Chapter 3

Innovation and entrepreneurship in the Tri-State Region

This chapter focuses on the region's innovation and entrepreneurship capacity. Human capital lies at the core of any innovation ecosystem, and while the region is a magnet for Midwest talent, the segment of the population with low skills along with shortages in particular skills, such as computer science, mathematics and business administration, constitute bottlenecks that need to be fixed. The private and non-profit sectors are more advanced than are the federal, state and local authorities in articulating, promoting and pursuing a true, region-wide vision for innovation-led growth. The chapter underscores the need for a public-sector change in attitude to ensure a reduction in the "race-to-the-bottom" style of competition among local and state authorities and a more strategic focus that orients investments toward supporting the region's innovation drivers through greater collaboration and pooling of scarce resources.

Key Findings

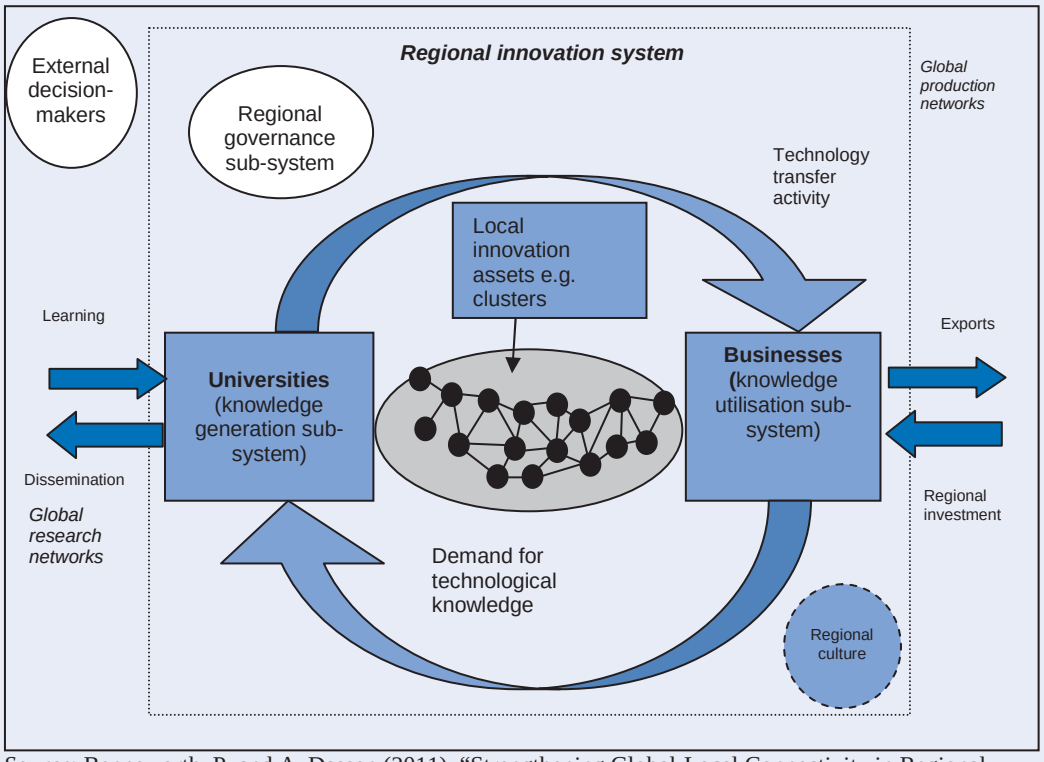
- *The region has generated important technology-based innovation assets; indicators for volume of R&D investment and patenting point to its large size. That said the region needs to use these assets more efficiently to improve its productivity growth and meet regional aspirations of being a global knowledge and technology hub.*
- *Human capital lies at the core of any innovation ecosystem, and while the region is a magnet for Midwest talent, the segment of the population with low skills along with shortages in particular skills, such as in computer science, mathematics and business administration, constitute bottlenecks that need to be fixed if the region is to optimise its innovation potential.*
- *The region's stakeholders need to identify clusters that represent potential for innovation-driven growth and make concerted efforts to capitalise on these clusters' attributes by developing and implementing cluster-specific growth strategies.*
- *The economic development approaches at the state and municipal level in the region, focused on tax breaks for large firms, are ill-adapted to a knowledge economy. Different factors to support entrepreneurship, especially related to start-ups, financing (including venture capital), and the expansion of existing small firms, are integral to the ecosystem and could be more systematically tracked with data and performance indicators that would facilitate enhanced policy support .*
- *Innovation support in the region should recognise that innovation goes beyond fundamental scientific R&D: policy support should also focus on other aspects of value creation, such as in business and financial services, architectural design (for which Chicago is world renowned), or in improving public service delivery to address social challenges. Innovation in these areas can sometimes lead to the successful pursuit of extra-regional or export-oriented market opportunities.*
- *The private and non-profit sectors are more advanced than are the federal, state and local authorities in articulating, promoting and pursuing a true, region-wide vision for innovation-led growth. Developing a common understanding of the region's innovation ecosystem, the key challenges it faces and some common goals for action, supported by more relevant regional data and performance indicators, can help guide efforts at enhancing the region's performance in innovation-driven business clusters.*
- *A public-sector culture change is required to ensure at a minimum a reduction in the "race-to-the-bottom" style of competition among local and state authorities and a more strategic focus that orients investments toward supporting the region's innovation growth drivers through greater collaboration and pooling of scarce public resources.*

The term innovation[1] is used to describe many different phenomena, from scientific discoveries to simply "thinking outside the box" through creativity and design. The OECD identifies four types of innovation in firms: the implementation of a new or significantly improved product (good or service), or process, a new marketing method, or a new organisational method in business practices, workplace organisation or external relations. Such innovations are technological (product or process), as well as non-technological (marketing and organisational). Note that an innovation may have different degrees of novelty. It does not have to be new to the world; it may be new to a market/sector or simply new to the firm/institution. The OECD is considering extending guidelines for innovation measurement to public sector innovation and innovation for social goals.

The latest OECD analyses on innovation[2] reveal several trends that the Tri-State Region could bear in mind for policy action:

- ***Intangible assets and innovation beyond R&D:*** innovation results from a range of complementary assets beyond R&D, such as software, human capital and new organisational structures. Investments in these intangible assets is rising and overtaking investment in physical capital (machinery and equipment) in Finland, Sweden and the United States for example.
- ***Mixed modes of innovation:*** firm-level innovation data reveal complementary strategies. Most innovative firms introduce both product and process innovations, as well as marketing or organisational innovations. This is true for firms in both manufacturing and services. There are, of course, differences by sector and firm size. For instance, a larger share of firms in services compared to manufacturing tends to introduce marketing or organisational innovation only.
- ***Collaboration and networks are essential:*** firms that collaborate on innovation spend more on innovation than those that do not. This suggests that collaboration is likely to be undertaken to extend the scope of a project or to complement firms' competences more than to save on costs. Collaboration is used in innovation processes whether firms perform a lot, a little or no R&D. In this respect, policies that stimulate collaboration and network initiatives will have an impact on the entire spectrum of innovative firms. Higher rates of collaboration are also observed in the sciences. Production of scientific knowledge is increasingly shifting from individuals to groups, from single to multiple institutions, and from national to international arenas.
- ***Convergence of scientific fields and multi-disciplinary/interdisciplinary research:*** there is evidence that increasingly innovations are achieved through the convergence of scientific fields and technologies. For example, nano-science research has arisen from the interaction of physics and chemistry and is interdisciplinary in character. Environmental research is one example of multi-disciplinary research. This convergence requires spaces for interaction and cross-fertilisation of different knowledge domains. The concept of an *innovation ecosystem* is important: innovation is a product of the interaction between a series of public and private actors, both individual (entrepreneurs) and institutional (universities, research centres, big firms, small start-ups, governments) in a given geographic space; *innovation networks* usually sustain these linkages and extend them to related actors in other ecosystems beyond the boundary of the given geographic space (Box 3.1).

Box 3.1. **Regional Innovation Ecosystems**



Source: Benneworth, P. and A. Dassen (2011), "Strengthening Global-Local Connectivity in Regional Innovation Strategies: Implications for Regional Innovation Policy", OECD Regional Development Working Papers, 2011/01, OECD Publishing, based on Cooke, P (2005), "Regionally Asymmetric Knowledge Capabilities and Open Innovation: Exploring „Globalisation 2" – A New Model of Industry Organisation", Research Policy, Vol. 34.

The Tri-State Region's lagging growth calls for more innovation in the economy to remain globally competitive (Chapter 1). The data reveals that the Chicago Tri-State Metro-Region, like many US Metro-Regions, has higher wealth (GDP *per capita*) levels than other OECD Metro-Regions; its growth has been lagging behind both European and many US Metro-Regions pre-crisis. The same is true for labour productivity (GDP per worker) growth. And with the crisis, the regional unemployment situation has worsened in both absolute and relative terms, with the Chicago region's rate changing from below the 2009 OECD Metro-Region average to above. In the long term, for advanced-economy Metro-Regions like the Chicago Tri-State area, the most sustainable factors of growth are those that contribute to a strong knowledge economy with innovating firms.

The Tri-State Region has a number of assets to support innovation in firms but has not prioritised innovation-driven growth drivers in its policy approaches. It also is keenly aware of "recipes" that encourage innovation in the region successfully (see Box 3.2). As developed in Chapter 1, Illinois ranks well on many indicators due to its large size relative to the scale of other OECD regions, but ranks lower when considering the efficiency of those assets relative to the region's size. The region has ambitions to rival coastal regions like the Boston and San Francisco Metro-Regions for a more high-tech and entrepreneurial innovation ecosystem. But it is lagging relative to its enormous potential for a stronger knowledge economy. Global innovation dynamics are changing,

making the process more interactive and requiring new orientations for innovation support in a broad sense, and the Chicago region needs to keep up with these trends.

Box 3.2. **InnovateNow: Chicago's collaborative model to encourage innovation**

The **InnovateNow** initiative is premised on the assumption that purposeful action designed to create a culture of collaboration, build strategic alliances and fully leverage regional innovation assets will result in a competitive advantage in the twenty-first century global economy. It further assumes that firms embracing collaboration and placing value on tapping into and exploiting internal as well as external ideas, resources and channels will be more successful than those firms that do not. It recognises that the traditional inward-focused vertical integration business model is no longer sufficient to compete and win. InnovateNow further recognises that public policy and NGOs can play a role in promoting and providing incentives to encourage collaboration and overcome the limitations of traditional approaches and roles. Fostering such collaboration between public agencies, academia, nonprofits and industry is a key goal for InnovateNow, as indicated in the examples below.

The Innovation Summit: This unique collaboration among business, academia and the public and non-profit sectors was created in 2005 to create a new model for economic development in the new global economy. The Innovation Summit is held annually and convenes the world's best innovation and entrepreneurial experts to highlight best practices and the role innovation can play in transforming Chicagoland into a globally recognised centre of innovation, entrepreneurism and creativity. Presenting partners of the Innovation Summit include an array of public/private organisations drawn from three states and the District of Columbia. **Illinois Innovation Talent Pilot:** This collaborative effort seeks to prepare students to become leaders in the global economy by promoting multidisciplinary problem-solving. InnovateNow, in partnership with the Illinois Department of Commerce and Economic Opportunity, assembled a public-private coalition to work with Illinois high schools to promote innovation-centred, problem-based learning. Through this partnership, teams of Illinois high schools are connected with industry, government and community partners to critically examine and solve complex problems as members of diverse, multi-disciplinary teams using leading-edge information technology. The pilot programme included 23 high school teams partnered with 29 professional organisations, including universities and community colleges from across the state.

Illinois Coalition for Manufacturing Innovation: InnovateNow, in partnership with the Illinois Institute of Technology (IIT) and Argonne National Laboratory, launched the Illinois Coalition for Manufacturing Innovation initiative to facilitate better collaboration around innovation and technology between the research and talent in universities and national laboratories and small and medium-sized enterprises. The objective of the initiative is to create and disseminate new models for engagement and collaboration to help small and medium-sized manufacturers more easily access the brainpower and innovation resources of research institutions.

Crowd sourcing and open innovation: To demonstrate the value of open innovation, InnovateNow posted a "challenge" on InnoCentive, a leading crowd-sourcing platform, to solicit ideas to help reduce greenhouse gas emissions from automobiles by increasing ridership on public transport. Through this platform, InnovateNow was able to tap into the unlimited resources and brainpower of over 170 000 minds from around the world on an issue of great significance to Chicagoland. Individuals as far away as Kenya, Australia and Japan had opinions and useful ideas about how Chicago could decrease automobile use and greenhouse gas emissions by boosting public transportation ridership. InnovateNow was the first organisation from a major metropolitan area in the United States to post a public policy-related challenge on InnoCentive.

Source: Chicagoland Chamber of Commerce (2009), *www.chicagolandchamber.org*.

The Tri-State Region may be reaching a tipping point with respect to a failure to recognise the importance of science, technology and innovation (STI) to boosting the region's economic performance. The region has not sufficiently promoted its science, technology and innovation assets either internally or externally, notwithstanding longstanding efforts by a limited number of regional STI professionals and such recent initiatives such as the creation of the Illinois Innovation Council. But a successful innovation ecosystem has to have many strong parts that work together.

To make this ecosystem more productive there are several axes for public and private action to address. The US in general has basic framework conditions conducive to innovation and specific actions can be taken in the Tri-State Region to build on its unique combination of resources. However, the Tri-State Region includes many municipalities and crosses state borders, preventing a more concerted effort to address the factors that could drive innovation and thus productivity increases. While formal regional innovation strategies are less common in the US than in European regions, the question remains as to how much more effective the region could be with some agreed principles to align interests across different private and public (federal, state and local) actors. Such actions concern:

- Fostering human capital, the base of a strong knowledge economy;
- Building on strong research assets and promoting their access to risk-capital for regional economic benefit;
- Mobilising regional clusters of expertise to develop more strategic approaches;
- Promoting entrepreneurship from start-ups to high growth;
- Reinforcing private financing of innovation and promoting access by entrepreneurs to risk-capital; and
- Taking a broader approach to innovation: beyond science and technology.

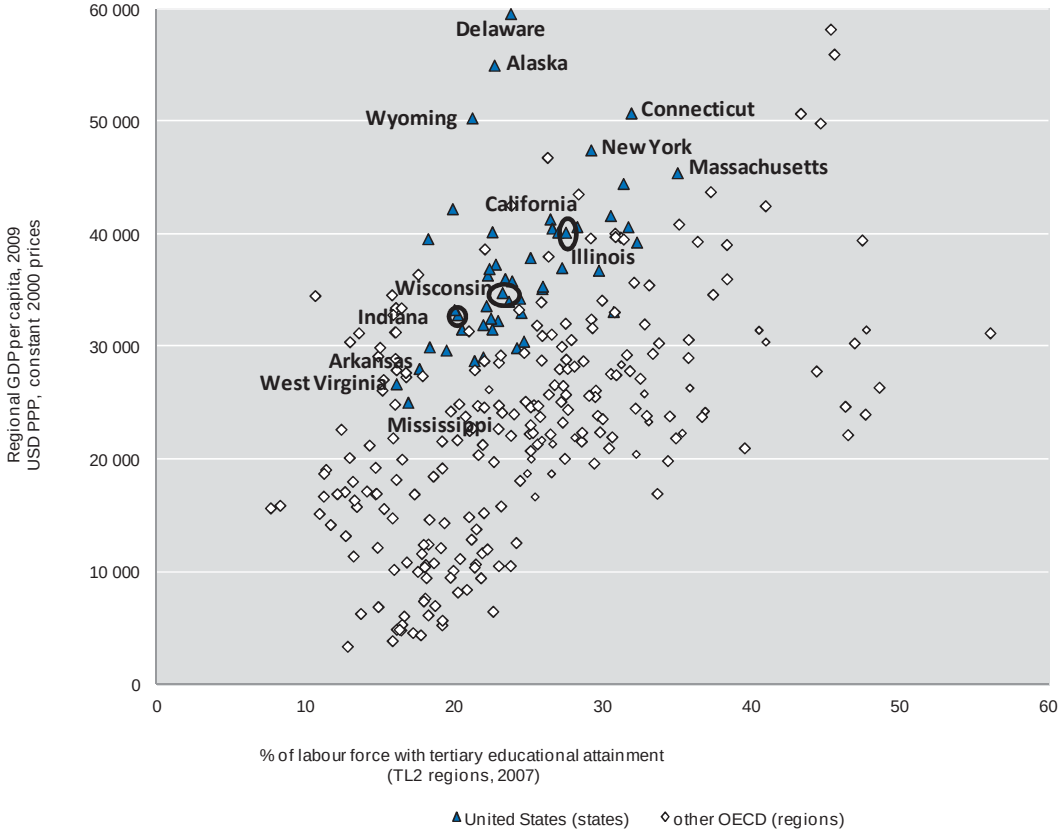
3.1. The Tri-State Region's innovation ecosystem and policies

Human capital: the basis of a strong knowledge economy

Skilled people are at the core of any innovation ecosystem, and the Tri-State Region's ecosystem does not rank among the top in the OECD. OECD analyses of regional growth illustrate that key public investments are ineffective without the presence of skilled human capital (OECD, 2009a), an issue that was also identified in the previous chapter on Workforce Development. Wealth levels of OECD regions are generally associated with a highly skilled labour force (Figure 3.1). While Illinois is performing above most OECD regions and many US states, in terms of educational attainment, it is not among the top. The share of the labour force with tertiary education (27%) places the region at only 105 out of 297 OECD regions with data (14th among US states), behind Canadian provinces such as Ontario and Quebec as well as Massachusetts, Maryland, Colorado, Vermont and Virginia among others. The other two states in the region do not perform as well: Wisconsin is ranked 126th (23.3%) and Indiana 205th (20.3%). There is a notable segment of the labour force with low-skills. In manufacturing, firms are reporting problematic skills shortages in basic math skills as the sector has grown more advanced.[3] In terms of current job ads in the region, the top positions in demand are computer and mathematical (17%), ranging from systems analysts and engineers to web developers and database managers. Other areas in high demand include Management (13% of openings), Sales

(12%), Office and Administrative Support (10%), Business and Financial (8%) and Healthcare Practitioners (7%). Among these jobs, a significant share requires some form of post-secondary education.[4]

Figure 3.1. **Virtuous relationship: wealth levels and human capital**



Note: Washington, D.C. is excluded from this graphic given its outlier status for GDP *per capita* due to commuting.

Source: Calculations based on the OECD Regional Database.

The Tri-State Region needs to be prepared with the skills for the future of advanced knowledge regional economies. The quality of education in the Tri-State Region should be a priority, a perennial challenge being the effective dispensation of basic literacy and numeracy skills through the public education system across the region. There are also gaps in STEM skills (science, technology, engineering and math), a problem for the US generally. For example, the 2009 OECD PISA results measuring the skills of 15-year-olds revealed that the US ranked rather poorly for an advanced economy, with math skills statistically significantly below the OECD average and science around the OECD average. The share of 15 year olds with math proficiency for Illinois was 31%, ranking it 31st of US states, Wisconsin with a higher share at 37% and Indiana at 35% (OECD, 2009b). And the skills for an advanced knowledge economy include thinking in new ways, such as with "decidedly different minds", even for training in STEM skills (Pace Marshall, 2011).

Building on strong research assets to generate region-wide benefits

Partnerships between universities and public labs

The Tri-State Region contains several strong research assets that can contribute to its innovation ecosystem (Table 3.1). Two private, not-for-profit universities – Northwestern University and the University of Chicago – are recognised as leading research universities, while the international conglomerate Arcelor-Mittal has located its world research headquarters in the region. A world ranking places the University of Chicago 9th and Northwestern University 29th.[5] For economics and business they are ranked 2nd and 11th in the world respectively and Northwestern is ranked 12th in engineering. Argonne National Laboratory and Fermi National Accelerator Laboratory combined accounted for approximately 6% of the US Federally Funded Research and Development Centres R&D expenditure in 2008, or around USD 825 million.[6] Argonne National Laboratory, Northwestern University and the University of Chicago accounted for 6% of patents among the top 30 patenting organisations in the Chicago Metro-Region and are therefore active in developing potential innovations.[7]

It is not clear that the Tri-State Region sufficiently promotes its different areas of technology and research excellence. While there is a wealth of research expertise within the universities, these nodes of expertise are not necessarily widely known outside of the region's academic networks. For example, the Chicago Metro-Region is the 6th largest in terms of nanotech publications from 1990-2006 (Shapira and Youtie, 2008). And the increasingly inter-disciplinary and multi-disciplinary nature of scientific discoveries requires new combinations of research competencies. Sometimes regional or national designations of excellence or research excellence are used for promotion and building on recognised strengths. Some universities, regions and countries around the OECD have directories or mappings of such research competence, which is also used in attracting firms. For example, the regions around Cambridge and Oxford in the UK worked together to develop an Innovation Research Map and a Research Excellence Directory. The Tri-State Region could better market itself to key target investor and research stakeholders by advertising its ranking results as well as its success in capturing national R&D funds as indicators of these assets.

Stakeholders in the Tri-State Region need to act more proactively to sustain inter-university strategic alliances to drive R&D. While different forms of ad hoc co-operation occur among the region's laboratories and universities, a more deliberate, strategic focus for their joint actions is needed. The University of Chicago and Northwestern University, among the region's most prominent research-intensive universities, are reported to have relatively ad hoc relationships. However, some university officials are beginning to think more strategically about regional strengths.[8] There are multiple examples of more strategic consortiums of universities in a region with the goal of creating greater critical mass together to compete for national resources and global recognition. Examples include the Georgia Research Alliance in the US, the N8 Research Partnership in the North of England, and the MaRS medical incubator in Toronto, which brings together a diversity of public and private stakeholders to spur basic and applied research and the commercialisation of its results (see box). In both cases these consortia help co-ordinate research and encourage partnering with industry to maximise the impact of the research base (OECD, 2008). The Illinois Science and Technology Coalition (ISTC) and the Wisconsin Technology Council are well placed to trigger such collaboration and act as "honest brokers" with the different universities across the Tri-State Region given that many local higher education institutions are partners in the coalitions (Box 3.3).

Table 3.1. **Leading university and federal lab research resources in the Tri-State Region**

Name	Description
Argonne National Laboratory	• Federally funded laboratory of the US Department of Energy, operated by the University of Chicago • Employs roughly 3 200 employees, 1 000 scientists and engineers (of which around 750 hold doctoral degrees) • Annual operating budget USD 630 million supports upwards of 200 research projects • Since 1990 worked with more than 600 companies and other organisations or federal agencies
Fermi National Accelerator Laboratory	• Federally funded laboratory of the US Department of Energy, operated by the Fermi Research Alliance, a joint venture of the University of Chicago and the Universities Research Association, located near Batavia, Illinois • Specialising in high-energy particle physics with particular accelerator second largest in world • 1 960 employees include about 960 physicists, engineers and computer professionals • Another 2 090 scientists and students from across the US and world carry out research in lab
Northwestern University	Private university with undergraduate and graduate education in multiple schools (business, medical, etc.) • License income 85.3 million USD (4th in US but mainly attributable to one pharmaceutical) (07) • 173 active licenses (07) • 23 start-up firms (04-07) • 11 tech transfer staff (07)
University of Chicago	Private university with undergraduate and graduate education in multiple schools (business, medical, etc.) • -License income 15.1 million USD (07) • -192 active licenses (07) • -2 start-up firms (04-07) • -22 tech transfer staff (07)
Illinois Institute of Technology	Private technological, Ph.D.-granting research university with five campuses throughout the Chicago area • -University Technology Park (including an entrepreneurship centre, incubation and office space, and wet and dry labs)
University of Illinois system	• -Main campus outside of the study region in Urbana-Champaign but a campus in Chicago • -Research parks in both locations, including Chicago Technology Park • -License income 8.1 million USD (07) • -399 active licenses (07) • -40 start-up firms (04-07) • -23 tech transfer staff (07)
University of Wisconsin / Milwaukee	• - Public university with undergraduate (83% of students) and graduate education that enrols more Wisconsin residents than any other university in state • -Stated commitment to support economic health of the state • -Research expenditures have increased from just more than USD 21 million in 1999-2000 to USD 68 million in 2009-10

Source: CMAP (2009), *Innovation Strategy Report*, using data from the annual survey of the Association of University Technology Managers (AUTM); Internet sites of institutions.

Box 3.3. **Science and technology coalitions in the Tri-State region**

The Illinois Science and Technology Coalition (ISTC)

ISTC is a membership organisation aiming at cultivating economic development in Illinois by increasing resources for R&D initiatives at Illinois-based businesses and institutions (including the University of Illinois at Urbana-Champaign, University of Illinois at Chicago, University of Chicago, Northwestern University, Northern Illinois University, and Argonne and Fermi National Laboratories). Its mission is (a) to foster public private partnerships to execute research and development projects, (b) to advocate for funding for R&D initiatives and (c) to collaborate with public and private partners to attract and retain research resources and talents in Illinois. Its current priorities include biotechnology and life sciences, energy and energy storage, food innovation and nanotechnology. With the support of ISTC, its partner research institutes and businesses collaborate with the international R&D community to advance science and discover new technologies that have applications far beyond Illinois' borders. ISTC is the administrative home of the Illinois Innovation Council, an advisory group of leaders convened by Governor Pat Quinn to promote engagement, innovation, and economic development in Illinois. The Council convenes and partners with academic, industry and policy leaders to improve support for innovation, align public and private resources and attract innovation-driven enterprises and individuals to Illinois in order to grow existing industry clusters.

Indiana's BioCrossroads, Conexus, and Energy Systems Networks

These three Indiana-based organisations have common origins and are examples of strong public-private coalitions designed to stimulate economic development in three different "sectors", focusing heavily on research, science and innovation. Indiana's three major research universities (Purdue, Notre Dame, and Indiana University) are heavily involved in one or more of these three cluster-based initiatives.

BioCrossroads serves as a catalyst for the continued growth of Indiana's robust life sciences industry (*http://www.biocrossroads.com/*). Functions include providing funding, launching new businesses or products, and partnering with research institutions, global companies, philanthropic organisations and government. Indiana has a strong base upon which to build as it is home to 825 companies and more than 50,000 life science workers as places like the global headquarters for Eli Lily and Company, WellPoint, Cook Medical, DePuy Orthopaedics, Dow AgroSciences, Zimmer, Bioment; and also serves as the North American headquarters for Roche Diagnostics.

Conexus Indiana is the catalyst to position Indiana as the recognised global leader in advanced manufacturing and logistics (*http://www.conexusindiana.com/).* Indiana has long been labelled as "The Crossroads of America" and has been seen as a national leader in the manufacturing sector, recognising that manufacturing is rapidly evolving as a high tech, innovation-driven industry that has led to an explosive growth in productivity. Conexus Indiana is designed to capitalise on emerging opportunities in advanced manufacturing and logistics, aligning resources and expertise to make Indiana a leader in these exciting industries.

Energy Systems Network (ESN) is an initiative focused on bringing 'clean technology' solutions to market, using innovation to confront tremendous energy challenges that include an overdependence on foreign oil, rising carbon emissions, and the need for a more energy efficient electrical grid (*http://www.energysystemsnetwork.com/*). The mission of ESN is to build an energy ecosystem that connects partner companies and institutions – in Indiana, across the country and around the world – to address energy needs and generate new jobs and investment in the process. ESN provides development and co-ordination for collaborative projects and joint ventures between network members who are working to commercialise new energy technologies.

Box 3.3. **Science and technology coalitions in the Tri-State region** *(cont.)*

The Wisconsin Technology Council

The Wisconsin Technology Council is the science and technology advisor to the Governor and the Legislature. Launched in 2001 and created by state statute, the Tech Council is an independent, non-profit and non-partisan board with members from tech companies, venture capital firms, all levels of education, research institutions, government and law. The Tech Council has three main functions:

1. It provides policy guidance to lawmakers, the governor, state agencies and other institutions in Wisconsin.
2. It serves an important in-state networking role through Wisconsin Innovation Network (WIN), a community-based organisation dedicated to fostering innovation and entrepreneurship.
3. It serves as an economic catalyst through programmes such as:
   - Wisconsin Innovation Network (WIN), community-based organisation dedicated to fostering innovation and entrepreneurship.
   - Wisconsin Entrepreneurs' Conference A programme focused on stimulating more entrepreneurial activity in Wisconsin across all segments of our economy.
   - Wisconsin Early Stage Symposium Open to technology companies seeking all capital.

Source: *http://istcoalition.org; www.wisconsintechnologycouncil.com.*

Box 3.4. **MaRS Toronto**

Toronto's MaRS incubator, standing for Medical and Related Sciences, is not only a successful example of an effort to link commercial success, economic growth and jobs to high quality basic research, it is a good model of a diverse stakeholder approach to achieving those goals.

Historically, Toronto has had a strong level of basic science research, particularly in medical-related areas. In Canada, governments typically fund basic science research through various research councils and grants. Toronto's several downtown teaching hospitals and the University of Toronto all have enviable international reputations in basic research. Toronto is also a major financial services centre, and home to a significant pharmaceutical industry. Yet these strengths did not lead to strength in the commercialisation of basic medical and pharmaceutical research.

As a result, a number of stakeholders – civic leaders, the University of Toronto, the major teaching hospitals such as Mt Sinai, Toronto General and Sick Children's, and private sector business people, (many of whom traditionally were rivals) raised initial funds and then approached the Federal, Provincial, City governments to establish an incubator to help generate social and economic prosperity through innovation. Opened in 2005, the project has been overwhelmingly successful. Everything a start-up needs – from lab space too expensive for any one start-up to build, to venture capital, to legal and patent advice – is available under one roof. MaRS has now incorporated a green lens with its new Tower Labs (supporting technological innovation in the construction and retrofitting of high rise buildings, and other Green initiatives).

The region's universities need to pay greater attention to the educational needs of the metropolitan workforce. Universities serve multiple needed roles in supporting the innovation ecosystem: teaching (the primary mission), research and a third mission of

economic development. Setting strategic objectives in pursuit of these other missions is important, but these objectives should be defined as a function of the primary mission – the education of the future labour force (SSTI, 2006). In terms of the teaching mission, the region has several universities that attract from the local area but also nationally and internationally. The total share of students in tertiary education as a share of the Illinois population is 7.41%, ranking it rather high among OECD regions (26 out of 331 regions). However, the overall share of the working age population with tertiary education is not among the top. In addition to mechanisms that link student curricula to regional industrial needs, there are also opportunities for greater placement of students and recent graduates into local firms to support innovation. One of the best-known programmes internationally is the Knowledge Transfer Partnership programme of the UK's Technology Strategy Board, whose mandate is to map recent graduates against job vacancies in key technology clusters across the UK. In the US a good example of an effective economic development focus can be found in Pittsburgh: Carnegie Mellon, Pittsburgh and Duquesne universities worked effectively with local leadership to develop a comprehensive set of initiatives aimed at redeveloping parts of the Pittsburgh Metropolitan Region.

Many countries and regions promote the placement of highly skilled workers, particularly PhDs, into small and medium-sized enterprises (SMEs) to improve their innovation capacity.[9] While there are no formal programmes at present to finance such placements in the Tri-State Region, different existing programmes could consider looking into opportunities for greater matchmaking between skilled graduates and regional firms. The universities themselves as well as private organisations may play this role in the absence of a publicly funded programme, albeit in many international examples public funding helps subsidise the placement in SMEs for a period of time.

The Tri-State Region's universities need to be more proactive and deliberate in combining these three missions and building strategic partnerships with other players in the region, such as laboratories and key firms, to extend their reach, whether domestically or internationally. The third mission of universities, namely economic development, generally tends to over-shadow the pursuit by the Tri-State Region's regional universities and engineering schools of the other two missions when compared to the global research leaders in the Tri-State Region. While world leading universities tend to focus on integrating all three missions into strategies that seek global reach, institutions that have a regional focus tend to be more active in pursuing local development partnerships (OECD, 2007a). This approach has focused on community development as a means to demonstrate that the university is a "good neighbour" through projects and research that address local (often social) challenges. This is hardly surprising, given that this type of local initiative is truly a function of the school's physical location in a neighbourhood. Since physical proximity seems to drive these relationships, economic development initiatives driven by these universities tends to focus on social issues in their neighbourhoods, given the university's responsibility for the safety of their faculty, staff and students. In the Tri-State Region, regional universities have made a significant commitment to local economic development in their respective sub-regions.

However, this "local" approach to economic development is evolving. The recognition of the value of a broader economic development mission has been gaining ground. The active involvement of the universities in different regionally based committees and councils represents one mechanism that has been adopted to link more convincingly the research-intensive universities with region-wide initiatives that can be marketed nationally and abroad, often garnering international recognition for the members of the partnership. Other incentives could be provided for universities and

national public laboratories in the Tri-State Region to engage regionally, a consideration for future public, private or non-profit initiatives seeking to promote regional economic development.

A number of more regional or applied universities are actively promoting this third mission in the Tri-State Region. Universities like the University of Illinois at Chicago, Northern Illinois University, as well as more local private universities such as DePaul, Roosevelt and Loyola, all have more explicit regional engagement missions and more applied academic programmes help match curricula and research towards regional needs. In the 21-county Tri-State area, the Universities of Wisconsin at Milwaukee and Parkside, Marquette University, the Milwaukee School of Engineering, Valparaiso University, the University of Notre Dame's Chicago operations, University of Indiana-Northwest and Purdue University-Calumet are also notable assets. Illinois recently signed into legislation the Higher Education Technology Entrepreneur Center Act that allows its public universities and community colleges to start such centres, albeit the centres would need to be funded. And the Illinois Institute of Technology, given the direct relevance of its research for firms, is also a key component of the regional system.[10]

The role of intermediaries or "brokers" in optimising research results

Tri-State Region universities are promoting patenting, licensing and start-ups, but the potential impact of such efforts on the regional (and the national) economy can be limited. In many OECD regions, there is an over-emphasis on the measures of success for universities in terms of patents, licensing and start-ups, as well as the resources dedicated to supporting such initiatives. However, these are the indicators by which many university technology transfer offices are evaluated. Often university spin-offs do not grow because the researchers involved do not have the requisite skills and network access to drive commercialisation of research results. And licensing revenues can be like a lottery, with an extremely low share making considerable revenues. Northwestern University's 4th ranked licensing revenues among US universities (2007 data) are mainly attributable to one blockbuster drug, Lyrica. At the University of Chicago, one drug under development ultimately failed a Phase III trial two decades later.[11] The highly variable potential results of these efforts do not guarantee a strong contribution to the regional economy.

Greater efforts should be pursued by universities, laboratories and other key stakeholders in the region to create and support common strategies and activities in a region-wide collaboration on innovation and entrepreneurship. The aim is to achieve greater region-wide effectiveness and to maximise the potential for national and international market penetration of the goods and services that result from effective technology-transfer processes. Indeed research oriented towards commercial application or regional business needs can provide greater potential economic benefits to the region, sometimes with national and even international implications. Technology developed of direct relevance to regional firms is more likely to be used than the occasional win for a high-technology (often in biotech) discovery.

One local report proposes a possible consolidation of university technology transfer offices for greater effectiveness across the region's public laboratories and universities (CMAP, 2009). Whether this specific recommendation is feasible at this time is questionable. However, new models for effective collaboration among university technology transfer offices should be explored. One possible model of such a consortium that could be of interest to regional stakeholders is Springboard Atlantic, a network to support the commercialisation of research in Atlantic Canada that includes fourteen

member universities and five provincial community colleges.[12] By pooling resources, this organisation is able to provide higher quality services at lower cost than if each institution had its own technology transfer office. These are the same principles behind a local example. The Northern Illinois Technology Enterprise Center (NITEC), while based at Northern Illinois University, also supports commercialisation and growth of technology-based enterprises in other local universities and research institutions (including e.g. College of Dupage, DuPage tech-park and IIT). NITEC should investigate the possibility to link with other University technology-transfer offices in the Metro-Region and not only those of technology universities; efforts should be made by the relevant public stakeholders to support such links.

A handful of Science and Technology (S&T) parks in the Tri-State Region support, to a certain extent, the region's innovation ecosystem. The Illinois Science and Technology Park located north of Chicago has a focus on life sciences. The Dupage National Technology Park in West Chicago has considerable space for firms, as does the Purdue Northwest Indiana Technology Center in northwest Indiana. The Chicago Technology Park (on the Chicago campus of the University of Illinois) and the University Technology Park (at IIT) appear to have more services for supporting incubation than the other parks given their university affiliation. Purdue University operates three S&T parks in the Tri-State Region in addition to its tech centre, including the largest one in the country. However, when firms based at these more space-limited university-based parks reach a stage to "graduate" from the parks, there may not be sufficient alternatives (CMAP, 2009). Indeed, the success of science and technology parks is about more than the physical infrastructure. There have been several generations of S&T parks across OECD regions, with the new generation accenting the combination of soft and hard infrastructure. Therefore it will be important that services to link start-up firms to relevant programmes as well as matchmaking services, which may be funded by the park or other sources, accompany such hard infrastructure investments (OECD, 2011a). In this context, key private and public stakeholders, including the chambers of commerce, municipal and county administrations and State agents responsible for innovation policy should undertake a review of incubation services in the Metro-Region to identify the opportunities for developing them and develop ways to address unmet needs in this area across the region.

Private-sector intermediary organisations or "brokers" that help articulate research expertise and business needs are critical for maximising regional "ecosystem" linkages. The most effective brokers often come from the ranks of business service professionals—individuals who have strong networks and relationships among inventors, transformers, and financiers. Economic development practitioners are less likely to play the broker role because they are expected to provide marketing, recruitment, information collection, technical assistance, or other services. Brokers act as facilitators; they help identify current and potential sources of innovation in a region. They help connect innovators to other key actors in the innovation ecosystem often by facilitating collaboration, thereby contributing to the acceleration and expansion of innovation activity in the region. In the Tri-State Region, key institutional players, whether in the universities or the private sector, should seek to identify and maximise the type and role of innovation brokers to enhance innovation capacity in priority business clusters region-wide.

Mobilising the region's clusters of expertise

Conditions for job creation and innovation improve when there is a strong cluster of linked competencies in firms, universities, the workforce, and other related actors. While

the use of the term "cluster" is subject to debate, the general concept of building on different regional assets and making them work better together is not (OECD, 2007b). The efforts to support these groups, commonly referred to as a cluster initiatives or a cluster organisation if there is a specific entity, help to articulate the needs for such clusters of expertise to grow through more strategic private and public efforts.[13]

Key stakeholders in the region could consider adapting current partnerships that have led to successes in innovation in certain business clusters to other, emerging sectors of activity to maximise innovation potential in these sectors A few partnership initiatives have formed to capitalise on clusters of expertise in the Tri-State Region that can support innovation success (Box 3.3). The Illinois Biotechnology Industry Association (iBIO), for example, has focused on an area of regional strength and seeks to build critical mass in traditional biotech as well as linking with agriculture – a strength in the Midwest. The Illinois Technology Association supports the technology base of the region, particularly the IT-related sectors "that make the technology that makes businesses run." In addition to its networking role, it has supported an incubator for technology-based firms (102 firms over four years thus far).

The Tri-State Region has not traditionally had the reputation of being a technology hot spot as its typically business-to-business oriented IT assets tend not to be viewed as key, although more attention is being paid to the region's IT base (Box 3.5). A couple cluster organisations, such as the Milwaukee Water Council and the Clean Energy Trust, are both very new and were not identified based on a cluster mapping but rather recognition of assets and opportunities. The Milwaukee Water Council, for example, grew out of a regional champion and vision, despite a consulting firm reporting to the contrary, believing that it had significant water related assets.[14] Key players in these new business clusters and other emerging ones should build on the successes in the region's biotech and IT sectors to drive the region's partnership-driven innovation capacity. Given the strategic importance of these emerging clusters to green growth, the impact of such innovation could be national and global, as well as regional, over the longer term.

As a global hub for firm headquarters, the Tri-State Region's different advanced business services are of tremendous potential for supporting innovation yet are incomplete in terms of the research functions required to drive innovation in the region. For example, Boeing moved its corporate headquarters to Chicago. However, the research and production-related staff remain in their original location, resulting in more limited impacts on the Tri-State Region's innovation system. The region therefore needs to consider not only the global headquarters functions in its firm attraction strategy, but also those business functions that are best suited to drive innovation and the commercialisation of the results of this innovation. The case of Airbus industries in Europe might be worth considering. Even if its components plants are relatively scattered throughout the main partner-countries, some of its main business and R&D functions are located in Toulouse (France) along with the company's main headquarters that were transferred from Paris. The City of Toulouse has also succeeded in attracting complementary institutions and companies e.g. the National Center for Space Activities or the Spot (satellite) Company.

As the needs of each cluster will vary, further analysis is required. There are significant variations in the nature of technologies or innovations, product lifecycles, skills gaps and other factors that are cluster specific. Only through the identification by cluster actors themselves and associated studies can more clear recommendations be addressed by the cluster members themselves or through public policy efforts. The

recommendations by both the Chicago Metropolitan Agency for Planning (CMAP), in its *GoTo2040* report and others such as The Chicago Metropolis Strategies to further explore cluster needs are important for taking different components of the innovation system to the next level. The Oregon Cluster Plan, emphasising as it does the need to meet cluster demand, could be a useful benchmark here.

Box 3.5. **Industry/cluster organisations in the Tri-State Region**

Illinois Biotechnology Industry Association: iBIO, has a mission is to make Illinois and the surrounding Midwest one of the world's top life sciences centres. It does so through public policy advocacy, business connections (such as supporting venture capital and angel investor opportunities), group purchasing (helping particularly small and midcap funds), and special programmes to help firms (such as iBIO PROPEL that is a series of programmes to support life sciences start-ups and existing companies).

Illinois Technology Association: ITA is a 700+ membership organisation of firms "that make the technology that make businesses run." While it covers a range of sectors, its core constituency appears to be IT-related firms that are focused on technology for business-to-business needs.

Milwaukee Water Council: Founded in 2009, the Council seeks to align the regional fresh water research community and water-related industries to establish the Milwaukee 7 Region as the World Water Hub for water research, economic development, and education. It includes several committees (Talent/Education, Corporate-University Linkages, Global Communications, Policy Economic Development, International and Water Stewardship).

Clean Energy Trust: Launched in 2010, with support from the private sector and the US Department of Energy, it offers business development support to clean energy start-ups for commercialisation and market growth and possibly financial assistance (renewable energy, energy efficiency, smart grid and energy monitoring/controls and next generation transport). It also has a broader mission of education and advocacy related to the adoption and advancement of clean energy technology.

Source: *http://www.illinoistech.org/, http://www.thewatercouncil.com/, http://www.cleanenergytrust.org/, http://www.ibio.org./.*

Tri-State Region's is much broader than the above clusters and innovation is also relevant for the rest of the economy. While some are more explicitly research and technology-based and should be promoted, one cannot neglect the vast share of the economy in the region that is not R&D-driven but that generates significant value-added and jobs and ought therefore to be addressed through broader approaches to innovation. Even small increases in the productivity levels in the largest sectors in the economy could significantly impact the region's economic performance. In addition, important spillovers occur between clusters that should be tracked when developing policy to support innovation capacity: for instance, the region is a significant air and ground passenger transportation hub; this spurred the creation of the internet-based travel company Orbitz. Founded by several of the region's airlines, Orbitz was launched in Chicago due in part to the existence of a hub of such international importance in the region.

Entrepreneurship: key to innovation-driven high-growth potential

The Tri-State Region's economy is shifting towards a smaller firm size, and the challenge will be for such firms to grow to the next stage with critical mass to invest in innovation. In 1999, only 21% of the region's labour force was in firms of fewer than ten employees or self-employed, 36% in key, "second-stage" firms from 10-99 employees, and 43% in firms with 100+ employees. Over the following decade, the absolute and relative share of employment in these small firms has grown (to 31%) while those in firms over 100 has declined (to 34% of employment) (Figure 3.1). Therefore it is small and "second-stage" firms, and the self-employed, that have generated around 440 000 jobs over the period while medium and large-sized firms (over 100 employees), have shed around 375 000 jobs.

Table 3.2. **Employment shifting to smaller-sized firms in the 21-county region**

Establishments	2007	2008	Opened	Closed	Net Opened	Expanded	Contracted	Net Expanded	Move In	Move Out	Net Moved In
Total	668 330	719 839	80 094	28 327	51 767	26 726	5 668	21 058	2 705	2 973	-268
Non-commercial	39 729	41 516	2 934	1 211	1 723	1 656	343	1 313	97	100	-3
Non-resident	31 571	30 544	641	2 358	-1 717	509	378	131	170	169	1
Resident	597 030	647 779	76 519	24 758	51 761	24 561	4 947	19 614	2 438	2 704	-266
Self employed (1)	191 571	211 305	39 009	8 159	30 850	12 792	0	12 792	652	862	-210
Stage 1 (2-9)	334 254	366 373	36 757	14 058	22 699	10 632	3 941	6 691	1 326	1 431	-105
Stage 2 (10-99)	65 980	65 088	727	2 346	-1 619	1 011	850	161	416	372	44
Stage 3 (100-499)	4 607	4 422	23	171	-148	106	131	-25	38	34	4
Stage 4 (500+)	618	591	3	24	-21	20	25	-5	6	5	1
Jobs	**2007**	**2008**	**Opened**	**Closed**	**Net Opened**	**Expanded**	**Contracted**	**Net Expanded**	**Move In**	**Move Out**	**Net Moved In**
Total	6 431 545	6 396 718	185 385	275 291	-89 906	127 181	81 683	45 498	43 448	33 905	9 543
Non-commercial	856 410	855 423	9 950	15 075	-5 125	7 783	4 283	3 500	723	540	183
Non-resident	1 221 885	1 171 442	25 650	90 285	-64 635	16 187	32 827	-16 640	8 124	7 103	1 021
Resident	4 353 250	4 369 853	149 785	169 931	-20 146	103 211	44 573	58 638	34 601	26 262	8 339
Self employed (1)	191 571	211 305	39 009	8 159	30 850	20 906	0	20 906	652	862	-210
Stage 1 (2-9)	1 050 560	1 126 624	84 774	42,428	42 346	40 510	5 775	34 735	4 693	4 848	-155
Stage 2 (10-99)	1 593 281	1 572 439	18 210	56,095	-37 885	25 381	8 731	16 650	10 532	8 907	1 625
Stage 3 (100-499)	796 912	763 300	4 742	28 339	-23 597	9 744	11 589	-1 845	6 195	5 873	322
Stage 4 (500+)	720 926	696 185	3 050	34 910	-31 860	6 670	18 478	-11 808	12 529	5 772	6 757

Source: *Youreconomy.org* based on NETS database, Edward Lowe Foundation.

Fiscal incentives to large firms do not work

While there are several examples of entrepreneurship support programmes, the most visible public to support firm growth in the region are tax incentives for large firms. Federal, state and local programmes for SME support and entrepreneurship in general are accessible in the Tri-State Region, including through universities and specialised centres, as well as those managed by local private initiatives (Box 3.6). However, much of the effort for supporting firms is actually oriented to large firms through tax incentives at both state and municipal level, with a limited focus on entrepreneurs who are actually driving innovation. As one prominent local financier has noted, efforts have been focused on attracting corporate headquarters instead of helping "the guy who's tinkering around in the garage."[15] Therefore consideration should be given conducting a thorough cost-benefit analysis of the impact of public expenditure (and foregone tax revenues) on innovation and job-creation in the region generated by such expenditures.

Some high profile cases of locally educated entrepreneurs who have left the Chicago region have begun to raise awareness about regional conditions for entrepreneurs. Founders of several famous internet firms such as Netscape, Paypal and YouTube studied at the University of Illinois but founded their companies in California where there was greater access to talent, capital, and other environmental factors conducive to internet-based high-tech start-ups. A co-founder of YouTube, a graduate of the Illinois Math and Science Academy as well as the University of Illinois, has indicated that the region does not have a sufficiently attractive environment for new technology investment.[16]

Box 3.6. **Examples of local innovation and entrepreneurship initiatives in the Tri-State Region**

Chicagoland Entrepreneurship Center: The CEC was created in 1999 by the Chicagoland Chamber of Commerce in response to studies commissioned by the Commercial Club of Chicago and the Mayor's Council of Technology Advisors and prepared by McKinsey & Co. and the Metropolis Project. The studies determined that there were many supportive agencies for entrepreneurs, but most had a narrow focus that didn't allow for the type of comprehensive guidance high-growth businesses often require. It identifies the region's most promising entrepreneurs and helps them build high-growth, sustainable businesses that serve as platforms for economic development and civic leadership for the Chicago area. In turn, CEC clients mentor young talent, advising their peers, and joining the CEC "movement" to inspire entrepreneurship in the Chicago region. The CEC is funded through private entities and corporations, as well as government grants. It is also supported by numerous budding and successful entrepreneurs, established businesses and academia.

The Kellogg School of Management, Northwestern University: The Center for Research in Technology and Innovation (CRTI) pursues academic research of relevance for innovation managers, notably concerning the role of technology. The centre and its faculty are engaged in collaborative research with many multi-national firms. The Kellogg Technology Strategy Summit (KTSS) are forums for firm executives for discussion that informs CRTI research.

The **Kellogg Innovation Network (KIN)**, founded in 2003, is a global community of innovation and growth leaders. The core members represent large, established corporations, though since 2009 the KIN has expanded to include leaders from non-profits, government, academia, defence and the arts. The mission of the KIN is to enhance its members' capabilities and professional networks to help them build prosperity through innovation. In 2011, the KIN initiated a KIN ASEAN for the southeast Asian region, a KIN Nordics for the Nordic countries and KIN Natural Resources for the global mining industry. Over the next few years, these informal groups will develop their own regular programming, with everyone congregating at the Kellogg School each May at KIN Global.

Box 3.6. **Examples of local innovation and entrepreneurship initiatives in the Tri-State Region** *(cont.)*

The **Wisconsin Angel Network** (WAN)'s mission is to build angel network capital capacity throughout Wisconsin in order to increase the number and amount of seed-stage equity investments in Wisconsin companies, creating jobs and improving our economy. The ***Wisconsin Entrepreneurs Network*** provides entrepreneurs with access to a state-wide network of resources and expertise, identifies high-potential entrepreneurs and helps move their businesses forward, facilitates collaboration between entrepreneurs and between organisations that assist entrepreneurs, and helps create and grow minority-owned businesses.

The Wisconsin Entrepreneurs Network provides entrepreneurs with access to a state-wide network of resources and expertise, identifies high-potential entrepreneurs and helps move their businesses forward, facilitates collaboration between entrepreneurs and between organisations that assist entrepreneurs, and helps create and grow minority-owned businesses.

The mission of BizStarts Milwaukee is to create a vibrant, innovative and prosperous entrepreneurial business climate in the Milwaukee 7 region by inspiring, nurturing, connecting and celebrating entrepreneurs and their companies.

The **Wisconsin Security Research Consortium** of research institutions in Wisconsin is dedicated to delivering world-class science and technology solutions in response to our nation's homeland security requirements.

BioForward is the member-driven state association that is the voice of Wisconsin's bioscience industry. The association focuses on creating investment and partnership opportunities, attracting and retaining talent and supporting public policy that fosters continued growth.

Source: www.wisconsinbiotech.org; http://www.innovatenow.us; http://www.kellogg.northwestern.edu/research/crti/kin/; http://www.chicagolandec.org/.

Family-owned firms: the next level

The region's manufacturing sector has a significant family-owned component of SMEs that requires tailored strategies to move these enterprises to the next level of productivity and market reach. OECD research has shown that greater economic impacts may be found by helping existing SMEs as opposed to focusing on start-ups. The OECD and others have found that many high-growth SMEs are not necessarily high-tech pioneers, but have been able to incorporate existing technology or business models quickly for innovation with commercial benefit (OECD, 2010b). In the U.S., data show that 1% of firms with high growth are responsible for around 40% of new jobs (Stangler, 2010). Another entrepreneurship issue for the region is the transition planning for family-owned firms, such as in manufacturing that could grow but suffer from weaknesses in management and succession. In a survey of 1 100 member manufacturing firms in the area, the average company was around 50 years old, family owned, had 47 employees, USD 10 million in sales, and only exported 4% internationally.

Private financing of innovation

In the Tri-State Region, access to venture capital by start-ups and SMEs is significantly hampered, notwithstanding the fact that the region is an important national banking centre. Venture capital (VC) is among the private financing sources commonly used to measure the dynamism of an innovation system. Funds tend to be sector based and require a critical mass of companies and skilled talent. VC funds also rely on tight

networks for providing more than financial support.[17] This is why the flow of private VC funds is highly skewed in any national context to a limited number of higher-technology firms for expansionary capital. It is therefore not a financing source for most high-growth firms. Firms in the Tri-State Region are reporting that they are being asked by VC funds to move to the coast to receive funds, and that funds for start-ups and major investments are more readily available than for the middle range of VC investments.[18]

Indeed, in the Tri-State Region, while research universities conduct more than USD 1 billion annually in basic research, innovative firms face a "Valley of Death" syndrome, meaning that entrepreneurs cannot seem to obtain financing to move their invention to a stage where it can be produced and commercialised. As a result, inventions in the region sometimes "wither on the vine".[19] While Illinois is ranked 5th in the US in 2010 for volume of VC, due in large part to investments in Groupon that year, it remains far behind the coastal hotspots. Illinois investments were approximately USD 732 million (Figure 3.2) California raised 16-fold the level of investments of Illinois, and Massachusetts over 3-fold. When considering the volume relative to population, even just taking the Chicago Metro-Region population, those rates for California and Massachusetts are still five-fold and four-fold higher relative to the figure for Illinois.[20] Illinois investments covered a range of industries, 34% biotech, 19% industrial/energy, 18% business products and services, 16% telecom, 7% software, and 6% other sectors. Three-fourths of the funds invested in Illinois companies actually came from funds located outside of the state (16% California, 7% New York, 6% Texas, 3% Massachusetts, and 44% other). While the amounts for the other two states may not flow to the Chicago region of this study, it should be noted that Wisconsin ranked 21st at USD 122 million, 76% to biotech and 95% coming from outside the state. Indiana ranked 23rd with USD 80 million (mainly to the computers & peripherals, software, and media & entertainment sectors, with half of the investments coming from California-based funds and 25% from funds based in other Midwestern states).[21]

The Tri-State Region could also generate greater economic benefit from these venture capital investments by developing and implementing strategies to commercialise the results of VC-funded R&D, thereby creating more jobs through start-ups, spin-offs and tech-transfer schemes in the region. A joint study by the National Venture Capital Association and HIS Global Insight found that Illinois ranked 13th for jobs and revenues for Illinois-registered venture capital backed firms, yet it was 5th for overall volume of fund receipt. This implies a greater potential economic impact of such investments than currently achieved.[22] Wisconsin ranked 25th in jobs and 24th in revenues (versus 21st for volume) and Indiana 19th in jobs and 17th in revenues for venture-backed companies headquartered in the state (versus 23rd for volume). In comparison, other states ranked lower than Illinois for volume but higher for impact include: Washington State (6th for volume yet 4th for jobs and 2nd for revenues) and Pennsylvania (7th for volume but 3rd for jobs and 4th for revenues).

Financial support for innovation in firms comes mainly from private sources, but there are some possible public levers with respect to venture and angel capital. For example, state and even large local governments in the Tri-State Region may supply capital (through its own fund or as a fund of funds via equity or loans, generally for seed and start-up needs as opposed to expansion), give incentives or regulations to encourage venture capital investment (including tax incentives – including investment (including tax incentives – including investment tax credits of the kind explored by Wisconsin, and guarantees, tax credits of the kind explored by Wisconsin, and guarantees, allowing new actors to invest in VC), or provide other services (organise events to link venture capital

funds to firms, provide services to aid firms in becoming venture capital ready, etc) (OECD 1997). The recently renewed authorising legislation for the Technology Development Account in Illinois allows the state to invest up to 2% of its portfolio in venture capital funds.[23] Illinois has ceased matching support for the federal Small Business Innovation Research (SBIR) and Small Business Technology Transfer (STTR) programmes (while Indiana continues to do so), yet such funds serve as early stage capital innovation finance where venture capital funds may not invest. As angel capital networks rely more on local information and trust than venture capital, there is even greater scope for filling information gaps through such localised networks that include linkages with technology incubators, public/university spinoffs and national networks. For example, in regions where VC funds are less likely to seek investment opportunities, the City of Ottawa (Canada) organised visits for venture capital funds located elsewhere to meet the region's local ITC firms. The Tri-State Region could therefore consider adopting some of these approaches to enhance the supply of venture capital.

While venture capital is important for firm growth, there are many other forms of investment in innovation that could be further developed in the Tri-State Region such as investments in skills, management practices and external R&D absorption capacity by firms. While there was USD 260 million venture capital invested in Illinois in 2005, R&D spending by private firms that year totalled USD 9.7 billion (37 times more) in addition to the USD 2.8 billion in public/non-profit R&D spending. Furthermore, many innovations are generated without R&D so these values under-estimate the total of firm-level innovation investments. One study shows that around 75% of innovations in the United Kingdom derive from investments in activities other than traditional R&D investments, including investments in skills, organisational innovations and design (NESTA, 2009). Therefore public or private efforts that seek to influence firm spending on innovation should not be focused solely on R&D. The goal of public spending is to have a leverage effect on private spending on innovation in its different forms.

3.2. Broaden the innovation focus

Non-science-and-technology-based innovation

In the context of its innovation efforts from public and private actors, the Tri-State Region can also promote innovation policies that go beyond science and technology. For example, 77% of the economy is in service sectors. The Tri-State Region has been a long-time innovator in the financial services sector. The Chicago Board of Trade (now part of Chicago Mercantile Exchange Group) began in 1848 as the first futures and options exchange in the world. The Tri-State Region is also a global hub for knowledge-intensive business services such as transportation and logistics, legal, consulting, accounting and advertising industries where innovation is important. The Tri-State Region has strong cultural industries as well as architecture that buttress a thriving creative sector. Other OECD regions have made active efforts to promote their design capacities, along with the linkages between design and local firms, through cluster associations, specialised centres, financing incentives for firms, and other means (Box 3.7). Chicago has a strong foundation in the discipline of design. The Illinois Institute of Technology's Institute of Design, established in 1937 as the New Bauhaus, is the largest full-time graduate design programme in the United States. Private sector design and innovation firms founded in Chicago, such as Gravity Tank and Doblin, have led the way in helping global clients grow through boosting design and innovation capacity. Other firms not founded in Chicago but with offices in Chicago, like IDEO, provide additional depth in the design community.

Box 3.7. **Non-traditional forms of innovation support**

Beyond the different tools to promote innovation via R&D spending and technology transfer, newer forms of innovation support are being promoted at national and regional level in OECD countries, including those regions with a strong industrial tradition.

Building on creative sectors: Baden-Württemberg in Germany has recognised for over 15 years that there are important synergies between culture and the creative industries with its technology base. The agency created by the region is focused on linking the IT, software and telecommunications sector with the creative industries.

Using design: As innovation through design can result in significant commercial value, there are many programmes to promote design. Many countries have created agencies to support industrial design, including France, the United Kingdom and Canada. The province of Quebec (Canada), for example, offers incentives to firms for design-led innovations to groups of three or more firms that engage in design-led innovation projects in manufacturing, ICT and services. Others have promoted regional branding with design, such as regions in Italy.

Promoting business and organisational innovation: The Basque Country, Spain has supported programmes and institutions that promote excellence in management, such as Euskalit, the Basque Foundation for Excellence, as a driver for innovation.

Developing new skill sets for the future workforce: The province of Guipuzcoa in the Basque Country, Spain has recognised that culture change is important for its future in the knowledge society. One of the initiatives has been to adapt Daniel Goleman's work on emotional intelligence to educational modules for school children as well as the workplace and other civil society actors such as sports teams. The province has also promoted entrepreneurship initiatives in schools to raise awareness at an early age.

Establishing universities as a core actor of regional innovation system. The NURI (New Universities for Regional innovation) was planned to strengthen the innovation capacities of provincial universities in Korea. . Major strategies of NURI includes i) attracting good students and retain talents in the regions, ii) improving educational conditions and develop workforce education and develop programmes, iii) building productive partnerships with local authorities and business and to provide skilled workers and advanced technologies to the industrial clusters in the regions and iv) playing a leadership role in developing and maintaining effective regional innovation systems.

Expertise pooling: The Plato initiative: The concept of expertise pooling is based on learning by interaction among participating SMEs on the one hand and between SMEs and large well established companies playing the role of tutors on the other hand. Typically, Plato is a two year programme addressing the managerial needs of regional network of small firms. Small business owners and managers are forming groups of 8-12 members. Each group has usually two leaders representing large local parenthood companies. The Plato experience started in the Flemish region but is now replicated in many European countries including Denmark, France, Germany, the Netherlands, Sweden and the UK

Strengthening social innovation Stanford University's highly ranked Graduate school of Business hosts a large Centre for Social Innovation that has the mandate to build and strengthen the capacity of individuals and organisations to develop innovative solution to social problem. Stanford defines social innovation as a novel solution to a social problem that is more effective, efficient, sustainable than existing solutions and for which the value created accrues primarily to society as a whole rather than private individuals

Source: OECD (2011), OECD Reviews of Regional Innovation: Basque Country, Spain, OECD Publishing; OECD (2010) Higher Education in Regional and City Development: Amsterdam, the Netherlands, OECD Publishing; and OECD (2010), Higher Education in Regional and City Development: the Autonomous Region of Andalusia, Spain, OECD Publishing.

The levers for public support in service sectors differ from traditional S&T support instruments associated with R&D or technology transfer, often focusing on talent development and attraction. OECD work on services has noted that success for large service firms is often based on: a) open markets, b) innovation and ICT and c) work organisation and human resources (OECD, 2005). Furthermore, studies of innovation in knowledge intensive service activities (KISA) show that such firms serve as sources, facilitators and carriers of innovation throughout the economy (OECD, 2006). Efforts to revitalise the city of Chicago and its downtown as well as its cultural vibrancy are elements of this increasingly attractive environment for certain kinds of skilled labour, the so-called "creative class", serving as a magnet for talent.[24] And training the workforce to adapt to new ways of thinking and working, as well as entrepreneurship, could be promoted in the Chicago region, either through educational systems in K-12, like in the Basque Country, Spain, as part of the upcoming reinvention of Chicago's community college system and in the reform of higher education more generally (Box 3.6). The links between creative media and technology reinforce innovation, as promoted in Germany through cluster development efforts (Box 3.6). Chicago's Tribeca Flashpoint Media Arts Academy is one local institution training for this interdisciplinary mix of media products and services with technology. Stakeholders in this cluster in the region could therefore examine whether these linkages could be deepened across the Tri-State Region to enhance the performance and growth prospects in the region's ICT cluster.

Meeting social challenges through innovative service delivery

The Tri-State Region has a long-standing tradition of philanthropy and civic engagement, including efforts to support for the region's development and social innovation. Innovation driven by philanthropists and civic institutional leadership can potentially significantly improve the lives of thousands of the region's residents through enhancements in the delivery of basic public services, in stressed neighbourhoods, for instance. Philanthropy and civic leadership groups play a prominent role in the region. In fact, the initial Burnham plan for the region's development was commissioned in 1906 by the Merchants Club, which later merged with the Commercial Club of Chicago, which published the report under its name in 1909. More recently, it has created the Chicago Metropolis 2020 (now Metropolis Strategies) to promote healthy regional growth. The Chicago Metropolis Strategies, founded in 1915, has a mission through philanthropic efforts to improve the quality of life and prosperity of the region by supporting projects and research, including more recently support for broader regional economic development. The Civic Consulting Alliance, which brings together not-for-profit, private and public actors, provides concrete solutions to public sector challenges. For example, it has provided technical support for the implementation of the new Chicago Metropolitan Agency for Planning (CMAP). It has also helped tackle issues of education, workforce development, public safety and the environment.

That said there has not been a comprehensive evaluation conducted of the impact of all this civic-minded activity on key policy outcomes across the Tri-State Region. What impact have the Foundations and community-based not-for-profits actually had on addressing social challenges in the Tri-State Region? Can positive impacts be scaled up? Can successes achieved by philanthropic organisations decades ago be adapted to today's social challenges in stressed neighbourhoods across the Tri-State Region? Can the traditional business-civic relationships that characterised the successes in the Tri-State Region in the last century be replicated today, given the profound transformation in the region's economy and evolution of region's business leadership? Can successes in a

given policy area in a given neighbourhood be replicated to address different challenges in different neighbourhoods in the region? Do these successes represent a business opportunity for export into other Metro-Regions around the country and abroad? These issues could be studied more systematically to understand the civic leadership potential in the Tri-State Region more clearly.

Indeed, the Tri-State Region suffers from many social challenges that can be addressed through innovative solutions in the delivery of basic services to the public; for example by adopting purpose-designed software to increase the effectiveness of delivering, say, training or educational services, based on a general public call for proposals for new software. There are persisting pockets of poverty in the region that are often grouped along racial and ethnic lines. The lesser successful public schools in the Chicago region are a problem both for the general skill level of the workforce as well as retaining a strong tax base to improve city attractiveness. The concept of social innovation is gaining ground internationally. There are numerous examples of social innovation efforts in the Tri-State Region, including those supported by area universities and philanthropies. One of the Illinois Innovation Council initiatives is to support better services in the Chicago metro area through software applications that are created by the public at large in an open innovation approach.[25] And social innovation is now being promoted by the new US federal government Social Innovation Fund to finance activities that will lead to high-impact innovations to social challenges. In 2010, the Chicago area had ten sub-grantees in the economic opportunity area of this Fund, the largest number of sub-grantees of any region in the country.[26]

Social challenges also represent market opportunities, not simply an arena for philanthropy, and the public sector can help drive this through procurement and other regulations. Much of the efforts in the Tri-State Region are associated with some form of charity or civic responsibility. But there is a limit to what can be supported outside of the market. The region's efforts with respect to supporting innovation and clusters in health care, water and clean energy are some examples of market based efforts addressing social challenges. Government action to support the demand side of innovation (i.e. giving an incentive for the private sector to develop products), is often neglected in favour of policies that promote uptake of knowledge from public laboratories or universities. Such demand-side policies are used by many OECD countries to address social challenges where market and system failures may justify public intervention (OECD, 2011c). Standards and regulations can oblige firms to develop innovations to address social needs, such as in areas of green growth. Public procurement approaches that promote development of new products, depending on procurement regulations, can also have an important impact. The region may consider how local and state level procurement and regulations can be used more effectively to encourage innovation with existing spending through innovative, strategic partnerships between public authorities and their civic and philanthropic counterparts.

3.3. Public-Private-Partnerships for innovation: adapting to the knowledge economy

The three states belonging to the Tri-State Region maintain, overall, relatively traditional economic development approaches among advanced OECD regions, characterised by initiatives designed to lure businesses away from one part of the functional region to another (or from other parts of the country), often with old-fashioned financial incentives whose impacts are short-term at best. One of the primary areas of focus for economic development is attracting and retaining large firms via lowering tax

rates in exchange for a move into the state. This is typified by the "Illinoyed" campaign (a play off of the words Illinois and annoyed) launched by the Indiana Economic Development Corporation to attract firms from the Illinois part of the region based mainly on its lower tax rates. Even within Illinois, there is intense competition among municipalities. For example, United Airlines made a symbolic move of its operational centre (including 2 800 jobs) from a location in a suburb near the airport to the Willis Tower (formerly Sears Tower) in downtown Chicago. This move may have benefitted the city but it was clearly not a net gain for the Tri-State Region as it is an intra-regional move. A culture change among state and local public officials towards innovation-driven growth is needed.

A degree of competition across municipalities and states is critical; however this "race-to-the-bottom" type of competition is not a durable source of job creation and economic growth. Several studies in the US have highlighted this problem within and across states for regional and US competitiveness in a global marketplace (ITIF and Kauffman, 2010; Council on Competitiveness, 2010). This problem was also observed for Mexican states whose economic development approaches have been focused on attracting foreign direct investment and large multi-national firms but not as much on building a knowledge-based infrastructure to attract and maintain multi-national firms (OECD, 2009). Swiss cantons are knowledge-intensive regions that are highly competitive for firm attraction. As many of the cantons are relatively small in size and population, this is a disadvantage for the functional regions to which multiple cantons may belong. A recent study highlighted this problem for the country's innovation-driven regional development (OECD, 2011d). In the EU the INTERREG programme, implemented by the European Commission to promote co-operative projects between regions including hard and soft infrastructure projects, represents a good tool to balance these centripetal forces.

Many OECD regions that are highly successful knowledge hubs, even with relatively higher level tax regimes, nevertheless remain competitive because they have put a strong focus on fostering innovation. The region that includes Gothenburg Sweden, for example, was successful in retaining a Ford Plant because it mobilised around its research strengths and not tax giveaways (OECD, 2007c). The Copenhagen Metro-Region has also proven highly competitive in areas such as biotechnology and design. It has been attracting international highly-skilled talent to reinforce the positive dynamics of its innovation ecosystem (OECD, 2009d).

Among the more technology and innovation-driven state-level efforts in the Tri-State Region, there are a few noteworthy public or public-private institutions and programmes (Table 3.3). The Governor of Illinois recently created the Illinois Innovation Council, at the public urging of the Chairman of the Chicagoland Chamber of Commerce, the late Jim Tyree,[27] in its efforts to expand beyond the basic economic development approaches. The state also has a Technology Development Account to invest in private venture capital funds. However several authorised programmes have seen budgets cut or eliminated, such as the Innovation Challenge Grant program (to match federal SBIR grants) or the Illinois Technology Enterprise Centers program. The creation of the public-private Wisconsin Economic Development Corporation is another step towards providing institutions better able to address innovation-driven economic development. Indiana's 21st Century Fund created in 1999 supports commercialisation and technology development, including through matching grants to the federal SBIR program. The state also promotes a Venture Capital Investment Tax Credit. Overall, for an OECD region, particularly those in a decentralised country context such as the U.S., state policy efforts to support innovation in the region remain relatively limited.

Table 3.3. **Key state level innovation bodies and programmes in the Tri-State Region**

State	Agency or Council	Key innovation programmes
Illinois	Department of Commerce and Economic Opportunity (public)	-Technology Development Account: to support VC funds (up to 2% of state's portfolio) - -IEN: Illinois Entrepreneurship Network offers co-ordinated access to small business services.
Illinois	Illinois Innovation Council (private)	Launched in 2011 to advise the Governor, it seeks to transform the state economy through 30-50 new projects in five areas They concern: *i*) **message** (broaden the notion of innovation, improve image), *ii*) **Productivity/connectors**, *iii*) **Stakeholder groups** (to build on disparate organisations and share information), *iv*) **Access to capital** and *v*) **Innovation in government** (examples include developing data and challenging the technology community to take into account under-utilised assets)
Indiana	Indiana Economic Development Corporation (public-private partnership)	-21st Century Research and Technology Fund, created in 1999, supports development and commercialisation of advanced technologies, including 20% fund set aside for matching grants to federal SBIR program -Venture Capital Investment Tax Credit
Wisconsin	Wisconsin Economic Development Corporation (public-private corporation)	-Wisconsin Angel Network (WAN); (privately managed) -Wisconsin Entrepreneurs' Network (WEN); funded by state (managed by the University of Wisconsin-Extension's Division of Entrepreneurship and Economic Development) -Wisconsin Innovation Network (WIN);
Wisconsin	Wisconsin Technology Council (private)	Launched in 2001 as the science and technology advisor to the Governor and the Legislature.

3.4. Capitalising on federal innovation support programmes

There are several federal programmes to support innovation, including new cluster-related initiatives, notwithstanding the fact that innovation policy generally falls under state-level economic development responsibility. Federal support for research and innovation is fragmented across a number of departments and agencies, with defence research spending accounting for a large share of R&D, and other mission-driven research spending such as in health and increasingly energy and nanotech (Shapira and Youtie, 2010). Many programmes, including those with a regional dimension in their conception or implementation, come from the Department of Commerce, the National Science Foundation, and even the Department of Labor.[28] Furthermore, there have been increasing efforts to consider a regional innovation cluster approach in policies of several federal agencies, including in addition to the above, for example, the Department of Agriculture (Muro & Katz, 2010). Among programmes of the Economic Development Administration of the Department of Commerce, there are several projects in the region that directly support its innovation system (Box 3.8). The Department of Commerce Manufacturing Extension Partnership program has centres and offices in all states, and which serve the Tri-State Region via the state administration of the programme. While there have been some additional federal investments with recent stimulus packages, state budgets are getting tighter, and public investments to spur innovation are at risk for being cut dramatically across the country.[29]

Among the most prominent federal programmes that firms may access are the SBIR/STTR programs, and the Tri-State Region does not capture a strong share. Eleven federal departments participate in the SBIR (Small Business Innovation Research) program. The funds are awarded to small firms for feasibility or proof of concept. Several federal departments participate in the related STTR (Small Business Technology Transfer) program as well. For uptake for the prominent SBIR program, Illinois ranked only 17th among US states for awards from 2000-07, capturing about 1.6% of the national total (versus 4.5% and 6th for state GDP in 2007). For Indiana, which also gives matching SBIR awards, the state's capture is 0.7% ranking it 26th (versus 1.8% and 18th

for state GDP), albeit an analysis of recipients reveals that most are located outside of the Tri-State Region and are elsewhere in the state.[30] For Wisconsin that figure is 1.0%, ranking the state 24th (versus 1.7% and 22nd for state GDP).[31]

Box 3.8. **Innovation-related projects supported by EDA of the US Department of Commerce in the Tri-State Region**

- ***Chicagoland Entrepreneurship Center:*** funding for a Cluster Acceleration Program to provide critical business information, resources, knowledge and relationships to incubate emerging business ventures and encourage entrepreneurship growth.
- ***Chicago's Sustainable Industries:*** financing of a project to identify opportunities for the City to create greater long-term economic and environmental impact from public and private investment. The three phases include: *i)* a strategy document that identifies the manufacturing sectors that have a future in Chicago, economically and ecologically, and recommendations to support these industries, *ii)* obtaining data and developing that data into systems for future use, and *iii)* targeting public investments, preserving industrial land, co-ordinating business services, and public/private enterprise facilitation.
- ***Battelle Memorial Institute:*** Assist and recruit businesses in Chicago's Humboldt Park neighbourhood to increase local capacity by providing management expertise and technical support and contributing technology and literacy training initiatives as the basis for a comprehensive "Latino Development and Technology Accelerator" operating plan.
- ***Illinois Institute of Technology:*** Interior and exterior build-out and renovation, including equipment, for wet and dry lab business incubator facility.
- ***Southeast Wisconsin Innovation Center:*** Construction of a LEED-certified Southeast Wisconsin Innovation Center (and business incubator), including, office space, a wet lab and flexible R&D space. The office space will include modest accommodations for entrepreneurial support agencies and related technical assistance for incubator tenants, including for economic development and University partners.
- ***BizStarts Milwaukee:*** to create a network of support resources for start-ups in Southeast Wisconsin
- ***Center for Advanced Technology and Innovation (CATI):*** Its mission is to connect "technology patrons and entrepreneurs" with "technology beneficiaries." Serving as a technology transfer intermediary, CATI helps private industries leverage their idle intellectual properties by matching them with existing companies and start-up businesses in need of those technologies. CATI is the link between technology excess and technology success. CATI is located near midway between Milwaukee and Chicago outside of Racine, Wisconsin
- ***EDA's University Center Program:*** its most recent round of funding (2011) was unprecedented in its emphasis on innovation and entrepreneurship. Three of its 2011 awards went to Tri-State Region universities: Purdue, the University of Illinois and the Milwaukee campus of the University of Wisconsin.

Source: Economic Development Administration, US Department of Commerce and local sources.

Stakeholders in the Tri-State Region should focus on engaging federal and state responsibility centres that manage innovation-support programming to co-ordinate their investments more systematically and tie these investments more explicitly to evidence of innovation potential across the established and emerging business clusters in the region. Federal and state governments should, for their part, focus on achieving a balance

between longer-term new or basic research and development versus applied R&D for the dissemination/commercialisation of existing technologies and develop more inter-institutional collaboration and partnerships of a complementary nature to exploit both. Indeed in a study of a nearby Midwestern large-scale region, federal innovation funds were noted as larger scale financing sources with greater impact on firm-level innovation but not linked to regional development strategies. The Cleveland, Akron, and Youngstown (Ohio) and Pittsburgh (Pennsylvania) area was one of the 19th century industrial motors of the US While it has suffered from industrial decline, the region has taken many innovative actions to reinvigorate declining industries. The study found such federal innovation funds were too time consuming to access and siloed, that state and local funds were easier to access but were more limited in amounts, and that the combination of programmes did help firms both leverage private financing as well as benefit from new expertise and financing sources. Federal funds were found to be more successful at supporting incremental improvements in goods and services than state funds, in part due to larger aids. The study also suggested that federal programmes work more closely with state and local leaders who are close to firms to take into account more regionally tailored and new approaches to regional economic development (Feldman and Lanahan, 2010). Indeed, with respect to supporting research, federal and state governments should pay attention to the balance between longer term basic R&D for new development and applied R&D for the use and dissemination of existing technologies. Such a focus can lead to more inter-institutional collaboration and partnerships of a complementary nature.

Networking to overcome barriers

There are many impediments to a more coherent strategic approach to supporting innovation in the Tri-State Region. While the private sector does not restrict its operations to jurisdictional boundaries, public actors do. Some of the reasons for the lack of a strong coalescence around core goals include: a diversified economy which require co-ordination and policy coherence, an excessive number of units of local government, the three state boundaries, and the tax competition based economic development approach of public actors focused on firm attraction based on job counts but not necessarily quality.

Common goals and limited transactions costs are essential for collaboration but have been hard to address. Such collaboration motivations generally include: functional ties that span administrative borders (labour markets, clusters, research competencies); confronting common problems; building critical mass; increasing specialisation and complementarity of regional assets; or economies of scale for jointly financed public action. As developed in Chapter 1, the functional linkages have been growing over time. For certain sectors and clusters, building greater critical mass is still an issue to place the region more squarely within global networks. The other rationale also holds in the case of the Tri-State Region. However, given that Illinois' innovation assets predominate in volume and performance in the region, supporting the integration of innovation assets located in the parts of the other two states located in the Tri-State Region requires even greater political will (and foresight) since it requires a recognition of the need to support an out-of-state asset that drives the regional economic engine. In a context of slower growth in the Tri-State Region the need to accelerate region-wide innovation might nevertheless become more pressing. At the same time regional actors are now in a better position to build strategies as new analytical tools, methodologies and metrics are being made available by federal departments such as the EDA's Regional Innovation Acceleration Network (RIAN). Stakeholders in the region should take full advantage of these federal support tools.

Administrative boundaries notwithstanding, it becomes crucial for key public and private stakeholders from across the region to sustain strategic alliances to encourage innovation and expand domestic and international market-penetration opportunities for the region's innovation-driven enterprises. Indeed many OECD cross-border regions have been working to overcome these barriers in line with common interests, even across countries, ranging from light to more intensive interventions (Table 3.4).

Table 3.4. **Examples of cross-border S&T and innovation collaboration in some OECD regions**

Name	Scale	Focus	Instruments
Southern Technology Council (US)	13 southern US states	• Information sharing • Investment promotion • Image/culture change	• Publications such as "Innovation with a Southern Accent" to highlight facts about the South and areas of technical competency • Periodic theme meetings
Northern Way (UK)	Spans 3 administrative regions	• Building critical mass • Advocating to central government the importance of this region • Increasing functional linkages	• N8 Research Partnership program to support excellence in industry-relevant research for priority sectors/clusters • Policy intelligence and data on the functional linkages within the Northern regions • Interfacing with central government as a group of regions
Greater South East (UK)	Spans 3 administrative regions	• Building on strong connectivity and critical mass	• Joint innovation programmes University business fellows and technology transfer programme • Innovation research map • Research excellence directory • Joint business support and knowledge networks in area of common strengths
Oresund (Sweden and Denmark)	2 regions spanning two countries	• Broader economic integration agenda • For innovation, cluster initiatives like Medicon Valley	• Infrastructure investments to facilitate movement and economic linkages • Cross-border cluster organisation to promote region's life sciences research and firms
Brainport – Eindhoven area (Netherlands)	21 municipalities that span parts of two Dutch provinces	• Promoting the region as a knowledge hub internationally • Advocating to central government the importance of this region • Supporting business and technology efforts	• Promotes the region as an attractive location to bring in high skilled labour • Support of High Tech campus with open innovation model • Knowledge transfer activities
Co-ordination across Bureaus of Science and Technology	Shanghai municipality with neighbouring provinces of Zheijang and Jiangsu	• Supporting science and technology projects jointly for large economic zone • Mobilising greater national funds for research projects of joint interest	• Harmonisation of policies for actors to engage across administrative boundaries

Notes: Following the change in government of the United Kingdom, regional administrative districts were abolished in 2011.

In the wider Tri-State Region, the Milwaukee 7 group is a local example of how to overcome the competition barriers once there is recognition of a common goal. While individual counties may still compete for firm attraction, they do so with the support of this branding through the Metropolitan Milwaukee Association of Commerce and using their economic development code of ethics. The private sector has therefore been facilitating efforts to make the region stronger, thus helping all seven constituent counties better off. The Denver Metro Economic Development Corporation has also created a regional code of ethics to reduce the losses associated with inter-municipal competition (Council on Competitiveness, 2010). For cross-state and cross-country boundaries, there are also examples. The Oresund region between Copenhagen (Denmark) and Malmo (Sweden) have been working to integrate this cross-national region. For the Southern Technology Council, an advisory council on innovation and technology policy issues for a group of Southern US states, the primary motivation for collaboration is a set of common goals (information sharing, investment promotion and image/culture change). There are many examples of cross-boundary strategic partnership building, some close to home, one within the Tri-State Region itself that regional stakeholders can examine as they pursue the development and implementation of region-wide strategies to support innovation-driven growth.

The closest document to an overall regional strategy that includes innovation is the *GOTO 2040* Comprehensive Regional Plan produced by the Chicago Metropolitan Agency for Planning. While it only covers north-eastern Illinois by mandate, many of the principles are valid for the Metro-Region or the Tri-State Region more generally. It identifies the importance of: *i*) improving data and information systems, *ii*) nurturing the region's industry clusters, *iii*) enhancing the commercialisation of research, targeting investments and pursuing new funding opportunities, and *iv*) developing a "culture of innovation". The plan also identifies key public and private actors that can support innovation, be they CMAP, the Illinois Department of Commerce and Economic Opportunity or the private and non-profit sectors via the Chicagoland Chamber of Commerce, foundations or universities.

The Chicago Metropolis Strategies, which helped support the development of the GOTO 2040 Plan, has encouraged further community discussion by also supporting an analysis by RW Ventures, Regional Innovation Acceleration Network of the plan's economic impacts and additional recommendations, notably including those focusing on innovation. The analysis notes that:

The recommendations are not deeply tailored to analysis of the particular types and stages of innovation which present current opportunity in the local economy – a key next step as implementation proceeds

The emphasis of GOTO 2040's recommendations around knowledge networks and spillovers is primarily focused on the later stages of the innovation process – fostering relationships that contribute to increased commercialisation and entrepreneurship – rather than on the earlier stages. As it moves toward implementation, CMAP may want to consider augmenting its innovation recommendations to address strengthening of networks and idea exchange in the idea generation and concept testing states, including particularly between research institutions and the private sector

The recommendations aimed at improving the region's institutional environment and culture for innovation may be focused in three ways:

- Efforts to improve the commercialisation of technology may be more effective if they were delivered through a cluster-based framework

- Cultural improvements need to be targeted. In particular, the business community may offer insight into both the innovation opportunities in the marketplace and the types of challenges that they face in pursuing innovative activities in the region

The innovation needs of large firms, in addition to those of start-ups and small business, need to be addressed.[32]

In addition to CMAP, there are several other state and local councils and associations that are promoting technology and innovation-related strategies and actions. Illinois has recently launched the Illinois Innovation Council that will finance projects seeking to transform the Illinois economy through five levers. The Illinois Science and Technology Coalition, relatively dormant for several years, has become more active in lobbying efforts at state and federal level for S&T-based development, as well as supporting some other innovation-related projects like the secretariat of the Illinois Innovation Council. The Chicago Council on Science and Technology (C^2ST), founded in 2006, has a mission of promoting science education and science awareness through public events. The Wisconsin Technology Council, in place for ten years, has a *Vision 2020: A Model Wisconsin Economy* that recognises the importance of education and other key drivers of a knowledge economy. The strategy highlights guiding principles, such as a global perspective, international centres of excellence and a focus on wealth not just jobs. To do so, it recommends organisational initiatives such as a think tank (Institute for Inter-disciplinary Research), Research Centres of Excellence and Technology Clusters.

Achieving region-wide benefits

Several actions could set the stage for greater future collaboration among regional public and private actors towards more strategic regional thinking in support of innovation. This is of course easier said than done, but is increasingly an imperative in light of global competition. In fact, Indiana has a Regional Economic Development Partnership Program to support communities working together regionally, albeit within the state borders. Success in several regional examples for the US on collaboration for innovation have noted that to move from "competitive disadvantage to collaborative advantage", regions need: *i*) regional leaders, *ii*) joint actions, *iii*) ongoing intermediary organisations, iv) identities and a story to tell, v) a focus on enabling action over precision of regional definitions (Council on Competitiveness, 2010). Some of the actions that the region could take to achieve the common goals for a stronger regional innovation system include:

- *Create inter-state and inter-municipal dialogue to reduce zero-sum-game competition*: The notable economic linkages within region and the Midwest more generally, illustrate that all have an interest in the success of this area for driving growth. Tax incentives that simply move firms from one side of a border to the other do not contribute to overall regional growth or to improving its innovation ecosystem. There are examples in the US of economic development codes of ethics developed by different groups, including through a recommendation encouraging regional governors associations or even the National Governor's Association to consider this issue (ITIF and Kauffman, 2010). As is the case with the need to harmonise inter-state fiscal policy for the benefit of the entire Tri-State Region's growth prospects (see Chapter 6), the need to sustain inter-state dialogue on innovation policies, even if it simply focuses on reducing overlap or duplication in regulations or incentives to attract business, is crucial to build trust

across state lines as a basis for developing a common approach to optimising the region's innovation-driven growth potential over the long term.

- Expand the types of stakeholders involved in building regional innovation actions by extending the notion of innovation to non-R&D-based activities and by ensuring that non-profit, civic and academic actors are included within innovation networks across the region. One of the challenges for changing the traditional approaches to promote innovation-driven regional development is to involve new actors in the process, including young entrepreneurs and firms that are not always among "the usual suspects". The large-firm bias in many public policies is reinforced by the nature of leading associations that are often driven by large firms.
- *Produce relevant data on innovation at the regional scale.* As recommended in other regional reports, this step will help raise awareness that underpins more regional thinking. The work to develop an Illinois Innovation Index is one important step at raising awareness, and should allow when possible for cross-county and cross-state calculations. A balance will need to be struck between an index based on indicators that simply valorises the region versus serving as a true measure of areas of problematic performance that needs to be addressed by regional actors (Box 3.8).
- Federal agencies and philanthropic foundations could provide incentives for learning to collaborate, as well as programme-related investments to support start-ups. Federal actors may provide incentives for developing strategies for functional regions. For example, the EDA has provided a grant to support the regional strategy of the three counties in northeast Indiana. As they are dependent on the health of the Tri-State Region, incentives could be provided to for such a project to include strategy development collaboration with the entire functional economic area. Congressional leaders from the three states associated with the Tri-State Region could work more together in Washington in support of joint needs. And private foundations that play an increasingly important role in supporting regional economic development could also make this collaboration a condition for certain grants. Indeed, in the Tri-State Region, there is a history of private foundations supporting start-ups in stressed neighbourhoods and such community organisations as the Clean Energy Trust that focus on bridging the gap between research institutions and start-ups. In the OECD the above-mentioned INTERREG programme has supported cross-regional STI activities in a more general development context over the past two decades. It has been so successful that its budget has grown regularly over the period. In France, co-operation is being enhanced between competitiveness poles in several regions notably in the aerospace, automobile and green technologies industries. In the US, the southern technology council groups 13 states all seeking to promote innovation through information sharing, investment promotion and image/cultural changes (OECD, 2011a).
- *Critically review economic development programming for cost-neutral innovation-driven growth.* It is also a time to prioritise among existing investments, including lost revenues in tax breaks, to make strategic choices. Even if there is no additional public expenditure, there can be a reorientation of existing approaches towards more durable sources of economic development. And public procurement and regulation, cost neutral to public budgets, can also be

potential tools for spurring innovation. Thus many state departments can consider how to make their portfolios innovation-friendly.

- *Consider a long-term-investment strategy for innovation-supported economic development.* While many of the actions to support the regional innovation ecosystem may be achieved without significant expenditure, public investment is of course an important option to consider. Ohio voters supported a USD 700 million bond issuance to extend the state's Third Frontier programme during the recent recession given their commitment to technology-based economic development. OECD countries such as Finland, Korea and Sweden have made investments in innovation during prior crises that helped them successfully grow later. In the Tri-State Region, given the states' debt and operating deficit challenges (see Chapter 6), any strategy to convince the state administrations to enhance public investments in support of innovation needs to underscore the key importance of pooling scarce resources across state lines and between public, private and academic stakeholders.

Box 3.9. **Examples of innovation-related categories and scoreboards for regions in OECD countries**

Regional Innovation Scoreboard (EU): This periodic analysis of EU regions considers a range of indicators classified into enablers, firm activities and outputs which ultimately classifies regions into high, medium-high, average, medium-low and low innovation regions. (*http://www.proinno-europe.eu/page/regional-innovation-scoreboard*)

State New Economy Index (IITT and Kaufmann Foundation): This index uses a range of variables that are organised into sub-indices covering the categories of: knowledge jobs, globalisation, economic dynamism, the digital economy, and innovation capacity. (*http://www.kauffman.org/research-and-policy/snei-interactive.aspx*)

OECD Categorisation of Regions: This analysis considers 12 indicators across OECD regions to classify them into eight groups based on similarities of performance on economic structure and innovation-related variables.

Source: Ajmone Marsan, G. and K. Maguire (2011), "Categorisation of OECD Regions Using Innovation-Related Variables", OECD Regional Development Working Papers, No. 2011/03, OECD Publishing.

Box 3.10. **Argonne National Laboratory**

Argonne National Laboratory, one of the US Department of Energy's oldest and largest national laboratories for science and engineering research, employs roughly 2 800 employees, including about 1 000 scientists and engineers, three-quarters of whom hold doctoral degrees. Argonne's annual operating budget of around USD 695 million supports upwards of 200 research projects, which are broadly described below. Since 1990, Argonne has worked with more than 600 companies and numerous federal agencies and other organisations.

Argonne's mission is to apply a unique mix of world-class science, engineering and user facilities to deliver innovative research and technologies. We create new knowledge that addresses the most important scientific and societal needs of our nation.

Source: U.S. Department of Energy (2011), *http://www.anl.gov/*.

Notes

1. According to a recent stream of research (OECD 2010a, Corrado et al. 2009), firms' investments in new knowledge, namely in intangible assets, benefit from a higher output growth not only at the time of the investments but also years later. In some countries, such as the US, estimates show that intangible assets have a great impact on economic growth and they explain a good portion of the multifactor productivity growth (i.e. a measure of technological change and the inability to fully measure the sources of economic performance) data to be added on the economic multipliers of each of the forms of innovation cited – and the skills sets and characteristics of the workforce that implements the innovation or that produces or brings on-line the new product/service to determine whether the Tri-State area would score high on process innovation, which would support a race to the bottom in extracting cost out of production as a substitute for creating a new product or service.

2. OECD (2010) Ministerial report on the OECD Innovation Strategy: Innovation to strengthen growth and address global and social challenges: Key Findings, OECD Publishing, Paris; OECD and Eurostat (2005), Oslo Manual – Guidelines for Collecting and Interpreting Innovation Data, OECD Publishing, Paris; OECD (2010), Measuring Innovation: A New Perspective, OECD Publishing, Paris.

3. Per interviews with firms, workforce development professionals and other agencies during OECD mission 21-25 March 2011.

4. Per study by the Chicago Workforce Investment Council for the Chicago Metro Region, Q2 2011, based on 234 430 recent postings from internet job boards from 3 April through 1 July 2011 in the following counties: Cook, DuPage, Lake, Will, McHenry, Kane and Kendall.

5. Academic Ranking of World Universities is compiled and published by the Center for World-Class Universities and the Institute of Higher Education of Shanghai Jiao Tong University, China. The ranking uses six objective indicators to rank world universities, including the number of alumni and staff winning Nobel Prizes and Fields Medals, number of highly cited researchers selected by Thomson Scientific, number of articles published in journals of *Nature* and *Science*, number of articles indexed in Science Citation Index - Expanded and Social Sciences Citation Index, and per capita performance with respect to the size of an institution.

6. Per data from the National Science Foundation.

7. Data provided in background survey to OECD based on data from Prof. Michael E. Porter, Cluster Mapping Project, Institute for Strategy and Competitiveness, Harvard University.

8. Per interviews during OECD mission 21-25 March 2011.

9. For further information, see *http://www.ktponline.org.uk/*.

10. For example, New York City announced in mid-2011 that it would provide significant incentives (land in Brooklyn's Navy Yard or on Roosevelt or Governors Island and up to USD 100 million in infrastructure upgrades) for a university to build engineering or applied sciences campus with the goal of building a critical mass of technology entrepreneurs.
11. Per interviews during OECD mission 21-25 March 2011.
12. For more information on Springboard Atlantic, please see *http://www.springboardatlantic.ca/index.html.*
13. While the concept of clusters is not new, it has gained prominence in policy circles in large part due to the research of Prof. Michael Porter. For further detail on the common definitions of cluster-related entities, please refer to Sölvel, O., G. Lindqvist and C. Ketels (2003) *The Cluster Initiative Greenbook*, Ivory Tower AB, Stockholm, Sweden.
14. Per interviews during OECD mission 21-25 March 2011.
15. "We're not doing a good enough job of letting people outside Chicago know what exists here," says Mr Pritzker. "Many of our business organisations have been focused on getting the headquarters of big corporations to locate here, rather than saying: 'How do we help the guy who's tinkering around in the garage?'" from Financial Times Article 28 December 2011 *High-tech savvy helps Chicago shrug off rustbelt image http://www.ft.com/cms/s/0/72cd826a-129d-11e0-b4c8-00144feabdc0.html#ixzz1Ty3kEh4k.*
16. Per interviews during OECD mission 21-25 March 2011 and 20-24 June 2011.
17. See Sorenson and Stuart (2001) and Sorenson and Stuart (2008) for a detailed analysis on VC networks and spatial distribution.
18. Per interviews during OECD mission 21-25 March 2011 and 20-24 June 2011.
19. *February 2011 issue of* Technology Transfer Tactics*.*
20. Over the last ten years, the Illinois Ventura Capital Association reports that the Chicago MSA has accounted for approximately 93% of deals and 99% of venture capital and private equity volume in the state.
21. For more data on venture capital, see the National Venture Capital Association *http://www.nvca.org/* VC Impact by State and *https://www.pwcmoneytree.com/.*
22. Per a 2011 study by the HIS Global Insight and the National Venture Capital Association *http://www.nvca.org/.*
23. However, the conditions imposed for within-state investment (the fund must double the state investment in the fund in terms of investments in Illinois firms), while already occurring in the last round of the TDA, is an example of conditions that could nevertheless add an additional barrier for attracting outside funds to the state.
24. Term coined by Richard Florida.
25. See examples at *http://appsformetrochicago.com/.*
26. For further information, please consult *http://www.nationalservice.gov/about/programs/innovation.asp.*
27. ("Help wanted: Innovation czar to transform Illinois", Crain's Chicago Business, March 30, 2009
28. National Science Foundation programs include, among others: the Partnerships for Innovation; Advanced Technological Education Program; and the University Cooperative Research Centres. Department of Commerce programs include:

Manufacturing Extension Partnerships; Technology Innovation Program; and Economic Development Administration programs. The Department of Labour has the WIRED program, Community-Based Job Training Program.

29. For example, 30 states have made significant cuts in higher education expenses, a major source of innovation-related funding for research as noted in European Commission, 2009 based on information from the Rockefeller Center on Budget and Policy Priorities.

30. Analysis of recipients of Indiana state matching SBIR grants may be found in Ball State University (2010), *Comprehensive Examination of the Performance of the Indiana 21st Century Research and Technology Funds*, Prepared by the Center for Business and Economic Research, Ball State University, September 2010.

31. For all US states, see US National Science Foundation Science and Engineering State Profiles: 2006–08 (November 2009*), http://www.nsf.gov/statistics/nsf10302/*.

32. "Economic Impacts of GOTO 2040", Kosarko, Gretchen and Robert Weissbourd, RW Ventures, LLC, pp 27 – 28, January 2011, The Chicago Metropolis Strategies (*http://www.cct.org/sites/cct.org/files/CCT_GOTO2040Impact_0111.pdf*).

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