997	1.1094	0.2903	0.2036	1.43	0.117	N0 : 1,161
	ATT	1.3997	1.0995	0.3002	0.2590	1.16	0.28	N1 : 573
2012	Sample	On- Park	Off- Park	Difference	S.E.	t	p	Obs(N0/N1)
NI1p	Unmatched	0.2035	-0.0176	0.2211	0.0903	2.45	0.002	N0 : 1,189
	ATT	0.2035	0.0906	0.1129	0.0594	1.9	0.156	N1 : 650
Op1p	Unmatched	0.2221	0.0045	0.2176	0.1772	1.23	0.099	N0 : 1,189
	ATT	0.2221	-0.0261	0.2482	0.3101	0.8	0.186	N1 : 650
Sa1p	Unmatched	4.5779	5.1386	-0.5608	0.3261	-1.72	0.076	N0 : 1,189
	ATT	4.5779	4.3235	0.2543	0.4036	0.63	0.355	N1 : 650
Patents	Unmatched	1.9723	1.3785	0.5938	0.2406	2.47	0.075	N0 : 1,189
	ATT	1.9723	1.5892	0.3831	0.3260	1.17	0.293	N1 : 650
2013	Sample	On- Park	Off- Park	Difference	S.E.	t	p	Obs(N0/N1)
NI1p	Unmatched	0.1483	0.1919	-0.0437	0.0513	-0.85	0.336	N0 : 1,144
	ATT	0.1483	0.1545	-0.0062	0.0499	-0.13	0.908	N1 : 699
Op1p	Unmatched	0.2225	0.0461	0.1764	0.2108	0.84	0.31	N0 : 1,143
	ATT	0.2225	0.1872	0.0353	0.0589	0.6	0.81	N1 : 699
Sa1p	Unmatched	4.5374	5.2162	-0.6787	0.3493	-1.94	0.007	N0 : 1,144
	ATT	4.5374	4.3917	0.1457	0.3599	0.4	0.608	N1 : 699
Patents	Unmatched	2.1445	1.4336	0.7109	0.2488	2.86	0.013	N0 : 1,144
	ATT	2.1445	1.8670	0.2775	0.3401	0.82	0.483	N1 : 699

Note : N0 is the number of non-participants and N1 is the number of participants.

Table A2c. On- and Off-Park Firms' PSM Results of Zone B

2011	Sample	On- Park	Off- Park	Difference	S.E.	t	p	Obs(N0/N1)
NI1p	Unmatched	0.1649	0.1260	0.0389	0.0604	0.64	0.533	N0 : 176
	ATT	0.1649	0.1992	-0.0343	0.1031	-0.33	0.694	N1 : 122
Op1p	Unmatched	0.0480	0.2260	-0.1780	0.1804	-0.99	0.389	N0 : 176
	ATT	0.0480	0.2776	-0.2296	0.2252	-1.02	0.281	N1 : 121
Sa1p	Unmatched	4.5127	5.2621	-0.7493	0.8141	-0.92	0.258	N0 : 176
	ATT	4.5127	4.5662	-0.0535	0.5260	-0.1	0.924	N1 : 122
Patents	Unmatched	0.8607	0.8352	0.0254	0.2131	0.12	0.904	N0 : 176
	ATT	0.8607	0.8689	-0.0082	0.3181	-0.03	0.977	N1 : 122
2012	Sample	On- Park	Off- Park	Difference	S.E.	t	p	Obs(N0/N1)
NI1p	Unmatched	0.1143	0.1002	0.0141	0.0834	0.17	0.853	N0 : 198
	ATT	0.1143	0.0486	0.0657	0.0685	0.96	0.555	N1 : 131
Op1p	Unmatched	0.0454	0.1624	-0.1170	0.1403	-0.83	0.464	N0 : 198
	ATT	0.0454	0.1202	-0.0749	0.1567	-0.48	0.704	N1 : 131
Sa1p	Unmatched	4.6165	5.2810	-0.6645	0.8180	-0.81	0.25	N0 : 198
	ATT	4.6165	4.0319	0.5846	0.5278	1.11	0.309	N1 : 131
Patents	Unmatched	1.2519	1.2626	-0.0107	0.2965	-0.04	0.968	N0 : 198
	ATT	1.2519	1.0763	0.1756	0.3971	0.44	0.714	N1 : 131
2013	Sample	On- Park	Off- Park	Difference	S.E.	t	p	Obs(N0/N1)
NI1p	Unmatched	0.2249	-0.0404	0.2654	0.1089	2.44	0.003	N0 : 199
	ATT	0.2249	0.1682	0.0567	0.0760	0.75	0.754	N1 : 131
Op1p	Unmatched	0.2786	-0.0365	0.3152	0.2136	1.48	0.096	N0 : 198
	ATT	0.2786	0.1407	0.1379	0.1433	0.96	0.684	N1 : 131
Sa1p	Unmatched	4.7344	5.2587	-0.5244	0.6947	-0.75	0.417	N0 : 199
	ATT	4.7344	5.4046	-0.6702	0.8549	-0.78	0.496	N1 : 131
Patents	Unmatched	1.2901	1.1759	0.1142	0.2866	0.4	0.704	N0 : 199
	ATT	1.2901	1.3130	-0.0229	0.4297	-0.05	0.956	N1 : 131

Note : N0 is the number of non-participants and N1 is the number of participants.

Table A2d. On- and Off-Park Firms' PSM Results of Zone C

2011	Sample	On- Park	Off- Park	Difference	S.E.	t	p	Obs(N0/N1)
NI1p	Unmatched	0.2478	0.0245	0.2234	0.2445	0.91	0.218	N0 : 354
	ATT	0.2478	0.1602	0.0876	0.1346	0.65	0.824	N1 : 125
Op1p	Unmatched	0.2216	0.2412	-0.0196	0.1035	-0.19	0.791	N0 : 353
	ATT	0.2216	0.3033	-0.0818	0.1541	-0.53	0.68	N1 : 125
Sa1p	Unmatched	5.0029	5.3885	-0.3856	1.1612	-0.33	0.636	N0 : 350
	ATT	5.0029	5.0640	-0.0610	0.6900	-0.09	0.949	N1 : 125
Patents	Unmatched	2.6640	1.1723	1.4917	0.6095	2.45	0.022	N0 : 354
	ATT	2.6640	1.1840	1.4800	0.8201	1.8	0.222	N1 : 125
2012	Sample	On- Park	Off Park	Difference	S.E.	t	p	Obs(N0/N1)
NI1p	Unmatched	0.1530	-0.0638	0.2169	0.2924	0.74	0.254	N0 : 372
	ATT	0.1530	0.1277	0.0253	0.1003	0.25	0.96	N1 : 140
Op1p	Unmatched	0.1938	0.1569	0.0369	0.1079	0.34	0.61	N0 : 371
	ATT	0.1938	0.1377	0.0562	0.0984	0.57	0.676	N1 : 140
Sa1p	Unmatched	4.5925	4.6735	-0.0811	0.4175	-0.19	0.859	N0 : 372
	ATT	4.5925	4.5469	0.0455	0.6175	0.07	0.931	N1 : 140
Patents	Unmatched	3.1143	1.5161	1.5982	0.6183	2.58	0.018	N0 : 372
	ATT	3.1143	1.4143	1.7000	0.8235	2.06	0.063	N1 : 140

Note : N0 is the number of non-participants and N1 is the number of participants.

Table A2d (Continued). On- and Off-Park Firms' PSM Results of Zone C

2013	Sample	On Park	Off- Park	Difference	S.E.	t	p	Obs(N0/N1)	
NI1p	Unmatched	0.1261	0.1449	-0.0188	0.1266	-0.15	0.8	N0 :	369
	ATT	0.1261	-0.0108	0.1368	0.1415	0.97	0.171	N1 :	155
Op1p	Unmatched	0.1339	0.1128	0.0211	0.1220	0.17	0.823	N0 :	367
	ATT	0.1339	0.2244	-0.0905	0.1191	-0.76	0.532	N1 :	155
Sa1p	Unmatched	4.8199	4.7734	0.0466	0.4752	0.1	0.932	N0 :	366
	ATT	4.8199	4.3755	0.4445	0.5790	0.77	0.423	N1 :	154
Patents	Unmatched	3.5161	1.6179	1.8982	0.6559	2.89	0.03	N0 :	369
	ATT	3.5161	1.4387	2.0774	0.8241	2.52	0.051	N1 :	155

Note : N0 is the number of non-participants and N1 is the number of participants.

Table A2e. On- and Off-Park Firms' PSM Results of Zone D

2011	Sample	On- Park	Off- Park	Difference	S.E.	t	p	Obs(N0/N1)	
NI1p	Unmatched	0.0607	0.1859	-0.1252	0.0811	-1.54	0.202	N0 :	167
	ATT	0.0607	0.1977	-0.1370	0.0873	-1.57	0.186	N1 :	103
Op1p	Unmatched	-0.1594	0.1540	-0.3134	0.2540	-1.23	0.35	N0 :	167
	ATT	-0.1594	0.2414	-0.4008	0.2854	-1.40	0.198	N1 :	103
Sa1p	Unmatched	4.5678	5.7868	-1.2190	1.4575	-0.84	0.302	N0 :	167
	ATT	4.5678	4.3020	0.2658	0.6788	0.39	0.699	N1 :	103
Patents	Unmatched	1.4466	1.9581	-0.5115	1.4706	-0.35	0.671	N0 :	167
	ATT	1.4466	2.7379	-1.2913	2.8356	-0.46	0.616	N1 :	103
2012	Sample	On- Park	Off- Park	Difference	S.E.	t	p	Obs(N0/N1)	
NI1p	Unmatched	0.0691	0.0977	-0.0286	0.1062	-0.27	0.706	N0 :	175
	ATT	0.0691	0.2154	-0.1464	0.0866	-1.69	0.144	N1 :	108
Op1p	Unmatched	-0.0118	0.0993	-0.1112	0.2578	-0.43	0.65	N0 :	175
	ATT	-0.0118	0.0266	-0.0385	0.3544	-0.11	0.893	N1 :	108
Sa1p	Unmatched	4.8760	5.7292	-0.8532	1.5681	-0.54	0.512	N0 :	175
	ATT	4.8760	4.0826	0.7934	0.6219	1.28	0.28	N1 :	108
Patents	Unmatched	1.8333	2.2057	-0.3724	1.5328	-0.24	0.785	N0 :	175
	ATT	1.8333	2.3056	-0.4722	1.0279	-0.46	0.866	N1 :	108
2013	Sample	On- Park	Off- Park	Difference	S.E.	t	p	Obs(N0/N1)	
NI1p	Unmatched	-0.0204	-0.3256	0.3052	0.3615	0.84	0.352	N0 :	181
	ATT	-0.0204	0.0458	-0.0662	0.1258	-0.53	0.6	N1 :	123
Op1p	Unmatched	0.0930	0.0241	0.0689	0.1387	0.5	0.566	N0 :	181
	ATT	0.0930	0.1244	-0.0314	0.1079	-0.29	0.754	N1 :	123
Sa1p	Unmatched	4.5921	6.4058	-1.8137	1.7829	-1.02	0.236	N0 :	179
	ATT	4.5921	4.0819	0.5102	0.5460	0.93	0.481	N1 :	121
Patents	Unmatched	1.8780	1.1934	0.6847	0.6914	0.99	0.347	N0 :	181
	ATT	1.8780	1.2439	0.6341	0.8055	0.79	0.502	N1 :	123

Note : N0 is the number of non-participants and N1 is the number of participants.