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VALUE CAPTURE and LAND POLICIES

Edited by Gregory K. Ingram and Yu-Hung Hong

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Science Parks and Land Value Capture

Michael I. Luger and Justyna Dabrowska

For many years, universities around the world have taken an active role in technology development, creating or investing in science parks, developing parts of their campuses for technology-oriented research and commercialization, and participating in incubators. There are several motivations for these efforts, including a desire to attract and retain inventive and entrepreneurial faculty, to create an additional source of income for the university, and to justify their claims on public resources by helping to generate jobs and incomes in the region. One thing is clear from the research on these initiatives: there is neither a single organizational setup nor a single financial model for them. Both the ownership/organization and finances of these developments are driven by the specific nature of each institution.

However organized and financed, these efforts all beg the same critical questions: Are the benefits generated sufficient to justify the actual and opportunity costs to the university and other stakeholders? Are the stakeholders even aware of that cost-benefit trade-off? Do they care? Indeed, research and science parks,[1] like many high-tech ventures, have been characterized as a "bandwagon" onto which universities and governments have jumped simply to avoid being left on the sidelines.[2]

One way to address the questions about these parks is to develop metrics of success and try to monetize the value to the regional economy of a research park, incubator, or other such development. Creating such metrics has been a

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1. Throughout this chapter, the terms *research park* and *science park* are used interchangeably.

2. The general phenomenon is laid out in Rohlfs (2003). One of many practical examples is the Missouri Research Park, which has been called a "field of dreams" (*Business Saint Charles Magazine* 2002).

small industry for researchers over the past 30 years. The problem is that it is an inexact science at best, requiring data that do not always exist and resting on assumptions that cannot always be tested. Some returns are more straightforward than others. For example, we can measure the value of rents received or the number of jobs created more easily than the increased reputation of the university, the retention of top scholars, or the identification of a region as high-tech-friendly.

In this chapter, we focus on research parks as real estate investments. Previous work on these parks moved away from that approach, arguing that the motivation of research parks and their related activity went well beyond real estate and had to be judged more broadly. But after working on this topic for some 30 years, we can attest that the players are still primarily real estate professionals and the operations are largely driven by commercial metrics. At the end of the day, these are real estate ventures that have to be judged as such.

That does not mean we cannot deduce a value from the projects for non–real estate benefits. Those benefits can be defined as the difference between the actual return and the return that would be obtained through the highest and best permissible use of the land. The problem with this approach, of course, is that "permissible use" is subject to the judgment of planning officials, which is based on political as well as economic considerations. What is the value of the land and buildings used for these activities compared to the highest permissible use? That framework is tantamount to a contingent valuation methodology. Researchers end up asking various stakeholders how much maximum return they are willing to forgo because of the non–real estate benefits they expect.

Consider what this means for a local or state government or university that is putting up land or up-front capital to buy land. What return is that entity getting in terms of rents or capital gains? What is the demand of existing users (owners and renters) for local infrastructure and services, and are they priced in a way that covers costs? If the land and buildings were not devoted to that use, what could they be used for? What if the land and buildings are owned by a commercial entity? How is that entity kept at the table?

These questions are central to the theme of this volume: land value capture. If public sector and university investments in the land, buildings, or other infrastructure, as well as the very status of the affiliation, add value to a science park, does that increase in value get captured by those stakeholders?

This chapter begins by discussing the issue of town-gown fiscal relations. As universities diversify their activities in and around their campuses, the question of what they pay in taxes and payments, and for what, becomes more complicated. We then review the literature on measuring the success of research parks and related projects and outline the methodological approach used in the case study, Manchester Science Parks in the United Kingdom, which is presented as a successful example of land value capture. Finally we explore a few other science parks in the United Kingdom and United States and offer some suggestions for further work.

The Widening Role of Universities in Community or Regional Economic Development and Town-Gown Relations

One long-standing issue in town-gown relations is the degree to which universities pay for the land they use and the public services they consume. That issue has become more complex as universities have diversified their activities. Until the mid-twentieth century, university campuses typically consisted of classroom and administration buildings, labs, libraries, parking lots, sports facilities, dorms, and fraternity houses. From 1950 on, research parks began springing up on or adjacent to campuses. More recently, universities have begun developing technology campuses where industry and academic research is done jointly. In some cases, those campuses are not adjacent to the main university and may even have multiple partners. Universities also have invited private providers onto campus to own or manage student housing, conference and catering operations, and other functions (Gann 2010).

For many decades, the biggest hitch in town-gown relations has been the tax-free status of universities, which exempts them from paying property taxes. Universities differ in how much they pay in taxes and for what, as well as in what they pay for the community services they consume and their use of payments in lieu of taxes, or PILOTs. (See Kenyon and Langley [2010] for an overview and extensive reference list.)

In general, universities pay less in property taxes than private enterprises. The standard rationale universities use is that they contribute to the local economy in many other ways, such as employment opportunities; the generation of sales outside the university, including in the housing market; and the attraction of businesses to the region. A counterargument is that the benefits universities generate (especially higher-status research universities) are not just local benefits, but are more global. Through that lens, the nonimposition of property taxes becomes the opposite of what economists call "tax exporting"—that is, local taxpayers are paying for benefits that are exported.

Property tax exemption is typically applied to academic uses on campus, but not to commercial uses such as sports stadiums, conference centers, hotels, restaurants, and fraternity houses.[3] But what is considered an academic use? And is it an all-or-nothing consideration? What about a lab used in both teaching and research, including collaborative projects with industry? These questions are particularly relevant to university-owned research parks, incubators, and science campuses.

Obviously, university administrators want to minimize their tax and other related payments, especially when budgets are tight. Presumably, local governments

3. In the United Kingdom, council taxes are not levied on student accommodations regardless of their ownership.

care about the fiscal arrangements as well, especially regarding facilities that are not strictly for academic uses. Arguably, the community would be better off financially if that land were given to commercial use instead, unless the community derives other benefits from the facilities.

As we will see in the case study later in the chapter, some science parks and related developments are not owned by universities, or at least not solely, so the town-gown fiscal question is not always an issue. If universities use facilities within such a park, they may seek to escape or reduce property taxes for those facilities, but that also differs from case to case.

Measuring the Success of Science Parks

As an epistemological matter, measurement of success can be both descriptive and analytic. Most science park and technology project managers collect and publish general statistical information on the progress of their organizations. These reports tend to be descriptive rather than analytic and take a variety of forms. Hodgson (1996, 348) defines these as "relative performance" and "impact evaluation" assessments.

Science parks and technology projects often have different goals and objectives, and different stakeholders have different expectations of them. It is a challenge to construct a single ranking of objectives even for one set of stakeholders. Luger and Goldstein (1991) attempted to do that for research park managers and directors by surveying them about their objectives and weighting those objectives by strength of preference (see table 10.1).

At the time of their survey, economic development was judged to be most important for that group of stakeholders. Had they surveyed other stakeholders—for example, the companies in the parks—the third set of objectives would likely have been more prominent. Similarly, if they had surveyed the university sponsors of the parks, the second group of objections probably would have come out higher. Private investors in research parks or local governments would have been looking at financial return or fiscal outcomes, respectively.

Massey, Quintas, and Wield (1992) grouped science parks' objectives into three categories: economic development, transfer of technology, and local benefits (jobs created, cultural change, and impact on city's image). No reference was made to financial objectives.

The literature also covers various outcomes of science parks and technology projects consistent with their objectives, since evaluation requires results to be measured against expected outcomes (objectives). The ANGLE Technology study commissioned by the United Kingdom Science Park Association (UKSPA) broke down the performance of science parks into two categories: their economic performance, and the innovation and technology commercialization performance of their tenant companies (ANGLE Technology 2003).

Table 10.1
Park Managers' and Directors' Perceptions of Research Park Objectives

Importance of Original Objective	Ranking[a]	
	#1	#2
RELATIVELY IMPORTANT: *Economic development*		
To diversify region's economic base	2	1
To develop and nurture new business	1	2
To capitalize on existing R&D in region	3	3
To expand local employment opportunities	4	4
AVERAGE IMPORTANCE: *University and technology development*		
To enhance university's technical training via collaborative research	5	5
To increase technology transfer by park businesses	6	6
To encourage entrepreneurship in region	7	7
To increase region's productivity via innovation	9	8
To expand employment opportunities for local university graduates	11	9
To commercialize university-based research	10	10
To enhance prestige of affiliated university	8	11
RELATIVELY UNIMPORTANT: *Income/profit generation and redistribution*		
To provide higher-paying jobs locally	12	12
To maximize profits from land/facility sales/leases	13	13
To expand employment opportunities for low-skilled workers	14	14

[a]Ranked in order of importance based on two weightings of the survey responses. Ranking #1 attaches weights of 0.55, 0.375, 0.225, and –0.15 to "very important," "moderately important," and "not important," respectively. Ranking #2 is based on a data sort, with each response as a successive key.
Source: Luger and Goldstein (1991).

Economic performance was measured using

- companies' employees and job growth;
- companies' turnover and revenue; and
- access to financing.

Innovation and technology commercialization performance was assessed using

- new products launched;
- new services launched;

- patent applications;
- proportion of qualified scientists and engineers; and
- intensity of investment in research and development (R & D) as a proportion of turnover.

Following Monck (2010), table 10.2 divides performance indicators into three subgroups. Not shown in this table is the growing interest in measuring the financial as well as nonfinancial performance of science parks and technology projects to justify whether they have been successful (see Allen 2007; Monck and Peters 2009; Neely, Adams, and Kennerley 2002; Neely, Gregory, and Platts 2005).

The methods used to measure success vary greatly. Many studies rely on elicitation methods—asking stakeholders how they regard performance to have been. That approach is useful to follow changes in perception over time and perhaps to

Table 10.2
Objectives of Science Parks: Measurements of Performance

Key Performance Indicators	Intermediate Results	Short-Term Management Indicators of Performance
Contribution to local economy's gross value added (GVA)	Amount of inward investment induced, including associated new jobs	Volume of turnover and spending by park tenants
Contribution to local economy's productivity (GVA per worker)	Amount of new technology created in and drawn to region	Number of qualified inquiries
Growth in sales, including exports	Growth in business-to-business interactions, within park and beyond	Number of companies in park
Additional spending on R&D, marketing, training, and facilities	Increases in the retention of university graduates	Occupancy rates
Number and quality of new jobs created	Growth in the use of business services in the region	Number of companies being incubated
Number of new start-ups	Amount of new R&D, debt, and equity funds brought into region	Number of events for park tenants and participation rate
	Increased survival rates and growth of start-up companies	Number of companies being assisted in some way
		Extent to which park companies use local knowledge resources

Source: Dabrowska (2011).

identify differences in perception among different groups of respondents. But the high level of response bias compromises the credibility of the results.

Another approach, pioneered by Monck et al. (1988) and Luger and Goldstein (1991), uses a quasi-experimental design methodology—comparing the performance of organizations within the project with that of similar organizations located elsewhere. This method is looking for any statistically significant differences in terms of number of jobs created, sales, profitability, R & D output, new products or services, companies' survival rate, and so on (Monck and Peters 2009).

Luger and Goldstein (1991) also attempted a cost-benefit approach to a sample of research parks, comparing the actual costs of development and operation with the value of induced benefits. This study was inherently limited by the lack of reliable data. For example, it is difficult to monetize the benefit of a better reputation for the university or a stronger perception of the region among businesses and talent. To assess the latter, Luger and Goldstein surveyed companies and workers who recently moved into the region to ascertain the degree to which the parks affected their decisions to relocate, but that measure is inexact at best.

It is beyond the scope of this chapter to review the findings of all past studies of the success of research parks and related technology developments. Dabrowska (2011) provides a fairly comprehensive literature review.[4] The appendix to this chapter gives a general overview of performance and impact evaluation studies and their key outcomes.

A Real Estate–Oriented Methodology for Measuring Success

The projects to which we refer in this chapter are not virtual; they occupy land and buildings. In most cases, the land could have been used for other purposes, perhaps more densely zoned.[5] Consider, for example, the approximately 7,000 acres now occupied by the Research Triangle Park in North Carolina. Instead of the large-lot, low-density, research-related commercial uses to which the land was put in the 1950s, it could have been sold to developers for higher-density housing, retail, and office uses, much as land in adjacent parts of the Research Triangle region has been. Indeed, the parcel today is in a prime location, equidistant

4. Of the many studies she covers, the most pertinent to this chapter is Link and Scott (2003). Their analysis does not focus on firms, but on universities and their relationships with research parks. They found that research parks have a positive impact on universities' growth and profile. Parks enable universities to increase their number of publications and patents, facilitate the transfer of technologies, and help them place graduates.

5. We say "most cases" to account for idiosyncrasies such as the Stanford Research Park, in Stanford, California, which was built on land that the benefactor, Leland Stanford, designated could be used only for university-related purposes.

(approximately 10 miles) from each of three major universities, adjacent to an international airport, and easily accessible to several million skilled workers.

This thought experiment contains a circularity. The very use of the land for Research Triangle Park ostensibly fueled the growth and development of the region, making it into a higher-sought location for skilled workers and businesses. If the park had not been developed, the universities may not have become as strong as they are, the airport may not have developed as it has, and skilled talent and companies may not have been drawn to the area. The value of the alternative uses would have been much less than the current value. Or would it have been?

The problem with counterfactuals is that they are not verifiable. An alternative scenario might have gone like this: The State of North Carolina succeeded in attracting a major car assembly plant to part of the site (as South Carolina and Alabama did some time later), and the rest of the land was highly sought by suppliers. The local universities developed greater strength in engineering and automotive-related sciences, also drawing talent to the region. The airport would have been as successful, and the demand for housing, services, retail stores, and so on would have been as robust. If that (or some other positive alternative scenario) had occurred, the region may have been better off economically than it is now. In other words, the much-celebrated and copied Research Triangle Park may actually have been a detriment to economic development in the area.

Or take the case of Manchester Science Parks, located on the south side of Manchester, England, adjacent to both the University of Manchester and Manchester Metropolitan University. That land is owned by the City of Manchester, which rents it to the park for use by its tenants. Do the rents and payments for services from the park tenants represent the highest and best use of that land?

This question about the "highest and best use" of land is a bit of a red herring, since it depends on zoning, which ostensibly reflects strategic and political priorities as much as just health and safety considerations. So even if a parcel could generate more rents and payments for services if used for, say, industrial rather than research-related uses, local decision makers may be following a development path to promote R & D versus manufacturing, in which case the opportunity cost of using the land for industry is zero.

Under the assumption of an omniscient decision-maker, the different values of alternative scenarios should indicate the implicit value of harder-to-measure outcomes. Suppose the use of land for a park or technology project is less than what would have been generated by the highest use. That gap could approximate the economic development benefits, including reputation. What if the opposite were true—that the alternative value were less than the value of the project? In that case, the economic development outcomes of the alternative scenario would have to have been more than from the park to have made the scenario more favorable.

Symbolically,

$$(1) \qquad V_{t+1}^{A} - V_{t}^{A} = \left[\left(REV_{t+1}^{A} - REV_{t}^{A}\right) + \left(EDV_{t+1}^{A} - EDV_{t}^{A}\right)\right],$$

where V, REV, and EDV are, respectively, value, real estate value, and economic development value, all under scenario A. And,

$$(2) \qquad V^B_{t+1} - V^B_t = \left[\left(REV^B_{t+1} - REV^B_t\right) + \left(EDV^B_{t+1} - EDV^B_t\right)\right]$$

is the same for scenario B. Where (3) $\Delta V = V_{t+1} - V_i$ we are interested in both the values of ΔV^A and ΔV^B, as well as $\Delta V^A - \Delta V^B$.

If A is the actual outcome, ΔREV^A can be constructed more easily than ΔEDV^A. If B is the counterfactual scenario, the change in REV can be constructed using assumptions consistent with the counterfactual. If the counterfactual were not a project with any induced economic development expectations, ΔEDV^B could be considered to be negligible.[6]

If the null hypothesis is that $\Delta V^A = \Delta V^B$, ΔREV^A and ΔREV^B can be calculated, and if ΔEDV^B is assumed to be negligible, $\Delta REV^A - \Delta REV^B$ approximates ΔEDV^A. If ΔEDV^B is not negligible, then it would have to be estimated using assumptions about the alternative use.

We can take the next step and ask what determines REV at any time, under any scenario. Capital asset theory tells us that REV should reflect the present discounted net value of the land, which depends on the allowable use, the market rents within that use, and the costs of taxes and fees for the use of the land. REV also would be enhanced by the receipt of grants. REV can be observed for the actual scenario, but it could be constructed under an alternative scenario by applying appropriate assumptions about revenue and cost flows.

This framework is provided to put the case study that follows in perspective.

Case Study: Manchester Science Parks

Manchester is the third-largest city in England and the administrative and commercial hub of the country's North West region. It is some 197 miles northwest of London, 32 miles east of Liverpool, and 40 miles southwest of Leeds. The city has a population of approximately 400,000, but Greater Manchester (the immediate surrounding region with a radius of 12 miles) is home to 2.4 million people.[7] Manchester's main employment sectors are "other services" (29.1 percent), "banking, finance & business services" (18.6 percent), and "retail" (15.7 percent). Between July 2000 and June 2009, its unemployment rate was 8.4 percent, 1.5 percentage points above the U.K. average of 6.9 percent.

6. This raises a fundamental flaw with much of the existing literature on the economic development impacts of these projects. If economic development benefits are estimated only for the site when used for a research park, then the implicit assumption is that the alternative use would produce no economic benefit when, in fact, other uses also would generate jobs and income.

7. Greater Manchester is a confederation of 10 local authorities.

Table 10.3
Growth of Manchester Science Parks, 1989–2010

Year	Total Managed Space (sq m)	Total Space Owned (sq m)
1989	5,786	3,054
1995	12,070	6,049
1999	14,964	11,212
2004	25,257	18,229
2010	46,372	18,229

Source: Based on data from Manchester Science Parks.

Manchester is notable for having the largest student population in Europe, with more than 80,000 enrollees in the city and upwards of 100,000 in Greater Manchester. It has the highest retention of graduates of any city in the United Kingdom except London.

Manchester Science Parks (msp) was established in 1984 on land adjacent to the campus of the University of Manchester. Today it manages 12 buildings, encompassing 46,372 square meters of space, on its original site (18,229 square meters) and on three satellite campuses within Greater Manchester: Manchester Technopark (opened in 2000), One Central Park (part of the building managed by msp since 2004; entire site managed by msp since 2010), and Salford Innovation Park (managed by msp since 2010). Table 10.3 shows the organic growth of msp.

The stated objectives of the science park are to enhance the economic and technological wealth of the Manchester city region by providing quality accommodations and added-value services to companies in high-technology sectors, and to increase the employment opportunities of Manchester's residents by harnessing the resources of the affiliated academic institutions. This formal statement makes it clear that the property operation is a means to an end.

Manchester Science Parks is a successful example of the "triple helix," a partnership model that requires governments, universities, and industry (private companies) to have a stable relationship based on continuous collaboration in the knowledge-based regional innovation system (Etzkowitz 2001, 2008; Leydesdorff and Meyer 2003). Manchester Science Parks has had a sustainable relationship with all the above parties for more than a quarter of a century. In msp there is shareholder balance; none of the partners has an overall majority. The three groups of shareholders are shown in table 10.4.

The City of Manchester and the University of Manchester own 27 percent of the shares each, and Manchester Metropolitan University owns 10 percent of the shares. In 2010 the City of Salford acquired 3 percent of msp's shares. Four of the five commercial entities have approximately 6 percent each; the fifth

Table 10.4
Shareholders in Manchester Science Parks

Public	Commercial	Universities
City of Manchester	Quiros Ltd.	University of Manchester
City of Salford	Pochin's PLC	Manchester Metropolitan University
	NatWest Bank PLC	
	BASF	
	ITV Services Ltd.	

has 9 percent. This ownership structure adds weight to our earlier discussion of measurements of success. As in most cases, all of the shareholders want to protect their investments, but they presumably give different weights to other benefits that the park provides.

Manchester Science Parks was originally conceived as a property management company. The company soon recognized that it would be easier to become financially sustainable if it developed and owned its own buildings. Not having its own resources, and so far not able to attract a major equity partner, msp uses a combination of bank loans, preference shares at fixed interest rates, and grant funding to finance construction. The loans and share dividends, as well as other costs (business taxes), are repaid from the rents msp receives from tenants.

The 62,780 square meters of land adjacent to the University of Manchester is owned by the City of Manchester, which granted msp a 125-year lease.[8] The city financed the construction of the first building, Enterprise House, completed in 1984, and retained msp to manage it in exchange for a management fee. Fourteen years later, the improved financial position of msp allowed it to purchase Enterprise House from the city. That transaction marked the transformation of the park's finances from a struggling new company into a viable commercial operation. The city sold Enterprise House at a commercial rate, making some profit, but retained ownership of the land to make sure the original focus of the park is maintained and to share the financial benefits by receiving a percentage of the rents collected by msp. Moreover, the city is one of the major shareholders of msp and is represented on its board. Therefore, the city takes part in the decision-making process related to any development plans or changes. In the language of this volume, the City of Manchester maintained ownership of the land to ensure land value capture once it disposed of the one building it owned.

8. In the United Kingdom, the original landowner often maintains long-term ownership (the "freehold") and transfers a time-limited "leasehold" to a tenant, who can then rent the property to others.

Table 10.5
Manchester Science Parks Properties, Original Sites

Property	Year Established	Ground Rent (% of total)	Market Value, 2009[a] (millions of pounds)
Enterprise House	1984	9	1.2
Skelton House	1989	8	5.0
Synergy House	1993	8	Not owned by msp
Rutherford House	1995	9	2.8
Williams House	1998	9	4.5
Kilburn House	2000	9	4.5
Greenheys Centre	2000	Freehold	2.3
Total			20.3

[a] Valuations by Rickitt Mitchell.
Source: Based on data from Manchester Science Parks.

With each subsequent development (see table 10.5), a specific head lease relevant to that plot was negotiated, reflecting the current state of the commercial property market. In most cases, a ground rent—a percentage of the rents receivable—is payable to the city, so local government receives a market-related financial reward for its support (in addition to the economic development value). Only one building (Greenheys Centre) out of seven located on the original site is on freehold land. The building and the land were bought from English Partnerships in 2000.

Manchester Science Parks has had a positive net cash flow since 1992. Table 10.6 shows msp's profit and loss information for 2009 and 2010. Rather than receive any dividends, the shareholders have always preferred to reinvest net revenues into further development.

Table 10.7 shows msp's balance sheet for 2009 and 2010. Since the initial share price was £1, the original shareholders have realized nontrivial potential capital gains. For the City of Manchester and the University of Manchester, that amounts to approximately £5.2 million each; for Manchester Metropolitan University, £1.9 million; for Salford, £580,000; for the 6 percent commercial investors, £1.16 million; and for the 9 percent investor, £1.74 million. Each shareholder's capital gains are based on the percentage of shares owned, which mirrors the initial investment in the park. Shareholders from whom the park borrowed cash during the development years have been given preference shares. This is (potential) land value capture at its best.

Of course, the shareholders benefit from the park's presence in other ways. For instance, the Manchester City Council receives ground rents on the leaseholds, as shown in table 10.8. The city council is looking for economic development and regeneration, the universities for collaboration opportunities and quality space where they can direct their students and start-ups, and the commercial firms are looking for a positive return on a public-minded investment. As an internationally recognized center of excellence, the park presumably bestows prestige on the

Table 10.6
Manchester Science Parks Profit and Loss Information, 2009 and 2010 (thousands £)

	2010	2009
Turnover	3,168	3,059
Operating costs	–1,456	–1,403
Other operating income	961	598
Gross profit	2,673	2,254
Administrative expenses	–1,892	–1,646
Operating profits	780	608
Net interest payable	–310	–342
Income from investments	250	9
Profit before taxation	721	275
Taxation	–200	–78
Profit after taxation	520	197

Source: Based on data from Manchester Science Parks.

Table 10.7
Manchester Science Parks Balance Sheet, 2009 and 2010 (thousands £)

	2010	2009
Investment properties	20,383	19,360
Other fixed assets and investments	93	150
	20,476	19,510
Current assets	2,814	2,800
Liabilities and provisions	–2,201	–2,828
Grants received	–1,766	–1,766
	19,323	17,715
Capital and reserves	13,323	11,715
Loans	6,000	6,000
Net balance	19,323	17,715

Source: Based on data from Manchester Science Parks.

Table 10.8
Manchester Science Parks Ground Rents, Original Site (£)

	Rent Payable (%)	Previous Years	2007	2008	2009	2010	Total
Enterprise House	9	384,000	16,580	17,513	17,214	16,588	451,895
Kilburn House	9	224,000	38,354	39,564	37,296	36,740	375,954
Rutherford House	9	240,000	25,504	24,458	23,702	21,249	334,913
Skelton House	8	648,000	41,247	41,529	34,629	34,802	800,207
Synergy House	8	—	—	2,765	2,878	24,910	30,553
Williams House	9	324,000	42,859	43,127	43,904	43,341	497,231
Total		1,820,000	164,544	168,956	159,623	177,630	2,490,753

Source: Based on data from Manchester Science Parks.

commercial shareholders. These benefits account for the economic development value (EDV) discussed in the previous section.

Based on all this information, we can ask how the various stakeholders have fared relative to other possible uses of their resources.

THE CITY OF MANCHESTER

The city has benefited considerably as a shareholder, holding £5.2 million in potential capital gains (an average of almost £200,000 for each of the 27 years). It also has collected roughly £2.5 million in rents on the 62,780 square meters it leases to the park. The counterfactual question is whether the city would have ended up doing better financially had it used the land for some other purpose.

The particular geography of Manchester is pertinent here. The area adjacent to the University of Manchester now occupied by the park was not considered prime real estate in the park's early years. It was a low-income, low-density neighborhood that had a relatively high crime rate through the 1980s and 1990s. The price the vacant land would have fetched if sold fee simple in 1994 would have depended on the allowable uses. Supposing it would have been attractive for university housing and office/commercial uses, our estimate is that it would have sold for £1.1 million.[9] If that had been invested in 1994 at a 5 percent average return, the land sale receipts today would be worth approximately £2.5 million. The same parcel of vacant land would now be valued at £2.75 million, suggesting that the park itself has added around £250,000 to the value of the land. That

9. This estimate was provided by a qualified quantity surveyor who wishes to remain anonymous.

differential could be from better management of the land, improvement of the neighborhood, or the economic development benefits that are generated.[10]

THE UNIVERSITIES

The two universities have expanded considerably over the past 27 years. The University of Manchester bought its shares in the park for £70,000 (£1 per share) and Manchester Metropolitan University bought its shares for £32,500 (£1.25 per share). Their investments were, therefore, minimal. Both universities have benefited financially from the potential capital gains, £5.2 million and £1.9 million, respectively. If they were to sell their shares, they would make a considerable profit, which would be subject to a capital gains tax, because the transaction would be considered "commercial" by the government.

Manchester Metropolitan University (MMU) has developed buildings on other land in the vicinity that it had to buy. One could question whether the park land would have been a better option for MMU. However, the university purchased the land from the city on very favorable terms. The University of Manchester, after it merged with the University of Manchester Institute of Science and Technology in 2004, found itself with surplus buildings that it has begun to dispose of. It is not likely, therefore, that the university would have coveted the park land.

THE COMMERCIAL SHAREHOLDERS

None of the original commercial shareholders has realized much return on an annualized basis (£44,000 to £65,000 per year from potential capital gains). That should not be of much concern to them since they did not invest any funds up front.

Other Science Parks

The msp model seems to have more in common with other science parks in the United Kingdom than those elsewhere in the world, at least based on an initial examination of the University of Warwick Science Park (UWSP) in England and the Research Triangle Park and Stanford Research Park in the United States. In further work, we will analyze detailed data from other science parks to develop more systematic relationships between the financing/ownership model used and local government tax and expenditure patterns on one hand, and the ability of shareholders to capture increases in land value on the other.

10. The differential could also be from the assumptions used, notably the rate of return and the valuation estimates. We're focusing on the change in land value alone under the assumption that the value of any improvements would have been the same under the alternative scenario. If a denser zoning scheme had been put in place, that assumption may be incorrect.

UNITED KINGDOM

The University of Warwick Science Park (UWSP), located 100 miles south of Manchester, near Coventry in the Midlands, has 50 acres and 38,000 square meters under ownership and 130 companies on-site. Like msp, UWSP is jointly owned, by the University of Warwick (35 percent), the Coventry City Council (47 percent), the Warwickshire County Council (10 percent), and the West Midlands Enterprise Board, the regional economic development organization (8 percent). The governing board has three members (including the chairman) from the university and two members from each of the other partners. Also like msp, UWSP serves as park developer and manager, with investments (loans and land) from the shareholders. The ownership of shares in the UWSP correlates with the degree of control and flow of profits, much as it does for msp. The university's paid-in capital (value of loans and land) represents 35.5 percent of the park's total debentures. The Coventry City Council is credited with 56.8 percent of the debentures, based on the land that was given to the park fee simple. The Warwickshire County Council has 7.7 percent of the debentures. The county council essentially has turned its share of ownership over to the city council, but not its representation on the board.

The UWSP's financial model is more complicated than msp's, involving, for example, automatic leaseback arrangements and additional investors in particular projects. The park claims to be operating at a profit and reports that the rents have risen steadily, so the initial investments have been more than paid back. In further work, we will assess the nature of the returns and to what extent they represent land value capture, given the model in use.

UNITED STATES

Generally, science parks in the United States are financed very differently from the two British examples. Consider first the Research Triangle Park in North Carolina.[11] A group of public-minded citizens launched a campaign in the late 1950s to raise $1.5 million to buy the initial parcels of land for the park, totaling 4,400 acres. A not-for-profit corporation, the Research Triangle Foundation, was established as park developer and manager. The land was subdivided and sold, allowing the foundation to buy additional land and provide common infrastructure. Today the park encompasses approximately 7,000 acres.

The key to the park's success was the largesse of private citizens who were willing to make charitable contributions with no monetary payback. Duke University, the University of North Carolina, and North Carolina State University were given representation on the foundation board, but did not provide any funds. The benefits they get today are mostly indirect (e.g., access to high-tech

11. The facts about the Research Triangle Park quoted here come from Weddle, Rooks, and Valdecanas (2006).

companies, opportunities for employment and research). Some share of the capital gains generated from land sales has enabled the Research Triangle Foundation to provide funds for the Triangle Universities Center for Advanced Studies Inc. (TUCASI), which can be construed as a benefit financed by land value capture. Unlike msp, however, where the universities get a direct share of the notional capital gains, the North Carolina universities receive discretionary pass-throughs from the developer (the foundation).

The North Carolina state government and local governments get tax receipts from the commercial companies in the park—corporate and sales taxes for the state and property taxes for the city and county. Economists debate whether development pays for itself through the tax system. In this case, it does because the park itself does not require schools, which are a major public expense, and other residential-related services.

There is, arguably, some fiscal surplus to governments from the park, but that is not from land value capture. Even if the land did not increase in value, the local and state governments would receive tax payments and, in this case, some fiscal surplus. However, as suggested earlier, there may be scenarios that would have provided the governments in North Carolina with more tax revenue, if not more fiscal surplus. An analysis of alternative land uses has never been done for those prime acres and might be a topic for future research.

Any increase in land value redounds directly to the foundation, which recirculates the captured value to expand the park. In terms of the analytics in this chapter, the direct benefits of the park are in what we called economic development value (EDV) rather than real estate value (REV): the foundation expresses its success in terms of jobs in the park (37,600), companies (136), payroll, start-ups and spin-outs, and intellectual property. Those kinds of benefits do not directly increase REV. Instead, the rise in value can be attributed to (1) the overall economic development of the region via the strengthening of the universities and the job base; and (2) the quality of the park improvements by the foundation. Indeed, the land value rise captured by the foundation and plowed back into the improvements has been part of this story.

Another well-known American science park is the Stanford Research Park, established adjacent to Stanford University, in Menlo Park, California, in the early 1950s. The land for that park was essentially a "free good," since it could not be put into any alternative use (see note 7). As in North Carolina, the public sector plays only a regulatory and taxing role in this park. Initial leases were granted for 50 years at the prevailing rates (before the Silicon Valley boom). As land values rose, especially in the 1970s onward, Stanford University (which served as park developer) was essentially subsidizing the businesses in the park, which were paying lower-than-market rents. As more and more leases have come up for renewal, rents received have increased. Is this land value capture? As long as the university is constrained from selling the land, there can be no capital gains. But one could convert the rents into a notional land value that the university is capturing. To make that point clear, consider the case of a $10 million initial investment in land that grows to $20 million, representing a capital gain of $10 million. The recipient could either put that money under a mattress or invest it. If the rate of return on the investment was 5 percent, the $10 million increase in value would create a flow of $500,000 per year. If the Stanford Research Park could increase its rents by $500,000 each year, the result would be the same.

These three examples illustrate how the details of research parks' financing differ. Those differences, plus the regional economic context, affect the amount and nature of potential land value capture. In every case, land value growth comes directly from increases in REV (e.g., rising rents) and indirectly from positive economic outcomes (EDV). The question remains, however, whether the observed increase in land value is greater or less than would have been the case under an alternative land use scenario.

Conclusions

We've long known that university-related science parks and other technology projects on or near university campuses differ in many ways, including the mix of stakeholders and the expectations about outcomes. In some cases, such as the Research Triangle Park, the affiliated universities had no expectation that the park would increase land values, which would in turn generate capital gains for them. The affiliated governments also had no expectation of rising land values, but instead hoped that the park would enhance economic development and, perhaps, generate a fiscal surplus. The initial investment for the Research Triangle Park came from citizens' donations, not university or government funds. The park's success created land value gains for the developer, the Research Triangle Foundation, which reinvested them for the indirect benefit of the universities and governments.

In the case of the Stanford Research Park, land value capture was not a requirement for launching the park. The Silicon Valley boom helped make the park increasingly valuable over time, which has benefited Stanford University considerably.

Manchester Science Parks (as well as Warwick Science Park) is a more interesting story of land value capture, because there are three sets of shareholders: universities, governments, and private companies. The developer is a not-for-profit company that acts as middleman, crediting any land value increases to the shareholders. Our analysis of real estate returns for the stakeholders indicates that all have benefited more than they would have had the land been developed for an alternative use. The park management has added value by assembling the financing for buildings on mostly leasehold land. The shareholders, therefore, have all realized potential capital gains from the increased asset value. The park tenants pay rent to the park, which in turn pays the city for the leased land. The tenants also pay providers directly for gas, water, and power, so the city does not subsidize utilities either. The companies benefit from the services provided by park management.

We asked whether the City of Manchester (which owns and leases the land) would have been better off financially if it had sold the land outright in 1994 for a similarly zoned use. Our simple simulation suggests that the park has added around 10 percent to the value of the land, which could be capturing the economic development benefits. That result, plus the capital gains benefits, reduced the need for us to measure the economic development value (EDV) directly. Those benefits are "gravy" on what otherwise has been a very sound investment.

The question of land value capture is only important because it speaks to the viability of science parks as sustainable activities. Universities today are hard-pressed to develop science parks and other technology-oriented projects without public and private partners. (The Research Triangle Park and Stanford Research Park are exceptions to the rule.) Land value capture is essential to provide funds to reinvest in park growth that will produce the economic and technology development outcomes sought by universities and governments. Some private investors may be community-minded to an extent, but ultimately they will require a fair return on their investment in order to stay at the table.

Manchester Science Parks is a model for how to make land value capture work. Its success is due in large part to three key variables: (1) the British land tenure system, which distinguishes freehold from leasehold, whereby the Crown or local governments maintain ownership of land that is leased to commercial tenants; (2) the partnership of local universities, governments, and private investors; and (3) the special role the MSP staff plays as property manager and middleman.

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APPENDIX: SAMPLE INSIGHTS FROM EMPIRICAL LITERATURE ON SCIENCE PARKS

	Country of Study	Year of Analysis	Methodology	Key Outcomes
Science Parks and the Growth of High Technology Firms Monck et al. (1988)	U.K.	1986	Survey of firms in parks (183) and outside parks (101) (match sample)	New technology-based firms (NTBFs) located in science parks have a similar closure rate as firms outside parks.
High-Tech Fantasies: Science Parks in Society, Science and Space Massey, Quintas, and Wield (1992)	U.K.	1986	Empirical evaluation (reinterpretation of the study by Monck et al. [1988])	Jobs in science parks are not created, but simply relocated. Science parks are involved in small innovations rather than major innovative breakthroughs (not innovators per se).
Technology in the Garden Luger and Goldstein (1991)	U.S.	1989	Case study and survey of 72 U.S. parks	Science parks have a positive impact on regional economic development; they help generate jobs and strengthen economic diversity.
Science Parks and the Growth of New Technology-Based Firms—Academic-Industry Links, Innovation and Markets Lindelöf and Löfsten (2002)	Sweden	1999	Match sample	NTBFs in parks have more links with institutes of higher education (HEIs) than firms outside parks.
How Effective Are Technology Incubators?: Evidence from Italy Colombo and Delmastro (2002)	Italy	2000	Companies in incubators (45) versus companies outside incubators (match sample)	NTBFs in incubators show higher growth than NTBFs outside incubators. Incubators attract highly skilled entrepreneurs and have a positive impact on links with HEIs.
Assessing the Impact of University Science Parks on Research Productivity: Exploratory Firm-Level Evidence from the United Kingdom Siegel, Westhead, and Wright (2003)	U.K.	1992	Match sample	Firms in university research parks are more efficient than those outside parks in terms of creating new products or services and patents.

Evaluation of the Past and Future Economic Contributions of the UK Science Park Movement ANGLE Technology (2003)	U.K.	2003	Surveys of technology-based firms in parks (617) and outside parks (259) (match sample)	Firms in parks have higher growth rates than similar firms outside parks. Companies in parks employ 10% more full-time staff and have higher turnover than companies outside parks.
Science Park Location and New Technology-Based Firms in Sweden—Implications for Strategy and Performance Lindelöf and Löfsten (2003)	Sweden	1999	Match sample	Differences between firms in parks and firms outside parks are insignificant in terms of patents, R & D output, and new products or services. However, firms in parks have stronger innovation ability, employment growth, sales, and profitability than firms outside parks.
U.S. Science Parks: The Diffusion of an Innovation and Its Effects on the Academic Mission of Universities Link and Scott (2003)	U.S.	2001	Survey of university provosts	Science parks have a positive impact on universities' growth and profile. They enable universities to increase their number of publications and patents, facilitate the transfer of technologies, and help them easily place graduates.
Proximity as a Resource Base for Competitive Advantage: University-Industry Links for Technology Transfer Lindelöf and Löfsten (2004)	Sweden	1999	Match sample	There is a small discrepancy between firms in parks and firms outside parks in terms of R & D output. However, firms in parks that have strong relations with a university have higher growth rates than similar firms outside parks.
Science Parks and the Development of NTBFs—Location, Survival and Growth Ferguson and Olofsson (2004)	Sweden	1995 and 2002	Match sample	There is an insignificant difference in sales and employment growth between firms in parks and firms outside parks. However, firms in parks demonstrate a higher survival rate than firms outside parks.
R&D Networks and Product Innovation Patterns—Academic and Non-academic New Technology-Based Firms on Science Parks Lindelöf and Löfsten (2005)	Sweden	1999	Match sample	There is no significant difference between the profitability of NTBFs in science parks versus those outside parks.

(continued)

APPENDIX
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	Country of Study	Year of Analysis	Methodology	Key Outcomes
Science Parks in Japan and Their Value-Added Contributions to New Technology-Based Firms Fukagawa (2006)	Japan	2001–2003	Match sample	NTBFs in parks exhibit a higher propensity to engage in joint research with research institutes than firms outside parks. There is no significant difference between science parks and other types of property-based initiatives with regard to the degree of encouragement provided to tenants to establish localized HEI linkage.
A Theoretical and Empirical Analysis of the Decision to Locate on a University Research Park Leyden, Link, and Siegel (2007)	U.S.	2006	Match sample	Firms in parks demonstrate higher economic diversity, growth, and R & D output than firms outside parks.
Science Parks' Tenants Versus Out-of-Park Firms: Who Innovates More? A Duration Model Squicciarini (2008)	Finland	1970–2002	Survey of a sample of 252 firms in parks versus firms outside parks, before versus after hazard rate of patenting activity (match sample)	Firms in parks exhibit a comparatively better performance in patenting activity than firms outside parks.