

Dynamic Cities and Creative Clusters*

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World Bank Policy Research Working Paper 3509, February 2005

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* This paper was prepared for the East Asia Prospect Study being conducted in DECRG at the World Bank. The author thanks Shahid Yusuf, Anjum Altaf, and Kaoru Nabeshima for their suggestions and guidance. The author also is grateful for the helpful comments provided by the participants of the workshop organized for this study held in Bangkok, February 22-23, 2004.

Abstract

This paper focuses on how urban policies and the clustering of creative industries has influenced urban outcomes. The set of creative industries include those with output protectable under some form of intellectual property law. More specifically, this subsector encompasses software, multimedia, video games, industrial design, fashion, publishing, and research and development. The cities that form the basis for the empirical investigations are those where policy induced transitions have been most evident, including Boston; San Francisco; San Diego; Seattle; Austin; Washington DC; Dublin (Ireland); Hong Kong (China); and Bangalore (India).

The key research questions motivating the paper are: What types of cities are creative? What locational factors are essential? What are the common urban policy initiatives used by creative cities? The paper first explores the importance of the external environment for innovation and places it in the larger context of national innovation systems. Based on a study of development in Boston and San Diego, the paper isolates the factors and policies that have contributed to the local clustering of particular creative industries. In both cities, universities have played a major role in catalyzing the local economy by generating cutting-edge research findings, pro-actively collaborating with industries, and by supplying the needed human capital. In addition, these two cities benefited from the existence of anchor firms and active industry associations that promoted fruitful university-industry linkages.

Many cities in East Asia are aspiring to become the creative hubs of the region. However, their investments tend to be heavily biased towards infrastructure provision. Although this is necessary, the heavy emphasis on hardware has can lead to underinvestment in developing the talents and skills needed for the emergence of creative industries in these cities.

Dynamic Cities and Creative Clusters

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In recent years, a subset of knowledge-intensive industries that are reliant on individual creativity and talent, known as creative industries, have received increasing attention. An important hallmark of these industries is the continuing innovation and development of products and processes, as often measured by the number of patents awarded. Overall, the average rate of patenting per employee in centers of creative industries is about twice as high as for all metropolitan in the United States (Cortright and Mayer 2001).¹ These knowledge-intensive production and service activities also are almost exclusively city based, making urban places the central organizing unit of the creative economy (Florida 2002). Creative industries tend to cluster in large cities and regions that offer a variety of economic opportunities, a stimulating environment and amenities for different lifestyles.

This paper focuses on the interactions of the clustering of creative industries, urban policy, and urban outcomes. The set of creative industries include those with output protectable under some form of intellectual property (IP) law. More specifically, the paper investigates the industries of software, multimedia, video games, industrial design, fashion, publishing, and biotech research and development (R&D). Drawn primarily from the U.S., the cities that form the basis for the empirical investigations are those where policy induced transitions have been most evident, including Boston; San Francisco; San Diego; Seattle; Austin; Washington DC; Dublin (Ireland); and Bangalore (India). The key research questions motivating the paper include: What types of cities are creative? What locational factors are essential? and What are the common urban policy initiatives used by creative cities?

The paper first explores the importance of the external environment for innovation and places it in the context of a national innovation system. Based on a study of development in the selected cities, the paper then isolates the factors and policies that have contributed to the local clustering of particular creative industries. Next the paper presents more in-depth case studies of two successful creative cities – Boston and San Diego, followed by a discussion on whether

¹ Some key indicators of innovation and creativity include patents per worker, venture capital funding per worker, fast growth firms, and initial public offerings. See Porter and Monitor Group (2001), Cortright and Mayer (2002).

particular features of individual cities make them better suited for specific creative industries and why some places are less than successful in capturing creative activities (illustrated primarily through a case study of Baltimore). Finally, the paper infers what the research findings imply for aspiring cities in East Asia, such as Hong Kong; Beijing; Shanghai; Seoul; Singapore; Kuala Lumpur; Bangkok; Manila; and Jakarta.

There are at least two definitions of creative industries. For some, they are the sectors of the economy whose products fall under the purview of IP law. There are four main types of IP: patents, copyrights, trademarks, and designs (Howkins 2001). With this definition, creative industries constitute a very large portion of capitalist economies – design, fashion, film, multimedia, software, publishing, advertising, arts and so on (about 15 sectors).² Their dependency on a state-enforced system of IP rights (IPRs) highlights the legal institutions that allow profits to be made from ideas (Healy 2002). For others, this sectoral definition necessarily lumps together people doing creative jobs and simple service workers in the same sector. Having creative industries in place thus is not at all the same thing as being creative. So instead they use an occupational approach by focusing on the rise of a class of occupations (Florida 2002, Markusen and Schrock 2001). The creative class mainly includes people in science and engineering, architecture and design, arts, and entertainment whose job is to create new ideas, new technology and new creative content. This occupation definition, therefore, reaches beyond workplaces and likely calls for strategies focusing on people.

Fused with innovation and commercialization of technologies, creative activities often take place in clusters – geographic concentrations of interconnected firms and institutions in a particular industry or sector (Porter 1998, Porter and Stern 2001).³ Clusters promote both cooperation and competition.⁴ Firms locate near one another to take advantage of a common

² With this definition, creative industries in the U.S. and Britain account for 5-8 percent of GDP (“Creativity as Singapore’s New Growth Engine,” *United Press International*, 25 September 2002).

³ Clusters encompass an array of linked industries and other entities important to competition. They include suppliers of specialized inputs such as components and providers of specialized infrastructure. Clusters also often extend downstream to channels and customers and laterally to manufacturers of complementary products and to companies in industries related by skills, technologies, or common inputs. Finally, many clusters include governmental and other institutions (such as universities, standards-setting agencies, think tanks, vocational training providers, and trade associations) that provide specialized training, education, information, research, and technical support. See Porter (1998).

⁴ The significance of cooperation and networking among firms should not be over-emphasized. Although earlier research attributes the rise of Silicon Valley to its operation as a network system with a shared regional culture of openness (Saxenian 1994), there is evidence that relations there are not so cooperative and are often competitive (Cohen and Fields 1999). Increasingly scholars are touting competition as a central feature underpinning dynamic

pool of labor, knowledge, information and ideas. Thus clusters mitigate the problems inherent in arm's-length relationships without imposing the inflexibilities of vertical integration or the management challenges of maintaining formal linkages such as alliances and partnerships. The success of clusters ultimately lies in the concept of collective efficiency – the joint actions and benefits generated by proximity.⁵ Creative industries also tend to have a large number of small firms. They are considered to be more flexible and independent than large ones, but also have less access to technological information, are constrained by available resources and face high training costs (Berranger and Meldrum 2000, Fujita 2003). Clustering is particularly beneficial for them as competitive advantage could be derived by obtaining efficiency gains that a small firm may not manage on its own.

For cities hosting significant concentration of creative industries, the beneficial impacts are tremendous, in terms of both high-paying and entry-level jobs generated.⁶ In most cases, the quality of the jobs is seen as advantageous as they may provide a more interesting and satisfying working environment for employees.⁷ When most of the economic and social resources are local, the economic process becomes endogenous even if continuous adaptation is required. The strong advantages in providing technological innovation, sharing information, differentiating products, and regulating the market are reliable guarantees of sustainable growth (Santagata 2002, Throsby 2001). As creative industries concentrate in a city, new business formation also becomes more likely through startups and spin-offs. Barriers to entry are lower than elsewhere as needed assets, financial support, skills, inputs and employees are often available locally (Porter 1998, Porter and Monitor Group 2001). Another benefit is the potential for tie-in

clusters (Porter 1998, Rantisi 2002). Local rivalry can be highly motivating and the desire to stand out can spur firms to outdo one another.

⁵ One of the most meaningful characteristics of clustering is the interdependency of firms. Compared to market transactions among dispersed and random buyers and sellers, the proximity of firms in one location fosters higher productivity and efficiency (Santagata 2002).

⁶ In the U.S., for instance, these places have experienced higher per capita income and faster income growth than elsewhere. In the 1990s, aggregate employment in these areas grew 50 percent faster than the rest of metropolitan U.S. (Cortright and Mayer 2001). In Seattle, for instance, most of the 6,000 new high-tech jobs between 1995 and 1998 occurred in the software/computer services/internet cluster (Sommers and Calson 2000).

⁷ The employment pattern of creative industries, however, also is characterized by job flexibility, high mobility and insecurity, short-term or freelance contracts, and part-time or self-employed activities (HKU 2003). Another notable feature of the creative labor market is horizontal hypermobility. Instead of move up through the ranks of one firm, employees move laterally from company to company in search of what they really want. See Florida (2002).

products that open a large merchandizing market (Santagata 2002).⁸ In addition, a growing concentration signals opportunity, which helps attract the best talent as individuals with ideas or relevant skills migrate in from other locations.

I. Creative Cities in the Context of A National Innovation System

What then drives innovation in creative cities? Traditional thinking focuses more on internal factors, such as the capabilities and processes within firms. Recent research shows that the external environment for innovation or a creative milieu is at least as important (Kresl and Singh 1999, Porter 1998, Porter and Stern 2001). Creative milieu is similar to what historians have termed as a “moral temperature” allowing a particular kind of talent to develop in one place at one time (Hall 2000). In periods of intense creativity historically (mainly in the arts), a group of people have acquired a set of common characteristics, a kind of accumulated culture and style of life. Major breaks also seem to come through clashes between generations. A creative milieu, a notion similar to that of the innovative milieu, has four key features: information transmitted among people, knowledge or the storage of information, competence in certain activities, and creation of something new out of these three activities (*ibid*).

Beyond the local environment, the vitality of innovation in a place also is shaped by a national innovation system – a complex network of agents, policies and institutions supporting the process of technical advance and spanning all industries (Crow and Bozeman 1998, Nelson and Rosenberg 1993, Porter and Stern 2001). This system, specifically, includes a nation’s IP protection system, its universities and its research laboratories. More broadly, it may also include many other subsystems and processes, such as norms of competition and a nation’s financial and monetary policies. Research shows that the aggregate level of R&D spending, the effectiveness of IP protection, openness to competition and the intensity of spending on higher education are particularly important determinants of innovative output (Porter and Stern 2001).⁹

⁸ For the software cluster, Bangalore’s huge pool of software engineers is attracting attention for services that include E-commerce, customer relationship management, application service providers, and information technology (IT) enabled services. A McKinsey study notes that IT-enabled services could generate annual revenues of \$17 billion in India by 2008 and create as many as 1 million new jobs (cited in Reason 2001).

⁹ The importance of national innovation systems is showcased in, for instance, Denmark and Finland. They have made major gains in wireless technology since the mid-1980s by substantially increasing their R&D workforce and investment and emphasizing policies that support open competition and strong IP protection. New centers of innovation also are emerging outside of the western hemisphere, in Singapore, Taiwan (China), Korea and Israel (Porter and Stern 2001).

There are different types of national innovation systems among the major industrialized countries. Two distinctive models have captured much attention: the attractiveness of the American model has waned while the Japanese institutions have waxed as targets for emulation (Nelson and Rosenberg 1993). In spite of the variations, three key institutional actors – industry, research organizations, and government – occupy important positions in all national innovation systems (Mowery and Rosenberg 1993, Fujita and Hill 2004).

The U.S. federal government's role is perhaps most important in setting the public policy environment and a number of federal statutes are particularly noteworthy. The passage of the Stevenson-Wydler Technology Innovation Act and the Bayh-Dole University and Small Business Patent Act (both in 1980) ushered in a new era in the transfer of publicly funded IP to industrial firms (Feldman and Francis 2004).¹⁰ These and other institutional changes have allowed enterprising individuals to license technology out of their own labs to create startup companies and encouraged universities to embrace closer interactions with industry to facilitate innovation diffusion.¹¹ More recently the federal government has improved enforcement of IP protection, reduced antitrust restrictions on collaboration in research (through the National Cooperative Research Act), and pursued stronger international protection of IPRs in trade negotiations (Mowery and Rosenberg 1993). Although it has invested large sums in R&D, the U.S. federal government lacks comprehensive oversight of the effects of publicly financed R&D in a wide range of programs.¹² During the postwar decades this investment has largely been driven by national security concerns, with military services dominating the federal R&D budget and counting for more than half of federal R&D obligations in most years (Mowery and Rosenberg 1993).¹³

¹⁰ The Stevenson-Wydler Technology Innovation Act facilitates the transfer of technologies that have originated and are owned by federal laboratories to the private sector. The Bayh-Dole University and Small Business Patent Act permits small business, universities and nonprofit institutions to retain title to inventions resulting from federally funded grants and contracts. See Feldman and Francis (2004).

¹¹ Other major policy initiatives include two amendments to the Stevenson-Wydler Technology Innovation Act – the Federal Technology Transfer Act and National Competitiveness Technology Transfer Act – and the Small Business Innovation Development Act (Feldman and Francis 2004).

¹² As the largest funder, the federal government finances close to half of all R&D. The bulk of federally funded R&D is performed by private industry (over two-thirds), followed by federal research labs as a distant second and university R&D centers (Mowery and Rosenberg 1993).

¹³ As a result of the development emphasis of defense R&D and large size of the military R&D budget, the distribution of the federal R&D investment across industry sectors is highly concentrated, primarily in aircraft and missiles and electrical machinery.

A major change in the postwar U.S. national innovation system is the immense expansion of research in institutions of higher learning. By simultaneously providing funds for university research and education, the federal government has strengthened the university commitment to research (Mowery and Rosenberg 1993). In contrast to European countries, both public and private universities in the U.S. have long played a significant role in conducting research that contributes to technological development and industrial performance.¹⁴ There are diverse interfaces between research universities and the industrial sector. Industry-university relations in Europe, on the other hand, have lagged behind partly because of legal prohibitions in some countries against faculty collaboration with commercial firms and cultural biases against academic involvement with commerce (Owen-Smith and others 2002).¹⁵ One particular feature of industry research in the U.S. is the prominent role of new, small firms. The large basic research establishments in universities, government, and private firms serve as important incubators for the development of innovations. Individuals then establish firms, often small startups, to commercialize them. This pattern has been particularly significant in the biotech, microelectronics, and computer industries. High levels of labor mobility thus serve as both an important channel for technology diffusion and a magnet for other firms in related industries (Mowery and Rosenberg 1993).

In contrast to the American model, the rise of Japan as a model indicates that an explicit national technology policy can be effective (Nelson and Rosenberg 1993). The Japanese government targets certain key civilian technologies and focuses its tax incentive programs, subsidies, and R&D on emerging industries. Historically, the determination to catch up with western countries and their military capacity has given the government a strong incentive to support technological advances. Since the 1960s when the Japanese economy began to compete internationally, the need to develop its own technology also has become more urgent. Government policies to promote domestic R&D have been emphasized since (Odagiri and Goto 1993). State expenditures on science and technology have grown steadily, even in the 1990s when severe fiscal deficits forced cutbacks in overall public spending. In general, Japan invests more heavily in R&D than most Western countries, with a ratio of R&D spending to GDP

¹⁴ Patenting by U.S. universities increased nearly sevenfold over the period of 1976-1998 and licensing revenues from the sales of IP grew briskly as well (Owen-Smith and others 2002).

¹⁵ This predisposition is shared by a small number of U.S. universities, such as Johns Hopkins University (Feldman and Desrochers 2004).

around 3.3 percent in 2001 compared to 2.7 percent in the U.S. (Fujita 2003, Fujita and Hill 2004).

A key policy measure in Japan is joint or cooperative research efforts based on the Act on the Mining and Manufacturing Industry Technology Research Association (Odagiri and Goto 1993). Research associations have been a convenient way to distribute government subsidies to promote the technology deemed important by the Ministry of International Trade and Industry (MITI), particularly semiconductors and computers. More recently the second national science and technology policy has been promulgated, targeting four frontier areas – environmental technology, life science, information technology and nanotechnology (Fujita 2003).

Unlike their American counterparts, Japanese industrial firms tend to integrate the process of innovation – from basic or product research to commercialization – within one organizational framework (Fujita and Hill 2004). Thus private firms are the core actors in the national innovation system. The role of venture capitalists and the stock market is much less prominent in starting up new businesses and commercializing new technology. Japan's industrial innovation also centers in major cities, and most significantly in Tokyo. Regional firms tend to use Tokyo as the gateway to national and world markets while maintaining their local R&D and production bases (Fujita and Hill 2004).

II. Factors for Successful Creative Centers

To leverage the advantages conferred by a particular national innovation system, cities need to build institutional and political mechanisms that nurture creativity and channel innovation. Adapting their economies to new technologies, dynamic cities are constantly reinventing themselves by moving from one field of specialization to another. In the case of the United States, there is evidence that the presence of leading research universities and a high share of college graduates are essential for dynamic cities to leverage locational advantages (Glaeser and Saiz 2003). But innovation capacity alone is not sufficient, as generating new technologies locally may not be as important as having the ability to adapt them. The surrounding community needs to be able to absorb the innovation generated by research institutions and help develop the lifestyle amenities sought by creative firms and workers. The local culture needs to be supportive of experimentation, failure, and recovery so that entrepreneurship is more likely to occur (Walcott 2002).

The collective experience of successful creative centers in the U.S. – Boston, San Francisco, San Diego, Seattle, Austin, and Washington DC, shows that several factors are among the important contributors to dynamic cities. As elaborated in the following discussion, some factors are related to the U.S. national innovation system, such as outstanding university research and commercial linkages and the availability of venture capital. Other factors are more related to the local innovation environment, including successful anchor firms and mediating organizations, an appropriate base of knowledge and skill, targeted public policies, quality of services and infrastructure, and diversity and quality of place. However, this list is by no means exhaustive; there is also no conclusive evidence in the literature to suggest that any of the factors is more important than the others.

Outstanding university research and commercial linkages

A scan of nearly all of the clusters, particularly biotech R&D, points to the critical role played by local universities and research institutions in bridging technology and industries. Most creative communities seem to spring up near universities where learning and industrial activity are woven into the local culture. Universities can become incubators for startup firms, as places where knowledge is patented, where specialized research is housed, and where scientists and industry work together on product commercialization (Abdullateef 2000, Mayer 2003). The core of this success is a university's ability to build intellectual capacity by recruiting and retaining top-notch faculty. For instance, successful biotech clusters are highly dependent on the quality of medical research and availability of specially trained research scientists and technicians. These universities have been a hot bed of technological innovation and entrepreneurs, inventing the gene chips to transform medicine and pushing the boundaries in stem cells research. Most scholars agree that the driving force of biotech R&D in the Bay Area of U.S. is the combined clout of Stanford University, University of California at San Francisco (UCSF) and UC Berkeley. Professors from Stanford and UCSF launched Genentech in 1976, a successful anchor firm for the biotech cluster, with the new gene splicing technology (Newscientistjobs.com 2003a). The result is often tight-knit R&D communities dense with insiders. People who start up as graduate students together can end up as faculty members at the same institution or collaborators in different firms. Similarly, Tokyo's concentration of universities and public

research institutions plays a vital role in developing new frontier technologies and stimulating corporate R&D (Fujita 2003).

Local universities are vital players in augmenting technological progress in the software cluster as well, as showcased in Bangalore. Prestigious universities, such as the Indian Institute of Technology and the Indian Institute of Science provide highly specialized training and offer unrivalled opportunities for the brightest students to do research with professors. Many professors work with local firms in developing technological breakthroughs and their students often stay on after finishing school to work in a research capacity for the firms. This fuels the cycle of technology upgrading and innovation within the cluster (Levitsky 1996). In addition, a number of universities in Bangalore offer commercial or business administration degrees.

The importance of local universities and schools is again demonstrated in the fashion cluster, as in the case of New York. The schools serve not only as a venue for design training, but also as a conduit for establishing key social networks. There are often strong school-industry links, through internships or by having industry leaders serve as visiting instructors or critics. A sizeable number of design graduates go on to work for the companies with which they have held internships (Rantisi 2002). New talent also obtains a second opportunity for training by apprenticing in leading design firms before they strike out on their own.

The local impact of university-based innovation and entrepreneurship, however, should not be overstated. Although small in number, selected U.S. research universities share the European cultural predisposition to contribute to knowledge for its own sake and unwillingness to allow commercial interest to influence research (Feldman and Desrochers 2004, Owen-Smith and others 2002). The Johns Hopkins University in Baltimore, for instance, has not significantly influenced the urban economy in Baltimore because of the university's founding culture emphasizing basic research and scholarly publication, as well as the lack of a local supportive and innovative environment (Feldman 1994, Mayer 2003). In the case of Seattle, the University of Washington (UW) has not been an active participant in the formation of new biotech firms, and its primary role has been in the acquisition of federal research funding (Haug 1995). The evolution of the software industry, in particular, has not been significantly affected by UW. In other U.S. cities such as Portland, Oregon, the creative economy appears to be emerging by utilizing key high-tech firms as surrogate universities that contribute to the creation of a skilled labor pool, knowledge, and entrepreneurship. The case of Seattle, as well as Portland, presents

some evidence for successful knowledge-based development in the absence of leading universities (Mayer 2003).

Availability of venture capital

Continuing investment in product development is essential in the growth of creative clusters, especially the R&D industry. Take biotech research for example. A strong research presence appears to be a necessary condition for biotech commercialization, but not a sufficient one.¹⁶ Another critical factor seems to be the flow of venture capital. Although improved understanding of genetics has led to some novel therapies, relatively few research projects lead directly to new products. Most firms operate at a loss and spend large amounts on research in advance of earning any sales revenue. It often takes a decade or more to develop new products (including testing and clinical trial) and the success rates of commercialization may only be one in 1,000. As a result, these firms depend on venture capital investments, as well as research contracts from pharmaceutical companies and stock sales in public markets (Cortright and Mayer 2002). Startup firms, in particular, depend on venture capital to underwrite their initial costs. Once they develop some promising products, there is the possibility of entering research alliance with pharmaceutical companies and/or having initial public offerings. Research activity has become more dispersed, thanks to substantial public funding. But biotech firm formation and commercialization are concentrated in just a handful of cities (*ibid.*). Therefore, the critical missing ingredient in most aspiring cities is likely to be the availability of venture capital for new biotech investments.

Venture capital shows a strong tendency toward localization. It flows not only to a few creative centers, but also to a specific set of technologies within those areas. In the U.S., for instance, more than 60 percent of all venture capital flowed to just five cities – San Francisco, Boston, New York, Los Angeles, and Washington DC (Cortright and Mayer 2001). In the biotech industry, 75 percent of the new venture capital is concentrated in a slightly different set of five cities (Boston, San Francisco, San Diego, Seattle and Raleigh-Durham). In Boston venture capital flowed more to software and biotech, while in San Diego it went disproportionately to medical and biotech R&D. Because venture capital drives the creation of

¹⁶ Four U.S. cities – Chicago, Detroit, Houston and St. Louis – have very high levels of research but low values of commercialization activity. See Cortright and Mayer (2002).

new firms and the growth of creative employment, it tends to accentuate existing technological differences among cities.

The availability of venture capital is contingent in part on the presence of local venture capital firms (Cortright and Mayer 2002, Florida 2002). A good deal of venture capital also can be characterized as follow-the-lead investment and chasing the trend *du jour*, just as investment in the public stock markets (Florida 2002). As creative clusters begin to form, founders of successful firms become local investors. Venture capitalists from elsewhere move offices into these growing places. To minimize risks and increase the probability of success, venture capital firms play an active role in the management of the companies they invest in, become engaged in brokering alliances with other companies having complementary skills, and offer advice on marketing and other business issues. Because these tasks are often time-consuming, venture capitalists strongly prefer to invest in and work with companies located nearby. These on-site venture capitalists are the key actors in the whole system of financing creative firms. In addition, venture capital firms tend to specialize in particular markets or technologies.

Anchor firms and mediating organizations

New clusters have risen from one or two innovative companies that stimulate the growth of many others. Microsoft played this role in helping create the software cluster in Seattle. Similarly, Hybritech became the first nationally successful firm in San Diego's biotech R&D cluster and a training ground for a large number of scientists. These scientists also learned how to manage as they were given great responsibility in the firm. More than 50 spin-off firms have been formed later, largely benefiting from Hybritech's significant financial success and encouraged by its sale to Eli Lilly. MCI and America Online have been hubs for growing new businesses in the telecommunications cluster in Washington DC (Porter 1998, Porter and Monitor Group 2001). The success of these anchor firms is critical to that of the entire local cluster as it demonstrates the vitality of an emerging industry.

For almost all clusters, the role of institutions for collaboration or mediating organizations is important. Some such organizations are established prior to the takeoff of innovative activities while others emerge as part of the process. They facilitate the exchange of information and foster joint actions that can improve the overall business environment. In particular, university technology transfer offices can facilitate commercialization by connecting

research with entrepreneurs. The best examples are the technology transfer models of Massachusetts Institute of Technology (MIT) in fostering Boston's creative community and Stanford University in creating the Silicon Valley (Porter and Monitor Group 2001, Saxenian 1994, Walcott 2002). In addition, industrial associations can function as political lobby groups to advance collective interests. For instance, the ambitious Bay Area Multimedia Partnership is aggressively seeking to implement a regional development agenda for the multimedia industry in the Bay Area (Scott 2000).

Vital to the fashion cluster are the cultural intermediaries and their role in facilitating the image-building process. These intermediaries include runway shows, fashion magazines, and media fashion segments. Their target is primarily the consumer, even in the case of runway shows, as most high-end designers have already placed their orders with buyers by the time of their shows (Rantisi 2002). Cities like New York have a distinct advantage over other centers of fashion design because of the presence of such intermediaries. The Council of Fashion Designers has coordinated the designers' shows in New York and the top ten fashion magazines are all based there.

Appropriate base of knowledge and skill

Almost all creative centers are places with a high concentration of educated people and the ability to retain skills.¹⁷ The best example is probably Washington DC, where 42 percent of the adult population has at least a bachelor's degree and 19 percent has a graduate degree (McNally 2003). In the software industry, firms have essentially one tangible asset – the talented software developers and entrepreneurial thinkers (Sommers and Calson 2000). These key employees know that other firms are eager to hire them if compensation and local living conditions are not ideal. Attracting and retaining them are one of the highest priorities for software firms. Much the same is true for the publishing industry. A publishing firm has few assets other than its key personnel, which is highly mobile (Caves 2000). But the dependence of writers on a dense creative milieu and a large number of gatekeepers appear to tie the publishing industry more firmly to places than the software cluster. Similarly, the multimedia sector appears to flourish most likely in places where an existing and well-developed skill base of

¹⁷ Research has shown that increasing the average level of education in a metropolitan area by one grade increase total factor productivity by 2.8 percent (cited in Appleseed Inc 2003).

traditional media and software is already in place.¹⁸ A common employment strategy is to maintain a small core of full-time employees and to use part-time and freelance workers as buffers as the need for labor fluctuates.

The most popular locations for offshore software operations, including Dublin and Bangalore, offer well-educated and skilled, English-speaking programmers and convenient time differences for round-the-clock work. Increasingly the original attraction of low cost is fading in these locations, but is being offset by greater sophistication in the workforce and in the technology infrastructure (Reason 2001). Dublin is now Europe's largest center for the software industry and has become increasingly central to the organizational strategies of many U.S. transnational firms operating in Europe. Five of the world's top ten software companies have chosen it as their European headquarters location (Breathnach 2000, Kelly 2003). The city's appeal for the software cluster is at least three-fold.¹⁹ First, it provides high-quality skilled workers from a well-developed educational system. In Dublin there is also a high rate of multilingualism. Linguistically and culturally, there is a high degree of commonality between Ireland and U.S. Second, the city has a very advanced telecommunications infrastructure that offers very competitive rates for high-volume international traffic. This is the product of a major national investment program initiated in the 1980s. Third, acting as the "hunter and gatherer" of foreign firms, the national Industrial Development Authority has supported managers in these firms to upgrade their operations and has been the largest owner of industrial space in Dublin (Breathnach 2000, Ó Riain 2004)

The presence of more traditional industries also may be a stepping stone to the success of a new creative industry. For instance, firms in multimedia clusters, particularly those providing Internet content, are closely connected to the traditional media industry – movies, games, entertainment, education materials, novels, and music. They also intersect with the computing and software sector, particularly in terms of full digitalization and interactivity (Fujita 2003, Scott 2000). This is not surprising as a creative idea that works well in one industry often can be licensed to or further developed in other industries. The multimedia clusters in California draw

¹⁸ In San Francisco's multimedia industry, the majority of the skill base is originally from elsewhere. But once they enter the California labor market, employees in this cluster tend to become quite rooted in the region. The abundance of training opportunities and presence of multiple networks of associations appear to supplement general processes of worker socialization and job mobility within the region, hence helping retaining skill (Scott 2000).

¹⁹ Dublin also boasts another competitive cluster – call center activities, and it houses close to 30 percent of all international call centers located in Western Europe. See Breathnach (2000).

extensively on the resources and capabilities of these two groups of industries – combining elements of Silicon Valley (computer and programming expertise) and Hollywood (dramatic and imaginative presentation forms).²⁰ There is also an abundance of educational and training opportunities offered locally. Most subcontract linkages tend to be with local firms and only a small amount flows between separate clusters.²¹

Targeted public policies

While the development of clustering is often independent of significant government intervention, the critical role played by public policy in fostering a technology sector in the city of Bangalore is perhaps the most important factor in its success (cited in Skordas 2001). The software cluster in Bangalore initially developed in response and because of government intervention (particularly at the national level). Since 1948, the government of India has prepared the Peenya industrial site and provided the necessary infrastructure. In addition to the establishment of the Indian Institute of Science and Hindustan Aeronautics, a large number of public firms were strategically placed in the city, including the Indian Telephone Industries and Bharat Electronics. These large firms helped form a local pool of skilled labor and provided a training ground for future industrial talent. Over time, smaller ancillary units and local suppliers also grew in number and technical sophistication. After India liberalized its trade regime in the 1990s, foreign firms, such as IBM and Motorola, were attracted to the city by the highly skilled labor pool available for technology-intensive operations. The establishment of India's first software technology park in Bangalore reinforced the skill advantages already in place and was critical in the emergence of a software production agglomeration (Parthasarathy 2004, Skordas 2001). Both government-sponsored institutions (e.g. Integrated Entrepreneurship Development Program) and private trade associations (e.g. Karnataka Small Scale Industries Association) provide business and marketing advice to local firms. In particular, the Bureau of Indian Standards encourages local firms to obtain certificates of international quality to ensure

²⁰ The content of multimedia products ranges from action games through business and commercial applications to encyclopedias and databases. The technical foundation is complex computers and communication systems, access to which is provided by means of software engineering. See Scott (2000).

²¹ Scott (2000) has observed this tendency between the multimedia cluster in the Bay Area and that in Southern California. Bay Area firms are significantly more specialized in products with more business and commercial applications, and with a much greater emphasis on tool development and programming capabilities. By contrast, those in Southern California are much more likely to be involved in entertainment and communications activities.

compliance with advanced design standards. Research has shown that business associations like these are instrumental in fostering network ties, marketing the area, and promoting the firms abroad (cited in Skordas 2001).

Having a readily available and qualified workforce is one of the best investments cities can make.²² Whether or not municipal governments have a direct role in education, they have a leadership role in ensuring that local schools, colleges and universities have math, science and IT programs of high quality (Sommers and Calson 2000). They can use their political clout to articulate the importance of focusing educational resources in such fields. They can help create a favorable environment for educational institutions through zoning and transportation policy. They also can build a financial support system to make loans directly to technology upgrading, startups, and R&D in new product development.

Municipal governments also can help young entrepreneurs develop viable business plans and startup operations (Sommers and Calson 2000). Many entrepreneurs leave a university or lab with an idea for a product or service, but with little or no business experience. In addition, small businesses in general have a higher failure rate. City leaders can play a significant role in fostering organizations to provide business assistance and establishing industry associations. Research shows that, in most cases, smaller firms need some support to take advantage of information and communication technologies (Berranger and Meldrum 2000). This implies that just setting up the infrastructure, although paramount for cities, is not sufficient to ensure adoption. In Tokyo, for instance, the metropolitan government actively applies technology transfer licensing programs to small firms to create new startups and jobs. It also provides consultation on loans, employment law changes, patenting, marketing, and management. In helping small firms gain low-priced access to telecommunication, it has persuaded major railway companies to connect their fibre-optic networks to broadband networks (Fujita 2003).

Quality of services and infrastructure

A city's attraction to creative firms may be affected by how well it handles basic government services such as planning, permitting, and public services (Sommers and Calson 2000, Porter and Monitor Group 2001). For instance, how quickly designs can be approved and

²² Research shows that investments in higher education infrastructure predict subsequent city and regional growth far better than investments in physical infrastructure like highways and railroads (cited in Florida 2002).

construction can begin are critical elements in a firm's planning process. A city will have an edge if it offers replicable processes for getting complicated permitting issues resolved, updated building/fire codes allowing for special technical requirements, and availability of ready-to-occupy office space. Tax regime also matters. In Dublin, the establishment of an International Financial Services Center in 1987 has generated a considerable influx of foreign firms. Aware of the rise in labor and overhead costs, the Irish government has recently begun an effort to spread development beyond Dublin, with similarly flexible tax regime and low regulation.²³

Good infrastructure is important to creative firms, particularly that critical to the direct operation of the firms. For biotech laboratories, Internet-based companies and large facilities housing multiple servers, non-interruptible power is critical. So is a reasonable rate structure. Making infrastructure information open to the high-tech and creative community is beneficial, as shown in the case of Seattle's updated map of the major fiber optic network (Sommers and Calson 2000). In addition, it has been shown in the U.S. that availability of direct flights may be the number one priority in the location decisions of high-tech firms with above-average innovation (Echeverri-Carroll 1999). Proximity to airport facilities encourages services to clients, minimizes travel time, and provides welcoming opportunities to visitors.

Appropriate real estate also is essential for the development of creative industries and there may be cluster-specific preferences. Bioscience companies often need specially configured labs that may be less interchangeable than general office space (Walcott 2002). Developers must be willing to build such facilities on a speculative basis, given the high failure rate of startup firms. The real estate market also needs to provide space for companies from incubation to startup and through established maturity, as well as an array of amenities for employees. Software/internet engineers, on the other hand, prefer private offices and the ability to work at all hours. Therefore, access to backup power and telecommunication lines is critical. New server hotels – large facilities constructed specifically to house serves of multiple firms – are becoming a significant factor in local electric demand (Sommers and Calson 2000).

²³ The corporate tax rate of 12.5 percent (10 percent for manufacturing and international services) was phased in by 2003, in addition to no restrictions on currency movements, no local content requirements and unlimited profit repatriation for foreign firms. See Reason (2001).

Diversity and quality of place

In addition to technology and talent, existing creative centers rank high on quality of place, which refers to a unique set of local characteristics – attractive natural and built environments, diverse range of people, and vibrant street life. These places do not just provide one thing, but a range of options. In particular, cities rank high on diversity (or multiculturalism) and tolerance tend to attract more creative people who have always gravitated to certain kinds of places (Florida 2002).²⁴ Creative cities are places where outsiders can enter and feel a certain state of ambiguity. They ought to neither be excluded nor be so easily embraced that their creative drive is lost. Creative cities also tend to be places in flux, where new socioeconomic and ethnic groups are defining and asserting themselves.²⁵ The social environment is stable enough to allow continuity, yet diverse enough to nourish creativity in all forms (Florida 2002, Hall 2000).²⁶

Surveys in the U.S. find that knowledge workers want urban amenities such as outdoor dining, walking streets, vibrant night life, and river walks combined with outdoor recreation activities including urban kayaking, rock climbing and bike trails (CEOs for Cities 2000, IntelliQuest 1999). Within cities the focus of the recent wave of creative firms is often on the downtown, as opposed to more typical suburban office park locations. This cuts across clusters, including software in Austin, biotech R&D in San Diego and Seattle, publishing and fashion in New York, and video games in Tokyo. Typically, the downtown offers historic as well as modern structures, excellent public transportation, a mix of restaurants, a vibrant music/art/entertainment scene, and diverse residential neighborhoods. There is a variety of foot traffic, wide sidewalks, and different types of buildings (Florida 2002, Sommers and Calson 2000).²⁷

²⁴ Florida (2002) shows that the key values of creative people include individuality, meritocracy, diversity, and openness.

²⁵ There is evidence that highly conservative, very stable societies are not likely to be creative places; neither will be places in which all sense of order has disappeared. See Hall (2000). Historically it appears that highly creative cities have been those in which an old, established order was being challenged or overthrown, such as Vienna in 1900 and Berlin in 1920.

²⁶ To measure diversity, Florida (2002) has developed a composite index that adds together the Gay Index (concentration of gay people), Melting Pot Index (relative percentage of foreign-born people), and Bohemian Index (concentration of artistically creative people).

²⁷ These life-style preferences also are influencing the way architects and developers design and build the next generation of offices for creative and high-tech firms. Sidewalks, pedestrian streets, and entertainment facilities are being emphasized. See Sommers and Calson 2000.

Despite their high ranking on quality of place, some creative cities face unique challenges in quality of life, as diseconomies of scale also exist, including high costs that result from concentration, size, and congestion.²⁸ For example, salaries and housing prices in Silicon Valley are significantly higher than in many other places. Working by the Bay often involves hours of commuting and a stratospheric cost of living. Rents are steep, parking a nightmare, and the political climate sometimes inhospitable to business. Alleviating these problems is not going to be easy as firms there are located in an area containing more than one hundred cities with different governments and rules (News scientistjobs.com 2003a). Traffic congestion also is a major problem for many creative centers. Places like New York, Boston, Washington DC, and San Francisco experience near gridlock. These factors have led at least a few creative firms to relocate out of these places to mid-size metros where transportation mobility is still relatively easy (CEOs for Cities 2000).

III. Case Studies of Dynamic Cities

To illustrate how the factors discussed above may work together in dynamic cities to create unique attractions to specific clusters, two case studies are presented here in greater details. San Diego is a story of an emerging biotech R&D center with a combination of pioneer research and business savvy, while Boston represents a mature model of university-based creative growth in software and biotech.

San Diego

San Diego presents an interesting example of creative milieu, as it is located outside of the usual high-tech U.S. regions in northern California and the northeast. In a matter of a decade or so, San Diego has reduced its dependency on tourism and defense production to emerge from a severe recession and become one of the nation's fastest growing, diverse and knowledge-based economic regions (Porter and Monitor Group 2001).²⁹ With a focus on research, the city now has

²⁸ A somewhat different concept from quality of place, quality of life may refer to such important issues as quality public education, reliable health care, assured public safety, and a clean and attractive natural environment, as shown by results of a survey of high-tech communities in the U. S. In addition, the availability of recreational opportunities is another top driver of quality of life (IntelliQuest 1999).

²⁹ During the early 1990s, the region experienced a recession that was attributable to the basic restructuring of the local economy. See SANDAG (2001). But today, most agree that, San Diego ranks just behind San Francisco and Boston as a biotech center in the U.S. (News scientistjobs.com 2003b).

one of the strongest critical masses of biotech R&D and clinical testing institutions in the U.S. Significant investment in R&D, important connective institutions among industry and academia and government, and concerted actions of business and government leaders have enabled the city to attain a leading position in biotech R&D as well as communications clusters. Patents per worker have grown to more than twice the national average, and venture capital funding nearly three times. A large navy presence also proves to be a blessing as biotech firms are well poised to collaborate on some military projects. In addition to being a source of R&D funding, the military has been a large and sophisticated consumer.

San Diego's success is a story of how academia, local business and political interests have come together, even though direct government involvement is minimal. There is an ease of communication among company heads and employees, university and research center scientists, and students (Cortright and Mayer 2002, Walcott 2001). Critical is the nurturing role played by University of California at San Diego (UCSD) CONNECT as a bridge to university, financial, and corporate interests, which showcases local science and brings it to the attention of investors /entrepreneurs worldwide. It has assisted both established and startup firms. Another industry organization BIOCOM not only offers professional development assistance and promotes informal networking, but also gives biotech firms a united political voice. Specially, it has been very successful in working with the local government to secure water availability for the industry and promoting the region as a biotech hub (Newscientistjobs.com 2003b, Niiler 2003, Porter and Monitor Group 2001). Functioning in tandem, CONNECT and BIOCOM illustrate the importance of mediating organizations.

In San Diego's biotech R&D cluster, a trinity serves as the industry foundation or brain trust – UCSD, the Scripps Research Institute and the Salk Institute (Newscientistjobs.com 2003b, Porter and Monitor Group 2001). All three were formed in the late 1950s and early 1960s, with the objective to attract talented and entrepreneurial researchers.³⁰ In particular, the prominence of UCSD in biotech research is almost unsurpassed for cluster development (Walcott 2001). Scientists from these institutions have founded pioneering R&D firms, some of which also have become incubators for new companies. For instance, Ivor Royston and Howard Birndorf from UCSD formed Hybritech as a technology transfer to take advantage of a breakthrough –

³⁰ The existence of top research institutes also has lured other institutions to San Diego, such as the Burnham Institute and Sidney Kimmel Cancer Center. See Porter and Monitor Group (2001).

monoclonal antibodies. The company founders made millions, attracting attention to biotech's possibilities as a great investment opportunity (Newscientistjobs.com 2003b, Walcott 2001). Specialized training in these institutions, such as that offered through UCSD's Center for Bio/Pharmaceutical and Biodevice Development, also has continued to infuse local labs with talent (Newscientistjobs.com 2003a, Porter and Monitor Group 2001). To help meet the need for science graduates with business experience, UCSD also has begun a dual major Ph.D./MBA program with San Diego State University, primarily for molecular-biology students (Niiler 2003).

Individual leadership also matters as generating scientific discoveries and corporations depends on particular people (Walcott 2002). For San Diego's research trinity, the type of people recruited to run them and the way in which they are run have been equally important. The Scripps Institute hired Frank Dixon, who worked to develop new fields of study there. At UCSD, Chancellor Roger Revelle set out to establish the university as a world-class research center focused on physics and medicine. Later Chancellor Richard Atkinson, formerly at Stanford, drew on the Stanford model of university-business collaboration and encouraged more entrepreneurship among faculty. Several other individuals also are consistently regarded by the local community as great contributors – William Otterson of UCSD CONNECT, Ivor Royston of Hybritech, and David Hale of CancerVax (Porter and Monitor Group 2001).

The success of an anchor firm – Hybritech – has been critical as it demonstrated to the local business and financial community that the biotech R&D cluster was viable in San Diego. It created not only the prostate specific antigen but, more importantly, the attitude that biotech could actually contribute to health care. This positive mentality began to spread from the firm to the local biotech cluster, and then to the broader business community. In addition, former employees of Hybritech in spin-offs created a core of local venture capitalists eager to increase their profits and stay in the area by assisting other startups (Porter and Monitor Group 2001, Walcott 2002). The cluster's particular strength is agricultural bio-science, cancer therapy and bioinformatics. A number of firms, including Aguron, IDEC and Ligand, have received drug approvals by the U.S. Food and Drug Administration.

San Diego's cheaper real estate and small-town feel also prove to be a better draw, in comparison with the Bay Area, for biotech's big pharmaceutical partners. Local developers have been willing to invest in specialized lab and office space to accommodate bioscience work that

involves such messy media as blood and tissue. Companies concentrate around a UCSD roadway and in industrial parks within ten minutes of each other, with rapid access to university labs and contracted scientists (Walcott 2001). The proximity has helped give the city a collegial spirit and forge a cohesive cluster. The compact nature also makes it easier for the industry to strike deals on zoning and infrastructure issues as most of the companies are under one city authority (Newscientistjobs.com 2003b). But San Diego is rapidly changing into a sizeable metropolis, with a potential danger of becoming more and more like Los Angeles and San Francisco in costs of living and housing but without comparable wages or cultural amenities.³¹ Air transportation, is another problem. Although its international airport is centrally located, it lacks both frequent and direct flights to many destinations (Niiler 2003, Porter and Monitor Group 2001).

Boston

The Boston region has long been recognized as a leader in education, innovation and knowledge. For instance, Boston, together with San Francisco, is the research leader and dominant center of the biotech industry (Cortright and Mayer 2002). It is now home to large pharmaceutical installations from Merck, AstraZeneca, Abbot and Pfizer, and Novartis. In biotech R&D, Boston derives its advantage from establishing an early lead enhanced by the combination of a strong research capacity and the ability to convert research into successful commercial activity – the two necessary ingredients for industry growth (Cortright and Mayer 2002). Another major advantage is its location on the east coast, making for easier communication and travel to the European offices of these multinational companies (Newscientistjobs.com 2003a).

Research at local universities has had a fundamental impact on industrial growth, helping define sectors such as computing, IT, medical devices, biotech and genetics (Appleseed Inc. 2003). The eight research universities, in particular, are primary recipients of federal research funding and creators of new patents, and serve as a magnet to large national and international

³¹ San Diego's cost of living is roughly 25 percent above the national average, whereas its average wages are 2-5 percent above the national average (Porter and Monitor Group 2001).

companies to locate research operations in the region.³² Among the companies are Amgen, Cisco, Merck, Novartis, Pfizer and Sun Microsystems. Much of the biotech research is undertaken at medical schools and other medical research institutions with substantial assistance of federal funding (especially from the National Institute of Health or NIH). Most biotech firms trace their intellectual roots and human capital to these institutions. Boston has three of the nation's top-ranked medical research institutions and gets more NIH funding than any other metropolitan region in the U.S. The universities are, in effect, the intellectual infrastructure that supports the continued growth of the leading local clusters. But academic research does not take place just in an ivory tower, but in a complex network of relationships among universities, hospitals, other affiliated institutions, corporations and entrepreneurs (Appleseed Inc. 2003).

Boston has a long history of university-industry research alliance. Since World War II, researchers at MIT are leading beneficiaries of defense and aerospace contracts and pioneered innovations in radar and computing (Saxenian 1994). By 1970, the Boston region had established itself as the nation's leading center of innovation in electronics. MIT's Division of Industrial Cooperation and Research, established in the 1920s, keep companies apprised of university research findings. Other major research universities in the area have similar research partnerships, such as Boston University's Photonics Center, Northeastern's Barnett Institute (biotech), and Harvard's Institute for Chemistry and Cell Biology (Appleseed Inc. 2003).

The licensing of technologies to commercial enterprises is perhaps the most direct way in which academic research can be translated into industrial growth. All of the research universities have created technology transfer offices dedicated to promoting commercialization of new innovations and providing extensive support to university members in new startups (Appleseed Inc. 2003). Such support includes seed money for further work on inventions, assistance in business planning, introduction to venture capitalists, and assistance in recruiting a startup team, and incubator space. This is also why Boston excels in biotech commercialization, in addition to its strength in research. MIT is particularly renowned for an institutional culture that encourages faculty entrepreneurship. Research university faculty has been among the founders of leading local companies in IT, biotech, and architectural consulting. Many companies also have been

³² The eight research universities include Boston College, Boston University, Brandeis University, Harvard University, MIT, Northeastern University, Tufts University, and University of Massachusetts Boston. For a fuller description of their economic impact on the region, see Appleseed Inc. (2003).

founded by university alumni (Appleseed Inc. 2003, Saxenian 1994). Another factor is the availability of venture capital, as Boston trails only San Francisco in the number of such investments and has a venture capital industry with a long history of investing in the growth of local companies (Cortright and Mayer 2002). Boston also benefits from maturing industries that generate more investable capital than they consume.

Boston's so-called Research Row – composed of MIT, Harvard, and other local universities and a growing concentration of industrial labs – offers an intellectual and technical labor pool unsurpassed in the nation in its depth and diversity. In particular, the opportunity to studying or even working with professors engaged in cutting-edge research greatly enhances the quality of students' education. The existence of such a community of knowledge also makes the area a more attractive place for leading scholars and scientists. Specifically for biotech, the area offers probably the best availability of bioscience research scientists and technicians.³³ For software firms, the radical computer culture formed around MIT (dubbed Technology Square) provides an attractive ethic and partially explains the clustering there. It allows for open information sharing, free and unlimited access to computers, and promotes a meritocratic culture (Saxenian 1994).

The research universities have worked to cater their teaching and training programs to the needs of the regional labor force. In addition to traditional continuing education opportunities, several have organized formal programs aimed at educating student entrepreneurs and helping them launch new businesses.³⁴ Students in some of the extension programs can even take specialized or graduate-level courses. Co-operative education programs link students at the universities to area employers. The universities also have contributed significantly to the quality of life in the region, by providing affordable housing, contributing to community improvement programs, and helping deliver health services. All of them are involved intensely in an array of programs to improve the quality of local K-12 education systems, as well as providing a wide range of educational opportunities for these younger students (Appleseed Inc. 2003). Several universities also have been actively developing the space needed to support the continued growth

³³ Among all major U.S. metropolitan areas, Boston rank first by the number of life scientists in 1998 and second by the number of bioscience Ph.D.s granted in 1999 (trailing New York City). See Cortright and Mayer (2002).

³⁴ The most notable of these efforts is MIT's \$50K competition for which teams of aspiring entrepreneurs with at least one MIT student prepare business plans for proposed new ventures. During the process, students also take part in a year-long series of workshops and lectures on business planning, startup financing, marketing and management. See Appleseed, Inc (2003).

of knowledge industries. For instance, the latest university-sponsored real estate development project is Tuft's University's Tufts Science Park that will house R&D, pilot manufacturing, and other activities related to biotech.

IV. Power of Place on Creative Clustering

Creative industries are diverse and prosper in response to the distinctive knowledge base and characteristics of each community, as indicated in the case studies. Research shows the difficulty of generating a new cluster where none previously exists, as cluster development often is path dependent (Cortright and Meyer 2001). Path dependence may be particularly strong for creative centers in fashion and industrial design. Thriving design firms are critical for a viable fashion cluster as they represent the creative source for new innovation. The ability to source locally quality fabrics in the small quantities required for rapid response, small batch production also is important. So are the ability to repeat particular lines at very short notice and the reliability afforded in terms of delivery (Crewe 1996). Successful development of creative clusters, especially those involving high technology, also is usually an indigenous process, building on the distinctive knowledge and industrial base of a city. As a result, communities without technological endowment may be handicapped. Progress in one cluster does not necessarily qualify an area to succeed in others. Even cities with current strength are not guaranteed to be competitive in every new industry segment (Abdullateef 2000).

The most fertile location for innovation and creativity tends to vary markedly across clusters (Porter and Stern 2001). Research shows there is a significant variation in technological specialization among cities, manifested in three key indicators – employment patterns, patent activities and venture capital flows (Cortright and Mayer 2001). Different cities tend to specialize in relative few creative products or technologies and their employment in a few industry segments. Cities with high concentration in software, Washington DC for instance, shows very low concentration in hardware. In addition, the majority of patents issued in any city are granted to only a handful of firms specializing in one or more related technologies. Venture capital flows to a specific set of technologies within those areas. As an exception, Silicon Valley or the Bay Area is the only place specializing in multiple clusters. There is an incredible pool of local talent to draw from, which includes top scientists, seasoned venture capitalists, patent lawyers, IT specialists, medical chemists, and so on. The region provides an integrated

environment for intense high-tech work (in Silicon Valley), exceptional outdoor recreational activities, and a vibrant urban center in downtown San Francisco (Florida 2002, Newsscientistjobs.com 2003a).

It is clear that in the new knowledge economy, costs or government-influenced low costs (e.g., lower taxes) and access to natural resources are less important. To attract both creative people and firms, places need to foster a culture of innovation and provide an integrated habitat for all forms of creativity.³⁵ The winning formula in Europe appears to have been a combination of a favorable business environment and technological acumen (Kelly 2003, Simmie 2001). Particularly important are local policies designed to build an infrastructure to support small and emerging creative businesses. Such policies range from establishing industry forums to identify sectoral needs, creating publicly supported venture capital funds, investing in digital labs, supporting art and technology studios, organizing trade missions around particular products, to providing business development support and training (Tepper 2002). In the U.S., San Diego's phenomenal rise is probably most inspiring. But this is not to suggest that San Diego's competitive edge is locked in. In fact, it faces imminent shortages in the supply of marketing and management professionals and skilled workers.

Despite concerted development efforts and presence of leading research universities, some places remain trapped in past cultural and organizational norms and unable to adapt to new technologies. The case of Baltimore may be a good example of local inertia and an alternative model of university research. Funded in 1876 as the first research university in the U.S. and ranked today as the single largest recipient of federal R&D funding, Johns Hopkins University has given priority to basic research and scholarly publication from the very beginning.³⁶ Its dedication to the norms of "open science" also has been translated into an unwillingness to allow commercial interests to influence research (Feldman and Desrochers 2004). This academic culture has not encouraged direct involvement with industry, and instead has carried an almost persistent emphasis on fundamental inquiry. The failure of its first spin-off company or

³⁵ The Creative Index developed by Florida (2002) is a useful gauge of the creative capabilities of places. This index is a mix of four equally weighted factors: share of creative employees in the workforce, innovation measured by patents per capita, presence of high-tech industry, and diversity measured by the Gay Index.

³⁶ On the other hand, the university ranked second to lowest among the top twenty American universities in its percentage of industry-sponsored research as a proportion of total research expenditure at the end of 1990s (Feldman and Desrochers 2004).

university-industry link, Rowland Telegraphic Company, further enforced such a culture.³⁷ As a result local representatives of industry and commerce in Baltimore have formed an impression of the university as remote from everyday life.

Compounding this disconnection between the university and industry is the lack of a supportive and innovative environment in the Baltimore community (Feldman 1994). The large employers in the city tend to be branch plants instead of national headquarters, and are less able to generate innovation spin-offs. The absence of a highly developed corporate complex also contributes to the lack of producer services. Although there are several venture capital firms in the state of Maryland, they have not invested in Baltimore and tend to conduct business elsewhere. To overcome this problem, an independent high-technology development group called Triad Investors was formed in 1988 by the university and its health systems. But Triad Investors has not been as successful as similar ventures by other top research universities (Feldman 1994). The importance of a supportive local environment is further confirmed by Pittsburgh's difficulty to adapt to the creative era despite the presence of two leading research universities and a strong base of metallurgical and chemical industries (Florida 2002).³⁸

V. Implications for Aspiring Asian Cities

The experience and lessons from existing areas of leading clusters have significant relevance to cities in East Asia. Local innovation capacity is conditioned by the national innovation system and dynamic cities leverage locational advantages by attracting and retaining talent. But it is important to note that national innovation systems in East Asia differ from the U.S. model. Research shows that settings with different institutional profiles may produce distinctive forms of innovation (Indergaard 2003). The question of whether developmental states are a viable alternative is somewhat important for studies of East Asian cities. Hill and Kim (2000) argue that East Asia's developmental states produce a "state-centered political-bureaucratic" type of world city, such as Tokyo (p. 2177). Similarly, state policy and politics, not market forces, have shaped Tokyo's core clusters – IT, multimedia and videogames –

³⁷ Established in 1898, the company went out of business in 1910 (Feldman and Desrochers 2004). Another frustrated experience was the formation and re-formation of the university's engineering school, which strayed away from basic science in favor of the more practical approach in early years but returned to emphasize abstract problems after re-formation in the late 1970s.

³⁸ Florida (2002) attributes this difficulty largely to a conservative local culture that is not open to diverse populations and new demands of the creative class.

primarily through policy incentives to coordinate and stimulate corporate R&D investment on frontier technology (Fujita 2003). But this theme still rests the nestedness of cities at the national level, which is increasingly challenged by regional and global forces. Evidence shows, as in the case of Malaysia's development of digital industry, that a developmental hybrid is often used in East Asia in which the state devises a comprehensive plan and uses venture capital to enroll participants (Indergaard 2003).

Given the ongoing or completed projects led by direct government initiatives, several East Asian cities may have the potential to cultivate a substantial presence of multimedia production and services. Singapore is in the process of creating a "Mediapolis" that uses a total value chain perspective and focus on broadcasting, film/animation, computer gaming, music and e-learning ("Creativity as Singapore's New Growth Engine," *United Press International*, 25 September 2002). Its Economic Review Committee (2002) has been promoting an aggressive development strategy for creative industries by specifically identifying two potential clusters for the city state – "Design Singapore" and "Media 21." The Seoul Metropolitan Government is developing a 565,000 square meter Seoul Digital Media City, scheduled for completion in 2010, as a world class complex for digital media industries. Malaysia is building a multimedia super-corridor (with target completion in 2020) tailored directly to software and multimedia products, and it already has attracted some high-powered tenants like Microsoft and Intel. The race is on in the region to attract global talent and to compete for the mantle of East Asia's creative hub.

Substantial investment, however, has gone into building the hardware of creativity and improving physical infrastructure, and less has been done in the way of supporting creative process and talent. Singapore may be moving towards addressing the negative perception of the city as a highly regulated place. But some cities are experiencing the drying out of public funding for cultural and research activities at the same time as new, grandiose infrastructure is being built. Shanghai today, for instance, boasts a new art gallery, an elegant museum for antiquities, a luminous \$150 million grand theater, a new expansive conventional center, and one of the largest libraries in the world (Wu 2004). Yet film professionals are compelled to look abroad for finance and to attract co-productions financed through Hong Kong (China). Together with its bureaucracy's effective control over creativity, the city is having difficulties in retaining domestic talent. Hence investment in creative talent and liberalization of the cultural climate need to be a key element of the future strategies of these cities.

Hong Kong's recent experience may showcase the making of a creative city in East Asia. It has robust film and music industries. Similarly its architecture, publishing, design and advertising businesses enjoy an edge over regional competitors in terms of creativity.³⁹ Cross-fertilization of creative ideas is common among the film, television, comics and software industries. The territory's world-class telecommunications infrastructure, creative software designers (in some 500 independent software vendors), pioneering online services, and people's enthusiastic interest in acquiring novel products provide fertile grounds for creativity (Berger and Lester 1997, Enright and others 1997).⁴⁰ In addition, most of the manufacturing firms display remarkable flexibility, in terms of producing for customers with diverse needs, detecting changes in trends rapidly, and switching lines quickly from one product to another (Berger and Lester 1997). Another advantage lies in the strength of its service cluster – accounting, legal, and financial services, as well as business infrastructure (Enright and others 1997).⁴¹ But Hong Kong is weak in its R&D capacity. Specifically, universities are seen as holding themselves aloof from the industrial sector and not tailoring their teaching and research activities closely enough to industrial needs. Combined with limited public and private funding for R&D in its earlier development, Hong Kong displayed a low-tech pattern of industrial development until the 1990s (Berger and Lester 1997, Enright and others 1997).⁴²

In recent years, however, the government has become more active in supporting industry upgrading and providing financial infrastructure to meet the general needs of individual industries. The funding schemes of Innovation Technology Fund (ITF) and Film Guarantee Fund (FGF) are some of the notable means (HKU 2003). ITF supports mainly applied R&D

³⁹ Most companies in Hong Kong's creative industries are small and export-oriented, which tend to be long on growth prospects but short on physical assets. The two largest creative industries, in terms of value added, are publishing and architectural services. For details on specific industries, see HKU (2003). Together creative industries contribute to 2 percent of Hong Kong's GDP and 3.7 percent of total employment (HKTDC 2002).

⁴⁰ Some significant new technology-intensive products and services that have originated in Hong Kong include: the line of Chinese-language pagers and paging services, a wireless hand-held betting device, and the line of color computer-aided-design software systems for garment manufacturers. In addition, Hong Kong has a consumer base that is among the world's most technological sophisticated as indicated by the extremely high density of cellular and pager usage (Berger and Lester 1997).

⁴¹ During the past two decades Hong Kong has undergone economic restructuring and transformation from a "manual economy" to a "knowledge economy" (Enright and others 1997). The industry sector now constitutes less than 15 percent of its GDP (manufacturing industries only 5.1 percent). In contrast, the service sector counts for more than 85 percent of Hong Kong's GDP, of which 50 percent is attributable to producer services (HKU 2003, Tao and Wong 2002).

⁴² As a result, its biotech sector is small and engaged primarily in importing, repackaging and distributing bulk generic western drugs.

projects conducted by universities, industry support organizations, trade associations or even private companies that contribute to innovation and technology upgrading in industry (www.itf.gov.hk). FGF assists local film production companies to obtain loans from local participating lending institutions for producing films (a loan guarantee scheme) and helps create an environment conducive to the development of a new financial infrastructure for film production (www.fso-tela.gov.hk/film_guarantee_fund.cfm). Public funding also has been used to set up the Hong Kong Institute of Biotechnology and Biotechnology Research Institute.⁴³

Hong Kong continues to uphold its rare combination of the government as a referee and private companies as active players, which fosters an environment for businesses to make strategic decisions freely in the city (Enright and others 1997). In particular, it maintains a good international reputation in the protection of IPRs through a comprehensive legal framework and some of the world's toughest legal restrictions. The government has been able to act promptly on complaints about piracy, often filed by large transnational corporations.⁴⁴ In addition, the government provides a very low tax regime, with a low capital-gains tax and flat personal income tax.⁴⁵ With marked clarity, its fiscal policy is considered the most favorable to entrepreneurial activity in the world (Enright and others 1997). Recently the Mainland and Hong Kong Closer Economic Partnership Arrangement (CEPA) has allowed zero import tariffs on textiles and clothing, which helps the branding of Hong Kong's fashion products in the Mainland.

A number of mediating organizations have been established, either through industry initiatives or public support or both, to provide cross-sector platform for exchange of IPRs, industry solutions and information services, and incentive and award systems (HKU 2003). The Hong Kong Productivity Council and Trade Development Council (TDC) are the main entities involved in cross-sector promotion. Trade fairs organized by the TDC have long been the platform for the exchange among different industries and for local and overseas participants to

⁴³ But true venture investments or funds, particularly those with a pure focus on technology, are still rare in Hong Kong because of the short-term-driven investment culture and dominance of property investments. As a result, startup firms often have to rely on family finances or rolled over trade credit. This reliance is true not only in Hong Kong, but also throughout much of Asia (Berger and Lester 1997).

⁴⁴ For instance, piracy level of music records dropped from 25-50 percent in 2000 to 10-25 percent in 2001. Hong Kong is said to be one of the first places in the world to implement a licensing policy for manufacturing optical discs that requires each disc be marked with the manufacturer's code (HKU 2003).

⁴⁵ The lack of withholding taxes also increases its role as a regional financial center. See Berger and Lester (1997).

develop business matching.⁴⁶ TDC's matchmaking function is further amplified by its global network of more than 50 offices that collect information from international buyers, promote Hong Kong products and services, and locate Hong Kong contacts for overseas businesses (Berger and Lester 1997).⁴⁷ In addition, Hong Kong has been using flagship projects in its marketing and branding (HKU 2003). The building of the Convention & Exhibition Center Extension and Chek Lap Kok International Airport are two well-known, completed projects. Hong Kong plans to complete the construction of its Cyberport by 2007 to complement its already fully digital network (Indergaard 2003, Jessop and Sum 2000). The West Kowloon Cultural Center Development has the potential to be a major flagship project on the world stage and could turn into a partnership with Shenzhen's establishment of a theater district north of the border (HKU 2003).

Similar to Hong Kong (China), a number of middle and higher-income economies in East Asia may be at the stage where future growth is likely to depend on a transition to innovative economies centered on knowledge-based and service-oriented activities (Yusuf and Evenett 2002). The focus of transnational companies on the cities of Asia as production bases and potential markets has remained strong. But these cities may be competing with well-established creative hubs of the world, such as San Francisco, Boston and Dublin, to attract and retain creative talent. Winners of such competition are likely those that can provide a successful combination of local innovation capacity and supportive environment.

⁴⁶ An example is the Hong Kong Licensing Show and Conference that brings together licensors, licensing agents, licensee advertising agents and legal advisors (HKU 2003).

⁴⁷ There are other new mediating organizations. The Hong Kong Design Center serves as an intermediary between designers, on the one hand, and industrialists, the business sector and general public, on the other. The Hong Kong-Asia Film Financing Forum facilitates financial collaboration among filmmakers, producers, distributors and bankers (HKU 2003).

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