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Greater Boston's Economy and the Entrepreneurial Age

Executive Summary

Greater Boston has been resilient amidst the whirl of the Great Recession, and the region's technological prowess has been part of its success, but will technology start-ups continue to be an economic engine in the future? Moreover, even if technological success endures as a mainstay of the Boston economy, will technology start-ups provide employment for ordinary workers without advanced degrees? Are there sensible steps that state and local government can take to further strengthen the region's technology eco-system?

Relatively high wages make it difficult for Massachusetts to compete globally manufacturing ordinary, old products, but over the past 30 years, greater Boston has shown a remarkable ability to survive and even thrive through innovation. The economic health of the region depends upon the continued humming of its innovation engine, and ensuring that innovation helps people throughout the income distribution.

Detroit's recent bankruptcy should remind us of the risks. A century ago Detroit was a hotbed of entrepreneurship—a place where small firms competed and collaborated to produce the new, new thing. The success of a small number of those firms transformed the metropolitan area into a city of big corporations. As entrepreneurship vanished, so did economic vitality. As Figure 1 illustrates, using metropolitan level data, an abundance of small scale establishments predicts economic success. Dominance by a few large firms predicts failure. Boston should worry that despite a growing number of small startups, Suffolk County's average establishment has over 28 employees, which is more than 80 percent above the national average.

In this policy brief, we review the current state of technology entrepreneurship in greater Boston. The technology sector remains in remarkable flux. In 1998, computers and related manufacturing represented about half of the technology-intensive employment. Twelve years later, that sector had declined by well over 50 percent and now represents only one-in-seven technology jobs in greater Boston. Moreover, the technology sector tends to locate away from the region's poorer neighborhoods and tends to employ the disproportionately skilled. These facts limit the ability of the current technology cluster to employ less advantaged residents of the region.

Next, we examine the micro-geography of small technology firms. As of 2010, the two traditional technology clusters around Kendall

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Square and Route 128 remain strongholds of this sector. These clusters are remarkably successful, but it is an open question whether their success can be reproduced in less privileged places. Kendall Square is anchored by M.I.T.; Route 128 clusters around well-educated communities.

The policy approach to entrepreneurship must be radically different from the traditional economic development policies of the past. Supporting technology entrepreneurs does not mean offering generous tax incentives to attract a single large employer. It is hard to imagine that any government entity—state or local—will ever have the technological expertise to successfully play venture capitalist, funding nascent companies in such an environment of change and uncertainty. Professional venture capitalists have enough trouble playing venture capitalist. Moreover, the challenge is particularly extreme because technology is such a moving target. We discuss the use of tax and financing incentives to boost technology start-ups, as well as infrastructure-a second traditional tool for boosting economic development.

The Innovation District connects an old approach to business development (infrastructure) with an alternative approach that focuses on increasing the supply of entrepreneurs either by luring them from other areas through quality of life or education or reducing the barriers to entrepreneurship.

We compare the ex post progress of a small sample of companies that have received some form of financial aid from the Commonwealth's MassDevelopment between 2004 and 2008, with a similar set of firms that did not receive aid, and find no significant difference in outcomes between the two sets of firms. This does not imply that the MassDevelopment aid didn't achieve positive results—the data do not come to any firm conclusion—but it does strongly suggest that these programs need to be better structured for serious evaluation. In particular, all government entities that finance private firms engage in ex post evaluation and ideally should designate a control sample for the purposes of comparison.

While there may be scope for sensible broadband investment in Boston, the small physical footprint of most technology entrepreneurs somewhat limits the ability to engender entrepreneurship through traditional infrastructure. We find little robust relationship between broadband availability and technology start-ups at the zip code level. Still, there are potential gains from well-targeted infrastructure investments, especially those that are paid for by users themselves. Indeed, it is possible to see Boston's Innovation District as a form of infrastructure investment, albeit one that is privately funded and aimed primarily at empowering small scale start-ups.

The Innovation District connects an old approach to business development (infrastructure) with an alternative approach that focuses on increasing the supply of entrepreneurs either by luring them from other areas through quality of life or education or reducing the barriers to entrepreneurship. Finally, we discuss four potential policy levers for promoting technological entrepreneurship: (1) strengthening the educational pipeline of entrepreneurs, (2) cluster creation, (3) reducing regulatory barriers to entrepreneurship and (4) legal reforms that reduce the power of non-compete clauses. Regulatory reform that speeds the approval of new permits and centralizes the public sector's administrative interface offers a possibly lower cost to reducing the costs of new entrepreneurial activity.

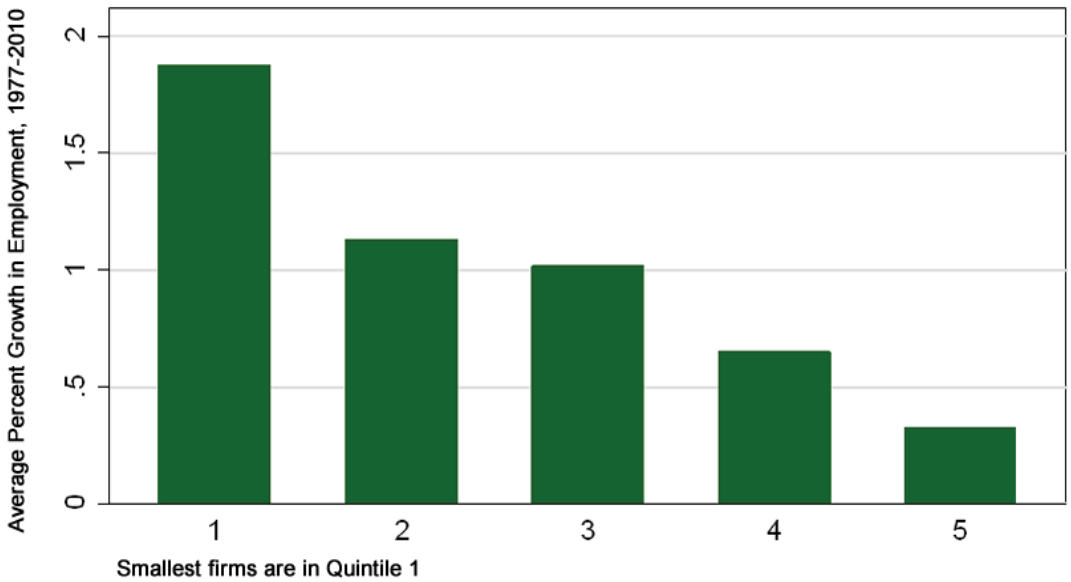
Introduction

Small establishments are seen by many researchers as one proxy for entrepreneurship. Figure 1 shows the relationship between average establishment size in 1977 and employment growth between 1977 and 2010 across America's MSAs. The first bar shows that the one-fifth of MSAs with the smallest average establishment size experienced nearly 200 percent employment growth over the 33 year period. The last bar shows that the one-fifth of MSAs with the largest average establishment size experienced employment growth of only about 20 percent. Controlling for area attributes such as initial population level and education do little to reduce this robust connection.

There is a similarly strong relationship between employment growth between 1977 and 2010 and the share of employment in small establishments in 1977, as shown in Figure 2, demonstrating another proxy for entrepreneurship. Those MSAs with the most employment in new establishments in 1977 (defined as those created since 1976) experience an average of nearly 200 percent growth. Those MSAs with the less employment in such start-ups experienced growth of less than 25 percent. Again, these results are relatively unchanged when we control for a bevy of local characteristics.

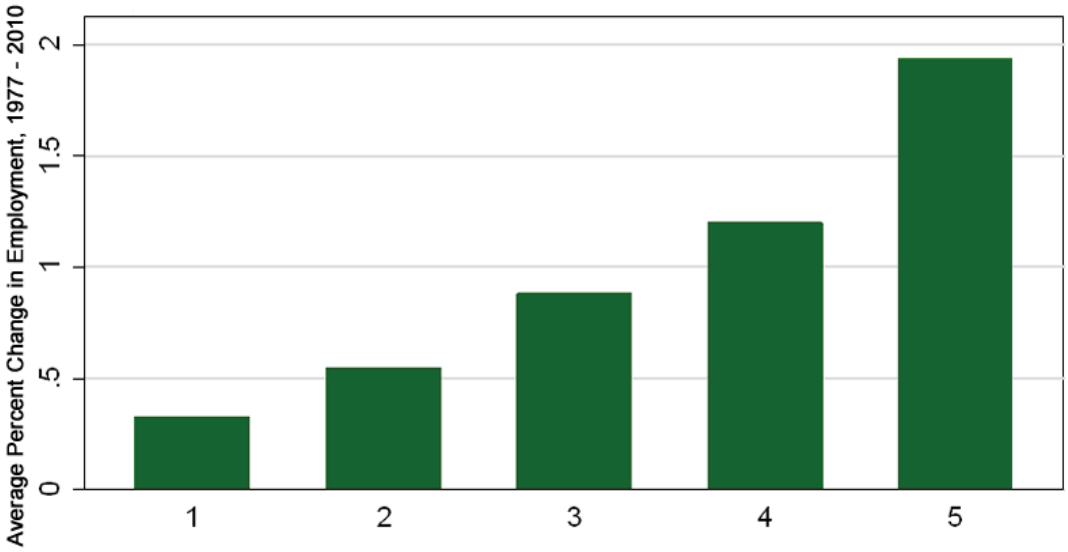
Despite Boston's well-deserved reputation as a center of innovation, the city is dominated by large employers, not small start-ups. Boston

Figure 1: Economic Growth and Firm Size
MSA Employment Growth (1977 - 2010) by Average Firm Size (1977) Quintiles



Source: County Business Patterns

Figure2: Growth and New Establishments
MSA Employment Growth (1977 - 2010)
by Quintiles of Share of Employment in New Establishments, 1977



Smallest share of employment in new establishments in Quintile 1
Dropped outliers of <1% and >99%
Source: Longitudinal Business Database

has only 2.3 establishments with less than ten workers for every hundred workers in Suffolk County. America averages 4.8 establishments with less than ten workers for every hundred workers. Across the U.S., there are on average only six establishments with more than 1,000 workers for every 100,000 total workers, but in Suffolk County, there are about ten such large establishments for every 100,000 workers. Moreover, while the national trend is towards smaller establishments, average establishment size in Suffolk County is growing.

To a certain extent, Boston's large firms represent a few sectors that are disproportionately dominated by major employers. Health care, universities, finance and insurance collectively account for 41 out of Suffolk County's 54 employers with 1,000 or more employees. It's not so much that these sectors typically have such large firms, but rather that Boston has unusually large players in these industries. Boston is lucky to have these successful, world-class institutions, just as mid-20th century Detroit was lucky to have the Big Three, but for the city to avoid the fate of Detroit, it must ensure that these entities do not crowd out the small-scale start-ups that deliver sustainable growth.

The apparent domination of greater Boston by large enterprises is somewhat misleading, because many of those entities are better seen as loose alliances of potential entrepreneurs. On one level, M.I.T. is an enormous institution, which has many of the bureaucratic constraints seen in large entities, like General Motors and U.S. Steel. Unlike those entities, many of M.I.T.'s academic employees have been more likely to operate like individual entrepreneurs than middle managers. Over a century ago, M.I.T. chemist Arthur D. Little founded his eponymous consulting company and a few years later M.I.T. engineer Vannevar Bush founded Raytheon and mentored the young Frederick Terman who would later create the Stanford industrial park. Similarly, business school professors at major universities are

prone to start-up consulting firms, and law school professors often have their own practices. Massachusetts General Hospital has its own "innovation fund" and helps its researchers commercialize their products.

The State of Technology Employment, Employees, and Firms in Greater Boston

In our exploration of the technology sector in Greater Boston, we focus on eight key industries: software publishing; scientific research and development in the hard sciences; computer and related manufacturing; computer related services; medical manufacturing; data processing, hosting and related services; internet publishing, broadcasting and web search portals; and electronic commerce. In Table 1, key facts about these industries are documented using County Business Patterns. In Suffolk County, this group of industries has

Table 1: Technology Industries in Greater Boston and the United States

Employees						
	Middlesex		Suffolk		United States	
	1998	2011	1998	2011	1998	2011
Total Tech	111,874	122,245	8,247	14,446	3,329,537	4,240,737
Computer & Related Mfg	51,905	19,506	2,527	309	1,680,833	877,469
Computer Related Servicecs	22,687	28,646	2,848	5,021	873,270	1,444,864
Medical Mfg	2,880	3,113			217,111	227,894
R&D in Hard Sciences	13,817	40,562	1,475	2,654	275,141	651,026
Electronic Commerce		906		1,248		140,079
Data Processing, Hosting, & Related Services		9,280		1,222		401,079
Internet Pub. & Broadcasting & Web Search Portals		1,944		2,141		135,554
Software Publishing		20,585	18,288	1,397	1,851	362,410
Venture Capital	123	421	483		25,721	31,265
Establishments						
	Middlesex		Suffolk		Massachusetts	
	1998	2011	1998	2011	1998	2011
Total Tech	2,786	3,068	469	689	126,132	199,829
Computer & Related Mfg	458	298	22	22	17,625	13,151
Computer Related Services	1,542	1,611	301	363	85,356	125,837
Medical Mfg	30	38	3	5	1,812	2,008
R&D in Hard Sciences	337	538	73	97	9,650	15,068
Electronic Comerce		97		39		17,628
Data Processing, Hosting, & Related Services		174		53		12,294
Internet Pub. & Broadcasting & Web Search Portals		82		63		6,398
Software Publishing	419	230	70	47	11,689	7,445
Venture Capital	36	65	49	59	9,650	6,986

Source: County Business Patterns

been growing, admittedly off a small base. In Middlesex County, the employment in these areas is slightly less than in 1998.

The decline in Middlesex County tech employment since 1998 reflects the massive decline in computer-related manufacturing employment, which has dropped by 60 percent since that year, and a somewhat smaller decline in software publishing. These declines have been offset by an impressively large increase in scientific research and development, and by a smaller increase in computer related services. These declines have also been offset by rising earnings in the tech sector, which mean that these technology sectors have actually increased as a share of county earnings, to 24 percent, even as the number of bodies in these areas has declined.

These changes in employment and earnings have been accompanied by shifts in the size distribution of firms as well. As computer manufacturing has declined, its firms have gotten smaller on average, although the overall number of small establishments in that industry has declined dramatically. By contrast, software publishing firms have gotten bigger, because the decline in that sector has particularly hit smaller establishments.

In Boston and elsewhere, the technology sector has not managed to significantly employ the less skilled or reduce social inequities. Ensuring the the benefits from technological innovation flow to the poor, as well as the rich, is one of the great challenges of the 21st century.

Firm sizes have increased in the growing fields of computer-related services and scientific research and development, as once smaller firms have become more successful. Research and development has seen a reasonable increase in the number of smaller establishments, while the number of establishments in computer-related services has remained stable in Middlesex County. Suffolk County has seen more growth in the number of small scale technology establishments in computer-related services, but there has been a dramatic decline in the number of software publishers in the city.

Who works in technology firms? Using microdata from the American Community Survey, we explore the skills and demographics of workers and the self-employed in the technology sector. These workers are disproportionately skilled, disproportionately young and somewhat less likely to be African-Americans or Hispanic, but more likely to be Asians and immigrants. These results don't suggest any immediate policy imperative—except, perhaps, the benefits of closing the state's achievement gaps. Technology firms have tended to pay high wages, and employ skilled workers. They have tended to hire more workers who are aged between 25 and 39. The strong skills and youth of many workers in this technology sector suggest that importance of retaining and attracting young and skilled workers to the region. Yet it also reminds us that in Boston and elsewhere, the technology sector has not managed to significantly employ the less skilled or reduce social inequities. Ensuring that the benefits from technological innovation flow to the poor, as well as the rich, is one of the great challenges of the 21st century.

We now shift from the overall trends in employment to the shifts in the number of establishments. Is greater Boston seeing an entrepreneurial expansion, with a growing number of little firms, or instead, is the number of establishments declining, even in the industries that are growing? If we interpret the correlation between average firm size and subsequent employment growth as reflecting

a causal effect, where abundant small firms generate subsequent growth, then greater Boston should care deeply about whether these dynamic technology sectors are experiencing growth in the number of establishments.

We use the County Business Patterns to first look at the change in computer and related manufacturing establishments over the time period of 1998 and 2007, right before the recession hit. Both Suffolk and Middlesex counties have seen some contraction in the number of these manufacturing establishments, but the decline has been most severe in Middlesex County. Computer related services is a growing, not declining area in greater Boston, but despite this growth, the number of establishments, especially in Middlesex County has declined since 2000, which the real fall occurring between 2000 and 2005. The number of establishments has stabilized since then, but overall, this suggests that the industry, while thriving, is getting less entrepreneurial, not more.

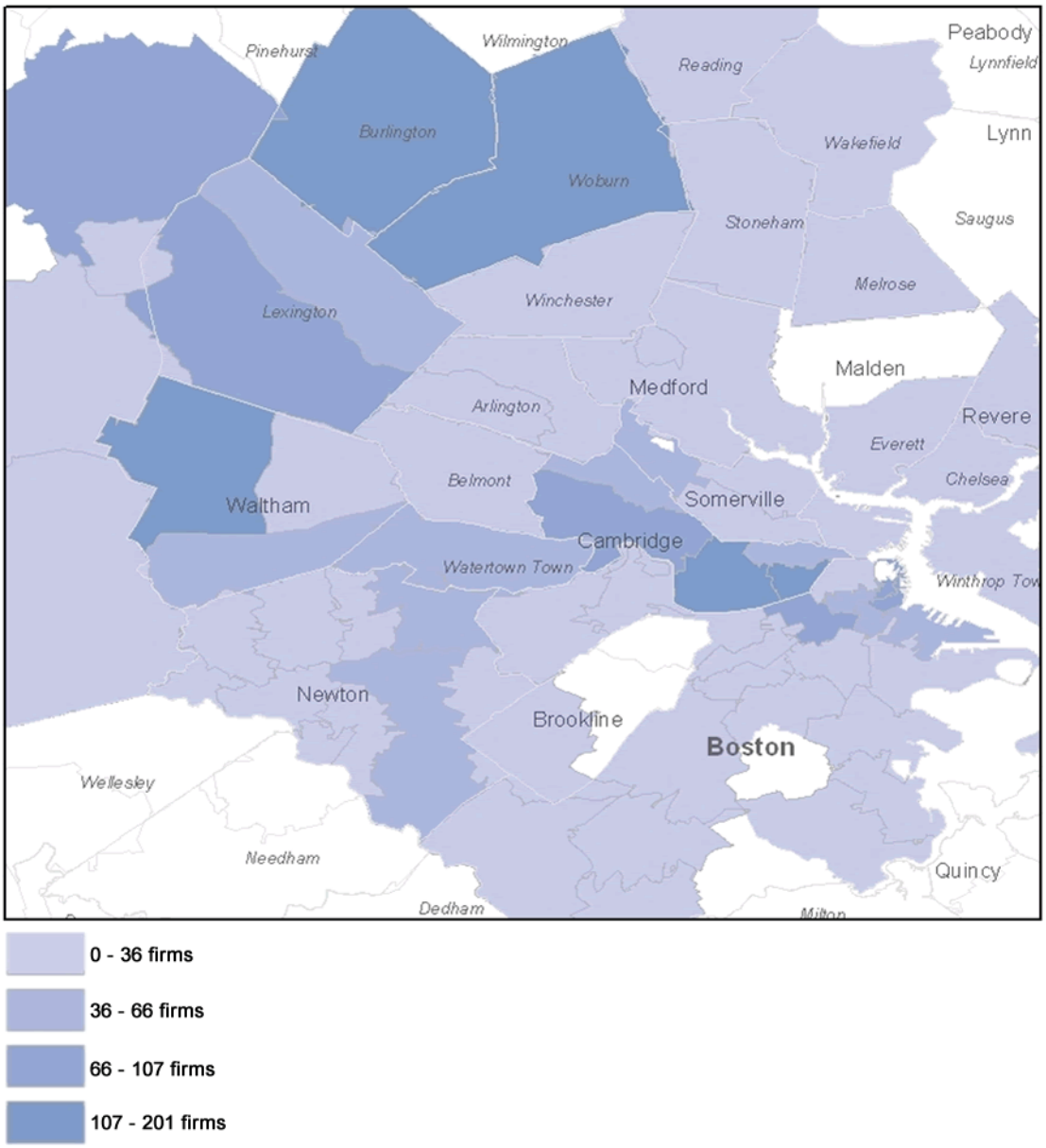
Both counties have increases in the number of establishments in research and development in the hard sciences, with Middlesex County entrepreneurship seeming especially strong, with over a fifty percent increase in the number of establishments during this time period.

As in the case of computer-related manufacturing, there has been a steady decline in the number of software publishing establishments in Middlesex County. All told, Middlesex County has forty percent fewer establishments in software publishing then it did in 1998. This decline further illustrates the remarkable cooling of entrepreneurship in this area. The number of software publishers in Suffolk County has been far more stable, but average establishment size is also rising.

Both counties have increases in the number of establishments in research and development in the hard sciences, with Middlesex County entrepreneurship seeming especially strong, with over a fifty percent increase in the number of establishments during this time period. Not much has happened to either county regarding medical manufacturing establishments. Electronic commerce establishments, on the other hand, have boomed since 2003, when they first started appearing. The growth in the number of establishments has been phenomenal, especially in Suffolk County, but it is worth stressing that the number of establishments and employees is still small. The similarly nascent industry of data hosting/ processing and related services shows was stability and growth through 2007, but then the number of establishments declined dramatically.

Using data purchased from Walls & Associates, who created the National Employment Time Series (referred to as NETS in the text from now on) database based on Dun & Bradstreet data, we look at the formation of new technology establishments in Greater Boston. The rate of entry provides another means of looking at the state of technology entrepreneurship in greater Boston. We use data from 1991 to 2010, with each data point representing the number of new establishments divided by the stock of establishments during the prior year. Overall, the trends show stability and even growth in research and development, but a general decline in new establishment births in all of the computer related fields. Computer-related services remains stable in employment, but the decline in the number of new establishments suggests that greater Boston will not be able to depend on continuing growth in this area. Hopefully, research and

Figure 3: Concentration of Tech Firms in Greater Boston, 2010



Source: County Business Patterns

development will be able to make up some of the slack, but we suspect that Boston's future depends on some other new, new thing.

The Geography of Technology Entrepreneurship within Greater Boston

A remarkable feature of Boston's entrepreneurial eco-system is its geographic concentration. We explore the micro-geography of entrepreneurship and technology with zip-code level County Business Pattern data. Figure 3 shows the geography of all of our tech companies using County Business Patterns. The map illustrates the two technology clusters in greater Boston. The outer cluster runs along Route 128, from Waltham to Woburn, and includes five zip codes. The inner cluster is East Cambridge, centered around M.I.T., and includes three zip codes. The average number of technology establishments in both

of these clusters was 105 in 2010, and in both clusters about 30 percent of the establishments have more than 20 employees, while 70 percent of the establishments are smaller than that amount. Of the 2,674 technology establishments in our sample, 662 or one-fourth of them lie in zip codes that include the Route 128 cluster, and 703 lie in the 13 zip codes within two miles of Kendall Square. Fully, one-half of greater Boston's technology establishments lie within these two tight geographic clusters.

These two clusters represent two alternative visions of metropolitan space in the 21st century. Route 128 is car-oriented and suburban; Kendall Square is dominated by foot traffic and public transportation and sits in the urban core of the region. Boston's innovation district is an attempt to provide an alternative inner city technology hub. Both models appear able to co-exist, although they seem to excel in slightly different industries and slightly different enterprises. Kendall Square has seen somewhat more growth in smaller establishments and has little manufacturing, but much research and development. Route 128 has a wider range of industries and specializes in somewhat larger and presumably older enterprises. The two clusters may be evolving into a well-defined feeder system where new firms are more likely to start out in Kendall Square, where expensive space is compensated for by proximity to M.I.T. and other start-ups, and if they are successful they move out to Route 128, before eventually moving to even lower cost space outside the region. Density seems most valuable where creativity is most vital. We also find a strong geographic link between venture capitalists and new start-ups, which might reflect the importance of financing but could just as easily reflect the extra skills embodied in venture capitalists.

Despite the growth in those areas, there are newer technology areas that are less tightly tied to these traditional clusters of Massachusetts technology, and this gives some hope to the idea of supporting a new technology cluster in some less privileged areas. One geographic fact is that the technology sector, even more than employers more generally, tends to locate in the region's wealthier zip codes. In the region's poorest fourth of zip codes, there are 17.7 employers per 1,000 residents and 2.5 percent of them are technology firms. In the region's richest fourth of zip codes, there are 44 employers per 1,000 inhabitants and 7.2 percent those employers are technology-related. It is certainly troubling that the region's poorest zip codes are technology employer deserts, but there is no easy policy response, for technology firms have tended to reap the benefits of clustering near one another in areas that benefit from strong research institutions and good public schools. The great English economist Alfred Marshall wrote almost a century ago that in dense clusters "the mysteries of the trade become no mystery but are, as it were, in the air" and that appears to be true today, as information-intensive enterprises flock to be near one another.

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Traditional Approaches to Development: Taxes, Subsidies and Infrastructure

Next, we turn to three plausible arguments for supporting policies that encourage

entrepreneurship. The more modest view is simply that technology entrepreneurship is an important sector worthy, like any major part of the economy, of decent public governance. According to this view, the sector deserves the infrastructure that it is willing to pay for, regulations that are reasonable, and taxes that are not punitive. Even such a modest view justifies some attention to public policies towards technology entrepreneurship.

But there is a second policy viewpoint that is significantly more radical. According to this more activist stance, entrepreneurs in general, and technology entrepreneurs in particular, yield positive spillovers for the economy as a whole. These spillovers come from the creation of jobs, which reduce the social costs of unemployed workers, and the payment of taxes by employees, landlords and shareholders. In the case of technology firms, there is also the possibility of society-wide benefits from the generation of new ideas and products. For example, technology products that are provided essentially for free, like Facebook, seem guaranteed to generate benefits for users who do not pay for them.

Economists have regularly heaped skepticism on public financing proposals, citing the shortage of venture capital skills within the public sector and the potential for abuse. One now classic study of Japanese support for start-ups found that the Ministry of International Trade and Industry (MITI) picked losers rather than winners.

The third approach is to view Greater Boston's technological prowess as a tool for solving other problems, most notably the deprivation that exists in too many of our communities. According to this view, the point of innovation policy is not just to encourage innovators but to ensure that the benefits of innovation are spread more widely. This approach points towards policies that build pathways towards technological employment in educational institutions that cater to the less privileged. It also suggests encouraging technology start-ups to locate in less-privileged areas.

First, we turn to the traditional tools of supporting businesses: tax subsidies, public lending programs and infrastructure. Given the relatively modest level of profits among most start-up companies, it is crucial to distinguish between taxes on corporate profits and other taxes, which still impact the costs of doing business. A start-up that is currently earning no profits has little to fear from the statewide business tax, but it will still pay the costs of sales taxes or property taxes. Taxing business profits, rather than increasing the cost of business inputs is less likely to drive down entrepreneurship rates.

A second traditional policy approach is to provide financing for apparently promising start-ups. Certainly, would-be entrepreneurs repeatedly complain about the short-sightedness of local venture financiers, alleging something like a market failure. Yet it is neither obvious that these claims reflect more than sour grapes nor that the public sector is in any position to correctly direct the flow of new financing. Economists have regularly heaped skepticism on public financing proposals, citing the shortage of venture capital skills within the public sector and the potential for abuse.

One now classic study of Japanese support for start-ups found that the Ministry of International Trade and Industry (MITI) picked losers rather than winners (Beason and Weinstein, 1995). The Commonwealth has several funds which support start-ups within Massachusetts, and we attempted to follow the

Beason and Weinstein approach by comparing the subsequent careers of these supported start-ups with comparable careers of initially similar industries. We have created a data set of firms that received financing from the MassDevelopment fund. Using the NETS data, we compare these firms with similar firms that did not receive such financing. We use a propensity score tool to test whether the public financing appears to have improved their odds of success or survival. We find that there is little or no correlation between state financing and either employment growth or survival level between these two samples. Despite our best efforts, there is no randomization in this analysis so we cannot be sure that the treatment and control samples are identical.

We cannot conclude from these results that the state's programs are failures, but it would be helpful if the state itself engaged in more rigorous evaluation of these programs, ideally with some randomization of support. The larger policy lesson of this report is that small, nimble technology start-ups play an outsized role in driving technology employment and metropolitan growth. Direct financial support for these enterprises seems less crucial than other activities, such as land use planning and regulations that are more traditional parts of the public purview. As the molders of the Innovation District realize, space that supports entrepreneurship seems to be an important ingredient in the creativity that is the ultimate source of greater Boston's economic energy.

A third traditional approach is to support business development with infrastructure spending. During the 19th century, cities like Buffalo and Chicago grew because of their transportation linkages with east and west. Since technology companies use inputs and produce outputs that are easy to ship, they have relatively little need for classical physical infrastructure. The relevant infrastructure question concerns technologically-specific infrastructure such as fiber or broadband.

We do have measures of broadband accessibility from 2010 and later, and while it is impossible to fully address issues of causality, it does seem quite likely that idiosyncratic forces helped determine the location of broadband within the region. Moreover, we find some significant correlations between broadband availability and the location of technology start-ups. This does not make the case for subsidizing broadband, but it does suggest revisiting the private provision of fiber options in Boston itself.

We now turn instead to somewhat more novel policies that focus on increasing the supply of entrepreneurs including policies surrounding education, cluster-making regulatory reform and legal reform regarding non-compete clauses. The success of the Kendall Square district is only one of the many examples where universities can serve as the focal point for technology areas, providing human capital in the form of both faculty and students. Moretti (2004) finds the presence of a land grant college, such as M.I.T., in a metropolitan area is a good predictor of success during recent decades. The correlation between area level education and technology establishments reported here provides further support for

The success of the Kendall Square district is only one of the many examples where universities can serve as the focal point for technology areas, providing human capital in the form of both faculty and students. Moretti (2004) finds the presence of a land grant college, such as M.I.T., in a metropolitan area is a good predictor of success during recent decades.

the link between skills and start-ups. Our association with a major research university somewhat precludes us from providing disinterested analysis of policies relating to universities. However, for local governments, it remains important to consider those local policies, especially land use regulations that may make it difficult for private entrepreneurs to grow near university campuses.

Another way to increase the supplying of entrepreneurs is to develop clusters such as Boston's Innovation District. Lerner (2009) relates the many failed attempts to produce Silicon Valley in cities throughout the world, so we must be cautious about throwing significant tax dollars at such plans. Yet there are many reasons to be optimistic about Boston's Innovation District, an innovative attempt to create a third technology cluster in Suffolk County. The district recognizes the power of density to spur technology innovation, and it takes advantage of the pedestrian streetscape that exists at the heart of Boston. It certainly appears to have been a success so far.

Rules that bar start-ups are implicit taxes that limit the supply of entrepreneurship into the region. Greater Boston might benefit from centralizing and streamlining its regulatory process, as well as from re-evaluating old regulations to see whether their benefits really outweigh their costs.

Moreover, the real estate is intrinsically attractive, with great views, good public transit access, and easy walks into historic Boston. The area does lack access to a traditional technology-oriented university, and it doesn't sit in the middle of a dense cluster of highly educated workers, but that second lack is being remedied through the construction of residential dwellings right in the Innovation District. This cluster strategy remains a gamble, but it seems one that is well in line with the traditional sources of innovative success. Creating a center of small technology firms in the heart of Boston is not guaranteed to succeed, but it seems like as sensible a move as a government can make to further the growth of innovative entrepreneurship in the region.

The open question about clustering is whether a cluster can be developed in an area without prime waterfront real estate or proximity to a major research university, such as the Dudley Square neighborhood of Roxbury. For example, if the Boston Public School system was in the market for ongoing innovations in computer-related instruction, then the Dudley Square area, near to the new School System headquarters, could potentially become a hub for technology entrepreneurs interested in supplying school-related software. Success is surely not guaranteed in such an effort, but if the cost was sufficiently low, this could be an experiment worth trying. A particularly appealing lever would be to offer fast track regulatory approval for firms that locate in such an area.

More generally, reforming regulation is another plausible approach to encouraging entrepreneurship. Rules that bar start-ups are implicit taxes that limit the supply of entrepreneurship into the region. Greater Boston might benefit from centralizing and streamlining its regulatory process, as well as from re-evaluating old regulations to see whether their benefits really outweigh their costs.

A final approach is to eliminate the enforceability of non-compete clauses in Massachusetts, perhaps while also adopting the Uniform Trade Secrets Act. Though the act does protect firms from losing key employees

to competing firms, which may make them more willing to hire and trust workers with sensitive information, the act also directly prevents the movement of employees into new firms. Moreover, as long as other states, including California, decline to enforce non-compete clauses, then it is unlikely that Massachusetts' enforcing of these losses provides much protection, since workers can always move to a competing firm in another state. Eliminating non-compete clauses, while allowing more protection of trade secrets through the Uniform Trade Secrets Act, offers at least the promise of allowing more start-ups without excessively damaging existing firms' ability to trust their workers.

Technology start-ups have become a critical part of greater Boston's economy. Whether or not they deserve subsidies, they surely deserve attention and sensible politices.

Conclusion

Technology start-ups have become a critical part of greater Boston's economy. Whether or not they deserve subsidies, they surely deserve attention and sensible policies. The state cannot easily cut taxes without cutting service levels, which makes it all the more important to compete effectively in other areas. It also seems important to avoid taxes, like the technology service sales tax, that particulate target this important area of the Boston economy.

We are not confident that the public financing approach to technology start-ups has been successful. Our attempt to examine the impact of public loans on employment growth yielded few significant results. We urge the state to properly evaluate their loan programs, and ideally to even adopt a policy of randomized trials among a hand-picked set of good alternatives. We also believe that it is sensible to revisit the issues that have limited the availability of broadband in much of the city.

Moreover, we believe that there is a case for adopting a more supply-oriented approach to entrepreneurship that focuses on education, regulation and non-compete clauses. Our educational entities may or may not be appropriate recipients of added state aid, but it does seem sensible to adopt policies that make it easier to leverage their success. One natural policy tool would be to relax local land use regulations that impact private construction near science campuses. We also believe that it is appropriate to apply cost-benefit analysis to existing state and local regulations that impact entrepreneurship. An added proposal is to follow California's lead and cease enforcing non-compete clauses.

Our most high-risk proposal is to consider an innovation district in a lower income neighborhood. Much of the data we have marshaled suggests that such an experiment has a reasonably high probability of failure. Technology firms prefer to employ highly educated workers and to locate in higher income zip codes. Yet technological innovation must serve both rich and poor, and an innovation district in a poorer community provides a possible way to achieve that dream. Since such a district would be an experiment, it should be low cost and appropriately evaluated.

Too little time has passed to properly evaluate the Boston Innovation District, but certainly the early results are more than promising. The area has become a hub of entrepreneurship filled with exciting new start-ups. Its biggest challenge is keeping real estate costs low enough to continue attracting impecunious start-ups. The approach certainly is sensible, and offers some hope for transforming Boston from a city of big firms into a more sustainable city of start-ups.

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