Comparative Analysis of Leading Innovation Districts

FINAL REPORT – August 24, 2016

FINAL REPORT SUBMITTED TO:
Wexford Science & Technology, LLC
801 West Baltimore Street
Baltimore MD 21201

FINAL REPORT SUBMITTED BY:
Econsult Solutions, Inc.
1435 Walnut Street 4th Floor
Philadelphia PA 19102



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EXECUTIVE SUMMARY

A present concept in defining business locations of choice is that of "innovation districts." A 2014 Brookings Institute paper chronicles the current shift from auto-oriented suburban corporate campuses spatially isolated from residential and recreational uses to amenity-rich mixed-use urban locations:

> *These districts…are geographic areas where leading-edge anchor institutions and companies cluster and connect with start-ups, business incubators, and accelerators. They are also physically compact, transit-accessible, and technically-wired and offer mixed-use housing, office, and retail.*

The aim of this report is to validate University City in Philadelphia as an innovation district of choice, on par with and in many ways superior to other nationally prominent locations. This is accomplished in four steps:

1. First, by deconstructing Brookings' definition of innovation districts into 10 characteristics: (1) presence of advanced research institutions, (2) access to talent, (3) start-up culture, (4) entrepreneurial support resources, (5) collaborative mechanisms, (6) partnership with local government, (7) dense urban setting, (8) transportation infrastructure, (9) amenity-rich environment, and (10) cost factors.

2. Second, by identifying how firms that stayed in or moved to Kendall Square, Oakland, and South Lake Union, three nationally known innovation districts, were compelled by those characteristics in these locations.

3. Third, by comparing University City to these three locations in the 10 key metrics that define innovation districts, to see how it measures up in locational characteristics that matter to businesses.

4. Finally, because price matters, by comparing University City to these three locations in terms of the cost of locating there, both to firms and to the employees they seek.

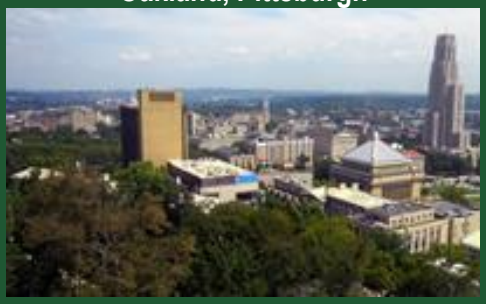
University City, Philadelphia



Kendall Square, Cambridge



Oakland, Pittsburgh



South Lake Union, Seattle



Scoring the four innovation districts in each category yields the conclusion that University City is the highest-performing site among its peers (see Table ES.1). This suggests that it can compete well head-to-head with and in some cases outpace these other locations on the fundamentals that matter the most to the companies that it and others are seeking to attract.

TABLE ES.1 – SUMMATION OF COMPARATIVE ANALYSIS OF SELECTED INNOVATION DISTRICTS

Innovation District Characteristic	University City	Kendall Square	Oakland	South Lake Union
Research Assets				
(1) Presence of advanced research institutions	10	10	9	8
(2) Access to talent	9	10	8	8
Subtotal	**9.5**	**10.0**	**8.5**	**8.0**
Innovation Culture				
(3) Start-up culture	7	10	8	9
(4) Entrepreneurial support resources	8	10	8	8
Subtotal	**7.5**	**10.0**	**8.0**	**8.5**
Collaboration				
(5) Collaborative mechanisms	9	8	8	7
(6) Partnership with local government	6	6	6	6
Subtotal	**7.5**	**7.0**	**7.0**	**6.5**
Place				
(7) Dense urban setting	9	8	6	6
(8) Transportation infrastructure	9	9	6	6
(9) Amenity-rich environment	8	6	5	6
Subtotal	**8.7**	**7.7**	**5.7**	**6.0**
(10) Cost Factors				
Commercial office rent	7	3	7	7
Local and state tax burden	3	3	3	7
Cost of labor	6	3	7	5
Cost of living	6	2	7	4
Subtotal	**5.5**	**2.8**	**6.0**	**5.8**
Total	**38.7**	**37.4**	**35.2**	**34.8**

In a sense, this report reaches a parallel conclusion to a recent article in Forbes, which referenced a survey about residential preferences conducted by millennial-run apartment search site Abodo. The survey found that although Philadelphia ranked low in respondent preferences (it was named as top choice by less than 1 percent of respondents, which placed it 17th among 20 cities), it actually outperformed all other cities in having the most qualities that respondents said mattered in a residential location. Similarly, this report finds that University City performs well compared to places like Kendall Square, Oakland, or South Lake Union on the characteristics that firms seek in a business location.

1.0 INTRODUCTION

1.1 BACKGROUND

When it comes to business location, perception matters. Yet one can argue that it has never mattered more than now, given the growing importance of place in branding a company to its employees, customers, and shareholders. Accordingly, cities and regions are investing significant attention in shaping the way they are perceived, both by improving the fundamentals that matter to those audiences and by emphasizing those strengths when marketing to those audiences.

One concept in defining business locations of choice that presently has a lot of currency is that of "innovation districts." A recent Brookings Institute paper chronicles the current shift from auto-oriented suburban corporate campuses, spatially isolated from residential and recreational uses, to amenity-rich mixed-use urban locations:

These districts…are geographic areas where leading-edge anchor institutions and companies cluster and connect with start-ups, business incubators, and accelerators. They are also physically compact, transit-accessible, and technically-wired and offer mixed-use housing, office, and retail.[1]

Archetypal examples of innovation districts include University City in Philadelphia, Kendall Square in Cambridge, Oakland in Pittsburgh, and South Lake Union in Seattle. All have seen recent success in producing, retaining, or attracting high-profile companies. This creates

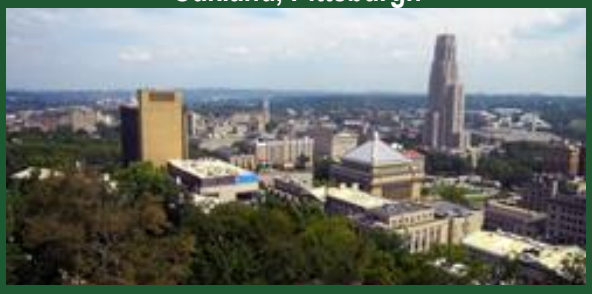
University City, Philadelphia



Kendall Square, Cambridge



Oakland, Pittsburgh



South Lake Union, Seattle



[1] "The Rise of Innovation Districts: A New Geography in Innovation in America," Brookings Institute (May 2014).

a virtuous cycle of high concentrations of high-end knowledge activity, which serves as a compelling draw for additional high-end knowledge activity to relocate and grow. For firms that have stayed in or moved to these locations, the reasons they offer confirm a shared set of preferences and a sense that these places contain these desired characteristics.

1.2 PURPOSE OF REPORT

The aim of this report is to validate University City in Philadelphia as a business location of choice, on par with, and in many ways superior to, other nationally prominent locations like Kendall Square, Oakland, or South Lake Union. This will be accomplished by first elaborating further on Brookings' definition of innovation districts (Section 2), then identifying how firms that stayed in or moved to Kendall Square, Oakland, and South Lake Union were compelled by those characteristics in these locations (Section 3).[2]

From there, University City will be compared to these three locations in key metrics that define innovation districts, to see how it measures up in locational characteristics that matter to businesses seeking such places (Section 4). Finally, because affordability matters, University City will be compared to these three locations in terms of the cost of locating there, both to firms and to the employees they seek (Section 5). The report will conclude with a summation of findings to suggest that University City is as desirable as or better than other, nationally known innovation districts (Section 6).

In a sense, this report reaches a parallel conclusion to a recent article in Forbes, which referenced a survey about residential preferences conducted by millennial-run apartment search site Abodo.[3] The survey found that although Philadelphia ranked low in respondent preferences (it was named as top choice by less than 1 percent of respondents, which placed it 17th among 20 cities), it actually outperformed all other cities in having the most qualities that respondents said mattered in a residential location (see Table 1.1). Similarly, this report finds that University City performs well compared to places like Kendall Square, Oakland, or South Lake Union on the characteristics that firms seek in a business location.

[2] These three comparison sites were chosen from among more than a dozen innovation districts researched for this report, and were selected to offer a mix of comparable location types.

[3] "Survey Says Millennials Want To Live In New York, Research Suggests They Should Live In Philadelphia," Forbes (June 13, 2016); "Living the Millennial Dream," Abodo (June 1, 2016).

TABLE 1.1 – RESIDENTIAL LOCATION PREFERENCES AMONG MILLENNIALS, ACCORDING TO SURVEY BY ABODO

Selected City	% Respondents That Named This City Their Top Choice	Rank	% Qualities Respondents Desire That This City Has	Rank
Philadelphia	**0.9%**	**17**	**95%**	**1**
New York City	19.9%	1	90%	T2
Seattle	9.2%	3	90%	T2
Boston	2.3%	10	90%	T2
San Francisco	10.3%	2	85%	T7
Pittsburgh	0.7%	19	70%	T18

Source: Abodo (2016)

1.3 INVESTING BIG IN UNIVERSITY CITY



Rendering of uCity Square

This report was commissioned by Wexford Science + Technology, a Baltimore-based real estate investment and development firm that "works collaboratively with its partner institutions to help create and develop vibrant, mixed-use, amenity-rich Knowledge Communities that are built on a foundation of research, discovery and entrepreneurial activity." In 2015, Wexford and the University City Science Center recently announced a major development in the heart of University City, uCity Square, which represents a 10-year, $1+ billion investment that will add 4 million square feet of commercial office and laboratory space as well as residential, retail, and recreational uses to the Science Center's 17-acre legacy campus.[4]



Rendering of uCity Square from above

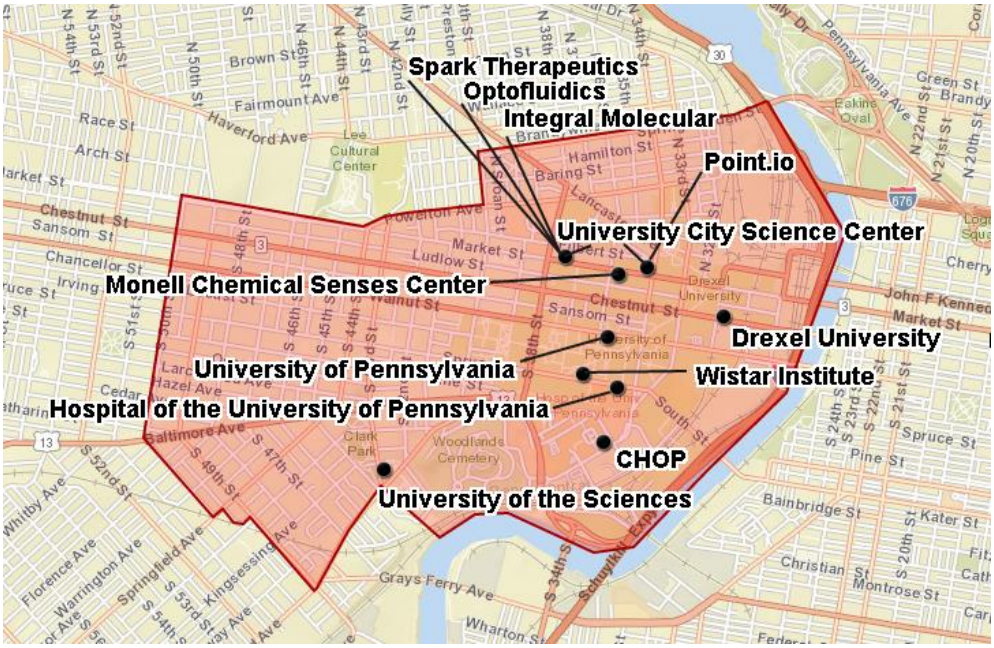
University City boasts the region's lowest commercial office vacancy levels, at 2.6 percent,[5] which is a function of both University City's attractiveness as a business destination as well as University City's relative dearth of commercial office space. uCity Square represents a response to this. Building from an already dynamic commercial environment that

[4] "Science Center Campus Gets A New Name: uCity Square," Philadelphia Inquirer (September 16, 2015).

[5] As cited from Newmark Grubb Knight Frank in "The State of University City 2016," University City District (2016).

includes the Cira Centre and the FMC Tower at Cira Centre South, it is a focused investment by Wexford and the Science Center on University City as a business location that can attract even more high-prestige technology and biomedical companies. University City's education and research institutions have already attracted several significant companies, particularly to the University City Science Center (see Figure 1.1). The confidence in University City's ability to draw increasingly prestigious tenants is borne of a sense that, like Philadelphia as a residential location per the Abodo survey, University City boasts all of the key characteristics firms seek in an innovation district. The analysis conducted for this report yields a conclusion that affirms this assessment.

FIGURE 1.1 – EDUCATIONAL AND RESEARCH INSTITUTIONS AND SELECTED COMPANIES LOCATED IN OR NEAR UNIVERSITY CITY



Source: ESRI ArcGIS Online (2016)

1.4 REPORT AUTHOR

This report was produced by Econsult Solutions, Inc. (ESI). ESI is a Philadelphia-based economic consulting firm that provides businesses and public policy makers with economic consulting services in urban economics, real estate economics, transportation, public infrastructure, development, public policy and finance, community and neighborhood development, planning, as well as expert witness services for litigation support. Its principals are nationally recognized experts in urban development, real estate, government and public policy, planning, transportation, non-profit management, business strategy and administration, as well as litigation and commercial damages. Staff members have outstanding professional and academic credentials, including active positions at the university level, wide experience at the highest levels of the public policy process and extensive consulting experience.

2.0 CHARACTERISTICS OF INNOVATION DISTRICTS

2.1 SECTION OVERVIEW

The purpose of this section is to deconstruct Brookings' definition of innovation districts so that it is understood how these places can be characterized. Specifically, the following 10 characteristics are identified and defined (see Table 2.1): (1) presence of advanced research institutions, (2) access to talent, (3) start-up culture, (4) entrepreneurial support resources, (5) collaborative mechanisms, (6) partnership with local government, (7) dense urban setting, (8) transportation infrastructure, (9) amenity-rich environment, and (10) cost factors. This will facilitate a review of how Kendall Square, Oakland, and South Lake Union have been successful in retaining and attracting high-profile tenants (Section 3) and an analysis of how University City compares to these locations in those characteristics (Sections 4 and 5).

TABLE 2.1 – CATEGORIZATION OF LOCATION CHARACTERISTICS THAT DEFINE INNOVATION DISTRICTS, ACCORDING TO BROOKINGS INSTITUTE

Research Assets	Innovation Culture	Collaboration	Place	(10) Cost Factors
(1) Presence of advanced research institutions (2) Access to talent	(3) Start-up culture (4) Entrepreneurial support resources	(5) Collaborative mechanisms (6) Partnership with local government	(7) Dense urban setting (8) Transportation infrastructure (9) Amenity-rich environment	Rent Taxes Cost of labor Cost of living

Source: Econsult Solutions, Inc. (2016)

2.2 RESEARCH ASSETS: (1) PRESENCE OF ADVANCED RESEARCH INSTITUTIONS, (2) ACCESS TO TALENT

Knowledge economy work benefits from close proximity to academic institutions, because of the research activity and concentration of intellectual talent contained within them. Brookings puts it like this: "Talent and technology appear to be the twin drivers of innovation in these districts." Indeed, advanced research institutions play a vital role in all three of the innovation district models profiled in the Brookings paper: (1) the "anchor plus" model clusters large mixed-use development around major anchor institutions and related firms, (2) "reimagined urban areas" locate advanced research institutions and anchor companies in formerly industrial urban settings,

and (3) the "urbanized science park" densifies suburban campuses anchored by advanced research institutions.

FIGURE 2.1 – ILLUSTRATIVE EXAMPLES OF INNOVATION DISTRICTS ANCHORED BY RESEARCH UNIVERSITIES

Cortex is a 200-acre innovation district in progress within St. Louis, anchored by Washington University. St. Louis excels in plant and life sciences, and Cortex attracts talent in these academic areas. The district has attracted companies like Ikea, Boeing, and the Cambridge Innovation Center, and is estimated to create 10,000 jobs.

East Baltimore is a budding center of bio-tech innovation, anchored by Johns Hopkins University and its Medical Center research facilities. The city is planning to expand the area with a Science and Technology Park, which will provide over one million square feel of office and facility space.

Mission Bay is another biotechnology hub located in San Francisco, anchored by the University of California San Francisco along with research institutes like QB3 and the Gladstone Institutes. Now, about 30 new biotech companies form in the Bay Area each year.

Source: Johns Hopkins University,[6] UC San Francisco,[7] Washington University in St. Louis (2016)[8]

[6] "Innovation Districts," The City of Baltimore.

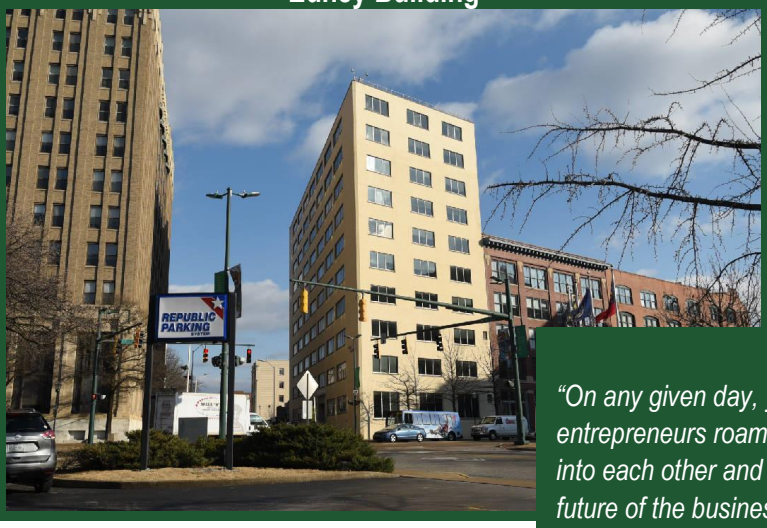
[7] "Greater Mission Bay Area - San Francisco," California Governor's Office of Business and Economic Development.

[8] "10,000 Jobs Being Created in St. Louis Innovation District: Brookings Data Now", Brookings (June 12, 2014).

2.3 INNOVATION CULTURE: (3) START-UP CULTURE, (4) ENTREPRENEURIAL SUPPORT RESOURCES

Innovation benefits from high concentrations of start-up activity, especially when it consists of diverse sectors in one place. These conditions enable chance encounters, facilitate collaboration, and create a vibrant culture that draws in additional activity. Innovation districts are therefore increasingly characterized by the presence of co-working spaces, technology accelerators, and other entrepreneurship technical assistance providers, as well as dedicated space for new ventures. For example, Brookings notes that Boston's innovation district earmarks 15 percent of new development space for entrepreneurs and start-up ventures.

Edney Building



"On any given day, you can see designers, coders and young entrepreneurs roaming in and out of the ground floor, bumping into each other and experiencing what many believe to be the future of the business and start-up culture in Chattanooga: 'intentional creative collisions.'" – recent description of Edney Building in the heart of Chattanooga's 140-acre innovation district

2.4 COLLABORATION: (5) COLLABORATIVE MECHANISMS, (6) PARTNERSHIP WITH LOCAL GOVERNMENT

Co-location of research institutions, corporate presence, and innovation activity means very little if there is not actual circulation of people, ideas, and efforts. Therefore, successful innovation districts do more than just draw in knowledge activity; they are also characterized by a wide range of vehicles to facilitate collaboration. This includes multi-institution initiatives, mechanisms by which institutions do research work in concert with the private sector, and venues where larger companies distribute some of their research efforts outside their walls to partnering smaller companies. These collaborations are often facilitated by dedicated co-location space, which is

often aided by the participation of local governments seeking to encourage more shared innovation activity within their jurisdictions.

> *"In today's economic landscape, no one company can master all the knowledge it needs, so companies rely on a network of industry collaborators. This, in turn, has led to a shift in where companies and support organizations locate. A recent article, for example, on the growth of Pfizer, Novartis, and other major pharmaceutical companies in Cambridge noted the following:*
>
> > *'Pharmaceutical companies traditionally preferred suburban enclaves where they could protect their intellectual property in more secluded settings and meet their employees' needs. But in recent years, as the costs of drug development have soared and R&D pipelines slowed, pharmaceutical companies have looked elsewhere for innovation. Much of that novelty is now coming from biotechnology firms and major research universities like MIT and Harvard, just two subway stops away.'"*
>
> – from Brookings' "Innovation Districts" paper

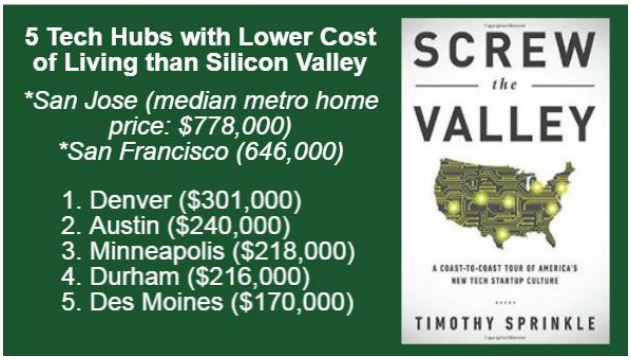
2.5 PLACE: (7) URBAN SETTING, (8) TRANSPORTATION INFRASTRUCTURE, (9) AMENITY-RICH ENVIRONMENT

Importantly, innovation districts represent a fundamental shift of innovation activity from stand-alone, auto-oriented suburban office parks to dense, mixed-use urban settings. Indeed, even the few suburban examples of modern innovation districts have become more urbanized through denser clustering of multiple uses and through investment in supportive transportation infrastructure (e.g. light rail, bike share, pedestrian walkways). This shift acknowledges both the power of closely co-locating lots of different kinds of activities and the preferences of many knowledge workers for work spaces that are more open and less auto-dependent. Notably, both of these drivers advantage compact and amenity-rich urban settings within which people can easily circulate, as compared to sprawling single-use settings where something as simple as eating a meal involves either being cloistered in the office cafeteria or driving many miles to a separate location.

> *"In recent years, a rising number of innovative firms and talented workers are choosing to congregate and co-locate in compact, amenity-rich enclaves in the cores of central cities. Rather than building on green-field sites, marquee companies in knowledge-intensive sectors are locating key facilities close to other firms, research labs, and universities so that they can share ideas and practice 'open innovation.'"*
>
> – from Brookings' "Innovation Districts" paper

2.6 (10) COST FACTORS

Affordability matters for innovation districts for two reasons. One is that innovation districts must attract a critical mass of start-up activity and young talent, so low rents are needed to encourage more and earlier forays into entrepreneurship as well as to make nearby housing options reasonably affordable to newcomers. The other is that innovation districts are seen as a potential solution to the nation's growing inequality, with their ability to create jobs that are functionally and geographically accessible to nearby residents and inject sufficient housing supply into an area so as to mitigate any displacement from upward pricing pressure. Hence, affordable rents and house prices are important factors for innovation districts, as are other determinants of living costs, most notably commute times and other determinants of startup costs, like rent, taxes, and salary levels.



Source: US News and World Report[9]

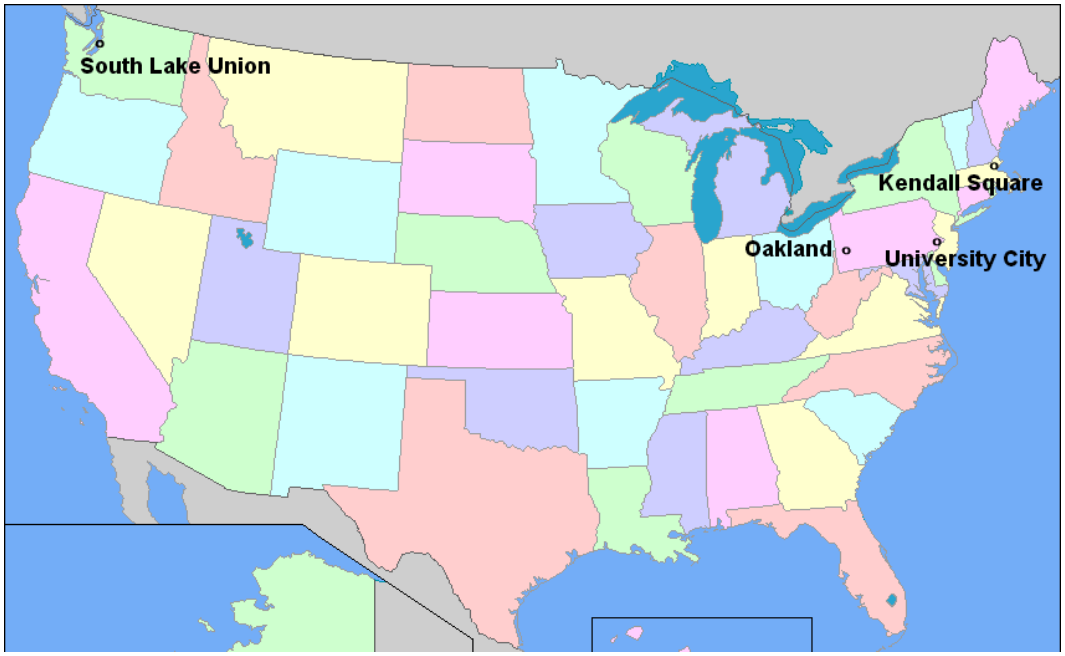
[9] "Forget Silicon Valley: 5 Tech Hubs With a Lower Cost of Living," US News and World Report (March 2, 2016)

3.0 INNOVATION DISTRICTS

3.1 SECTION OVERVIEW

The previous section identified 10 characteristics of innovation districts that make them locations of choice for a variety of companies. The purpose of this section is to take a closer look at three innovation districts – Kendall Square in Cambridge, Oakland in Pittsburgh, and South Lake Union in Seattle (see Figure 3.1) – to see how those characteristics played a part in convincing high-profile firms to choose these locations.

FIGURE 3.1 – LOCATION OF UNIVERSITY CITY AND THREE COMPARISON INNOVATION DISTRICTS



Source: Owl & Mouse (2016)

3.2 KENDALL SQUARE

Kendall Square is a largely commercial neighborhood tucked in the southern part of East Cambridge, stretching from Portland Street to the Charles River and flanked in the north and south by Main Street and Binney Street. Massachusetts Institute of Technology (MIT) is immediately to its south, and Harvard University lies 1.5 miles away to the northwest. The Broad Institute, the Schlumberger-Doll Research Center, the Whitehead Institute, and the Novartis Institutes are also all located in or near Kendall Square (see Figure 3.2).

FIGURE 3.2 – EDUCATIONAL AND RESEARCH INSTITUTIONS IN OR NEAR KENDALL SQUARE IN CAMBRIDGE

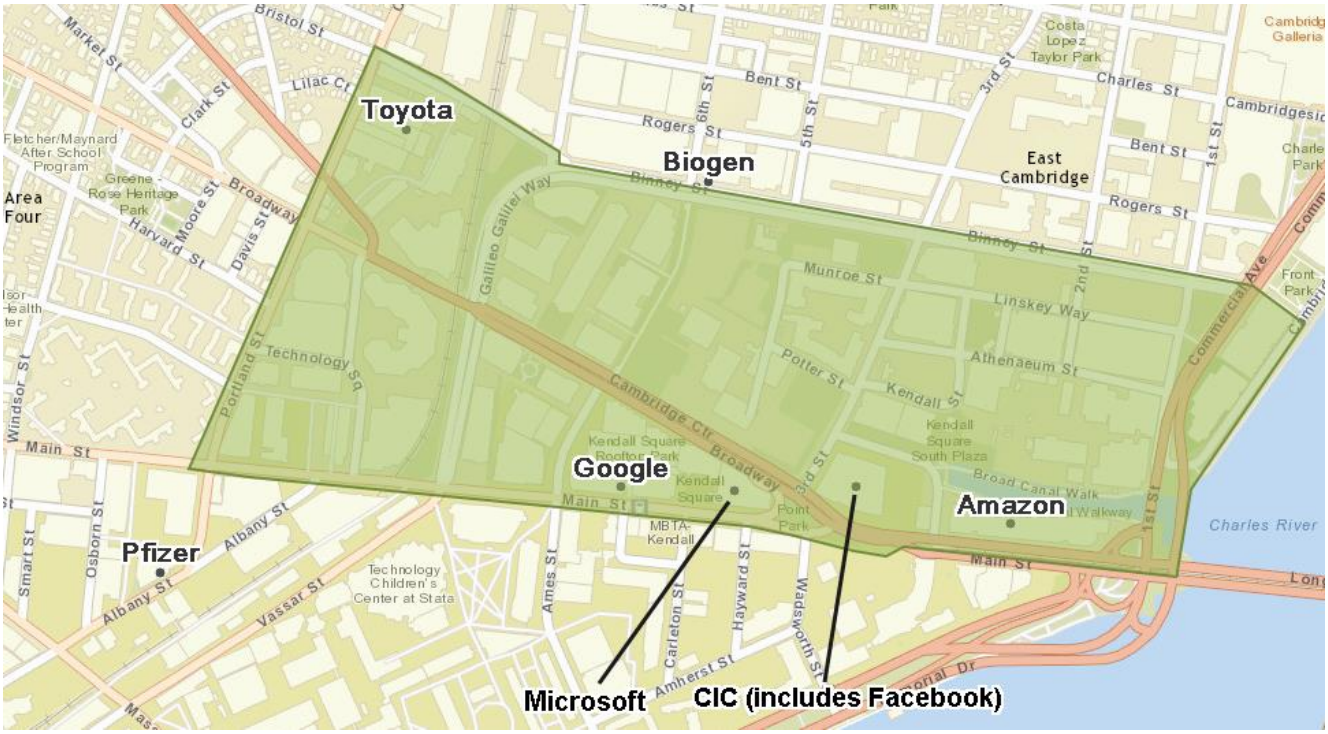


Source: ESRI ArcGIS Online (2016)

The Cambridge Innovation Center, a co-working facility in Kendall Square that hosts more than 800 companies, is an important asset to Kendall Square, serving as a gateway into Kendall Square for many technology, bioscience, and pharmaceutical firms who first rent office space there and then use that as a platform to expand into larger space nearby. MIT's close proximity is another considerable asset for Kendall Square, both because it becomes a natural growth location for MIT-affiliated researchers and because it can sell easy access to the institution to prospective tenants.

Kendall Square boasts numerous high-profile tenants, including Amazon, Biogen, Facebook, Google, Microsoft, Pfizer, and Toyota (see Figure 3.3). Their decision to have a presence in Kendall Square confirms many of the characteristics Brookings uses to describe innovation districts, with a particular focus on ready access to advanced research institutions and high-end technical talent (see Table 3.1 and Figure 3.4).

FIGURE 3.3 – SELECTED HIGH-PROFILE COMPANIES LOCATED IN OR NEAR KENDALL SQUARE



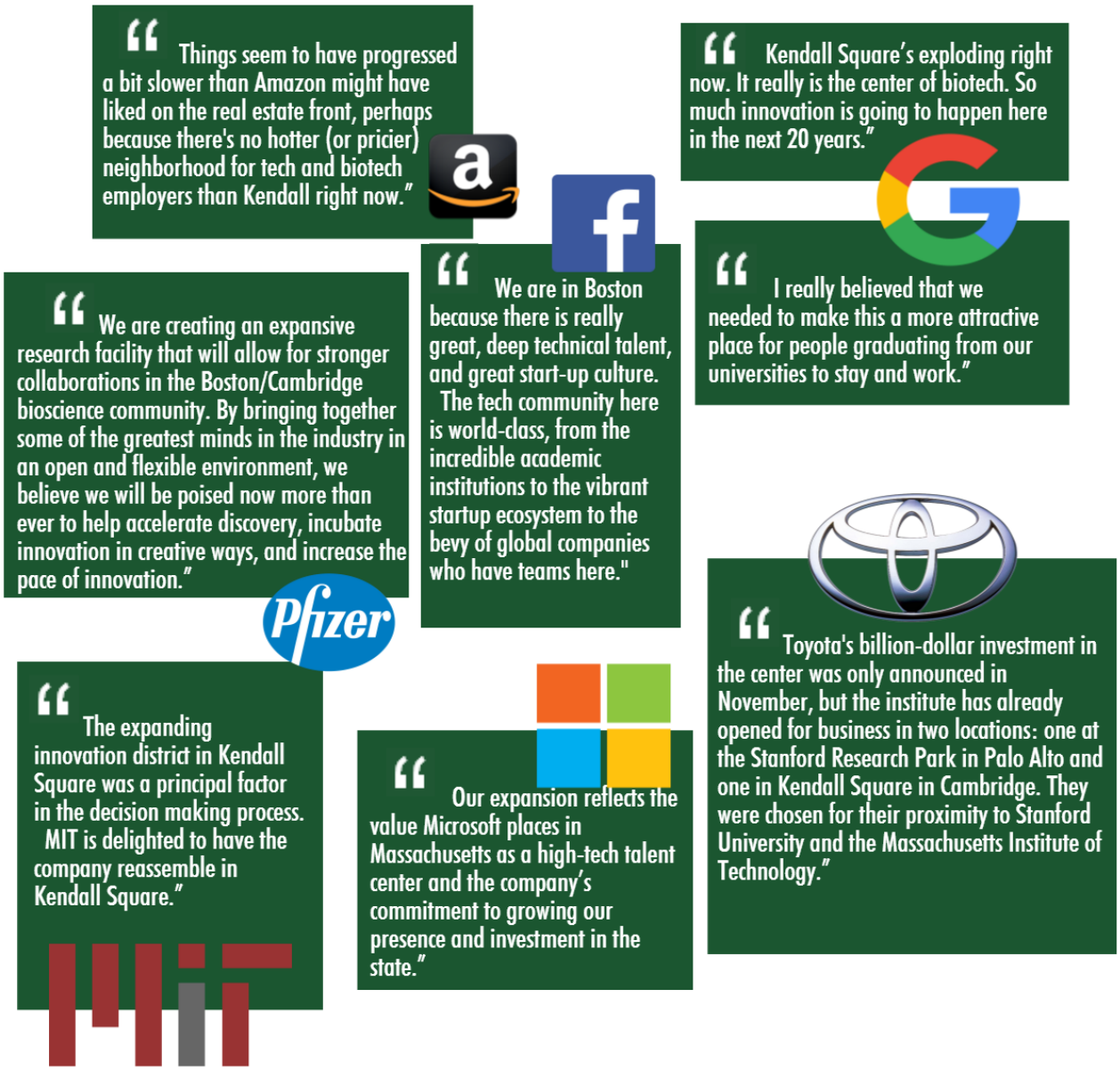
Source: ESRI ArcGIS Online (2016)

TABLE 3.1 – LOCATION CHARACTERISTICS EXPLICITLY MENTIONED BY HIGH-PROFILE TENANTS AS REASONS FOR CHOOSING KENDALL SQUARE AREA (SEE FIGURE 3.4)

Innovation District Characteristic	Amazon	Biogen	Facebook	Google	Microsoft	Pfizer	Toyota
(1) Presence of advanced research institutions		√	√	√		√	√
(2) Access to talent	√		√	√	√	√	
(3) Start-up culture			√			√	
(4) Entrepreneurial support resources							
(5) Collaborative mechanisms			√	√		√	
(6) Partnership with local government							
(7) Dense urban setting							
(8) Transportation infrastructure							
(9) Amenity-rich environment							
(10) Cost factors							

Source: Econsult Solutions, Inc. (2016)

FIGURE 3.4 – MEDIA COVERAGE OF HIGH-PROFILE RELOCATIONS INTO KENDALL SQUARE AREA



Sources (clockwise from top left): *Boston Globe,*[10] *Ryan Mack of Facebook Boston,*[11] *Steve Vintner of Google Cambridge,*[12, 13] *PC World,*[14] *Microsoft New England Blog,*[15] *Kirk D. Kolenbrander of MIT,*[16] *Michael Ehlers MD/PhD of Pfizer Cambridge*[17]

[10] "Amazon Has Landed (Almost) in Kendall Square," Boston Globe (March 7, 2012).

[11] "Facebook Is Opening an Engineering Office in Kendall Square," Boston Magazine (November 7, 2013).

[12] "Google Opens Cambridge Office," High Profile (August 21, 2014).

[13] "Google Shows Off New Cambridge Campus," Boston Globe (August 5, 2014).

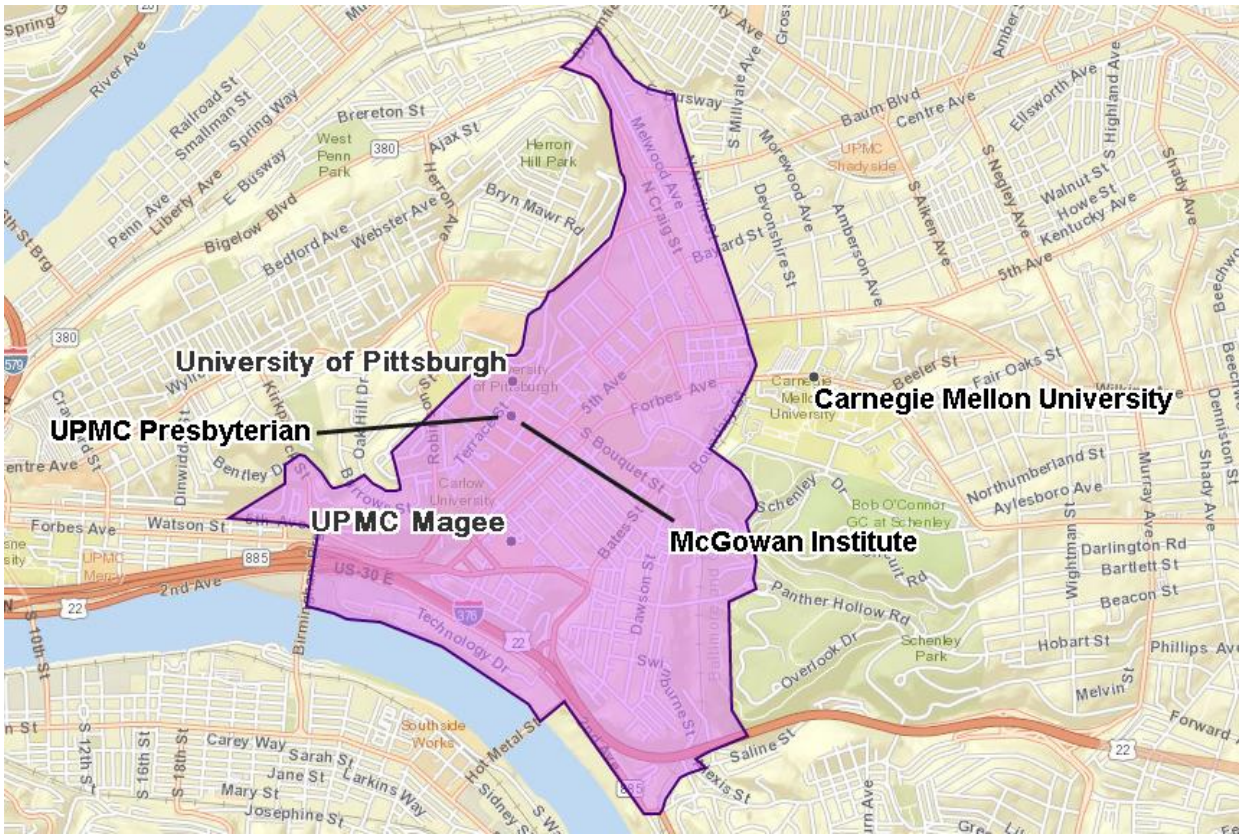
[14] "Google Loses Robotics Chief to Toyota's $1B Research Lab," PC World (January 5, 2016).

[15] "NERD is Expanding in Kendall Square," Microsoft New England Blog (May 25, 2010).

3.3 OAKLAND

Oakland is located east of downtown Pittsburgh. North Oakland is home to most of the University of Pittsburgh campus as well as some residential buildings. Central Oakland contains off-campus residential locations for Carnegie Mellon University (CMU) and University of Pittsburgh students, as well as some small businesses, retail stores, and restaurants. South Oakland and West Oakland include much of the campus of the University of Pittsburgh Medical Center as well as some non-student residential locations (see Figure 3.5).

FIGURE 3.5 – EDUCATIONAL AND RESEARCH INSTITUTIONS IN OR NEAR OAKLAND IN PITTSBURGH



Source: ESRI ArcGIS Online (2016)

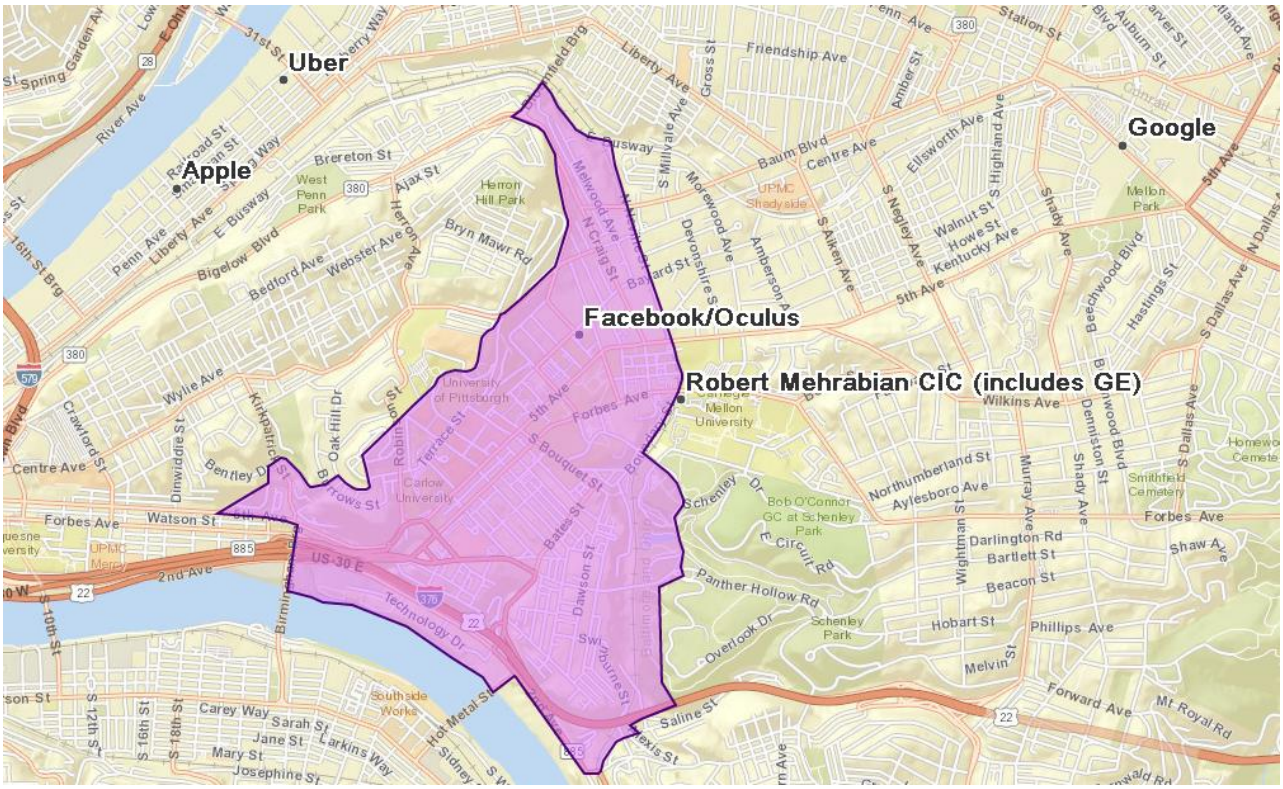
[16] "Kendall Biogen Back," The Tech (March 20, 2012).

[17] "Pfizer Announces Expansion of Lease Agreement with Massachusetts Institute of Technology Subsidiary for Kendall Square Research Facility," Pfizer (July 22, 2015).

The Robert Mehrabian Collaborative Innovation Center on the CMU campus plays a similar role in Oakland as Cambridge Innovation Center in Kendall Square, in that it represents a Pittsburgh toehold for many companies that sometimes leads to a larger and more permanent space. One of its original tenants, Google, came to CMU to tap into its deep computer science strengths, and then subsequently moved out in 2010 to 40,000 square feet in the East Liberty neighborhood in order to stay in Pittsburgh and remain close to CMU.

The Oakland area has achieved national notoriety in landing several high-profile tenants, including Apple, Facebook/Oculus, GE, Google, and Uber (see Figure 3.6). Much of this clustering of corporate activity is attributable to CMU's strengths in engineering and particularly robotics (see Table 3.2 and Figure 3.7).

FIGURE 3.6 – SELECTED HIGH-PROFILE COMPANIES LOCATED IN OR NEAR OAKLAND



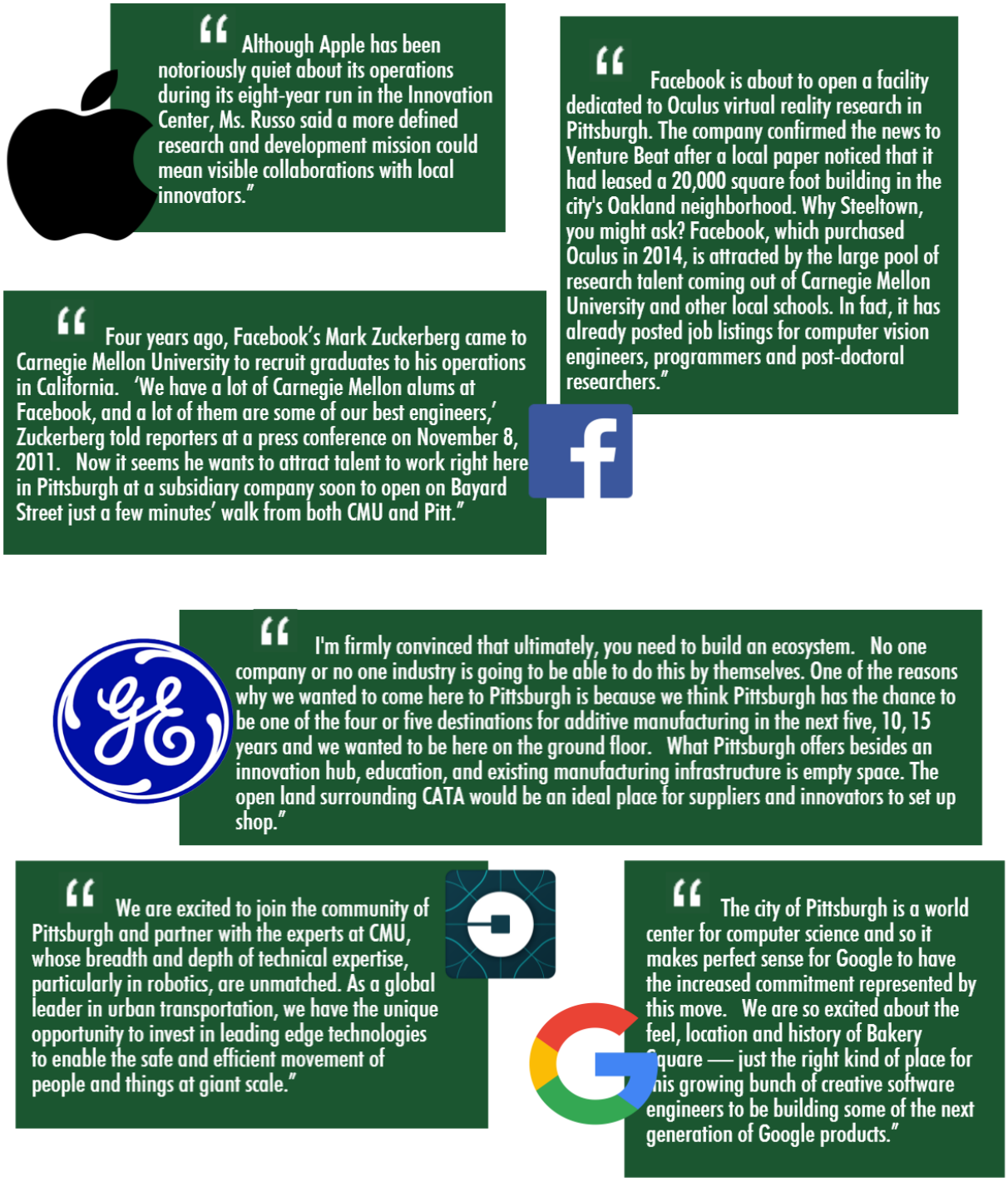
Source: Esri ArcGIS Online (2016).

TABLE 3.2 – LOCATION CHARACTERISTICS EXPLICITLY MENTIONED BY HIGH-PROFILE TENANTS AS REASONS FOR CHOOSING OAKLAND AREA (SEE FIGURE 3.7)

Innovation District Characteristic	Apple	Facebook / Oculus	GE	Google	Uber
(1) Presence of advanced research institutions		√	√	√	√
(2) Access to talent	√	√		√	√
(3) Start-up culture					
(4) Entrepreneurial support resources					
(5) Collaborative mechanisms	√		√		
(6) Partnership with local government					
(7) Dense urban setting					
(8) Transportation infrastructure					
(9) Amenity-rich environment					
(10) Cost factors			√		

Source: Econsult Solutions, Inc. (2016)

FIGURE 3.7 – MEDIA COVERAGE OF HIGH-PROFILE RELOCATIONS INTO OAKLAND AREA



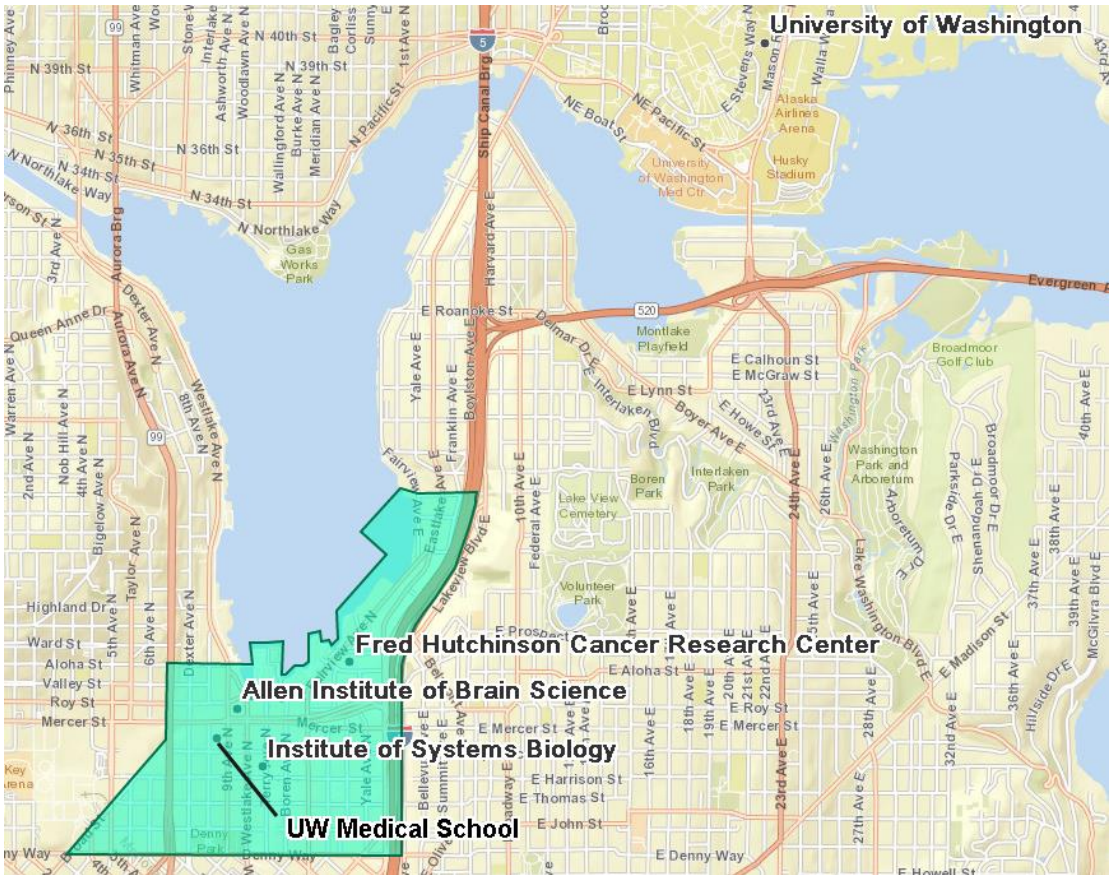
Sources (clockwise from top left): Pittsburgh Post-Gazette,[18] CBS Pittsburgh,[19] Engadget,[20] Jeffrey Immelt of GE,[21] Andrew Moore of Google,[22] Jeff Holden of Uber[23]

[18] "Apple Seeks to Expand Its Presence in Pittsburgh," Pittsburgh Post-Gazette (September 9, 2014).

3.4 SOUTH LAKE UNION IN SEATTLE

South Lake Union is north of downtown Seattle and south of Lake Union. The University of Washington's main campus is 2.5 miles to the northeast, but its medical school moved into South Lake Union in 2000 and its biomedical and microbiology labs are located in the Brotman Building and the Rosen Building. This cluster of research activity has spurred the arrival of other bioscience organizations such as the Fred Hutchinson Cancer Research Center, the Allen Institute of Brain Science, and the Institute of Systems Biology (see Figure 3.8).

FIGURE 3.8 – EDUCATIONAL AND RESEARCH INSTITUTIONS IN OR NEAR SOUTH LAKE UNION IN SEATTLE



Source: ESRI ArcGIS Online (2016)

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[19] "Facebook-Owned Company Opening Research Office in Pittsburgh," CBS Pittsburgh (January 18, 2016).

[20] "Facebook is Opening an Oculus Research Office in Pittsburgh," Engadget (January 20, 2016).

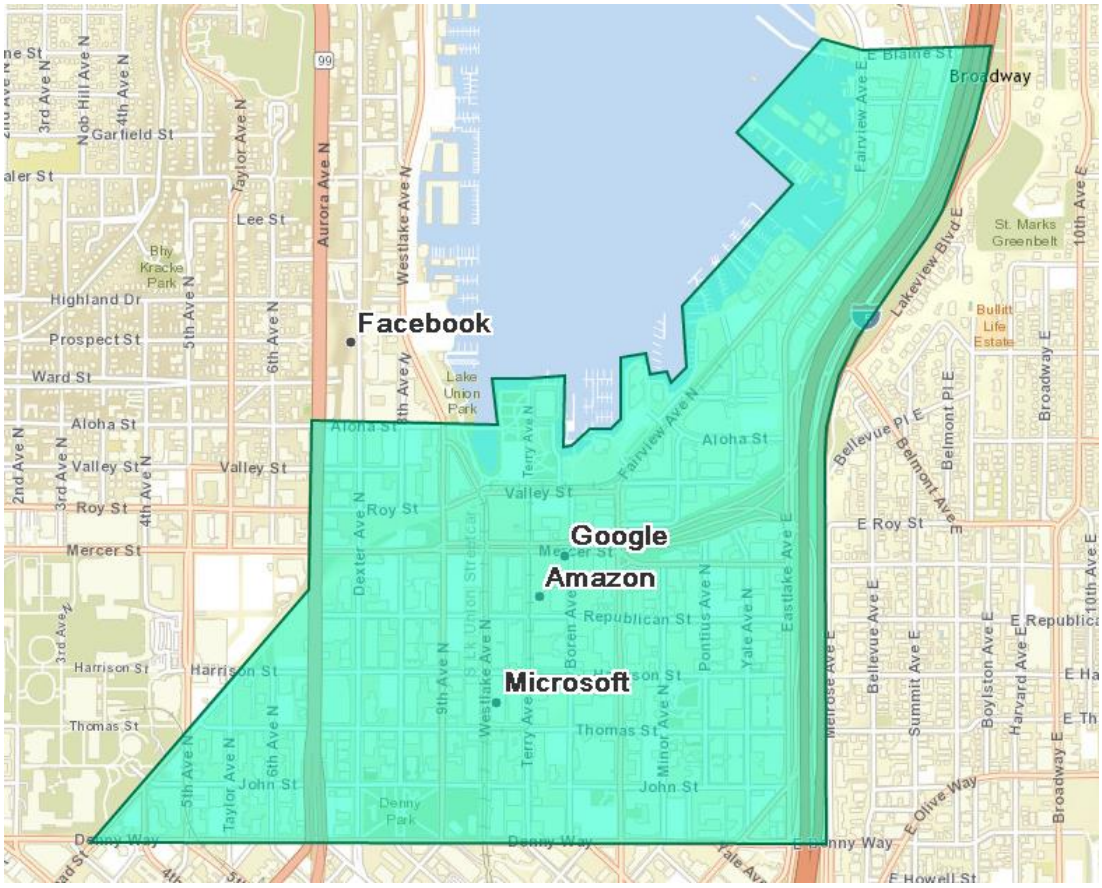
[21] "GE Unveils Advanced Manufacturing Center in Pittsburgh," Pittsburgh Business Journal (April 7, 2016).

[22] "Google Grows Out of CIC Space," Building Pittsburgh (December 30, 2009).

[23] "Uber and CMU Announce Strategic Partnership and Advanced Technologies Center," Uber (February 2, 2015).

The main driver of South Lake Union's success as a business location has been Amazon's relocation of its headquarters in 2007. The district also boasts Facebook, Google, and Microsoft and has become known as a center for software and technology innovation (see Figure 3.9). Importantly, South Lake Union's urban location and related amenities are cited as a reason to choose it over suburban office park locations common in the Pacific Northwest (see Table 3.3 and Figure 3.10).

FIGURE 3.9 – SELECTED HIGH-PROFILE COMPANIES LOCATED IN OR NEAR SOUTH LAKE UNION



Source: Esri ArcGIS Online (2016).

TABLE 3.3 – LOCATION CHARACTERISTICS EXPLICITLY MENTIONED BY HIGH-PROFILE TENANTS AS REASONS FOR CHOOSING SOUTH LAKE UNION AREA (SEE FIGURE 3.10)

Innovation District Characteristic	Amazon	Facebook	Google	Microsoft
(1) Presence of advanced research institutions				
(2) Access to talent	√	√		√
(3) Start-up culture				
(4) Entrepreneurial support resources				
(5) Collaborative mechanisms			√	
(6) Partnership with local government				
(7) Dense urban setting	√			
(8) Transportation infrastructure	√			
(9) Amenity-rich environment	√			
(10) Cost factors				√

Source: Econsult Solutions, Inc. (2016)

FIGURE 3.10 – MEDIA COVERAGE OF HIGH-PROFILE RELOCATIONS INTO SOUTH LAKE UNION AREA



Sources (clockwise from top left): Paul Carduner of Facebook Seattle,[24] Jeff Bezos of Amazon,[25] Amazon,[26] Patty Smith of Amazon,[27] Seattle Post-Intelligencer,[28] Clyde McQueen of Google Seattle[29]

[24] "Facebook Inks Lease for Seattle Office with Room for 2,000 Staffers," Geekwire (February 14, 2015).

[25] "Why Bezos Loves Amazon's 'Unique' South Lake Union Campus," Seattle Business Journal (June 15, 2015).

[26] "Our Urban Campus," Amazon.

[27] "Amazon to Make Giant Move to South Lake Union," Seattle Times (December 22, 2007).

[28] "Microsoft Expands Seattle Footprint," Seattle Post-Intelligencer (September 6, 2007).

[29] "Google to Move to New 4-Building Complex in Amazon's Backyard in Seattle," Geekwire (March 24, 2016).

4.0 COMPARATIVE ANALYSIS OF UNIVERSITY CITY VS. OTHER LEADING INNOVATION DISTRICTS

4.1 SECTION OVERVIEW

Having established what is characteristic of innovation districts (Section 2) and seen how those characteristics influence high-profile firms to choose specific innovation districts (Section 3), the purpose of this section is to see how University City compares to these innovation districts in those characteristics. Various metrics that serve as proxies for these characteristics are marshaled in an attempt to provide a quantitative and objective assessment of each business location, from which a score from 1 (poor) to 10 (excellent) can be assigned. This comparative analysis indicates that University City measures up well to other nationally known innovation districts that have been successful in attracting prominent tenants.

4.2 DEMOGRAPHIC CONTEXT

Prior to delving into the 10 characteristics Brookings elevated in its “Innovation Districts” paper, it is important to provide some overall demographic context to this comparative analysis (see Table 4.1). Note that by land area, University City is a much larger district than Kendall Square, Oakland, and South Lake Union, and on a related note contains many more residential areas. Forthcoming metrics will attempt, where appropriate and possible, to normalize across business locations in order to provide a fairer comparison.

TABLE 4.1 – POPULATION AND WORKFORCE DENSITY IN SELECTED INNOVATION DISTRICTS

	University City	Kendall Square	Cambridge[30]	Oakland	South Lake Union
Land Area (sq. mi.)[31]	2.420[32]	0.217[33]	6.26[34]	1.675[35]	0.657[36]
Jobs[37]	67,351	18,902	108,372	60,507	19,957
Job Density (jobs per sq. mi.)	29,831	87,509	17,312	36,124	30,376
2016 Population[38]	51,011	1,677	111,011	23,148	5,873
Population Density (population per sq. mi.)	21,079	7,728	17,733	13,819	8,939
Median Household Income[39]	$28,407	$76,383	$74,242	$22,001	$50,737

Source: See detailed footnotes

4.3 RESEARCH ASSETS: (1) PRESENCE OF ADVANCED RESEARCH INSTITUTIONS, (2) ACCESS TO TALENT

The existence of a critical mass of research activity and the intellectual talent to drive it forward is paramount to the success of an innovation district. The metrics in this sub-section speak to each business location's quality and quantity of research institutions, and its access to high-end talent.

All four business locations boast high concentrations of elite research institutions (see Table 4.2) that draw in considerable public and private research funding (see Table 4.3 and Table 4.4). South Lake Union is penalized slightly relative to the other three business locations because while the others have two top-tier research universities within close proximity of them, South Lake

[30] Cambridge is included in this and other tables because it is in a sense a better comparable to University City; Kendall Square is a much smaller, more commercially oriented area. Note that job density is higher in Kendall Square than in University City but lower in Cambridge as a whole, and that University City's population density exceeds that of Cambridge and Kendall Square.

[31] Note that district boundaries, as defined here per the sources below, differ slightly from Brookings' geographic definition of these innovation districts.

[32] University City District (2007).

[33] Cambridge Community Development Department (2012).

[34] "Just the Facts," City of Cambridge (2016).

[35] "Interactive Map," Pittsburgh Department of City Planning (2016).

[36] "Seattle City Clerk's Geographic Indexing Atlas," City of Seattle (2016).

[37] "On the Map," US Census Bureau (2014). Note: Data is of all workers in 2014 with primary jobs within the corresponding district.

[38] "Housing Profile Report," ESRI (2016).

[39] "Income Profile Report," ESRI (2016).

Union only has one, the University of Washington, and most of its campus footprint lies 2.5 miles away.

Additionally, all four business locations benefit from close proximity to a considerable density of students (see Table 4.5 and Table 4.6) and employees (see Table 4.7) in the STEM (science, technology, engineering, and mathematics) fields. University City boasts the most students of the four locations (almost 50,000 enrolled students, almost 7,000 STEM degrees conferred each year[40]) and institutions such as the University of Sciences with a high percentage of STEM degrees (95% STEM degrees for 2014-15)[41], but Kendall Square has many more technical workers (over 10,000 in the professional, scientific, and technical fields).

Each of the four innovation districts is both helped and epitomized in part by its large international population, with the attendant proliferation of languages, cultures, perspectives, and connections associated with that (see Table 4.8 and Table 4.9). University City's numbers are larger than the other three locations by dint of it having a larger residential population.

TABLE 4.2 – MAJOR RESEARCH INSTITUTIONS LOCATED IN OR NEAR SELECTED INNOVATION DISTRICTS

University City (7)	Kendall Square (6)	Oakland (3)	South Lake Union (4)
University of Pennsylvania	Massachusetts Institute of Technology	Carnegie Mellon University	University of Washington
Drexel University	Harvard University	University of Pittsburgh	Allen Institute of Brain Science
University of the Sciences in Philadelphia	Broad Institute (Harvard/MIT)	University of Pittsburgh Medical Center	Fred Hutchinson Cancer Research Center
Children's Hospital of Philadelphia	Novartis Institutes for Biomedical Research	McGowan Institute for Regenerative Medicine	Institute of Systems Biology
Hospital of the University of Pennsylvania	Schlumberger-Doll Research Center		
Monell Chemical Senses Center	Whitehead Institute for Biomedical Research		
University City Science Center			
Wistar Institute			

Source: U.S. Census Bureau, OnTheMap Application (2014)

[40] Taken from institutional research departments for academic institutions in or near selected innovation districts.

[41] "Number of Degrees and Certificates Awarded, by Level and Program: July 1, 2014 – June 30, 2015," NCES (2015).

TABLE 4.3 – 2014 RESEARCH AND DEVELOPMENT FUNDING TO TOP-TIER RESEARCH UNIVERSITIES LOCATED IN OR NEAR SELECTED INNOVATION DISTRICTS (IN $MILLIONS)[42]

Location	Institution	Federal	State/Local	Business	Non-Profit	Institution	Other[43]	Total
University City	University of Pennsylvania	$620	$16	$76	$59	$55	$1	$828
	Drexel University	$78	$5	$5	$9	$36	$0	$131
	Total	**$698**	**$21**	**$81**	**$67**	**$91**	**$1**	**$960**
Kendall Square	MIT	$484	$0	$136	$108	$82	$98	$908
	Harvard University	$573	$4	$47	$105	$189	$17	$934
	Total	**$1,057**	**$4**	**$183**	**$213**	**$271**	**$114**	**$1,842**
Oakland	Carnegie Mellon University	$198	$2	$24	$7	$11	$9	$251
	University of Pittsburgh	$582	$8	$15	$42	$133	$76	$855
	Total	**$780**	**$10**	**$39**	**$49**	**$144**	**$85**	**$1,107**
South Lake Union	University of Washington	**$913**	**$18**	**$50**	**$105**	**$75**	**$22**	**$1,183**

Source: National Science Foundation (2016)

[42] Although the data source is the National Science Foundation, data includes all federal funding sources.

[43] Includes funds from foreign governments, foreign or US universities, and gifts designated by individual donors for research.

TABLE 4.4 – 2015 NIH FUNDING TO RESEARCH INSTITUTIONS LOCATED IN OR NEAR SELECTED INNOVATION DISTRICTS (IN $MILLIONS)

Innovation District	Research Institution	Funding
University City	University of Pennsylvania	$453
	CHOP	$114
	Drexel University	$27
	Wistar Institute	$24
	Monell Chemical Senses Center	$5
	University of the Sciences in Philadelphia	$1
	Total	**$624**
Kendall Square	Harvard University	$55
	MIT	$100
	Broad Institute	$138
	Whitehead Institute	$19
	Total	**$312**
Oakland	Carnegie Mellon University	$15
	University of Pittsburgh	$430
	Total	**$445**
South Lake Union	University of Washington	$434
	Allen Institute of Brain Science	$6
	Fred Hutchinson Cancer Research Center	$233
	Institute for Systems Biology	$5
	Total	**$678**

Source: National Institutes of Health (2016)

TABLE 4.5 – 2016 STUDENT ENROLLMENT AT RESEARCH UNIVERSITIES LOCATED IN OR NEAR SELECTED INNOVATION DISTRICTS

Location	University	Undergrad	Grad	Total
University City	Drexel University	16,464	9,131	25,595
	University Of Pennsylvania	10,406	11,157	21,563
	University of the Sciences in Philadelphia	2,246	418	2,664
	Total	**29,116**	**20,706**	**49,822**
Kendall Square	Harvard	6,700	14,500	21,200
	MIT	4,527	6,804	11,331
	Total	**11,227**	**21,304**	**32,531**
Oakland	Carnegie Mellon University	6,454	7,194	13,648
	University of Pittsburgh	17,694	10,923	28,617
	Total	**24,148**	**18,117**	**42,265**
South Lake Union	University of Washington	**31,099**	**14,114**	**45,213**

Source: university websites (2016)

TABLE 4.6 – 2014 STEM DEGREES CONFERRED BY RESEARCH UNIVERSITIES IN OR NEAR SELECTED INNOVATION DISTRICTS[44]

Location	University	Undergrad	Grad	Total
University City	Drexel University	1,608	1,358	2,966
	University Of Pennsylvania	1,589	1,678	3,267
	University Of the Sciences in Philadelphia	367	380	747
	Total	**3,564**	**3,416**	**6,980**
Kendall Square	Harvard	706	992	1,698
	MIT	1,023	1,251	2,274
	Total	**1,729**	**2,243**	**3,972**
Oakland	Carnegie Mellon University	765	1,625	2,390
	University of Pittsburgh	3,210	736	3,946
	Total	**3,975**	**2,361**	**6,336**
South Lake Union	University of Washington	**3,130**	**1,432**	**4,562**

Source: university websites (2016)

TABLE 4.7 – 2014 CONCENTRATION OF EMPLOYMENT IN SELECTED INDUSTRIES IN SELECTED INNOVATION DISTRICTS

Industry	University City	Kendall Square	Oakland	South Lake Union
Professional, Scientific, and Technical Services	2,830	10,543	1,129	5,480
Educational Services	26,923	83	19,076	195
Health Care and Social Assistance	25,482	231	24,661	3,277
Total	**55,235**	**10,857**	**44,866**	**8,952**

Source: U.S. Census Bureau (2016)

[44]STEM degrees are defined as engineering, physical sciences, geosciences, life sciences, math and computer sciences, psychology, social sciences, science and engineering technologies, and interdisciplinary or other sciences.

TABLE 4.8 – 2014 FOREIGN NATIONALS LIVING IN SELECTED INNOVATION DISTRICTS [45]

Category	University City	Kendall Square	Oakland	South Lake Union
5 most common countries of origin	China (2,238) India (871) Korea (568) Germany (383) Bangladesh (374)	Portugal (390) Haiti (264) China (251) Korea (246) Japan (205)	China (872) India (234) Mexico (125) Korea (115) Germany (110)	India (1,145) Canada (585) China (450) Mexico (356) Taiwan (303)
Total number of foreign nationals	9,220	3,792	2,702	6,430

Source: American FactFinder (2016)

TABLE 4.9 – MOST COMMON LANGUAGES SPOKEN AT HOME IN SELECTED INNOVATION DISTRICTS [46]

University City	Kendall Square	Oakland	South Lake Union
Chinese (2,377)	Spanish (803)	Chinese (1,255)	Chinese (129)
Spanish (1,714)	Chinese (708)	Spanish (624)	Spanish (124)
Korean (696)	Other Indic languages (240)	Korean (208)	Russian (44)
Hindi (667)	Portuguese (220)	Italian (207)	Other Asian languages (39)
Other Indic languages (616)	Other Asian languages (219)	Hindi (180)	Vietnamese (39)

Source: Statistical Atlas (2016)

Collectively, there is much to commend all four innovation districts in terms of their research assets (see Table 4.10). South Lake Union is scored slightly lower than the others since it boasts only one top-tier research university, whose main campus footprint lies 2.5 miles away, while the other three locations have multiple such institutions in or near their boundaries.

[45] See Appendix A, Table A.1 for full breakdown of country of origin.

[46] See Appendix A, Table A.2 for full breakdown of languages spoken.

TABLE 4.10 – SUMMATION OF COMPARATIVE ANALYSIS OF RESEARCH ASSETS FOR SELECTED INNOVATION DISTRICTS (10 POINTS POSSIBLE FOR EACH CATEGORY)

Innovation District Characteristic	University City	Kendall Square	Oakland	South Lake Union
Research Assets				
(1) Presence of advanced research institutions	10	10	9	8
(2) Access to talent	9	10	8	8
Average	**9.5**	**10**	**8.5**	**8**

Source: Econsult Solutions, Inc. (2016)

4.4 INNOVATION CULTURE: (3) START-UP CULTURE, (4) ENTREPRENEURIAL SUPPORT RESOURCES

An important determinant of an innovation district's productivity is its ability to translate high concentrations of research activity into commercial success. This means monetization of intellectual capital, high start-up formation rates, and attention from the global venture capital community.

Regions competing for innovation activity know that like attracts like and more attracts more. People and capital are fluid, and they will flow to where other people and capital are being productively deployed. It is therefore instructive to see how the four business locations profiled in this report compare in key innovation metrics.

Here the Boston/Cambridge region outpaces the Philadelphia region in the output of research activity, as proxied by invention disclosures and patents granted, and particularly outperforms in various expressions of the commercialization of that innovation activity, such as licenses executed, university start-ups formed, and venture capital received. Indeed, in monetizing research-driven intellectual capital, the Boston/Cambridge region's outcomes are four, five, and six times larger than the Philadelphia region's (see Table 4.11 and Table 4.12).

TABLE 4.11 – INNOVATION METRICS FOR REGIONS OF SELECTED INNOVATION DISTRICTS[47]

Region	2012 Invention Disclosures	2010 Patents Granted	2012 Licenses and Options Executed	2007-2012 University Startup Ventures Formed	2007-2012 Venture Capital Received (in $Billions)
Philadelphia	819	2,501	272	12	$0.6
Boston	2,259	4,330	490	60	$3.3
Pittsburgh	486	740	187	15	N/A
Seattle	504	4,052	371	10	$1.0

Source: Econsult Solutions, Inc. (2014)

TABLE 4.12 – INDEX[48] OF TECHNOLOGY TRANSFER AND COMMERCIALIZATION METRICS BY REGION[49]

	Innovation Inputs[50]		Innovation Activity		Innovation Outcomes			Total Across All Metrics
Region	STEM Degrees Conferred	Academic R&D	Invention Dis-closures	Patents Granted	Licenses Executed	Startups Formed	Venture Capital Received	
Phila-delphia	100	100	100	100	100	100	100	100
Boston/ Cambridge	57	181	276	173	180	500	550	274
Pittsburgh	91	100	59	30	69	125	N/A	79
Seattle	65	129	62	162	136	83	167	115

Source: Econsult Solutions, Inc. (2014)

Kendall Square is part of a broader Boston/Cambridge market that attracts considerable national attention and venture capital dollars. South Lake Union benefits as an innovation district from its

[47] All metrics are from Association of University Technology Managers (2014) except for venture capital received, which is 2007-2012 data from PriceWaterhouseCoopers (2014). PriceWaterhouseCoopers utilizes different definitions of regions from all other data sets for Boston (defined in this data set as "New England") and Seattle (defined as "Northwest"), and leaves out Pittsburgh altogether. A 2016 report by National Venture Capital Association published the following information on the four regions profiled in this report:

- Philadelphia – 115 deals totaling $0.52 billion (ranked 8th among regions)
- Boston – 428 deals totaling $5.58 billion (3rd)
- Pittsburgh – 93 deals totaling $0.20 billion (10th)
- Seattle – 110 deals totaling $1.17 billion (6th)

[48] Philadelphia is set at 100, and all other regions' values were calculated relative to that benchmark. Hence, a score of 200 represents a performance level twice that of Philadelphia, while a score of 50 represents a performance level half that of Philadelphia.

[49] "Technology Transfer and Commercialization in Greater Philadelphia," Econsult Solutions (December 2014).

[50] 2012 data from National Science Foundation (2014).

ties to top-tier technology companies in the corporate sector. Oakland's entrepreneurial accomplishments are born of a match between their research institutions' core strengths in the engineering and medical fields and the research interests of nearby corporate partners. This is a formula that can be used to describe University City's successes, especially as its major research institutions extend their existing collaborative efforts to create a full-service ecosystem to stimulate innovation, commercialize research discoveries, and attract capital (see Table 4.13).

TABLE 4.13 – SUMMATION OF COMPARATIVE ANALYSIS OF INNOVATION CULTURE FOR SELECTED INNOVATION DISTRICTS (10 POINTS POSSIBLE FOR EACH CATEGORY)

Innovation District Characteristic	University City	Kendall Square	Oakland	South Lake Union
Innovation Culture				
(3) Start-up culture	7	10	8	8
(4) Entrepreneurial support resources	8	10	8	8
Average	**7.5**	**10**	**8**	**8**

Source: Econsult Solutions, Inc. (2016)

4.5 COLLABORATION: (5) COLLABORATIVE MECHANISMS, (6) PARTNERSHIP WITH LOCAL GOVERNMENT

An important purpose of dense co-location of high-end knowledge activity is to make possible the collaborations needed to achieve commercial success. Successful regions boast numerous kinds of collaborations – across institutions, between institutions and corporations, and within the private sector – as well as numerous physical places where those collaborations can flourish. Successful regions are also characterized by local, regional, and state government initiatives that encourage collaboration and support innovation.

All four innovation districts are characterized by intentional efforts to create physical and collaborative space for research institutions and the corporate sector to interact (see Table 4.14 and Figure 4.1). University City Science Center, Cambridge Innovation Center, and the Robert Mehrabian Collaborative Innovation Center represent three different models for cultivating an innovative and collaborative culture for a region in a specific physical location, and are a significant reason why University City, Kendall Square, and Oakland are such vibrant places for innovation to flourish.

TABLE 4.14 – ILLUSTRATIVE COLLABORATIONS BETWEEN RESEARCH INSTITUTIONS AND THE CORPORATE SECTOR IN OR NEAR SELECTED INNOVATION DISTRICTS

University City	Kendall Square	Oakland	South Lake Union
Microsoft Reactor Penn Center for Innovation Penn-Novartis Center for Advanced Cellular Technologies **University City Science Center –** *"Founded in 1963 as the nation's first urban research park, the Science Center provides business incubation, programming, lab and office facilities, and support services for entrepreneurs, start-ups, and growing and established companies."*	**Cambridge Innovation Center –** *"CIC Cambridge is home to over 900 companies. More than 3/4 of them are startups."* Optum Labs	Disney Research Lab GM Collaborative Research Lab Intel Research Pittsburgh **Robert Mehrabian Collaborative Innovation Center –** *"The vision of the CIC is to create the optimal environment to serve the next generation of university–industry collaboration."* Uber Advanced Technologies Center	**Startup Hall –** *"Forged by a unique public-private partnership of the region's leading research university, the nation's #1 startup accelerator and the Pacific Northwest's #1 seed-stage venture capital fund, Startup Hall exists to help exceptional founders build the next generation of world-leading companies here in the Pacific Northwest."*

Source: Econsult Solutions, Inc. (2016)

FIGURE 4.1 – ILLUSTRATIVE COLLABORATION MECHANISMS BETWEEN RESEARCH INSTITUTIONS AND THE CORPORATE SECTOR IN OR NEAR SELECTED INNOVATION DISTRICTS



Clockwise from top left: University City Science Center, Cambridge Innovation Center, Startup Hall r, Robert Mehrabian Collaborative Innovation Center

All four locations also boast significant concentrations of incubators/accelerators (see Table 4.15) and co-working spaces (see Table 4.16), as well as strong participation by the public sector (see Table 4.17). In University City, Kendall Square, and Oakland, the presence of multiple research universities creates the opportunity for inter-institutional cooperation, which has led to a proliferation of initiatives designed to stimulate further innovation activity (see Table 4.18), and which advantages these locations versus South Lake Union in the area of collaboration (see Table 4.19).

TABLE 4.15 – CO-WORKING FACILITIES IN OR NEAR SELECTED INNOVATION DISTRICTS

City	# Spaces	Total SF	Largest Space (SF)
Philadelphia[51]	30	270,000+	MakeOffices (67,000)
Boston/ Cambridge[52]	30	N/A	Cambridge Coworking Center (150,000)
Pittsburgh[53]	18	N/A	The X Factory (250,000)
Seattle[54]	29	648,000	WeWork (197,000)

Source: See detailed footnotes

TABLE 4.16 – COUNT OF INCUBATORS AND ACCELERATORS IN REGIONS OF SELECTED INNOVATION DISTRICTS [55]

Philadelphia	Boston/ Cambridge	Pittsburgh	South Lake Union
39	31	11	20

Source: Econsult Solutions, Inc. (2016)

[51] "D.C. Firm Will Open Largest Coworking Space in Philadelphia," PhillyVoice (December 10, 2015).

[52] "Coworking and Incubator Spaces," Cambridge Community Development Department.

[53] "The Big Guide to Co-Working Spaces in Pittsburgh – Updated," Next Pittsburgh (January 21, 2016).

[54] "Coworking Seattle," Co-Working Wiki.

[55] See Appendix B.1 for full list of incubators and accelerators.

TABLE 4.17 – ILLUSTRATIVE PUBLIC SECTOR INITIATIVES AVAILABLE TO FIRMS LOCATED IN OR NEAR SELECTED INNOVATION DISTRICTS

Philadelphia	Boston/Cambridge	Pittsburgh	Seattle
Ben Franklin Technology Partnership BioAdvance Keystone Opportunity Zones Philadelphia Industrial Development Corporation Startup Pennsylvania Startup PHL University City Keystone Innovation Zone World Trade Center of Greater Philadelphia	Boston Industrial Development Financing Authority Boston Loan Development Corporation Economic Development Incentive Program Massachusetts Innovation Mentoring Initiative	Ben Franklin Technology Partnership Keystone Opportunity Zones / Pittsburgh Technology Zone PowerUp Pittsburgh Startup Global Pittsburgh Startup Pennsylvania	Choose Washington Economic Development Council of Seattle and King County Fund Local Grow Seattle Only in Seattle Startup Seattle

Source: Econsult Solutions, Inc. (2016)

TABLE 4.18 – ILLUSTRATIVE COLLABORATIONS BETWEEN RESEARCH INSTITUTIONS IN OR NEAR SELECTED INNOVATION DISTRICTS

University City	Kendall Square: Harvard/MIT	Oakland: CMU/Pitt
Blood Center for Patient Care and Discovery (Penn/CHOP) Center for Digestive, Liver, and Pancreatic Medicine (Penn/CHOP) Nanotechnology Institute (Penn/Drexel) Special Program of Research Excellence (SPORE) grant-funded melanoma projects (Penn/Wistar)	Broad Institute Center of Cancer Nanotechnology Excellence	Center for the Neural Basis of Cognition Pittsburgh Health Data Alliance Pittsburgh Supercomputing Center Robotics Foundry

Source: Econsult Solutions, Inc. (2016)

TABLE 4.19 – SUMMATION OF COMPARATIVE ANALYSIS OF COLLABORATION FOR SELECTED INNOVATION DISTRICTS (10 POINTS POSSIBLE FOR EACH CATEGORY)

Innovation District Characteristic	University City	Kendall Square	Oakland	South Lake Union
Collaboration				
(5) Collaborative mechanisms	9	8	8	7
(6) Partnership with local government	6	6	6	6
Average	**7.5**	**7**	**7**	**6.5**

Source: Econsult Solutions, Inc. (2016)

4.6 PLACE: (7) DENSE URBAN SETTING, (8) TRANSPORTATION INFRASTRUCTURE, (9) AMENITY-RICH ENVIRONMENT

The fundamental shift in the location of innovation activity, from suburban office parks to mixed-use urban settings, is borne of both a more distributed form of research exploration as well as a change in place preferences among knowledge workers. Therefore, business locations like the four profiled in this report are selling not only a bundle of characteristics – research institutions, intellectual talent, innovation activity, and collaborative mechanisms – but also a physical location in which they are located, one which speaks to modern preferences for amenity-rich urban settings well-served by transit.

To begin with, University City is located in the largest city and metropolitan area, although Philadelphia also has the lowest median household income and has among the highest proportion of low-income households among the four cities (see Table 4.20, Table 4.21, and Figure 4.2). University City also outscores the other three locations in terms of non-automobile forms of transportation, with an average of transit, walk, and bike scores that exceeds that of Kendall Square, Oakland, and South Lake Union (see Table 4.22 and Table 4.23).

TABLE 4.20 – DEMOGRAPHIC INFORMATION FOR CITIES OF SELECTED INNOVATION DISTRICTS

	Philadelphia	Boston/ Cambridge	Pittsburgh	Seattle
Population	1,567,442	777,539	304,391	684,451
Mean Household Income	$55,353	$87,307	$60,922	$94,559

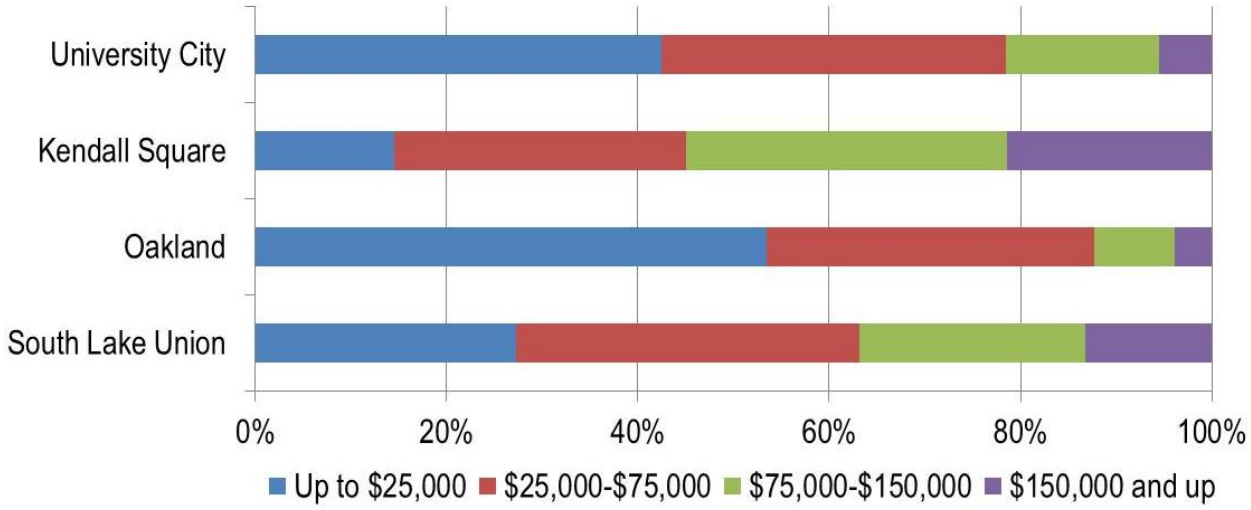
Source: US Census Bureau (2000, 2015), American Community Survey (2010-2014), US Department of Commerce Bureau of Economic Analysis (2014)

TABLE 4.21 – DEMOGRAPHIC INFORMATION FOR METROPOLITAN AREAS[56] OF SELECTED INNOVATION DISTRICTS

Innovation District Characteristic	Philadelphia MSA	Boston/ Cambridge MSA	Pittsburgh MSA	Seattle MSA
Population	6,069,875	4,774,321	2,353,045	3,733,580
Median Household Income	$61,927	$72,769	$50,182	$67,437
Gross Domestic Product ($B)	$391	$382	$136	$301

Source: US Census Bureau (2000, 2015), American Community Survey (2010-2014), US Department of Commerce Bureau of Economic Analysis (2014)

FIGURE 4.2 – INCOME DISTRIBUTION IN SELECTED INNOVATION DISTRICTS



Source: Esri Business Analyst (2016)

TABLE 4.22 – PUBLIC TRANSIT METRICS FOR REGIONS OF SELECTED INNOVATION DISTRICTS

Category	University City	Kendall Square	Oakland	South Lake Union
Transit agency	SEPTA	MBTA	Port Authority	Metro
Modes	Commuter rail, heavy rail, trolley, bus	Commuter rail, heavy rail, trolley, bus	Light rail, bus	Commuter rail, light rail, bus
Annual ridership (millions)	330	400	64	30

Source: SEPTA, MBTA, Port Authority, and Metro Websites

[56] Philadelphia-Camden-Wilmington PA-NJ-DE-MD MSA, Boston-Cambridge-Quincy MA-NH MSA, Pittsburgh PA MSA, and Seattle-Tacoma-Bellevue WA MSA.

TABLE 4.22 – NON-AUTOMOBILE MOBILITY SCORES FOR REGIONS OF SELECTED INNOVATION DISTRICTS [57]

	University City	Kendall Square	Oakland[58]	South Lake Union
Transit Score	95	80	68	86
Walk Score	92	86	83	92
Bike Score	97	98	52	72
Average	**95**	**88**	**68**	**83**

Source: WalkScore.com (2016)

University City also performs very well against its peers in the concentration of retail and restaurant offerings (see Table 4.24 and Figure 4.3), arts and culture venues (see Table 4.25 and Figure 4.4), and nearby park space (see Table 4.26 and Figure 4.5). Neighborhood services and programming is also very strong in University City, thanks in large part to the University City District, which is primarily funded by the area's major research institutions (see Table 4.27).

TABLE 4.24 – RETAIL AND RESTAURANT ACTIVITY IN SELECTED INNOVATION DISTRICTS (IN $MILLIONS IN MERCHANT SALES)

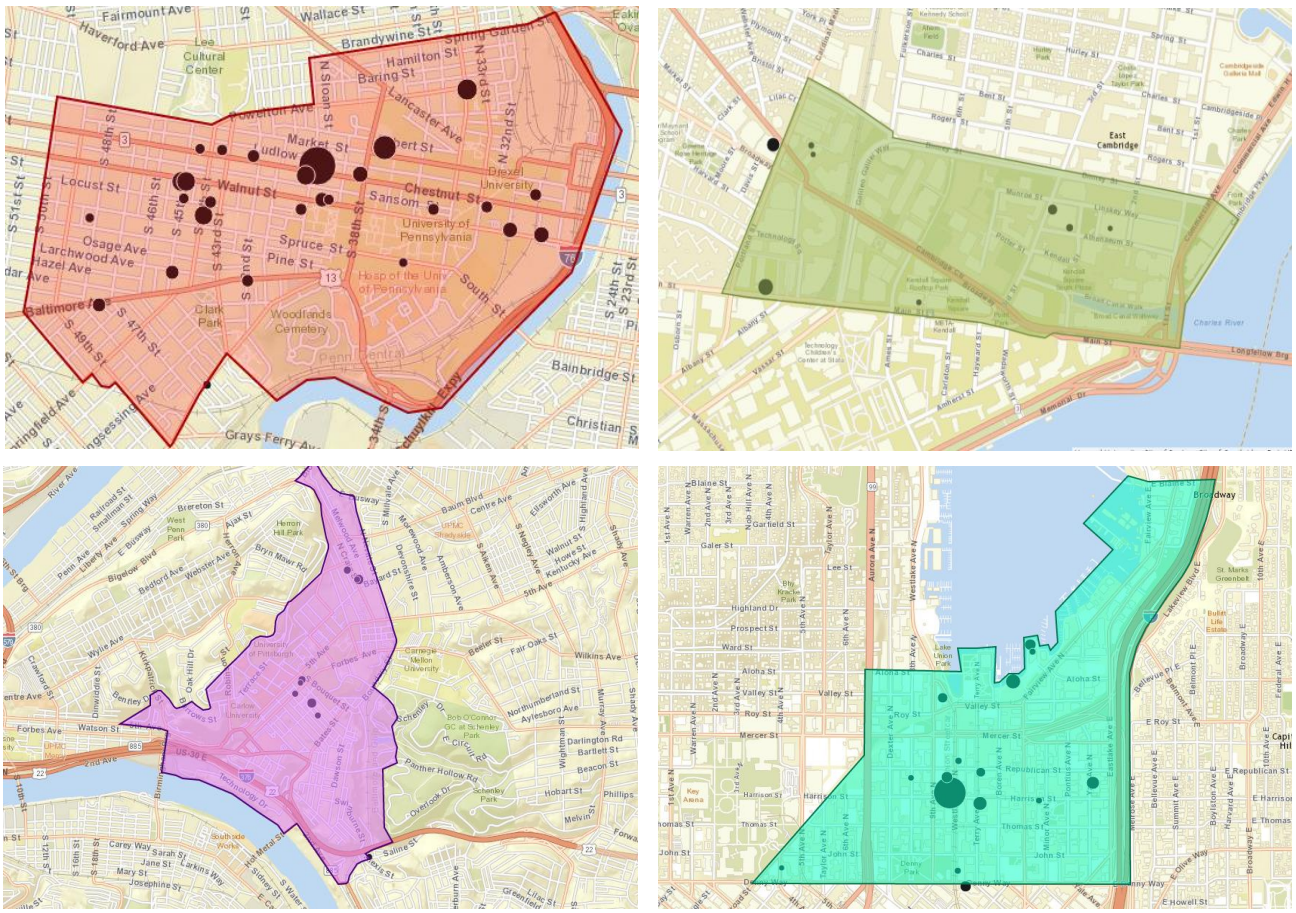
	University City	Kendall Square	Oakland	South Lake Union
Retail	$392	$193	$199	$229
Food & Drink	$148	$38	$56	$44

Source: ESRI Business Analyst (2016)

[57] Walkscore.com uses a variety of area metrics to determine the ease of walking, transit, or biking in specific neighborhoods. Walk Score is determined by evaluating pedestrian friendliness, population density and intersection density. Transit Score is a measure of how well an area is served by public transportation by evaluating the distance to and usefulness of nearby rail, bus, and subway stops. Bike Score is measured by analyzing the bike infrastructure, hills, road connectivity, and number of bike commuters.

[58] Average of scores for North Oakland, South Oakland, West Oakland, and Central Oakland.

FIGURE 4.3 – POPULAR RETAIL AND RESTAURANT LOCATIONS IN SELECTED INNOVATION DISTRICTS [59]



Clockwise from top left: University City, Kendall Square, South Lake Union, Oakland

Source: Yelp (2016), Econsult Solutions, Inc. (2016)

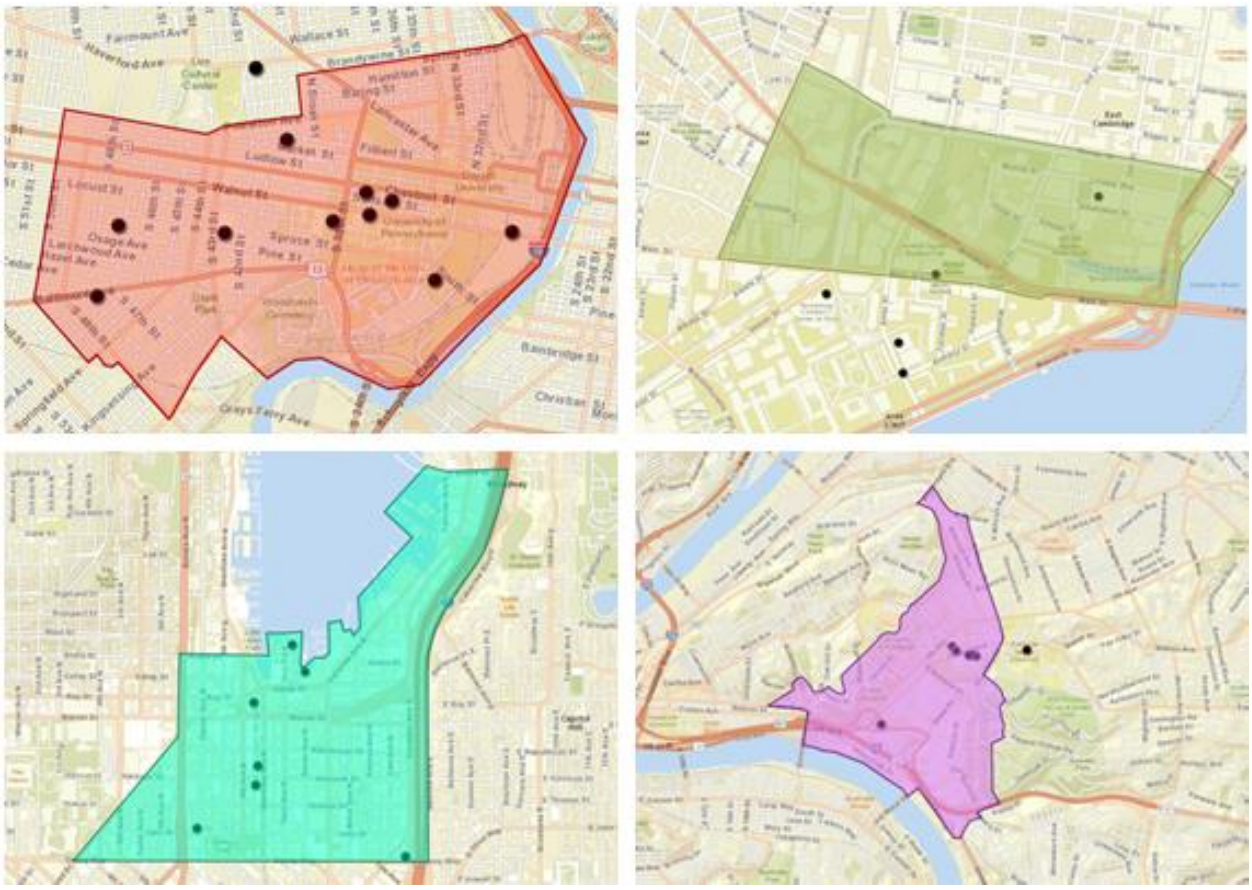
[59] Defined as 100 or more reviews and 4 or more stars on Yelp. Size of circle related to number of Yelp reviews.

TABLE 4.25 – SELECTED ARTS AND CULTURE VENUES IN OR NEAR SELECTED INNOVATION DISTRICTS

University City	Kendall Square	Oakland	South Lake Union
Annenberg Center for Performing Arts	Collier Memorial	Carnegie Museum of Art	415 Westlake
Curio Theater Company	Entrepreneurs Walk of Fame	Carnegie Museum of Natural History	Center for Wooden Boats
Esther Klein Gallery	Le Laboratoire	Carnegie Music Hall	El Corazon
Innovators Walk of Fame	List Visual Arts Center	Cathedral of Learning	MadArt Studio
Institute of Contemporary Art	Media Lab Complex	Center for American Music Museum	Museum of History and Industry
Iron Gate Theater		Pittsburgh Playhouse	Pivot Art + Culture
Kelly Writers House		Regina Miller Gallery	Winston Wachter Fine Art
Penn Museum of Archaeology and Anthropology			
Philadanco			
Spiral Q Puppet Theater			
Take the Lead Dance Studio			
University City Arts League			
World Café Live			

Source: University City District (2016), Cambridge (2016), Imagine P!ttsburgh (2016), South Lake Union (2016)

FIGURE 4.4 – SELECTED ARTS AND CULTURE VENUES IN OR NEAR EACH SELECTED INNOVATION DISTRICT



Clockwise from top left: University City, Kendall Square, Oakland, South Lake Union

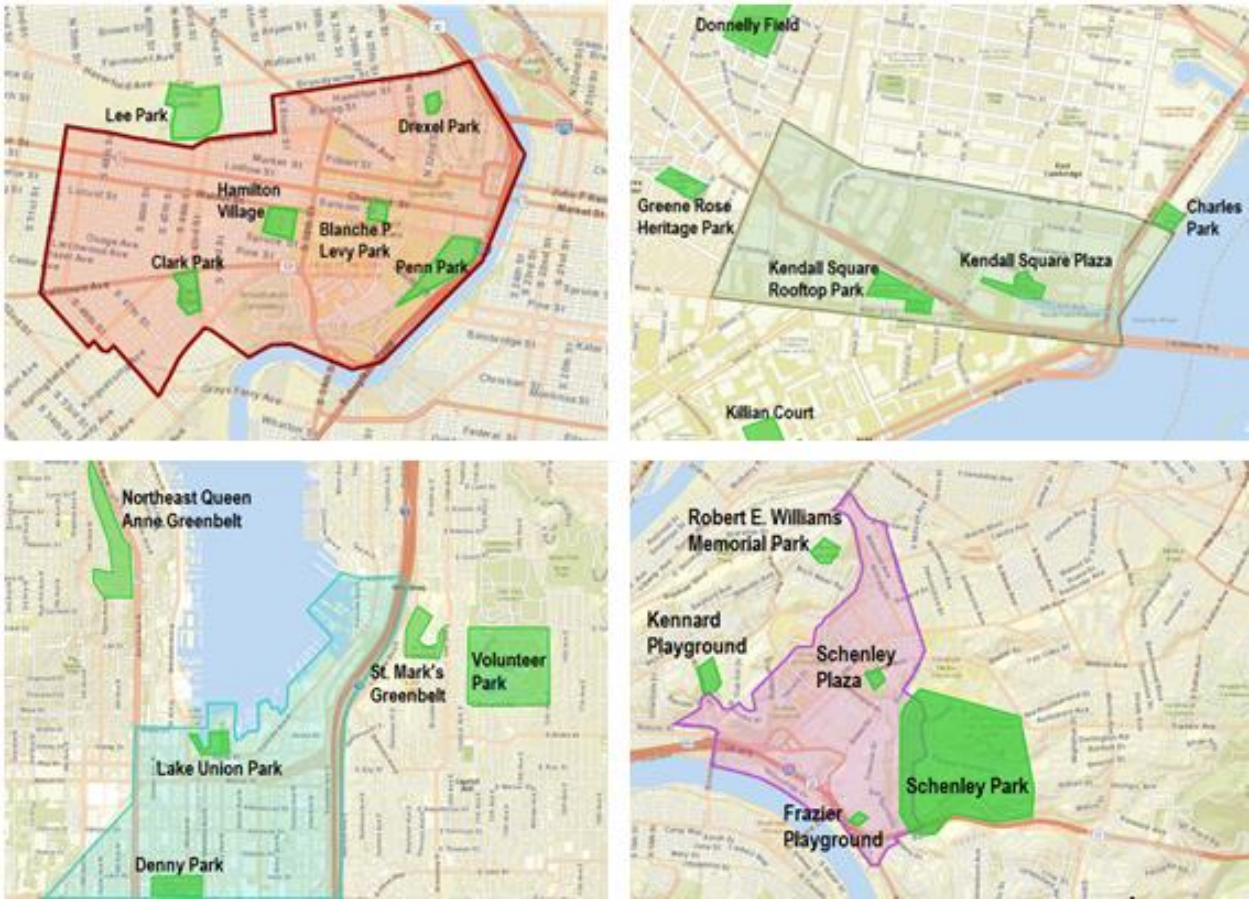
Source: ESRI ArcGIS Online (2016)

TABLE 4.26 – PARK SPACE IN OR NEAR SELECTED INNOVATION DISTRICT (IN SQ. MI.)

	University City	Kendall Square	Oakland	South Lake Union
Land Area (sq. mi.)	2.42	0.22	1.68	0.66
Park Area (sq. mi.)	0.07	0.07	0.07	0.25

Source: Google Maps (2016)

FIGURE 4.5 – PARK SPACE IN OR NEAR EACH SELECTED INNOVATION DISTRICT



Clockwise from top left: University City, Kendall Square, Oakland, South Lake Union

Source: Google Maps (2016)

TABLE 4.27 – PROGRAMMING AND SERVICES PROVIDED BY ORGANIZATIONS IN SELECTED INNOVATION DISTRICTS

Programming/Service	University City District	Kendall Square Association	Oakland Business Improvement District	Discover South Lake Union
Public safety	√		√	
Street cleaning	√		√	
Streetscape improvements	√			
Promotion of retail corridors	√	√	√	√
Recreational events	√	√		√
Workforce development	√	√		
Blight remediation	√		√	

Source: Organization websites (2016)

The importance of place to the success of an innovation district cannot be overstated, nor can the momentousness of the shift in where and how innovation occurs in the US. University City is well-positioned to compete as a business location of choice on this front, as it boasts all of the characteristics sought after by employers and employees alike: a dense urban setting, strong transportation infrastructure, and many restaurant, retail, art, cultural, and recreational amenities. Thus, it outperforms other innovation districts on place, although Kendall Square is close (see Table 4.28).

TABLE 4.28 – SUMMATION OF COMPARATIVE ANALYSIS OF PLACE FOR SELECTED INNOVATION DISTRICTS (10 POINTS POSSIBLE FOR EACH CATEGORY)

Innovation District Characteristic	University City	Kendall Square	Oakland	South Lake Union
Place				
(7) Dense urban setting	9	8	6	6
(8) Transportation infrastructure	9	9	6	6
(9) Amenity-rich environment	8	6	5	6
Average	**8.7**	**7.7**	**5.7**	**6**

Source: Econsult Solutions, Inc. (2016)

5.0 COST COMPARISON BETWEEN UNIVERSITY CITY AND OTHER INNOVATION DISTRICTS

5.1 SECTION OVERVIEW

The previous section was a comparative analysis of University City and three other innovation districts in the characteristics that matter to firms seeking such locations. This section introduces the important variable of cost, both for firms and for their employees. Firm location expenditures include going rents, tax burden, and labor costs, while employee living expenditures focus on the cost of housing and transportation. This cost comparison analysis cements University City's status as a strong value location in terms of its competitiveness in key characteristics compared to its cost to employers and employees, relative to innovation districts such as Kendall Square, Oakland, and South Lake Union. This is important because lower costs mean lower barriers to entry for firms and workers alike, increasing the density of innovation activity in a location.

5.2 COMMERCIAL OFFICE RENTS

Rent for Class A office space is about the same in University City, Oakland, and South Lake Union, but is over twice as much in Kendall Square (see Table 5.1). This puts tenants in Kendall Square at a significant cost disadvantage relative to their peers in other business locations. There are two ways of describing the ramifications of this cost difference. One is that the same firm shopping between these four innovation districts for a business location knows that it has to pay twice as much in rent in Kendall Square as in the other three locations. The other is that if there are different firms that compete against each other, one in each location, the one in Kendall Square is disadvantaged relative to its competitors because it has to pay so much more in rent.

TABLE 5.1 – KEY COMMERCIAL OFFICE CHARACTERISTICS IN SELECTED INNOVATION DISTRICTS

Category	University City[60]	Kendall Square[61]	Oakland[62]	South Lake Union[63]
Total Square Feet	4,775,000	6,938,453	3,558,857	10,464,703
Class A Rent per Square Foot	$34.41	$69.05	$31.79	$32.94

Source: REIS (2016), Cushman & Wakefield (2016)

[60] "Q4 2015 West Philadelphia," REIS (2016).

[61] "Q1 2016 Boston Office Snapshot," Cushman & Wakefield (2016).

[62] "Q1 2016 Pittsburgh Office Snapshot," Cushman & Wakefield (2016).

[63] "Q1 2016 Seattle Office Snapshot," Cushman & Wakefield (2016).

5.3 TAX BURDEN

Taxes, similar to rents, are a cost borne by all businesses that may differ greatly in level from one location to another. As with rents, the implications of these differences can be understood in two ways: either that the same firm would have to pay more or less in one location versus another, or that competing firms would be subject to different tax burdens when competing with one another.

In order to compare tax burden across the four business locations profiled in this report, illustrative companies were created in the professional services – one in scientific research and one in pharmaceutical manufacturing – with their financial characteristics based on industry averages found using data from the Internal Revenue Service. Local and state tax information[64] was collected for each business location and then used to calculate a total tax burden for each illustrative company in each business location.

South Lake Union enjoys a considerable tax burden advantage relative to the other three business locations. Philadelphia, Cambridge, Pittsburgh, and Seattle are all relatively high-tax municipalities, with Philadelphia's corporate net income tax a particularly onerous burden, but the State of Washington has no personal income tax and low business taxes (see Table 5.2). This is of particular importance for the kinds of business activity that these locations are seeking to attract, which is highly profitable firms and highly compensated workers.

As a result, the comparative tax burden on the illustrative companies is much lower there than in the other three locations (see Figure 5.1 and Figure 5.2).[65] It is important to acknowledge, however, that tax disadvantages are often minimized or even eliminated through various state and local tax incentive programs, and that states and localities with higher tax burdens tend to be more aggressive in making such incentives available. Philadelphia, for example, is a high-tax city that makes liberal use of a variety of tax incentives, including a 10-year property tax abatement, exemption of certain business taxes for new firms, and local participation in the Commonwealth of Pennsylvania's Keystone Opportunity Zone Program.

[64] Federal tax information is excluded from this analysis because all four business locations are in the US and therefore companies would be subject to the same federal taxes across all locations.

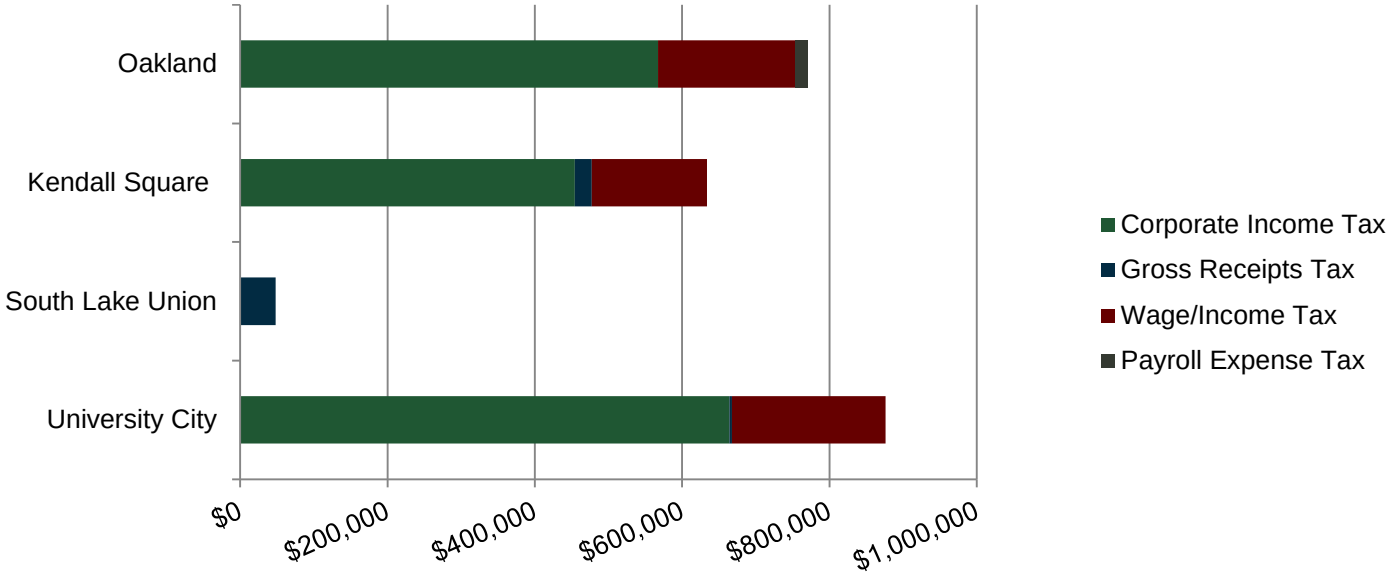
[65] See Appendix C, Table C.1 for additional detail on state and local tax rates, Appendix C, Table C.2 for additional detail on archetype businesses, Appendix C, Table C.3 for sample tax burden calculations, and Appendix C, Table C.4 for additional detail on resulting tax burdens.

TABLE 5.2 – LOCAL AND STATE TAX BURDEN FOR SELECTED INNOVATION DISTRICTS

	Philadelphia	Cambridge	Pittsburgh	Seattle
Personal Income – State	Medium	High	Medium	None
Personal Income – Local	High	None	Low	None
Sales – State	Medium	Medium	Medium	Medium
Sales – Local	High	None	Low[66]	High
Business – State	High	High	High	Low
Business - Local	High	None	Low[67]	Low

Source: Philadelphia Revenue Department (2016). Washington State Department of Revenue (2016). Massachusetts Department of Revenue (2016). Pittsburgh Department of Finance (2016).

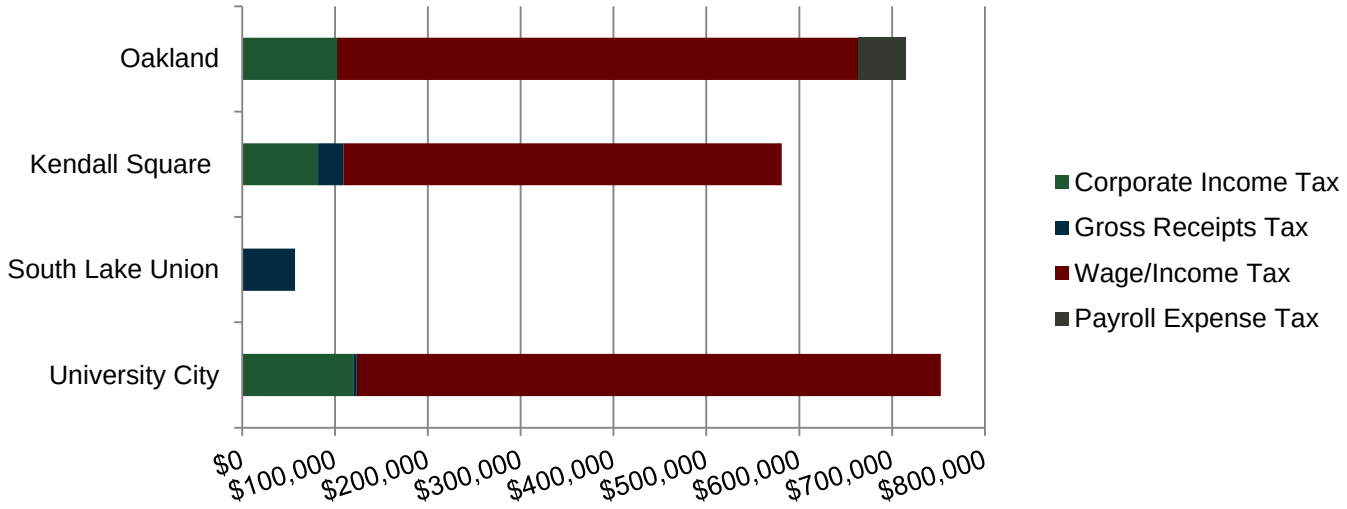
FIGURE 5.1 – ESTIMATED TAX BURDEN ON ILLUSTRATIVE SCIENTIFIC R&D COMPANIES IN SELECTED INNOVATION DISTRICTS



Source: Econsult Solutions (2016)

[66] Allegheny county sales tax of 1 percent
[67] Pittsburgh does not have a business tax on income or receipts. Instead it has a payroll expense tax that is charged to the business and is not a pass through tax.

FIGURE 5.2 – ESTIMATED TAX BURDEN ON ILLUSTRATIVE PHARMACEUTICAL MANUFACTURING COMPANIES IN SELECTED INNOVATION DISTRICTS



Source: Econsult Solutions (2016)

5.4 COST OF LABOR

A large portion of most companies' expenditures is salaries and wages. Due in large part to cost of living differences (detailed in the next sub-section), average annual incomes differ considerably across innovation districts. Depending on the industry, labor tends to be more expensive in Cambridge and Seattle than Philadelphia and Pittsburgh (see Table 5.3).

TABLE 5.3 – 2015 AVERAGE ANNUAL INCOME FOR VARIOUS TYPES OF EMPLOYEES IN THE PROFESSIONAL AND TECHNICAL SERVICES INDUSTRY FOR THE COUNTIES OF SELECTED INNOVATION DISTRICTS

Professional and Technical Services[68]	Philadelphia	Cambridge	Pittsburgh	Seattle	US
Annual Income	$102,412	$132,262	$86,915	$96,518	$89,769
Indexed (US = 100)	114	147	97	108	100
Information Technology[69]	**Philadelphia**	**Cambridge**	**Pittsburgh**	**Seattle**	**US**
Annual Income	$99,930	$135,134	$77,864	$174,005	$95,038
Indexed (US = 100)	105	142	82	183	100
Scientific R&D[70]	**Philadelphia**	**Cambridge**	**Pittsburgh**	**Seattle**	**US**
Annual Income	$92,642	$162,691	$104,429	$108,959	$129,553
Indexed (US = 100)	72	126	81	84	100
Pharmaceutical Manufacturing[71]	**Philadelphia**	**Cambridge**	**Pittsburgh**	**Seattle**	**US**
Annual Income	$105,092	$212,323	N/A	$83,687	$123,811
Indexed (US = 100)	85	171	N/A	68	100

Source: US Bureau of Labor Statistics Quarterly Census of Employment and Wages (2016)

5.5 COST OF LIVING

As noted above, Brookings considers low cost of living to be an essential characteristic of innovation districts. The significantly higher cost of housing in the Boston and Seattle real estate markets greatly disadvantages Kendall Square and South Lake Union relative to University City and Oakland (see Table 5.4). Accounting for wage levels and transportation costs, Philadelphians pay a smaller share of their earnings for housing and transportation than residents in the other three cities (see Table 5.5). Cost of living calculators confirm that Cambridge and Seattle are much more expensive places to live than Philadelphia or Pittsburgh (see Table 5.6).

[68] NAICS Code 54.

[69] NAICS Code 51.

[70] NAICS Code 5417.

[71] NAICS Code 3254.

TABLE 5.4 – RESIDENTIAL REAL ESTATE COMPARISON ACROSS SELECTED INNOVATION DISTRICTS

	University City	Kendall Square	Oakland	South Lake Union	US
Average Home Price	$143,200	$552,600	$91,500	$437,400	$175,700
Average 1-Bedroom Rent	$915	$1,656	$794	$1,131	$920

Source: Community and Economic Research (2015)

TABLE 5.5 – HOUSING AND TRANSPORTATION COSTS AS A PERCENTAGE OF HOUSEHOLD EARNINGS ACROSS SELECTED INNOVATION DISTRICTS

	Philadelphia	Cambridge	Pittsburgh	Seattle	US[72]
Housing	22%	31%	23%	30%	32%
Transportation	14%	11%	19%	16%	19%
Total	36%	42%	42%	46%	51%

Source: Center for Neighborhood Technology Housing and Transportation Index (2015)

TABLE 5.6 – COST OF LIVING INDEX ACROSS SELECTED INNOVATION DISTRICTS

Index	Philadelphia	Cambridge	Pittsburgh	Seattle	US
Housing Index	87	274	62	211	100
Transportation Index	117	116	120	108	100
Groceries Index	117	108	100	120	100
Good and Services Index	115	127	97	114	100
Cost of Living Index	**107**	**170**	**90**	**143**	**100**

Source: Areavibes.com (2016)

5.6 SUMMARY

University City can rightly be seen as a value option relative to Kendall Square, Oakland, and South Lake Union (see Table 5.7). While its local and state tax burden is the worst of the four, it boasts affordable commercial office rents, a reasonable residential real estate market, and a

[72] "Transportation and Housing Costs," US Federal Highway Administration Office of Planning, Environment, & Realty (2015).

strong regional transportation network. Meanwhile, Kendall Square's commercial real estate market and South Lake Union's residential real estate market are far more expensive, and Oakland's transit system is far less developed.

TABLE 5.7 – SUMMATION OF COMPARATIVE ANALYSIS OF COST FACTORS FOR SELECTED INNOVATION DISTRICTS (10 POINTS POSSIBLE FOR EACH CATEGORY)

Innovation District Characteristic	University City	Kendall Square	Oakland	South Lake Union
Cost Factors				
Commercial office rent	7	3	7	7
Local and state tax burden	3	3	3	7
Cost of labor	6	3	7	5
Cost of living	6	2	7	4
Average	**5.5**	**2.8**	**6.0**	**5.8**

Source: Econsult Solutions, Inc. (2016)

6.0 CONCLUSION

This report has concerned itself with five matters: (1) acknowledging the concept of "innovation districts" as a new way of organizing innovation activity in metropolitan regions, (2) articulating 10 specific characteristics that define successful innovation districts, (3) seeing how those characteristics played a role in specific high-profile business client selecting certain innovation districts, (4) seeing how University City measures up to those innovation districts in these characteristics, and (5) comparing the cost of doing business in each innovation district.

This coverage has yielded a very favorable evaluation of University City in Philadelphia, relative to Kendall Square in Cambridge, Oakland in Pittsburgh, and South Lake Union in Seattle (see Table 6.1). Scoring the four innovation districts in each category yields the conclusion that University City is the highest-performing site among its peers. This suggests that it can compete well head-to-head with these other locations on the fundamentals that matter the most to the tenants that it and others are seeking to attract, and thus add to the roster of existing firms that have gladly chosen University City as a business location to locate and grow (see Table 6.2 and Figure 6.1).

TABLE 6.1 – SUMMATION OF COMPARATIVE ANALYSIS OF SELECTED INNOVATION DISTRICTS (10 POINTS POSSIBLE FOR EACH CATEGORY)

Innovation District Characteristic	University City	Kendall Square	Oakland	South Lake Union
Research Assets				
(1) Presence of advanced research institutions	10	10	9	8
(2) Access to talent	9	10	8	8
Average	**9.5**	**10.0**	**8.5**	**8.0**
Innovation Culture				
(3) Start-up culture	7	10	8	9
(4) Entrepreneurial support resources	8	10	8	8
Average	**7.5**	**10.0**	**8.0**	**8.5**
Collaboration				
(5) Collaborative mechanisms	9	8	8	7
(6) Partnership with local government	6	6	6	6
Average	**7.5**	**7.0**	**7.0**	**6.5**
Place				
(7) Dense urban setting	9	8	6	6
(8) Transportation infrastructure	9	9	6	6
(9) Amenity-rich environment	8	6	5	6
Average	**8.7**	**7.7**	**5.7**	**6.0**
(10) Cost Factors				
Commercial office rent	7	3	7	7
Local and state tax burden	3	3	3	7
Cost of labor	6	3	7	5
Cost of living	6	2	7	4
Average	**5.5**	**2.8**	**6.0**	**5.8**
Total	**38.7**	**37.4**	**35.2**	**34.8**

TABLE 6.2 – LOCATION CHARACTERISTICS EXPLICITLY MENTIONED BY HIGH-PROFILE TENANTS AS REASONS FOR CHOOSING UNIVERSITY CITY AREA (SEE FIGURE 6.1)

Innovation District Characteristic	Spark Therapeutics	Point.io	Optofluidics	Integral Molecular
(1) Presence of advanced research institutions	√	√	√	√
(2) Access to talent		√		
(3) Start-up culture				
(4) Entrepreneurial support resources				
(5) Collaborative mechanisms				
(6) Partnership with local government				
(7) Dense urban setting				
(8) Transportation infrastructure				
(9) Amenity-rich environment				
(10) Cost factors	√		√	

Source: Econsult Solutions, Inc. (2016)

FIGURE 6.1 – MEDIA COVERAGE OF HIGH-PROFILE RELOCATIONS INTO UNIVERSITY CITY AREA



Sources (clockwise from top left): Glenn Goldenberg of Point.io,[73] Jeffrey Marrazzo of Spark Therapeutics,[74] Bernardo Cordovez of Optofluidics,[75] Intergral Molecular[76]

[73] "High-Tech Company Says Goodbye Suburbs, Moves to New Workspace in University City," Philadelphia Business Journal (June 25, 2014).

[74] "Spark Therapeutics Establishes Permanent Headquarters in West Philadelphia," Spark Therapeutics (May 13, 2014).

[75] "University City Science Center Deciding Factor in Tech Firm's Move to Philadelphia," Philadelphia Inquirer (December 25, 2012).

[76] "About Us," Integral Molecular (2016).

APPENDIX A – DEMOGRAPHICS

TABLE A.1 – NUMBER OF FOREIGN NATIONALS LIVING IN SELECTED INNOVATION DISTRICTS

Country of Origin	University City	South Lake Union	Kendall Square	Oakland
Total	**9,220**	**6,430**	**3,792**	**2,702**
China, excluding Hong Kong and Taiwan	2,238	450	251	872
India	871	1,145	176	234
Korea	568	279	246	115
Germany	383	228	64	110
Bangladesh	374	0	7	0
Sierra Leone	324	0	0	0
Mexico	296	356	23	125
Vietnam	281	173	42	40
Ethiopia	244	201	102	10
Japan	244	283	205	50
Other Western Africa	215	51	0	0
Canada	196	585	93	99
United Kingdom, excl. England/Scotland	179	58	86	8
France	157	17	11	12
Taiwan	142	303	49	68
Egypt	121	13	4	9
Saudi Arabia	115	17	9	0
Cambodia	108	0	14	0
Russia	98	198	34	42
Kazakhstan	97	60	0	0
Philippines	94	263	0	10
Turkey	90	56	7	16
Colombia	87	0	27	9
Ghana	85	0	17	0
England	84	103	8	48
Dominican Republic	73	59	86	0
Australia	68	70	59	0
Lebanon	66	21	0	0
Spain	63	54	44	0
Thailand	60	27	0	0
Iran	56	79	0	27
Other Western Asia	51	0	39	0
Hong Kong	50	30	42	0
Romania	50	101	18	28
Guatemala	44	0	35	59

Country of Origin	University City	South Lake Union	Kendall Square	Oakland
Honduras	44	0	11	0
Kuwait	40	0	10	0
Argentina	36	0	0	0
Ireland	36	0	42	0
Singapore	36	47	65	20
Albania	35	19	0	9
Eritrea	35	53	16	0
Italy	32	39	105	105
Iraq	31	0	0	0
Morocco	30	24	4	0
Other Eastern Africa	30	0	3	17
Other Northern Africa	29	0	49	0
South Africa	27	0	24	67
Chile	26	0	18	17
Peru	24	36	57	34
Ukraine	24	14	12	0
Costa Rica	23	24	0	0
Kenya	22	39	0	0
Switzerland	22	22	16	0
Africa, n.e.c.	21	3	0	34
Nepal	20	0	111	22
Trinidad and Tobago	19	0	22	0
Croatia	18	0	0	0
Pakistan	18	0	22	107
Serbia	18	80	0	0
Brazil	17	47	168	15
Other Middle Africa	16	0	0	0
West Indies	15	0	0	0
Asia (unspecified)	14	0	0	6
Greece	14	0	10	8
Cameroon	13	0	8	0
Other Eastern Europe	13	52	8	13
Netherlands	12	0	31	0
Bulgaria	11	19	0	0
Burma	11	0	0	0
Venezuela	11	16	127	0
Other Caribbean	10	0	0	11
Bolivia	9	0	0	0
Nigeria	9	17	0	77
Belarus	8	0	0	0
Haiti	8	0	264	0

Country of Origin	University City	South Lake Union	Kendall Square	Oakland
Jamaica	8	0	43	23
Jordan	8	0	0	0
El Salvador	7	0	112	0
Barbados	6	0	0	0
Ecuador	6	0	37	0
Lithuania	6	0	0	0
Malaysia	6	0	56	10
Sudan	6	0	0	0
Oceania (unspecified)	5	0	7	9
Other South Central Asia	3	0	0	0
Austria	0	72	16	0
Bosnia and Herzegovina	0	44	0	0
Cuba	0	0	0	16
Denmark	0	0	15	0
Indonesia	0	33	0	0
Israel	0	47	27	0
Laos	0	156	0	0
Nicaragua	0	6	24	0
Other Australian and New Zealand Subregion	0	17	0	9
Other Northern Europe	0	25	0	0
Other South America	0	0	0	15
Other South Eastern Asia	0	0	0	9
Panama	0	2	30	0
Poland	0	27	16	8
Portugal	0	11	390	3
Scotland	0	0	3	0
Sri Lanka	0	83	0	0
Sweden	0	26	10	0
Syria	0	24	0	47
Uzbekistan	0	26	5	0

Source: American FactFinder (2014).

TABLE A.2 – LANGUAGES SPOKEN AT HOME IN SELECTED INNOVATION DISTRICTS

Language	University City	Kendall Square	Oakland	South Lake Union
Chinese	2,377	708	1,255	129
Spanish	1,714	803	624	124
Korean	696	110	208	21
Hindi	667	129	180	17
Other Indic	616	240	79	
Arabic	494	152	176	10
Gujarati	419		45	21
African	333	98	120	17
French	319	120	83	32
Other Asian	316	219	22	39
Russian	249	49	49	44
Vietnamese	241		54	39
Tagalog	147		14	8
Hebrew	162		25	
Japanese	120	155	102	16
German	100	64	19	13
Armenian	89			
Thai	86			
Urdu	83	63	55	
Other Indo-European	66		14	24
Scandanavian				11
Other Pacific Island		50	18	10
Italian		155	207	9
Serbo-Croatian		37	23	7
Portuguese		220		
French Creole		146		
Polish		33		
Other Slavic		28		
Yiddish			11	
Persian			31	
Hungarian			13	
Other				7

Source: Statistical Atlas (2016).

APPENDIX B – INCUBATORS AND ACCELERATORS IN SELCTED INNOVATION DISTRICTS

B.1 INCUBATORS AND ACCELERATORS

PHILADELPHIA[77]

- ACIN Camden Center for Entrepreneurship in Technology
- Bridge Business Center
- Bucks County Technology Park
- Burlington County Community College High Tech Small Business Incubator
- Center for Entrepreneurial Studies
- Corzo Center
- Delaware Technology Park
- Digital Health Accelerator (University City Science Center)
- Dorrance H. Hamilton Center for Culinary Enterprises
- Dreamit Ventures[78]
- Emerging Enterprise Center
- FastFWD[79]
- GoodCompany Group (result of a merger between the Good Company Ventures and Green Village Incubators in the of Winter 2012)
- Greenhouse Ventures[80]
- ic@3401 (University City Science Center)
- Innovation Center at Eagleview
- Independents Hall ("Indy Hall")
- Lankenau Institute for Medical Research Biotech Incubator
- Montgomery County Technology Center
- Novatorium
- Pennsylvania Biotechnology Center of Bucks County
- Philadelphia Fashion Incubator
- Port Business Incubator (University City Science Center)
- Project Liberty Digital Incubator
- PSLU Accelerator[81]
- Rutgers Camden Business Incubator
- Rutgers EcoComplex
- Skylight Coworking
- Southern Jersey Technology Park
- Stuzo[82]

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[77] "Incubators, Tech Parks, and Co-working Spaces in Greater Philadelphia Help Your Business Grow," Select Greater Philadelphia.

[78] "Incubators & Accelerators," NextPlex.

[79] "Philly's 'Super-Group' Startup Accelerator Targets Urban Problems," Forbes (January 5, 2016).

[80] "What We Do," Greenhouse Ventures LLC.

[81] "PSLU Accelerator," Philly Startup Leaders.

- Temple University at the University City Science Center's Port Business Incubator
- The Business Center for Entrepreneurship & Social Enterprise
- The Philadelphia Navy Yard
- Trenton Technology and Business Center
- University Technology Park
- VentureF0rth
- Waterfront Technology Center
- Wilmington Retail Incubator Program

BOSTON/CAMBRIDGE[83]

- Autodesk BUILD Space
- Bolt
- Cisco Entrepreneurs in Residence
- Cleantech Open Northeast
- Cogo Labs
- Cybersecurity Factory
- DCU Financial Services Center of Excellence
- EforAll
- Fairmount LaunchPad
- Greentown Labs
- Hack/Reduce
- HealthBox
- Idea – Northeastern's Venture Accelerator
- InnoLoft
- Leangap
- LearnLaunch
- Martin Trust Center for MIT Entrepreneurship
- MassChallenge
- NeuroLaunch
- PayPal's StartTank Boston
- Power Launch Accelerator
- Quincy Center for Innovation
- RaizLabs XLR8
- RevUp by BetaSpring
- Roxbury Innovation Center
- Smarter in the City
- Startup Institute Boston
- StepLadder
- TechStars
- TiE ScaleUp
- Venture Development Center University of Massachusetts Boston

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[82] "Startup Accelerator Program," Stuzo.

[83]."Boston Startup Accelerators, Incubators & Support Programs" Boston Startups Guide; "Incubators and Accelerators," Massachusetts Technology Collaborative

OAKLAND

- AlphaLab[84]
- Catalyst Connection[85]
- C-Leveled[86]
- Hustle Den[87]
- Idea Foundry[88]
- Pittsburgh Life Sciences Greenhouse Incubator[89]
- Riverside Center for Innovation[90]
- StartUptown[91]
- Smallman Gallery[92]
- Thrill Mill[93]
- Working Order Incubator[94]

SEATTLE[95]

- 9Mile Labs
- Accelerator Corp.
- CoMotion (UW)
- Eastside Incubator
- Entrepreneur's Organization
- Fledge
- Founder Institute
- HouseOGames
- Ivy Softworks
- Kick Incubator
- Madrona Venture Labs
- McKinstry Innovation Center
- Microsoft Ventures
- Reactor
- Seattle Fashion Incubator
- Startup NEXT (Up Global)
- SURF Incubator

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[84] "Incubators & Accelerators," NextPlex.

[85] "Co-working and Accelerator Project," Pittsburgh.gov.

[86] "Co-working and Accelerator Project," Pittsburgh.gov.

[87] "Incubators & Accelerators," NextPlex.

[88] "Incubators/Accelerators," Launch PGH (March 24, 2016).

[89]."PLSG Incubator," Pittsburgh Life Sciences Greenhouse.

[90] "Co-working and Accelerator Project," Pittsburgh.gov.

[91] "Incubators & Accelerators," NextPlex.

[92] "Restaurant incubator Launches in the Strip District- Now Accepting Applications for its First Class," Next Pittsburgh *(April 1, 2015).*

[93] "About Thrill Mill," Thrill Mill.

[94]."Working Order Incubator," Volunteers of America.

[95] "Mapping Seattle's incubators, accelerators and co-working spaces," Geekwire (March 20, 2015).

- TechBA
- Techstars
- Village88 Tech Lab

APPENDIX C – ADDITIONAL DETAIL ON TAX BURDEN ANALYSIS

TABLE C.1 – STATE AND LOCAL TAX RATES FOR SELECTED INNOVATION DISTRICTS (2016)

Type of Tax	Authority	University City	Kendall Square	Oakland	South Lake Union
Wage/Income[96]	State	3.07%	5.10%	3.07%	-
	Municipality	3.9004% (Res) 3.4741% (Non-Res)	-	1.00%	-
	School District	-	-	2.00%	-
Business	State	9.99% (CNIT)	8.00% (NI) + 0.26% (Property/Net worth) with minimum of $456 -	9.99% (CNIT)	0.471% (Retail) 0.484% (Wholesale & Manufacturing) 0.15% (Other) (GR, B&O Tax)
	Municipality	6.41% (NI) 1.415 mills (GR)	-	0.55% (Payroll Expense)	0.215% (Retail, Wholesale, and Manufacturing) 0.415% (Service and Other) (GR, Business License Tax)
Sales	State	6.00%	6.25%	6.00%	6.50%
	County	-	-	1.00%	-
	Municipality	2.00%	-	-	3.1%
Property[97]	State	-	-	-	-
	County	-	-	0.473%	-
	Municipality	0.63%	1.771%	0.806%	0.948564%
	School District	0.77%	-	0.984%	-
Use and Occupancy	Municipality	1.21%	-	-	-

Source: Philadelphia Revenue Department (2016). Washington State Department of Revenue (2016). Massachusetts Department of Revenue (2016). Pittsburgh Department of Finance (2016)

[96] State and local taxes on wages and income, while paid by employees and not employers, is considered part of the employer's tax burden because it ultimately means more or less take-home pay for their employees and therefore is a source of competitive advantage or disadvantage from jurisdiction to jurisdiction.

[97] Local property taxes and related taxes (e.g. the Use and Occupancy tax in Philadelphia) are not considered part of the employer's tax burden because they are assumed to be accounted for in the rents paid by employers for their space.

TABLE C.2 – ARCHETYPICAL BUSINESS FOR TAX BURDEN ANALYSIS FOR SELECTED INNOVATION DISTRICTS [98] [99]

Industry	Employment	Revenue ($M)	Profit ($M)	Wages ($M)
Scientific Research and Development	35	$118	$76	$3
Pharmaceutical and Medicine Manufacturing	109	$140	$14	$9

Source: United States Census Bureau SUSB, Bizstats.com (2013)

TABLE C.3 – SAMPLE METHODOLOGY FOR TAX BURDEN ANALYSIS[100] [101]

Corporate Net Income	Payroll Expense Tax
Location: University City Industry: Scientific Research and Development = Business Net Income Tax Rate x Portion of Sales in Jurisdiction x Net Profits	Location: Oakland Industry: Pharmaceutical and Medicine Manufacturing = Payroll Expense Tax Rate x Wages

Source: Econsult Solutions (2016)

TABLE C.4 – TAX BURDEN BY TAX TYPE FOR SELECTED INNOVATION DISTRICTS (IN $THOUSANDS)

Location	Industry	Net Income	Gross Receipts	Income Tax	Payroll Tax
University City	Scientific R&D	$664	$3	$206	$0
	Pharmaceutical Manufacturing	$120	$4	$629	$0
Kendall Square	Scientific R&D	$454	$23	$157	$0
	Pharmaceutical Manufacturing	$82	$27	$472	$0
Oakland	Scientific R&D	$567	$0	$186	$17
	Pharmaceutical Manufacturing	$102	$0	$562	$51
South Lake Union	Scientific R&D	$0	$47	$0	$0
	Pharmaceutical Manufacturing	$0	$57	$0	$0

Source: Econsult Solutions (2016)

[98] "2013 SUSB Annual Data Tables by Establishment Industry," United States Census Bureau.

[99] "2015 Financial Content, 5000 Industry Choices, Local-US Industry Financials," Bizstats.

[100] "2013 SUSB Annual Data Tables by Establishment Industry," United States Census Bureau.

[101] "2015 Financial Content, 5000 Industry Choices, Local-US Industry Financials," Bizstats.