

NEW YORK HEARTS TECH
Tech in the City under Bloomberg

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Introduction

From Austin's Silicon Hills, to Louisiana's Silicon Bayou, Southern California's Silicon Beaches to the Midwest's Silicon Prairie, cities across the country have been actively courting tech. New York City is no exception. Since the financial crisis, the Bloomberg administration has pursued tech as a way to diversify the City's economy. Over the past four years, the government has introduced a suite of tech-focused economic development initiatives, including competitions, incubators, and a well publicized (and expensive) campaign to overhaul the state of the City's engineering education. Simultaneously, the growth of the City's tech industry has been remarkable by any measure – companies, jobs, investment, or community network.

Much of the government's attention has been directed at the purported shortage of local tech talent. Less evaluated has been the government's impact in directing tech's growth. This thesis asks thus to what extent the Bloomberg administration's tech agenda has impacted the tech community and contributed to its resurgence in the City. I derive my answer from both a detailed survey of the tech community, as well as from targeted interviews with winners of government-sponsored competitions, academics and industry leaders. My research finds the tech community considerably more impacted by and reliant for its growth on the City's existing competitive advantages (its strength and diversity across industries, its skilled labor force, its global economy and its livability) than on the direct and visible support of the government.

Tech's Rise in New York City

Tech's resurgence in the City has been well documented. As the authors of Center for an Urban Future's *New Tech City* report write, "any way you measure it – companies, jobs, investment or community – New York has experienced stunning growth..."¹ What makes tech's rise even more remarkable, the report adds, is that it has occurred at a time when very few other City industries are growing.

Employment

Although there is no standardized approach to measuring tech employment (as discussed within the Methodology), a cross-section of data and methodologies all point to New York's considerable job growth in tech year over year. According to Center for an Urban Future, while the City's private sector grew in employment by only 3% between 2007 and 2012, tech jobs (measured as IT) grew by almost 30% (from 41,100 employees to 52,900). The executive search firm Cook Associates reported earlier this year that the City saw a 19% increase in tech jobs (pure-play Internet and digital media) during the 2012 calendar year alone, and the company predicts "healthy" employment gains for the City this coming year.² Data from EDC meanwhile (using a more expansive definition of tech), indicates in 2010 there were already 90,273 people working in tech at over 7,000 local companies, a 30% gain in employment from 2005. Tech sector employment reportedly grew ten times faster than the overall change in City employment during the same time.³

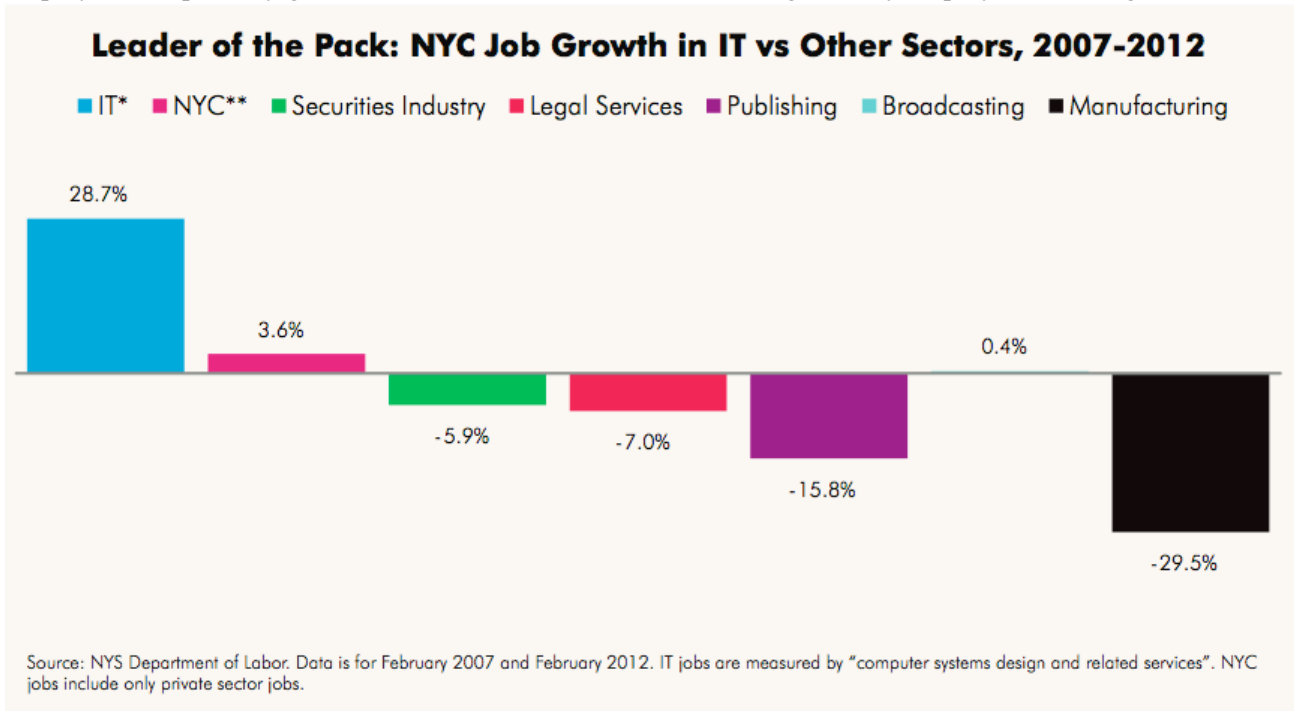


Figure 1. Leader of the Pack: NYC Job Growth in IT vs Other Sectors, 2007-2012.

New Company Formation

Center for an Urban Future identified in their report (using data collected through April 2012) 486 startups formed in the City since 2007 that have received angel, seed or VC funding. The Center estimates an additional 1000 startups that have not secured investment capital are also located in the City.⁵ The Mayor's Office for Media and Entertainment's *We Are*

¹ *New Tech City*.

² <http://www.cookassociates.com/media-center/press-releases/2013-press-releases/bid/94385/New-York-and-Boston-Jobs-Growth-Continues-Decline-Fourth-Quarter-2012-Internet-and-Digital-Media-Jobs-Index>. May 2013.

³ *New Tech City*.

⁴ *New Tech City*. 7.

⁵ *New Tech City*

Made in New York campaign meanwhile lists 986 startups on their website that have more than one employee, 75% or more of their employees based in New York and at least 10,000 subscribers.⁶

The precise value of the overall tech sector is hard to quantify as the majority of City startups are privately held. However, one confirmation of economic value comes from recently released data on local M&A activity. PrivCo's *Private Tech Company M&A Report for 2012* reported the sale of 100 City high tech firms over the past year, at a total price of \$8.3 billion. The City ranked second for acquisition volume and value nationwide, losing only to Silicon Valley (the Valley totaled 226 deals for the year for \$21.5 billion). Boston, the West Coast's longtime rival, was a distant third with 62 deals and \$1.7 billion. New York also had 2012's largest single tech acquisition: \$2.2 billion paid for AboveNet by Zayo Group. PrivCo also revealed that the City's average deal value of \$83 million is a significant increase from previous years, when the average was in the \$30-40 million range. Exits are important (and important as a data point), says Michael Moynihan, Chief Economist at EDC, because they not only validate new technologies by providing strong returns, but because they support this virtuous cycle by releasing funds for new rounds of investments.⁷

Venture Funding

The City had the highest growth rates in the nation in VC deals and VC funding. The number of deals, 97, and their value, \$572 million, represented a 24% increase over the City's third-quarter figures.⁸ The even distribution of deals between Seed, Series A and later rounds, suggests that financing is available at all stages of the fundraising process. According to the EDC (with data from CB Insights), VC funding for the City topped \$2 billion in 2012. Broken down by type, this included \$115 million in seed funding, \$467 in Series A and \$449 million in Series B. Disaggregated by sector (again, by CB Insights), the Internet sector received the most funding followed by healthcare and mobile/telecommunications. The top deal for the year was a \$101 million round raised by e-commerce design website Fab.com, followed by a \$68 million round by social product development company Quirky and a \$53 million financing round by market data provider Street Response Labs.⁹ (Fab.com is the seventh private digital company to have risen over \$100 million in capital since 2008).¹⁰

Until four or five years ago, City startups struggled to access investment capital. Between 2007 and 2011, however, New York City was the only tech region in the United States with an increase in the number of VC deals. Activity here increased 32% during this period, whereas venture activity was down significantly in every other region, including Silicon Valley (-10%) and New England (-14%). There were almost as many City tech-related VC deals in 2011 (165) as in 2006 and 2007 combined (172), according to data by SeedTable.¹¹ Growth in local venture activity is even more pronounced when including data from last year: between 2007 and 2012 venture capital deals in the City have grown by 52%.¹²

Increasing Presence of Venture Firms and Other Support Infrastructure

Increases in local venture capital investment reflect not only a growth in local tech activity, but a growing number of players in the City's venture capital community as well. The boutique investment bank Gridley & Company LLC estimates that as of December 2012 there are approximately 150 investors nationally with a focused interest on the City's tech sector. This figure represents firms focused on startups at all stages of growth, from Seed through to Buyout. While

⁶ The City has proved fertile ground for starting businesses in every industry – not just tech. In March 2013, Center for an Urban Future published its *New York New Business* report. Using data from the New York State Department of State, the authors of the report describe the entrepreneurial explosion in the City over the past 20 years. Citywide the percentage growth in business incorporations rose 86% percent between 1991 and 2011, with the largest percentages in growth in the outer-boroughs: 305% growth in the Bronx, 161% in Brooklyn, 128% in Queens, 93% in Staten Island, and 25% in Manhattan respectively. Of all the boroughs, however, Manhattan saw the largest number of startups incorporated in 2011 (the last year for which they have data), and the most startups per capita (143 startups per 10,000 residents).⁶

⁷ www.nycedc.com/blog-entry/new-york-citys-tech-boom. May 2013.

⁸ PricewaterhouseCoopers/National Venture Capital Association MoneyTree report; data from Thomson Reuters.

⁹ www.nycedc.com/blog-entry/new-york-citys-tech-boom. May 2013.

¹⁰ Gridley & Company

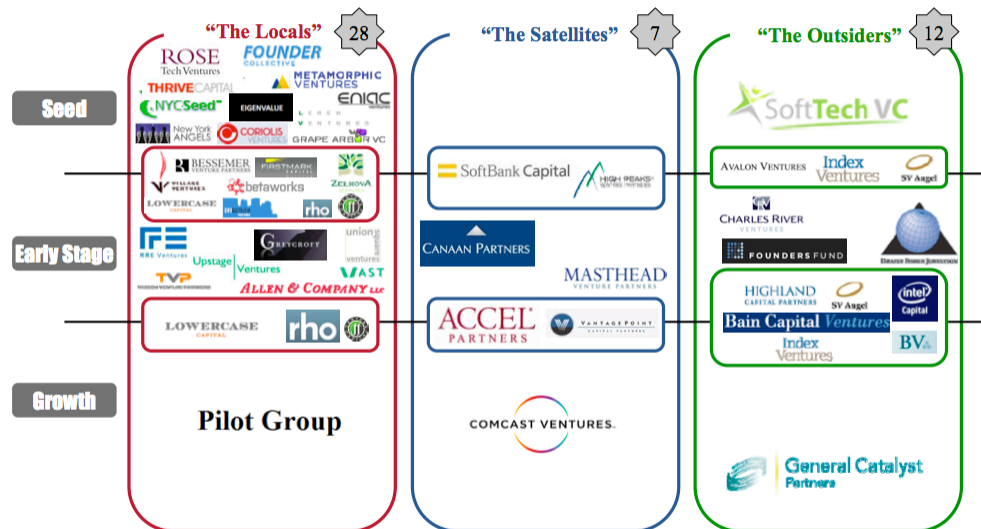
¹¹ *New Tech City*

¹² <http://nyunews.com/2013/02/28/tech-2>. May 2013.

some of these venture firms have little or no physical presence in New York, the report claims the majority of active local investors are headquartered in the City. Indeed, several of these local VCs have played significant roles in directing the City’s tech growth over the past few years, acting as community leaders, mentors and advisors, as well as political liaisons with the City. Fred Wilson, for example, City-based venture capitalist and influential blogger, established his first venture firm in the City in 1996 and shepherded the industry through the first dot.com wave and its mid 2000s resurgence. After key early investments in companies like Twitter, Tumblr, Foursquare and Zynga, he now sits on multiple judging panels for EDC contests and awards, and is an active board member for a handful of recently opened tech-focused secondary schools across the City.

“The All-Stars” - VC/PE Firms with at Least 5 NY Area Digital Investments

• January 2008 – October 2012



Source: Capital IQ, TechCrunch, public filings, and press releases

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Gridley & Company LLC

Figure 2. New York City’s Venture Capital/Private Equity Orbit, 2008-2012

Beyond the classic venture industry infrastructure there is a growing number of privately run incubators and accelerators, as well as co-working spaces. *New Tech City* reports that prior to 2009 there were no tech accelerators in the City, and only a handful of incubators and co-working spaces. Today by comparison there are close to 30 of these shared spaces, which the report estimates had graduated over 500 companies by May 2012. The increase in the number of such spaces reflects the growth in demand. The wildly popular and competitive accelerator program TechStars, for example, which opened its doors in the City in 2011, received 1,700 applications this past March from 420 cities across 66 countries.¹³ The company received 1,600 applications for its third class in March last year, up from 1,100 and 600 applications respectively for its two admissions cycles the year before.¹⁴ Twelve spaces are awarded each year.

This support network also extends to the local tech startups that have assumed the role of tech educators. These companies, the largest of which is General Assembly, exist to strengthen the skills of those already working in the industry as well as to introduce tech skills to the un-initiated. Unanticipated community demand led General Assembly to quickly outgrow its original space. The startup responded by not only acquiring a much larger second campus a block away, but also by expanding to Boston, San Francisco, Los Angeles, Sydney, Hong Kong, two locations in London and two locations in Berlin as well (!). General Assembly is itself not only a product of the community, emblematic of tech’s rise, but also an important progenitor of community and perpetuator of its organic growth. At the time of the company’s New York expansion, Adam Pritzker, co-founder and chief product officer, told a reporter, “We set out to build this [New

¹³ TechStars website. May 2013.

¹⁴ *New Tech City*

York] community and one of the things the community asked for were classrooms... This is a continuation of what we've been doing. When we initially started it was a grass roots community building effort. We wanted to build a community for technologists, designers, and entrepreneurs... New York represents a lot of different stakeholders and a lot of different types of businesses... GA represents the convergence of all those things. The informal piece [common areas] are as important as the formal piece [workshops] and it's the combination of those two things that can lead to something amazing."¹⁵ In the past six months two additional education-driven startups have opened branches in the City (Center for Social Innovation and Startup Institute), as local demand for tech skills and additional networking opportunities continues to outstrip supply.

Commercial Real Estate Absorption

The term "Silicon Alley" is often used by the media just in reference New York's tech *scene*, but as the name suggests, it has physical implications as well. According to commercial real estate firm Cassidy Turley, the media/information and computer/tech sectors leased roughly six million square feet of office space in Manhattan in 2011, nearly double the figure from 2010 (3.84 million). CB Richard Ellis reports meanwhile that the tech/media sector accounted for 13% of Manhattan's overall leasing in 2011, up from 11% in 2005.¹⁶ According to Cushman & Wakefield, technology and media companies combined ranked as the City's top leasers of space in the first quarter of 2012, accounting for 28% of new leases signed for that period, compared with 26% for finance (the longtime leader).¹⁷

Midtown South, referred to by commercial leasing professionals as "the hottest market in the country,"¹⁸ and "most desired commercial real estate market," ended the first quarter of 2012 with a 5.9% vacancy rate, down 2.1% from the year before. The area outpaced every other market in New York City. Data from Cushman & Wakefield from the second quarter of 2012 had Midtown South with the lowest vacancy rate of all central business districts in the nation. "Historically, Midtown was the location that companies flocked to for affordable rent following a recession, but that's not the case this time," Cushman & Wakefield's senior economist said in a statement to the press, crediting tech's ascension for Midtown South's new fortune.¹⁹

Tech firms now also increasingly have to look at other markets in the City in their search for office space. Leasing professionals believe the market will force tech's movement downtown and to Brooklyn: "The market is going to force [movement towards Brooklyn]. In 2002, people didn't want to go to Dumbo, either. But it's going to happen, because it has to."²⁰

The administration for its part is also trying to redirect some of tech's activity downtown. As detailed later in this study, a handful of EDC initiatives encourage some of the industry's physical expansion into Lower Manhattan. EDC hopes that tech's migration downtown will further diversify the office market and strengthen the area's recovery from 9/11 and Hurricane Sandy. So too, the Brooklyn Downtown Partnership, in conjunction with other nearby Business Improvement Districts established the Brooklyn Tech Triangle initiative late last year in their bid to promote the Downtown Brooklyn area as thriving place for tech. Data from the Partnership's *Economic Impacts of the Tech and Creative Sectors* report, which they published last year show that there are currently over 9,000 technologists employed in the area, occupying 1.7 million square feet of office space. In proof of the City's centrifugal tech activity, 30% of the firms surveyed for the study reportedly started in one of the other NYC boroughs and relocated to Brooklyn, while 12% of the firms surveyed moved to Brooklyn from other (non-NYC) places in the US and abroad.²¹

Growth of Tech Media and Events

The number of local tech (web)publications and blogs has increased significantly in the past couple of years. These industry-focused publications include Valley transplants as well as local startups, and exist as either standalone, tech-centric operations or as arms of more generalized media (*The Observer's BetaBeat* for example). The Valley's

¹⁵ <http://techcrunch.com/2012/06/19/ga-nyc-expansion>. May 2013.

¹⁶ *New Tech City*.

¹⁷ <http://www.datacenterjournal.com/it/nycs-changing-commercial-tenant-landscape-and-growing-broadband-needs/>. May 2013.

¹⁸ <http://commercialobserver.com/2012/04/the-big-squeeze-how-technology-start-ups-found-midtown-south-and-what-happens-when-the-bubble-bursts/>. May 2013.

¹⁹ <http://www.bloomberg.com/news/2012-07-10/manhattan-midtown-office-rents-slip-as-silicon-alley-favored.html>. May 2013.

²⁰ <http://observer.com/2013/02/tech-in-downtown-brooklyn-inevitable-despite-firms-reluctance/>. May 2013.

²¹ <http://brooklyntechtriangle.com/assets/Brooklyn-Tech-Triangle-Economic-Impact.pdf>. May 2013.

TechCrunch and *VentureBeat* opened their New York offices in May and October of last year respectively. AlleyWatch, one of the more prominent and prolific of the local startups, and self-proclaimed “Pulse of Silicon Alley,” meanwhile was founded late last year and serves as a one-stop shop for all community news and events. The site also publishes a (uniquely helpful) weekly series of Made in NY™ interviews, asking CEOs listed with the Mayor’s Office’s campaign about what the campaign means for them, as well as what working in tech in New York means more generally.

As the sector continues to grow, so too have the number of meetups, happy hours, demos and other networking events. WNYC’s *New Tech City* blog estimates hundreds of events a month are held throughout the City. The blog calls the New York Tech Meetup the “crown jewel” of City tech events. The Meetup, founded with a handful of members in 2004 has grown to over 31,000. Tickets to its monthly demos, which cost \$10 to attend, sell out in minutes (the demos are “more popular than a Dylan concert”²² according to one tech interviewee), and have spawned an active secondary market. The event also streams live online, and according to the WNYC blog, groups convene all over the City to watch together. Technologist David Rose told Center for an Urban Future’s *New Tech City* authors, “You just have to go to any of the dozens and dozens of tech related meetups in the city, or go to New York Tech Meetup, or the other events happening here, and it is absolutely apparent in your face that this is a vibrant living community.”²³

Webby nominations released earlier this month are just the latest salvo for the City’s tech community. *Crain*’s reported that New York Internet companies received 99 more nominations than California businesses. The “Internet’s highest honor” (according to the *New York Times*²⁴) recognized 279 City organizations for advances online and use of social media. New York’s increasingly starker showing at the Awards is another important and visible barometer of the sector’s growth. As David-Michel Davies, the executive director of the Awards told the press: “It’s really striking [to see] how well-known and well-used a lot of these Internet products are from New York. I don’t think that was the case five years ago....My expectation was that New York would have a strong showing in media and marketing, but we saw nominations from all categories...small and big. There isn’t a particular area that New York isn’t dominating.”²⁵

The amount of press the local tech industry receives has even become its own punch line. So too, tech’s rise has generated some of the most hyperbolic economic development writing yet encountered: “The NYC tech start-up ecosystem is pregnant with some awesome potential. This fact is accentuated further by the “aphrodisiacal” intensity with which NYC tech start-up ecosystem is mushrooming. The dizzying momentum attributed this ecosystem, and what it has nurtured and curated, blows any comparison out of the stadium. With intent, investors and talent for Hi-Tech seeping in the NYC core, a rich bed for Hi-Tech ecosystem is being prepared. Given this ecosystem, Hi-tech success stories will proceed to announce their existence like tomorrow.”²⁶ Indeed, you couldn’t make this stuff up.

²² <http://www.wnyc.org/shows/newtechcity/blogs/new-tech-city-blog/2012/oct/09/tech-booms-new-york-city-so-do-meetups/>. May 2013.

²³ *New Tech City*.

²⁴ <http://www.crainsnewyork.com/article/20130410/TECHNOLOGY/130419995>. May 2013.

²⁵ <http://www.crainsnewyork.com/article/20130410/TECHNOLOGY/130419995>. May 2013.

²⁶ Forbes.com’s Bhriku Pankaj Prashar. <http://www.forbes.com/sites/bhrigupankajprashar/2012/08/10/why-hasnt-nyc-produced-many-tech-ipos/>. May 2013.

“Talent Crunch” as a Key Driver of Government Action

It is clear why the New York City administration has been keen to help grow the tech sector: it is a source of highly paid employment, directly and indirectly, during a national recession – a time of high unemployment, which has hit financial services, one of New York’s key industries, particularly hard. (Tech’s appeal for city governments is further explicated in the Appendix).

An April 2012 study for the borough of Brooklyn illustrates tech’s substantial direct and indirect effects on local employment. Three Brooklyn Business Improvement Districts commissioned a study last year to assess the economic impact of the Brooklyn Triangle’s tech and creative sectors (an area that includes Downtown Brooklyn, the Brooklyn Navy Yard and DUMBO), and the sectors’ potential for growth in the greater Downtown Brooklyn area.²⁷ By applying average annual growth rates from the past five years of local employment data to current estimates of firms and employees to determine short term job growth, the Initiative’s analysis implies that direct tech and creative employment within the Triangle supported an additional 23,000 jobs throughout Brooklyn in 2012, and is projected to support an additional 43,000 jobs in 2015:

	2012	2015
Direct Jobs	9,628	17,960
Total (Direct and Indirect) Jobs	32,735	61,065
Direct Economic Impact Output 2012 DOLLARS, IN MILLIONS	\$2,461.4	\$4,591.5
Total Economic Impact Output (Direct and Indirect) 2012 DOLLARS, IN MILLIONS	\$3,137.5	\$5,852.8

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Figure 3. Economic Impacts from the Tech and Creative Sectors in the Brooklyn Tech Triangle, Current & Projected

It is also clear (and will be amplified in a later section) that a large part of the administration’s agenda has been concerned with improving the supply of local tech “talent.” To understand why the City has focused on this particular supply-side approach to development it is necessary to appreciate how pervasive is the notion that New York City suffers from a dearth of said “talent.”

The Talent Crunch

“Start-up CEOs speak of “talent” so gravely that one thinks of sorcerers who can conjure living things, and although ace engineers can’t quite create life, the mystique reflects a very real competitive force. People who are good at writing thousands of lines of scalable code, and who are good at anticipating the thousands of unlikely ways that code can fail, are extremely rare.”²⁹ Center for an Urban Future’s *New Tech City* report

According to Center for an Urban Future, the *foremost* challenge to perpetuating tech’s growth in the City is the “dearth of top-flight engineering talent.”³⁰ The report’s pages are lined with quotes from founders and CEOs of local startups who reiterate this point. The Center is not alone. In tech data portal Startup Genome’s comprehensive 2012 *Startup Ecosystem Report*, New York City ranks 12th out of 20 world cities in the Talent Index, by far the City’s weakest link (the City ranks 5th overall). Likewise, in a report from Manhattan Borough President Scott Stringer’s office, *Start-Up City: Growing New York City’s Entrepreneurial Ecosystem for All*, released at the end of last year, Stringer lists the “Talent Shortage” as the number one area of concern expressed by local tech sector business leaders. Back in December 2011 entrepreneur and blogger Ben Parr published a blog entry titled “The Talent Crunch Will Define the Tech Industry in 2012,” in which he

²⁷ <http://brooklyntechtriangle.com/assets/Brooklyn-Tech-Triangle-Economic-Impact.pdf>. May 2013.

²⁸ <http://brooklyntechtriangle.com/assets/Brooklyn-Tech-Triangle-Economic-Impact.pdf>. May 2013.

²⁹ “New Tech City.” Center for an Urban Future. 36. May 2012. <www.nycfuture.org>

³⁰ “New Tech City.” Center for an Urban Future. 36. May 2012. <www.nycfuture.org>

emphasized his prediction that 2012 would be the year “it hits the breaking point and the general public starts paying attention to the engineering talent wars.”³¹

In an opinion piece for *Forbes* titled “An Insider’s View of Silicon Alley’s Talent Feeding Frenzy” from October of last year, David Wood, CTO at video-ad platform Jun Group, provides a particularly vivid picture of the City’s hiring craze:

Over the past 20 years, I’ve been a developer, a manager and an entrepreneur, for the last several, the CTO of a New York-based startup. Having lived through the first Internet bubble, investor excess and wild job market swings don’t surprise me. But the current feeding frenzy is big enough to feel like uncharted territory. In its scale and lack of discrimination, it goes well beyond the last bubble. It crystallized for me on June 22nd of last year, when Craigslist had 67 listings for developer jobs posted in a single day.

These postings, which, in 2006 would likely have garnered a few dozen responses, were drawing just six or eight by 2009. And starting last year, many were getting no response at all. These ads, which had once avoided mentioning salary figures, now began to include them. Then the whole industry watched as the numbers trended sharply upwards. In the space of 24 months, average salaries for senior developers jumped from \$100,000-\$115,000 to \$150,000, where they remain today. A few desperate businesses could be seen hitting the \$175,000 and even \$200,000 mark. Signing and referral bonuses jumped from \$1,000-\$5,000 to \$10,000, then \$25,000. Vacation days shot up. Options became equity grants.

Corporate titans like Google and Facebook were dogfighting for each others’ employees. The industry’s quiet (and illegal) anti-poaching agreements were falling apart. Flush with freshly printed money, investors were plowing it into venture capital and private equity portfolios, which in turn, showered it on what they believed were promising sectors of the economy...

It was late last year when we saw the first job posting promising a free iPod just for agreeing to come in for an interview. Even boozy informal “hacker” get-togethers were collecting multiple “sponsors,” driving the hackers to arrange social events practically in secret, to avoid being harassed by desperate would-be employers. A company called DeveloperAuction has actually begun auctioning qualified software developers to the highest bidder...³²

In addition to the escalating salaries, signing bonuses and other employee enticements Wood describes, New York’s tech press has covered multiple other ploys. As the WNYC blog notes, many of the industry’s meetups and networking events function not just as vehicles to pitch products and ideas to investors and end-users, but sometimes more importantly, to recruit other engineers.³³ Likewise, much has been published about how the City’s coworking spaces, where multiple startups work side by side, are hotbeds for employee-poaching. Tech websites and business journals have also documented the growing ‘acqui-hire’ craze – startup acquisitions aimed squarely at bringing in talent.

And if acquiring active startups for their talent seems too forthright, New York venture capital and angel investment database CB Insights released earlier this year their list of “dying tech startups.” The company boldly and bluntly introduces the concept on its website: “Solving the Tech Talent Crunch – Find Dying or Cash-Starved Startups and Poach Their Talent.”³⁴

Things have gotten so bad as of late on the hiring front it seems, that the Partnership Fund for New York City, in conjunction with risk management and insurance brokerage firm Aon, published in their April 2013 “New York City as a Destination of Choice for Talent” report a recommendation that the City’s administration establish a new post at City Hall, that of a Chief Talent Officer, to manage the city’s pipeline of human capital. According to a *Crain’s* article covering the report, while Democratic mayoral candidates seem largely in favor of the idea, Republican candidates have dismissed it as a “bureaucratic obstacle to entrepreneurship.”³⁵ The dénouement, however, to the tech hiring saga is perhaps another Silicon Valley gambit transplanted east. Earlier this month, *Bloomberg Businessweek* reported in “Silicon Valley Goes Hollywood: Top Coders Can Now Get Agents” that the West Coast firm 10X Management is currently making headlines as the first tech talent agency, already representing scores of talented tech freelancers.

³¹ <http://benparr.com/2011/12/talent-wars-the-return-of-the-engineers/>. May 2013.

³² <http://www.forbes.com/sites/ciocentral/2012/10/10/an-insiders-view-of-silicon-alleys-talent-feeding-frenzy/>. May 2013.

³³ <http://www.wnyc.org/articles/wnyc-news/2012/may/16/engineer-led-start-ups-add-hiring-crunch/>

³⁴ <http://www.cbinsights.com/blog/trends/tech-talent-crunch>. May 2013.

³⁵ <http://www.crainsnewyork.com/article/20130326/ECONOMY/130329901>. May 2013.

But What Can Be Made of This?

While there is, as described, significant anecdotal evidence to support the City's hiring crunch, little direct empirical research has been published. One exception is the "America's Tech Talent Crunch" report, released in March this year by the national tech job board Dice. The report provides a snapshot of the cities with the greatest number of tech job postings on any given day, as well as an overview of those cities with tech hubs growing the fastest in terms of hiring. The company's data reveals New York City is the national talent crunch leader on any given day, with 8,829 IT postings on the job-search website in early March 2013.³⁶ The one-day snapshot shows a 60% jump from the low ebb of the recession two years ago. However, New York State ranked fourth on Dice's list of shortage states for STEM graduates. California, the home of it all, is number one.³⁷ That is, shortage of talent may not be a sign of impending failure, so much as a sign of success.

Moreover, this success not only exerts pressure on the job market for talent, but acts to discourage talent from seeking employment in favor of building businesses directly. Fundamentally lower barriers to entry to tech, due to advances in programming languages and cheaper hardware, combined with relatively easy access to earlier round financing, means more skilled individuals can go into business themselves: "You're not just facing competition from other companies... If you're a smart person, chances are you can get funding for your own company. The same force which is creating such a demand for engineers as employees is also creating demand for engineers to be their own boss and start their own companies."³⁸

In addition, the City's core industries are also competing with tech startups for engineering talent. As Jay Bhattaacharya, founder of local fin-tech startup Zipmark, told authors of "New Tech City," while fin-tech requires customized engineering prowess to deal with complicated security issues, very few, if any, startups can match the salary levels that engineers command at Goldman Sachs or JP Morgan.³⁹ So too, financial companies with deep pockets are also able to outcompete small startups when it comes to funding immigration battles, supporting recruits through the H1B visa process in a way firms with fewer resources cannot.⁴⁰

Educating and Keeping More Talent

Rather than focus on these issues as either endemic to all successful tech locations or as indicative of and a consequence of the success of New York's diversified economy, politicians, the media, and the tech industry alike have criticized New York City's academic infrastructure for not graduating enough engineers, entrepreneurs or new businesses. For Jun Group's David Wood, local academic deficiencies are readily apparent: "... When we see labor shortages in fields like software development, while overall employment remains at a national crisis, we can look nowhere else than at our education system." Said Mayor Bloomberg, meanwhile, at last year's Internet Week, "The fact that [New York startup] companies are having to go round the country and around the world to find talent tells you it has a lot more to do with our public school system and our universities. We have great engineering schools. We just don't have enough of them."⁴¹

³⁶ It is worth noting, however, that this is raw data and not normalized to population size or any other relevant metric. Their findings also raise other methodological concerns about tech's definition, as discussed in the Methodology section of this thesis (found in the Appendix.)

³⁷ http://marketing.dice.com/pdf/Dice_TechTalentCrunch.pdf. May 2013.

³⁸ Tom Lehman, founder of Rap Genius at a recent tech job fair in the City. <http://www.wnyc.org/articles/wnyc-news/2012/may/16/engineer-led-start-ups-add-hiring-crunch/>. May 2013.

³⁹ *New Tech City*. 36.

⁴⁰ Indeed, national immigration laws remain a sizeable obstacle. The "New York City as a Destination of Choice for Talent" report recommends that the City and the State change license and accreditation laws to make it easier to recruit foreign workers who have already received similar accommodations in their home countries. Immigrant entrepreneurship has long been documented as a significant driver of domestic economic growth. Research from the Information Technology Industry Council shows that across all industries foreign-born graduates raise U.S. GDP by an estimated \$37 billion each year. In addition, the Council found that for every 100 foreign-born STEM graduates, 262 additional jobs are created.⁴⁰ An influential study in 1999 by UC Berkeley's Dean of Information, AnnaLee Saxenian, meanwhile, found that immigrants established a quarter of all Silicon Valley technology companies started between 1980 and 1998. More recently, for example, a 2012 study by the Partnership for a New American Economy, revealed that 76% of patents issued in 2011 to the top 10 patent-producing universities had at least one foreign-born inventor. <http://www.itic.org/public-policy/workforce>. May 2013; <http://engine.is/blog/posts/high-skilled-immigrants-driving-u-s-innovation>. May 2013.

⁴¹ http://www.huffingtonpost.com/2012/05/16/new-york-tech-sector-boom-jobless-rate-digital-map_n_1518875.html. May 2013.

Others have gone further and accused New York’s academic institutions of ignoring opportunities to collaborate with industry in fostering innovation, comparing them unfavorably with institutions that have “expanded their mission beyond that of basic research and teaching to become places where knowledge fuels patent development, business collaborations and incubators for startups.”⁴² In places such as Boston, San Diego, the San Francisco Bay area, and the “Research Triangle” of Raleigh, Durham and Chapel Hill in North Carolina for example, “academic research institutions ... have served as laboratories for new businesses in emerging technology sectors—including biotechnology, nanotechnology, digital media, software development, computer and communications hardware, clean-tech and telecommunications... [Some of these firms] have achieved explosive growth, collectively creating thousands of jobs and billions of dollars in economic activity.”⁴³ Perhaps the best example is MIT in Boston: according to a 2009 study, an estimated 6,900 companies founded by MIT graduates are currently located in Massachusetts; those firms employ just under one million people worldwide and account for 26 percent of the sales of all companies in the state.⁴⁴

While New York City academic research institutions are among the world’s leaders in generating royalties from their discoveries, one report claims these schools have lagged behind their counterparts in other regions when it comes to converting their research into start-up companies.⁴⁵ Within the City’s tech sector, more pertinently, the same report found that “hardly any” of the firms had emerged out of research at the City’s scientific research institutions. So too, many of the companies spun off from local institutions had reportedly established their operations elsewhere.⁴⁶ Another report meanwhile shows California institutions UC Berkeley and Stanford have much greater success keeping alumni companies nearby (with 88% and 85% of graduating companies remaining local respectively).⁴⁷

In “Building New York City’s Innovation Economy,” CUF also argues that the City is behind other tech regions when it comes to engaging local industry with its academic institutions: “New York City ranks well behind every other major technology region in the amount of industry-financed R&D going to its colleges and universities, a deficiency due in large part to its limited engineering presences... ‘New York City has great research, great inventions, but most of the academic institutions have absolutely no concept on what it takes to move things down the commercialization path.’”⁴⁸

Although CUF’s report and data date from 2009, and the City’s tech sector has grown considerably in these interim years, the relevance of the authors’ assertions remains. Both of the report’s two main contentions – that New York schools 1) do not graduate enough engineers or entrepreneurs (to support the City’s growing tech sector), and 2) do little to keep the few engineers and entrepreneurs they do graduate local – are supported by more recent studies. The recent Dice “Talent Crunch” report cited earlier reveals over the past five years the number of STEM graduates in the state has “absolutely cratered,” falling more than 30%.⁴⁹ Meanwhile, Aon and the Partnership Fund for New York use 2012 data from the City to provide a snapshot of STEM graduate school education in the City today. Engineering and Math & Computer Sciences together constitute a mere 14% of degrees conferred:

⁴² <http://nycfuture.org/research/publications/building-new-york-citys-innovation-economy>. May 2013.

⁴³ <http://nycfuture.org/research/publications/building-new-york-citys-innovation-economy>. May 2013.

⁴⁴ <http://nycfuture.org/research/publications/building-new-york-citys-innovation-economy>. May 2013.

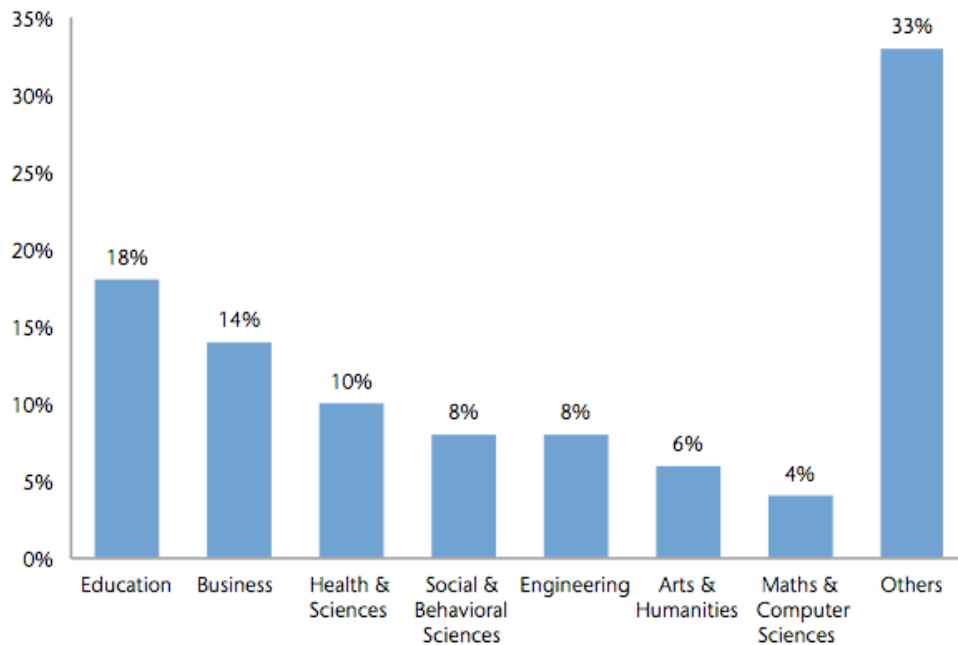
⁴⁵ In more recent research from the Partnership for a New American Economy, no City institutions made the top ten U.S. patent-producing universities for 2011.

⁴⁶ Other (non-CUF) studies also support these findings of local “alumni leakage.” Venture capital and angel investment database CB Insights profiled entrepreneurial activity associated with NYU alumni in their Winter 2012 *University Entrepreneurship Report*. The report, which uses data from 2007 to 2011, found that while the large majority of NYU alumni establish their companies within New York State, a third do not. <http://www.cbinsights.com/blog/venture-capital/university-entrepreneurship-report>. May 2013.

⁴⁷ <http://www.cbinsights.com/blog/venture-capital/university-entrepreneurship-report>. May 2013.

⁴⁸ <http://nycfuture.org/research/publications/building-new-york-citys-innovation-economy>. May 2013.

⁴⁹ http://marketing.dice.com/pdf/Dice_TechTalentCrunch.pdf. May 2013.



Source: *Graduate Enrollment and Degrees, Council of graduate schools.*

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Figure 4. Graduate Degree Concentration – New York City

At a panel event during February’s Social Media Week, EDC’s Ann Li used the ratio of number of engineers to the size of the economy to measure this talent insufficiency. “New York is really underweight in the number of engineers we produce when compared to the size of our economy,” she said. While existing academic institutions are doing their part, Li opined, “[without the addition of Bloomberg’s upcoming Cornell NYC Tech], there was just no way we were going to achieve our ambition of being a tech hub through organic growth on the talent front.”⁵¹

Maria Gotsch, CEO of the Partnership Fund for New York City that authored the “New York City as a Destination of Choice for Talent” report is adamant that the City’s academic institutions also be leveraged to a greater degree, not only in terms of the number of engineers they graduate, but in retention of those that they do. She highlights CB Insight’s concept of “alumni leakage” as a particularly critical hole to be plugged. A journalist explains Gotsch’s position on Xconomy.com: “Ideas that can be commercialized may be born at local academic institutions, [Gotsch] says, but the city loses many of those potential startups to other hubs in the country. In some ways, she jokes, it’s like venture capitalists from California are standing in front of New York’s ... research institutions with three things: a bag of cash, a CEO, and a moving van.”⁵²

Center for an Urban Future underscores the importance of keeping entrepreneurial alumni local: “The shame of [losing talent] is that New York City frequently misses out on the tremendous economic benefits of technology start-ups that were created here. One missed opportunity is the jobs: while many tech startups never succeed, some end up achieving phenomenal growth and creating dozens or hundreds of jobs, with revenue benefits accruing to the city through taxes. Another is the chance to establish a critical mass of technology companies as well as a community of seasoned entrepreneurs, both of which are fundamental to the formation of an entrepreneurial ecosystem.”⁵³

⁵⁰ *America’s Talent Crunch Report.*

⁵¹ <http://www.xconomy.com/new-york/2013/02/25/new-yorks-technology-future-is-it-a-bubble-or-a-lasting-boom/>. May 2013.

⁵² http://www.xconomy.com/new-york/2013/03/18/partnership-fund-for-nyc-expects-a-spring-of-fintech-life-sciences-more/?utm_source=feedburner&utm_medium=feed&utm_campaign=Feed%253A%20XconomyNewYork%20%2528Xconomy%20NewYork%2529. May 2013.

⁵³ <http://nycfuture.org/research/publications/building-new-york-citys-innovation-economy>. May 2013.

It is this picture – a golden opportunity lost possibly due to inadequate performance of New York educational institutions – that underlies much of the Bloomberg administration’s tech agenda.

The administration's tech agenda: 2009-2013

The City formally announced its bid for local tech entrepreneurship in 2009. Both Bloomberg's State of the City address, and the administration's Economic Diversification Program that followed, made clear the need for the City to reduce its dependence on Wall Street following the recession, and to continue to diversify the economy through the formal support of tech. Bloomberg's State of the City revealed new City initiatives to aid both existing small business owners (across all industries) as well as to harness those laid off from financial services sector through new entrepreneurship programs and training. He also outlined the City's intent to support the creation of incubator spaces for tech startups through public-private partnerships and to stimulate angel investment through provision of City funds. The mayor emphasized his own experiences starting a business in relation to the City's efforts:

...The third element of our jobs plan is strengthening small business. Half of all New Yorkers in the private sector work in a small business, and believe me, I appreciate how difficult it is to start and run one... We are going to do everything possible to make it easier to do business with the City... This year, our Business Express web site will – for the first time – allow one-stop shopping for City permits making it easier and faster to start or expand a business.

As we improve the skills of our workforce, we won't forget workers who - even if they've been laid off – possess talents and skills that are sought the world over: those in the financial services industry. And so the ninth and final piece of our jobs strategy is to do more to keep them right here and keep New York the strongest financial capital in the world.

In every crisis there is opportunity and in every recession there is rebirth. Our Small Business Services agency and our Economic Development Corporation will work together to help laid-off workers connect to start-ups and small firms in other industries by launching new job-training programs. They'll also partner with private foundations to create 'entrepreneur boot camps' for all those interested in starting their own companies. And when the aspiring entrepreneurs are ready to take the next step, we'll help them find office space. Right now, many landlords face rising levels of vacancies. But a number of academic institutions see value in those vacancies, and are interested in creating incubator space for new start-ups. By connecting these two groups, we can fill vacant commercial space and help launch start-ups that may have come up with the next big thing.

Of course when Wall Street rebounds, some of these workers may choose to go back – or they may have found a successful new career as an entrepreneur. But either way, we'll keep them here in New York. That's the goal. We'll stimulate entrepreneurship in other ways, too. For instance, we'll provide additional seed funding to high-tech start-ups. Right now, across the whole City, only \$40 million in private money is being spent on this kind of 'angel' investing and yet there is a huge demand for it. So our Economic Development Corporation will find \$3 million in its budget to attract new private angel investors. That will allow us to increase the pool of available financing by \$10 million net – a 25 percent increase.⁵⁴

The Mayor's Office's Economic Diversification Program, released shortly thereafter (as part of the Mayor's broader, "long-term, strategic economic development vision for New York City" Five Borough Economic Opportunity Plan), formalized the initiatives outlined in the Address. The Program articulated not only the need to diminish the City's fiscal dependence on Wall Street and to continue to retain and attract top talent in so doing, but also to diversify in a way that would build specifically on the City's existing strengths. As the report states, "...Central to this [diversification] effort are entrepreneurship-related activities that foster the innovation vital to the City's future economic growth, policies that attract and retain top talent, and programs that support existing businesses across the five boroughs...The City is focusing its efforts on fields in which it has particular competitive advantages, including bioscience, fashion, financial services, green, manufacturing/distribution, media/technology, non-profit, and tourism."⁵⁵ So too, the report established a new rivalry with Silicon Valley – and Boston – in the competition for venture capital, noting that while the "New York

⁵⁴http://www.nyc.gov/portal/site/nycgov/menuitem.c0935b9a57bb4ef3daf2f1c701c789a0/index.jsp?pageID=mayor_press_release&catID=1194&doc_name=http%3A%2F%2Fwww.nyc.gov%2Fhtml%2Fom%2Fhtml%2F2009a%2Fpr022-09.html&cc=unused1978&rc=1194&ndi=1. May 2013.

⁵⁵ http://www.nyc.gov/html/econplan/downloads/pdf/diversification_final.pdf. May 2013.

metropolitan area attracted approximately \$1.7 billion in venture capital investment in 2007, it still lags significantly behind the Silicon Valley and New England regions.”⁵⁶

The report accompanying the administration’s Economic Diversification Program emphasized the need for the City to wean itself “from its traditional dependence on a small number of cyclical industries that are subject to booms and busts that, in turn, can make or break the City’s finances.”⁵⁷

While Bloomberg had talked about the need to diversify the economy since his first year in office, the financial crisis, in conjunction with the ongoing contraction of the City’s tax base through job losses in financial services, provided sufficient impetus for the administration to redouble its efforts in promoting local entrepreneurship and the rise of a homegrown tech economy.⁵⁸ As stated in *Building New York City’s Innovation Economy*: “It might have taken the implosion of several Wall Street giants and the prospect of long-term job losses in the finance sector to press them into action, but city economic development officials are finally taking meaningful steps to support technology-based entrepreneurship in New York.”⁵⁹

“Since the 2008 financial crisis, no other industry has enjoyed more attention from the Bloomberg administration than tech.”⁶⁰ Beginning in early 2009, as described, the administration launched the handful of initiatives outlined in the Economic Diversification Program. This included two new incubators for startup companies – where fledgling ventures were able to sublease space at inexpensive rates while having access to mentoring services and business seminars provided by entrepreneurship experts from Polytechnic Institute of NYU – and a City-funded angel fund, overseen by private fund managers, with the intent to provide early stage financing to 250 local startups over the following eight years. The online portal “VC Connect” (later dissolved) was designed to create a central clearing house and support network for entrepreneurs and startup companies.

In January 2011, the Mayor hired the City’s – and the nation’s – first Chief Digital Officer, and her team, NYC Digital. Together, they were tasked with transforming New York into the “world’s leading digital city”⁶¹ – a challenge defined more broadly as promotion of digital engagement in the City, initiation of new open government efforts, the development of digital educational opportunities and “support [of] the aspirations of the NYC tech industry.”⁶² The City’s new Chief Digital Officer, Rachel Haot, a former NYU history major and founder of the New York news platform startup GroundReport,⁶³ began work quickly on the inaugural *Digital Roadmap* (released originally as *Roadmap to the Digital City*). Published in May 2011, the plan announced the administration’s formal technology-focused economic development strategy, and was updated in May 2012 with an accompanying progress report on the government’s success thus far.

A few months prior to the *Roadmap*’s release, however, the City’s Economic Development Corporation (EDC)⁶⁴ published its *Innovation Index*, and its related *Promoting Entrepreneurship in New York City* report. Both documents were important precursors to the *Digital Roadmap*, positioning human capital development as an absolute necessity for local economic development in tech. To build on the reported \$3.4 billion in venture capital raised by the local tech industry since 2009,⁶⁵ the *Promoting Entrepreneurship* report outlined an “aggressive” series of tech-focused programs designed to further spur local innovation. As stated by EDC, initiatives contained in the report represented the “ecosystem of

⁵⁶ http://www.nyc.gov/html/econplan/downloads/pdf/diversification_final.pdf. May 2013.

⁵⁷ <http://www.nyc.gov/html/econplan/html/home/home.shtml>. May 2013.

⁵⁸ *New Tech City*.

⁵⁹ http://nycfuture.org/pdf/Building_New_York_Citys_Innovation_Economy.pdf. May 2013.

⁶⁰ *New Tech City*. 24.

⁶¹ <http://www.informationweek.com/government/leadership/new-york-city-builds-on-its-technology-b/240153276>. May 2013.

⁶² www.theverge.com. May 2013.

⁶³ www.theverge.com. May 2013.

⁶⁴ The Center for Economic Transformation (CET) is the arm of EDC concerned with developing the City’s major business sectors. It is the part of EDC that implements policy and programmatic initiatives to address issues faced by each industry, create jobs, and promote entrepreneurship and economic diversification across the five boroughs. While the CET is the center that affects local tech policy, I refer to EDC throughout my study for clarity’s sake.

⁶⁵ http://www.nycedc.com/sites/default/files/filemanager/Resources/Brochures/Promoting_Entrepreneurship_in_New_York_City1.pdf May 2013.

programs to focus on three key goals: attract and develop human capital, promote company growth and foster connections to build community among entrepreneurs.”⁶⁶

The EDC’s 2011 *Promoting Entrepreneurship* initiatives included a number of tech-focused programs that have become hallmarks of the administration’s tech legacy. Introduced or formalized in this report were Applied Sciences NYC, NYC Tech Talent Draft, NYC BigApps, NYC Next Idea, NYC Incubator Network, NYC Venture Fellows, and the NYCEDC Entrepreneur at Large. I will briefly cover each of these, as they comprise the bulk of the *Roadmap*’s – and the administration’s – industry-focused agenda.

Applied Sciences NYC

The most high profile of the administration’s initiatives so far, Applied Sciences NYC is the product of a “remarkable partnership”⁶⁷ between the administration, existing academic institutions both local and global, and private donors and advisers. The program is also the centerpiece of the City’s human capital development efforts. As EDC announces in the *Promoting Entrepreneurship* report: “Innovation is the key to our City’s economic growth and prosperity. Creating the right environment for entrepreneurs and innovative businesses to flourish is therefore critical to the City’s future success as a global high-tech hub. NYCEDC is an engine starter: our initiatives galvanize the entrepreneurial spirit of the City and drive its economic transformation. By attracting an Applied Science campus to the five boroughs, we will make the City an even more attractive place for entrepreneurs to succeed, for venture capitalists to invest, and for the brightest engineers in the world to study, work and live in.”⁶⁸

All told, the government estimates that the “\$2 billion capital investment for STEM” Applied Sciences NYC will create “an estimated 400 new businesses, 22,000 construction jobs, and billions of dollars in economic activity.”⁶⁹

Cornell-Technion Innovation Institute

In December 2010 the administration launched a contest to attract a new applied sciences and engineering campus to New York – an effort that resulted in 7 applications from 17 leading universities around the world (including Silicon Valley’s own Stanford University). The contest culminated in the selection of Cornell University and the Technion-Isreal Institute of Technology (Isreal’s Haifa-based Stanford University equivalent, credited as the academic engine behind the country’s startup revolution). A panel of university presidents, venture capitalists, city Mayoral staff (and the EDC), and local entrepreneurs selected the Cornell/Technion bid.

The 2 million square foot, \$2 billion Cornell-Technion Innovation Institute (Cornell Tech or NYC Tech for short), will be built on Roosevelt Island in stages. The first stage will be completed in 2016, and the last by 2037.⁷⁰ The City donated the land to the universities as well as \$100 million for infrastructure improvements. An April 2013 article from *Time Magazine* says the City’s total contribution to the project has been approximately \$300 million.⁷¹ EDC meanwhile estimates Cornell Tech will generate \$7.5 billion in economic activity, 600 companies and at least 30,000 jobs over the next 30 years.⁷² As Mayor Bloomberg has said, “We are excited to be partnering with Cornell University to train the next generation of engineering talent right here in NYC.”⁷³

⁶⁶ http://www.nycedc.com/sites/default/files/filemanager/Resources/Brochures/Promoting_Entrepreneurship_in_New_York_City1.pdf May 2013.

⁶⁷ <http://business.time.com/2013/04/23/cornell-nyc-tech-hub-heres-why-a-qualcomm-billionaire-gave-133-million/>. May 2013.

⁶⁸ http://www.nycedc.com/sites/default/files/filemanager/Resources/Brochures/Promoting_Entrepreneurship_in_New_York_City1.pdf May 2013.

⁶⁹ <http://www.nyc.gov>. May 2013.

⁷⁰ <http://www.crainsnewyork.com/article/20130220/TECHNOLOGY/130219895>. May 2013.

⁷¹ <http://business.time.com/2013/04/23/cornell-nyc-tech-hub-heres-why-a-qualcomm-billionaire-gave-133-million/>. May 2013.

⁷² <http://www.economist.com/node/21542448>. May 2013.

⁷³ <http://business.time.com/2013/04/23/cornell-nyc-tech-hub-heres-why-a-qualcomm-billionaire-gave-133-million/>. May 2013.

There has been both vocal and demonstrated industry support for the initiative. Google is currently housing the school's first beta class in their Chelsea offices. Roughly \$500 million in private money has been donated to the project since it was first announced.⁷⁴

The school will cost an estimated \$2 billion by the time the 12-acre campus is completed, and will accommodate over 2,000 students.⁷⁵ The school will offer these students eight information technology degrees, with three of them dual Master's degrees from Cornell and Technion based on "hubs" rather than departments. The three hubs will be "connective media" for designing mobile technology and social media (in a nod to the City's strength in media), "healthier life" for health care and personal technology, and "built environment" for increasing the efficiency and sustainability of large-scale urban environments like New York. The school will also offer an "Industrial Affiliates" program that will invite entrepreneurs and experts to provide students guidance and mentorships.

Throughout, the goal is decidedly practical. The school is structured to allow students and faculty to pursue research and product development in parallel, rather than sequentially (as is the model practiced at Stanford). EDC expressly states on its website that Cornell Tech (and the EDC's other Applied Sciences institutions) is designed not only to "enrich the City's existing research capabilities, but also to lead to innovative ideas that can be commercialized, catalyzing hundreds of spinoff companies and increasing the probability that the next high growth company – a Google, Amazon, or Facebook – will emerge in New York City."⁷⁶ According to a professor at Cornell, the school's success will be measured both by typical metrics of academic success, as well as by measures more reflective of the school's mission. This includes the number of entrepreneurs and the number of companies that graduate, the number of patents produced, the faculty's own output, and the school's reputation overall.⁷⁷

NYU Center for Urban Science and Progress (CUSP)

Announced last year, the NYU Center for Urban Science and Progress (CUSP), a 460,000-square-foot engineering and science school in Brooklyn (housed in a property owned by the MTA), is a joint effort between New York City, the MTA, NYU-Poly and a consortium of universities and technology companies. NYU received \$15 million from the City to dedicate to the school's completion. Like Cornell Tech, CUSP is designed to connect local tech entrepreneurs with student researchers. The nearby new NYC Media Lab housed at NYU Poly meanwhile focuses on research in emerging market technologies, new search technologies, content distribution products, content formatting and computer animation. Microsoft and Lutron Electronics are reported partners.⁷⁸ A new Center for Data Science on the main NYU campus in Manhattan is also opening this fall.

Columbia University's Institute for Data Sciences and Engineering (IDSE)

Also unveiled last year: the Institute for Data Sciences and Engineering, a 44,000-square-foot space on Columbia University's campus to be completed in 2016 with \$15 million in financial help from the City. The City's gift will result in the hire of a reported 75 new professors over the next 15 years. A certificate program will commence in the fall.⁷⁹ EDC estimates that IDSE alone will account for nearly \$4 billion of economic growth across the five boroughs in the next three decades.⁸⁰

⁷⁴ Duty-Free magnate and alumnus Charles F. Feeney has donated \$350 million (one of the largest donations in the history of higher education) and Cornell alumnus and Qualcomm founder Irwin Jacobs and his wife pledged \$133 million to the campus in April this year. The latter donation will be used specifically toward establishment of a special innovation institute on campus. <http://business.time.com/2013/04/23/cornell-nyc-tech-hub-heres-why-a-qualcomm-billionaire-gave-133-million/>. May 2013.

⁷⁵ <http://www.economist.com/node/21542448>. May 2013.

⁷⁶ Indeed, Cornell Tech will be the first school in the country to have an on-campus patent officer. <http://www.nycedc.com/project/applied-sciences-nyc>. May 2013.

⁷⁷ <http://www.cornellsun.com/section/news/content/2013/04/22/panelists-cornell-technion-partnership-will-foster-innovation-nyc>. May 2013.

⁷⁸ http://www.nytimes.com/2013/04/14/education/edlife/new-york-and-seattle-compete-for-data-science-crown.html?hp&_r=0. May 2013.

⁷⁹ http://www.nytimes.com/2013/04/14/education/edlife/new-york-and-seattle-compete-for-data-science-crown.html?hp&_r=0. May 2013.

⁸⁰ <http://www.nycedc.com/project/applied-sciences-nyc>. May 2013.

Academy for Software Engineering

The Academy for Software Engineering opened near Union Square in September 2012. It is just the latest addition to the 21 existing software-engineering trade program academies the City has established in the past decade (the Pathways in Technology Early College High School in Brooklyn, which awards associates degrees to students in an innovative six-year program, is another notable example). Seven more such academies are set to open this fall. Until Bloomberg took office, the City had not established any new technical schools since the 1970s.⁸¹

The Academy's curriculum includes instruction in programs like Python and Java, and students are taught how to create web pages and mobile applications. The school organizes field trips to nearby tech firms, and classrooms themselves are purposely designed to look like a startup. Like all of the recently opened trade programs, the philosophy at the Academy is to provide high school students with skills they can use to be hired immediately upon graduation, or to bolster in college. Many of these trade schools, including the Academy, convene industry leaders on their advisory boards – for example, New York venture capitalist Fred Wilson. Wilson has said “understanding software is probably a required life skill for the 21st century.”⁸² In September, the administration will open pilot programs modeled after the Academy in 20 existing secondary schools around the City.⁸³

NYC Tech Talent Draft

The NYC Tech Talent Draft aims to “help the City's technology sector mobilize technical talent” by actively branding the City as a tech hub while recruiting skilled technologists from all over the country. The inaugural recruiting event at the beginning of 2012 took place in Boston, where 15 New York startups met with approximately 150 students from around the Northeast. By the end of the spring and fall sessions, EDC estimates that a total of 700 students attended sessions at seven different schools, showcasing a total of 40 New York startups. EDC concluded from a post-event survey “96% of the students indicated that the event bettered their perception of NYC as a viable and exciting location for a career in the technology industry.”⁸⁴

NYC BigApps

The City Council passed groundbreaking legislation last year with Local Law 11, which requires City agencies to make data available in open formats. More than 1,000 data sets are currently available on the City's Open Data portal. The NYC BigApps competition is designed to leverage this cache of data and the talent of the City's local innovators to bring useful applications to New York City residents. As EDC describes the initiative: “NYC BigApps [is] an annual software competition challenging individuals or companies to develop online and mobile applications that utilize official City data. NYC BigApps serves to stimulate innovation in the information technology and media sectors...and yields dozens of apps – made for New Yorkers by New Yorkers...In democratizing access to our data, we make sure developers of all levels can make their next app a reality.”⁸⁵

The competition is in its fourth year. Eight cash prizes will be awarded this year and seven winners will be announced at an awards ceremony in June. Federal, State and private sector datasets will be eligible for use this year for the first time. Winners will also be eligible to participate in the Founders' Network, designed to provide networking and business support for those intending to launch companies centered on their apps.

The award categories and prizes have changed each of the last four years (last year's award payout totaled \$50,000), while the judging panel has routinely included local tech leaders, venture capitalists and members of the Mayor's Office and

⁸¹ <http://www.nydailynews.com/new-york/education/stem/social-media-minds-money-behind-tech-school-revolution-article-1.1305212>. May 2013.

⁸² <http://www.nydailynews.com/new-york/education/stem/social-media-minds-money-behind-tech-school-revolution-article-1.1305212>. May 2013.

⁸³ Demand for the programs is high – applications for the Academy's incoming class of 2013 reportedly outnumbered available seats 10 to 1. The school uses unscreened admissions to admit students regardless of their academic background. <http://www.nydailynews.com/new-york/education/stem/social-media-minds-money-behind-tech-school-revolution-article-1.1305212>. May 2013.

⁸⁴ http://www.nycerc.com/sites/default/files/filemanager/Resources/Brochures/Promoting_Entrepreneurship_in_New_York_City1.pdf. May 2013.

⁸⁵ http://www.nycerc.com/sites/default/files/filemanager/Resources/Brochures/Promoting_Entrepreneurship_in_New_York_City1.pdf. May 2013.

EDC. Criteria for judging include Quality of the Idea, Implementation of the Idea, and Potential Impact on New York City residents, visitors and businesses. The Investors' Choice Award also assesses the submissions' commercial potential. The competition is administered in partnership with BMW iVentures, the New York City-based venture capital arm of BMW (BMW recently opened a tech incubator in Manhattan), and other local private tech firms. NYC BigApps is open to individual developers, and companies with fewer than 50 employees. Organizations with more than 50 employees are eligible to enter for recognition, but not cash prizes. All entrants retain intellectual property ownership of their software, but winners must agree to make their applications available for free throughout the competition and for one year thereafter (submissions can include advertisements).

According to EDC, BigApps has helped create nearly 240 new applications using NYC open data since the competition's inception. The event has also engaged roughly 270,000 unique visitors to the BigApps website and more than 83,000 people have voted thus far for its popular choice award. EDC received 85 eligible submissions for the first round of competition, 58 the following year, and 96 applications last year.⁸⁶

NYC Next Idea

While Big Apps eligibility is restricted to the fifty U.S. states, NYC Next Idea is designed to attract promising young companies from around the world: "New York City has always been an attractive destination for businesses and talented individuals from all over the world. NYC Next Idea, an annual global business plan competition run by NYCEDC, leverages this asset to grow the City's entrepreneurial community. Aiming to promote NYC as an ideal location to launch an entrepreneurial venture, Next Idea challenges students at top foreign universities to develop business ideas specific to a New York City launch."⁸⁷

Hosted in partnership with Columbia Engineering, NYC Next Idea invites teams of two to five participants to submit business plans for ideas that may be commercially viable in New York City. (The program launched initially as a competition directed only at international teams, but has since expanded to include domestic submissions as well). Six finalist teams are invited for a week long, all-expenses paid trip to the City to present their ideas to a panel of New York investors. The competition winners also receive startup capital to further pursue their venture (approximately \$35,000). There is no contingency included with the prize to relocating to New York or to developing winning ideas here locally.

NYC Venture Fellows

In partnership with Fordham University, NYC Venture Fellows aspires to help seasoned entrepreneurs scale their operations in the post-incubator, post-seeding funding period. The program accepts both local as well as international nominees. Each Fellow is matched with two or more mentors (who range from serial entrepreneurs to CEOs of major companies). The website says care is taken to pair Fellows with multiple perspectives relevant to their individual circumstances. Fellows participate in two intensive series of events during their one-year fellowship. These events include workshops, industry roundtables, program-related or sponsored events, all aimed at helping the Fellows grow their networks and strengthen their organizational leadership skills.

The program is now in its third year. For the class of 2013, 30 Fellows from eight different international cities were selected from 148 applications.⁸⁸ The program does not provide direct funding, and as with NYC Next Idea, there is no requirement that participants relocate their businesses to New York upon the Fellowship's completion.

NYC Incubator Network

By 2011, EDC had partnered with the private sector in the establishment of nine different incubators across the five boroughs representing a number of different industries. Five of these were oriented specifically toward tech, including Varick Street, Hive@55, the Sunshine Bronx Incubator, General Assembly and most recently the DUMBO incubator. These incubators offer startups affordable and flexible real estate, an engaged peer community, shared infrastructure and equipment, access to mentors, and educational and networking opportunities. By providing support to startups at their earliest and riskiest stages, EDCs incubators are designed to help young companies grow and succeed. The *Promoting*

⁸⁶ <http://www.nycedc.com/program/nyc-bigapps>. May 2013.

⁸⁷ http://www.nycedc.com/sites/default/files/filemanager/Resources/Brochures/Promoting_Entrepreneurship_in_New_York_City1.pdf. May 2013.

⁸⁸ <http://www.entrepreneur.com/article/226225#ixzz2S8GcAiRX>. May 2013.

Entrepreneurship report advertised that by 2011 City incubated companies had attracted \$30 million in capital and supported 500 jobs. The report also claimed that six companies had thus far graduated and moved into their own market-rent spaces.⁸⁹

NYCEDC Entrepreneur at Large (EAL)

EDC elected its “NYCEDC Entrepreneur at Large” – local entrepreneur Steve Rosenbaum – to report on City tech-oriented events (particularly those orchestrated by EDC), as well as on local industry successes. Rosenbaum publishes his tech articles both with the Huffington Post and on the EDC’s website. “The Entrepreneur-at-Large (EAL), an experienced NYC entrepreneur, serves as NYCEDC’s eyes and ears with the entrepreneurial community in NYC. The EAL provides mentoring to emerging entrepreneurs across NYCEDC’s network of incubators and the City’s larger startup community and provides insights into the challenges that entrepreneurs face as they grow and expand their businesses.”⁹⁰ In addition to industry updates and articles, the EAL holds virtual and in-person office hours, and advises EDC on its industry agenda.

The Digital Roadmap

The May 2011 *Digital Roadmap* expanded on the many industry-focused initiatives introduced in the *Promoting Entrepreneurship* report. In a bid to become “the world’s premier digital city,” the *Roadmap* outlined five focal points of the City’s revamped digital push: *Access, Education, Open Government, Engagement and Industry*. The *Roadmap* organized efforts at human capital development primarily within the education and industry sections. Education initiatives, spanning elementary school through graduate study, were identified as long-term development strategies, while Industry initiatives, in contrast, were positioned as human resource development in the short-term. The programs and competitions described as part of the EDC’s *Promoting Entrepreneurship* agenda constituted the bulk of the Education and Industry initiatives presented in the *Roadmap*. The other three foci outlined in the *Roadmap* meanwhile extended themes Bloomberg has pursued since he first took office. Program innovations continue, large and small, all on related themes. Efforts continue to work toward broadening both the impact and the engagement of different groups in the City.⁹¹

Rebranding the City

A second strand to the administration’s support for the industry has been the rebranding of the City as a viable environment for tech. While the *Made in NY* brand itself has been used by the City’s entertainment industry since 2005, it was extended in February of this year to include local tech startups. As the campaign describes itself on its website, “*We Are Made In New York* is an economic development initiative that supports the city’s vibrant tech community by highlighting job opportunities in the sector, celebrating the growing number of NYC-based digital companies, and providing access to resources and programs that help tech companies grow, and novices learn how to become part of the innovation ecosystem.”⁹² Digital companies that base at least 75% of their development in the City, have at least one employee that works locally, and a user base of 10,000 or more are eligible to advertise with the *Made in NY* logo and be featured in the campaign. The project currently hosts close to 1000 startups.

While the campaign’s website convenes resources for existing and would-be entrepreneurs, such as links for free and low-cost digital education training, the site is also positioned to the greater New York community via a hiring map. The *Made in NY* digital jobs map (an innovation of the 2012 *Roadmap*) plots locations of local tech companies that are currently hiring (regardless of whether or not they comply with campaign eligibility criteria). The initiative thus also includes an extensive citywide ad campaign to promote awareness that features the *Made in NY* companies. Said Bloomberg about the campaign at its unveiling: “Growing our local tech industry is an important part of our economic development strategy to

⁸⁹ http://www.nycedc.com/sites/default/files/filemanager/Resources/Brochures/Promoting_Entrepreneurship_in_New_York_City1.pdf. May 2013.

⁹⁰ http://www.nycedc.com/sites/default/files/filemanager/Resources/Brochures/Promoting_Entrepreneurship_in_New_York_City1.pdf. May 2013.

⁹¹ Additional programs introduced as part of the 2012 *Digital Roadmap* to promote the industry and human capital development include NYC Generation Tech (tech training and mentorship provided to low-income high school students), the Reinvent NYC.gov Hackathon (the City’s first sponsored hackathon, which invited local companies in July 2011 to transform the City’s website), the NYC Entrepreneurial Fund, Code Corps (a “program that engages vetted volunteer technologists to realize lifesaving City government initiatives”), and Take the H.E.L.M. (designed to encourage diversification of and growth in Lower Manhattan’s economy by providing companies grants to move downtown).

⁹² <http://wearemadeinny.com/about/>. May 2013.

bring new businesses to the our city and more job opportunities to New Yorkers.”⁹³ The campaign was unveiled at BuzzFeed’s offices, and is the product of both public (the Mayor’s Office and EDC) and local tech and media brands’ efforts.⁹⁴

Rebranding efforts begin, first and foremost however, at the top. Throughout this recent economic development campaign and tech’s local expansion, Mayor Bloomberg has provided the industry “an unprecedented level”⁹⁵ of support. Although the City is limited in its ability to affect changes in immigration policy to immediately affect the pipeline of local talent, Bloomberg himself has been an ardent campaigner for immigration reform. In addition, as the authors of *New Tech City* explain, “The mayor himself has been an unflagging promoter of tech entrepreneurs. He’s visited scores of start-ups, given major speeches at local industry events such as Tech Disrupt and the NY Tech Meetup, and last year installed a chief digital officer [Rachel Haot] to help coordinate promotion efforts. As the “mayor” of City Hall on Foursquare, he’s even become an avid user himself.”⁹⁶ At his most recent State of City address the mayor referred to the tech sector ten times, while leaving out Wall Street altogether.⁹⁷ He told his audience at the February launch of the *We Are Made in NY* campaign meanwhile that “...there’s simply no better place to build a digital business.”⁹⁸ And at the Shapeways’ factory opening in October last year – as *BetaBeat* writes – “a quick Q&A offered the mayor a quick chance to—as always—be booster-in-chief for New York City. Achieving utter tech sector dominance, he explained, is largely a matter of attaining critical mass: ‘People will say, “Oh, we have no chance of being bigger in technology than Silicon Valley.” That’s not true. Once you get the critical mass here, I’ve always thought that New York’s value proposition is a better one.”⁹⁹

⁹³ <http://nyunews.com/2013/02/28/tech-2>. May 2013.

⁹⁴ Beyond programs and competitions organized to promote the industry, the Bloomberg administration itself has grown improve the state of tech governance in the City. In April 2012, Bloomberg added another digitally oriented leadership position to City government with the appointment of Rahul Merchant as the City’s first Chief Information and Innovation Officer. The position was established to spearhead IT development and management across all City agencies, and to place new leadership at the head of the NYC Department of Information Technology and Telecommunications (a department added by Bloomberg in 2003). Bloomberg’s most recent appointment in service of the City’s digital advancement was promotion of Michael Flowers to the new position of Chief Analytics and Open Platform Officer earlier this year. In his new position, Flowers is tasked with creating a platform to facilitate information sharing among City agencies and with the public.

⁹⁵ *New Tech City*. 24.

⁹⁶ *New Tech City*. 24.

⁹⁷ <http://www.wnyc.org/shows/newtechcity/blogs/new-tech-city-blog/2013/feb/25/mayors-race-will-test-techs-political-force/>

⁹⁸ <http://upstart.bizjournals.com/news/technology/2013/02/21/new-york-tech-scene-here-to-stay.html?page=all>. May 2013.

⁹⁹ <http://betabeat.com/2012/10/shapeways-grand-opening-factory-long-island-city-michael-bloomberg-mayor-3d-printing/>. May 2013.

The Administration's Impact, Now and Going Forward

It is certainly true that the rapid rise of the City's local tech industry has coincided with the activities of the administration to foster tech's growth. However, evidence suggests the relationship between policy and tech's economic success is not nearly as simple as either the media or the administration portray. Rather, it is my contention that growth to date can be explained for the most part by other factors entirely, albeit ones truly New York City related. The extent to which the administration's initiatives will accelerate this growth in the future remains an open question. However, there are some clear lessons, derived from the success to date, which should inform City government actions if the tech industry is to remain a growing part of the City economy.

Both economic theory (as summarized in the Appendix) and the experience of other tech centers suggest that two factors should be the dominant drivers of tech's growth in the City. The first is an extremely fertile environment for the profitable application of tech. The second is the appeal of the City for those who labor at its application, and who comprise the talent that indeed drives the success of tech innovation. The administration's impact in supporting these two aspects of the City is likely to be as important to future success as its very visible direct initiatives in education, engagement and boosterism.

New York City's Tech Opportunity

The term "tech" (as explicated in the Methodology) encompasses a great variety of activities, from developing robots to video games to customer relationship management software to algorithms for high frequency trading and much more. No single tech hub – Silicon Valley, Alley or Prairie, here in the U.S. or elsewhere – actually leads or even meaningfully participates in all these activities. Investing in innovation is financially risky to the investor. The risks become acceptable when there are substantial potential markets for the innovative ideas in reasonable proximity.

As Center for an Urban Future explains in *New Tech City*, "... 'tech' in New York tends to mean something pretty specific, a particular slice of a much larger industry space that includes defense contractors and superconductor manufacturers as well as e-commerce businesses and information technology companies. Although New York's technology strengths spread across a surprisingly wide spectrum of more traditional industries, a vast majority of the city's new companies offer products and services focused around the Internet."¹⁰⁰

Indeed, the changing nature of technology itself has afforded cities in general and New York in particular, the ability to capitalize on an industry previously the domain of large research centers and office parks. In "The Joys of Urban Tech" Richard Florida explains, "A generation or so ago, the fastest-growing high-tech companies were more like factories. They developed proprietary software systems, designed and manufactured chips, built computers and created the infrastructure that made the Internet possible. Whether it was Microsoft or Apple, they deployed big engineering teams—and they needed big suburban campuses to house them. The changing nature of technology—cloud-based applications in particular—enable new start-ups to succeed more quickly, with smaller teams and much smaller footprints. The speed of technology has also accelerated. The companies that succeed are the ones that stay in the closest contact with their end-users and first adopters, as MIT's Eric Von Hippel has shown. When a company is located in a city, many of those end-users can be found right on its doorstep."¹⁰¹ Florida also notes that high-tech products and industries are more multidisciplinary than they used to be – "success often requires excellence in more than one field of technology and in other lines of business." So too, "[Some] areas of high-tech are premised less on breakthrough innovations and more on the application of technology to massive new markets in retailing, advertising, media, financial services, education, publishing, communications, fashion and music. Big cities like New York and London are where those industries—and the talent that powers them—are most concentrated."

New York's competitive advantage and its particular 'brand' of tech come from the application of this new technology to the other sectors in which the City is already a leader. As the authors of *New Tech City* write, "...today's technology revolution is much less about creating the infrastructure and plumbing for the Internet, but about applying technology to traditional industries like advertising, media, finance, fashion and health. New York is natural for this wave of technology growth because it is a market leader in most if not all of these sectors, and boasts an unmatched concentration of talent in

¹⁰⁰ *New Tech City*. 26.

¹⁰¹ <http://online.wsj.com/article/SB10000872396390444914904577619441778073340.html>. May 2013.

each of these fields.”¹⁰² West Coast entrepreneur and venture capitalist Hadley Harris further explicates this phenomenon: “Silicon Alley’s expansion is ... rooted in certain characteristics particular to New York. As a long-established center of industries such as finance, fashion, advertising and media, New York has amassed a large pool of extremely talented people from those industries... [It’s] the melding of these industries with technology that makes the NYC tech scene special. Take fashion and commerce startups such as Gilt, Etsy, Warby Parker and Birchbox, or adtech companies such as TapAd, Local Response, OnSwipe and AppNexus. Fashion and advertising have long been booming in New York, but in the past few years they have branched into the tech space, creating several successful companies at those industry intersections. As startups arise in New York, many of those brilliant people are joining emerging companies and strengthening them with influence from these creative industries.”¹⁰³

The application of tech to fashion and advertising that Harris references is just one part of the City’s tech niche – a niche that is increasingly being labeled as ‘dash-tech.’ Writes Anika Anand in a recent entry for *Upstart Business Journal*, while “New York might not be able to rival Silicon Valley in the tech startup space, [it does] now [own] the burgeoning ‘dash-tech’ space.”¹⁰⁴ While bio-tech and clean-tech predate the City’s tech resurgence, and are for the most part specialties found in other parts of the country (San Diego and Boston are leaders), New York’s dash-tech advantage does extend to industry sectors like ad-tech, ed-tech, health-tech, fin-tech, and fit-tech, all of which are emblematic of the tech-suffix phenomenon that has come to define New York’s tech scene. As venture capitalist Alan Patricof emphasized at the recent Social Media Week, while deals made in the past were focused largely on semiconductors and computers, many deals today are about the advertising industry and content: “You can’t be in those areas without being in New York,” he told the audience. “The whole ad tech business is centered in [the City].”¹⁰⁵

The same logic mitigates the “talent shortage” that has been the focus of so much media and government attention.

The early days of technology growth was driven by semiconductors and computer hardware, products that depended on a deep roster of engineering talent and required large amounts of physical space to develop – neither of which are favored in New York. In contrast, today’s growth is being fueled by the Internet and smart phones, and the creation of new ways of taking advantage of these now widely used platforms to deliver content, sell products, deliver services, play games and simplify life for individuals and businesses. New York’s rich pool of creative, marketing and business talent is well suited for creating and running these new businesses, all of which can be built with comparatively few engineers. At the same time, today’s technology revolution is much less about creating the infrastructure and plumbing for the Internet, but about applying technology to traditional industries like advertising, media, finance, fashion and health. New York is natural for this wave of technology growth because it is a market leader in most if not all of these sectors, and boasts an unmatched concentration of talent in each of these fields.¹⁰⁶

Where the Talent Wants to Be

Just as tech businesses have migrated from Silicon Valley to San Francisco, where the Valley’s talent wants to live, New York’s lifestyle advantages are a similar driver of local talent clustering.

Tech’s real estate footprint in the City is emblematic of New York’s appeal for talent at large. Indeed, Midtown South’s popularity stems from its appeal as a place to both work and live. As one leasing professional notes, “It’s really a 24/7 micro market where everything is available all the time. It’s a live/work/play environment. People want a 24-hour atmosphere.”¹⁰⁷ The proximity of major commuter hubs like Penn Station and Herald Square is also important. Google’s free WiFi pilot program for Chelsea meanwhile – the largest public outdoor network in the City – which started in January of this year, has added to the appeal. According to area leasing professionals, companies are increasingly seeing a neighborhood’s desirability as a factor in the competition for hiring talent: “...the big thing for [tech firms] is to attract young talent and they need to be in cool hip areas that have a creative feel and vibe to do that,” the vice president of

¹⁰² *New Tech City*. 9.

¹⁰³ <http://venturebeat.com/2013/02/01/why-nyc-startups-winning-engagement-race/>. May 2013.

¹⁰⁴ <http://upstart.bizjournals.com/news/technology/2013/02/21/new-york-tech-scene-here-to-stay.html?page=all>. May 2013.

¹⁰⁵ <http://www.xconomy.com/new-york/2013/02/25/new-yorks-technology-future-is-it-a-bubble-or-a-lasting-boom/>. May 2013.

¹⁰⁶ “New Tech City.” Center for an Urban Future. 9. May 2012. <www.nycfuture.org>

¹⁰⁷ <http://commercialobserver.com/2012/04/the-big-squeeze-how-technology-start-ups-found-midtown-south-and-what-happens-when-the-bubble-bursts/>. May 2013.

CBRE told *The Observer* last year.¹⁰⁸ The strong market has also emboldened some landlords to renovate and reposition their product to capture this demand. Tech firms have expressed their preference for open layouts, tall windows and high ceilings, which can be found in older industrial spaces, as well as in lofts and some of the newer commercial office stock found throughout Midtown South.

These conclusions, based on the opinions and experience of various third-party experts, are substantiated by the direct querying of New York City tech-industry participants that I undertook in the first quarter of 2013. I conducted a survey of the technology community in New York City, as well as a series of targeted interviews. My survey asks members of the tech community about their occupation and industry, location of education and field, place of origin and length of stay in New York, as well as their convergence with government initiatives and perceptions of the administration's agenda. I also interview past winners of government competitions, NYCEDC employees, academics, and industry experts and leaders to round out a profile of New York's tech community and gauge the administration's impact on its resurgence.

The methodology of the survey is explained in Appendix 1, and a detailed analysis of the responses is presented in Appendix 6. Here I will summarize the responses categorized by the issues identified by the Bloomberg administration as driving tech in the City and against the actions that the administration has taken since 2009.

New York's Talent Shortage

The frenzied discussions of talent shortage aside, it is clear the City is a powerful draw for tech talent from many other places. It is not as clear there is a tech education crisis, at least not so far.

- There is more tech talent in New York City than would seem on the surface. Almost all respondents listed themselves as employed in a tech *industry* (98%), with noticeably fewer employed in tech *occupations* (76%). This result reinforces the fundamental difference between tech employment counts by industry and tech employment counts by occupation. That noticeably more participants listed their employment in a tech industry rather than in a tech occupation reflects both the many non-tech occupations required within a tech industry, as well as my channels of survey distribution; almost all of the startups included in the *We Are Made in NY* campaign conform to an industry definition of tech (i.e. there very few companies listed with the campaign that have a primary function that is not tech). As discussed in the Methodology, these non-tech occupations would be included within a tech employment count by industry, but not a tech employment count by occupation. Conversely, and not captured directly by the results of my survey because of these methodological limitations, this difference between the number of participants employed in a tech occupation versus a tech industry illustrates the inverse phenomenon of employment within a tech occupation, but non-tech industry. Data collected at the national level reveal greater employment counts by occupation, than by industry.¹⁰⁹ These results underscore the importance of using *both* types of counts in understanding the dynamics of local tech employment.
- Of the 75% of survey respondents not originally from New York City, 58% relocated to the City within the past four years. This is significantly higher than the average for the City as a whole, and suggests that the industry is represented largely by recent transplants that relocated to the City because of its viability as a place to pursue tech. The City's recent appeal for tech is further underscored when one considers that a staggering 75% of survey participants did not receive their most recent degree in the City.
- Only 25% of survey respondents *were* most recently educated in the City supports the widely documented contention that the City's existing academic infrastructure has not contributed meaningfully to the tech community's growth. "The majority of people that I know building interesting tech companies in New York did not come out of New York schools. From a technology perspective, there are not nearly enough kids coming out of college and building something out of their dorm room considering the number of students here in New York."¹¹⁰ Perhaps so, but note that only a third of my survey respondents were most recently educated in STEM, and only 22% were most recently educated in Computer & Math Sciences, which is lower than expected. These

¹⁰⁸ <http://commercialobserver.com/2012/03/love-of-art-and-tech-cbres-matthew-bergey-relies-on-smarts-paintings-to-secure-tech-tenants/>. May 2013.

¹⁰⁹ Related data is provided in the Methodology.

¹¹⁰ Charlie O'Donnell, cofounder and CEO of online employment startup Path 101 and the creator of networking community nextNY. *New Tech City*.

findings indicate at the very least that the future of tech in the City is not as unequivocally reliant on STEM education as the government insists.

Large Local Opportunity Attracts Investors

The pull of profitable application of technology to the City's existing core industries has motivated the venture capital and greater investment community to grow tech in New York.

- Answers to the question of why participants relocated to the City or opened an additional office here included either one or all of the following: proximity to their consumer base, access to local talent, local industry, or venture capital, and several variations on their desire to live in the City. 20% of my survey participants relocated their companies to the City. Responses to my question regarding opportunities to work in the City in tech listed the same collection of determinants: “various industries intersect allowing for more creativity and synergy,” “access to capital,” “vibrant community,” “diversity in disciplines for tech [and] diversity in companies,” “lots of conferences and events,” “access to clients, investors and employees,” “density of customers,” “benefit of being near other firms,” “lots of talented creative people,” “biggest opportunity is the talent pool,” and “its NYC, the center of the world.”
- The vast majority of companies represented in my survey originated in New York, indicating the necessary determinants for local entrepreneurship are being met. 20% of my survey participants meanwhile relocated their companies to the City, underscoring further New York's tech appeal.
- The diverse representation of tech industries among my survey participants reflects the wide permeation and application of tech across all industries, and in particular those industries in which the City is already dominant. 70% of survey respondents represent companies with fewer than 25 employees. And 69% of companies represented by survey participants were started within the past four years. This conforms to the government and the media's depiction of the tech industry as a collection of young startups. But 10% of respondents represent companies of greater than 250 employees, and 3 participants represent companies of over 1000 (2500, 4000 and 4800 respectively). As *New York Magazine's* Kevin Roose notes in “What Bloomberg's Startup Overture is Missing,” is that while the vast majority of tech operations in the City are indeed small startups, “there are also big, established tech companies that don't meet [We Are Made in NY's] 75% [of company employees in the City] threshold, but have offices in New York, and do major recruiting in the city.”¹¹¹

Impact of the Administration's Efforts to Date

Both the results of my survey and my interviews with members of the community attest to the relatively minor role the government's *direct* support of the industry has played thus far.

- Only a handful had participated in City-sponsored programs, while only one had graduated from a City-sponsored incubator.
- A truly surprising number of survey participants that were unaware – aside from the cheerleading antics of the Mayor specifically – that the administration is in fact actively engaged in promoting the industry, with an economic development agenda in place.
- There is a widely held opinion amongst participants that the government's efforts – when aware of them – are mostly in service of publicity for the industry. Almost all responses to questions about the *Made in NY* campaign for example were variations on “helpful for awareness for community, but no direct benefit to my company,”; “I think it's good – for the NYC tech scene, for the city – but it doesn't impact me or my company directly...,” and “I like that it is bringing a sense of identity and pride to the NYC tech scene, and perhaps some awareness to people outside of the industry.”
- Furthermore, participants expressed that the only material use for the *We Are Made in NY* campaign might be that the campaign affect “recruitment,” “bring more engineers to NYC,” “help our hiring” and “drive talent.” So too,

¹¹¹ <http://nymag.com/daily/intelligencer/2013/02/what-bloombergs-start-up-overture-is-missing.html>. May 2013.

my question regarding challenges to working in tech in the City, elicited in almost every individual response some mention of “hard to find good tech talent.”

- Interestingly, where the government *has* had more success are in leveraging low cost initiatives – such as the NYC BigApps and NYC Next Idea competitions, and the groundbreaking Open Data legislation – to drive localized innovation and fulfill important functions of government certification.

Education and the Future

Many in the media, as well as those I surveyed and interviewed, believe New York City now has either reached or is nearing a critical mass of venture capital, talent and entrepreneurial momentum in the direct and indirect concepts of tech industry growth. The government’s greatest impact then might well lie in the future, maintaining and accelerating growth it did not actually trigger, through the massive investments in tech-related and entrepreneurial education it has initiated.

Future increase in the supply of local talent will further diminish risk for those who relocate to the City or who start their businesses here, thus feeding a virtuous cycle of risk mitigation for every party involved. William Janeway’s Erie Canal analogy about the government’s legacy in tech innovation (see Appendix 3) finds fitting resonance in the assertion of EDC President Seth Pinsky that through Cornell Tech and Applied Sciences NYC, the Bloomberg administration has provided the New York of today with its own “Erie Canal moment.”

“[Cornell Tech] will help to ensure that the City remains a hub of innovation, increasing access to talent and fostering entrepreneurship for generations, thereby connecting the City’s legacy industries ... to new ways of doing business, and encouraging the formation of new companies in industries about which today we can only dream. ...As was the case with the Erie Canal nearly 200 years ago, Applied Sciences NYC has the potential to create competitive advantages for the City that will carry us forward for decades and perhaps centuries to come. By following in the footsteps of DeWitt Clinton and continuing to invest in the City’s future on a grand scale, under the leadership of Mayor Bloomberg, we are both following in footsteps that should be familiar to New Yorkers versed in our City’s history and simultaneously ensuring that our City’s best days remain ahead of us.”¹¹²

¹¹² <http://nycedc.tumblr.com/post/15397911873/our-erie-canal-moment>. May 2013.

APPENDIX

1. *Methodology*

As detailed, there is ample literature that documents the tech sector's resurgence in New York City. Likewise, the City's tech "talent crunch" has received increasing media attention over the past few years. There is, however, little research that profiles the talent that *does* exist here – the talent that by all accounts is fueling the sector's growth. So too, the administration's impact on those employed in tech locally has been similarly understudied. While many of the City's industry-focused initiatives are long-term in scope (specifically those focused on education), there are, as described above, numerous short-term strategies that the City has pursued since 2009.

As such, my research is comprised of both a survey of the technology community in New York City, as well as a series of targeted interviews. My survey asks members of the tech community about their occupation and industry, location of education and field, place of origin and length of stay in New York, as well as their convergence with government initiatives and perceptions of the administration's agenda. I also interview past winners of government competitions, NYCEDC employees, academics, and industry experts and leaders to round out a profile of New York's tech community and gauge the administration's impact on its resurgence.

Survey

Surveying members of the 'tech community' has precedence as a research method. Startup Genome's influential and widely cited *Startup Ecosystem Report* released last year, relied in part on data from the company's own web-based survey, Startup Compass. Startup Genome was created with the mission to "enable local startup communities to collect, curate, and display their city's data anyway they want." The company uses Startup Compass to serve the larger goal of increasing the success rate of startups and accelerating the global pace of innovation by empowering entrepreneurs to make better decisions through better context and information. As explained on their website, Startup Compass' data comes from over 17,000 internet startups, ranging from founders with just an idea to startups that raised through Series B. They write: "If you have a startup we would greatly appreciate you signing up and contributing to the project. Every startup helps us get closer to cracking the code of innovation and spreading the magic of Silicon Valley with the rest of the world. All your data is anonymized, treated absolutely confidential and will not be shared."¹¹³

My web-based SurveyMonkey® survey was distributed in two ways. The first was distribution to the members of the New York Tech Meetup via the Meetup's monthly newsletter (sent to all members who opt into the service.) The second form of distribution was through individual email solicitations to every startup listed on the Mayor's Office's official Made in NY List, a list of "over 900 tech and digital companies that base 75% or more of their development in New York City."¹¹⁴

Distribution of my survey through the Meetup newsletter serves as my primary form of distribution because of the group's size and industry prominence. NYTM is a non-profit organization that "supports the growing NY technology community."¹¹⁵ Co-founded in 2004 by the entrepreneur Scott Heiferman and industry organizer Dawn Barber, the group currently boasts over 30,000 members representing "professionals from all parts of the New York technology community."¹¹⁶ NYTM centers on its monthly events, where members come to watch emerging companies demonstrate new ideas, hear leading-edge thinking on technology topics, and build their business networks.

According to *New Tech City*, "There is no better illustration of how far the city has come in building a meaningful tech "community" than the monthly New York Tech Meetup." NYTM itself claims "it has been integral to the birth of New York's new technology industry, with nearly every notable new company, including Foursquare and Tumblr, making its debut at NY Tech Meetup's monthly event."¹¹⁷ NYTM's credibility is further underscored by its role, past and present, as a mediator between the government and the City's tech community. When Hurricane Sandy struck last October, NYTM's mobilization of the industry was instrumental to the government's relief efforts. The Meetup quickly signed up more than

¹¹³ <http://blog.startupcompass.co/>. May 2013.

¹¹⁴ <http://wearemadeinny.com/made-in-ny-list/>. May 2013.

¹¹⁵ <http://www.meetup.com/ny-tech/>. May 2013.

¹¹⁶ <http://www.meetup.com/ny-tech/>. May 2013.

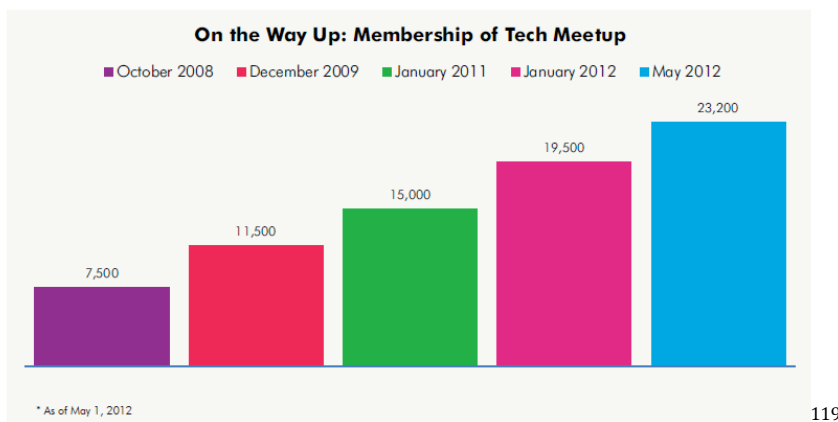
¹¹⁷ <http://www.meetup.com/ny-tech/>. May 2013.

800 volunteers to help build tech tools on the fly. One of these, the Sandy Coworking Crowdmap, provided Lower Manhattan’s workforce with an invaluable platform to offer and find workspace space in the aftermath of the storm.

NYTM has also gained further recognition as the de facto lobbying group for the City’s tech industry. The strength of the Meetup’s internal networks was evidenced with the large rallies it organized in protest of the Protect Intellectual Property Act (PIPA) and Stop Online Piracy Act (SOPA) that were both defeated last year. Meanwhile the group’s open letters in support of immigration reform to both Mitt Romney and President Obama prior to the November 2012 election received widespread media attention and responses from both candidates. Just this past January the Meetup announced that it aims to play a larger role in crafting tech policy in New York, by starting discussions and crowdsourcing ideas amongst its members online. In a blog post titled “Help Us Make NYC the Best City for Tech in the World!,” NYTM’s Board of Directors emphasized that the community should not only mobilize in times of crisis. Rather, they point to the upcoming City elections as an important opportunity to debate in policy not just integral to those working in technology, but those enabled by technology. They write, “It’s hard to overestimate the importance of the opportunity ahead of us – the policies implemented by public officials going forward will have a profound effect on the city’s future, so by doing our part to ensure the candidates are well-informed and are committed to implementing sound policies, we’ll have played a significant role in helping make a better NYC for everyone for a long time to come.”¹¹⁸ NYTM aims to present the results of its discussions to the attention of public candidates running for office later this year.

The recent *Made in NY* campaign is just the latest partnership between the Meetup and the City. Indeed the campaign’s list of startups through which I distribute my survey originated with NYTM.

Although there are numerous other (widely-used) New York-based “community” platforms – most notably, We Are NY Tech, Gary’s Guide, This is going to be big, Startup Digest, Startup Genome, New York Venture Community, Columbia Venture Community, North Brooklyn Breakfast Club, Sandbox, and Women in Tech Meetup – none have the membership or the sustained relevance of NYTM. Because of NYTM’s industry recognition, legacy, and substantial membership base, NYTM is the best vehicle through which to distribute a survey to the city’s tech community.



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Figure 5. On the Way Up: Membership of the Tech Meetup

The Mayor’s Office of Media & Entertainment’s official *We Are Made in NY* list of local startups is the second organizing framework for distribution of my survey. The list inventories 927 New York startups that base “at least 75%” of their development in the city, have a minimum of one employee and “at least 1,000 users or monthly visitors.” The *We Are Made in NY* campaign was launched in February of this year in partnership with NYTM. It extends some of the same business privileges to New York’s tech companies (most significantly marketing) that have been available to local media and entertainment industries since the *Made in NY* campaign launched in 2005. The list of tech companies is accompanied by an interactive *Made in NY* digital jobs map, which plots locations of tech companies across the five boroughs and indicates which are hiring. All digital companies, whether homegrown or not, are eligible for inclusion on the jobs map, which links directly to the jobs listings. While none of the development programs, funding and education opportunities

¹¹⁸ <http://nytm.org/blog/entry/13-24-2013/help-us-make-nyc-the-best-city-for-tech-in-the-world>. May 2013.

¹¹⁹ *New Tech City*. 17.

highlighted on the *Made in NY* website are new for purposes of this campaign, their integration into one hyperlinked forum is significant. The extension of the *Made in NY* brand is articulated on the campaign website as “an economic development initiative that supports the city’s vibrant tech community by highlighting job opportunities in the sector, celebrating the growing number of NYC-based digital companies, and providing access to resources and programs that help tech companies grow, and novices learn how to become part of the innovation ecosystem.”

I use the *We Are Made in NY* list as the second means of distribution because the employees of those companies listed represent a majority of the City’s tech workforce – the audience to whom my survey is directed.



Figure 6. *We Are Made in NY* Campaign Advertisement
The February launch of the campaign was accompanied by a citywide media blitz.

My survey contains the 28 questions reproduced below. The fully formatted survey is included in the Appendix.

Survey Questions:

PERSONAL INFORMATION

1. Are you in a tech industry?

(Does your company produce tech-related goods and services?)

- Yes
- No

2. Do you have a tech occupation?

(Do you work in a tech-related activity? Occupational data classifies workers by what activity they are engaged in regardless of industry)

- Yes
- No

3. Industry (as best fits):

- Advertising
- BioTech
- CleanTech
- Communications
- Consulting
- Consumer Electronics/Devices
- Consumer Web
- eCommerce
- Education

- Enterprise
 - Finance
 - Food
 - Games, Music, Sports, Video and Entertainment
 - Hardware/ Semiconductor
 - Legal
 - Mobile/Wireless
 - Network/Hosting
 - Public Relations
 - Venture
 - Search
 - Security
 - Social Media
 - Software
 - Other, please specify: ____
4. What is your occupation? ____
5. What is your place of origin?
- NYC
 - Not NYC
6. If Not NYC, How long have you lived in NYC?
- Less than 1 year
 - 1-2 years
 - 3-4 years
 - 5+ years
7. Where did you receive your most recent degree?
- NYC
 - Not NYC
 - If NYC, please specify: ____
8. What was your most recent degree?
- High School Diploma/GED
 - Associate's
 - Master's
 - Doctorate
 - Certificate
 - Other, please specify: ____
9. In what field was your most recent degree?
- STEM (Science, Technology, Engineering, Mathematics)
 - Computer & Math Sciences
 - Engineering & Related
 - Physical & Life Sciences
 - Not STEM
 - Psychology
 - Social Sciences
 - Humanities
 - Education
 - Professional Fields
 - Other, please specify: ____

COMPANY INFORMATION

10. Company size (in employees):

- 1-3
- 4-9
- 10-24
- 25-49
- 50-249
- 250-999
- 1000+

11. What was your company size (in employees)?

- Last month? _____
- Last year? _____

12. Is your company actively hiring?

- Yes
- No

13. Company age

- Less than 1 year
- 1-2 years
- 3-4 years
- 5-9 years
- 10+ years

14. Did your company start in NYC?

- Started in NYC
- Relocated to NYC
- Opened an additional office in NYC

15. If Relocated to NYC, or Opened an Additional Office, how long ago?

- Less than 1 year
- 1-2 years
- 3-4 years
- 5+ years

16. If Relocated to NYC, or Opened an Additional Office, why?

- _____

BLOOMBERG ADMINISTRATION TECH POLICY & TECH IN NYC

17. Did you or your company graduate from an NYC incubator, accelerator or wetlab?

- Yes
- No

18. If Yes, was it NYCEDC-sponsored?

(NYCEDC incubators: NYU-Poly Varick Street Incubator, NYU-Poly DUMBO Incubator, BMW.i Ventures Incubator, Hive @ 55, General Assembly and Sunshine Bronx)

- Yes
- No

19. If Yes, length of time since graduation?

- Less than 6 months
- 6-12 months
- 1-2 years

- 2-3 years
- 3-5 years

20. Did you or your company participate in, or are you or your company active, in any NYC-sponsored tech industry program? (Please check all that apply)

- Applied Sciences NYC
- Broadband Express
- Code Corps
- ConnectNYC
- Digital Divide
- Made in NY
- NYC BigApps
- NYC Broadband Connect Map
- NYC Generation Tech
- NYC Next Idea
- NYC Tech Talent Draft
- NYC Venture Fellows
- Reinvent Green Hackathon
- Reinvent NYC.gov Hackathon
- Take the H.E.L.M.
- WiredNYC
- Other, please specify: ____

21. If you answered Yes to the previous question, in which role/what capacity did you or your company participate in an NYC-sponsored tech industry program?

- ____

22. What are your opinions of the recent *We Are Made in NY* campaign? If included, how will this affect your company?

- ____

23. If you or your company have NOT availed yourself of government services or programs, please comment as to why not:

- ____

24. Have you or your company/do you or your company interact with any NYC academic institutions in a professional capacity?

(In terms of recruiting/hiring, attending events, using physical space, for R&D, etc.)

- ____

25. Is it currently difficult for you or your company to hire the necessary talent in NYC?

- Yes
- No

26. How networked would you consider your company with other tech community members or industry companies

- ____

27. How do you perceive the opportunities and challenges to working in tech in NYC (irrespective of government activity)?

- ____

28. What are your perceptions of the Bloomberg administration's tech industry focused policies and programs:

- ____

Survey Question Exposition:

Defining Tech: Questions 1-4

To approach tech-focused economic development from an academic perspective requires first and foremost a definition of what exactly tech is. Moreover, it requires a definition of what exactly tech is in the context of economic development. Because my study – and my survey – evaluates the City’s tech community, I focus here on a definition of tech in the context of employment. While employment is certainly not the only indicator of concern to the City (and as discussed earlier, it is not the only indicator used to document tech’s rise), employment is a tangible, widely accepted barometer of the economy’s health, and allows for simple comparisons across industries.

The definition of tech, however, varies widely. As a July 2007 publication prepared by the Massachusetts Department of Workforce Development states: “There are no “official” definitions of Life Science, Bio-Tech, High-Tech and Knowledge Industries assigned by the federal government, the Commonwealth of Massachusetts or other organizations. The definitions of these industries may be subjective and may change over time. Most definitions of special industries groups are subjective or a result of a variety of organizations membership lists. Other definitions use a combination of qualitative & quantitative research methodologies to form a comprehensive list.”¹²⁰

Before a definition of tech can be discussed here it is critical to note that the term itself has been, and continues to be, used broadly to describe not only employment in tech *industries* (the most common focus of the definition), but also employment in tech *occupations* (an important semantic distinction that will be covered in more detail in the next section). While classification by industry relates to the *goods and services a company produces*, understood as the *primary* business activity to take place at a particular establishment, classification by occupation pertains to how workers classify the type of activity they are engaged in, *regardless* of industry. Thus, tech employment when defined, and more importantly when quantified by industry, is not synonymous with tech employment when defined and quantified by occupation. Tech employment by industry only counts those jobs assigned to an *industry* classified as tech, regardless of the job function performed. Tech employment by occupation conversely, counts all jobs assigned to an *occupation* classified as tech, which can include tech occupations within industries the *primary* goods and services of which are not tech products. Furthermore, tech occupations contained within industries not designated as tech industries can only be counted towards tech employment – when using an industry-based employment count – if those occupation are housed in a *physically separate* location, due to the data collection process (a process explained below in more detail). The result therefore is that employment counts by industry and employment counts by occupation illustrate not only two distinct concepts of tech employment, but produce dramatically different numbers as well. While I am getting slightly ahead of myself, I elucidate this definitional nuance to justify my inclusion of questions of both industry and occupation within my survey, and to underscore some of the difficulties in evaluating tech-directed economic development (issues that will be explored in more detail).

In returning, however, to the issue of defining tech employment I begin with an *industry*-focused definition of tech, as the federal government’s industry-focused definition constitutes the most detailed empirical definition tech has. More importantly, the federal government’s Bureau of Labor Statistics (BLS) defers to an industry-focused definition (its own) in collecting, analyzing and publishing statistical data related to the U.S. business economy (including employment data of any kind). The BLS’ North American Industry Classification System (NAICS)¹²¹, a six-digit code at the most detailed industry level, provides the BLS its definitional framework. While BLS data is updated quarterly, and in some instances monthly, for many industries at the national level, data through to six digits at the level of the county is only updated for most indicators every five years.

In 2005, the BLS published the most recent update to its NAICS-based definition of high-technology employment (NAICS codes themselves were most recently updated in 2012). The update, written by BLS economist Daniel Hecker, describes the Bureau’s definitional criteria and methodology (a process that originated with occupation-based data).

¹²⁰ <http://lmi2.detma.org/lmi/pdf/Definitions.pdf>. May 2013.

¹²¹ NAICS uses a six-digit coding system to identify particular industries & their placement in this hierarchical structure of the classification system. The first two digits of the code designate the sector, the third digit designates the sub-sector, the fourth digit designates the industry group, the fifth digit designates the NAICS industry, and the sixth digit designates the national industry. A zero as the sixth digit generally indicates that the six digit industry and the five digit industry’s are the same.

Hecker includes the four major factors the BLS believes describe a high-tech industry: a high proportion of scientists, engineers and technicians; a high proportion of R&D employment; production of high-tech products, as specified on a Census Bureau list of advanced technology products; and the use of high-tech production methods, including intense use of high-tech capital goods and services in the production process. The occupations the BLS identified that satisfied these criteria coalesced broadly around three main groups – computer and math scientists; engineers, drafters and surveyors; and physical and life scientists – that were then analyzed to determine which industries contained large shares of technology-oriented workers. He writes, “An industry is considered high tech if employment in technology-oriented occupations [accounts] for a proportion of that industry’s total employment that [is] at least twice the 4.9-percent average for all industries.” At this low-threshold, 46 four-digit NAICS industries are classified by the BLS as high tech. The Bureau further organizes these into Levels I, II and III based on each industry’s degree of intensity in technology-oriented workers (with Level I having the highest ratio of employment in technology-oriented occupations to the industry’s total employment). The complete list of industries included in the BLS definition at the four-digit level is included in the Appendix. The Level I tech industries through to four digits are included below:

NAICS Code	Industry
3254	Pharmaceutical and medicine manufacturing
3341	Computer and peripheral equipment manufacturing
3342	Communications equipment manufacturing
3344	Semiconductor and other electronic component manufacturing
3345	Navigational, measuring, electromedical, and control instruments manufacturing
3364	Aerospace product and parts manufacturing
5112	Software publishers
5161	Internet publishing and broadcasting
5179	Other telecommunications
5181	Internet service providers and Web search portals
5182	Data processing, hosting, and related services
5413	Architectural, engineering, and related services
5415	Computer systems design and related services
5417	Scientific research-and-development services

Source: Bureau of Labor Statistics; calculations by Bay Area Council Economic Institute

Figure 7. BLS’ NAICS High-Technology Level I List of Industries

As can be seen in the table above, the BLS’ definition of tech comprises not only industries typically thought of as high tech, such as manufacturing and services in computers, advanced communications and electronics, but also the medical and aerospace manufacturing, engineering services, and scientific research and development industries that also exhibit very high shares of technology oriented workers. It is a definitional inclusivity that is worth keeping in mind in the analysis of all industry-based definitions of tech that originate with the BLS.

While industry-based definitions of tech rely – in their most technical form – on NAICS codes, occupation based-definitions find empirical grounding in Standard Occupation Classification Codes (SOC). SOC-definitions of tech follow the same logic as the BLS’s NAICS-based definition of tech, and include scientific, engineering and technician-oriented sectors. The SOC-derived definition of tech concerns computer and mathematical scientists, SOC 15-0000; engineers, SOC 17-2000; drafters, engineering, and mapping technicians, SOC 17-3000; life scientists, SOC 19-1000; physical scientists, SOC 19-2000; life, physical, and social science technicians, SOC 19-4000; computer and information systems managers, SOC 11-3020; engineering managers, SOC 11-9040; and natural sciences managers, SOC 11-9120. The U.S. Census Bureau collects occupational data via the American Community Survey and publishes it annually for all

geographies over 65,000 people. Five-year data is available for all the geographies in the U.S. SOC codes are used by Federal statistical agencies to classify workers into occupational categories for the purpose of collecting, calculating, or disseminating data only, and are not used for tax purposes.

Despite this foundation then that the BLS provides in its explicit classification of tech by industry or by occupation, and the definitions it sets as standards for each with which to count employment, very little employment data circulated about the tech industry in New York City actually defers to the BLS or acknowledges the clear distinction it sets between the two forms of counts. TechAmerica, a trade organization that describes itself as the “leading voice and resource for the U.S. technology industry,” is one of the few sources of tech-related research that ascribes to the BLS’ inclusive industry-based definition and its data. The organization publishes a yearly compendium of high-technology industry data for the United States that tracks employment, wages, establishments, payroll, employment concentration, and wage differential. They organize the BLS’ designated tech NAICS codes – and respective employment figures – into four sectors: high-tech manufacturing, communications services, software services, and engineering and tech services, to provide for a more nuanced, and digestible, picture of the industry. Their widely republished employment statistics about the New York MSA (by their count the number one “cybercity” in the country) were most recently updated in 2010, using data from 2009. Michael Kazmierszak, Senior Vice President & Director of the TechAmerica Foundation says TechAmerica uses the BLS’ industry-focused, NAICS-based definition of tech employment for its relative accuracy and comparability across geographies, and across time. The unreliability of SOC-based data, on the other hand, he says, comes from the nature of the ACS, which as a survey is rife with inconsistencies and errors. Kazmierszak does concede that using the BLS’ data and industry-based definition does have its limitations. Obstacles he cites include the significant lag time between when the BLS collects the data and publishes it, the infrequent updates of data at the level of the state and the county, and the inclusivity of the definition, which extends beyond the industries and occupations most readily associated with tech. Although TechAmerica’s use of an industry-based employment count is due to its role as a trade organization (representing tech companies, he says, not individual occupations), Kazmierszak agrees an industry-based employment count is likely an undercount, due to the nature of NAICS classification itself (as discussed above).

It is perhaps not surprising then – given the limitations to using BLS data and definitions – that tech employment counts for New York City are often the product of guerilla tactics in data generation and tailored definitions. The executive search firm Cook Associates, for example, produces its widely circulated quarterly tech employment figures for the City using data collected from the online professional network LinkedIn. According to John Barrett, Cook Associates’ Managing Director for Digital Media & Entertainment, the company generates its employment figures by maintaining a database of “pure-play Internet and digital media” companies in New York City with ten or more employees, the names of which he then runs through LinkedIn to count the number of employees at each company. Even though Barrett does not include digital-focused employees of “traditional” companies and digital ad agencies, he still believes that the companies he surveys represent more than 90% of the Internet and digital media employees currently in the City. The pure-play Internet and digital media companies that he assigns as his definition of tech include, he says, the sub-sectors of media/content, social networking, advertising, mobile media/commerce, e-commerce, video, local, analytics and marketing software.

Indeed, the definition of tech that I use in my survey to generate data about participants’ industries and occupations conforms to neither tech’s NAICS-based nor SOC-based definition. Rather than posit my own definition that might limit or confuse respondents, the list I provide for **Question 3** is a composite of industry categories used by prominent tech industry platforms in their own community surveys. TechCrunch’s *CrunchBase*, a free database of technology companies, people, and investors that anyone can edit, (Figure X) and *Startup Genome* (Figure X) form the basis for my list. This informal definition of tech is thus more characteristic of the term’s use in City media and reports (both tech data experts I interviewed, Barrett and Kazmierszak, felt that the age-old definition of pornography represented an appropriate analogy for defining tech – you know it when you see it). The large number of categories thus, and importantly, the ability to provide one’s own answer, is intended to reveal the industry and occupational diversity of those employed under the widely permeated net of tech in New York City.

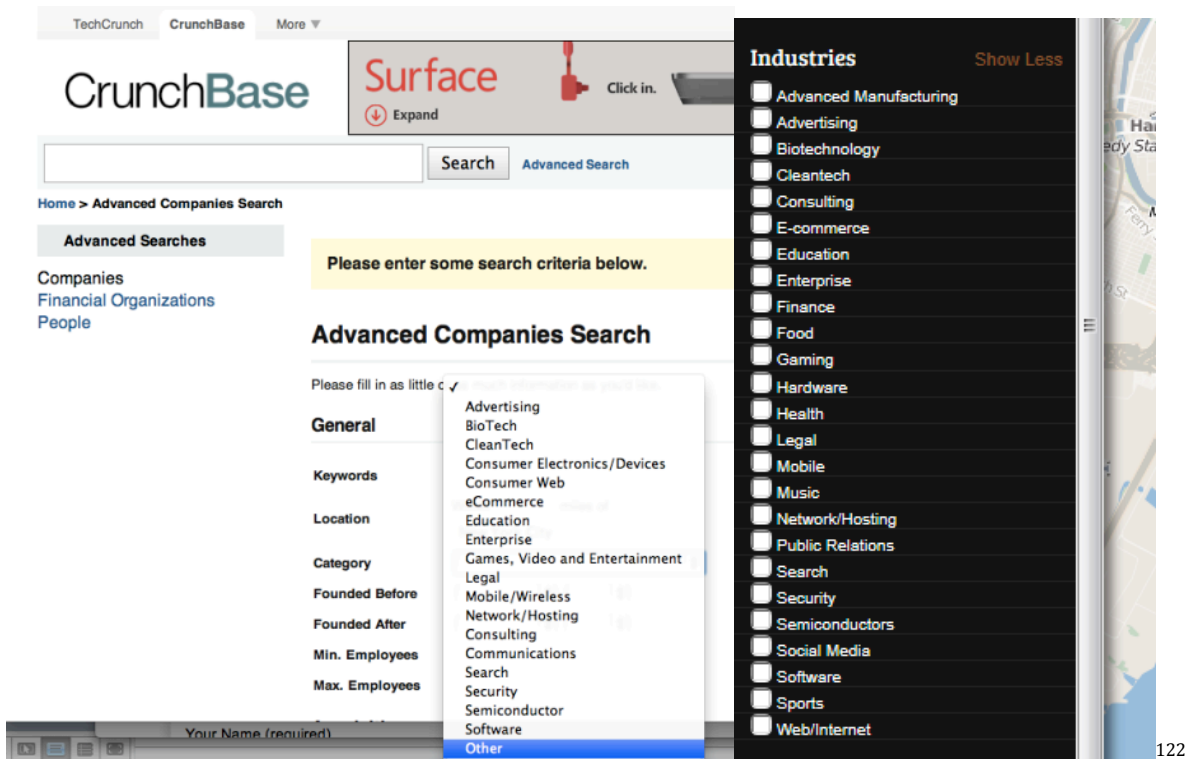


Figure 8. *CrunchBase's* List of Industries

Figure 9. *Startup Genome's* List of Industries

By asking all of **Questions 1-4** I hope to address the industry/occupation distinction discussed earlier, which is absent from other similar online surveys (*CrunchBase & Startup Genome* included). In “The Occupation – Industry Mismatch: New Trajectories for Regional Cluster Analysis and Economic Development,” Elizabeth Currid and Kevin Stolarick elucidate this importance of linking occupational analysis with the more traditional focus on industry in regional cluster analysis and economic development. Published in 2010, their study of the IT sector in Los Angeles shows that the industry approach *in combination with* an ‘occupational cluster analysis’ leads to a better understanding of regional competitiveness and trajectories for growth. They draw from both Michael Porter’s seminal studies on industrial clusters and their cross-fertilizing linkages across industries, as well as from more recent occupational cluster analyses that attempt to measure a region’s skillset and point toward other industries that require the skills of the region’s occupational advantages, in positing their own hybrid approach. They write, “We find that neither approach [industry nor occupation] illuminates the region-specific nuances and that both must be incorporated to capture the region’s dynamics. In other words, occupations and industries are both important, and simultaneously evaluating them will lead to a better understanding of regional competitiveness and possibilities for development and policy trajectories.”

By asking my survey respondents to list both their industry with their occupation I hope to arrive at thus a richer picture of the tech (employment) landscape, as it exists in New York. The two questions of industry and occupation allow for four different combinations: tech industry and tech occupation, not tech industry but tech occupation, tech industry but not a tech occupation, and not a tech industry and not a tech occupation (because my survey was deliberately positioned toward the tech community I do not expect to find this option in my results). Data across these three poles should provide (at a very elementary level) a more nuanced understanding of the skillsets and types of occupations that represent the tech sector locally, as well as, importantly, basic insight into the pervasiveness of tech beyond the industries definitionally ascribed to it (and otherwise not captured through more prevalent industry-focused analyses). Indeed, in the context of New York City, recognizing this crucial definitional distinction and the dominance of industry-based employment counts is even more essential, as discussed in an earlier section, as so much of the City’s technological activity concerns the

¹²² <http://www.crunchbase.com/>. May 2013.
[http://startupgenome.com/city/new-york-ny-us#&category_ids\[\]=2](http://startupgenome.com/city/new-york-ny-us#&category_ids[]=2). May 2013.

application of tech to other major City industries. As alluded to in the Introduction, the City is becoming increasingly recognized for its particular brand of ‘dash’-tech, a phenomenon that in the absence of adequate occupation-driven data cannot be empirically understood. Says Andrew Rasiej, the current chairman of the New York Tech Meetup in *New Tech City*, it is a mistake to conceive of City tech companies as comprising a sector at all: “Technology is not a slice of the pie, but the pan.”¹²³

While **Questions 1 to 4** establish the participant’s role within the community, the remaining questions in this first survey section try to assess how homegrown and home-educated the City’s tech population really is. As mentioned, the administration’s tech economic development agenda – particularly its emphasis on STEM education and recruiting outside talent – is a direct response not only to the talent crunch, as discussed, but also to the contention that the City’s existing academic institutions are graduating an insufficient number of engineers and failing to keep them local.

Indeed, to listen to much of the rhetoric surrounding the talent crunch and Applied Sciences NYC, one would think few native New Yorkers know how to code. At an Internet Week event last year, Jonathan Bowles, director of the Center for an Urban Future and co-author of *New Tech City*, told reporters that part of the reason New York’s tech resurgence is having a limited effect on the City’s overall unemployment is that recent hires at startups have tended to be people who relocated to the City. According to Bowles, 103 of Tumblr’s employees at that point had moved to New York from elsewhere (the company itself was founded in New York), while graduates of Harvard Business School founded at least eight startups launched in the City in the previous five years. **Questions 5 & 6** therefore address the community’s origins. For those not native to New York, **Question 6** asks how recently they moved. Because the administration only turned its attention to tech development at the start of Bloomberg’s third term, I am primarily concerned with immigration to the City within the past five years. Answer brackets for this question therefore extend up to five years; segmented to reveal changes in over time. It can be reasonably assumed (unless contradicted by answers to subsequent questions), that if a respondent moved to the City more than five years ago, he or she did not do so because the administration was actively pursuing a tech economy. In the case of respondents who relocated to the City more recently than five years ago, subsequent answers might reveal how much the City’s tech resurgence and the administration’s efforts compelled the move.

Questions 7, 8 and 9 address this issue of talent and the extent to which it is a product of local academic institutions. As mentioned earlier in this study, Center for an Urban Future’s 2009 *Building New York City’s Innovation Economy* revealed that despite leading the nation in STEM R&D and patent commercialization, the City’s academic institutions produce far fewer startup companies than their out-of-state counterparts, and even fewer that remain local. As such, **Question 7** tackles this idea of tech alumni retention by asking unambiguously about where a participant received his most recent degree. The question is thus in part an attempt to replicate the themes of the *University Entrepreneurship Report*, a study published by the venture capital and angel investment database CB Insights at the end of 2012. The seminal report tracks six universities and the companies founded by or led by their alumni, as well as the venture capital or angel financing they have raised. For each of the six, the report reveals by industry where in the U.S. alumni established their companies, how much funding these companies received per year (between 2007 and 2011), as well as how diverse and how local the venture capital and angel investment community is that funded them. CB Insights’ analysis goes even so far as to reveal the success rates (and percentage of firms acquired) for each university’s alumni-led startups.

Importantly, for the purposes of this study, CB Insights’ report lends critical geographic context to an understanding of the entrepreneurial activity of a university’s alumni. It also provides a compelling model for how to quantify a university’s contribution to its local ecosystem over time. The term “alumni leakage,” which the authors use to refer to the percentage of a university’s alumni-led startups that establish themselves outside the university’s home city or state, is indicative not only of a school’s strength in entrepreneurship and alumni relations, but also the extent to which the school’s environs are supportive of the graduates’ entrepreneurial endeavors. Data collected over time can underscore this point. While I do not have the luxury of surveying alumni of City institutions who work in tech outside New York, or performing a longitudinal study, **Question 7** does provide a platform upon which to assess the role of the City’s local academic institutions in tech’s rise. So too then, the question also reveals the City’s strength (academic assets aside), in attracting graduates of outside institutions.

¹²³ *New Tech City*.

The openness of **Question 8**, as it relates to the nature of the degree, is intended to capture the gamut of educational backgrounds, including dropouts. It is also an attempt to discern just how much education is necessary for a tech hub to approach critical mass. According to Dice's *America's Tech Talent Crunch* report, part of the reason the number of advanced Computer and Information Science degrees awarded nationwide has continuously dropped over the last ten years is the unappealing number of credits required to graduate with the skills required for today's technology. The authors write, "Asked to explain this decline, many academics interviewed for this paper echoed a similar theme: The faster the technology moves, the longer it seems to take to master moving technology forward."¹²⁴ Indeed, in some states, the number of computer-related *associate's* degrees have risen over the number of bachelor's degrees conferred – an indication of students desire to access the job market more quickly. The report points out however that "many recruiters in need of skilled tech help say that when they scour resumes for the next Mark Zuckerberg – the Facebook founder who famously dropped out before getting his Harvard bachelor's degree – the more education, the better."¹²⁵

Speaking of Zuckerberg, on the other hand, tech economic development specialist David Hochman posits that software/IT (his assessment of the City's dominant tech industries) are disciplines where entrepreneurship is *least* tied to advanced research. Answers to **Question 8** then in conjunction with **Question 9** should address these opposing claims.

After addressing *how much* education the community received, Question 9 looks at *what kind*. Despite controversy over whether the STEM disciplines characterize the type of education required of New York's tech workforce, and if STEM is actually the focus of Applied Sciences NYC, I use the STEM/Not STEM distinction to organize the categories of my response. Improving education in STEM, an acronym that stands for the fields of Science, Technology, Engineering and Mathematics and also a catchphrase for the U.S. Department of Education, the National Science Foundation and other federal agencies, has been identified in the national discourse as closely linked with our country's economic prosperity. For New York State and New York City, improving the state of STEM education from grades K-12 and beyond has been an impetus for educational reforms and funding.

Although the breadth of STEM education reflects the inclusivity of the BLS' NAICS-based industry-focused definition of tech, STEM is often conflated and confused with a more narrow definition of tech, even within the same report. To wit, Dice's *America's Tech Talent Crunch* refers throughout to "plummeting interest in STEM topics at the college level," yet supports its claims with data focused exclusively on Computer and Information Sciences from the U.S. Department of Education's Higher Education Central Information Survey (HEGIS). Similarly, data from Center for an Urban Future's influential *New Tech City*, which reports on the improving fortunes of the City's tech economy using BLS data for the IT sector only as its definition of tech, is overwhelmingly contrasted with the dire state of STEM education across a variety of media reports. This conflation permeates political discourse as well – Manhattan Borough President Scott Stringer published his economic development platform "Start-up City: Growing New York City's Entrepreneurial Ecosystem for All" premising his policy recommendation's for the "STEM Cell" (a dedicated STEM program at CUNY) on the CUF report's data and definition.

While TechAmerica's Kazmierczak agrees that STEM graduates and software developers are not necessarily one and the same, he emphasizes that the administration's push towards STEM and its rhetoric surrounding research-to-applications processes and R&D is at least directionally accurate. While students rehearsed in STEM can often move to study and pursue other fields, he says, the educational barrier to entry for the STEM professions precludes the reverse. For that reason I present survey respondents with both a breakdown of the STEM disciplines, as well as a variety of others. Answers to this question, in conjunction with those to occupation, industry and educational attainment should provide not only insight into the extent to which a background in STEM education characterizes New York's tech community, but also to the possible diversity of other educational and professional paths that distinguish this city's brand of tech.

Survey questions about the individual are followed by those that pertain to their company. Although Bloomberg often romanticizes the city's tech community as a victory of small business, tech companies in the City come in all sizes. In December of 2012, Google had over 3,000 employees at their New York City office. Other Silicon Valley-based titans like AOL, eBay and LinkedIn have almost as many. Thus, **Question 10** is intended to reveal some of this diversity, especially as when paired with information about a company's place of origin, which I ask about later in the survey.

¹²⁴ http://marketing.dice.com/pdf/Dice_TechTalentCrunch.pdf. May 2013.

¹²⁵ http://marketing.dice.com/pdf/Dice_TechTalentCrunch.pdf. May 2013.

However, because my survey was expanded from a distribution exclusively through NYTM to also include the membership of the *We Are Made in NY* campaign – a campaign geared almost exclusively to the fledgling Bloomberg-variety of startup – I can assume results will skew small. I have therefore included more answer categories between 1 and 50 employees than between 50 and 1000+ to reflect this bias and provide for a more nuanced analysis.

Question 11 follows from and provides context to the previous question to ask about the company’s growth. According to John Barrett’s research at Cook Associates, those companies in the City with the largest headcounts are not necessarily the ones growing most quickly. His 2012 fourth quarter report for the pure-play Internet and digital media companies he collects data separates the top 10 largest companies from those “up-and-coming” to show that homegrown brands such as Fab.com, Etsy, AppNexus and Warby Parker are also posting large gains. Answers to this question will give me a basic understanding of local business growth (and trajectory, when paired with the following question).

Question 12 addresses the talent crunch phenomenon directly by asking whether or not the company is hiring. That so many City startups are actively trying to recruit talent is reflected by the *We Are Made in NY* campaign, and its promotion of its digital jobs map and online company database. Because I use this company database to distribute my survey (in addition to distribution through NYTM) answers to this question will either lend credence to the talent crisis or provide a contrarian view. Answers to this question are also contextualized by responses to **Question 25** later in the survey, which asks whether it is currently difficult for the company to hire the necessary talent locally.

Because I am primarily concerned the administration’s tech-focused economic development activities over the past few years, my answer categories for **Questions 13** and **15** are segmented to reflect this. **Question 14** and **16** speak directly to the strength of the City as a place to found or grow a tech company. Answers regarding relocation or the opening of an additional office will hint at the City’s competitive advantage over another location. The open-form **Question 16** will provide critical insight to the decisions underlying a company’s relocation to New York or the opening of an additional office in the City, and whether the administration’s tech development agenda played any role.

The third and final section of the survey asks questions pertaining directly to the respondent’s experience with tech in NYC. These question ask for opinions on both the administration’s tech policies as well as tech’s viability in the city, government activities aside. **Questions 18** and **20** through **23** are to gauge the community’s convergence with *Roadmap* initiatives and other government programs. **Question 19**, which asks how recently a company graduated from a NYC-sponsored incubator, accelerator or wetlab is intended to assess the relevance of these City workspaces in supporting tech’s rise. Because most of these incubators predate the *Roadmap* initiatives listed in **Question 20**, **Question 19** might also provide some sense to a timeline in opportunities a company has pursued. Again, since the earliest City-sponsored incubator was opened in 2008, answers are restricted from less than six months ago through to five years.

Question 24 reintroduces the discussion about the impact of local universities on tech’s resurgence. This time, the question assesses impact not in terms of graduates, but in terms of infrastructural and intellectual support. As entrepreneur and Boulder tech community champion Brad Feld, writes in his book *Startup Communities: Building an Entrepreneurial Ecosystem in your City*, local academic institutions are important community ‘feeders.’ They can act as “community catalyst: a nerve center where the startup community convenes and information spillovers occur; [and as] as source of insight, ranging from innovative ideas that can be commercialized, to broad and fundamental understandings about what makes startups as well as startup communities work” (128). More specifically, Feld describes the relationship between CU Boulder and the Boulder tech community from its earliest days when it relied on campus space at CU Boulder for meetups, to later, when mutual gains were to be had from a strong internship program. **Question 24** therefore asks respondents whether and how New York academic institutions have figured in their career.

Asking the community whether the companies they represent are currently hiring, as I do in Question 12, replicates the work of the Mayor’s Office, which provides this information to the public on their Made in NY Digital Map. **Question 25**, however, which asks whether the companies they represent find it *difficult* to hire talent locally has been anecdotally supported by the press and the administration, but not yet empirically assessed.

Question 26 meanwhile also draws on another of Feld’s foci, which are the additive effects of a strongly networked ecosystem. Indeed Feld and numerous other scholars talk about the agglomeration economies of scale that lower certain costs, and the network effects that make co-location more valuable than both beget and sustain startup communities.

Network effects themselves are better leveraged by communities with a culture of information sharing across companies and industries. In New York City, these networks are said to be both the product of community efforts, as well as assistance from the City. In EDC’s 2011 *Promoting Entrepreneurship In New York City* report listed “foster[ing] connections to build community among entrepreneurs” as one of their three main foci to promote entrepreneurship in the City. EDC’s bid to create “gravitational centers for emerging [tech] clusters” includes NYC Venture Connect – an informational web portal for local entrepreneurs that integrates all the City’s business resources (a precursor to *We Are Made in NY*) and NYC Venture Fellows, in partnership with Fordham University. Meanwhile the 30,000 plus member strong New York Tech Meetup, and prevalence of other tech meetups and organizations throughout the City speak to the appeal and importance of networking and exchange in an innovation economy. **Question 26** asks for respondents to speak to this phenomenon (and the administration’s score in this regard) in more detail.

Lastly, by asking unambiguously about working in tech in NYC, answers to **Questions 23, 27 and 28** will provide direct insight to the community’s opinions on City tech policies and the attendant opportunities and challenges to pursuing a local tech career.

Interviews

I conduct interviews with a cross-section of New York’s tech community, as well as industry experts and leaders outside of the City to both substantiate my survey responses and to sharpen the theoretical lens with which they are framed.

To follow up with past winners of NYCEDC’s competitions to see how winning affected their career I sent interview requests to all previous winners of NYC Big Apps, NYC Next Idea, and Take the H.E.L.M, for whom contact information was available. Those who shared their experiences with me include:

NYC Big Apps winners:

1.0	MyCityWay	Emily Peck
2.0	Parking Finder	Ben Sann, founder and CEO of BestParking.com
2.0	Roadify	Scott Kolber, COO
2.0 & 3.0	Ontodia	Joel Natividad, self-described Semantic Web Entrepreneur
3.0	ParkAlly	Zachariah Reitano & Mason Silber

NYC Next Idea winners:

Kisibox	Carl Pfeiffer
TaxiTreats	Adam Gartenberg

To ask about the role the New York Tech Meetup has played in tech’s resurgence and the Meetup’s motivations behind its recent policy proposals, I spoke to NYTM Chairman Andrew Rasiej.

To query the role of Columbia University’s Engineering School and Columbia Technology Ventures, its technology transfer program, in the City’s tech boom, I spoke with Orin Herskowitz and Chris McGarry.

I spoke with David Wood at CTO at NYC startup Jun Group to follow up with articles he has written about the local talent shortage and with Anand Sanwal at CB Insights for more insight to their *University Entrepreneurship Report*. I also followed up with Colorado entrepreneur and author Brad Feld on his *Startup Communities* book, and its application to New York City.

For a better understanding of the data and methodologies used in their analyses of the City’s tech community I interviewed Matthew Kazmierzak at TechAmerica and John Barrett, Managing Director at Cook Associates.

Tech-based economic development specialist David Hochman, who consulted on Center for an Urban Future’s influential *New Tech City* report provided me with a much broader understanding of the administration’s role in developing an innovation ecosystem.

I also sent multiple interview requests to NYC Digital, NYCEDC and the Mayor's Office for Media & Entertainment that went unanswered. *One can only hope the administration is doing more to help City technologists than they are doing to help me.*

Methodology Shortcomings

Survey:

There are clear drawbacks and constraints to using a survey, as well as distributing it through the New York Tech Meetup and the *We Are Made in NY* campaign.

Because I distribute this survey only once (and collect it over a period of 60 days), the data I collect does not reveal changes within the community over time. I have tried to correct for this by incorporating questions that ask about a company's status last month, as well as last year. For example, questions 10 and 11, which ask what the respondent's company size is currently (in employees), and what it was both last month and last year, are an attempt to gauge a company's growth rate. Meanwhile, answers to some of the questions within the first section of my survey that ask for personal background information are necessarily fixed (for example, place of origin), and are therefore not affected by a one-time survey.

I am also constrained by the survey's length, as the more questions I add, the more I de incentivize participation. My survey is 28 questions long, requires respondents to click through five different pages (including a welcome page and an informed consent page) and is comprised of both multiple-choice and open-form questions. My survey takes approximately five minutes to complete. To improve my response rate I could reduce the number of questions, place all my questions on one page or restrict myself to multiple-choice only.

Because participation in the survey is both voluntary and without direct compensation, I am unable to obtain enough responses to form a meaningful profile of the City's the community. A future survey could include incentives to participation to increase my response rate.

Drawbacks to using NYTM include the fact that membership to the group is self-elected and non-verified. The Meetup's website claims 31,642 members. This number likely exceeds the number of Meetup members currently employed as NYC technology professionals. Because NYTM does not collect data on its own members¹²⁶, and being employed in tech locally is not a prerequisite to join, it is impossible to know just how its membership skews. By asking questions 1 through 4, however, I should be able to cull those not employed in a tech industry or occupation from my responses.

By distributing my survey to the companies promoted by the *We Are Made in NY* campaign, I gain further access to my target demographic (City technologists), but I bias my responses toward smaller startups. As discussed earlier, a company is eligible for the campaign if they have more than one employee, with at least 75% of the company's employees working in New York. While larger City-founded companies like Fab.com and Gilt Groupe can satisfy this demand, companies like Google and AOL, who employ thousands in the City, are not represented on this list. So too, the *We Are Made in NY* list does not include all local companies that satisfy these constraints. Indeed, both Ben Sann of ParkingFinder.com and Scott Kolber of Roadify, two previous NYCEDC BigApps competition winners and founders of City startups, were both unaware and unaffiliated with the campaign. That two local companies with an existing relationship to EDC could be entirely unaware of the campaign suggests there are many more "made in New York" companies not included on the official list.

In addition to being incomplete, there is also indication that the *We Are Made in NY* list is also out of date, as several companies I emailed have either failed or been acquired since the time the list went public.

To further complicate my methodology, the 989 companies that *are* included in the campaign are predominantly those that would satisfy an industry-based definition of tech. My survey, however, is in part a bid to reveal a more complete picture of the City's tech community than is afforded by more prevalent industry-based employment counts and other industry-based indicators, which distribution through *We Are Made in NY* could possibly undermine. I would therefore

¹²⁶ According to NYTM representative Jessica Lawrence.

distribute this survey in the future through a greater number of company aggregators and community organizations than the two I use here.

In the time since I constructed and distributed survey, my further review of the literature has revealed aspects of the survey itself I might alter if I distributed it again.

Unless addressed in an open-response answer within the survey, my questions as written do not ask whether a participant left a job in another local industry, such as finance, fashion or media, to go into tech. At an Internet Week event alluded to earlier in the Methodology, CUF's Jonathan Bowles said that another reason why tech's employment gains in the City have not improved the City's overall employment rate might be because – in addition to City in-migration – these shifts from one industry to another are not accounted for. While *education* in fields other than tech is probed within my survey, I do not query a person's career path to their current job in tech today. A question such as, "Have you worked in a non-tech occupation previously?" might help correct for this omission.

Also, while my survey asks about *how much* education and *what kind* of education, I do not inquire as to the participant's skill sets, data perhaps more applicable to understanding the local talent crunch phenomenon. In Dice's *America's Tech Talent Crunch* report, for example, the authors frame much of their discussion of the crunch around the concept of skillsets, and rank the skills most in demand for tech hires nationwide. (The fastest growing skills on requested on Dice include Android in first place, followed by Cloud, iPhone, Javascript and Peoplesoft.) Indeed, the title of an article in the *New York Daily News* from January of this year puts the issue bluntly, "A jobs crisis? No, it's a skills crisis."¹²⁷ Meanwhile, in yet another media report on the crunch, IBM's general manager of academic and developer relations goes even further, to state, "We are faced with one of the largest skills gaps in history."¹²⁸ Querying the skillsets of the City's tech community within my own survey would therefore provide an important and necessary dimension to a discussion about its level and background of educational attainment.

So too, in addition to querying skill sets I could also improve the quality of my community survey by probing expertise. Indeed, as detailed in an earlier section, the authors Lichtenstein and Lyons emphasize the need for economic developers to understand and evaluate local entrepreneurship not only in terms of *quantity*, but more importantly in terms of *quality*. The authors contend that without the proper tools to measure and understand quality, economic development efforts fall into the trap of treating all entrepreneurs the same. The result is support, but not development or transformation; efforts that fail to target assistance in an appropriate or meaningful way. Measures of quality at the level of the individual include *level* of skill proficiency, and the effectiveness and efficiency with which entrepreneurs move their companies through stages in a business life cycle. In *Investing in Entrepreneurs: A Strategic Approach for Strengthening Your Regional and Community Economy*, the authors develop their own multi-dimensional framework to assess the skill level of individual technologists, establishing five different rungs on a 'skill ladder' and four dimensions to a skillset at each rung. To gain a similar understanding of community quality, I could incorporate aspects of their framework within my own survey. However, asking respondents to gauge their own proficiency comes with its own data perils.

Currently, I only profile local business growth in terms of the number of employees. This aligns with my definition of tech by employment, as well as my substantive focus on those working here in tech, but excludes other perhaps more important and meaningful barometers of growth (to the community), like funding and revenue. Moreover, my simplistic and quantitative measurements of the companies represented by survey respondents cannot assess the issue of business *quality*, as stressed by Lichtenstein and Lyons. The authors' own evaluatory framework to profile entrepreneurs takes this into account by evaluating the stage at which a company is at within a business lifecycle. (It is only with an understanding of business quality the authors say that governments can provide the types of economic development assistance commensurate with progressing through each stage). In a future survey I could ask questions about respondents' companies that reveal aspects about quality as just described.

Lastly, in spite of my attempt to craft a meaningful profile of the City's tech community I have omitted from my survey salient demographic indicators such as gender and ethnicity. Because of my effort to keep the survey as anonymous and IRB-friendly as possible, I am unable to comment on issues of equity with regards to the government's support of the

¹²⁷ <http://www.nydailynews.com/opinion/jobs-crisis-skills-crisis-article-1.1240688>. May 2013.

¹²⁸ <http://chronicle.com/blogs/next/2012/09/12/skills-gap-employers-and-colleges-point-fingers-at-each-other/>. May 2013.

community, or systemic issues of gender or racial/ethnic discrimination that might characterize the tech industry more broadly. TechCrunch's *CrunchBase* meanwhile has capitalized on my omission by recently expanding their own community survey and database to include seven more demographic data points. As they advertise jubilantly on their website: "We are proud to announce that we've added 7 demographic filters to People Search to allow you to create hyper-targeted contact lists (names, phone #s and emails). You can search our People data by Religion, Gender, Ethnicity, Marital Status, Salary, Political Views and University Attended. *Want a list of enterprise companies who have a CEO, CFO or CIO who graduated from Stanford and who makes over \$250k per annum and who is either Hindu or Jewish? Takes 8 seconds.*"¹²⁹ Indeed, the demographic data I collect palls in comparison.

Interviews:

Because most of my interviews were in the form of email exchanges with structured questions, I was restricted in the number of questions I could ask, and the level of detail I could expect in response. I was also unable to speak with the majority of candidates I wished to interview. These included most importantly those within the administration (at NYC Digital, NYCEDC and the Mayor's Office), as well as past winners of EDC competitions and industry leaders for whom contact information was either unavailable or from whom I received no response.

¹²⁹ <http://www.crunchbase.com/>. May 2013.

2. *Why cities want tech*

Less than five years after the financial crisis, economies nationwide are still reeling from its repercussions. While many traditionally reliable industries like finance continue to lose jobs, one consistent bright spot in the nation's economy has been the tech sector. From Austin's Silicon Hills, to Louisiana's Silicon Bayou, California's Silicon Beaches to New York's own Silicon Alley, local governments have been actively courting tech. By providing subsidies and tax incentives, land and real estate, and initiatives and programs, cities across the country are hoping that cultivating a thriving local tech sector will give the regional economy a much needed boost.

As discussed in the section that follows, tech's economic benefits are manifold. Tech is not only a potent source of job growth, but it is also responsible for a disproportionate share of productivity gains and national income growth, with workers in tech industries and STEM occupations earning a substantial premium relative to workers in other fields. Tech's indirect effects are also substantial, as evidenced by its strong local multiplier, which is greatly in excess of other private sector industries.

Tech's appeal to the City's administration is even more pronounced when contrasted with the City's unemployment rate and lackluster rate of private sector job growth. According to the *New York Times*, the City's unemployment rate in February 2013 stood at 9.1%, unchanged from January. Meanwhile, the national unemployment rate fell to a four-year low of 7.7% that month, with New York State at 8.4%. The City is also trailing the national average in private sector job growth: in the past 12 months, the number of private-sector jobs in the City has risen by 1.5%, as compared with a national growth rate of 1.9%.¹³⁰ Importantly too, tech – and its wage premium – have a significant role to play in the administration's continuing bid to diversify the economy. While the City is less reliant on the financial sector than it was prior to the financial collapse of 2008, the securities industry remains the most valuable to the City by virtue of wages. This means that the jobs being lost on Wall Street pay far more, on average, than the jobs being added in either health care, education or tourism-dependent businesses like hotels and restaurants – all sectors that have come to represent a sizeable part of the City's economy in terms of employment, but not in taxes.¹³¹

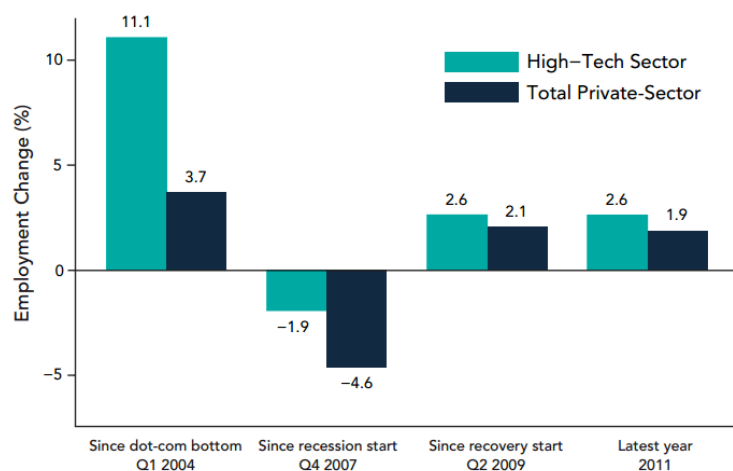
Tech as jobs

The Bay Area Council Economic Institute's (BACEI) "Technology Works" report, published in December of last year, analyzes patterns of high-tech employment and wages across the United States. Although the Institute's analysis pertains mostly to trends at the national level, it is nevertheless useful to demonstrate tech's broader impact and its implications for local economic development. So too, the report's claims about tech's comparative stability and growth potential both support and provide important context to my earlier narrative about tech's rise in New York City.

¹³⁰ <http://cityroom.blogs.nytimes.com/2013/03/28/weak-job-market-leaves-citys-unemployment-rate-flat/>. May 2013.

¹³¹ <http://www.crainsnewyork.com/article/20110815/BLOGS01/308159996>. May 2013.

Employment Change During Key Time Periods Through 2011

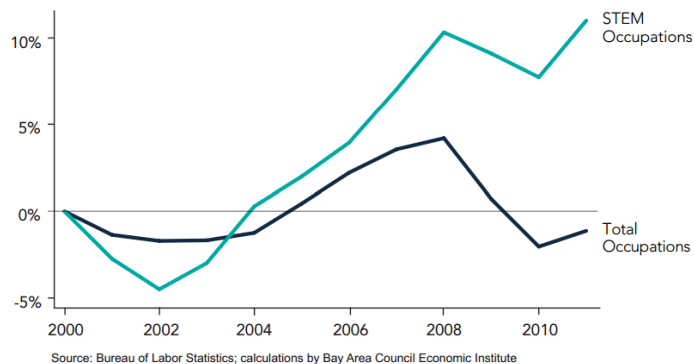


Source: Bureau of Labor Statistics; calculations by Bay Area Council Economic Institute
 Note: Data excludes public-sector workers.

Figure 10. Employment Change During Key Time Periods Through 2011

As the report states, the high-tech sector has been the “one consistent bright spot” in the U.S. economy since the dot-com fallout reached its nadir in the first quarter of 2004. (The BACEI uses the BLS’ Level-1 definition of tech¹³² for all industry metrics, and the BLS’ definition of STEM SOC codes for calculations by occupation.) The Council’s analysis shows that since the dot-com bust hit bottom in early 2004, employment growth in the high-tech sectors has outpaced growth in the private sector as a whole by a ratio of three-to-one. High-tech sector employment has also been more resilient in the recent recession-and-recovery period (through 2011, the last year for which they have data.) The unemployment rate for the high-tech sector has also been consistently well below the rate for the broader U.S. economy, reflecting high demand for high-tech skills, as can be seen in the chart below:

STEM Employment Change Since 2000



Unemployment Rate by Industry Group, 1995-2011



Figure 11. STEM Employment Change Since 2000

Figure 12. Unemployment Rate by Industry Group, 1995-2011

Employment growth in STEM occupations, meanwhile, has been consistently strong throughout the last decade, the Institute found, outpacing job gains across all occupations by a ratio of 27 to 1 between 2002 and 2011 (see chart above). Employment projections calculated in the study indicate that demand for high-tech workers will be stronger than for workers outside of high-tech at least through 2020. Employment in high-tech industries is projected to grow 16.2% between 2011 and 2020 and employment in STEM occupations is expected to increase by 13.9%. Employment growth for the nation as a whole is expected to be 13.3% during the same period.¹³³ (A study published earlier this year by Engine Advocacy, a public policy group committed to technological innovation and entrepreneurship, reached similar

¹³² A definition of which is provided in the Methodology section of this study.

¹³³ <http://www.bayareaeconomy.org/media/files/pdf/TechReport.pdf> May 2013.

conclusions,¹³⁴ with jobs in the tech sector projected to grow 16% over the next eight years, as compared to 12.8% for the private sector as a whole.)¹³⁵

Tech as wages

Although the job numbers and growth trends for the industry are important, tech’s substantial income dividends are perhaps more meaningful to local workers and households. (Employment wages reflect the share of national income that is captured by the tech workforce. As a result, wages are particularly reflective of value-added economic output by sector. Wages also reflect the relative supply and demand of workers in their respective fields and regions.)

In the “Technology Works” report from December of last year, the BACEI calculates tech’s average annual wages (2011) and five-year percentage change (2006-2011) by pairing STEM occupation data with high-tech industry data. As such, theirs’ is a comprehensive analysis of wage differentials and wage growth across the tech workforce. (Their data also accounts for many other factors that influence workers’ earnings, including age, gender, education, race, ethnicity, marital status, and geography).

BACEI’s research shows that workers in high-tech industries (across all occupations) earn almost three-quarters more per year than workers in the remaining industries. In STEM occupations (across all industries), workers earn nearly double. Workers with STEM jobs in high-tech industries earned almost 12% more than did STEM workers outside of high-tech industries. They also earned nearly one-third more than their non-STEM colleagues within high-tech industries in 2011.¹³⁶

The full spectrum of calculations is shown below:

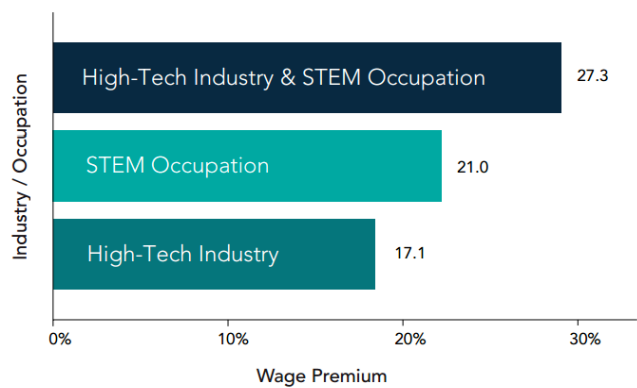
Average Annual Wages (2011) and Five-Year Percentage Change (2006-2011)

Industry	Occupation	Avg. Wage (\$)	5-Year Change (%)
Total	Total	45,230	3.4
Total	STEM	81,008	3.7
Total	Non-STEM	43,348	3.0
High-Tech	Total	75,431	5.7
High-Tech	STEM	86,173	3.8
High-Tech	Non-STEM	65,959	5.8
Non-High Tech	Total	43,752	3.1
Non-High Tech	STEM	76,992	3.5
Non-High Tech	Non-STEM	42,742	2.9

Source: Bureau of Labor Statistics; calculations by Bay Area Council Economic Institute

Figure 13. Average Annual Wages (2011) and Five-Year Percentage Change (2006-2011)

High-Tech Wage Premium, 1995-2011



Source: U.S. Census Bureau; calculations by Bay Area Council Economic Institute

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Figure 14. High-Tech Wage Premium, 1995-2011

As the BACEI contends, the substantial wage premium in high-tech industries is partly a reflection of the fact that high-tech industries, as drivers of innovation and productivity, are among the highest value-adding industries across the

¹³⁴ Research published by the Engine Institute in partnership with the Bay Area Council Economic Institute (BACEI) uses the BLS industry-based definition of tech, layered with occupation data. This is to say; they look “at all the jobs at companies in technology industries, not just workers with these professional skills. These industries include computer hardware, software, systems design, and information; high-technology communications and electronics equipment; Internet publishing and web search portals; data hosting and processing services; pharmaceutical and medical manufacturing; aerospace manufacturing; architecture and engineering services; and research and development services.” They use this layered approach to show that “technology doesn’t just create jobs for engineers and computer scientists, but managers, designers, salespeople, and executives as well.” Lastly, the Institute’s research focuses on *new* business establishments – first-year startups – in the same technology industries. This includes all types of businesses, including sole proprietorships that are not captured by Labor Department or Census Bureau data. As such it is a broader and more comprehensive picture of tech startup growth than found in reports that rely on these more traditional sources of data.¹³⁴

¹³⁵ <http://www.wnyc.org/shows/newtechcity/blogs/new-tech-city-blog/2012/sep/17/new-york-citys-tech-boom-bad-news-good-news/>. May 2013.

¹³⁶ <http://www.bayareaeconomy.org/media/files/pdf/TechReport.pdf>. May 2013.

¹³⁷ <http://www.bayareaeconomy.org/media/files/pdf/TechReport.pdf>. May 2013.

economy. Income gains, shared among workers, shareholders (in some cases) and governments, have followed accordingly, they write. When combined with very low unemployment rates and strong job growth (as previously shown), rapidly increasing wages also reflect the fact that these workers are in high demand. The same is true of workers in the STEM occupations.

Using more recent data (and an unspecified definition of tech), a salary report released in October of last year by the staffing and consulting firm Robert Half International, shows encouraging growth prospects for tech wages going forward. The firm's report claims jobs throughout the tech industry are expected to see the greatest average increase in compensation of any sector covered by the report, with an expected 5.3% uptick in starting salaries. Prospects for mobile app developers were particularly rosy, with an anticipated 9% rise in starting salary in 2013 (with starting salaries estimated in \$92,750-\$133,500 range). Wireless network and networks engineers rounded out the top three, with 7.9% and 7.8% respectively. Meanwhile, traditionally well-paying jobs in sectors that employ far greater numbers of New Yorkers, such as administrative support or accounting and finance, were only expected to rise 3.5% and 3.3% in 2013 respectively.¹³⁸

Tech's indirect and induced economic effects

Although tech represents a relatively small share of both total City and U.S. employment, UC Berkeley economist Enrico Moretti argues that a focus on tech's direct employment implications obscures its larger economic impact. Indeed, tech's multiplier effects are an important source of secondary job creation and economic development. As Moretti writes in the preface to the BACEI "Technology Works" report: "...How important is high-tech employment growth for the U.S. labor market? As it turns out, the dynamism of the U.S. high-tech companies matters not just to scientists, software engineers and stock holders, but to the community at large. While the average worker may never be employed by Google or a high-tech startup, our jobs are increasingly supported by the wealth created by innovators. The reason is that high-tech companies generate a growing number of jobs outside high-tech in the communities where they are located. My research shows that attracting a scientist or a software engineer to a city triggers a multiplier effect, increasing employment and salaries for those who provide local services."¹³⁹ Moretti explains that tech affects this "economic bang for the buck" through two channels – the first is through income gains generated by innovation, productivity and a global marketplace, the second is from the local jobs that are supported by that income generation.

The BACEI uses the BLS' Level-1 definition of tech¹⁴⁰ to calculate the local multiplier effect for high-tech at the national level. Their analysis shows that for each job created in the local high-tech sector, approximately 4.3 jobs are created in the local non-tradeable sector, the sector that produces goods and services that are consumed locally, in the same regions where they are produced. (This includes primarily localized services such as healthcare, restaurants, hotels and personal services, but also includes the goods-producing construction sector as well.) The manufacturing sector meanwhile, has a local multiplier of 1.4 (manufacturing falls within the tradeable sector). The especially high number attributable to tech is both the result of the higher levels of disposable income afforded by these industries, as well as the additive effects of high-tech clustering, which attracts additional high-tech firms and the local service providers that support their business activities.¹⁴¹

¹³⁸ <http://www.rhi.com/salaryguides>. May 2013.

¹³⁹ <http://www.bayareaeconomy.org/media/files/pdf/TechReport.pdf>. May 2013.

¹⁴⁰ A definition of which is provided in the Methodology section of this study.

¹⁴¹ <http://www.bayareaeconomy.org/media/files/pdf/TechReport.pdf>. May 2013.

3. *Tech Has Obvious Appeal – But Should the Government Intervene?*

The Theory behind Government Efforts to Promote Tech

Because of tech's significant direct and indirect economic benefits, as just discussed, the industry has an obvious appeal to local governments as a sector to both promote and support. The many Silicon imitators across the country and around the world attest to the industry's allure. However, as Harvard investment banking professor Josh Lerner argues in "The future of public efforts to boost entrepreneurship and venture capital," and more extensively in *Boulevard of Broken Dreams*, *successful* government involvement in entrepreneurship-focused economic development is not a foregone conclusion. Indeed, he writes, "For every successful public intervention spurring entrepreneurial activities, there are many failed efforts, wasting untold millions in taxpayer dollars. When has governmental sponsorship succeeded in boosting growth, and when has it fallen terribly short? Should government be involved in such undertakings at all? These issues are particularly timely, given the many billions of dollars that governments are spending worldwide...."¹⁴²

In both his article and in his book, Lerner provides a synthetic theoretical lens through which to view public sector efforts to support tech entrepreneurship and venture capital. In so doing, he places tech's immediate and obvious rewards, as outlined in the previous section, within the context of broad, three-part argument he says is often used to rationalize public sector tech entrepreneurship intervention.

As Lerner explains, the first part of this argument that *government* has a role to play is the now widespread recognition that technological innovation plays a crucial role in economic growth. (A study by the Information Technology Industry Council estimates that technological innovation accounted for almost half of U.S. economic growth during the past 50 years).¹⁴³ Economists have long documented the strong connection between technological progress and economic prosperity, both across nations and over time. Tech's visible rewards in the near term, as discussed in the section prior, are just the most immediate facet of tech's larger historical role.

The second part of the argument is that entrepreneurship and venture capital are two particularly effective vehicles through which to stimulate technological innovation – systematic research shows the importance of both new ventures and small firms for economic growth.

The third part of the argument however is much less conclusive, says Lerner. This last part is the assumption that *governments* can effectively promote entrepreneurial innovation and venture capital – a "much shakier" premise than the first two parts of the argument, he claims.

Before continuing to Lerner's arguments for and against (but mostly against) government involvement in tech-directed economic development, it is worth briefly unpacking this second case for public sector intervention – that of the importance of new entrants and small firm size in spurring innovation. Indeed, the aura of small business permeates much of the literature on economic development and holds a particularly firm place in the rhetoric of the Bloomberg administration; Bloomberg himself has called small business "the backbone of our economy" a countless number of times over the course of his tenure. Indeed, research makes a strong case for new, small business: a study from the Ewing Marion Kauffman Foundation from 2011, for example, concluded that if not for startups, the U.S. economy would see no new job growth. According to the study, between 1977 and 2005, new firms added an average of three million jobs a year, while existing firms lost one million net jobs per year. The same study showed that existing firms lost jobs in 22 of those 29 years, while young companies, 5 years old or less, added jobs in all 29.¹⁴⁴

As Lerner explains however in *Boulevard of Broken Dreams*, not all small new firms are equal players in driving the economy; the contribution of startups (both new entrant and almost necessarily small, by definition) is not central in all industries. "Rather, their role [is] a function of industry conditions; it [is] greatest in immature industries in which market power [is] relatively unconcentrated," (47) he asserts. It is within these industries that conform to the requisite market conditions then, that "...entrepreneurs and small firms play a key role in observing where new technologies can meet

¹⁴² <http://link.springer.com/content/pdf/10.1007%2Fs11187-010-9298-z.pdf>. May 2013.

¹⁴³ <http://www.itic.org/public-policy/workforce>. May 2013.

¹⁴⁴ <http://www.jsonline.com/business/job-creation-policies-should-be-tailored-to-highgrowth-entrepreneurs-nr8tgfp-201705781.html>. May 2013.

customers' needs, and rapidly introduce products" (47). (Big firms, even *within* immature industries, conversely, often have difficulty fomenting innovation. As Lerner clarifies, chief among these reasons are limited or misaligned incentives, myopia, stifling bureaucracy, and/or risk aversion).

There is also another important condition attached to understanding which startups in particular are the most effective innovators. As Lerner explains, recent research supports the advantage in innovation conferred most especially to firms *backed by venture capital*. He writes, "Where does this advantage come from? The financing of young and restructuring firms is a risky business. Uncertainty and gaps in information often characterize these firms, particularly in high technology industries. A lack of information makes it difficult to assess these firms, and permits opportunistic behavior by entrepreneurs after financing is received. To address these information problems, venture investors employ a variety of mechanisms that seem to be critical in boosting innovation" (50). The essential mechanisms that venture financiers have developed thus, are those that are purposely crafted and very well suited to the challenging task of nurturing high-risk but promising new ideas. The most important of these risk-mitigating mechanisms are the exhaustive screening process (only 0.5% to 1% of business plans receive venture funding, according to a study from 1996),¹⁴⁵ the advice, post-investment monitoring and control venture capitalists exercise to support high-quality innovation, and the staging of investments, which improves the efficiency of funding by attaching well-defined and targeted conditions to investment. One study estimates that, because of these tools, a single dollar of venture capital generates as much innovation as three dollars of traditional corporate research and development. The result of all of this is a rigorous financing process that allows venture-backed startups within select industries to have the means and ability to scale. Lerner provides data to show that venture backed firms are on average substantially younger than non-venture-backed firms when they go public, and he argues that venture-backed firms are also much less likely to encounter disappointment post-IPO, having the oversight and mentorship infrastructure in place to operate successfully as a public firm.¹⁴⁶

The importance of venture investing to tech startups and the innovation process cannot be overstated. Across all industries, venture capital strengthens and supports a substantial fraction of the U.S. economy (see footnote 4 below). However, once innovative industries are isolated from well-developed sectors dominated by mature companies (e.g. manufacturing), venture financing's impact is even more acute. Lerner reveals, for example, that companies in the computer software and hardware industries that received venture backing during their gestation as private firms represented more than 75% of the software industry's value in 2009. Venture financing meanwhile also played a crucial role in the biotechnology, computer services, and semiconductor industries at that time. Importantly, inherent to all of these industries considerably buoyed by venture financing are tremendous amounts of risk and innovation and thus frequent economically transformative upheaval. As Lerner emphasizes, "Venture capital has catalyzed change in these industries, providing the resources for entrepreneurs to generate substantial return from their ideas...venture capitalists [also] create whole new industries and seed fledgling companies that later dominate them. The message is clear: the venture capital revolution drove the transformation of the U.S. economy in recent decades" (61).

Which brings us back to the government. While it might be evident then that both tech startups and venture capital play a crucial role in the health of a local economy, it is less obvious to Lerner that *governments* can be effective in promoting either one of them. Despite notable and well-publicized public sector success stories (Silicon Valley! Route 128!), Lerner emphasizes there are reasons to be cautious about the efficacy of government intervention. Many barriers exist, he claims, to effective implementation of public programs, which result in failures of either conception or implementation. Conceptual failures often derail a program at its very start by either ignoring the realities of the entrepreneurial process (particularly its protracted timeline), or by creating programs that ignore the market's dictates. Implementation failures meanwhile hinder a program's success once it begins, and are often the result of failure to include adequate incentives or to design appropriate evaluative measures.

Two well-documented problems derail government intervention in both conception and implementation, he says. "First, [government] can simply get it wrong," Lerner writes in his article "The future of public efforts to boost entrepreneurship

¹⁴⁵ (53).

¹⁴⁶ The overall impact of the venture industry on the U.S. economy can be measured by the economic weight of the companies backed by venture capital. Because data only exists for publicly traded companies, however, such estimates are inconclusive. Lerner's analysis from 2008 reveals nevertheless that the 895 venture firms that had gone public by that time constituted more than 13% of the total number of public firms in the U.S., and of the total market value of public firms (\$28 trillion), venture-backed companies came in at \$2.4 trillion – 8.4% (59).

and venture capital,” “allocating funds and support in an inept or, even worse, counterproductive manner.” Second, he says, is the problem identified by economists in the theory of regulatory capture, which suggests “private and public sector entities will organize to capture direct and indirect subsidies that the public sector hands out.” These include those programs, he explains, that are “geared toward boosting nascent entrepreneurs, [but] may instead end up boosting cronies of the nation’s rulers or legislators.” He concludes, “The annals of government venturing programs abound with examples of efforts that have been hijacked in such a manner.”

So too, Lerner says there are reasons to be skeptical of the need for government intervention, beyond faults attributable to the government directly. He provides the tech industry’s long-term market variations and instability as a prime example. Since data has been collected, he claims, the tech sector has been characterized by a pattern of boom and bust, with rapid increases in fundraising followed by precipitous declines. “In an ideal world,” Lerner writes in *Boulevard of Broken Dreams*, “we might think, public investors would even out these variations, encouraging investments at times when there are few, and stepping back when the market overheats.” He continues, “But given the tendency of some politicians to jump on the bandwagon at exactly the moment it careens off the road, can we trust them here? We can reasonably worry that government officials will only worsen this boom-and-bust pattern, by throwing money at these ventures at precisely the wrong times” (31).

In spite of his substantial distrust then of government actions, Lerner does concede however, that there *are* positive and beneficial ways in which the public sector can boost entrepreneurial and venture activity. His arguments in support of government intervention, and his examples of specific ways in which government investment can be most effectively leveraged, provide a useful framework in which to situate the Bloomberg administrations own efforts. I include some of Lerner’s arguments and government recommendations here for this reason, which I will later revisit in my analysis of Bloomberg’s economic development efforts to direct entrepreneurship in New York City.

Although Lerner is highly skeptical of government intervention as discussed (indeed, the byline to his book’s title reads “Why Public Efforts to Boost Entrepreneurs and Venture Capital *Have Failed* – and What to Do about It”), he says there are three legitimate reasons for public sector involvement. The first, Lerner argues, is that there is a “virtuous cycle” in entrepreneurship and venture capital: “Activities by pioneering entrepreneurs and venture capitalists pave the way for subsequent generations: in any given city, it is far easier to recruit the staff for the one-hundredth startup,¹⁴⁷ or to find a lawyer to structure the one-hundredth financing, than the first” (66). Because of this, he claims, there is a substantial body of economic thought in public finance that emphasizes that it is appropriate for the government to offer subsidies. The literature here suggests that subsidies are a proper response in the case of activities that generate positive externalities that can benefit others. Importantly, he says, once the industry reaches critical mass – a process that might take decades – the case for public intervention weakens. (Timing is plays a critical role in government intervention, he claims. Because entrepreneurship brings increasing returns, efforts by the government can play an important role in the industry’s early days.)

The second rationale for public sector involvement lies in the government’s ability to provide certification. Lerner cites the growing body of empirical research that suggests that new firms, “especially technology-intensive ones,” may receive insufficient capital to fund all value-creating projects. Although venture capitalists specialize in financing these types of firms, overcoming information asymmetries and giving the firms the legitimacy they need to unlock additional financing, Lerner explains that in actuality, venture capitalists only back a very small fraction of the technology-oriented businesses begun each year. In 2000, at the height of dot-com boom – a record year for venture disbursements – just over 2,200 U.S. companies received venture financing for the first time. In 2007, by comparison, that number was 1,279. The Small Business Administration meanwhile estimates that around the same time (the years prior to the book’s publishing in 2009), roughly one million new businesses were started annually. Moreover, these numbers concern disbursements across all of the industries funded by venture capital, with uneven and inconsistent disbursement across subsectors. (In 2000 for example, 92% of funding went to firms specializing in information technology or health care. In 2008, when renewable energy became an industry buzzword, the “energy and industry” category received 16% of venture funds.) While governments would have to overcome the many informational asymmetries and identify the most promising firms (or choose venture groups able to do so) in order for their efforts not to be counterproductive, Lerner does believe that the

¹⁴⁷ (although maybe not...! See *Reported lack of local talent*)

“signals provided by government awards are likely to be particularly valuable in technology-intensive industries where traditional financial measures fall short” (71).

Lerner’s last rationale for government entrepreneurship and venturing initiatives rests on the concept of knowledge spillovers – the process by which knowledge created in one organization becomes commercialized in another. The author contends that innovation is one area where spillovers are commonplace (a high degree of firm clustering is both part and product of this phenomenon) and as such, firms pursuing innovation may get fewer benefits than society as a whole. Left to their own devices, Lerner says, firms might therefore do less research than needed. *With* government subsidies, however, firms might instead be encouraged to invest the socially optimal amount of funds in R&D. So too, positive externalities persist even when the startups that generated the knowledge fail. Indeed, the high failure rate of new firm, knowledge-based startups has been widely documented; a phenomenon resulting from the high degree of uncertainty associated with these types of firms. The failure of knowledge-based firms does not mean, however, that no value was created by the firm. While an individual investor cannot appropriate a return if his or her startup failed, a failed firm generating positive knowledge contributes to the success of other third-party firms regardless. As such, it often does not matter from a public policy perspective which firms succeed, as long as most do. From an individual standpoint however, subsidization of knowledge spillovers is necessary to provide incentive to invest.

For reasons then of virtuous cycles in entrepreneurship and venture capital, the benefits of government signaling via financial support, and the advantages of subsidizing knowledge spillovers, Lerner admits the public sector *can* have a role in supporting an innovation economy. Before elaborating on the theoretical and programmatic underpinnings of government tech-focused economic development, however, it is worth contrasting Lerner’s position on public sector involvement with that of Princeton lecturer and Warburg Pincus Technology Investment founder William Janeway, who argues that questioning government legitimacy in entrepreneurship and venture capital intervention is misguided and counterproductive.

In an op-ed to the *Los Angeles Times* in December of last year, Janeway opens with this particular question of whether *government* can play a positive role in economic development. Despite forces, he says, that have been at work for a generation to delegitimize the state as an economic actor, his answer is unequivocally yes.

To understand how government has supported technological development Janeway points to the venture capital industry – the same industry Lerner shows is intrinsically tied to the startup economy. Like Lerner, Janeway describes how for more than three decades, venture capital has focused its investments on a few select industries; information and communications technology and biomedical sectors together have consistently accounted for over 80% of this investment. Janeway however goes on to ask importantly, “Why has it been in the world of information technology, and secondarily, biomedicine that venture capitalists have been successful? In brief: Only in these sectors did the state invest at sufficient scale in scientific research and in its translation to working technology.”¹⁴⁸ He goes on to explain how national funding by the Defense Department after World War II through to the end of the 1970s accounted for more than half of national R&D expenditures and exceeded the R&D expenditures of all the other governments in the Organization for Economic Cooperation and Development (OECD) combined. He writes, “From microelectronics and semiconductor devices through computer hardware and software and on to the Internet, development of all the components of digital information and communications technology reflected state policies for R&D and procurement.”¹⁴⁹

Within his opinion piece, and more expansively in his recent imprint *Doing Capitalism in the Innovation Economy*, Janeway places the Defense Department’s spending over the past half century within the greater context of 250 years of state-supported economic growth, driven by trial and error and error and error. He explains, “...from the Erie Canal to the Internet by way of the transcontinental railroads and the Interstate Highway System, the American state has played a strategic role in the deployment of transformational technologies that have created a succession of “new economies.””¹⁵⁰ Throughout, the American state’s role in affecting these new economies has been unambiguously requisite: Janeway writes, “At every stage, the innovation economy depends on sources of funding decoupled from concern for economic return. As economists have long recognized, such funding will not be delivered by competitive markets. Only an active

¹⁴⁸ <http://articles.latimes.com/2012/dec/27/opinion/la-oe-janeway-innovation-govt-investment-20121227>. May 2013.

¹⁴⁹ <http://articles.latimes.com/2012/dec/27/opinion/la-oe-janeway-innovation-govt-investment-20121227>. May 2013.

¹⁵⁰ <http://articles.latimes.com/2012/dec/27/opinion/la-oe-janeway-innovation-govt-investment-20121227>. May 2013.

state in pursuit of politically legitimate missions – national development, national security, conquering disease – can play the required role.”¹⁵¹

Much like Lerner, Janeway agrees that government cannot play the role of the entrepreneur or the venture capitalist in the innovation economy. But he stresses nevertheless that entrepreneurs and venture capitalists cannot build the new economy by themselves: “The venture capital model is radically unsuited” he writes “to investment in fundamental science or in technological invention in its nascent stages... For the next generation of entrepreneurs and venture capitalist to have their opportunity to dance, they need government agencies as active and creative as those that served my generation.”¹⁵²

Not only then is tech premised on government support, with the venture capital industry reliant on continued government subsidy of tech entrepreneurship, but as a final demonstration of public sector legitimacy, it is worth recalling that the venture capital industry itself – as a product of state investment – is *also* indebted to the government. For instance, the Small Business Investment Company (SBIC) program, formed by Congress in the late 1950s as part of the Small Business Investment Act led to the formation of the infrastructure for much of the modern venture capital industry.¹⁵³ Many of the early venture capital funds and leading intermediaries in the industry – such as law firms and data providers – began as organizations dependent on SBIC funds, and then gradually shifted their focus to independent venture capitalists. Even the dramatic growth of the venture industry in the late 1970s and early 1980s can be attributed in large part to the public sector. Much of this shift was the result of the U.S. Department of Labor’s clarification of the Employee Retirement Income Security Act’s “prudent man” rule in 1979. Prior to that year, pension funds could not make large investments in venture capital or other high-risk asset class. Clarification of rule on the other hand explicitly allowed pension fund managers to invest in venture capital and the like, and numerous specialized funds – concentrating in such areas as leveraged buyouts and mezzanine transactions, and such hybrids as venture leasing – emerged in the first few years thereafter. Meanwhile, the public sector’s role in spurring the venture industry was by no means relegated to the United States; public programs triggered the rapid growth of almost every other major venture market around the world.¹⁵⁴

Government efforts to support tech entrepreneurship (and venture capital)

Much of economic development theory characterizes public sector approaches to development (across industry) as conforming to that of a supply-side versus demand-side framework.

Urban policy professor Edward Blakely, in his characterization of ‘traditional’ economic development lists his ‘supply-side’ “Human Resource Development” option as one of four traditional strategies to local economic development.¹⁵⁵ The counter, “Business Development” strategy, is the ‘demand-side’ facet, creating jobs. Human Resource Development, as described by Blakely, is used, conversely to ‘create’ employees, by forging close connections between the employment needs of the local population, and the job-formation process. He writes, “The new emphasis on creative human capacity emphasizes people as the wealth-generating resource in the 21st century” (219). Supply-side strategies enumerated in in this generalized context include customized training, creative venue development (space and programs – including incubators), targeted placement, school-to-work programs, and local employment programs.

The supply-side/demand-side characterization also persists in economic development literature focused more squarely on promoting local tech entrepreneurship. Economist David Audretsch provides a particularly compelling model to understand public sector strategy. In positing a framework to understand the *determinants* of local entrepreneurship, from which public policy invested in promoting entrepreneurship can be both derived and assessed, Audretsch focuses on the factors that shape both the supply and the demand of entrepreneurial activity. Consistent with Blakely’s definition, Audretsch’s demand-side reflects the local opportunities to engage in entrepreneurial activity, which are generated by the types of goods and services demanded by the market. The local supply of entrepreneurship meanwhile is predicated on characteristics of the local population, the most important of which are its resources, capabilities and its perception of entrepreneurship. Cultural and institutional factors help shape the supply side as well, including such hurdles as access to finance, administrative burdens, and the degree of taxation. Importantly, it is through the interaction of supply and

¹⁵¹ <http://articles.latimes.com/2012/dec/27/opinion/la-oe-janeway-innovation-govt-investment-20121227>. May 2013.

¹⁵² <http://articles.latimes.com/2012/dec/27/opinion/la-oe-janeway-innovation-govt-investment-20121227>. May 2013.

¹⁵³ http://en.wikipedia.org/wiki/Small_Business_Administration#Small_Business_Investment_Companies. May 2013.

¹⁵⁴ *Boulevard of Broken Dreams*. 60-61.

¹⁵⁵ *Planning Local Economic Development*.

demand factors for entrepreneurship, he explains, that the local populations' (and I might add outsiders') risk-reward profiles are shaped. This risk-reward profile requires, he explains, weighing alternative types of employment and pursuits, and is based on both the opportunities presented by the demand side and the resources and capabilities afforded by the supply side. Because this development framework considers both environmental, or macro, conditions, and micro conditions at the level of the individual, the resulting risk-reward profile reflects the governments' full role in mitigating local risk – a concept to which I will return.

Lerner meanwhile structures his supply-side/demand-side dichotomy in terms of economic capital – an approach consistent with his emphasis on entrepreneurship's requirement for venture financing and his contention that for government intervention to make sense it must spur both entrepreneurial as well as venture activity. The author typifies government efforts as conforming to one of three separate approaches. The first two focus on creating an environment more conducive to entrepreneurial activity and venture capital investments, while the third encompasses direct interventions to increase the availability of financing. In economic terms, the first two can be seen as efforts to raise the demand for capital, while the third one is an attempt to increase its supply. Lerner, as part of his broader argument against public sector intervention, argues that all too often, governments orient toward the third option. He speculates that it might be merely for the reason that it is “more fun handing money to entrepreneurs than worrying about whether legal rules are conducive to efficient contracting” (89). Meanwhile, he claims, the process of what he calls “setting the table” goes neglected, and “no matter how many inducements are offered to make venture investments, without attractive investment opportunities the venture industry is unlikely to be sustainable” (90).

In *Boulevard of Broken Dreams*, Lerner highlights four issues of particular importance to government efforts to create hospitable environments for innovation. The first is ensuring that the legal system support entrepreneurship activity by facilitating early-stage financing. The second is encouraging the development and transfer of university technologies (as capacitated by the Bayh-Dole Act of 1980, which gave universities automatic title to research funded by the federal government and performed at their institutions). The third concerns creating the appropriate tax policies, either via incentives or by removing barriers. Lastly, the public sector can and has had success providing training for entrepreneurs and crafting education policies. (Lerner also outlines ways in which governments can create hospitable environments for *venture capital* and increase the venture market's attractiveness to institutional investors, beyond the latent appeal of attractive entrepreneurial activity. His suggestions however concern mostly those features that international investors, rather than local entrepreneurs or domestic sources of capital, regard as important, and are thus less relevant to New York City, where local and national sources of capital predominate.)

Lerner's economic supply-side approach on the other hand includes such government strategies as direct funding of entrepreneurs (which includes disbursement via a third party academic or private institution), matching funds, and capital provision with various strings attached or with a return on investment expected.

In *Investing in Entrepreneurs: A Strategic Approach for Strengthening Your Regional and Community Economy*, authors Lichtenstein & Lyons eschew a strict framework of demand and supply, and instead provide a broad critique of public sector tech economic development strategy and their own actionable plan in response. In addition to including a discussion of evaluative measures and methodologies in their analysis, the authors' critique is useful for my purposes as it establishes as its foundation the fundamental difference between 'tool-based' economic development and 'client-based' development. While tool-based approaches lead with the means – a service or offering, not the ends to which government efforts are working, client-based approaches on the other hand take into consideration who the target group is, and the many different needs it represents. Importantly, the latter approach requires nuanced and targeted criteria. They write, “The traditional criteria we use to classify entrepreneurs – by their age, gender, location, type of business – are simply not helpful. These characteristics are superficial and do not reveal anything useful about their needs” (2). This emphasis on a client-based approach is particularly relevant to my study as it establishes the local community – the focus of *my* study – and its advancement in the realm of entrepreneurship as the primary concern of tech entrepreneurship economic development, and thus concedes the role of the local community as a necessary arbiter of development efforts' success.

Paramount to the authors' critique is an emphasis on quality over quantity:

Somewhere along the way, economic development has become less about development and more about growth. Growth, itself, is not necessarily a bad thing, but it is very limited. It is about creating more of something and does

not address the issue of quality. At essence it is scalar. It is rooted in the assumption common to American culture that more is better. Yet more of anything does not necessarily guarantee its quality.

Most economic development activities are focused on attracting more businesses, creating more jobs, creating more wealth, and so forth. There is little or no attention paid to the appropriateness of the business attracted to the local economy or their complementarity to existing businesses; the quality of the jobs created; or the nature and distribution of the wealth created. Even those economic developers who are focused on entrepreneurship tend to pay the most attention to the number of new businesses created, the number of entrepreneurs to whom information has been handed off, or the amount of revenue these entrepreneurial ventures generate. Little thought appears to be given to measures of quality, such as the skill levels of the entrepreneurs or the effectiveness or efficiency with which they move their companies through the stages in the business life cycle (i.e. the quality and strength of their businesses).¹⁵⁶

Lichtenstein & Lyons characterize government strategy as a composite of three separate approaches, typically pursued either individually or together. The first is the Performance Enhancement Strategy, which focuses on ways in which to increase and accelerate growth and profitability. The focus here is on quantitative measures of revenue, jobs and profit, while the structure of local businesses and individuals' skill levels remain unchanged. The second is the Incubation Strategy, which is the only approach that addresses the transformation necessary to development. Strategies here are designed to transform the current structure of the business and the skill level of the entrepreneur, producing both qualitative and quantitative changes. Incubation strategies are particularly valuable because they are generally sustainable over the long term and are an approach towards building the up local innovation ecosystem as a whole, not just in specific parts. The major challenge here however is that these strategies require significant skill to design and execute, as well as a sizeable investment of time and resources. The last strategy the authors list is that of Selective Attraction. Approaches in this scenario are designed to add new players, or stock, to the entrepreneurial ecosystem in a highly targeted way. These strategies differ from traditional business attraction methods as they are specifically pursued so as to change the composition of the business assets in the local community, not simply in order to increase them in number.

In addition to characterization of these three development strategies, the authors' critique includes importantly a discussion about governments' own methods of evaluation, which again they claim are overly weighted towards measures of quantity (jobs, business starts, funding amounts, etc.), rather than the more useful measures of quality (such as individual skill level and strength of local business). This focus on outputs, they argue, is misplaced, as it does not capture the true impact of their efforts, and reflects instead an inability to measure entrepreneurial activity in a meaningful way.

Determinants for tech entrepreneurship converge in New York City

To close my survey of the relevant literature on tech-focused economic development, I reemphasize Audretsch's public policy model. Importantly, his is one that integrates the determinants of local entrepreneurship, the interaction of supply and demand factors, and the larger environmental context, to form a local risk-reward profile from which policy can be derived and then itself affect. This profile is then also used by would-be entrepreneurs and outsiders to decide whether to pursue tech entrepreneurship locally or to support the community more broadly.

Inclusion of environmental factors in assessment of this dynamic of risk and reward is essential because it reasserts the importance of place in economic development, and the importance of place in assessing development's impact. Indeed, an assessment of risk and reward inherent to both promoting – and engaging in – tech entrepreneurial activity is decidedly different in New York City than it is anywhere else, even before the government intervenes directly. Indeed, Bloomberg's own early success as a tech entrepreneur in New York is used by economist Edward Glaeser in "The Reinventive City" as an apt analogy to describe the City's unique place-based assets as they relate to the support and facilitation of an innovation economy.

In the article, written by Glaeser in 2009 – back before tech had made its comeback in the City – the economist boldly predicted New York would weather the recession. At the time of writing, he reasoned, the City remained rich in what he termed the "ultimate resource" – that of human capital, and would therefore survive this crisis, just as it had the crises before it. He reminds his readers that when the mayor created Bloomberg L.P. in New York in the early 1980s, the City was in the midst of another severe recession. "Despite being a continent away from Silicon Valley," Glaeser writes,

¹⁵⁶ 23.

“Bloomberg created his own computer firm. New York had provided him with the critical requirements for entrepreneurship: *skilled workers, financing, access to customers, and knowledge* (emphasis mine).” He continues, “The success of Bloomberg’s company reflects the great advantages of being in New York even during a recession. Today, Gotham’s strengths—*competition, diversity, access to the world, and, most of all, human capital, made even more potent through proximity* (emphasis mine) —will enable the city to reinvent itself, as it has done several times in the past, and survive the current economic storm.”¹⁵⁷

The same advantages that afforded Bloomberg’s entrepreneurial success thirty years ago remain present in the City today. Its concentration and networks of talent and ideas, its position as primary gateway between this country and the rest of the world and its dominance as a global economy¹⁵⁸ are all assets unique to New York, and all part of the risk-reward profile that underlies public policy making and community decisions. It is with recognition of the convergence of key determinants of local entrepreneurial activity with the City economy’s ongoing advantages that I continue to the next part of this study that surveys the Bloomberg’s supply-side tech-based policies to date.

¹⁵⁷ http://city-journal.org/2009/nytom_reinventive-city.html. May 2013.

¹⁵⁸ New York City is the strongest regional economy in the world, and the second-largest city economy in the world after Tokyo. <http://www.theatlanticcities.com/jobs-and-economy/2011/09/25-most-economically-powerful-cities-world/109/>. May 2013.

4. Survey Results

Please see item 7 in the Appendix for the full set of results.

I received a total of 85 responses to my survey. Almost all respondents listed themselves as employed in a tech *industry* (98%), with noticeably fewer employed in tech *occupations* (76%). (To reiterate the difference – a tech industry is one that produces tech-related goods and services, while a tech occupation is one that pertains to a tech-related activity, regardless of industry).

The difference in ‘tech employment’ counts within my survey, as generated by Questions 1 and 2 (with many more respondents employed in a tech *industry* rather than in a tech *occupation*) supports contentions made in the Methodology about the important distinction between job counts by industry and job counts by occupation. That noticeably more participants listed their employment in a tech industry rather than in a tech occupation reflects both the many non-tech occupations required within a tech industry, as well as my channels of survey distribution; almost all of the startups included in the *We Are Made in NY* campaign conform to an industry definition of tech (i.e. there very few companies listed with the campaign that have a primary function that is not tech).

Survey participants represented the majority of the industries I provided as answers to Question 3, with eCommerce, Social Media and Software comprising the most popular sectors. See chart:

Answer Choices	Responses	
Software	17.11%	13
Social Media	15.79%	12
eCommerce	15.79%	12
Advertising	9.21%	7
Consumer Web	7.89%	6
Mobile/Wireless	7.89%	6
Education	6.58%	5
Communications	6.58%	5
Consulting	3.95%	3
Enterprise	2.63%	2
Games, Music, Sports, Video and Entertainment	2.63%	2
Hardware/ Semiconductor	1.32%	1
Search	1.32%	1
Finance	1.32%	1
Total		76
Other (please specify) (10) Expand		

Figure 15. Question 3: Industry

Responses to the ‘Other Industry’ prompt elicited such varied responses as: Data – Monitoring & Analytics, 3D Printing, Digital Publication, Tech Art (!), Tech-enabled Tourism, Interaction Design, Startup Accelerator & Co-working Space, Health & Wellness, and Real Estate. Interestingly, none of my survey participants claimed employment in either the BioTech or CleanTech industries, reflecting appropriately the City’s comparative weaknesses in these sectors.

Strong representation in the eCommerce, Social Media and Software sectors conversely, reflects the City’s noted tech strengths. It is also appropriate that Advertising was the fourth most represented sector, as the ‘ad-tech’ industry is particularly strong in New York (as described earlier in my study). The number of write-in responses to Question 3, and indeed the wide variety of provided tech-sectors selected, is reflective both of the insufficiency of the options I listed, as well as, and more importantly, the wide permeation and application of tech across all industries in New York.

Question 4 asked participants to list their occupation. While the majority of those occupations listed have clear overlap with a tech industry (i.e. the participant is employed in a tech capacity in a tech industry), the results also reveal the necessary positions of non-tech occupation required by the tech industry. Such non-tech occupations listed include Customer Service, HR and Writer/Editor. As discussed in the Methodology, these latter occupations would be included within a tech employment count by industry, but not a tech employment count by occupation. (Because I positioned my

survey to the tech community, it is highly unlikely that any of my survey participants would be employed in both a non-tech occupation and a non-tech industry).

Just as much of the literature (City media, academic reports) attests, the majority of my survey participants were not originally from New York (75%). Of these City transplants, 60% had relocated to New York within the last five years. So too, the majority of respondents did not receive their most recent degree in the City (again 75%). While only a handful of respondents chose to answer the second part of Question 7 – which asked participants to list their most recent academic institution *if located in New York* – it is noteworthy that *not one* of the City’s existing engineering programs is mentioned. Rather, institutions listed for New York include seemingly every City institution except for the engineering schools! Responses included NYU, Columbia’s School of International and Public Affairs, Columbia Business School, NYU Tisch, Teacher’s College at Columbia, Fordham Graduate School of Business, The New School for Public Engagement, and Columbia undergrad. Despite admittedly few responses to this question, these results hint at the minimal impact of the City’s pre-Bloomberg engineering schools in terms of the supply of local talent (as again most of the literature and industry rhetoric attests.) (It is too early to assess the impact of the administration’s Applied Sciences NYC – Columbia’s IDSE, NYU’s CUSP and Cornell Tech have either yet to open or are only educating their inaugural class this year).

Just over half of the respondents listed a Bachelor’s as their most recent degree (55%), with roughly a third most recently acquiring a Master’s (38%). Interestingly, two participants listed a high school diploma or GED as their most recent certificate of education, suggesting perhaps the Bill Gates/Mark Zuckerberg spirit is alive and well.

Results from Question 9 provide necessary context to those from Question 7. While none of the City’s engineering schools were listed in Question 7, STEM disciplines *were* represented among the fields of most recent degree (perhaps engineering schools outside of the City are having more success graduating our City’s technologists). Roughly a third of respondents were most recently educated in STEM; 22% in Computer & Math Sciences (the third most represented discipline overall), 9% in Engineering & Related, and 3% in Physical & Life Sciences. The most selected field overall was the Humanities (25% of total responses), followed by Professional Fields (24%). In the open response field accompanying Question 9 participants could supply their own answer. Business degree or MBA was the most common of these responses. Others included Architecture, Arts, Communications, Journalism, Industrial Management, Interactive Design and Dance (!).

That only a third of my survey participants acquired their most recent degree in STEM reflects a number of possible issues already alluded to in this study. The first is the difference in the definition of employment by industry and by occupation, whereby not all employees of a tech company work in tech (and thus not all employees require tech education). Another is the widely documented tech talent shortage, which pertains most directly to a shortage of those with tech skillsets applying for tech jobs locally. That is to say, that so few of my respondents were most recently educated in STEM could simply point to the need for more. So too, the paucity in STEM representation could be instead a function of the way in which I worded the question. By asking for respondents’ most recent field of education I fail to account for those who perhaps pursued engineering as undergraduates and then received an MBA. Lastly the wide variety of alternative educational backgrounds selected beyond STEM could point to this vast permeation and application of tech to other industries in the City, and the ongoing digital transitioning of many traditional industries, as described.

Question 10 asked respondents for the size of their company (in employees.) The majority of respondents listed between 10-24 (38%), with the next smallest category, 4-9, the second most selected response (21%). 70% of participants listed a company size smaller than 24 employees. 10% conversely listed a company size over 250 employees. While these results support the small business characterization ascribed to the community by the administration, they also speak to the channels of survey distribution described in the Methodology. Because the City tech companies listed with *We Are Made in NY* skew toward smaller startups, it makes sense my results would skew small as well.

Company size (in employees):

Answered: 81 Skipped: 4

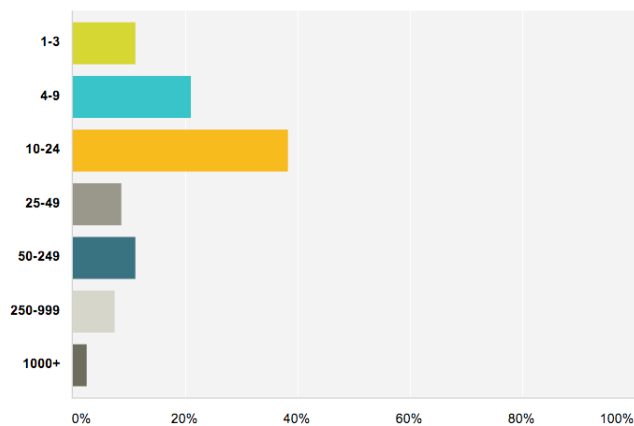


Figure 16. Question 10: Company Size

To gauge overall rate of company growth, Question 11 asked respondents about the size of their companies both last month and last year. Comparing current company size (Question 10) with the number of employees both last month and last year reveals quite significant growth across the board. Although in some instances growth appeared to be stagnant, none of the responses indicated company downsizing over the past year.

In Question 13, roughly 68% of respondents represented companies younger than five years of age, with 9% of participants representing companies younger than one year.

Company age:

Answered: 81 Skipped: 4

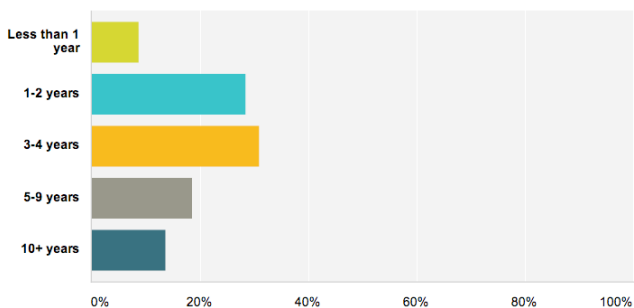


Figure 17. Question 13: Company Age

Did your company start in NYC?

Answered: 81 Skipped: 4

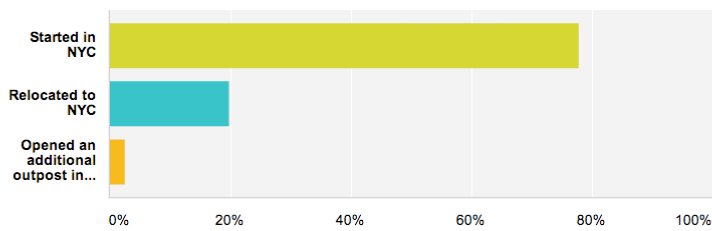


Figure 18. Question 14: Did Your Company Start in NYC?

Answers to Questions 13 and 14 together hint at New York’s recent tech renaissance. Indeed, with close to 80% of represented companies establishing themselves in the City (Question 14), and 68% of companies identifying themselves as less than five years old (Question 13), there is a high probability that the majority of companies started in New York did so within the past four years. This is roughly the length of time tech has been said to be making its comeback, and roughly the length of time the administration has been in active pursuit. Answers to Question 15 paint an even clearer picture of recent dynamics: none of the companies that either relocated to New York, or opened an additional office here did so more than 5 years ago, with the majority (80%) opening that office here within the past two years.

Question 16 asked participants to provide reasons for relocation to New York or for opening an additional office. Almost exclusively, answers included either one or all of the following: proximity to consumer base, local talent (one respondent even went so far as to say, “One of the largest markets for top engineering talent”), and access to local industry. Access to investors was also listed among the responses. Also included were variations of approbation for New York, including the observation that “There are more and better cultural resources and restaurants and other quality of life issues” in the City.

The second part of my survey asked participants questions about their convergence with the administration’s tech initiatives thus far. As revealed in Question 17, 12% of respondents had graduated from an incubator, accelerator or

wetlab in the City, but only one person/company of those 12% had graduated from an incubator, accelerator or wetlab *sponsored* by EDC. Of those 12% who identified themselves in Question 17, 76% had graduated within the past two years. These results suggest this type of support infrastructure has played a role in tech’s rise locally, albeit a limited one. Moreover, that only one survey respondent had graduated from a City-sponsored incubator, accelerator or wetlab, hints – on this particular account – at the minimal role of the government in incubating the industry.

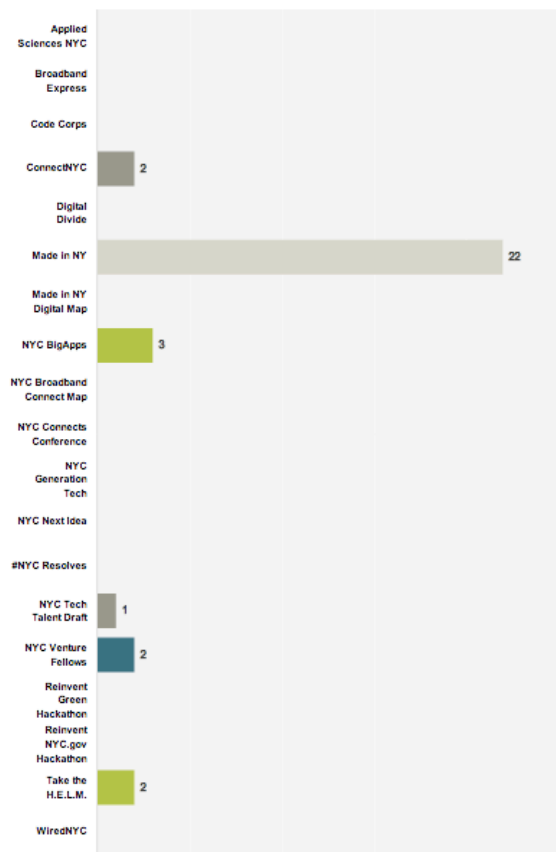


Figure 19. Question 20: Convergence with NYC-Sponsored Tech Industry Programs

Responses to Question 20 paint only a slightly more optimistic picture of the community’s convergence with the City’s activities. Question 20 asked whether respondents had participated in any of a listed 19 recent government tech-directed programs, with additional space provided to include any City initiative I omitted. (Almost of the programs listed were discussed earlier in this study). Overall there were 34 instances of convergence with a listed City initiative, with some individuals identifying participation in more than one. Not surprisingly, the *We Are Made in NY* campaign featured most prominently among selected initiatives. Of the other programs selected, those with the greatest longevity (programs that are now in their third or fourth year) had greater representation – an encouraging sign for the government. Two respondents identified City programs I had omitted – NYC Next Top Maker (a challenge to prototype new designs that have commercial potential, with the first-round of winners selected this past April) and Project Pop-Up NYC (a 2012 competition to recognize and reward emerging innovative, City-based fashion retailers and fashion-related technology companies.)

Questions 22 and 23 asked whether convergence with City programs was meaningful. Question 22 asked respondents for their opinions on the *We Are Made in NY* campaign in particular. Among the many colorful responses, certain key words and themes emerged. Almost all responses included some measure of skepticism as to whether the campaign would have any positive impact on their businesses. While some of these responses were ambivalent (“I don’t believe it has had a meaningful impact”), others were more enthusiastic (“It’s good, although I can’t say we’ve had any tangible benefits from it yet”). Some responses were downright jubilant (“HOPEFULLY GIVES BUSINESS INCENTIVES TO START TECH IN NY & HIRE GREAT TALENT”). A few respondents went so far as to give direct credit to the campaign for increasing site traffic and hiring visibility (“At first I didn’t think much of it – participated in it to support NY community and the NYTM. Surprisingly, however, we have had some good job candidates and one person we hired came to us from the map site that was apparently made off of the Made in NY list”). Some even had suggestions (“I would like it to focus more on the smaller companies that really need exposure and are looking to hire instead of the behemoths.”)

Question 23 asked participants who had *not* availed themselves of City tech services or programs to comment as to why they had not. Again this theme of skepticism over impact emerged, with some questioning government’s efficacy in administering programs overall. Some responses pointed to time as the limiting factor, with a larger number attributing their lack of convergence to being simply unaware these services exist. “Haven’t had the need,” was also a common response. Other answers were more specific. One participant in particular expressed the opinion that City support is directed towards very young startups in the earliest stages of funding, as programs and competitions are too narrowly focused and award too little money.

Question 24 meanwhile asked respondents whether they or their companies’ interact or have interacted in a professional capacity with any NYC academic institution. Of the roughly half of the survey participants who answered this question, two-thirds of respondents *had* interacted with City institutions in a meaningful way. Most respondents pointed to the hiring of employees and interns, with a few alluding to taking part in school events. Other forms of interaction included “materials research,” speaking at Grad schools about entrepreneurship and doing work *for* the university. One response mentioned interaction with NYU was predicated on a company co-founder having graduated from the school. Overall these answers point to more symbiosis between the tech community and local academic institutions than suggested by the literature. My failure to ask respondents to identify specific institutions as part of their response, however, means that further analysis is limited.

In loud confirmation of the reported hiring crunch, 83% of respondents said their company was actively hiring (Question 12). In Question 25, 71% of participants agreed it is *difficult* for them to hire locally. This would suggest that the crunch is more than a media meme.

Question 26 asked respondents for how networked they or their companies are with other members of the tech community. Almost all participants perceived themselves as well networked, which conforms to the image of the tech industry here as depicted by the media. This also hints at the strength of the community here, as a high degree of connectivity is for Brad Feld and other tech ecosystem theorists a necessary predicate for community stability.

The last two questions, Questions 27 and 28, asked participants how they perceive tech’s challenges and opportunities in New York, both respective and irrespective of the administration’s activities.

Of working in tech in New York, responses included as many challenges as opportunities. The most frequently listed challenges were hiring difficulties (including the cost of talent and competition with Wall Street and Madison Avenue), the cost of real estate and difficulties finding space, slow and unreliable broadband access, and the high cost of living. The most listed opportunities conversely were the density that allows for creativity and synergies across industries, a vibrant, supportive and connected tech community, diversity of talent and local industries, access to clients, talent and investors, and an overall “unparalleled” opportunity for company growth.

Perceptions of the Bloomberg administration’s actions were mostly positive. Many respondents felt that while the government’s actions are supportive, they are however mostly just cosmetic. Others meanwhile pointed to the likely beneficial effects of current government initiatives in the long-term. Genuinely appreciative comments included “feel surprisingly supported by the city for being such a small company,” “really like admin, very progressive,” and “I

appreciate the focus that [Bloomberg] has had on the tech industry. Without the BigApps competition I would be doing something completely different.” For one disgruntled member of the community, City tech development programs rated as the the “only thing [he could] pin as a positive about the Bloomberg administration.” Many respondents alluded to the community advocacy of the mayor in particular, indicating that his “unabashed support” has not gone unnoticed. Constructive criticism included the need for better promotion of government programs to members of the industry (an opinion well substantiated by the surprising number of responses that admitted to not knowing that government services or programs exist), while possible concern for the future of government initiatives was alluded to with “HOPEFULLY IT CONTINUES.” One of the only responses to not concede some measure of support, this last response was also my favorite: “Meh. Expand the broadband program to the whole city. Then we’ll talk.”

Assessing convergence: interviews with winners of City competitions

Winners of City competitions echoed similar responses to those given to my survey. While the majority of survey respondents were appreciative for the mayor’s support and the community’s increased visibility, they pointed to the limited role of the government in imparting meaningful community impact. So too, most winners of City competitions were thankful for the platform presented them by the administration, but hesitant to credit the government directly for their success. Of government efforts in promoting the industry overall, those who opined reiterated the positive impact of educational initiatives in the long term, with community/industry visibility again emerging as the benefit of government efforts in the short term.

Almost all of the interviewees said that the non-monetary prizes of credibility (particularly among investors) and contacts were more valuable than the money itself, and that the monetary prize was only tangential to their reasons for participating.

Winners lauded EDC for the structure and administration of the competitions. Joel Natividad of BigApps 3.0 winner NYCFacets/Ontodia said that EDC “did a bang-up job” and “really went out of their way to engage the community.” Natividad gave the City recognition for purposely directing monetary prizes and attention toward small startups, while still providing a platform for larger companies to compete. (As described earlier in this study, the BigApps competition awards prizes in two separate categories based on the size of the applicant team. Organizations with more than 50 employees are eligible to enter for recognition, but not cash prizes.) NYC BigApps participants in particular praised the government for opening City data. Said Ben Sann, Founder and CEO of BestParking.com, a winner of BigApps 2.0 with the Parking Finder application: “New York City is among a few progressive cities making data available online to developers via a data mine, and I applaud the efforts of the city....” Natividad, meanwhile, called it a “prescient program that will lead to a renaissance of Gov 2.0 for public/private innovation.”

EDC’s lack of follow-up with winners was the number one complaint among interviewees. This oft reiterated complaint supports the criticism repeated throughout my survey that City efforts are geared more towards promotion than substantive development. Indeed, said Sann “My only criticism regards post-event follow-up for winners. The city’s own parking data was quite out of date, and we offered to collaborate with them to improve it. Such conversations never led anywhere.” Natividad’s remarks, however, stand in marked contrast to the opinions of the other winners: “We are already benefitting from all the help EDC has been giving us in terms of facilitating getting legal counsel, helping us get into the NYU-Poly Incubator Program, introducing us to DoITT personnel, and involving us in all kinds of events promoting NYC and entrepreneurship.” (Natividad and his team won BigApps last year, so perhaps this is an encouraging sign of EDC’s increasing involvement with competition winners.)

All of the winners of whom I asked the question, were firmly of the belief that the City administration *should* be trying to promote the industry. Said Sann, “New York City needs to compete with Silicon Valley. Promoting the tech industry invites entrepreneurs and programmers to settle in New York. It’s a positive feedback loop.” The importance of the positive feedback loop was reiterated by Scott Kolber of Roadify, winner of BigApps 2.0, who emphasized that the BigApps competition in particular stimulates the use of public assets (open data) in a way that the private sector can benefit (business opportunities from and monetization of open data) but which also benefits the public (in service of the government, which does not have the resources itself to provide this data to the public in a useful form).

Interviewing a NYC Next Idea winner located outside of the United States revealed that some of EDC’s stated objectives in positioning the competition internationally are being met. Carl Pfeiffer of Kisibox, last year’s NYC Next Idea winner

from Munich, revealed that participating in the competition elevated his impression of tech's viability in New York (although "NYC is not perceived nearly as strongly as the Valley"), and that while it was still too early to talk of relocation, he is "strongly evaluating the NYC market." (It is worth noting for purposes of the debate over immigration reform that all three members of the Kisibox team had at one point studied in the United States – at Columbia and at Stanford.)

As to how the competition winners view the industry's prospects in New York post-Bloomberg, said Adam Gartenberg of TaxiTreats, winner of last year's NYC Next Idea, "I believe the mayor has made a conscious effort to increase the legitimacy and opportunities to form a startup and once it is formed to continuously prosper. Sure, if Christine Quinn would become the next mayor I would be a little concerned, but I certainly wouldn't lose sleep over it."

5. BLS' NAICS High-Technology Industry List

Table 1. High-technology employment, 1992, 2002, and projected 2012

[Levels in thousands]

NAICS code	Industry	Employment			Employment change				Median annual wage, May 2004 ¹
		1992	2002	2012	Change in level, 1992-2002	Change in level, 2002-12	Percent change, 1992-2002	Percent change, 2002-12	
...	Total nonfarm wage and salary, all industries ²	109,526	131,063	152,690	21,537	21,627	19.7	16.5	\$28,770
...	Total, three levels of high-technology industries	13,415	14,422	16,067	1,006	1,646	7.5	11.4	(³)
...	Level-I industries	4,783	5,883	6,804	1,100	921	23.0	15.6	
3254	Pharmaceutical and medicine manufacturing	225	293	361	68	68	30.2	23.2	43,930
3341	Computer and peripheral equipment manufacturing	329	250	182	-79	-68	-24.0	-27.1	61,830
3342	Communications equipment manufacturing	210	191	201	-19	10	-9.0	5.4	45,520
3344	Semiconductor and other electronic component manufacturing	519	531	452	12	-79	2.3	-14.9	39,210
3345	Navigational, measuring, electromedical, and control instruments manufacturing	549	451	396	-98	-55	-17.8	-12.2	47,960
3364	Aerospace product and parts manufacturing	711	468	386	-242	-83	-34.1	-17.6	51,990
5112	Software publishers	114	256	430	142	174	125.0	67.9	69,880
5161	Internet publishing and broadcasting	16	35	49	19	14	116.1	41.1	53,470
5179	Other telecommunications	16	10	8	-6	-2	-39.2	-21.9	45,470
5181	Internet service providers and Web search portals	39	142	233	103	91	265.3	64.2	52,780
5182	Data processing, hosting, and related services	220	305	430	86	125	39.0	40.8	45,570
5413	Architectural, engineering, and related services	902	1,251	1,306	349	54	38.7	4.3	48,570
5415	Computer systems design and related services	445	1,163	1,798	718	635	161.3	54.6	63,350
5417	Scientific research-and-development services	490	537	573	47	36	9.7	6.7	57,890
...	Level-II industries	4,760	4,528	4,998	-231	470	-4.9	10.7	(³)
1131, 32	Forestry	10	10	10	0	0	0	4.0	-
2111	Oil and gas extraction	182	123	88	-60	-34	-32.8	-27.8	49,290
2211	Electric power generation, transmission, and distribution	537	436	405	-101	-31	-18.8	-7.1	53,330
3251	Basic chemical manufacturing	246	171	140	-76	-31	-30.8	-18.0	45,970
3252	Resin, synthetic rubber, and artificial synthetic fibers and filaments manufacturing	151	114	89	-37	-26	-24.5	-22.6	42,730
3332	Industrial machinery manufacturing	142	132	125	-10	-6	-7.1	-4.7	39,480
3333	Commercial and service industry machinery manufacturing	138	132	141	-6	9	-4.6	6.6	35,940
3343	Audio and video equipment manufacturing	58	42	38	-16	-3	-27.7	-7.7	32,460
3346	Manufacturing and reproducing, magnetic and optical media	44	57	63	13	6	30.5	11.1	35,720
4234	Professional and commercial equipment and supplies, merchant wholesalers	584	659	790	76	130	13.0	19.8	41,770
5416	Management, scientific, and technical consulting services	358	732	1,137	374	406	104.4	55.4	45,610
...	Federal Government, excluding Postal Service	2,311	1,922	1,972	-389	50	-16.8	2.6	(³)
...	Level-III industries	3,8723	4,010	4,265	137	255	3.5	6.3	(³)
3241	Petroleum and coal products manufacturing	152	119	102	-33	-18	-21.8	-14.8	48,340
3253	Pesticide, fertilizer, and other agricultural chemical manufacturing	54	45	35	-10	-10	-17.7	-21.3	39,680
3255	Paint, coating, and adhesive manufacturing	81	72	62	-8	-11	-10.3	-14.7	35,110
3259	Other chemical product and preparation manufacturing	144	112	79	-32	-33	-21.9	-29.4	35,390
3336	Engine, turbine, and power transmission equipment manufacturing	111	100	100	-11	0	-9.6	.2	37,310
3339	Other general-purpose machinery manufacturing	317	288	339	-29	51	-9.0	17.7	35,320
3353	Electrical equipment manufacturing	219	176	180	-43	4	-19.4	2.2	32,520
3369	Other transportation equipment manufacturing	36	40	40	4	0	10.3	.5	34,230
4861	Pipeline transportation of crude oil	10	7	7	-3	0	-27.0	-2.7	52,020
4862	Pipeline transportation of natural gas	42	29	30	-13	1	-31.0	2.1	49,650
4869	Other pipeline transportation	7	5	5	-2	0	-25.7	-7.7	50,570
5171	Wired telecommunications carriers	637	662	600	25	-62	4.0	-9.4	50,940
5172	Wireless telecommunications carriers (except satellite)	48	196	295	148	99	309.8	50.5	38,480
5173	Telecommunications resellers	173	1856	188	13	2	7.6	1.3	49,400
5174	Satellite telecommunications	19	19	17	0	-2	1.6	-10.4	50,780
5211	Monetary authorities, central bank	24	23	23	-1	0	-2.5	.9	40,840