Clusters and Regional Economies:

Implications for the Great Lakes-St. Lawrence Region

by **Dr. Christian Ketels,** Harvard Business School

Summary

The Great Lakes – St. Lawrence Region, covering eight U.S. states and two Canadian provinces located around the lakes and waterways that have given this region its name, is what economic developers call a 'macro region'. It is an area of intensive economic interaction through trade and value chain linkages. And it shares many similarities in terms of economic development, competitiveness issues, and institutional structure, culture, and history. These two factors make the Region an important arena for policy action, both in areas with strong cross-border implications and for those where challenges are similar but action will ultimately be local.

The Great Lakes – St. Lawrence Region is, at an annual GDP in excess of $5 trillion and a population of more than 100 million, one of the largest macro-regions in the global economy. It is also highly prosperous in international comparison, roughly matching the Canada/US economy with a GDP per capita of close to $45,000. Heterogeneity across the Region is high, however, and more recently the Region has gradually lost position.

A key factor for understanding the Great Lakes – St. Lawrence Region economy and its recent performance is its industrial composition. The Region used to benefit from a higher share of traded industries, i.e. those that compete internationally and concentrate in specific regional clusters. These industries also achieved a particularly strong wage premium compared to their peers across Canada and the US. This 'double premium' has been eroding over time, with the Great Recession as a dramatic accelerator of this process. A closer look at the data reveals that the losses have been particularly pronounced in the Region's strongest clusters, i.e. those with the highest level of specialization, in particular in clusters related to core manufacturing activities. One hypothesis to explain this unusual outcome is that these strong clusters were less fast in adopting new technologies and serving more attractive market segments than their peers elsewhere. The Region's overall cluster portfolio includes a broad range of clusters, the manufacturing-heavy industries but also many others like Financial Services, IT and Analytical Instruments, and Food Processing. The IT and Analytical Instruments cluster, for example, meaningful but not a relative strength of the Region, has managed to gain market share, with the strongest dynamism in medium-size college towns rather than the traditional hubs in the largest cities. Many of the strong clusters are linked, creating opportunities for future growth in areas related to current strengths.

This diagnostic of the Region reveals a number of action opportunities where collaboration across the Region can make a difference:

- Conduct a **strategic cluster review in automotive**, aiming to understand how the Region's inherent cluster strength in this area can again be translated into economic success
- Establish a **cluster network in the emerging water technology clusters** across the Region, exploring the economic potential of this unique asset that the Region is developing
- Launch a **policy peer group for learning and exchange of best practices in cluster renewal and diversification,** building on some of the opportunities identified in this report
- Create a **Great Lakes – St. Lawrence Region STARS challenge fund,** providing competitive funding for a network of clusters willing to collaborate in upgrading competitiveness
- Produce a regular **State of the Great Lakes – St. Lawrence Region report** to track the competitiveness and collaboration across the Region

The Conference of Great Lakes and St. Lawrence Governors and Premiers is a non-partisan partnership of Governors from the eight Great Lakes States and the Premiers of Ontario and Québec working to advance the environmental health and high performance economy of the entire region. This report, written by Dr. Christian Ketels, Harvard Business School, was prepared for the 2015 Leadership Summit of the Conference in Québec City on June 12-14.

The report analyses the Great Lakes – St. Lawrence Region economy, focusing on medium-term patterns of performance and composition. It combines data for the entire territory of the states and provinces in the Region, and is thus moving beyond the more narrow boundaries of the watershed area. It aims to inform the policy discussion in the Region about ways to improve its underlying competitiveness in areas where collaboration across the Region can play a critical role. The analysis is based on publicly available data sources, in particular on a data set prepared by Richard Bryden, Institute for Strategy and Competitiveness, using the U.S. cluster mapping portal hosted by the Institute for Strategy and Competitiveness at Harvard Business School and the Canadian cluster data provided by the Institute for Competitiveness and Prosperity using the same methodology.

The report is organized in three sections. The first section discusses the role macro-regions like the Great Lakes – St. Lawrence Region play in the context of economic competitiveness and policy. The second and main section of the report provides a cluster-based view of the Region's economy. It puts the Region's medium-term performance into the context of its industrial composition, in particular the presence of clusters across the Region. The third section then develops a number of concrete action ideas where regional collaboration could be a powerful tool to address key issues the Region is facing.

The report highlights the Region's role as a key pillar of the North American economy, especially with regards to manufacturing-related activities. It also tracks the enormous transformation this Region is experiencing: many of its traditional strong clusters have been losing position, and where growth dynamics are visible it tends to be in new fields or locations. The Great Recession has played an important role in accelerating these changes, but in most cases the starting points for these trends was already far earlier. Since then, the macroeconomic

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recovery, the drop in energy prices, and other factors have created new opportunities. But the underlying trends still show a Region in need to reinvent its traditional strengths and find new areas of growth related to its assets and capabilities. With many of these issues shared across the Region, there is significant potential for joint learning and action. Many of the policy initiatives will eventually be local but regional collaboration can enhance both their quality and their impact. The Conference, together with partners in the private sector, academic institutions, and other levels of government, can play a crucial role in mobilizing and coordinating this agenda.

A. Why Macro-Regions Matter

The Great Lakes - St. Lawrence Region is covering eight U.S. states and two Canadian provinces, all located around the lakes and waterways that have given this region its name. Regions like this – joining several subnational regions and even cutting across national boundaries – have been described as 'macro regions', a concept that entered the economic policy discussion first in Europe. [1]

Traditionally, the focus for both economic analysis and policy making has been squarely on the national level. Nations were a good proxy to understand conditions relevant for business; the defined geographies in which industry structure was given by one set of conditions. Nations were also a good proxy for economic policy; this is the level of government at which most legal power resides and where most budgets are controlled.

Over time, however, a more differentiated perspective has evolved, to a large degree driven by the observation that the economic performance of locations differs widely even within nations. The figure on the next page shows this heterogeneity for U.S. states and Canadian provinces. For companies, this has driven an understanding that as places to invest and operate often more narrow geographies, economic areas and sometimes even metropolitan regions, matter significantly. In parallel, larger regions, like NAFTA, have become sufficiently integrated to be viewed as relevant in terms of a market to serve. For policy, it has highlighted the important role of states, provinces, and cities as policy arenas in which critical decisions are made that affect the quality of the business environment in a given geography.

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[1]See http://ec.europa.eu/regional_policy/en/policy/cooperation/macro-regional-strategies/

Performance of North American Regions

Source: OECD. All values in constant, ppp-adjusted, US dollars.
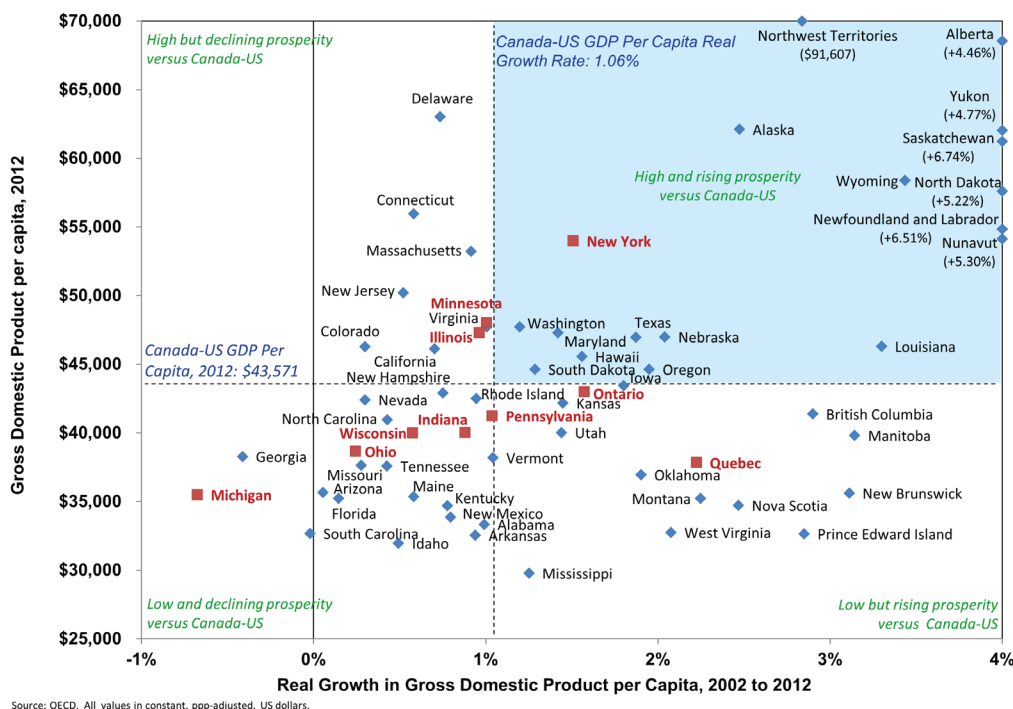
Macro-regions have two important characteristics: First, they capture areas of intensive economic interaction through trade and value chain linkages. These types of cross-border interactions have obviously become much more global in the last few decades. But they are in their intensity highly affected by proximity: Neighbors trade most with each other. Second, they often share similarities in terms of economic development, competitiveness issues, and – importantly – institutional structure, culture, and history. These similarities make a policy dialogue both relevant and useful, even on issues that ultimately require local action: The challenges to deal with are similar across such Macro-Regions, and the solutions to address them are often more easily transferable within than across such regions.

This gives macro-regional collaboration a number of potential roles:

• **Addressing issues that have cross-border effects.** For trade, this is mainly related to all kinds of formal and informal barriers but also to adequate connectivity through physical infrastructure. But there other areas with a similar logic, with environmental issues related to water management a key example in the Great Lakes – St. Lawrence Region. In all of these fields the benefits of action accrue across the region, and often actions by one part is not enough.

• **Policy learning.** Drawing on the logic outlined above, policy learning can be useful at the level of macro-regions in a whole range of issues, from economic development to the environment to other public policies at the level of states, provinces, and cities. Areas that are important across the region are the prime candidates for such efforts to get traction.

• **Joint action as a region.** Acting as 'one region' towards others, whether national governments or international investors, can help leveraging the overall size of the region. However, it is something that is often difficult to do, because interests across the region are not often fully

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aligned. It might be possible to lobby national governments in Washington, D.C. and Ottawa for similar regulation related to water transportation or specific environmental standards. But when it comes to attracting investors different parts of the region will be rivals as much as they are sharing a common interest in raising the global visibility of the broader region.

B. A Cluster-Based View of the Great Lakes/St. Lawrence Region

What is the economic character of the Great Lakes – St. Lawrence Region? This is the question the following section aims to answer. It will first look at the overall size and performance of the Region, looking both at the aggregate level and at different parts of the Region. It will then take a closer look at the economic composition of the Region to get a more granular sense of how the performance of specific parts of the economy has contributed to these overall outcomes.

a. Size and performance

The Great Lakes – St. Lawrence Region is one of the largest macro-regions in the global economy. It generates an annual GDP in excess of $5 trillion; more than Japan. Its population of more than 100 million puts it between Mexico and Germany, respectively the 8th and 9th largest countries in the world on this measure.

The Region is not only large, it is also highly prosperous in international comparison. Its GDP per capita level of about $44,000 puts it close to the Canada/US average as well as to Germany and the Nordic countries in Europe. Over the last decade, the Region has seen somewhat lower average prosperity gains than the US/Canada average. Its lower exposure to highly cyclical activities in real estate and finance was important prior to and during the Great Recession. Since then, the strong presence of manufacturing has had a positive impact, enabling the Region to benefit from lower energy costs.

Performance of the Great Lakes - St. Lawrence Region

Source: OECD. All values in constant, ppp-adjusted, US dollars.
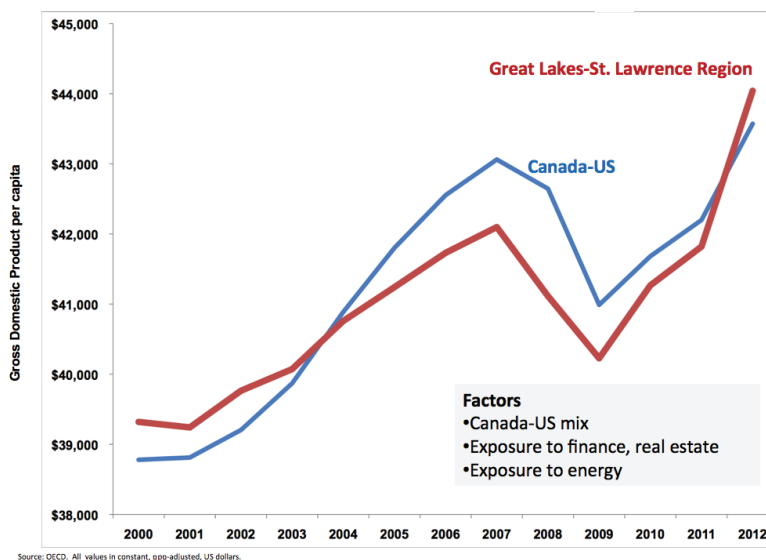
The Region has, despite stronger performance since the Great Recession, over the last decade lost some ground to the Canada/US average in terms of prosperity measured by GDP per capita. Beyond that, it has also lost some relative share: it now accounts for 32.1% of the total Canada/US workforce, a drop of 1.5% points over the last decade. This reflects population trends within both Canada and the US, where migration and demographics have shifted the centers of gravity west and south.
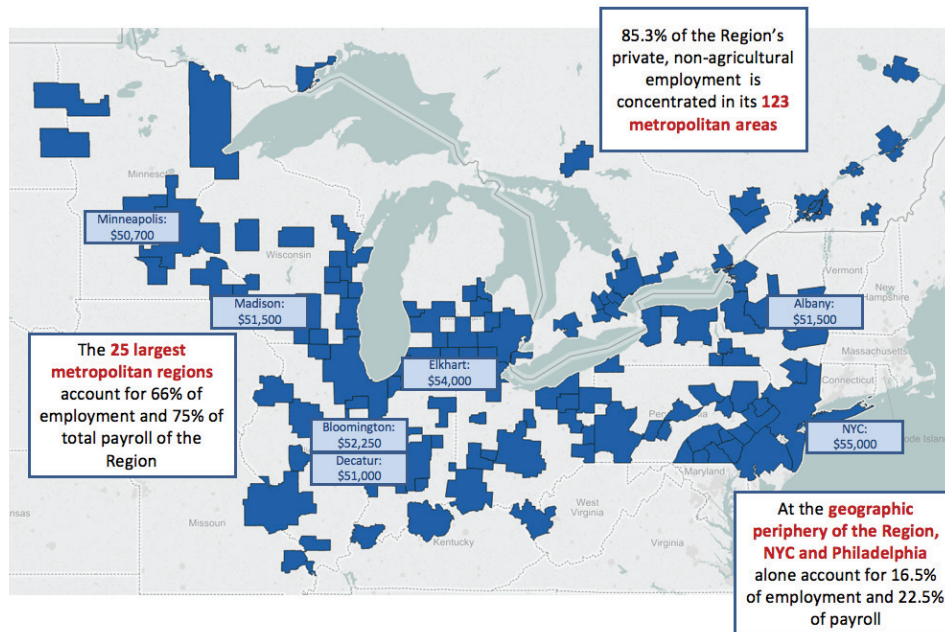
Within the Region there is significant heterogeneity in terms of economic performance. At the state/ province-level, New York state tops the prosperity rankings in the Region with a GDP per capita level more than 50% higher than Michigan. While Michigan was the only state to report negative average prosperity growth over the last decade, Québec registered an annual growth rate of more than 2%. While Michigan ranked lowest in terms of growth for both the 2000-07 and then 2007-09 periods, it topped the prosperity growth rankings of US states in the Region for the 2009-13 period.

Most of the population and economic activity in the Region is concentrated in metropolitan areas. These 125 areas account for the minority of the Region's landmass (especially in Ontario and Québec) but more than 85% of all employment. Within the group of metropolitan areas, the 25 largest regions account for 66% of the overall Region's employment and 75% of its payroll (average wages x employment). Among them are New York City and Philadelphia, cities oriented only in part to the Great Lakes - St. Lawrence Region.

Prosperity differences across these metropolitan areas are even larger than among states and provinces. The regions with the highest GDP per capita include a mix of large metropolitan areas like New York City and Minneapolis and smaller cities like Madison, Elkhart, and Albany.

The Heterogeneous Great Lakes - St. Lawrence Region | Metropolitan Areas

85.3% of the Region's private, non-agricultural employment is concentrated in its **123 metropolitan areas**

Minneapolis: $50,700

Madison: $51,500

Albany: $51,500

The **25 largest metropolitan regions** account for 66% of employment and 75% of total payroll of the Region

Elkhart: $54,000

Bloomington: $52,250

Decatur: $51,000

NYC: $55,000

At the **geographic periphery of the Region, NYC and Philadelphia** alone account for 16.5% of employment and 22.5% of payroll

b. Composition

Understanding composition

The composition of an economy provides important insights into the drivers of its performance. Industries differ in their inherent capacity to support high levels of wages, driven both by their factor intensity and the markets they serve. Industries also differ in the business environment conditions that determine their productivity in a specific location.

Regional economies are composed of two types of industries: traded and local. Traded industries serve markets beyond the region in which they are based, face competition from other locations, and are often free to choose where to be based. Conversely, local industries serve only regional markets, compete with companies based in the same location, having to be based there to serve these markets. Traded industries are on average significantly more human and physical capital intensive than local industries. They register the majority of all patenting, higher productivity, and a wage premium that has been growing over time. Local industries account for a higher share of total employment, and have seen their relative share in the labor force increase over time.

Traded industries tend to agglomerate in clusters, groups of related industries that concentrate in specific locations because of benefits from proximity. In these locations they can access deeper and more specialized labor markets, supplier networks, and infrastructure, benefit from knowledge-spillovers, and are driven to higher productivity and strategic focus by intense local rivalry. Where specific clusters reach critical mass they achieve higher rates of innovation, productivity, and wages, a better and more resilient performance on job creation, and stronger entrepreneurial activity.[2] Performance depends not only on what industry you are in, but how well you do in that industry, and this is significantly influenced by cluster effects.

The relative importance of traded industries in the Great Lakes – St. Lawrence Region

The Great Lakes – St. Lawrence Region has traditionally had a relatively strong presence of traded industries, reflecting its role as the industrial engine of the Canada/US-economy. Over the last decade, however, much of this traded industry-premium has disappeared. This trend has been a key drag on the overall performance of the Region.

In 2003, traded industries accounted for 38.7% of all private sector employment in the Great Lakes – St. Lawrence Region. Wages in these industries were on average 65.4% higher than in the Region's local industries. On both of these metrics, the Region had an advantage relative to the Canada/US-economy: traded industry employment for the combined economy stood at 37.4%, and their wage premium at 63%. While these differences appear small, they alone are sufficient to explain the GDP per capita gap that existed at that point.
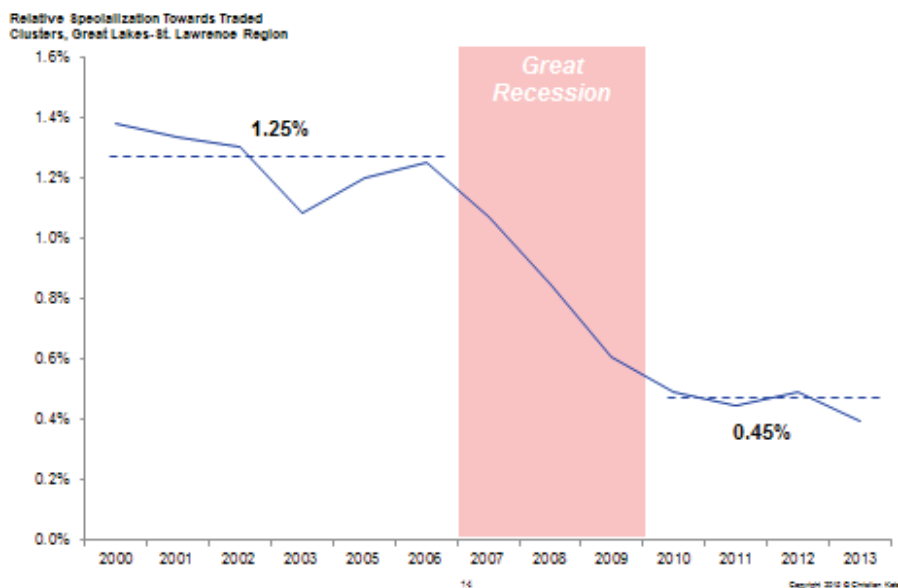
By 2013, the Great Lakes – St. Lawrence Region's advantage on traded industries had all but disappeared. The share of traded industries had dropped by 2.1%-points to 36.6%. A relative reduction in the share of traded industries also happened in the Canada/US-economy, reflecting healthy productivity gains in traded industries and growing demand for local industries like health care services. But with a fall of 1.3%-points the reduction was less pronounced, and at 36.1% the share of traded industries in employment for the combined economies is now almost equal to the Great Lakes – St. Lawrence Region. For relative wages, the changes have even created a relative advantage for the Canada/US-economy. The Great Lakes – St. Lawrence Region registered an increase in the wage advantage of traded industries of 12.1%, creating a wage premium now of 77.5%. For the Canada/US-economy the increase was even higher at 15.4%. Together, these two trends have eliminated the prosperity benefit that the Great Lakes – St. Lawrence Region had previously enjoyed from its strong presence of traded industries.

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[2]See Delgado, Porter, Stern (2012, 2014) for specific studies and Ketels (2013) for an overview

Strikingly, the Great Recession seems to have dramatically accelerated these trends. While the Region was on a slow track to lose its traded industries-advantage before, this process really gained pace between 2007 and 2009 before then stabilizing again during the recovery.

The Great Lakes - St. Lawrence Traded Economy | The Impact of the Great Recession

The traded cluster portfolio of the Great Lakes – St. Lawrence Region

The traded cluster portfolio organizes all traded industries into groups of related industries, i.e. those with strong linkages revealed through co-location, use of similar skills, or input-output relationships. This type of analysis has identified 51 categories of traded clusters which are applied here.[3]

The largest traded clusters in the Great Lakes – St. Lawrence Region by absolute employment are Business Services, Distribution and E-Commerce, and Education and Knowledge Creation. Together these three cluster categories account for roughly 5.5 million jobs, or about a third of all traded industry employment in the Region. They are followed in size by Finance, Hospitality and Tourism, Insurance, and Transportation and Logistics, which together add another roughly 2.5 million jobs. All of these cluster categories reflect the increasingly service and knowledge-driven nature of modern economies. They are large in this Region, but they are also large in many other parts of the US and Canada.

In terms of prosperity, it is the contribution to the Region's payroll that matters most – what is needed are not only jobs, but jobs that pay attractive wages. The figure on the next page shows the contribution to the Region's payroll by cluster category, focusing on those that create at least a total of $10bn in total wages per year. This brings a range of more industrially-driven cluster categories into focus. While individually smaller, they account for close to 20% of payroll generated in these large cluster categories. Together they are the second largest

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[3]For more detail see www.clustermapping.us and Delgado et al. (2015)

contributor to total payroll, behind business services and ahead of financial services. And they drive the demand for the cluster categories that offer business-oriented service.

The Great Lakes - St. Lawrence Region Payroll | A Cluster Perspective

Average Wage, 2013

Note: Includes only clusters with a wage bill above $10bn
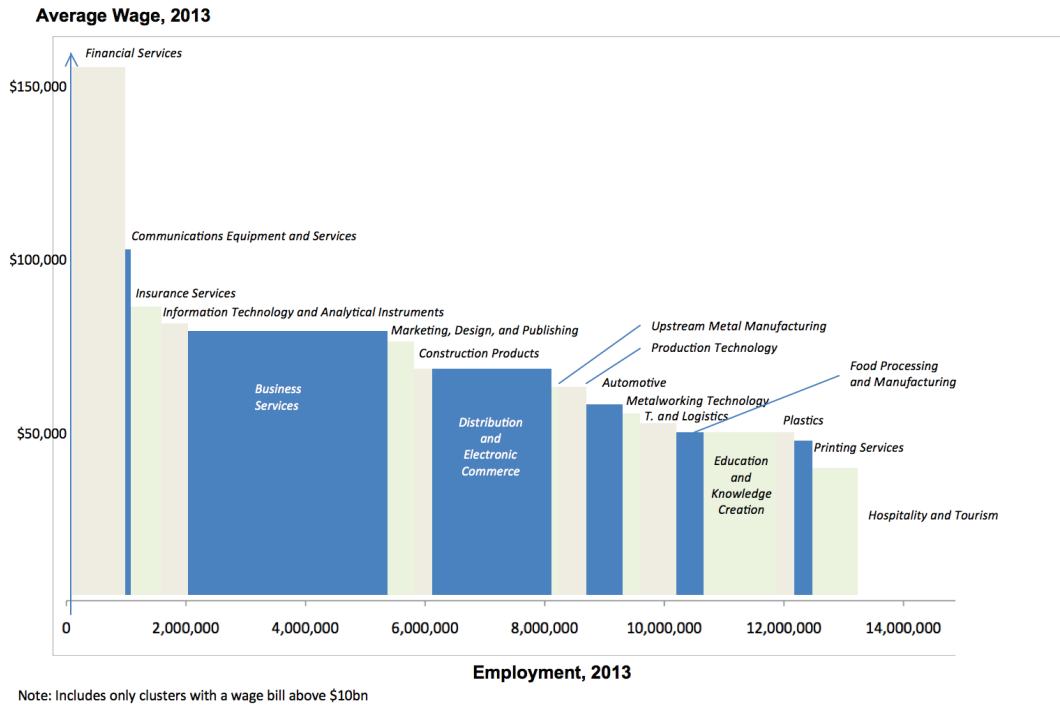
Employment, 2013

Apart from absolute employment and wages, it is the relative focus on specific cluster categories that gives a sense of the market position that these clusters have achieved. The benchmark for comparison is the overall share of 32.5% of employment that the Great Lakes – St. Lawrence Region has in the total traded industry employment of the Canada/US-economy. Where the Region's share is higher than this benchmark, it has developed a position of relative specialization. In addition, the data allows us to track where the Region has gained or lost market share relative to other locations in the combined economy. Here the relative benchmark is the overall loss of 1.6% market share over the last decade, driven in part by the relatively lower population growth in the Region.

The figure on the next page captures the overall cluster portfolio of the Great Lakes – St. Lawrence Region, indicating relative specialization on the vertical axis, changes in market share on the horizontal axis, absolute employment in the size of the bubble, and the direction of job creation in the color of the bubble (green – net gains over the last decade, red – net losses).

The Cluster Portfolio of the Great Lakes-St. Lawrence Region

Automotive
Metalworking Technology
Upstream Metal Manufacturing
Trailers, Motor Homes, and Appliances
Vulcanized and Fired Materials
Plastics
Production Technology and Heavy Machinery
Downstream Chemical Products
Printing Services
Paper and Packaging
Electric Power Generation and Transmission
Recreational and Small Electric Goods
Marketing, Design, and Publishing
Footwear
Music and Sound Recording
Financial Services
Furniture
Biopharmaceuticals
Education and Knowledge Creation
Insurance Services
Metal Mining
Food Processing and Manufacturing
Environmental Services
Medical Devices
Leather and Related Products
Jewelry and Precious Metals
Performing Arts
Wood Products
Transportation and Logistics
Apparel
Nonmetal Mining
Construction Products and Services
Distribution and Electronic Commerce
Hospitality and Tourism
Communications Equipment and Services
Information Technology and Analytical Instruments
Video Production and Distribution
Forestry
Coal Mining
Business Services
Upstream Chemical Products
Livestock Processing
Agricultural Inputs and Services
Aerospace Vehicles and Defense
Textile Manufacturing
Tobacco
Water Transportation
Oil and Gas Production and Transportation
Fishing and Fishing Products

The Region has registered job losses in many cluster categories in which it has comparatively strong specialization. Job gains have instead come from cluster categories in which the Region has a presence much in line with what is to be expected given its overall size. The most worrying sign is the strong loss of jobs and market share in a number of industrial cluster categories, visible on the top left hand corner. The Region has gained market share in a fair number of other cluster categories, but for most of them this has not been sufficient to translate into positive job creation.

Strong clusters in the Great Lakes – St. Lawrence Region

While we have so far looked at all employment in traded industries, the earlier discussion indicated that cluster effects are present largely in so-called 'strong clusters', i.e. locations where groups of related industries identified by cluster categories reach critical mass. These locations are empirically identified as the top quartile of regions by relative specialization in a given cluster category. This selection of 25% of all clusters by location accounts for close to 60% of all employment in traded industries, showing the strong degree of geographic concentration that characterizes these industries. A striking example is the Recreational Vehicle cluster in Elkhart, Indiana. Branded as the RV capital of North America, it claims to have produced roughly half of all RVs and Motor Homes on the road in the US and Canada today. And the region has achieved one of the highest GDP per capita levels across the Region.

The employment dynamics of strong clusters in the Great Lakes – St. Lawrence Region show a unique and disturbing picture: Between 2003 and 2013, strong clusters across the Region have lost about 10% of their employment, a total of 830,000 jobs. At the same time, employment

in traded industries outside of these strong clusters has dropped by only 2% or about 95,000 jobs. The Region has lost the most where it used to be the strongest. This is a pattern that is significantly different from what the research has shown in other locations, where strong clusters have registered much better relative performance.

A closer look at the data provides some more granular insights: Most of the job losses in strong clusters happened already before the crisis; there has been some normalization after 2008 and especially after 2010, where stronger clusters rebounded more. This indicates that the economic troubles facing strong clusters are structural, not cyclically driven by the Great Recession.

In terms of specific cluster categories, the core industry-driven clusters like automotive, production technology, and upstream manufacturing have suffered the most.

Geographically the Canadian provinces have tended to do better across both strong and weak clusters, but they saw a relatively more dramatic decline in strong clusters and less of a rebound in the recent recovery than their peers in the US.
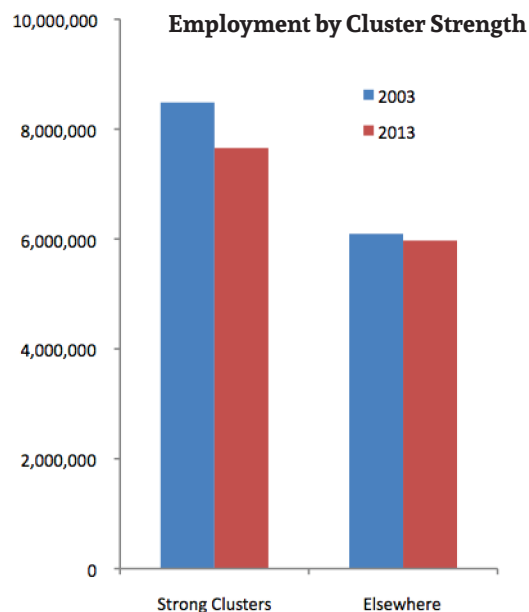
Overall, this unique pattern of high employment losses in strong clusters indicates that the loss of market share that the Region has experienced in its traditional areas of strength is not just a matter of productivity – in that case all locations in the Region would have been affected more equally. Instead, it is plausible that the strong clusters in the Region have in a significant number of cases ended up in serving less attractive segments within their markets, or have been slower in adopting new technologies and business models. Strong clusters can suffer from tunnel vision and technological 'lock-in'; this is a phenomenon that has been discussed in the literature before.[4]

The data is consistent with this interpretation but it will require more in-depth analysis in specific clusters to test and refine the diagnostics. What is critical for policy makers is the understanding that if this is indeed an accurate description of what has been happening in the Region, it will require at least as many changes in companies as in the business environment and policies to achieve a change in course. Changes in policy, whether in investing in skills and infrastructure or attempts to reduce labor costs, will benefit companies. But they will only have a fundamental impact if they are combined with strategic changes within individual companies.

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[4]For a well-known example see AnnaLee Saxenian's study of the Boston vs the Silicon Valley IT industry 'Regional Advantage: Culture and Competition in Silicon Valley and Route 128', Harvard University Press: 1996.
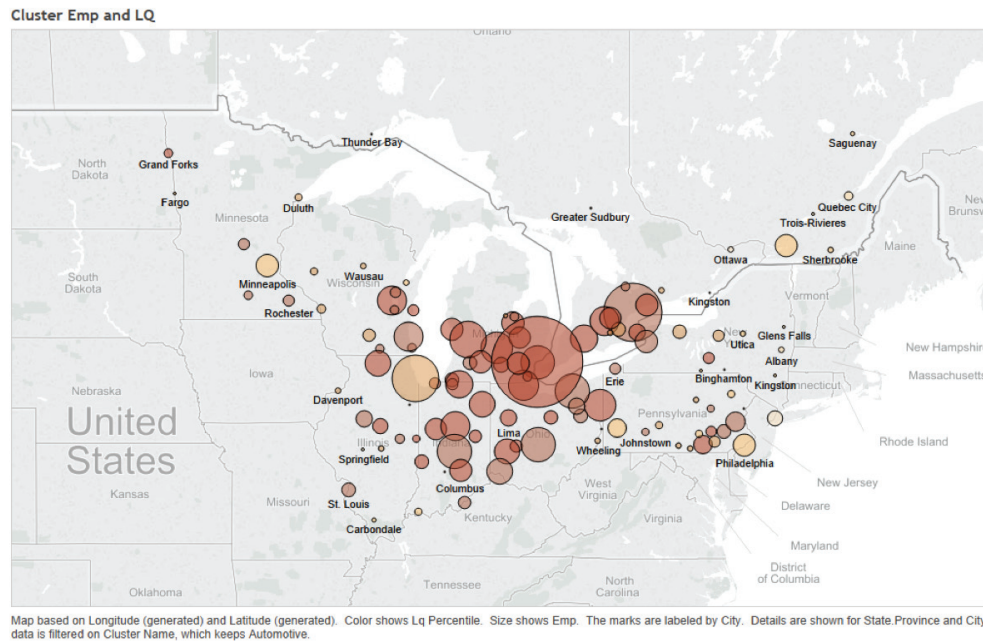
The economic geography of the Great Lakes – St. Lawrence Region

Clusters are not distributed equally across the Great Lakes – St. Lawrence Region. There are both differences in the strength and composition of the cluster portfolio by smaller region, and by the geographic footprint that individual cluster categories have across the entire Region. This report focuses on the latter aspect. The prior is of more interest to individual communities rather than to the Region as a whole; this data is available through the US Cluster Portal (www. clustermapping.us) and its Canadian counterpart (http://www.competeprosper.ca/clusters/ data).

Looking across cluster categories that are represented to a significant degree across the Region, there are three different types of geographical patterns:

• Clusters with wide presence across the Region, distributed among different types of locations
  – Automotive
  – Metalworking Technology
  – Production Technology
  – Upstream Metal Manufacturing
  – Plastics
  – Printing Services
  – Insurance
  – IT and Analytical Instruments
  – Food Processing

• Clusters with a presence in the larger metropolitan areas of the Region
  – Business Services
  – Financial Services
  – Education and Knowledge Creation
  – Transportation and Logistics

• Clusters with strong presence in specific parts of the Region
  – Aerospace Vehicles and Defense in Montréal, QC
  – Electric Power Generation and Transmission in the Toronto – Québec corridor
  – Medical Devices in Minneapolis, MN
  – Trailers, Motor Homes, and Appliances in Elkhart, IN

One interesting example is the **Automotive cluster.** The map on the next page shows both absolute employment levels (size of the bubble) and relative specialization (color of the bubble). As is clearly visible, Automotive industry employment is centered around the core cluster in Detroit but has strong extensions into many neighboring regions, including to Canada.

Cluster Emp and LQ

Map based on Longitude (generated) and Latitude (generated). Color shows Lq Percentile. Size shows Emp. The marks are labeled by City. Details are shown for State.Province and City data is filtered on Cluster Name, which keeps Automotive.
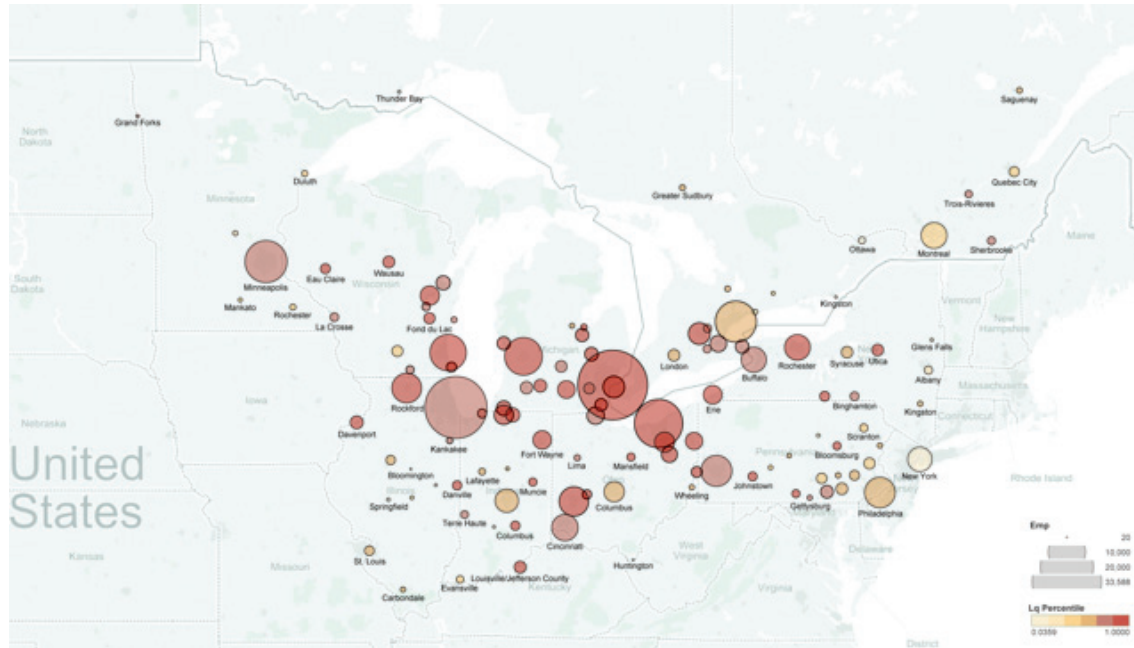
The cluster, once epitomizing the industrial strength of the Region, has seen its market share in the Canada/US-economy drop from 64% to 58% over the last decade. This process has been going on for a while, and reached its strongest momentum between 2003 and 2009. As has been documented elsewhere, it coincided with the emergence of strong new automotive clusters in a corridor stretching from the Midwest towards the Southeastern region of the United States.[5]

The fall of market share at a time when total employment in automotive industries had been falling as well resulted in a net loss of more than 220,000 jobs in the Region. The list of locations particularly hard hit is led by Detroit, Grand Rapids, Cleveland, Flint, Dayton, and Windsor; together they lost around 85,000 automotive jobs. The automotive industry is thus the core example of an industry losing in its strongest locations. While this is clearly influenced by business environment conditions – especially labor costs, labor market regulations, and tax incentives – this is unlikely to have been the only relevant factor.

Another example is the **Information Technology & Analytical Instruments cluster.** As can be seen in the map on the next page, there is a much broader network of clusters that stretches throughout many parts of the Region. Locations with clear strengths in this cluster include both core metropolitan centers and smaller college towns with strong higher education.

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[5]For a cluster-focused studies on Michigan but also in comparison South Carolina see http://www.isc.hbs.edu/resources/courses/moc-course-at-harvard/Pages/sample-student-projects.aspx

While Information Technology & Analytical Instruments are not traditionally a relative strength of the Great Lakes – St. Lawrence Region, this is a cluster category in which the Region has systematically gained market share over the last decade. It started out accounting for 26.5% of all employment in Canada and the U.S. in this area, and now stands at more than 30%, just a bit below the overall share of the Region in Canada/US-traded industry employment.

Interestingly, the list of locations in the Region that have created most jobs in IT & Analytical Instruments over the last decade is led by cities that are centers of academic activity, including many with relatively moderate overall size: Madison, Philadelphia, Albany, Utica, Ann Arbor, and Québec City. Despite the overall gains in market share and the job creation in some locations overall employment in this category is down, as it is for the overall Canada/US-economy. The largest metropolitan centers, including Chicago, New York City, and Toronto, were those that registered the strongest job losses.

Linkages across clusters

While clusters are characterized by the strong linkages of the related industries they include, they also have linkages to the rest of the economy. These cross-cluster linkages are important, because changes in the composition of regional economies often occur along development axes these linkages are creating. New industries and clusters tend to emerge from existing industries and clusters that provide some relevant capabilities and assets. From these 'bridgeheads' entrepreneurs than launch a discovery process exploring new markets and sectors that are within reach.

The figure below shows through proximity and the presence and thickness of connecting lines the patterns of relatedness across cluster categories.[6] This structure is then applied to the Great Lakes – St. Lawrence Region, shading cluster categories according to the number of metro areas that have strong clusters in the respective set of industries.

Cluster Linkages and Economic Diversification
Great Lakes - St. Lawrence Region, 2013
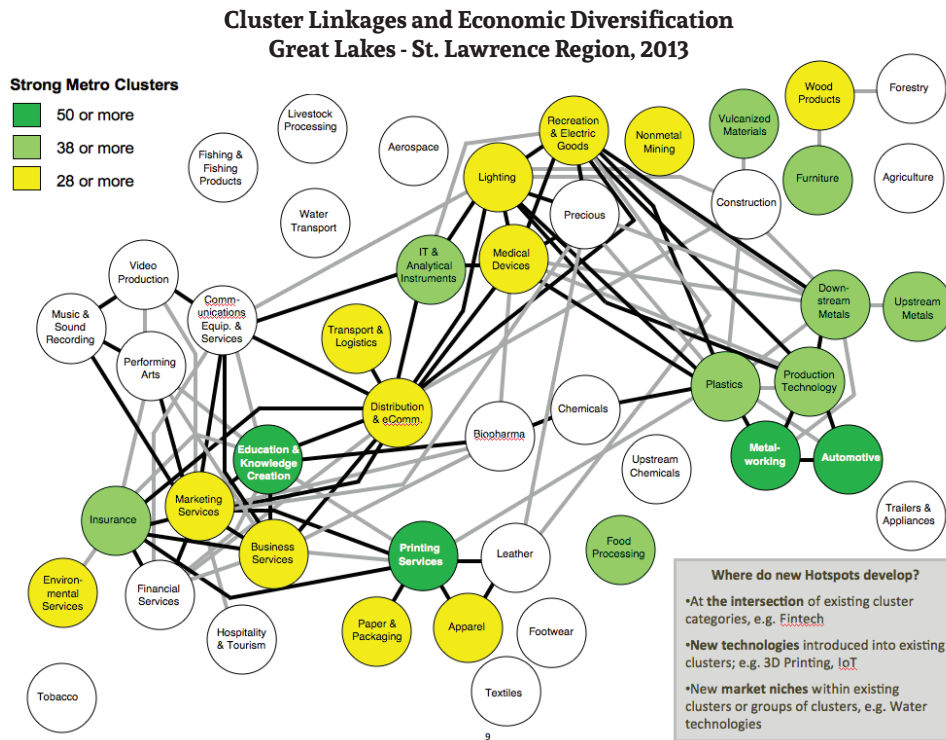
The Region has one if its clear strong-points in a set of related clusters focused on automotive and related sets of manufacturing oriented industries. There are also a number of other areas in which the Region has strong positions in more than one cluster. One is centered around education and knowledge creation and includes a number of advanced services. Another connects Information Technology with a range of 'light' manufacturing activities, including medical devices and lighting equipment. Finally, there are groups of cost-sensitive manufacturing activities around printing and apparel, and some activities related to the Region's natural endowments in Furniture and Wood Products.

This type of analysis can help the Region focus its economic development activities on areas with strategic importance across a number of clusters. In these areas the returns for public action seem most likely to occur, even though there is never a guarantee to what will succeed in the market place. The figure on the next page shows two of them, which are reinforcing in nature:

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[6]The underlying analysis is available at http://www.clustermapping.us/content/cluster-mapping-methodology

• The core group of **manufacturing-driven clusters** continues to account for a significant share of the Region's employment and represents a valuable set of assets and capabilities. These clusters are clearly under intense competitive pressure, and the new technologies and business models that have emerged present both opportunities and challenges to their traditional positioning. Necessary changes to take advantage of these opportunities will have to be looked at in both companies and the business environment in which they operate.

• A new opportunity could emerge in a new **knowledge-driven industry 4.0 triangle** between the Region's traditional manufacturing strengths and its newly emerging strengths in Education & Knowledge Creation as well as Information Technology & Analytical Instruments. While it is unlikely that the Region can challenge the dominance of locations at the East and West Coast in the core activities of these latter two clusters, the combination with manufacturing could provide an important new opportunity. Even here it will require systematic collaboration between firms, academic institutions, and the public sector to identify market opportunities and the needs they imply for strengthening the relevant business environment conditions in the Region.

Cluster Linkages in the Great Lakes - St. Lawrence Region, New Industrial Opportunities - Building on Existing Strengths
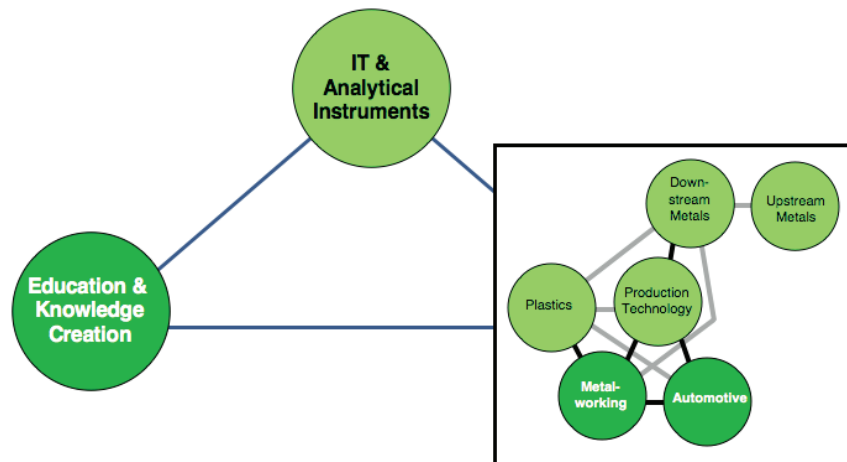
C. Policy implications: Where can macro-regional collaboration make a difference?

Principles for successful macro-regional collaboration

As the introduction of this report laid out, macro-regional collaboration provides clear opportunities in a number of areas. But it is important to also recognize that such collaboration across borders, especially when they include national borders like in the Great Lakes – St. Lawrence Region, requires a lot of sustained effort. A common ground needs to be created, to bridge the gap of different institutional structures, legacies, and in some cases language. And trust needs to be built to create a sense that all participants pursue their interests with a view to contributing to some common objective.

The evolution of collaboration in the Great Lakes – St. Lawrence Region is instructive to understand the dynamics at play: It started around sustainable water management, a policy area that meets three criteria making it a particularly suitable area for collaboration:

(a) it is individually important for all

(b) regional collaboration is needed or provides significant benefits

(c) the benefits are broadly shared

As the collaboration is now increasingly moving into other policy areas, it is important to keep these principles in mind. Political leadership that sees the long-term benefits of collaboration can sustain joint action even if one of these criteria is not met. But it makes collaboration much more fragile and subject to disruption if political priorities change.

The experience of other macro-regions provides some insights into how collaboration can be organized to make it more sustainable.

One learning is to create a flexible architecture that enables those parts of the macro-region most interested in a specific topic to collaborate without having to wait for others. This allows everyone interested to remain engaged, but does not slow down activity or force some sub-regions to participate in efforts that are not critical for them. Another important observation concerns the benefits of engaging other institutions beyond the public sector. This is an obvious need for effective action in many areas, not the least economic development. But it also helps enhance the robustness of the effort by making it less political. A third insight, and one that is an important complement to the one before, is the need to find a structure that engages the political leadership where needed and otherwise enables action to proceed without their active participation where possible. The Governors and Premiers lend important credibility and political authority to the collaboration. But given there many other responsibilities it is critical not to make them the bottleneck for implementation once they have set the overall direction. For implementation it has then proven useful to create a coordinating structure among the different agencies and institutions across the Region. There needs to be one point where macro-regional collaboration is being coordinated and is on top of the agenda.

Specific action ideas for the Great Lakes – St. Lawrence Region

Combining the principles outlined above and the analysis in the main part of this Report, there are a couple of specific actions that the Region could consider for action. They are all consistent with a broader view of economic development that is focused on upgrading competitiveness, draws on clusters as an organizing principle for action, mobilizes partnerships with the private sector as well as academic and educational institutions, and ultimately is driven by a strategic view on what role this macro-region aims for as a place to do business within NAFTA and globally. The ideas represent a mix of approaches and differ in their ambition; they share a focus on critical competitiveness issues of this Region:

A. Strategic cluster review: automotive in the Great Lakes – St. Lawrence Region

The automotive cluster remains a core driver of the Region's economy and despite its structural erosion over the last years it has recently shown new signs of stabilization and opportunity.

We suggest mobilizing a working group made up by core companies from the automotive clusters across the Region, representatives of leading research and educational institutions, and leaders from key state and local government. The working group would first deepen the analysis of the current status of the cluster, in particular the hypothesis that the cluster ended up in unattractive market segments and failed to adopt new technologies. Based on this analysis, the group would then draw up action agenda for all participating groups of entities.

This is an ambitious undertaking, both in terms of the issue and the process to address it. Much work has already been done, and this is a platform that needs to be built on. What is so far missing, however, is an integrated strategy that acknowledges the nature of the cluster as stretching over large parts of this Region.

B. Emerging cluster network: water technology in the Great Lakes – St. Lawrence Region

Water is the unifying theme for the Great Lakes – St. Lawrence Region. It has provided the starting point for macro-regional collaboration, focusing on environmental sustainability. It is now increasingly also perceived as a potential economic opportunity, and a number of efforts in different parts of the Region have been launched to explore this potential.[7]

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[7]As an example of recent reports and policy documents see "Sustaining Michigan's Water Heritage", Draft version, Michigan Office of the Great Lakes, June 2015; "Michigan Blue Economy", November 2014. As an example of an organization devoted to exploring the opportunities related to water see "The Water Council" in Milwaukee, http://www.thewatercouncil.com/

We suggest creating a network of interested efforts and groups across the Region that share this interest in the economic potential of water. This group would first define in more detail what the different elements of this opportunity are (water as a resource, water management technology, traditional industries relying on water like tourism and water transportation), building on the existing work in the Region and globally. It would then map in more detail the Region's competitive position relative to peers and rivals elsewhere in North America and globally. Based on this analysis, an initial set of action opportunities could be developed.

This, too, is an ambitious undertaking, given the need to translate a broad but also somewhat vague promise into specific market opportunities. Given that the economic geography of this field is also still evolving, there will also be significant competition among locations within the Region to take a leading role. But given the great strategic fit of this field with the Region's profile and its need to develop new areas of strengths that can build on its existing assets and capabilities, this is an opportunity the Region can ill afford to ignore.

C. Policy peer group: cluster renewal and diversification

Economic development officials across the Region face the clear need to renew and diversify the existing set of clusters. While much of this action will be local in nature, the tools and approaches will often be similar.

We suggest creating a working group of economic development professionals from across the Region to share, compare, and develop policy tools and implementation approaches focused on the renewal of existing strong clusters and on the diversification into related new fields. This working group would be operating in dialogue with the cluster-specific public-private efforts discussed above, providing input specific measures that state and local authorities can take. It would discuss the broad range of policy tools available, from workforce skill upgrading, the provision of real estate, the support of exports, access to capital, innovation, and many other instruments.

This is less ambitious and can build on many existing formal and informal networks that connect this community of practice. But it can provide these activities with more structure, and concentrate them on the critical issues related to transforming the Region's economy.

D. Great Lakes – St. Lawrence STARS: cluster networks across the macro region

The analysis in this report has identified a range of clusters that have a strong presence across many parts of the broader Region. While there are likely to be already a good number of contacts and linkages among them, there is further potential for both enhancing trade and investment and upgrading competitiveness by collaboration among them.

We suggest launching a competitive program that would provide moderate funding for creating a network as well as access to compete for more substantial funding from new or existing programs to support specific action initiatives of these networks.[8] The networks would operate in a field of their choice – most likely within one cluster category but it could be open to cross-cluster collaboration as well – and connect locations across the Region. Funding would be awarded based on criteria like the strengths of the participating partners, their capabilities to organize joint action, and the quality of their action plan.

This idea is initially focused on strengthening linkages, and broadening the base of collaboration across the Region. It requires states and provinces to pool some resources and find ways to avoid issues around the funding from out-of-state/province partners to become a problem (potentially there are also Canadian/US programs that could be used). The experience suggests that the most important and critical element is to encourage regional networks to take up this opportunity, particularly if they are only nascent.

E. Great Lakes – St. Lawrence State of the Region-Report: tracking competitiveness and collaboration across the macro region

Successful macro regional collaboration requires a shared sense of what the Region looks like and data and analysis to track its performance to guide action. This report has focused on some of the key aspects that are relevant, in particular the overall performance of the Region and its cluster composition.

We suggest launching a regular Report to profile the Region's economy, track its performance, its underlying competitiveness, and the main efforts and initiatives for collaboration across the Region.[9] The Report could be written by a consortium of researchers from across the Region, bringing in external exports as needed. It could also draw on relevant reports by banks and other institutions. Such a Report could be used externally as well as internally to provide a clearer sense of what the Region is, moving beyond simple marketing. And it could help guide collaboration to ensure actions are targeted on the most important issues, and are executed effectively.

This idea could build on the existing report as well as the report on the more short-term economic climate across the Region presented at the 2015 Summit of Governors and Premiers.[10] It requires some shared funding, potentially sponsorship through interested entities active across the Region.

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[8]For a similar existing program in the Baltic Sea Region see www.bsrstars.se
[9]Again, the Baltic Sea Region with its annual State of the Region-Reports since 2004 provides a useful example: http://www.bdforum.org/reports-publications/state-of-the-region-reports/
[10]BMO Capital Markets: Great Lakes-St. Lawrence Region – North America's Economic Engine, June 2015.

These ideas provide a range of potential approaches. There are others that might be equally promising. They key is to build on the existing momentum, find a project that meets the criteria outlined earlier and can mobilize initial support to be launched. Then the collaboration can be further developed over time as the benefits from working across the Region become apparent to a broader group of partners. The Great Lakes – St. Lawrence Region has the potential to become the role model for macro-regional collaboration in North America and beyond, creating significant benefits for its competitiveness and economic performance along the way.

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