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INNOVATIVE CAPACITY STRATEGY MEMO

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Introduction

Innovation fuels economic growth and improves our quality of life. The process of conceiving and developing new ideas, technologies, companies, and industries helps bring improved goods and services to market. These can provide better functionality, more affordable prices, or entirely new offerings, benefiting both companies and their customers. As the global economy evolves, sustainable and resilient growth increasingly depends on the Chicago region's capacity to transform new ideas into higher productivity and greater competitiveness. Public strategies can create the conditions for such innovation to fuel longer, more sustained and inclusive economic growth.¹ Despite being imbued with substantial economic assets, available data indicates the region lags behind peer regions in terms of research, commercial development, and entrepreneurial activity.

Innovation can take many forms and occurs throughout the economy. Rapid technological changes are often the most prominent examples, such as recent advances in artificial intelligence, advanced materials, and the digitalization of services.² New, unforeseeable industries can arise as these breakthroughs find applications throughout the economy.³ However, other forms of innovation can also generate important economic benefits, such as a better way of operating a business. More subtle process innovations can help businesses reduce errors, increase output, and improve quality and speed beyond current capabilities. For example, advances in data analytics have allowed businesses to reorganize production and distribution, finding new efficiencies.⁴ Based on the recommendations established in the GO TO 2040 plan, CMAP's policy and planning work aimed to support the full range of innovative and entrepreneurial activities that contribute to economic vitality.

Because the private sector drives innovation, the role of the public sector is to find ways to help spur innovation by supporting institutions, relationships, and the essential components of a modern economy like high-quality education and infrastructure. Policy and programs aimed at spurring innovation should focus primarily on supporting dense, dynamic economic activity in the Chicago region. In addition to economic development, ON TO 2050 will emphasize entrepreneurial growth and the adoption of innovations among incumbent businesses, while acknowledging the vital role and importance of new idea generation and development. CMAP continues to support the work of other organizations striving to improve our region's position at the cutting edge of scientific, technological, and commercial breakthroughs.

¹ National Science and Technology Council, "National Network for Manufacturing Innovation Program: Annual Report," (Executive Office of the President, 2016), <https://www.manufacturing.gov/files/2016/02/2015-NNMI-Annual-Report.pdf>.

² James Manyika, Michael Chui, Mehdi Miremadi, Jacques Bughin, Katy George, Paul Willmott, and Martin Dewhurst, *A future that works: automation, employment, and productivity*, (McKinsey Global Institute, 2017).

³ CMAP ON TO 2050 memo, "Alternative Futures: Transformed Economy," 2017, <http://www.cmap.illinois.gov/onto2050/futures/economy>.

⁴ Manyika et al. *A future that works*.



Acting on the CMAP Board’s guidance, ON TO 2050 strategy papers aim to refine existing policies, explore limited new policy areas, and develop more specific implementation strategies. This strategy memo focuses on major shifts in the region’s innovative capacity since GO TO 2040 was adopted. As in the previous plan, ON TO 2050 will primarily emphasize innovation as the product of vibrant economic activity and high-quality human capital. Continued efforts to bolster the region’s innovative capacity are necessarily predicated on support for the region’s existing economic strengths and assets. Its will inform ON TO 2050 recommendations to retain high-quality talent and businesses, nurture industry clusters, and foster strong economic and productivity growth. This memo is one of three that develop strategies to improve the region’s economic resilience; two others discuss regional economic development and human capital.

Research and stakeholder engagement

To develop this strategy, CMAP staff reviewed literature, analyzed data, identified major policy developments since GO TO 2040, and consulted partners at organizations that directly impact innovation goals. Stakeholders included individuals working in sub-regional economic and community development, incubators, applied innovation programs, education and training funding, and economic development research. Stakeholders helped to identify the region’s emerging needs for fostering innovative capacity and how long-range planning can bolster the entrepreneurial opportunities available to residents and businesses.

CMAP staff also solicited feedback on the strategy from the agency’s working committees, particularly the Economic Development and Human and Community Development working committees. Both the interviews and presentations to the working committees provided feedback on the relationship between improved innovative capacity and efforts to further strengthen the region’s economic and workforce development. Such feedback helped shape and refine the recommendation in this report.

Regional innovative performance

The Chicago region has the types of economic assets to support innovation -- world class research institutions, a diverse industry mix, and a high-quality labor force. Yet, available data indicate the region continues to fall short of peer regions in economic growth and the commercial development of new ideas. Since the 2007-09 recession, metropolitan areas have experienced uneven progress in translating product and business innovations into new regional economic growth.⁵ Although the Chicago metropolitan economy -- the third largest in the U.S. - is a global economic center, indicators show that the region’s post-recession growth (2009-15)

⁵ Richard Shearer, Alec Friedhoff, Isha Shah, and Alan Berube. *Metro Monitor: an index of inclusive economic growth in the 100 largest U.S. metropolitan areas*, (Brookings Institution, 2017).



ranks just 59th among the 100 largest U.S. metropolitan economies.⁶ Several macro issues – stagnant population growth, fiscal challenges, and economic disparities -- are constraining economic growth. While innovation is not easy to measure with precision, available indicators suggest that slower rates of innovation and entrepreneurship likewise contribute to the widening gap between the region and its peers, like Boston, Los Angeles, New York, and San Francisco.

Because invention and innovation can be a long-term and expensive process, one key measure of an innovative economy is research and development (R&D) activity among incumbent businesses. The private sector necessarily leads this process to develop and commercialize new ideas, and provides the majority of such R&D investments. In comparison to peer regions, the Chicago region performs less business R&D activity paid for by the companies themselves or other funders, such as federal and state governments or institutional collaborations.⁷ However, recent research demonstrates that such measures of R&D expenditures may underestimate other business investments that also spur productivity growth.⁸ Intangible investments -- like employee training or nonscientific product and organizational development -- may become more important as industry trends towards the caring professions, predictive analytics, and outsourced business services continue.⁹ Programs like the Illinois Manufacturing Excellence Center (IMEC) or the Digital Manufacturing and Design Innovation Institute (DMDII) offer examples of how the public sector can collaborate closely with the private sector and to support such practices.

Innovative growth requires the commercial development of newly invented products and services. Patents can encourage innovation by granting inventors exclusive rights to use, sell, or license an invention for a set period of time. These rights help businesses and institutions to capitalize on their investments in R&D by giving them a competitive edge in the marketplace, helping to drive prosperity. Employees in U.S. industries with higher than average levels of intellectual property and patenting earn 46 percent more than those in other industries, despite no significant difference in education levels.¹⁰ In 2016, metropolitan Chicago produced 3,826

⁶ CMAP analysis of U.S. Bureau of Economic Analysis data. For the purpose of making like comparisons, the geography included extends beyond the seven-county CMAP region to include the entire tristate, 14-county Metropolitan Statistical Area (MSA).

⁷ CMAP analysis of National Science Foundation data.

⁸ Lee Branstetter and Daniel Sichel, "The case for an American productivity revival," *Policy Brief* no. 17-26 (Peterson Institute for International Economics, 2017).

⁹ Carol Corrado, Charles Hulten, and Daniel Sichel. "Intangible Capital and Economic Growth," *Review of Income and Wealth* 55, no. 3 (2009): 661–85.

¹⁰ Justin Antonipillai and Michelle K. Lee, *Intellectual Property and the U.S. Economy: 2016 Update* (Economics and Statistics Administration and U.S. Patent and Trademark Office, 2016), <https://esa.gov/sites/default/files/ip-and-the-us-economy-september-2016.pdf>.

U.S. utility patents¹¹ -- well ahead of its prior peaks with a slight decrease since 2014 that was mirrored in peer regions.¹² Increased levels of R&D expenditures nationwide and a surge in information technologies have fueled patenting growth in recent years.¹³ However, the region has consistently patented fewer invented products and services than other regions over the last decade, producing 31,850 patents between 2007-16 and ranking seventh among U.S. metropolitan areas. This performance is well below major patenting centers in the San Francisco-San Jose (180,597 patents) and New York (65,052) areas, as well as smaller regions like Seattle (39,837). While many factors can effect patenting trends, a region's industry mix -- particularly among more intellectual property-intensive industries -- can play a key role.

Some innovative goods, services, and technologies reach the commercial market through new business startups. Venture capital plays a key role in the startup process by providing support for development and marketing costs before these companies are financially sustainable or able to access traditional financing. Tracking these investment deals serves as an indicator of both the region's innovation and competitiveness. In 2016, the State of Illinois attracted 141 venture capital deals, and the average investment was worth \$7.8 million, compared to the U.S. average of \$12.6 million. As with patenting levels, peer regions took a substantially larger share of national venture capital deals (Figure 1) due in part to their industry mix. Venture capital deals tend to be high-risk, high-reward investments and focused in high-growth sectors. A small group of industries -- including Software, Biotechnology, Media and Entertainment, and Information Technology Services -- attract the majority of both investment deals and dollars. Northern California (which encompasses the San Francisco Bay Area, including Silicon Valley) has a particularly high concentration of such industries and accounts for approximately a third of all venture capital deals in the U.S.

¹¹ Utility patents are referred to as "patents of invention" issued for a new useful process or product.

¹² CMAP Regional Economic Indicators website, <http://www.cmap.illinois.gov/economy/regional-economic-indicators/innovation>.

¹³ National Science Foundation, *National Patterns of R&D Resource: 2014-15 Data Update*, (National Center for Science and Engineering Statistics, 2017), <https://www.nsf.gov/statistics/2017/nsf17311/>.

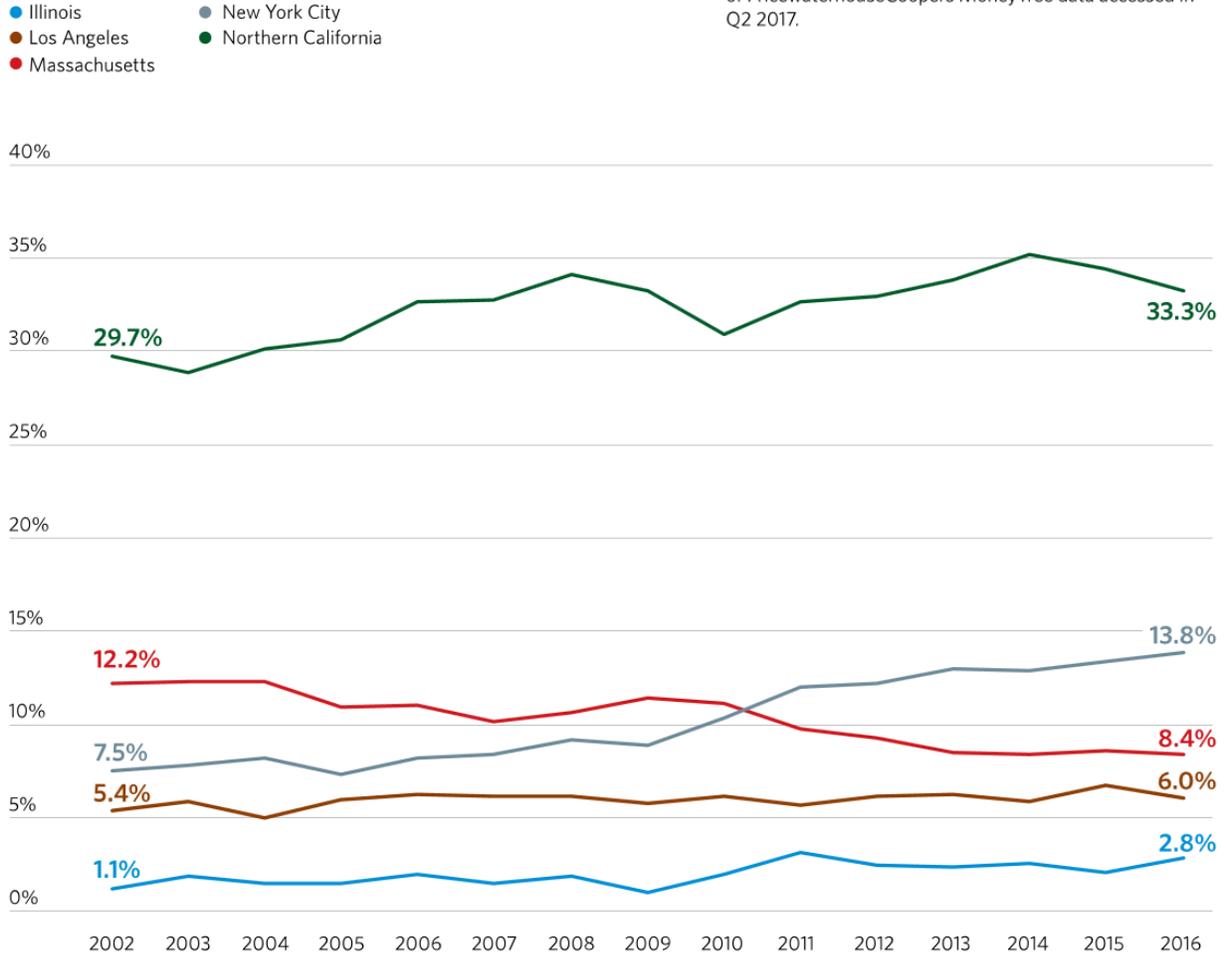


Figure 1.

Peer region shares of national venture capital deals, 2002-16

Note: Geographies for Los Angeles and New York City differ from traditional Census Bureau definitions. See About the Data section for more information.

Source: Chicago Metropolitan Agency for Planning analysis of PricewaterhouseCoopers MoneyTree data accessed in Q2 2017.



An inclusive, high-quality labor force spurs innovation in two ways: by developing more innovative ideas and by implementing those ideas more readily. The quality of our innovations can benefit from diversifying the voices contributing to their development.¹⁴ At the same time, the diffusion of new technologies and processes requires mobilizing our full inventive talent at all skill levels. As new innovations find uses throughout the economy, workers in most

¹⁴ Laurel Smith-Doerr, Sharla N. Alegria, and Timothy Sacco. "How diversity matters in the U.S. science and engineering workforce: a critical review considering integration in teams, fields, and organizational contexts," *Engaging Science, Technology, and Society* 3 (2017): 139-153.

occupations and at all skill levels will need to be equipped to use them to accomplish a wide range of creative and problem-solving tasks.¹⁵

Today, large segments of metropolitan Chicago's human capital are effectively excluded from participating in innovation and entrepreneurship. African American and Hispanic residents in particular experience persistent disparities in terms of employment, educational attainment, and business financing.¹⁶ These inequities can be particularly concentrated geographically—residents in economically disconnected areas¹⁷ have limited opportunities to advance economically without the access and resources to invest in education, skills acquisition, and entrepreneurship. Over time, these drains on productivity stifle the region's potential for economic growth. Research has found that racial and ethnic diversity, openness to immigrants, and low rates of racial segregation strongly contribute to a region's growth.¹⁸ These attributes bolster innovation and entrepreneurship growth by broadening the pool of talent and market-driven inventions available to businesses. Stronger investments in the region's human capital and equity are essential to achieving sustained economic growth.¹⁹

Workers employed in science, technology, engineering, and mathematics (STEM) occupations play a particularly significant role in fostering new ideas. As of 2016, STEM occupations represented 12.5 percent -- over 549,000 jobs -- of metropolitan Chicago's total employment, in line with the U.S. average and ahead of peer regions like New York and Los Angeles. Regional STEM employment has closely followed national economic trends since 2001. Yet, the Chicago region has experienced much slower growth in these occupations than in peer metropolitan areas (Figure 2). Creating and retaining a high-quality STEM workforce is essential to achieving broad regional prosperity. Data shows that scientists and engineers apply for patents at a rate eight times higher than the national average.²⁰ STEM occupations typically experience higher

¹⁵Carl Benedikt Frey and Michael A. Osborne. "The future of employment: how susceptible are jobs to computerisation?" *Technological Forecasting and Social Change* 114, 2017: 254-280.

¹⁶CMAP ON TO 2050 strategy paper, "Inclusive Growth," 2017, <http://www.cmap.illinois.gov/onto2050/strategy-papers/inclusive-growth>.

¹⁷Economically disconnected areas refer to neighborhood tracts that have real median household incomes less than 60 percent of the Chicago regional median by household size, and either high-minority populations or low levels of English proficiency relative to regional averages.

¹⁸Randall Eberts, George Erickcek, and Jack Kleinhenz, "Dashboard Indicators for the Northeast Ohio Economy: Prepared for the Fund for Our Economic Future," *Federal Reserve Bank of Cleveland Working Paper* (2006):20.

¹⁹Christ Benner and Manuel Pastor. *Equity, Growth, and Community: What the Nation Can Learn from America's Metro Areas*. (California: University of California Press, 2015) DOI: <http://dx.doi.org/10.1525/luminos.6>.

²⁰John Thomasian, *Building a Science, Technology, Engineering, and Math Education Agenda: An Update of State Actions*, (National Governors Association, 2011), <https://www.nga.org/files/live/sites/NGA/files/pdf/1112STEMGUIDE.PDF>.

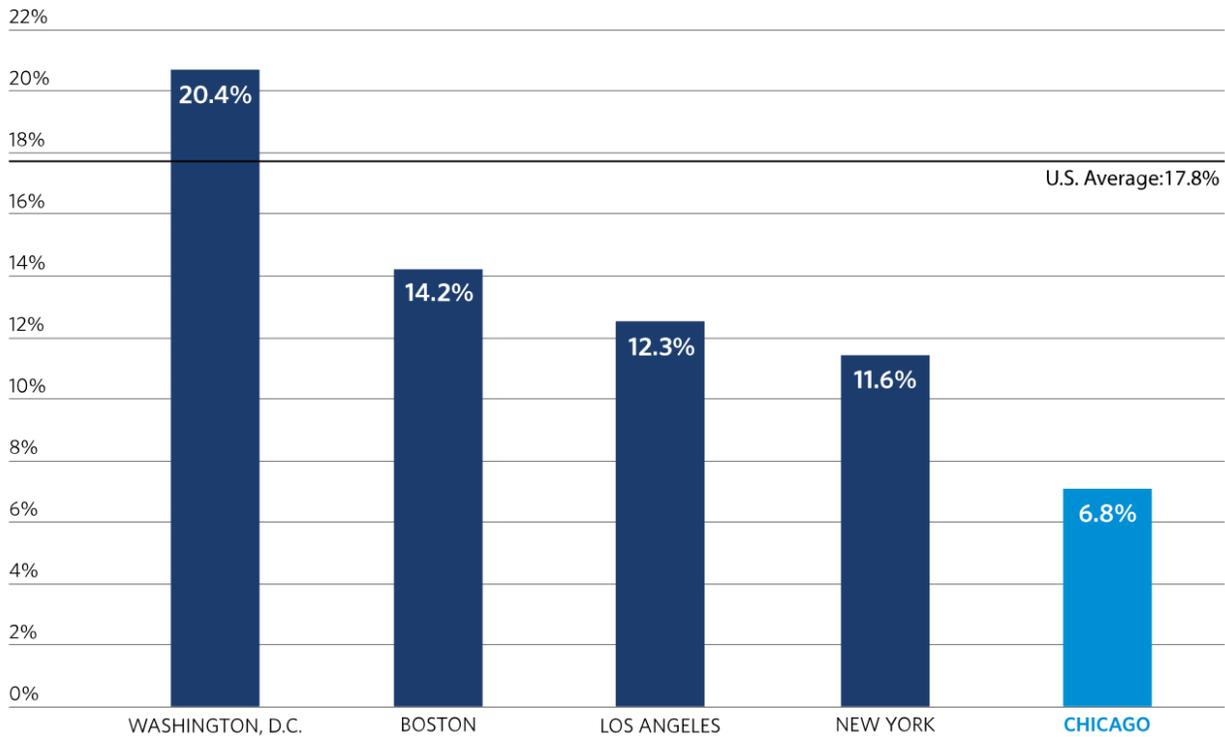
levels of job growth and support improved educational attainment, wages, and unemployment rates than non-STEM occupations.²¹

Figure 2.

STEM occupation growth in select metropolitan regions, 2001-16

Note: Data from metropolitan Chicago includes only the seven counties of northeastern Illinois; all other regions reflect U.S. Census Bureau metropolitan statistical areas.

Source: Chicago Metropolitan Agency for Planning analysis of Economic Modeling Specialists International data (Emsi 2017.3).



Strategies for ON TO 2050 and beyond

ON TO 2050 will provide policy and technical guidance on future CMAP work, with a focus on the core agency responsibilities of transportation and land use planning. The following section outlines strategies that CMAP and its partners can undertake to bolster innovation and productivity growth in the Chicago region. Today, the Chicago region has more than 100

²¹ Stella Fayer, Alan Lacey, and Audrey Watson, “STEM Occupations: Past, Present, and Future,” *Spotlight on Statistics* (U.S. Bureau of Labor Statistics, 2017). David Langdon, George McKittrick, David Beede, Beethika Khan, and Mark Doms, “STEM: Good Jobs Now and for the Future,” *ESA Issue Brief* no. 03-11, (U.S. Department of Commerce, Economics and Statistics Administration, 2011).

incubators, 300 corporate research and development centers, and launches approximately 275 new digital startups every year.²² Substantial progress has been made since GO TO 2040 to improve the region's ability to generate and develop new ideas. With adoption of ON TO 2050, additional actions should focus on aligning and improving initiatives already underway to create value through the innovation process.

Both the quality of an innovation and the extent to which it is used determine the impact it will have on the economy. For a wave of innovation to drive economic growth, advances need to spread across multiple sectors, attract additional business investment, and translate into higher productivity. Innovation policy has frequently focused more on spurring new ideas than on expanding their diffusion and adoption. Customary strategies include support for basic scientific research, intellectual property rights, access to financing, and commercial development.

However, other local and regional strategies can build from this foundation to spread and leverage new innovations for economic growth. Current institutions, programs, and policies should be tailored to support viable startup and young companies attempting to scale, as well as the adoption of innovations more broadly among incumbent businesses. While this strategy memo includes a number of new and existing CMAP activities, advancing some strategies will require entities other than CMAP to take the lead.

Multiple ON TO 2050 projects articulate recommendations that support a more resilient region, advance prudent use of limited resources, and promote shared economic prosperity in all areas of the region. Complementary strategy papers address topics such as the regional economy, human capital, inclusive growth, infill development, and municipal capacity.²³

Pursue regional coordination for economic development

The Chicago region's innovative capacity is both a condition and a consequence of broad economic development. The new technologies and efficiencies that enable growth are generated by the private sector, but can be supported through public policy. Research continues to refine how the public sector can best support an innovation and entrepreneurship ecosystem. However, poor business conditions and inadequate public investments can clearly suffocate the commercialization of new technologies and processes. Fostering, retaining, and attracting innovation necessarily begins with pursuing strong regional economic development.²⁴ The public sector plays a vital role in spurring market-driven innovation by providing high-quality

²² World Business Chicago, *Annual Report*, 2016, <http://www.worldbusinesschicago.com/wp-content/uploads/2017/06/WBC-Annual-Report-2016.pdf>.

²³ See CMAP ON TO 2050 Strategy Papers: <http://www.cmap.illinois.gov/onto2050/strategy-papers>.

²⁴ CMAP ON TO 2050 strategy memo, "Regional Economic Development," 2017, <http://www.cmap.illinois.gov/onto2050/strategy-papers>.

training and education at all levels, building the infrastructure needed for a modern economy, and supporting basic scientific research.

Economic development efforts achieve the most when municipalities, counties, and other partners work together across jurisdictional borders. The region's innovative capacity depends on our competitive advantages in human capital and transportation infrastructure, which extend across the region. Rapid innovation and robust investment requires coordinated economic development activities aimed at preserving the region's location advantages and ensuring efficient governance. The Chicago Regional Growth Corporation (CRGC) is an important first step toward collaboration among the various economic development organizations of Cook, DuPage, Kane, Kendall, Lake, McHenry, and Will counties and the City of Chicago.²⁵ CMAP and partners should support efforts to enhance coordination at the regional level, through CRGC and other entities. The ON TO 2050 plan will highlight the role CMAP can play in convening regional stakeholders and providing for appropriate data and analysis.

Leverage location advantages in workforce and transportation infrastructure

Innovation policy must build on the region's extensive transportation network, supply chain access, talent pool, high quality of life, and existing research and development resources. These regional assets will be key determinants in any efforts to capture the performance and productivity benefits of new advances. Regional and sub-regional planning can better take into account the region's innovative capacity, leveraging existing assets to spur economic development and growth.

The importance of the region's freight network and other infrastructure assets will only grow as innovative trends like agile supply chains take root in the economy.²⁶ The existing industry mix in the region -- including transportation, distribution, and logistics -- offer opportunities to develop new innovations, drawing on assets not present in other regions. Yet, related investments are not necessarily coordinated with regional economic development efforts. As a result, CMAP and other transportation funders must invest in a modern, multimodal transportation network to preserve its position as a destination for related experimentation and creativity. CMAP and partners should ensure access to high-quality transit for lower income residents who need affordable modes of transportation to reach education and employment opportunities.

Additional strategies should leverage the region's institutions of higher education and research. While their primary output is talent not technology, universities and community colleges have extensive resources for supporting economic growth through the retention of viable commercial

²⁵ Cook County, "Chicago Regional Growth Initiatives," 2013, <https://www.cookcountyil.gov/content/regional-initiatives>.

²⁶ CMAP ON TO 2050 memo, "Alternative Futures: Transformed Economy," 2017, <http://www.cmap.illinois.gov/onto2050/futures/economy>.



startups and local efforts to build inventive talent. Many R&D-intensive firms further benefit from proximity to institutional assets, including specialized research, data resources, analytical and faculty expertise, and business counseling services. The State of Illinois should provide robust and reliable public funding for higher education, which is crucial for cultivating, retaining, and attracting innovative talent and businesses to northeastern Illinois.

The region's national laboratories and other research institutions likewise offer exceptional opportunities for leveraging existing assets and economic strengths for economic development. In partnership with these institutions, economic developers should pursue strategies to connect such resources to regional firms and investors. As a regional growth strategy takes shape, CMAP and partners should emphasize objectives that draw on these unique assets not present in other regions. These objective should include higher rates of research and development investments, commercialization activities among existing businesses, and the creation of new businesses. CMAP and partners should especially support institutions and relationships that provide services to small and medium-sized enterprises lacking access to their innovation ecosystems and financing.

Ensure efficient, responsive governance within the region

Financial and regulatory incentives can reduce the cost of research and development, and help to improve the financial feasibility of innovative projects. In assessing the appropriateness of such incentives, local and state officials should consider overall community gains and regional goals. In today's environment of constrained resources, CMAP and partners encourage performance-based approaches whenever possible in the development and evaluation of plans, policies, and programs regarding economic development. The State of Illinois and some local governments may need to adopt governance reforms that regularly determine program outcomes, performance relative to goals, and trade-offs of using resources for an incentive program instead of other public investments. CMAP research could include examining national best practices and assessing existing programs -- such as investments in the form of tax credits and incentives -- intended to promote innovation.

The Chicago region's innovative and entrepreneurial performance is undermined by persistent state and local fiscal uncertainty. Addressing weak spots in the larger business climate and competitiveness would support the dense, dynamic economic activity that spurs innovation. State and local governments must find sustainable political agreements on how to ensure a balanced mix of revenue, stabilize budgets, and modernize the tax code. CMAP and partners should encourage planning that prioritizes revenue and information sharing, coordinated business attraction and retention initiatives, and multijurisdictional infrastructure investments. Where appropriate, consolidation of local governments could improve governance, reduce overhead costs, and increase the efficiency and quality of service delivery. The state's tax code can be modernized by expanding the sales-tax base to include additional services, phasing out the assessment classification in Cook County, and other strategies that align tax policies with regional and local economic development goals.



Establish stronger metrics of regional innovative performance

Sound measurement of innovation is crucial for evaluating the efficiency of public policies and programs, and assessing its contribution to achieving regional objectives. Yet, the indicators currently available do not adequately account for the full role innovation and entrepreneurship plays in today's economy.²⁷ Numerous metrics have been developed to help regions position their innovative capacity relative to peers. These indicators typically focus on inputs to idea generation, such as R&D expenditures, venture capital, and STEM jobs.²⁸ Due to data access and quality problems, measurements of outcomes -- the economic value of new-to-market or new-to-firm innovations -- remain underrepresented.²⁹ The use of indicators overly focused on inputs can lead local and regional stakeholders to overlook the importance of rapid technology adoption and other, more subtle forms of innovations.³⁰

CMAAP and partners should identify and communicate additional metrics and data sources for tracking innovative performance in the regional economy. Transparency and evaluation efforts require robust, accessible information regarding the public investments, regional industry trends, and business outcomes. Further analysis and improved indicators at the regional level may yield additional strategies to maximize metropolitan Chicago's innovative capacity. An initial step could be to establish stronger metrics of regional performance, such as productivity growth, university entrepreneurship, and private sector R&D investments. Effectively encouraging the investment and market incentives that foster innovation would help to maintain the region's comparative advantage.

Support initiatives to further grow and concentrate the region's traded clusters

Increasing competition among metropolitan economies worldwide indicates that future economic growth will primarily occur in specialized industry clusters.³¹ The Chicago region maintains a highly diversified economy with significant relative concentrations in numerous traded clusters -- those selling products and services in markets outside of the region. A growing body of research shows that the efficiencies of industry specialization can generate various ecosystem benefits.³² These include dense supply chains that improve firm productivity

²⁷ Nightingale et al. "The myth of the science park economy."

²⁸ Organization for Economic Co-operation and Development, *Measuring Innovation: A New Perspective*, (Paris: OECD, 2010), <http://www.oecd.org/innovation/strategy/measuring>.

²⁹ Morelix et al. "The Kauffman Index of Growth Entrepreneurship."

³⁰ Branstetter et al. "The case for an American productivity revival."

³¹ CMAAP ON TO 2050 strategy memo, "Regional Economic Development," 2017, <http://www.cmap.illinois.gov/onto2050/strategy-papers>.

³² Porter, Michael E. "Location, competition, and economic development: Local clusters in a global economy." *Economic development quarterly* 14, no. 1, 2000: 15-34.



and concentrated knowledge spillovers that fuel innovation. Increased competition and collaboration can occur on a variety of levels as workers and firms in close proximity learn from one another without incurring high costs. Firms in a cluster become better poised to anticipate trends and to adapt their operations by identifying and implementing innovations. As a result, specialized industry clusters support higher levels of patenting, startup activity, and employment growth.³³

Figure 3.



CMAP and partners should continue to support cluster initiatives by articulating the benefits of closer collaboration and playing a role in convening coalitions like the Chicago Metro Metals Consortium or the recently established Chicagoland Food and Beverage Network. These cluster initiatives can pursue a range of coordinated strategies as led by the private sector. Additional actions may include efforts to address common workforce needs or fostering dense, specialized networks for sourcing supplies, talent, customers, early-stage financing, ideas, and services. Cluster initiatives can also play a primary role in communicating needs to local partners regarding sub-regional policy and planning activities. Related CMAP research could include the regional research and innovation capacity of specialized clusters, as well as their unique land use, transportation, and employment trends.

The Chicago region also has an interest in pursuing rapid technology diffusion and adoption to help capture competitive advantages in its specialized industries. Cluster initiatives could lead efforts to connect regional businesses to their respective innovation ecosystems and assist the dissemination of new technologies and processes. For example, the region's innovative capacity depends on more effectively connecting research and development investments to market opportunities. Emerging trends in industry and consumer demand offer substantial potential for those companies that invest in process and product innovations, as well as risks to those that do not. Navigating these trends could be a particular challenge for small and medium-sized enterprises (SMEs), which are key to building the region's innovative capacity and overall economic growth. Cluster initiatives could coordinate strategies that engage viable SMEs looking to scale and provide technical assistance to regional businesses on implementing new advances or reaching global markets.

³³ Mercedes Delgado, Michael E. Porter, and Scott Stern, "Defining clusters of related industries," *Journal of Economic Geography* 16, no. 1 (2015): 1-38.

Leverage economic assets as a leading hub of transportation innovation

Cluster-based strategies spur innovative activity by leveraging existing assets to implement new-to-market or new-to-firm innovations. Available data suggests that regional firms in the transportation, distribution, and logistics cluster in particular benefit from the innovative advantages of participating in a cluster.³⁴ The Chicago region -- the preeminent North American intermodal freight hub -- has a dual concentration in manufacturing and freight industries, employing a skilled and specialized workforce of more than 670,000 workers.³⁵ Access to this workforce and to global supply chains underpins a constellation of headquarters and plants of major vehicle manufacturers, from aerospace to passenger automotive to construction and mining equipment. Alongside production, the Chicago region has high concentrations in business-to-business services, including engineering, supply chain and logistics consultancy, analytics, product support, and transportation arrangement. These enterprises have supported the growth of business administration, technological, and scientific expertise in the region's universities, national laboratories, and corporate research and development centers.

CMAAP and partners should identify strategies to cultivate economic activity that foster the region's position as a leading hub of innovation and scientific development in transportation, distribution, and logistics. The region's unique industry mix and location advantages offer uncommon, yet underutilized potential for research and development in these industries. Economic developers, research institutions, and private enterprises should seek out new partnerships to leverage these existing assets and preserve the Chicago region's standing as a destination for related innovation. CMAAP can assist in these efforts by helping to convene coalitions around these industries and supplying analysis on their infrastructure, land use, innovation, and employment trends.

Pursue inclusive growth by promoting entrepreneurship and prioritizing occupations that offer pathways for upward mobility

Human capital will always be the primary driver of next-generation ideas, the key to implementing those ideas, and the hardest regional asset to replicate.³⁶ Ongoing waste of people's ingenuity and knowledge encumbers the Chicago region's innovative capacity, and thus slows economic growth. Strengthening the regional economy will require developing inclusive strategies that can enhance our high-quality labor force and catalyze productivity growth. Key among these strategies are ensuring that low-income and minority populations have better access to education and employment opportunities.

³⁴ CMAAP report, "Metropolitan Chicago's Freight Manufacturing Cluster: A Drill-Down Report on Innovation, Workforce, and Infrastructure," 2013, <http://www.cmap.illinois.gov/economy/industry-clusters/manufacturing>.

³⁵ CMAAP analysis of Economic Modeling Specialists International data (Emsi 2017.3). See also: CMAAP, "The Freight-Manufacturing Nexus: Metropolitan Chicago's Built-in Advantage," 2013, <http://www.cmap.illinois.gov/documents/10180/27283/Freight-Manufacturing-Nexus-8-6-13-1.pdf/16f3459b-05af-4eac-af71-f9a8f18f7bc2>.

³⁶ CMAAP ON TO 2050 strategy memo, "Human Capital," 2017, <http://www.cmap.illinois.gov/onto2050/strategy-papers>.



Economic development and workforce services in the region should prioritize opportunities that offer residents better pathways for upward mobility. These pathways are more likely to occur in industries and occupations experiencing productivity gains and a need for high-quality talent to implement new technologies and processes. For example, strategies could include improving access to capital for entrepreneurs or STEM educational and training opportunities for residents of economically disconnected areas.

Talented workers and diverse entrepreneurial activity are critical components of economic growth. Mobilizing the region's full innovative capacity requires diversifying the communities and areas that foster entrepreneurship. Coordinated effort between workforce development providers and industry could help to develop strategies that increase mobility and entrepreneurship, such as addressing public policies and private practices that stifle innovation. Organizations across the innovation ecosystem should actively seek to diversify the entrepreneurial voices engaged in problem and solution development. CMAP should identify and support other strategies that bolster both the region's inclusive growth and innovative capacity. CMAP research could include analyses of occupation trends, industry shifts, entrepreneurship metrics, training requirements, and outcomes across demographic groups.

Next steps

The policy framework and strategies presented in this report set the direction for innovation and entrepreneurship in CMAP's future work, including ON TO 2050. These strategies will help to integrate consideration of growth-enabling innovation into many aspects of CMAP's policy and planning work, such as economic and workforce development, transportation, municipal capacity, inclusive growth, and infill development. CMAP expects to closely align work associated with this strategy paper with other relevant plan development tasks to create a cohesive approach to economic opportunity and growth in the ON TO 2050 plan. These recommendations were developed in conjunction with two closely related strategy memos, Regional Economic Development and Human Capital. Together, CMAP expects their recommendations to inform future strategy papers, snapshots, technical assistance projects, transportation programming, policy updates, research products, and data sharing. ON TO 2050 is expected to likewise synthesize these strategies into a comprehensive vision for the region.

Regional partners are critical to successful implementation of many strategies. Further discussions on the most effective ways to advance regional collaboration will be essential as the agency develops and then implements ON TO 2050. The largest unanswered questions from this paper -- how to address those topics for which CMAP should not take the lead -- will require continued work by staff in partnership with other organizations to hone both the regional approach and CMAP's role in that approach.

