Martin Prosperity Institute

The City as Innovation Machine

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July 2016
REF. 2016-MPIWP-002

Working Paper Series
Martin Prosperity Research

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Rotman

Abstract

This paper seeks to put cities and regions at the very center of the processes of innovation and entrepreneurship. To do so, we marry the insights of Jane Jacobs and more urban and regional thinking and research on the role of the city and the region to the literature on innovation and entrepreneurship going back to Joseph Schumpeter. Theory and research on innovation and entrepreneurship and their geography privileges the firm, industry clusters and/or the individual and poses the city as a container for them. Jacobs famously theorized that it is the city that is the key organizing unit for innovation, entrepreneurship, and economic growth. Marrying Jacobs' insights on cities to those of Schumpeter on innovation, we argue that innovation and entrepreneurship do not simply take in place in cities but in fact *require* them.

Keywords: innovation, entrepreneurship, creativity, cities, regions, urbanism, geography

JEL: O31, R11

Introduction

Any way you slice it, innovation and entrepreneurship power economic growth. But most theories of economic growth and development dating back to the classical economists, Marx and Schumpeter, and forward to modern growth theory associated with Solow, Romer, and others, pose them as processes that operate at the firm or individual level. Entrepreneurship, after all, is typically viewed as the product of visionary business leaders from Thomas Edison and Henry Ford to Steven Jobs, Bill Gates, Larry Page and Sergey Brin and Mark Zuckerberg. Innovation is seen as the product of forward looking and resource-rich firms from DuPont and IBM to Apple, Microsoft, and Google or great universities with their substantial R&D efforts. Similarly, the human creativity which lies behind both innovation, a form of technological creativity, and entrepreneurship, the application of human creativity for more instrumental economic ends, is typically posed as the product of great creative individuals like the above or their artistic counterparts from Beethoven and Mozart, DeVinci and Michelangelo to Picasso, Warhol, Stravinsky, Armstrong, Coltrane, McCartney and Lennon, and Hendrix. But recent research finds that all three — innovation, entrepreneurship, and creativity — are social processes that involve groups of people and build off one another historically.

This paper offers a simple but provocative argument. It posits that these three key processes that motivate technical advance, economic growth, and human progress writ large are the product not just of forward-looking individuals and leading-edge firms, but of cities and regions. To do so, it draws on the central insights of Jane Jacobs, of more urban and regional research, and our own thinking, to argue that under knowledge-based capitalism the city and the region have emerged as the key organizing unit for innovation, creativity, and entrepreneurship, bringing together the firms, talent and other regional institutions necessary for them. It argues that the traditional literature on innovation, creativity, and entrepreneurship going back to Joseph Schumpeter and more modern theories of innovation and entrepreneurship tend to privilege the firm and the individual over the city and the region. Jacobs famously theorized that prevailing theories of innovation and economic development going back to Adam Smith emphasize efficiency and the division of labor, but fail to account for the key inputs that drive innovation. Those, she argued, were less a product of firms and more a product of cities and regions which bring together the diversity of economic assets and actors required for innovative and entrepreneurial activity. This paper brings together these insights on the central role of cities and regions in the processes of innovation, creativity, and entrepreneurship with the broader research literature on their industrial and geographic dynamics, essentially marrying the insights

of Jacobs on cities to Schumpeter on the central role of innovation and entrepreneurship in economic growth and development.

The remainder of this paper is organized in five sections. We begin with a reprisal of Schumpeter's vision of innovation and entrepreneurship, focusing on the firm and industrial literature. We then turn to geography, with sections on the more recent literature on the geography of innovation and the geography of entrepreneurship. As our discussion will show, even though this literature is principally concerned with the geographic distribution and spatial dynamics and determinants of these processes, they also continue to privilege the role of the firm, industry and/or firm or industrial clusters. We then make the broader case, which is our core argument, that it is the city or region themselves which lie at the very heart of the processes of innovation, creativity, and entrepreneurship. Here we marry the fundamental insights of Jacobs on the role of the city as the very source of innovation and growth with Schumpeter and his disciple's research on innovation, entrepreneurship, and growth. It is our contention that the city and region are the key social and economic organizing unit for these processes, bringing together the diverse array of firms, talent, regional knowledge institutions, infrastructure, and other inputs required for them to occur. In a word, innovation, entrepreneurship, and creativity are less individual or firm-level processes and more quintessentially urban and regional ones.

Theories of Innovation, Entrepreneurship and Growth

The theory of innovation and growth dates back to Marx (1867/1912) and Schumpeter (1934, 1954). Marx argued that the rise of capitalism made technology an ongoing and disruptive force for economic growth. In his view, of course, the progress of capitalism was limited by the fundamental contradiction between growth and the flourishing of the forces of production and the constraints of the relations of production. Schumpeter updated Marx to take into account the processes of innovation and entrepreneurship. Instead of stalling, falling into crisis, and breaking out in class struggle, for Schumpeter innovation and entrepreneurship gave capitalism the possibility to continuously reinvent itself. As Marx had done, he understood economic change in evolutionary terms — economic history was understood as something more than a constant return to equilibrium (Rosenberg, 2011).

Schumpeter saw innovation and entrepreneurship as the key factors in resetting the economy for new, long waves of economic growth — a process he referred to as "creative destruction." The uneven trajectory of economic change is propelled by processes within the development sector of the economy — an area to be distinguished from equilibrium-governed circular flow sector. At the center of development are the visionary innovators or entrepreneurs who are motivated by

more than just profit, but a desire for independence, distinction, and accomplishment. The entrepreneur does not take as given production technology, but instead seeks to bend it to her favor. Innovation is the dynamic in capitalism that allows it to transform itself based on its own logic.

In his earlier *The Theory of Economic Development,* Schumpeter (1934) had emphasized the role of smaller new firms, founded by entrepreneurs, in generating innovations. Small firms were said to embody new and better innovations which would replace older technologies and firms. In *Capitalism, Socialism and Democracy* incumbent large firms are said to have an advantage due to their large research and development budgets (Schumpeter, 1934).

Economic growth is highly cyclical. Innovation occurs in swarms of activity and is reaped in swarms of activity. Economic growth and development is more accurately seen as a transition between disequilibrium states than the other way around. As he put it, "the problem that is usually visualized is how capitalism administers existing structures, whereas the relevant problem is how it creates and destroys them" (1954; 1734–1735). His felicitous phrase for this process was "creative destruction."

Schumpeter's ideas about innovation and growth have been widely influential in economics. His treatment of innovation as endogenous to the economic system was early theoretical inspiration for more empirical work by Griliches (1957) and Schmookler (1966). They also informed the broader theory of economic growth (Aghion and Howitt, 1992; Grossman and Helpman, 1993). Schumpeter's insights also lie at the heart of evolutionary economics à la Nelson and Winter (1982), and helped to shape the industry life cycle theories (Vernon, 1966; Utterback and Abernathy, 1975; Klein, 1977; Klepper, 1996), some of which have been directly applied to regional development (Audretsch and Feldman, 1996). The basic insight here is that that industries and innovations each have more or less set lifetimes. The intensity of an industry's innovativeness is frontloaded in time toward the early part of its life. Eventually dominant organizational forms and product designs are established, products become standardized and both innovation and economic growth ebbs.

As we have seen, across this literature the individual and the firm remain the privileged actors and units of analysis. This is also true of the extensive and growing regional literature on innovation and technological change as we will now see.

The Geography of Innovation

Research on the geography innovation and entrepreneurship has been shaped by this basic set of ideas. This literature basically seeks to understand and chart the geographic distribution of innovation — the geographic distribution of innovative

activity, the spatial correlates of innovative regions, and the local microeconomic processes that might be implicated in these geographic patterns. In the main, it sees firms and the clustering of forms as the key drivers of innovation.

Innovation varies considerably across space and is clustered geographically. Jaffe and colleagues (Jaffe et al., 1993) find that patents and patent citations are heavily concentrated in a relatively small number of university regions and corporate R&D centers. They show that citation behavior is also localized, that is local patents were more likely to be cited by an inventor than similar patents from beyond a labor market (see also Jaffe, 1989; Trajtenberg, 1990; Jaffe et al., 1993; Acs et al., 1992; Anselin, et al., 1997).

Innovation is considerably more concentrated in space than manufacturing activities (Feldman and Kogler, 2010). Ellison and Glaeser (1999) show that there is a modest level of agglomeration across the secondary sector, but they also show that observed agglomeration is partially because of employment concentration at the plant level. However, these activities are themselves subject to the product life cycle and there may be relatively high levels of agglomeration in the manufacture of innovative products. Early-stage innovative activities thrive under agglomeration. Research, design, testing, and even the manufacture of new products and technologies are supposed to demand environments where industrial actors congregate together. As these products become mature, however, the benefits of colocation will ebb.

Acs and Audretsch (1988, 1990) developed an alternative approach to measuring commercial innovation, based on product innovation. Their research found commercial product innovations to be more concentrated in space than patents. Feldman and Florida (Feldman and Florida, 1994) use the same data and approach to identify the geography of innovation. Innovation varies greatly over space, they find, and is connected to a region's technological infrastructure, which they define as the level of local research and development activity, as well as its support services and localization of related research.

Another more direct way of accounting for commercially relevant innovation is venture capital investment. Regional scientists and urban economists have examined the geographic variation in flows of venture capital investment (Martin et al., 2002; Saxenian and Sabel, 2008). Venture capital is a crucial link in the division of labor that attends radical innovation. Venture and angel investment firms play the part of Schumpetarian financiers, connecting new process innovations with investment capital in the hope of realizing super profits. Florida and Kenney (1988, 2000) show that venture capital investment is spatially concentrated, with Silicon Valley winning the highest absolute and relative concentrations, and a handful of other regions rounding out the absolute rankings. Venture capital is found to flow between a discrete set of regions, for instance from finance-intensive New York, to technology-based Silicon

Valley. These connections tend to be more network-based than in other parts of the economy. Lead investors for local investment syndicates will closely monitor new opportunities and act as opinion leaders (Katz and Lazasfield, 1955) for their personal contacts. Regions with high levels of venture capital, then, tend to contain these networks, which themselves are structured to support the localization of venture capital (Powell et al., 2002).

Theorizing on the clustering and localization of innovative economy activity dates back to Alfred Marshall (1890). Marshall identified three mechanisms for why agglomeration in industrial districts would increase productivity: access to a thicker and more specialized labor market, access to more specialized services, and access to non-excludable knowledge. As he famously put it: "The mysteries of the trade become no mystery: but are as it were, in the air".

The Marshallian model has been influential on students of the geography of innovation. The non-excludable properties of knowledge, allow them to spill more freely within the local region than within the national or international innovation system. There is an entire literature in economic geography on the Marshallian industrial district (see (Becattini, 1990; Cooke et al., 1997; Saxenian, 1990, 1996; Storper and Walker, 1989). An industrial district can be distinguished as a fertile area for innovation due to its sharing of intermediate goods and financing, and its strong actor/networks which both match firms and labor and which help to efficiently transmit codified knowledge.

The Marshall-Arrow-Romer (MAR) view is that cities, and firms within them, benefit primarily from knowledge spillovers between proximate firms in the same industry. This work recognizes not just the contributions of Marshall but also Arrow (1962) and Romer (1990) who created formal models which explained growth through the non-rivalrous, non-excludable nature of knowledge.

An alternate view, linked to Jacobs (1969), is that the most meaningful knowledge spillovers cross industry boundaries; in other words, industrial diversity stimulates innovation and urban growth. Here meaningful innovation is seen as the recombination of disparate inputs, and thus more likely across industry boundaries. There has been strong empirical support for the Jacobs hypothesis, beginning with the Glaeser et al. (1991) who find evidence that variety and not specialization is related to urban growth. Bettencourt et al. (2007) find that patenting scales super-linearly with city size. Carlino et al. (2007) find that employment density predicts patents per capita. Strumsky et al. (2005) find that the influence of local co-patenting networks on agglomeration of innovation is dwarfed by the influence of urbanization. Subsequent work on related variety (Frenken et al., 2007; Boschma and Iammarino, 2009) narrows Jacobs' emphasis on the influence of activities in separate but cognitively proximate similar industries.

Duranton and Puga's (2001) "nursery city" model marries the industry life cycle to theories of MAR and Jacobs, predicting that geographic behavior will change as the technology of production becomes more established. There are two kinds of places: specialized places where all final and intermediate producers belong in the same industry, and diverse places where there is an equal share of agents from all sectors.

Another explanation for the clustering of innovation comes from the New Economic Geography (Fujita and Thisse, 1996; Krugman, 1990, 1991, 1998; Venables et al., 1999). Krugman's core-periphery model, considers how price effects inside of the firm can act to promote agglomeration. Firms huddle together near the most customers in order to minimize the final costs of their products. Venables (1966) amends this model to include intermediate suppliers, where backward and forward linkages act as the channel for lower pecuniary costs. Hysteresis is a key feature of NEG models. When trade costs are intermediate there can be one of two equilibrium outcomes, either agglomeration or dispersion, depending on the existing level of agglomeration. This is intriguing because it incorporates elements such as historic accidents and luck into a general economic model.

Yet another approach comes from evolutionary economics and its applications to geography. New industries owe their spatial pattern to specific firms' behaviors, which are assumed to have a spatial inertia (Dosi, 1997; Essletzbichler and Rigby, 2007; Frenken et al., 2007; Hodgson and Knudsen, 2004). When new products are created, there is a very high probability that the new operation will emerge in the same geographic space as the older products. The firm itself is a collection of routines that repeat themselves over time. Location is one such macro-behavior. Radical innovations emerge in new locations, where the lock-in effects of old technology can be avoided. Storper and Walker (1989) note that radical technologies open "new windows of locational opportunity" and lead to more dramatic changes in the urban hierarchy. The window of location opportunity closes as firm routines are replicated in space, and not necessarily because transactions costs are lower.

The literature on the regional geography of innovation has made serious advances. That said, it remains focused on the firm and firm clusters as the central unit of analysis, seeing the city and region mainly as a container for these activities.

The Geography of Entrepreneurship

We now turn from process innovation to organizational innovation, specifically the creation of new firms by entrepreneurs. In the main, it seeks to chart and describe the factors that shape the geographic distribution and clustering of entrepreneurs

and entrepreneurial firms, sometimes defined as new firms, new startups, or the process of firm formation. But, like the literature on innovation, it too privileges the firm, and in this case, the individual.

Alongside Schumpeter's insight into the actions and motivations of entrepreneurs as opposed to large corporations, Knight's (1921) early distinction between risk and uncertainty is influential. For Knight, entrepreneurialism is governed by radical forward uncertainty as opposed to risk. The former is calculable, the latter is not; entrepreneurs are needed in order to take the risks that existing firms would never themselves confront. The decision to form a new firm, then, is rooted partially in individual level-insensitivity to risk.

Research into the psychological foundations focuses on the distinct cognitive and personality traits of individual entrepreneurs. According to McClelland (1967), entrepreneurship is an innate, individual-level achievement trait, present across cultures regardless of their level of development. Shaver (2010) points to cognitive and emotional predictors of entrepreneurship and entrepreneurial success. Successful entrepreneurs are less sensitive to failure, possess a productive passion for their vocation, and confidence in the entrepreneurial effort (Bandura, 1986).

Psychology research increasingly poses entrepreneurship as a product of individual and situational characteristics. Shaver notes that an entrepreneurial environment can either provide an atmosphere conducive or corrosive to entrepreneurial success. Different networks offer entrepreneurs different access to information and capital (Burt, 2009; Granovetter, 1973) as well as forms of human capital and knowledge (Rosen, 1972). This has been found to be predictive of entrepreneurship and entrepreneurial success at an individual level (Evans and Leighton, 1989; Roberts, 1991) Baumol (1968) was among the first to focus on the supply of entrepreneurs, and factors that affect entrepreneurial incentives. Baumol and colleagues (2007) condense the recipe for entrepreneurial success to four factors: high returns, low start-up costs, disincentives for rent-seeking, and competitive pressures on winning entrepreneurs.

This brings us to regional geography of entrepreneurship. The region is the level at which the demand for entrepreneurial activity is articulated, and also where the supply of entrepreneurs is determined. Factors on both sides are identified as regional predictors of entrepreneurship. Entrepreneurial success itself is found to be clustered and oriented towards existing agglomerations. New high-tech ventures within clusters have higher employment growth and revenue across a range of industry contexts: both innovative and less so (Canina et al., 2005; Gilbert et al., 2006; Porter, 1998). Entrepreneurial failure seems to be similarly clustered, suggesting that the metabolism of these places is faster (Folta et al., 2006; Shaver and Flyer, 2000).

Chinitz (1961) originally investigated durable differences in the regional supply curve. He proposed that the fortunes of Pittsburgh and New York diverged because of different entrepreneurial cultures with the latter oriented to large firms in a single industry, and the former favoring smaller, diverse firms across industries. Glaeser et al. (2010) found substantial evidence for his theory. As a predictor of entrepreneurship, the premium from smallness exceeds what would be expected based on economies of scale alone. Rosenthal and Strange (Rosenthal and Strange, 2005) found this effect is highly local, operating at the neighborhood level.

Regional differences in the labor supply curve or supply of talent also affect the supply of entrepreneurs. Immigration (Froschauer, 2001; Kloosterman and Rath, 2001; Saxenian, 1999) helps to improve entrepreneurial success and virtuous entrepreneurial cycles by establishing essential network connections between the entrepreneur and foreign expertise/markets. Glaeser (2007) finds that regional variation in human capital, in combination with industry structure, explains half of the geographic variation in entrepreneurship compared to just seven percent of person-to-person variation in self-employment. Armington and Acs (1998) connect the entrepreneurial event to human capital, agglomeration, and market potential growth.

Chinitz (1961) also described entrepreneurial culture in more ethereal terms, harkening back to Marshall's elegant observation that the mysteries of trade are in the air. Saxenian (1994) and the other scholars of industrial districts referenced above use thick case studies to illustrate this. Glaeser et al. (2010) also find some evidence of a more ethereal entrepreneurial climate by looking at the effect on entrepreneurship in manufacturing of being near other industries that are entrepreneurial on a national basis. Lee et al. (2004) find that metro-level firm formation is related to creativity as well as an index of diversity, which measures the openness of an area to outsiders.

Generally speaking the geography of entrepreneurship exhibits the same spatial behaviors as other innovative activity. Again, this research privileges the firm, and even more so, the individual in explaining the geographic clustering and concentration of entrepreneurial activity variously measured.

Putting the City and the Region at the Center of the Process of Innovation

We now turn to the central piece of our argument. As we have seen, prevailing economic theories as well as prevailing regional and geographic theories of innovation and entrepreneurship place the firm and the individual at the center of these processes. Our argument seeks to put the city and the region at the very center of the processes of innovation, entrepreneurship, and creativity and to pose

that the city and region are the central organizing unit of these processes. It is the city itself that brings together the firms, individuals, talent, and other institutions and services that drive these critical processes. Essentially, innovation and entrepreneurship are an urban or regional process, more than firm or individual level ones. Indeed, Place has replaced the industrial corporation as the key economic and social organizing unit of our time.

There is a longstanding literature which places cities at the center of the creative process. New innovations, routines, and industries tend to start in the urban "nursery" (Duranton and Puga, 2001). Cities are simultaneously a place where skilled workers assemble and interact, and an organizational technology for that interaction. We are accustomed, in our day-to-day lives, to describing cities as the catchment areas for a common set of rules and other institutions. In our view, the city is the ultimate enabler of innovation, entrepreneurship, and growth.

Jacobs (1969) stands out to us as the theorist who has come closest to expressing how cities and regions actively spur innovation and entrepreneurship. Whereas mainstream economics sets developments stories at the scale of the firm, the entrepreneur and the national economy, Jacobs put cities at the center of the process. This rescaling involved a move away from specialization and cost-reduction as mechanisms for development. The urban economy is not governed by a single production function, nor can it optimize within that. If firms have an intensive margin for growth, cities have an extensive margin. Scope and diversity trump scale and specialization. The city collects skills, firms, physical capital, and provides a physical platform for them to be recombined into new and productive forms. Together, all of these insights setup a distinctly urban model of growth. In fact, Jacob's summarized her own central contribution as follows (Stiegerwald, 2001):

> If I were to be remembered as a really important thinker of the century, the most important thing I've contributed is, "What makes economic expansion happen?" This is something that has puzzled people always. I think I've figured out what it is, and expansion and development are two different things. Development is differentiation—new differentiation of what already existed. Practically every new thing that happens is a differentiation of a previous thing. Just about everything—from a new shoe sole to changes in legal codes—all of those things are differentiations. Expansion is an actual growth in size or volume of activity. That is a different thing.

Specialization is the second-nature advantage that predicts continued growth. Since Adam Smith's 1776 classic *The Wealth of Nations*, growth has been assumed to follow from a more intensive division of labor. Ricardo's slightly later vision of comparative advantage rooted national growth in the ability of countries to specialize and trade.

An emphasis on specialization and trade has resurfaced in the relatively young disciplines of regional science and regional economic geography, which each tend to prize the ability of regions to develop specialized economic bases.

Specialization involves lowering unit costs through an expansion of scale. A region would support this process by providing lower transaction costs to its firms. Lower taxes, subsidized infrastructure and business services are all attempts to stimulate the development process by reducing the cost of doing business. A place-centered theory of innovation, entrepreneurship, and economic growth stands in opposition to views that emphasize efficiency and specialization, and can more comfortably account for the way these processes actually occur.

Here, the parallels between Jacobs and Schumpeter are striking. Expansion is the humdrum, growth dimension that Schumpeter would have called "circular flow." Growth is achieved through an expansion of output, and bigger and smaller places are distinguished by mere quantitative differences in their output levels. Jacobs and Schumpeter each prized a second, radical type of growth that was propelled by innovation, not specialization. Novelty was seen as the mechanism for growth, not specialization; the production of new things was seen as crucial, when compared to the production of more things at lower cost. Diversity in inputs is seen as crucial. The big city, in addition to having more costs and people, has a more complex set of functions that become self-organized. Urban growth is an emergent process that unfolds endogenously according to the related parameters of size and diversity.

In his Nobel Prize winning work on growth, Lucas (1988, p. 7) placed Jacob's work on the city at the very the center of the process of economic growth itself.

> "I will be following very closely the lead of Jane Jacobs, whose remarkable book, *The Economy of Cities*, seems to me mainly and convincingly concerned (although she does not use this terminology) with the external effects of human capital."

Lucas' focus on these "Jane Jacobs externalities," led him to an endogenous theory of growth that privileged interactions between people that occur in cities. Cumulative and everyday knowledge spillovers between agents led to dynamic growth. As Lucas framed it, the city — as it attracts and pushes together talented and creative people — is itself the central factor and unit of analysis in innovation, entrepreneurship, and economic growth (1988, p. 39).

> If we postulate only the usual list of economic forces, cities should fly apart. The theory of production contains nothing to hold a city together. A city is simply a collection of factors of production—capital, people and land—and land is always far cheaper outside cities than inside. … It seems

> to me that the "force" we need to postulate to account for the central role of cities in economic life is of exactly the same character as the "external human capital." … What can people be paying Manhattan or downtown Chicago rents for, if not for being near other people?

The factors of production: labor, capital, and technical expertise were important in the way that the ingredients of a recipe are. However, the recipe itself — the way in which these interact — is determinative of growth. For Jacobs, Lucas, and us, cities are a more conducive environment for this, the place the recipe gets made.

There are clear indications that innovative and entrepreneurial activities, which have long been understood as clustered and concentrated, are now becoming more quintessentially urban and place based. First, innovation (measured by patents) has become increasingly concentrated in one place: the San Francisco Bay Area. Goldfarb et al. (2016) show that the Bay Area has accounted for virtually all of the increase in patenting in the United States since the mid-1970s, while patenting in all other large metros either stagnated or declined.

Second, entrepreneurship measured as startup activity has become even more concentrated than innovation. The Bay Area's share of venture capital backed startups increased from roughly 22 percent in 1995 to 45 by 2005. The only other U.S. metro to see its share of startups increase over this period was New York (Florida and Mellander, 2014; Florida, 2016).

Third, the past couple of decades have seen a massive shift in startup activity from traditional suburban locations to urban centers. Early research on high tech industry and venture capital finance startups noted their concentration in suburban areas, or "nerdistans" liks Silicon Valley, the Route 128 suburbs outside Boston, or the suburbs of Austin and Seattle. Across the United States, more than half of all startup neighborhoods are urban, with 57 percent of startup companies and 54 percent of venture capital investments located in urban zip codes. In effect, startup activity has shifted back to dense cities and urban areas, which have the talent and diversity to generate them. It is likely that the previous suburban orientation of high-tech and startups was an aberration caused by the large corporate structures of the industrial age. Now that innovation and startup activity is, in effect, shifting back to denser urban areas which are more predisposed to it and serve as the key organizing unit for it (Florida and Mellander, 2014; Florida, 2016).

Fourth, startup activity is not only concentrated at the metro level, it is massively concentrated in neighborhood-level micro-clusters. Just the top twenty zip codes across the United States account for more than $10 billion in venture capital investment—roughly a third of the national total. Furthermore, less than one percent (0.2 percent) of all zip codes, or 83 neighborhoods, attract more than $100 million

in venture capital investment, representing over 60 percent of all venture capital investment nationwide. There are two small neighborhoods in downtown San Francisco which attract more than a billion dollars in venture capital each, more than any other nation in the world outside the United States. This research indicates that these micro-clusters have formed in older, underutilized and, in many cases, formerly derelict urban neighborhoods where no existing firm clusters were located. In other words, these micro-cluster grew up over time in isolation from existing firm- or individual-level capabilities. They were self-generating from the place itself (Florida and Mellander, 2014; Florida, 2016).

Stern and Guzman (2016) find this to be even more the case for high-quality entrepreneurial firms. They chart the geographic distribution and distribution of high quality entrepreneurial activity in the regions of Boston, San Francisco, and Miami, showing that the center of gravity for entrepreneurship has shifted from the exurban Route 128 area to downtown Boston and dense transit-served areas of Cambridge around MIT and Harvard, and Silicon Valley to the downtown and adjacent areas of San Francisco. While these regions had high levels of overall entrepreneurship and high levels of geographic change, Miami, a city with high levels of self-employment did not. They attribute these changes to entrepreneurial quality, concluding that low quality entrepreneurial ecosystems will not *become* urbanized over time. They find evidence for the concentration of such firms in adjacent zip codes or micro-clusters.

Thus our central contention that the city and the region lie at the very center of the processes of innovation, entrepreneurship, and creativity and to pose city and region as the central organizing unit of these processes. It is the city itself that brings together the firms, individuals, talent, and other institutions and services that drive these critical processes. Essentially, innovation and entrepreneurship are an urban or regional process, more than firm or individual level ones. Indeed, in our view, place has come to replace the industrial corporation as the key economic and social organizing unit of our time. Cities have always been important engines of economic growth, but they are assuming an even greater importance in today's knowledge-driven, innovation economy, where place-based ecosystems are critical to economic growth. But brainpower alone only tells part of the story. Even more key is the aptitude for marshaling and focusing all that raw intelligence that's on tap. Cities are not just containers for smart people; they are the enabling infrastructure where connections take place, networks are built, and innovative combinations are consummated.

The relationship dates back through history, with the exception of the aberration of the industrial age. Over the course of history, certain cities have been fonts of innovative, creative, and entrepreneurial activity. The Swedish regional scientist, Åke E Andersson frames it thusly: "Creative people need creative cities" (Andersson, 2011). He focuses

on how Athens of 400 BC, Renaissance Florence, Enlightenment London, and fin de siècle Vienna became platforms for disruptive creative output:

> In the course of the past 2,500 years, a small number of relatively large cities have functioned as hotbeds of revolutionary creativity. These cities attracted a disproportionate share of migrants with creative inclinations, and they also facilitated the growth of creativity among those already present. Such cities were both used as arenas for presenting findings from elsewhere and as fertile locations for developing new ideas in collaboration with other creative people.

But even this might understate the relationship between agglomeration and human ingenuity. Shennan, a theoretical archeologist, argues that societies in the Middle East and Africa passed technological and cultural milestones well before contemporaneous ones because they were able to achieve high levels population density sooner (Shennan, 2002; Shennan et al., 2013). In a related contribution, Boyd links community population size and breakthroughs in tool-making. In both cases, additive changes in the diversity of the local population can be said to create qualitative changes in society's development. It is worth remembering that these breakthroughs happened in an environment with lower-than-modern levels of trade and specialization (Boyd and Richerson, 1988).

The city can be seen as a meso-level *treatment* for their residents, an active influence on how the mind of a creative worker forms. They do this in two ways according to psychologist Simonton (2011). They assemble personal role models, who can influence the development of the young, higher plasticity mind. They also provide the diverse ideational milieu that will allow the creative mind to better overcome blocks in the creative process. It is common for the creative mind to return to ordinary life in the moments when it cannot solve an important problem. In the urban environment, there are many more diverse, but related influences that might trigger a solution via what is commonly understood as a eureka moment.

These insights, uncontroverted in the psychological literature, challenge the idea that creation is a solitary pursuit and an outgrowth of some preformed genius. Modern society instead *enables* creative output by organizing actors in conducive arrangements. The research laboratory, so prominent in late Schumpeter, is actually only a more artificial and limited example of such an arrangement. The city, with its greater level of diversity and freer rules for entry and exit, is the more eternally conducive environment from the standpoint of human creativity.

We have contrasted literature on the geography of creativity with that of innovation and entrepreneurship. We have argued that radical innovation, in the Schumpetarian sense, is more a function of scope economies and diversity than scale economies and

specialization and, in this sense, that innovation and entrepreneurship do not simply take in place in but *require* cities

We would also encourage the field to embrace the original Schumpeterian concept of innovation, which referred to radical novelty in all of its forms, and to broaden away from its focus on high tech industrial sectors. A broader scope of inquiry will open up new sources of data, but more importantly it will prevent the development of theories that only conform to arbitrary product environments. We particularly believe that studies of creative industries like music and the arts which have no physical constraints, such as requiring access raw materials, or location near ports and harbors, or even access to universities per se, can help the development of new theories of innovation, entrepreneurship, and creativity as the product of cities. The music industry illustrates the central role of the city in this process. The modern musician needs little more than a laptop and an Internet connection to record and distribute music. There is moreover, a local music market in every large village or city that provides musical instruments, lessons and performances. We might expect for this industry to "fly apart" in Lucas' words, yet we observe the opposite. Much like so-called high tech activities, music is highly concentrated. Indeed, research on the geography of the creative economy notes high levels of clustering. (Adler, 2014; Agrawal et al., 2011; R. Florida and Jackson, 2010; Florida et al., 2010, 2012; Currid, 2007; Markusen and Schrock, 2006; Storper and Christopherson, 1987; Ghemawat and Nueno, 2003).

We further encourage research to focus on the competition for space that stems from the concentration of innovation, entrepreneurship, and creativity in a relatively small number of superstar cities and knowledge hubs. Alonso (1964) long ago outlined a general model of the competition for space. For much of history, firms and corporations competed for land at the center of the city with households located further afield. The modern city is now the subject of an attenuated competition for space which Scott dubs the "urban land nexus" (Florida, 2017; Scott, 2013). To what degree will this competition for space creativity and innovation out of cities. As Jacobs one said, "when a place gets boring even the rich people leave." An improved model of urban innovation and entrepreneurship with place at its center would better identify how the cyclicality of the urban land market can enable and disable creative activity, explaining in part the tendency of innovations to swarm.

We have argued that the firm has been too much the center of the literature on the geography if innovation and entrepreneurship and that it is time to put the city at the very center. As we have seen the city, the region, and place are not just the containers where innovation and entrepreneurship happen, they are the key mechanisms which enable them.

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