On the growth of U.S. science parks

By: Albert N. Link and Kevin R. Link

Link, A.N., Link, K.R. On the Growth of U.S. Science Parks. *The Journal of Technology Transfer* **28,** 81–85 (2003). https://doi.org/10.1023/A:1021634904546

Abstract:

Science parks were first established in the United States in the 1950s. They have been widely touted as a potentially important source of technological spillovers and economic growth—regional economic growth in particular (Audretsch, 2001). Given the complexity of the relationships that arise from the creation of these institutions and their considerable heterogeneity, it is perhaps not surprising that there is no generally accepted definition of a science park. The Association of University Related Research Parks (AURRP) has set forth one definition.

Keywords: university research parks | industrial organization | technology management

Article:

1. Introduction

Science parks were first established in the United States in the 1950s. They have been widely touted as a potentially important source of technological spillovers and economic growth—regional economic growth in particular (Audretsch, 2001). Given the complexity of the relationships that arise from the creation of these institutions and their considerable heterogeneity, it is perhaps not surprising that there is no generally accepted definition of a science park. The Association of University Related Research Parks (AURRP) has set forth one definition. As stated in their *Worldwide Research & Science Park Directory, 1998* (p. 2):

> The definition of a research or science park differs almost as widely as the individual parks themselves. However, the research and science park concept generally includes three components:
> - A real estate development
> - An organizational program of activities for technology transfer
> - A partnership between academic institutions, government and the private sector.

Over time, the term "science park" has evolved to become a generic term which refers to parks with some or all of the aforementioned characteristics.

As the tables clearly illustrate, science parks in the United States vary in both age and size. The oldest park, as shown in Table I, is Stanford Research Park, established in 1951. The largest park, based on acres acquired and employees and acres acquired per year (Tables II, III, and IV) is Research Triangle Park. Stanford Research Park tops the list in terms of buildings, as shown in Table V. Table VI shows that Metro Tech in Brooklyn is the largest park in terms of annual employment, while Table VII indicates that the University of Pittsburgh Applied Research Center is the largest, based on the average annual number of buildings.

Table I. Oldest research parks by year established

Park	City	State	Year
Stanford Research Park	Stanford	CA	1951
Cornell Business & Technology Park	Ithaca	NY	1952
University Research Park (originally Swearingen Research Park)	Norman	OK	1957
Research Triangle	Research Triangle	NC	1959
Purdue Research Park	West Lafayette	IN	1960

Table II. Largest research park by 1998 acres acquired (rounded)

Park	City	State	Year Established	Acres
Research Triangle Park	Research Triangle	NC	1959	6,800
Cummings Research Park	Huntsville	AL	1962	3,800
University Research Park	Charlotte	NC	1974	3,200
Princeton Forrestal Center	Princeton	NJ	1974	2,150
The Woodlands Research Forest	The Woodlands	TX	1984	2,000

Table III. Largest research park by 1998 employees (rounded)

Park	City	State	Year Established	Employees
Research Triangle Park	Research Triangle	NC	1959	37,000
Cummings Research Park	Huntsville	AL	1962	26,000
Stanford Research Park	Stanford	CA	1951	26,000
Metro Tech	Brooklyn	NY	1986	18,000
University Research Park	Charlotte	NC	1968	18,000

Table IV. Largest research park by 1998 acquired acres per year

Park	City	State	Year Established	Acres per year
Research Triangle Park	Research Triangle	NC	1959	174.36
The Woodlands Research Forest	The Woodlands	TX	1984	142.86
Oakland Technology Park	Auburn Hills	MI	1983	120.00
Texas Research Park	San Antonio	TX	1987	112.36
University Research Park	Charlotte	NC	1968	106.67

Table V. Largest research park by 1998 buildings

Park	City	State	Year Established	Buildings
Stanford Research Park	Stanford	CA	1951	165
Research Triangle Park	Research Triangle	NC	1959	102
Cummings Research Park	Huntsville	AL	1962	95
University of Pittsburgh Applied Research Center	Pittsburgh	PA	1986	55
Princeton Forrestal Center	Princeton	NJ	1974	40

Table VI. Largest research park by 1998 employees per year

Park	City	State	Year Established	Employees per year
Metro Tech	Brooklyn	NY	1986	1,500.00
Research Triangle Park	Research Triangle	NC	1959	948.72
Cummings Research Park	Huntsville	AL	1962	722.22
University Research Park	Charlotte	NC	1968	600.00
Stanford Research Park	Stanford	CA	1951	553.19

Table VII. Largest research park by 1998 buildings per year

Park	City	State	Year Established	Buildings per year
University of Pittsburgh Applied Research Center	Pittsburgh	PA	1986	4.58
Stanford Research Park	Stanford	CA	1951	3.51
Cummings Research Park	Huntsville	AL	1962	2.64
Research Triangle Park	Research Triangle	NC	1959	2.62
OREAD WEST Corporate & Research Park	Lawrence	KS	1987	1.73

An inspection of these tables, especially those containing average annual figures, clearly demonstrates that there is considerable heterogeneity in growth rates among parks. This raises the logical question of why some facilities grow more rapidly than others. Several factors seem likely to induce variation in growth. We conjecture that geography, distance, and organizational factors may be important. For instance, some parks may be closer to faster growing universities or industrial communities than others. Additionally, certain facilities may be managed more effectively than others. Finally, it is conceivable that differences in park growth may simply reflect the heterogeneity of the parks. We provide an initial test of all three of these hypotheses in this paper.

2. Towards a taxonomy of U.S. science parks

The academic literature on science parks is sparse, especially as related to classifying such institutions. Some, such as Lugar (2001), have posited alternative classification schemes based on third-party information, but to date there has not been a systematic effort to formulate a meaningful taxonomy of science parks. Toward this end, we undertook a survey of all directors of science parks that are or have been members of the AURRP. Our purposes were several fold. We sought first-hand knowledge about how directors (1) classify their park among the population of U.S. parks, (2) assess the success of their park relative to the population of U.S. parks, and (3) characterize their relationship with universities.

Of the 123 U.S. members of UARRP for which contact information was available, 50 directors were willing to participate in a short telephone interview during summer 2002. The other directors were either not available (e.g., would not accept a telephone call or would not return a telephone call) on three attempts. In a statistical sense, we view this sample of 50 as representative of the population as defined in terms of UARRP membership and hence we generalize below about U.S. science parks.[1]

[1] We estimated a probability of response model with independent variables being the age of the park, size of the park, and region of the park. None of these independent variables were statistically significant within a probit model.

Based on our interviews, we conclude that U.S. science parks can most meaningfully be divided into three categories:

- real estate parks with no university affiliation
- university research parks with tenant criteria
- university research parks with no tenant criteria.

Regarding the latter two categories, tenant criteria include, among other things, being R&D and technology based, not conducting heavy manufacturing, and/or being committed to hiring graduate students and interacting with university faculty.

Also based on our interviews, we conclude that park directors measure the success of their park in a variety of ways including profitability (especially for real estate parks), contributions to the local and regional economy, and ability to interact with the universities (not relevant for real estate parks). Regardless of what combination of success measures the directors mentioned, all were in one way or another tied to the ability of the park to grow both in terms of number of companies and number of employees.

3. Estimating the growth of science parks

Referring to the question posed in the Introduction, we investigated, using the taxonomy of parks we developed, which type of park has grown the fastest. Our model is:

$$\text{Park Growth} = f(\text{Park Type}, \mathbf{X}) \qquad (1)$$

where, for each of the 50 parks for which we collected information, Park Growth is measured as the annual rate of growth in park companies (*COGR*) and in park employees (*EMPGR*), with a maintained assumption that there were no firms and no employees during the year that the park was established. Regarding Park Type, each park was classified as either a real estate park (*RE*), a university park with tenant criteria (*UPTC*), or a university park with no tenant criteria (*UPNTC*). The vector **X** contains two additional variables, a mileage variable interacted with *RE* (*REMI*) to account for the fact that some real estate parks are closer to universities than others, and a dummy variable to control for some parks having an incubator facility (*INC* = 1) and others do not.

Descriptive statistics on these variables are in Table VIII and the ordinary least squares regression results are in Table IX. Based on the mean values in Table VIII, several key findings are immediately apparent. The first is that real estate parks tend to be larger than university-related parks, in terms of number of companies and number of employees. They have experienced growth since their establishment at about the same rate as university parks with tenant criteria and faster than university parks without university criteria. A second finding is that university parks with tenant criteria tend to be closer to a research university than university parks without tenant criteria. Finally, we note that most parks, regardless of type, do not have an incubator facility within their boundaries.

Table VIII. Descriptive statistics: mean values by type of science park

	***RE* = 1**	***UPTC* = 1**	***UPNTC* = 1**
No. companies	33.20	31.28	22.18
No. employees	4623.50	2566.94	1512.18
Age of park	14.50	15.44	13.30
Mileage to a research university	38.90	0.89	7.36
COGR	0.017	0.018	0.012
EMPGR	173.50	173.52	66.03
INC	0.30	0.278	0.364
n	10	18	22

Table IX. OLS regression results (t-statistics in parentheses)

	***COGR* as dependent variable**			***EMPGR* as dependent variable**		
Variable	**(1)**	**(2)**	**(3)**	**(1)**	**(2)**	**(3)**
RE	0.217 (2.133)**	0.023 (2.498)**	0.017 (2.652)**	361.099 (3.006)*	319.495 (2.87)*	173.497 (2.220)**
UPTC	0.017 (3.072)*	0.018 (3.521)*	0.017 (3.524)*	196.098 (3.015)*	173.525 (2.880)*	173.525 (2.801)*
UPNTC	0.011 (2.124)**	0.012 (2.729)*	0.012 (2.73)*	94.926 (1.524)	66.032 (1.225)	66.032 (1.195)
REMI	–0.0001 (–0.811)	–0.0002 (–0.964)	—	–4.266 (–1.994)**	–3.753 (–1.799)**	—
INC	0.003 (0.438)	—	—	–72.234 (–0.930)	—	—
R^2	0.399	0.397	0.384	0.317	0.303	0.249
F-level	5.46	6.91	8.92	3.81	4.55	4.74

* Significant at the .01 level or better.
** Significant at the .05 level.

The regression results in Table IX are robust, and not unexpected given the patterns in Table VIII. First, real estate parks have been the fastest growing type of park, but their growth is not related to being geographically close to a university (although the algebraic sign of the coefficient on *REMI* is negative as might be expected—growth is greater as distance decreases). Second, tenant criteria seem to be important to a university park in terms of attracting companies and thus employees at a relatively faster pace. And third, incubators, while present in only about one-third of the parks (see Table VIII), are not a statistical determinant of park growth.

4. Conclusions

The results presented in this exploratory analysis should be interpreted with caution, since ours is one of the earliest studies to systematically classify and analyze U.S. science parks. We provide a taxonomy of science parks and also attempt to "explain" park growth, based on this classification. Our findings provide some useful insights to universities and localities considering the formation of a science park.

Our results also raise a number of unexplored issues. A key question concerns the relationship between state funding and the success (e.g., company and/or employee growth) of science parks. Another critical issue relates to the diffusion mechanisms by which science parks affect local and regional economic growth. Certainly, as the literature on science parks develops, these will hopefully be among the topics being studied.

Acknowledgment

This study was funded, in part, by the National Science Foundation. Thanks to Donald Siegel for comments and suggestions on an earlier version of the paper.

References

Audretsch, D.B., 2001, 'The Prospects for a Technology Park at Ames: A New Economy Model for Industry-Government Partnership?' in C. Wessner (ed.), *A Review of the New Initiatives at the NASA Ames Research Center*, Washington, DC: National Research Council.

Link, A.N., 2002, *From Seed to Harvest: The Growth of the Research Triangle Park*, Research Triangle Park: The Research Triangle Foundation of North Carolina.

Lugar, M.I., 2001, 'Science and Technology Parks at the Millennium: Concept, History, and Metrics,' in C. Wessner (ed.), *A Review of the New Initiatives at the NASA Ames Research Center*, Washington, DC: National Research Council.