

PATH-DEPENDENT STARTUP HUBS
Comparing Metropolitan Performance:
High-Tech and ICT Startup Density

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September 2013

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Regional entrepreneurship ecosystems, aka startup communities, are being studied and touted as the next new thing in economic development for cities and metropolitan areas across the country—especially in the high-technology and information technology (ICT) sectors. And for good reason. According to a report by Ian Hathaway of Engine that looked closely at the dynamism of the high-tech and ICT sectors in the United States, particularly new and young companies,¹ these are the firms that create jobs at the fastest pace and are important drivers of economic growth.

Hathaway's paper included a list of the top metropolitan areas by startup density in these two sectors. The Appendix included this density information for metropolitan areas for 1990 and 2010. Using these appendix tables, I took a closer look at the relative performance of metropolitan areas over the past twenty years in terms of high-tech entrepreneurship. Specifically, I was interested in answering the following questions:

- What metropolitan areas saw the biggest increases or decreases in high-tech startup density?
- What did relative performance look like by different-sized MSAs?
- Were the top metro areas identified by Hathaway for 2010 the same as in 1990?

This exploration suggests several interesting observations, some of which challenge commonly held beliefs:

- Many areas currently considered “new” startup hubs actually have either a history of strong technology sectors or experienced strong growth among technology startups over the past two decades.
- Contrary to the opinions of many, a strong regional or local culture of technology entrepreneurship is not a recent phenomenon. The top ten cities in 2010 also were in the top twenty some two decades prior. Startup density appears to be a path-dependent phenomenon.
- The adoption in recent years of new entrepreneurship programs in many cities is perhaps more an indication of the underlying strength of the region and its base of talent on which those programs can build than it is a cause of startup activity.
- While metro areas with research universities and other postsecondary institutions certainly appear among the top ranks by tech startup density, their presence does not appear to be a *sine qua non*.
- The most fertile source of entrepreneurial spawning is the population of existing companies, which has implications for economic policymaking and economic development strategies.

¹ Ian Hathaway, “Tech Starts: High-Technology Business Formation and Job Creation in the United States,” Kauffman Foundation Research Series on Firm Formation and Economic Growth, August 2013, at <http://www.kauffman.org/uploadedFiles/bds-tech-starts-report.pdf>.

Largest MSAs

The table below displays the top twenty large metropolitan areas and metropolitan divisions by high-tech startup density in 1990 and 2010. The bold font indicates cities that fell out of the top twenty after 1990 or were new entrants to the top twenty in 2010.

Top Large Metropolitan Areas and Divisions by High-Tech Startup Density		
Rank	1990	2010
1	San Jose-Sunnyvale-Santa Clara, CA	San Jose-Sunnyvale-Santa Clara, CA
2	Bethesda-Frederick-Rockville, MD	San Francisco-San Mateo-Redwood City, CA
3	Austin-Round Rock-San Marcos, TX	Cambridge-Newton-Framingham, MA
4	San Francisco-San Mateo-Redwood City, CA	Denver-Aurora-Broomfield, CO
5	Dallas-Plano-Irving, TX	Seattle-Bellevue-Everett, WA
6	Cambridge-Newton-Framingham, MA	Washington-Arlington-Alexandria, DC-VA
7	Houston-Sugar Land-Baytown, TX	Salt Lake City, UT
8	Santa Ana-Anaheim-Irvine, CA	Raleigh-Cary, NC
9	Denver-Aurora-Broomfield, CO	Bethesda-Frederick-Rockville, MD
10	Washington-Arlington-Alexandria, DC-VA	Austin-Round Rock-San Marcos, TX
11	Raleigh-Cary, NC	Portland-Vancouver-Beaverton, OR-WA
12	Seattle-Bellevue-Everett, WA	Wilmington, DE-MD-NJ
13	Orlando-Kissimmee-Sanford, FL	Phoenix-Mesa-Glendale, AZ
14	Salt Lake City, UT	Dallas-Plano-Irving, TX
15	San Diego-Carlsbad-San Marcos, CA	Santa Ana-Anaheim-Irvine, CA
16	Warren-Troy-Farmington Hills, MI	Fort Lauderdale-Pompano Beach-Deerfield Beach, FL
17	Oakland-Fremont-Hayward, CA	Atlanta-Sandy Springs-Marietta, GA
18	Fort Lauderdale-Pompano Beach-Deerfield Beach, FL	Kansas City, MO-KS
19	Minneapolis-St. Paul-Bloomington, MN-WI	New Orleans-Metairie-Kenner, LA
20	Atlanta-Sandy Springs-Marietta, GA	San Diego-Carlsbad-San Marcos, CA

Table 1. These data are derived from National Establishment Time Series data and do not directly correspond to OMB/Census-defined metropolitan statistical areas. Thus, the largest MSAs on this list are broken down into metropolitan divisions. Each metropolitan area or division on these lists had a high-tech density above 1.4 (1990) or above 1.2 (2010), compared to 1.0 for the entire United States.

The biggest observation that jumps out from this table is how much persistence there is across time—at least over this two-decade period—in high-tech density.² The metropolitan areas in the top ten shuffle around, for example, but only one top ten city in 1990 (Houston) dropped off the list entirely. All of the top ten cities in 2010 were already in the top twenty two decades prior. That ranking persistence, however, hides some decreases in high-tech startup density among even the top areas.

² This paper uses the same sectoral definitions for high-tech and ICT (information and communications technology) as Hathaway (Appendix Table 4). Fourteen sectors are included, ten of which are ICT, and four of which are “miscellaneous” high-tech—the latter four are identified in footnote 4. The ten ICT sectors are: computer and peripheral equipment manufacturing; communications and equipment manufacturing; semiconductor and other electronic component manufacturing; navigational, measuring, electromedical, and control instruments manufacturing; software publishers; internet publishing and broadcasting; other telecommunications; internet service providers and web search portals; data processing, hosting, and related services; and, computer systems design and related services.

Change in High-Tech Startup Density, 1990–2010, Largest Metropolitan Areas		
Rank	Largest Increases	Largest Decreases
1	Seattle-Bellevue-Everett, WA	Houston-Sugar Land-Baytown, TX
2	Wilmington, DE-MD-NJ	Dallas-Plano-Irving, TX
3	Kansas City, MO-KS	Bethesda-Frederick-Rockville, MD
4	New Orleans-Metairie-Kenner, LA	Warren-Troy-Farmington Hills, MI
5	Denver-Aurora-Broomfield, CO	Austin-Round Rock-San Marcos, TX
6	Jacksonville, FL	Santa Ana-Anaheim-Irvine, CA
7	Washington-Arlington-Alexandria, DC-VA	Palm Coast, FL
8	Louisville/Jefferson County, KY-IN	Orlando-Kissimmee-Sanford, FL
9	Richmond, VA	Nassau-Suffolk, NY
10	Virginia Beach-Norfolk-Newport News, VA-NC	Fort Worth-Arlington, TX

Table 2. Largest changes in high-tech startup density, 1990–2010.

For example, the Bethesda and Dallas metro divisions experienced two of the largest decreases in high-tech startup density from 1990 to 2010, but both remained in the top twenty in 2010. In fact, there are four Texas metropolitan divisions among the top ten decreases: Houston, Dallas, Austin, and Fort Worth. Two of those Texas cities—Houston and Austin—remained among the top twenty in 2010, but the fall in high-tech startup density among these four must at least raise some questions about the nature of the celebrated Texas economic growth story over those same two decades. Likewise, while Virginia’s recent economic experience often is attributed mainly to Northern Virginia’s proximity to Washington, D.C., we see here that there is more geographic dispersion behind the state’s economic growth than that.

Most of the cities and metropolitan areas in these two tables are more or less predictable: Silicon Valley, the Pacific Northwest, Washington, D.C., and Cambridge, Mass. (the breakout of metro divisions from larger MSAs here allows us to confirm that Cambridge is the real seat of technology dynamism in the Boston area). Other places are more surprising: Wilmington and New Orleans probably don’t make most people’s lists of tech hotspots.

Kansas City also may strike some as surprising, although it is less of a surprise to those familiar with the technology ecosystem there.³ In fact, what Kansas City’s growing tech density (also illustrated in the following table with just ICT) demonstrates is that the metropolitan area had a strongly growing technology sector prior to recent milestones, such as the advent of the high-speed Internet service potential of Google Fiber. The burgeoning startup activity in Kansas City—which most observers attribute to Google Fiber and other recent events—is thus building on a strong base of prior tech growth, and is less of a recent phenomenon than some acknowledge.

³ See the Kansas City Tech Galaxy, developed by Heike Mayer, at http://www.kauffman.org/uploadedFiles/kc-tech-galaxy_6-13.pdf.

If we look only at ICT (information and communications technology), we see similar rankings and changes, with a few differences.⁴ As previously, bold font indicates cities that either fell out of the top twenty or were new entrants.

Top Large Metropolitan Areas and Divisions by ICT Startup Density		
Rank	1990	2010
1	San Jose-Sunnyvale-Santa Clara, CA	San Jose-Sunnyvale-Santa Clara, CA
2	Dallas-Plano-Irving, TX	Seattle-Bellevue-Everett, WA
3	San Francisco-San Mateo-Redwood City, CA	Washington-Arlington-Alexandria, DC-VA
4	Bethesda-Frederick-Rockville, MD	San Francisco-San Mateo-Redwood City, CA
5	Santa Ana-Anaheim-Irvine, CA	Denver-Aurora-Broomfield, CO
6	Cambridge-Newton-Framingham, MA	Cambridge-Newton-Framingham, MA
7	Seattle-Bellevue-Everett, WA	Raleigh-Cary, NC
8	Washington-Arlington-Alexandria, DC-VA	Salt Lake City, UT
9	Austin-Round Rock-San Marcos, TX	Austin-Round Rock-San Marcos, TX
10	Oakland-Fremont-Hayward, CA	Portland-Vancouver-Beaverton, OR-WA
11	Denver-Aurora-Broomfield, CO	Bethesda-Frederick-Rockville, MD
12	San Diego-Carlsbad-San Marcos, CA	Lake County-Kenosha County, IL-WI
13	Phoenix-Mesa-Glendale, AZ	Kansas City, MO-KS
14	Minneapolis-St. Paul-Bloomington, MN-WI	Dallas-Plano-Irving, TX
15	Houston-Sugar Land-Baytown, TX	Atlanta-Sandy Springs-Marietta, GA
16	Salt Lake City, UT	Phoenix-Mesa-Glendale, AZ
17	Raleigh-Cary, NC	Minneapolis-St. Paul-Bloomington, MN-WI
18	Atlanta-Sandy Springs-Marietta, GA	Charlotte-Gastonia-Rock Hill, NC-SC
19	Nassau-Suffolk, NY	Chicago-Naperville-Joliet, IL-IN-WI
20	Chicago-Naperville-Joliet, IL-IN-WI	Fort Lauderdale-Pompano Beach-Deerfield Beach, FL

Table 3. Source: Hathaway.

Not surprisingly, we see most of the same metropolitan areas and divisions at the top of the list each year, with a few new ones. Two metropolitan areas to note that did not show up when we looked at overall high-tech startup density are Fort Lauderdale and Lake County, Ill.—the latter could indicate the suburbanization of ICT companies in greater Chicago.

Likewise, when looking at the biggest changes, positive or negative, in ICT startup density, the story is broadly the same.

⁴ The ICT category excludes: pharmaceutical and medicine manufacturing; aerospace product and parts manufacturing; architectural, engineering, and related services; and, scientific, research-and-development services.

Change in ICT Startup Density, 1990–2010 Largest Metropolitan Areas		
Rank	Largest Increases	Largest Decreases
1	Kansas City, MO-KS	San Jose-Sunnyvale-Santa Clare, CA
2	Seattle-Bellevue-Everett, WA	Dallas-Plano-Irving, TX
3	Denver-Aurora-Broomfield, CO	Santa Ana-Anaheim-Irvine, CA
4	Lake County-Kenosha County, IL-WI	Bethesda-Frederick-Rockville, MD
5	Jacksonville, FL	Houston-Sugar Land-Baytown, TX
6	Washington-Arlington-Alexandria, DC-VA	Nassau-Suffolk, NY
7	Richmond, VA	Oakland-Fremont-Hayward, CA
8	Charlotte-Gastonia-Rock Hill, NC-SC	Warren-Troy-Farmington Hills, MI
9	Raleigh-Cary, NC	Fort Worth-Arlington, TX
10	Palm Coast, FL	Newark-Union, NJ-PA

Table 4. Source: Hathaway.

One notable observation here, echoing the previous comments, is that Kansas City experienced the largest increase—among big metro areas—in ICT startup density from 1990 to 2010. This not only confirms much of the buzz building in Kansas City about its growing startup movement but also illustrates, again, that much of the recent talk is built on strong prior technology-sector growth and that much credit goes to that growth.

The Charlotte metropolitan area shows up in the top ten here, as does Palm Coast, Fla., even though Palm Coast experienced a decrease in high-tech startup density. It also bears mention that the seat of Silicon Valley—the San Jose metropolitan area—experienced the largest decline in ICT startup density even though it still held the highest concentration of ICT startups. Just as four cities in Texas had large falls in high-tech startup density, three Texas cities are among the top ten decreases here.

Mid-Large Metropolitan Areas

We now turn to mid-to-large-sized metropolitan areas, those with populations between 500,000 and 1 million. The table below shows the top ten cities by high-tech startup density in 1990 and 2010—these were, for the most part, the only cities in this size class to have high-tech densities over 1.0.

Top Mid-Large Metropolitan Areas and Divisions by High-Tech Startup Density		
Rank	1990	2010
1	Palm Bay-Melbourne-Titusville, FL	Colorado Springs, CO
2	Oxnard-Thousand Oaks-Ventura, CA	Provo-Orem, UT
3	Bridgeport-Stamford-Norwalk, CT	Durham-Chapel Hill, NC
4	Madison, WI	Des Moines-West Des Moines, IA
5	Provo-Orem, UT	Baton Rouge, LA
6	Albuquerque, NM	Boise City-Nampa, ID
7	Honolulu, HI	Palm Bay-Melbourne-Titusville, FL
8	Colorado Springs, CO	Honolulu, HI
9	New Haven-Milford, CT	Portland-South Portland-Biddeford, ME
10	Worcester, MA	Omaha-Council Bluffs, NE-IA

Table 5. Bold font, again, indicates cities that fell out of the top 10 after 1990, or were new entrants by 2010.

Overall, what is perhaps most interesting about these comparative rankings is how much they confirm shifts that have been documented elsewhere, demonstrated by the high turnover among the top ten cities. In particular, Des Moines and Omaha, Nebr., have in recent years gained national recognition as new hotspots for entrepreneurship, particularly in technology. This has become known as the “Silicon Prairie.”

Boise, too, has been on the rise as a technology hub, and Boise’s story, along with Portland, Ore., Seattle, and Kansas City, has been documented in a series of studies and visualizations by Heike Mayer. These cities and regions have hosted large institutions, such as research universities and big companies, which have spawned multiple generations of entrepreneurs. This history certainly is apparent in the rankings presented here.⁵

The table below displays the largest changes in high-tech startup density among mid-large metro areas.

Change in High-Tech Startup Density, 1990–2010 Mid-Large Metropolitan Areas		
Rank	Largest Increases	Largest Decreases
1	Colorado Springs, CO	New Haven-Milford, CT
2	Baton Rouge, LA	Bridgeport-Stamford-Norwalk, CT
3	Durham-Chapel Hill, NC	Oxnard-Thousand Oaks-Ventura, CA
4	Boise City-Nampa, ID	Toledo, OH
5	Little Rock-North Little Rock-Conway, AR	Madison, WI
6	Des Moines-West Des Moines, IA	Grand Rapids-Wyoming, MI
7	Ogden-Clearfield, UT	Albuquerque, NM
8	Provo-Orem, UT	*

Table 6. Asterisk (*) indicates that all other metro areas in this size class that experienced declines had decreases that were too small to report.

The list in Table 6 is none too surprising given the comparison in Table 5. Two Connecticut cities had the largest declines in high-tech startup density from 1990 to 2010. The appearance of Madison, Wis., on this list may be a surprise to some, particularly those involved in entrepreneurship in Madison. The city hosts a world-class research university and is often spoken of in the same breath as other vibrant “cool” cities, such as Portland and Boulder, Colo. As shown in Table 5, however, Madison had one of the highest densities in this size class in 1990, but experienced a substantial decline over the next twenty years, falling out of the top ten. This would seem to corroborate some of the latest coverage about faltering dynamism and entrepreneurship in Madison.⁶

⁵ Heike Mayer’s work on “spinoff regions” and “entrepreneurial genealogies” is available here: <http://www.heikemayer.com/spinoff-regions.html>. See also Heike Mayer, *Entrepreneurship and Innovation in Second Tier Regions* (Elgar, 2012).

⁶ See, e.g., Jim Russell, “Madison’s Portland Problem,” *Pacific Standard*, June 12, 2013, at <http://www.psmag.com/business-economics/burgh-disapora/madisons-portland-problem-60073/>; Mike Ivey, “Madison lagging behind peer cities in economic vitality,” *The Capital Times*, June 12, 2013, at http://host.madison.com/ct/news/local/writers/mike_ivey/madison-lagging-behind-peer-cities-in-economic-vitality/article_80eeb206-2d30-5827-967a-8ae8106cfb36.html.

Things aren't all bad, of course, as Madison still boasted a top ten ICT startup density in 2010 (see Table 7), but even here, the city experienced a slight decline.⁷

Top Mid-Large Metropolitan Areas and Divisions by ICT Startup Density		
Rank	1990	2010
1	Provo-Orem, UT	Colorado Springs, CO
2	Bridgeport-Stamford-Norwalk, CT	Provo-Orem, UT
3	Oxnard-Thousand Oaks-Ventura, CA	Des Moines-West Des Moines, IA
4	Colorado Springs, CO	Durham-Chapel Hill, NC
5	Palm Bay-Melbourne-Titusville, FL	Portland-South Portland-Biddeford, ME
6	Madison, WI	Boise City-Nampa, ID
7	New Haven-Milford, CT	Bridgeport-Stamford-Norwalk, CT
8	Albuquerque, NM	Madison, WI
9		Little Rock-North Little Rock-Conway, AR

Table 7. The table only displays cities with an ICT startup density over 1.0.

Change in ICT Startup Density, 1990–2010 Mid-Large Metropolitan Areas		
Rank	Largest Increases	Largest Decreases
1	Boise City-Nampa, ID	New Haven-Milford, CT
2	Des Moines-West Des Moines, IA	Oxnard-Thousand Oaks-Ventura, CA
3	Durham-Chapel Hill, NC	Stockton, CA
4	Colorado Springs, CO	Bridgeport-Stamford-Norwalk, CT
5	Little Rock-North Little Rock-Conway, AR	Toledo, OH
6	Portland-South Portland-Biddeford, ME	Palm Bay-Melbourne-Titusville, FL
7	Baton Rouge, LA	*
8	Harrisburg-Carlisle, PA	*
9	Winston-Salem, NC	*
10	Provo-Orem, UT	*

Table 8. *See note in Table 6 caption.

Again, there are few new cities in these tables compared to high-tech startup density, with the exception of Harrisburg, Penn., and Winston-Salem, N.C., experiencing large increases in ICT startup density. Yet both of these cities remained below 1.0 in density. Colorado Springs and Provo-Orem, Utah, had some of the highest technology startup densities in the entire country, among metropolitan areas of all sizes.

⁷ Given, too, that the ICT sectors exclude pharmaceuticals/medicine and R&D companies, perhaps that is of even greater concern to Madison leaders since the University of Wisconsin is known for its strength in these areas.

Small-Mid Metropolitan Areas

We now take a look at small-to-mid-sized metropolitan areas, those with populations between 250,000 and 500,000.

Top Small-Mid Metropolitan Areas and Divisions by High-Tech Startup Density		
Rank	1990	2010
1	Boulder, CO	Boulder, CO
2	Manchester-Nashua, NH	Fort Collins-Loveland, CO
3	Ann Arbor, MI	Huntsville, AL
4	Rockingham-Strafford, NH	Manchester-Nashua, NH
5	Huntsville, AL	Trenton-Ewing, NJ
6	Santa Cruz-Watsonville, CA	Ann Arbor, MI
7	Santa Barbara-Santa Maria-Goleta, CA	Rockingham-Strafford, NH
8	Reno-Sparks, NV	Lafayette, LA
9	Naples-Marco Island, FL	Anchorage, AK
10	Fort Collins-Loveland, CO	Lexington-Fayette, KY

Table 9. Rockingham and Strafford Counties (NH) are metro divisions of the Boston-Cambridge-Quincy MSA. Because of the way the NETS data are structured, Hathaway broke-out the metro divisions from the largest MSAs. Because of the Rockingham-Strafford population, I reclassified it here as a small-mid metro area.

The most immediately apparent characteristic of this table is the predominance of university locales: University of Colorado-Boulder (Boulder); Colorado State University (Fort Collins); Princeton (Trenton-Ewing); University of Michigan (Ann Arbor); University of Louisiana-Lafayette (Lafayette); University of Kentucky (Lexington-Fayette). In addition, Huntsville, Ala., is a major center of federal government research and development, and has been home to many high-growth firms in the past few years.⁸

Now let's look at which small-mid metros had the largest changes in high-tech startup density from 1990 to 2010.

Change in High-Tech Startup Density, 1990–2010 Small-Mid Metropolitan Areas		
Rank	Largest Increases	Largest Decreases
1	Boulder, CO	Manchester-Nashua, NH
2	Fort Collins-Loveland, CO	Ann Arbor, MI
3	Fayetteville-Springdale-Rogers, AR-MO	Rockingham-Strafford, NH
4	Lexington-Fayette, KY	Santa Cruz-Watsonville, CA
5	Greeley, CO	Santa Barbara-Santa Maria-Goleta, CA
6	Green Bay, WI	*

Table 10.

Surprisingly, even though they still ranked in the top ten in 2010, Manchester-Nashua and Ann Arbor experienced some of the largest national declines in high-tech startup density. Boulder, already ranked atop this category in 1990, experienced further technology startup activity, and its neighbor, Fort Collins, also rose up the ranks. Further observations on Colorado follow in the concluding section.

⁸ See Yasuyuki Motoyama and Brian Danley, "An Analysis of the Geography of Entrepreneurship," Kauffman Foundation, September 2012, at http://www.kauffman.org/uploadedFiles/inc_geography.pdf.

Top Small-Mid Metropolitan Areas and Divisions by ICT Startup Density		
Rank	1990	2010
1	Boulder, CO	Boulder, CO
2	Manchester-Nashua, NH	Fort Collins-Loveland, CO
3	Ann Arbor, MI	Huntsville, AL
4	Rockingham-Strafford, NH	Manchester-Nashua, NH
5	Santa Cruz-Watsonville, CA	Rockingham-Strafford, NH
6	Fort Collins-Loveland, CO	Cedar Rapids, IA
7	Reno-Sparks, NV	Trenton-Ewing, NJ
8	Norwich-New London, CT	Ann Arbor, MI

The only notable difference between the high-tech and ICT startup densities among these metro areas is the addition of Cedar Rapids, Iowa, which also was one of the most active areas of the Startup America Partnership from 2011 to 2013.⁹

Change in ICT Startup Density, 1990–2010 Small-Mid Metropolitan Areas		
Rank	Largest Increases	Largest Decreases
1	Fort Collins-Loveland, CO	Manchester-Nashua, NH
2	Boulder, CO	Ann Arbor, MI
3	Cedar Rapids, IA	Santa Cruz-Watsonville, CA
4	Lexington-Fayette, KY	Lubbock, TX
5	Huntsville, AL	*
6	Port St. Lucie, FL	*
7	Green Bay, WI	*
8	Hagerstown-Martinsburg, MD-WV	*
9	Fayetteville-Springdale-Rogers, AR-MO	*
10	Tallahassee, FL	*

Table 11. Asterisk (*) again indicates that no additional metro areas had significant enough changes to report.

While this table indicates a change in a given metro’s ICT startup density—and not necessarily an above-average density—we do see some new and perhaps unexpected metros show up, such as Tallahassee, Fla. It is not clear why Manchester-Nashua, N.H., has experienced such large declines in tech-startup density.

Small Metros

At this point, we enter the realm of small samples. Metropolitan areas in this size class have populations less than 250,000. High density of technology startups, then, reflects both the presence of such companies and the city’s small size. So while the high-tech startup density in small and small-mid-sized metros in 2010 may have “rivalled, even surpassed, that of more blockbuster hubs,” we need to keep some perspective.¹⁰ The following table displays the top small metros, in 1990 and 2010, by high-tech startup density. At this level of density, a dozen tech companies are enough to land a small metro area among the top-ranked places in the nation.

⁹ “The Start-Uprising,” Kauffman Foundation, December 2012, at http://www.kauffman.org/uploadedFiles/SUAPreport_FINAL2.pdf.

¹⁰ Richard Florida, “The Surprising Cities Leading America’s Startup Revolution,” *The Atlantic Cities*, August 15, 2013, at <http://www.theatlanticcities.com/jobs-and-economy/2013/08/surprising-cities-leading-americas-startup-revolution/6493/>.

Top Small Metropolitan Areas and Divisions by High-Tech Startup Density		
Rank	1990	2010
1	Midland, TX	Corvallis, OR
2	Barnstable Town, MA	Cheyenne, WY
3	Holland-Grand Haven, MI	Bend, OR
4	Sebastian-Vero Beach, FL	Grand Junction, CO
5	Santa Fe, NM	Missoula, MT
6	Edison-New Brunswick, NJ	Sioux Falls, SD
7	Grand Junction, CO	Santa Fe, NM
8	*	Ames, IA
9	*	Edison-New Brunswick, NJ
10	*	Burlington-South Burlington, VT
11	*	Ithaca, NY
12	*	Lawrence, KS
13	*	Rapid City, SD
14	*	Carson City, NV
15	*	Champaign-Urbana, IL

Table 12. Asterisk (*) indicates that, in 1990, only these seven small metro areas had high-tech startup densities over 1.0.

Hathaway notes in his paper that while Missoula and Cheyenne had elevated startup densities in 2010, these were accounted for by, respectively, sixteen and eleven ICT startups. Likewise, Corvallis and Ames each had eleven ICT startups in 2010, accounting for their relatively high ICT startup densities. The increase experienced by Cheyenne in high-tech startup density from 1990 to 2010 (see Table 13) thus reflects the addition of a few companies. So while it may be accurate, from one perspective, to say that these small metro areas now “rival” traditional tech hubs such as Silicon Valley, from the standpoint of volume they are incomparable. It also says nothing about the character of technology startup concentration in various places.

Change in High-Tech Startup Density, 1990–2010 Small Metropolitan Areas		
Rank	Largest Increases	Largest Decreases
1	Cheyenne, WY	Holland-Grand Haven, MI
2	Sioux Falls, SD	Midland, TX
3	Corvallis, OR	Sheboygan, WI
4	Bend, OR	Pittsfield, MA
5	Missoula, MT	Barnstable Town, MA
6	Ames, IA	Sebastian-Vero Beach, FL
7	State College, PA	Odessa, TX
8	Champaign-Urbana, IL	Napa, CA
9	Dover, DE	*
10	Crestview-Fort Walton Beach-Destin, FL	*

Table 13.

For example, especially in the smaller size classes, research universities and other postsecondary institutions dominate the ranks of metro areas with high densities of technology startups. Yet it wouldn't be accurate to claim that a university causes that density, per se: plenty of other places with such universities have almost no technology

startups. Included in this latter category are small metros such as Columbia, Mo. (University of Missouri) and Athens, Ga. (University of Georgia).

Top Small Metropolitan Areas and Divisions by ICT Startup Density		
Rank	1990	2010
1	Edison-New Brunswick, NJ	Missoula, MT
2	Ames, IA	Corvallis, OR
3	Peabody, MA	Cheyenne, WY
4	*	Ames, IA
5	*	Champaign-Urbana, IL
6	*	Edison-New Brunswick, NJ
7	*	Carson City, NV
8	*	Bend, OR
9	*	Lawrence, KS
10	*	Santa Fe, NM

There clearly is some variation in how universities interact with their surrounding communities and their contributory role to regional economic growth. It could be the case that, notwithstanding the overall poor record of universities in commercializing technology, some do it much better than others in ways that are not captured by the standard data of licensing royalties. It also is likely that universities produce entrepreneurs outside of official institutional channels. And, those university-centric locales with high-technology startup densities also may have other institutions, with which the universities interact, that contribute to the entrepreneurial ecosystem. This is discussed in the following section.

Change in ICT Startup Density, 1990–2010 Small Metropolitan Areas		
Rank	Largest Increases	Largest Decreases
1	Missoula, MT	Bismarck, ND
2	Cheyenne, WY	Holland-Grand Haven, MI
3	Corvallis, OR	Sheboygan, WI
4	Champaign-Urbana, IL	St. Joseph, MO-KS
5	Grand Junction, CO	*
6	Bend, OR	*
7	Dover, DE	*
8	Crestview-Fort Walton Beach-Destin, FL	*
9	Santa Fe, NM	*
10	Grand Forks, ND-MN	*

Other small metro areas that experienced significant increases in ICT startup density from 1990 to 2010 include: Carson City, NV; Fargo, ND; State College, PA; Rapid City, SD; Bloomington-Normal, IL; Coeur d’Alene, ID; Kokomo, IN; Sioux Falls, SD; Jacksonville, NC; Lawrence, KS; and, Iowa City, IA.

Concluding Discussion

The simple and straightforward tables in this paper raise some provocative points regarding regional entrepreneurship as well as questions deserving further consideration and research.

Direction of Causality

First, there is a question of causation—many of the places lauded as “new” startup hubs by media and others in fact show up in these tables as having either a history of strong technology sectors or experienced strong growth among technology startups from 1990 to 2010. Do many of the “new” startups spots—Omaha, Des Moines, Fort Collins, Cedar Rapids, and elsewhere—owe their recent activity to a strong and growing base of technology entrepreneurship? That is, perhaps a city’s adoption of the latest and greatest entrepreneurship program reflects a receptivity borne of several years of startup activity. Program adoption is less cause than effect, in this view, and we need to look elsewhere to understand the reasons for the rise of startup activity in these locales.

Colorado

Second, in recent years, Boulder, Colo., has received a great deal of attention for having joined the ranks of Silicon Valley, Austin, and elsewhere as a leading technology startup hub. Indeed, at every metropolitan size class, cities from Colorado ranked at or near the top in density and the change in density. Boulder, for example, does indeed have the highest technology startup density in the country. Other Colorado cities—Denver, Fort Collins, Colorado Springs, and Grand Junction—also rank highly.

This strong culture of technology entrepreneurship, moreover, is not a recent phenomenon, despite what some may believe. Indeed, Boulder, Fort Collins, and Denver had some of the highest metropolitan startup densities in 1990, indicating lots of entrepreneurial activity in the 1980s. The densities have increased in the past two decades, of course, but they did not rise from the bottom ranks. This suggests two observations.

First, the adoption in recent years of new entrepreneurship programs in places like Boulder and elsewhere likely is less a cause of startup activity than an indication of the underlying strength of the region and a base of talent that those programs can build on. Second, when looking for the causes of Boulder’s startup culture, perhaps we should look not so much at characteristics specific to Boulder itself but—considering the persistently strong performance of other Colorado metros—to the entire state. Perhaps there is an aspect of state law that shapes an environment conducive to entrepreneurship. Perhaps the substantial concentration of universities and federal institutions (the U.S. Air Force Academy, the National Center for Atmospheric Research) has helped create a pool of human capital. Or, perhaps the mountains attract a certain cohort of individuals more likely to start technology companies—this, of course, is a feature of economic growth not susceptible to easy imitation by other regions.

Entrepreneurship and Socioeconomic Mobility

It also is worth noting that a superficial comparison between the tables here and data on socioeconomic mobility raise the possibility of a connection between entrepreneurial dynamism and such mobility. Recently, the *New York Times* analyzed academic research on how different regions of the United States compare on the ability of residents to climb up or fall down the income ladder.¹¹

Among the largest metropolitan areas in Table 1 of this paper, for example, six of the top seven places have above-average or high mobility for their poorest residents. Salt Lake City and San Jose have the highest chances for children of poor families to ascend to the highest income bracket. Seattle and San Francisco also do well on this measure. In terms of stickiness at the top, children born in the highest income bracket have lower chances of remaining there in these same cities. Denver also performs well.

Any correlation between entrepreneurial dynamism and socioeconomic mobility has certainly not been confirmed by this eyeball comparison. Atlanta ranks in the top twenty by high-tech startup density, but has, among big cities, the lowest mobility in the entire country. The relationship between mobility, inequality, and entrepreneurship deserves further investigation.

Federal Government

In their 2012 study of high-growth firms, Motoyama and Danley, observing the high proportion of government services companies and the concentration of high-growth firms in areas with a large federal government presence, suggested that perhaps the United States, which shuns explicit industrial policy, might actually have a de facto industrial policy.¹² We certainly seem to see some of that reflected in the tables here, with metropolitan areas that host federal labs or military bases also enjoying a high density of technology startups.

The observations here cannot establish a definitive causal connection, but at a time when concern over budget deficits is at high levels, we would do well to recognize the role of the federal government in stimulating entrepreneurship. At the same time, it is likely not a matter of undifferentiated government spending or presence—rather, “productive” government spending (infrastructure, defense, education, technology) would appear to be more valuable for entrepreneurship than “less productive” spending on entitlements.¹³ Unfortunately, the proportion of government spending deemed “productive” has fallen to one-third of the total today, from around two-thirds in 1970.

¹¹ David Leonhardt, “In Climbing Income Ladder, Location Matters,” *New York Times*, July 22, 2013, at http://www.nytimes.com/2013/07/22/business/in-climbing-income-ladder-location-matters.html?_r=0.

¹² See Yasuyuki Motoyama and Brian Danley, “An Analysis of the Geography of Entrepreneurship,” Kauffman Foundation, September 2012, at http://www.kauffman.org/uploadedFiles/inc_geography.pdf.

¹³ Mary Meeker, *USA, Inc.: A Basic Summary of America’s Financial Statements*, 2011, Kleiner Perkins Caufield & Byers.

Demographics

Any search for the explanations behind metropolitan variation in technology startup density should include an examination of demographics. Metropolitan areas in the United States have begun to coalesce into a typology that differs from the old classifications of “Rustbelt” and “Sun Belt.” The Brookings Institution, for example, classifies metropolitan areas into seven categories:

- Next Frontier: “exceed national averages on population growth, diversity, and educational attainment,” mostly in the West;
- New Heartland: “fast growing, highly educated locales, but have lower shares” of foreign-born populations, particularly located in the ‘New South’;
- Diverse Giants: “some of the largest metro areas in the country,” such as New York and Chicago, as well as Miami, San Francisco, and others;
- Border Growth: “mostly located in southwestern border states” with growing populations of Hispanic immigrants;
- Mid-Sized Magnet: older populations, lower shares of foreign-born populations largely in the Southeast;
- Skilled Anchors: “slow-growing, less diverse metro areas that boast higher-than-average levels of educational attainment,” largely in Northeast and Midwest;
- Industrial Cores: “largely older industrial centers of the Northeast, Midwest, and Southeast.”¹⁴

The presumption, after preparing the tables in the first part of this paper, was that the ranks of metro areas with the highest technology startup densities would share certain characteristics. Among these would be: fast population growth; large and growing foreign-born population; high educational attainment; and a younger demographic profile. A casual comparison of the tables and the 100 largest metropolitan areas failed to confirm these initial suspicions, and in fact, pointed toward much more variety than one might anticipate when trying to explain startup densities.

For example, among the largest metropolitan areas included in Table 1 here, most of the 2010 top twenty would be classified as Next Frontier, New Heartland, or Diverse Giant. Yet we see the same breakdown in 1990 as well. Next Frontier places, according to Brookings, tend to have high wage inequality ratios and high educational inequality, as do the Diverse Giant places. New Heartland and Diverse Giant metro areas experienced strong population growth since 2000 in their primary cities. Diverse Giant and Next Frontier areas also have large foreign-born populations, but these are low in New Heartland areas.¹⁵

Similarly, with admittedly cursory comparisons, it is difficult to find systematic commonalities among metropolitan areas when it comes to population age structures. One might expect that places with lots of technology startups would tend to have

¹⁴ Brookings Institution, *The State of Metropolitan America: On the Front Lines of Demographic Transformation* (2010).

¹⁵ Brookings Institution, *The State of Metropolitan America: On the Front Lines of Demographic Transformation* (2010).

younger populations. Yet among the places with the highest growth rates of “pre-seniors” (ages 55 to 64), are cities such as Raleigh-Cary, Austin, Provo, Boise, and Denver, all of which have high technology startup densities.¹⁶ We know from other work that this age group has one of the highest rates of entrepreneurial activity, but more investigation is needed to sort out these relationships.¹⁷

The complex interaction between demographic dynamics and entrepreneurship means we likely cannot generalize about this or that characteristic that will promote more entrepreneurial activity.

Entrepreneurial Genealogies

Lastly, the foregoing tables confirm—at least impressionistically—the importance of spinoff activity for fostering vibrant entrepreneurial cultures. Research on the age distribution of entrepreneurs has shown that the “peak age” for entrepreneurs is roughly between ages thirty-five and forty-five.¹⁸ Entrepreneurs come from somewhere—this seems obvious, but runs against the prevailing stereotype that entrepreneurs are, or should be, recent college grads or college dropouts. That “somewhere” usually is a previous job in a big company or at an institution, such as a university, which helps explain the age distribution of entrepreneurs.

Such “entrepreneurial spawning” is not an isolated phenomenon, and research has repeatedly documented its extent and importance.¹⁹ From the fast-growing companies on the Inc. 500/5000 list, to “liquidity events” such as initial public offerings and acquisitions, the most fertile source of entrepreneurs is the population of existing companies.²⁰ Again, such a statement undoubtedly strikes many as obvious, but this insight has not yet seeped into economic policymaking, economic development strategies, or the rapidly expanding entrepreneurship industry.

A detailed analysis of all the metropolitan areas with high-technology startup densities is beyond the scope of this paper, but a brief glance at the preceding tables reveals that places such as Boise, Portland, Ore., Kansas City, and Seattle all owe their emerging entrepreneurial ecosystems to many years of spinoffs and entrepreneurial spawning.²¹ One hundred years ago, in the early years of the automobile industry, Detroit emerged

¹⁶ Brookings Institution, *The State of Metropolitan America: On the Front Lines of Demographic Transformation* (2010).

¹⁷ Robert Fairlie, *Kauffman Index of Entrepreneurial Activity, 1996-2012*, Kauffman Foundation, 2013.

¹⁸ Dane Stangler and Daniel Spulber, “The Age of the Entrepreneur: Demographics and Entrepreneurship,” Paper prepared for the i4J Summit, March 2013, at <http://iij.org/wp-content/uploads/2013/05/i4jDaneStanglerDemographicsandEntrepreneurship-1.pdf>.

¹⁹ Paul Gompers, Josh Lerner, and David Scharfstein, “Entrepreneurial Spawning: Public Corporations and the Genesis of New Ventures, 1986 to 1999,” *Journal of Finance*, April 2005.

²⁰ Amar Bhide, *The Origin and Evolution of New Businesses* (Oxford, 2000); Toby E. Stuart and Olav Sorenson, “Liquidity Events and the Geographic Distribution of Entrepreneurial Activity,” *Administrative Science Quarterly*, June 2003.

²¹ Heike Mayer’s work on “spinoff regions” and “entrepreneurial genealogies” is available here: <http://www.heikemayer.com/spinoff-regions.html>. See also Heike Mayer, *Entrepreneurship and Innovation in Second Tier Regions* (Elgar, 2012).

as the geographic “winner” among other areas largely because there was a faster pace of spinoff activity.²²

In imitation of Detroit, the two most-vaunted technology hubs in the country—Silicon Valley and Boulder—also developed over many years and owe their vibrancy to entrepreneurial genealogies. In Silicon Valley, the spinoff rate of semiconductor companies was incredibly high in the 1960s (and the federal government, either directly through the Pentagon or through defense contractors, was a major purchaser of semiconductors).²³ This spinoff culture continues today, and also characterizes Boulder. As noted previously, Boulder’s high concentration of technology startups is not a recent development—it had one of the highest concentrations in 1990 as well. The seminal companies in Boulder—together with the presence of government research institutions—were IBM and StorageTek, which was founded by former IBM employees and subsequently was the source of many entrepreneurial ventures in Boulder.²⁴

It would be too glib, however, to simply say that a given region or place should encourage spinoffs or rely on entrepreneurial spawning. This also could be wrongly interpreted as evidence supporting traditional economic development strategies of tax incentives for big companies. Geographic regions and industrial sectors differ in terms of their conduciveness to spinoff activity, for various reasons, including the type of industry, laws and regulations, and culture.

Path Dependence

Economic development at the regional level is a complex and dynamic process, and many of the factors discussed here—institutions, genealogies, demographics—don’t necessarily lend themselves to quick, short-term fixes. These combine to establish path-dependent development processes. Deep-seated factors and long-term forces often shape contemporary events and lead them in certain directions. This doesn’t mean nothing can be done, of course, and clearly many metro areas have moved from low tech startup densities to higher levels. As Hathaway showed, the geographic distribution of technology companies has become wider over time, a heartening trend.

But it’s also true that no place can transform itself overnight. Boulder has only entered the national consciousness as a startup hub in the last decade, yet it has enjoyed an increasingly dynamic tech sector for much longer than that. Silicon Valley’s roots lie in the early twentieth century, when Stanford was still a young institution and the U.S. Navy established a station on the California coast. Soon, the area was a hotbed for amateur radio enthusiasts, the first stirrings of a technology cluster.

²² Steven Klepper, “Silicon Valley, a Chip off the Old Detroit Bloc,” in Zoltan J. Acs, David B. Audretsch, and Robert Strom (eds.), *Entrepreneurship, Growth, and Public Policy* (Cambridge, 2009).

²³ Steven Klepper, “Silicon Valley, a Chip off the Old Detroit Bloc,” in Zoltan J. Acs, David B. Audretsch, and Robert Strom (eds.), *Entrepreneurship, Growth, and Public Policy* (Cambridge, 2009).

²⁴ Dylan Otto Krider, “Milestones Icon: StorageTek,” *Boulder County Business Report*, September 19, 2011, at <http://www.bcbcr.com/article/20110919/PUBLICATIONS14/59914>. Additionally, thank you to Phil Weiser at the University of Colorado-Boulder Law School for pointing this out to me.

More work must be done to understand the local and regional dynamics of entrepreneurship, barriers that may exist to catalyzing a self-fulfilling dynamic of entrepreneurial spinoffs, and what the proper role of supporting institutions should be. Each metropolitan area deserves to be approached on its own terms, with an understanding of how local dynamics shape its entrepreneurial ecosystem.