CANADA'S URBAN COMPETITIVENESS AGENDA

Completing the Transition from a
Resource to a Knowledge Economy

The Cities Project at the Martin Prosperity Institute focuses on the role of cities as the key economic and social organizing unit of global capitalism. It explores both the opportunities and challenges facing cities as they take on this heightened new role.

The Martin Prosperity Institute, housed at the University of Toronto's Rotman School of Management, explores the requisite underpinnings of a democratic capitalist economy that generate prosperity that is both robustly growing and broadly experienced.

CANADA'S URBAN COMPETITIVENESS AGENDA

Completing the Transition from a Resource to a Knowledge Economy

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Introduction

Small in population but vast in physical endowments, Canada's fortunes have long been tied to its natural resources.[1] The country's recent slide into recession, thanks to lagging world oil prices, is a stark reminder of the busts that come with the booms created by the nation's dependence on its natural endowments.[2] A well-known malady of resource-rich nations is the so-called "resource curse," where the short-term wealth derived from resources inhibits the development of other, more long-running and sustainable sources of wealth-creation and economic development.[3] And of course, resource-based economies are perpetually at the mercy of external economic-forces, exposing them to shocks that can quickly turn a boom into a bust. For the past decade or so, Canada's leadership has created a narrative that its resource-rich west is the primary source of long-run prosperity for the country.[4]

But, it is clear that the path to sustained prosperity in today's economy turns on knowledge, innovation, and creativity. These are areas where, according to recent studies, Canada lags behind its international peers.[5] As we will see, economic competitiveness and sustained economic growth rests on what we term the 3Ts of economic development: talent, technology, and tolerance.[6] Economists widely agree that talent and human capital are key drivers of productivity, innovation, and rising living standards. Technology has long been seen as a

key factor in innovation and the wealth of nations. Talent and technology are not just simple stocks or endowments, they flow to the places that are most productive and attractive. Tolerance — openness to people from across the spectrum — is a key factor in attracting talent and technology. Furthermore, these three key factors in economic growth are clustered and concentrated. The world is not flat, it is spiky, with its greatest spikes taking shape around cities and metropolitan areas that cluster and activate the 3Ts together.[7]

As this report shows, Canada is in effect a nation built around two different economic models — one based on resources, the other on ideas. These two economic models are centred in different regions of the country and shaped by different geographies. According to our Martin Prosperity Institute colleague Roger Martin, there are two basic ways firms, and by extension nations, compete.[8] The first is by turning out standard products at lower cost. This is essentially how resource based economies work. The second is by offering something new, different, and better that creates higher value. This is how knowledge economies work.

It does not have to be this way. Canada is one of the very few nations in the world that has the capacity to combine these two models, using resources to fuel the growth of the knowledge economy, while deepening and expanding the resource economy with technology and knowledge.

The key to Canada's overall future lies in this kind of synergy. It can no longer fall victim to the narrative that resources are the key to its economic future. Rather, it must use the proceeds that come from its resource rich economy to invest in the durable assets of talent, technology, and tolerance, fueling long-running economic growth and development while adding

talent and technology to create a higher-performing resource economy.

This report provides a data-driven examination of the key pillars of Canada's current and future economic competitiveness. It identifies how the nation's city-regions stack up in terms of its two growth models and evaluates their relative economic performance. We begin by outlining how Canada's 147 city-regions stack up on the 3Ts of economic development. To do so, we introduce several new indexes of the competitiveness of Canada's city-regions: the Canadian Talent Index, the Canadian Technology Index, and the Canadian Tolerance Index. After that, we introduce an overall composite measure of competitiveness in the knowledge and creative economy: the Canadian Creativity Index. We then turn to our comparative assessment of the economic performance of Canada's knowledge- and resource-based economic models. We summarize our key findings and discuss their implications for the future competitiveness of Canada and its city-regions in the concluding section. The technical appendix provides the details on our data, indexes, and overall methodology.

Talent

Economists have long noted the role of talent or human capital in economic development. Peter Drucker and Fritz Malchup famously identified the role of knowledge workers to economic development in the 1950s and 60s.[9] Paul Romer later formalized the role of knowledge in his theory of endogenous growth.[10] Numerous studies show the close connection between talent and economic progress at both the national and regional levels.[11] Economists have traditionally measured talent by the level of educational attainment. Talent, however, is more fundamentally related to skill. The best way to measure this is to look at the occupations workers are employed in.[12]

To get at this, we map the way Canada's city-regions stack up across the three main occupational classes: the creative class of knowledge-based professionals, the shrinking blue-collar working class, and the largest and fastest growing group, the service class, comprised of lower-wage workers in routine service jobs like food preparation, clerical work, and retail trade.

The Creative Class

The creative class is comprised of scientists and technologists; artists, designers, cultural creatives, and media workers; business and management professionals; and healthcare and education workers. The creative class currently accounts for 5.5 million workers, roughly a third of the workforce, up from just a quarter of employment in 1981.

Exhibit 1 charts the geography of the creative class across Canada's city-regions. *Exhibit 2* lists the 10 large city-regions with the largest and smallest shares of the creative class. Large city-regions are defined by Statistics Canada as having a population of over 100,000.
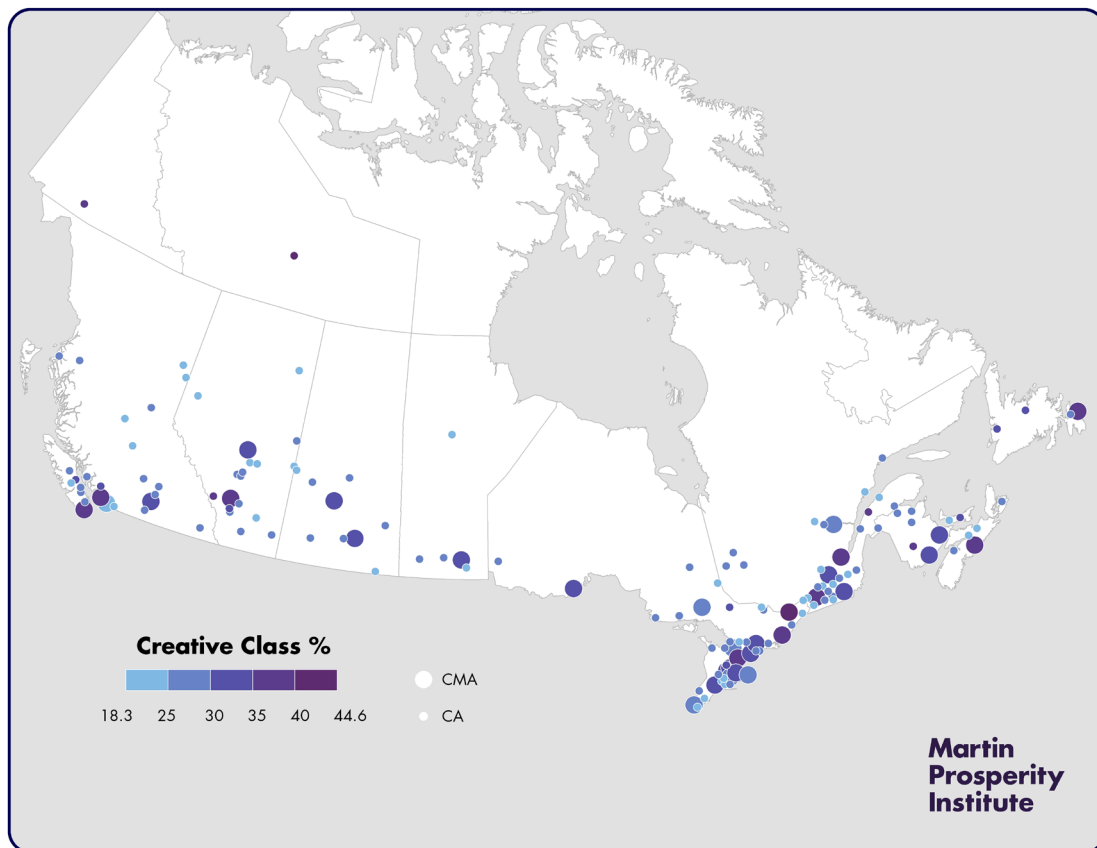
Exhibit 1: The Geography of Canada's Creative Class

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Rank (147)	City-region	Province/Territory	Creative class employment
1	Ottawa-Gatineau	ON/QC	**44.6%**
4	Calgary	AB	**38.7%**
5	Toronto	ON	**38.5%**
8	Victoria	BC	**37.4%**
9	St. John's	NL	**37.1%**
10	Vancouver	BC	**36.5%**
11	Halifax	NS	**36.5%**
12	Québec City	QC	**36.5%**
13	Montréal	QC	**36.3%**
14	Kingston	ON	**36.2%**
34	Thunder Bay	ON	**30.8%**
36	Trois-Rivières	QC	**30.6%**
38	Kelowna	BC	**30.5%**
40	Windsor	ON	**29.8%**
44	Greater Sudbury	ON	**29.4%**
50	Saguenay	QC	**29.1%**
59	Barrie	ON	**28.1%**
91	St. Catharines-Niagara	ON	**26.1%**
96	Brantford	ON	**25.8%**
108	Abbotsford-Mission	BC	**25.0%**

(Left margin labels: Top 10 large city-regions — rows 1–14; Bottom 10 large city-regions — rows 34–108)

Exhibit 2: Top and bottom 10 large city-regions for the Creative Class

The range is enormous. Some are well positioned, others not so much. Ottawa-Gatineau is the top ranked city-region with 44.6 percent of its workforce made up of the creative class. Calgary is second at 38.7 percent, followed by Toronto with 38.5 percent. Vancouver is sixth with 36.5 percent; Montréal is ninth with 36.3 percent.

Six of the 10 top-performing large city-regions are national or provincial capitals. All of the top 10 are home to significant research universities. Conversely, the city-regions with the smallest shares of the creative class are mainly smaller and medium sized industrial centres.

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The Working Class

The working class was the dominant class of the industrial age. It includes workers in the manufacturing, construction, and transportation industries. The size of the working class has fallen from half of the workforce in the middle of the 20th century to less than a fifth of workers (18.5 percent) today.

Exhibit 3 plots the geography of the working class across Canada's city-regions, while *Exhibit 4* lists the 10 large city-regions with the largest and smallest concentrations of the working class.
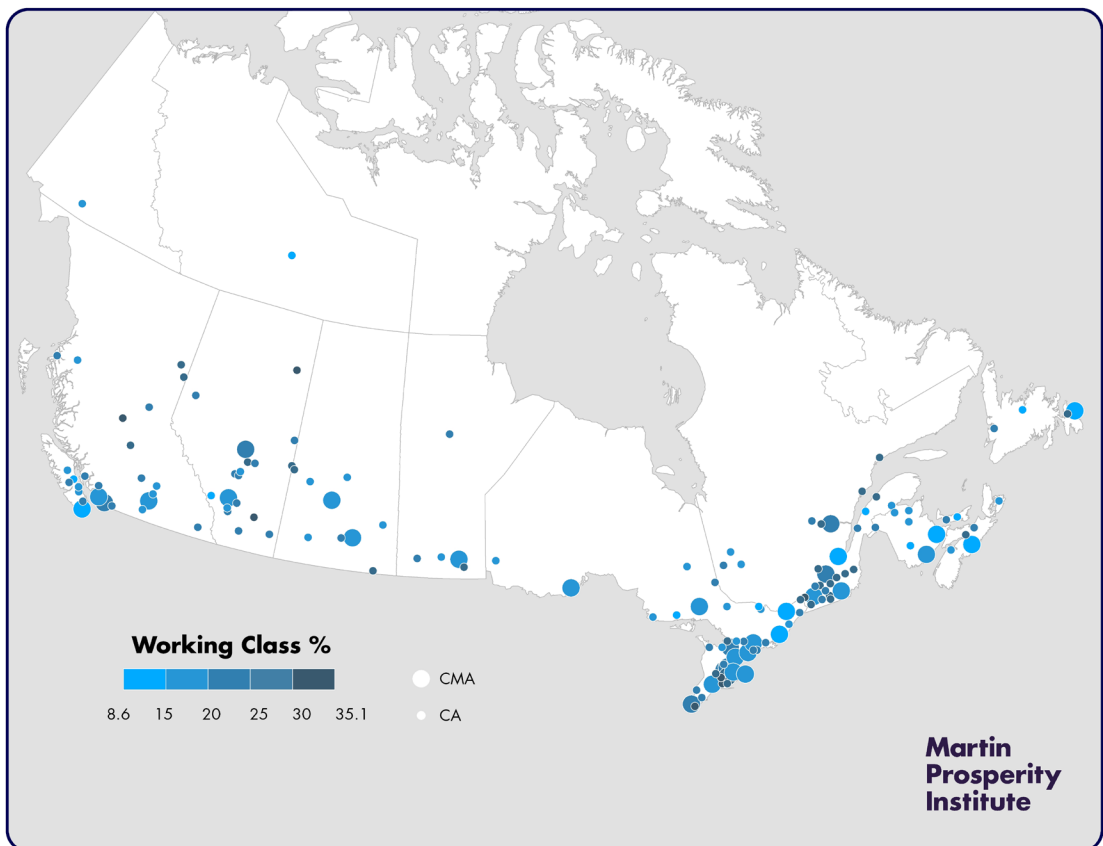

Exhibit 3: The Geography of Canada's Working Class

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Overall Rank (147)	City-region	Province/Territory	Working class employment
30	Brantford	ON	**25.8%**
36	Abbotsford-Mission	BC	**24.9%**
54	Windsor	ON	**22.7%**
58	Guelph	ON	**22.3%**
59	Kitchener-Waterloo	ON	**22.2%**
68	Saguenay	QC	**21.6%**
71	Barrie	ON	**21.3%**
81	Edmonton	AB	**20.4%**
84	Trois-Rivières	QC	**20.0%**
90	Oshawa	ON	**19.6%**
128	Toronto	ON	**15.6%**
129	Montréal	QC	**15.5%**
131	Vancouver	BC	**15.1%**
133	Moncton	NB	**14.9%**
135	St. John's	NL	**14.3%**
136	Québec City	QC	**14.2%**
140	Kingston	ON	**13.3%**
142	Halifax	NS	**13.2%**
143	Victoria	BC	**12.5%**
146	Ottawa-Gatineau	ON/QC	**9.6%**

(Left margin labels: "Top 10 large city-regions" for ranks 30–90; "Bottom 10 large city-regions" for ranks 128–146)

Exhibit 4: Top and bottom 10 large city-regions for the Working Class

Again, the range is considerable from more than 25 percent at the high end to less than 10 percent at the low end. The places where the working class make up the largest share of the workforce are, unsurprisingly, older industrial cities or city-regions where natural resources dominate the local economy. Brantford tops the list with 25.8 percent of its workforce in the blue-collar working class. It is followed by Abbotsford–Mission (24.9 percent), known for its historic forestry industry. Across the border from Detroit, Windsor (22.7 percent), the centre of Canada's automotive industry, rounds out the top three.

Ottawa-Gatineau has the smallest concentration of working class workers, with a mere 9.6 percent of workers falling in this occupational group. Montréal, Toronto, and Vancouver also number among the 10 places with the smallest concentrations of the working class. Many of the city-regions with the smallest concentrations

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of working class workers also have among the highest shares of the creative class. However, there are some exceptions, like Kitchener-Waterloo (22.2 percent) and Guelph (22.3 percent), which have tied manufacturing to their knowledge economies.

The Service Class

The service class is the largest and most rapidly growing class. It spans lower-skill occupations in food service, office and clerical work, and retail trade. Service class jobs are more routine, pay less, and are frequently more precarious. The service class totals 7.7 million workers, nearly half of the workforce (46 percent).

Exhibit 5 charts the geography of the service class across Canada's city-regions, and *Exhibit 6* lists the top and bottom 10 service class locations among Canada's large city-regions.
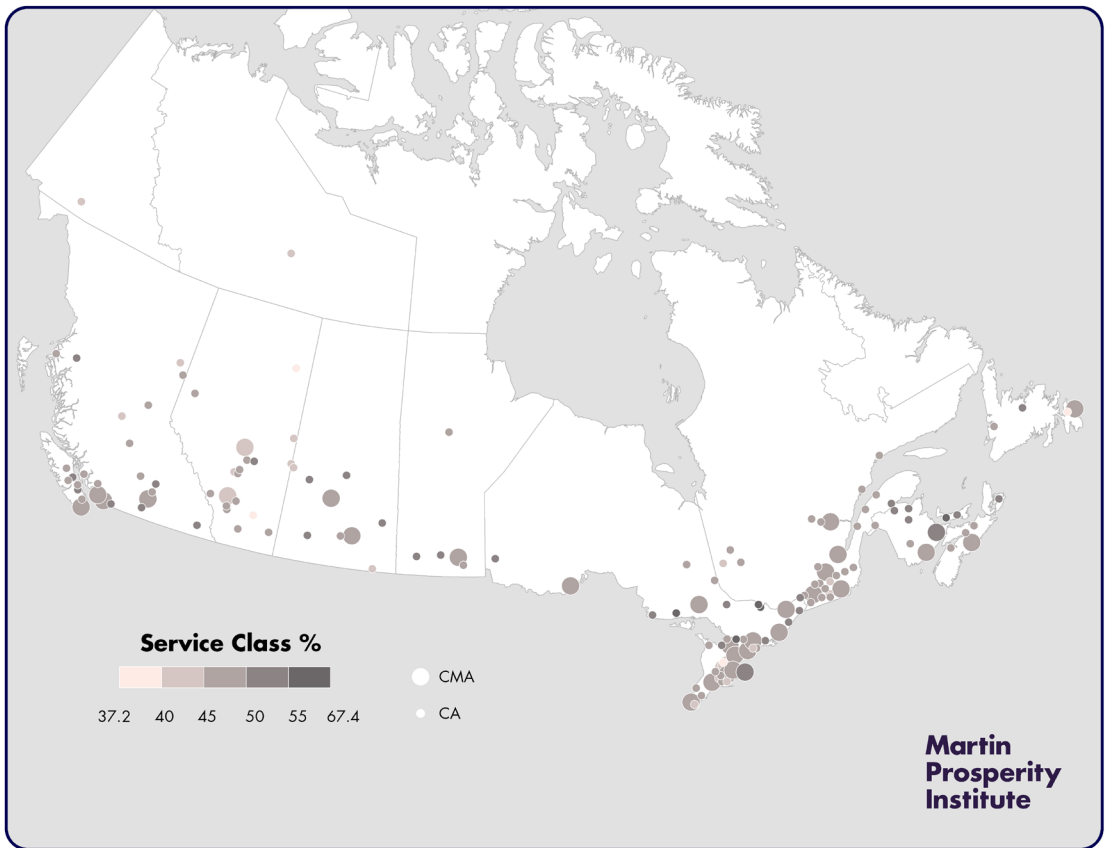

Exhibit 5: The Geography of Canada's Service Class

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	Overall Rank (147)	City-region	Province/Territory	Service class employment
Top 10 large city-regions	10	St. Catharines-Niagara	ON	52.5%
	11	Moncton	NB	52.4%
	43	Kingston	ON	49.6%
	44	Halifax	NS	49.5%
	45	Thunder Bay	ON	49.4%
	46	Barrie	ON	49.4%
	50	Kelowna	BC	49.0%
	54	Winnipeg	MB	48.8%
	56	Québec City	QC	48.7%
	58	Peterborough	ON	48.7%
Bottom 10 large city-regions	97	Brantford	ON	46.5%
	103	Windsor	ON	46.1%
	106	Saskatoon	SK	46.0%
	120	Abbotsford-Mission	BC	45.3%
	121	Toronto	ON	45.2%
	124	Ottawa-Gatineau	ON	45.1%
	126	Edmonton	AB	44.9%
	132	Calgary	AB	43.7%
	133	Kitchener-Waterloo	ON	43.7%
	141	Guelph	ON	41.9%

Exhibit 6: Top and bottom 10 large city-regions for the Service Class

Once again there is considerable variation. In Canada's largest metros, the service class account for anywhere between 41.9 percent and 52.2 percent of the local workforce. A high level of service class employment is often a sign of a lack of a strong economic base, especially in knowledge-intensive activities. At 52.5 percent, St. Catharines – Niagara has the highest share of service class jobs with Moncton not far behind at 52.4 percent. Kingston (49.6 percent), Halifax (49.5 percent), Thunder Bay (49.4 percent), and Barrie (49.4 percent) round out the top five. Metros with stronger creative economies tend to have lower concentrations of service class jobs. Such is the case for Guelph (41.9 percent), Kitchener-Waterloo (43.7 percent), Calgary (43.7 percent), Edmonton (44.9 percent), Ottawa-Gatineau (45.1 percent), and Toronto (45.2 percent).

The Canadian Talent Index

We now turn to our overall index of talent, the Canadian Talent Index. It includes both occupational and educational measures of talent and skill: the creative class share of the workforce, the share of the working age population with a university degree, and the number of doctoral degrees or PhDs per 1,000 people.

Exhibit 7 shows how Canada's city-regions stack up on the Canadian Talent Index, while Exhibit 8 lists the top and bottom 10 large metro-regions on it.
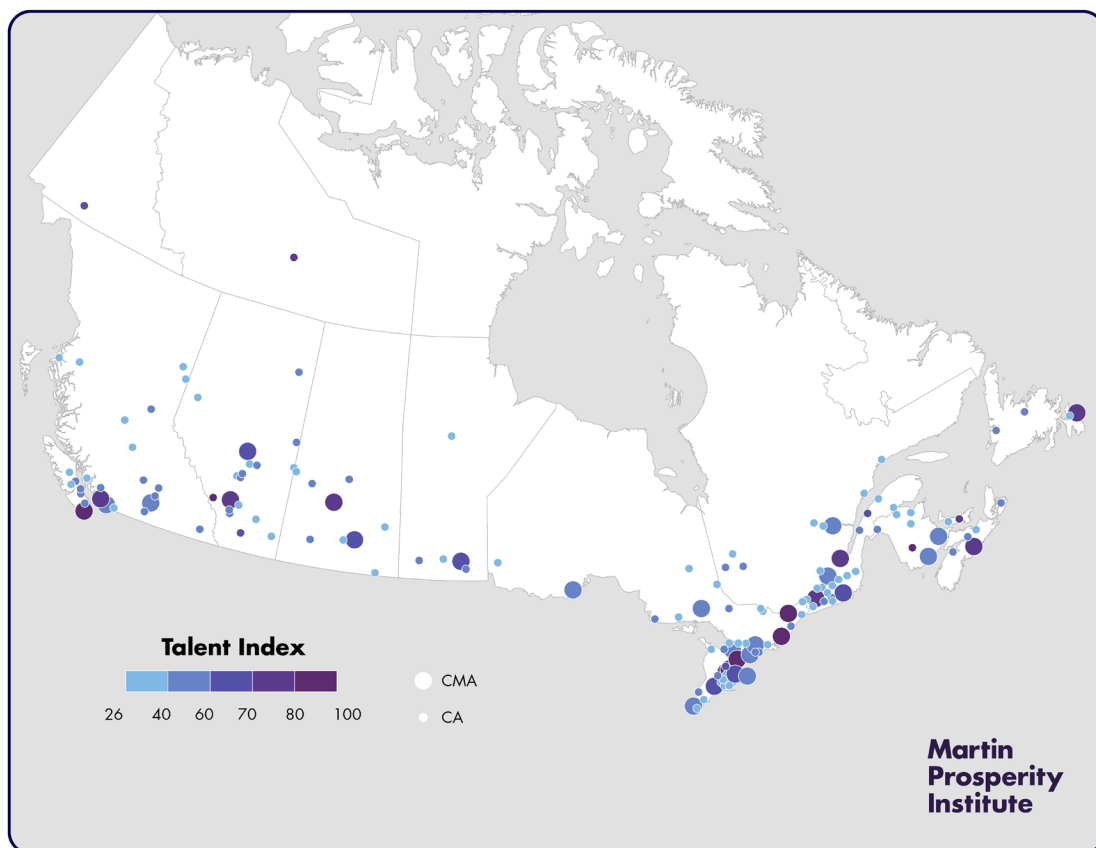

Talent Index

| 26 | 40 | 60 | 70 | 80 | 100 |

○ CMA
○ CA

Martin Prosperity Institute

Exhibit 7: The Canadian Talent Index

	Overall Rank (147)	City-region	Province/ Territory	University degree %	Creative class %	PhD per 1,000 population	Talent Index
Top 10 large city-regions	1	Ottawa-Gatineau	ON	38.2%	44.6%	16.8	**100.0**
	2	Guelph	ON	31.6%	34.2%	21.3	**93.0**
	5	Kingston	ON	27.8%	36.2%	21.9	**92.2**
	6	Victoria	BC	31.3%	37.4%	15.5	**85.6**
	7	Toronto	ON	36.8%	38.5%	9.1	**80.9**
	8	Vancouver	BC	34.1%	36.5%	10.8	**79.6**
	9	Calgary	AB	34.8%	38.7%	9.1	**79.2**
	10	Halifax	NS	32.9%	36.5%	10.8	**78.6**
	11	Saskatoon	SK	28.5%	32.6%	13.7	**76.0**
	12	Montréal	QC	29.6%	36.3%	9.7	**73.5**
Bottom 10 large city-regions	37	Thunder Bay	ON	21.1%	30.8%	6.0	**54.8**
	39	Kelowna	BC	19.3%	30.5%	6.3	**53.5**
	41	Saint John	NB	20.6%	31.8%	3.8	**51.7**
	42	Greater Sudbury	ON	19.2%	29.4%	5.5	**51.2**
	48	Oshawa	ON	19.6%	31.2%	2.7	**48.2**
	50	Saguenay	QC	17.3%	29.1%	4.9	**48.0**
	57	St. Catharines-Niagara	ON	17.9%	26.1%	4.5	**45.5**
	66	Abbotsford-Mission	BC	17.1%	25.0%	4.2	**43.4**
	71	Barrie	ON	17.5%	28.1%	1.8	**42.3**
	93	Brantford	ON	14.5%	25.8%	2.3	**38.6**

Exhibit 8: Top and bottom 10 large city-regions on the Canadian Talent Index

Topping the list is Ottawa-Gatineau, which scores high on each of the Index's three variables, including a first place rank for its creative class share. Its high performance reflects three things: its large federal employment base, its role as a major university centre, and the presence of a robust tech industry.

The remainder of the top 10 can be split into two broad categories. One includes large cosmopolitan centres like Toronto, Vancouver, and Calgary, which occupy the seventh through ninth positions. Each scores highly on university degrees and creative class shares, but lags slightly on our measure of PhDs per capita. These

three city-regions have well-developed knowledge economies with many opportunities for highly skilled workers. Their lower scores on PhDs are mainly due to the fact that they have large populations that dilute the numbers. The second group includes small to medium sized metros that have a major university presence such as Guelph (second), Fredericton (fourth), Kingston (fifth), Victoria (sixth), and Halifax (10th). Fredericton, Victoria, and Halifax are also provincial capitals, which bolsters their demand for talent. These places are major producers of talent, whose primary challenge is retaining young graduates through employment opportunities. Canmore, which takes third place, is the one outlier. Neither a large metro, nor a university town, it is located in close proximity to Calgary as well as the foothills of the Rocky Mountains. It is also home to a significant arts and culture community with a high quality of life that attracts and retains talent. The worst-performing metros on the Canadian Talent Index are mainly smaller places with manufacturing and resource-based economies.

Technology

Technology has also long been recognized as a key factor in wealth and progress. [Joseph Schumpeter](#) long noted that advances in technology allowed capitalism to create new industries, spurring new economic growth.[13] In the late 1950s, [Robert Solow](#) outlined technology's role as a driving force in economic growth.[14]

To get at this, we introduce our measure of technological competitiveness for Canada's city-regions — the Canadian Technology Index. It is made up of four components: innovation (based on patents per 10,000 people), venture capital investments, and two measures of employment in the information and communication technology (ICT) industries.

Exhibit 9 charts the Canadian Technology Index across Canada's city-regions, and *Exhibit 10* lists the top and bottom 10 locations for technology among Canada's large city-regions.
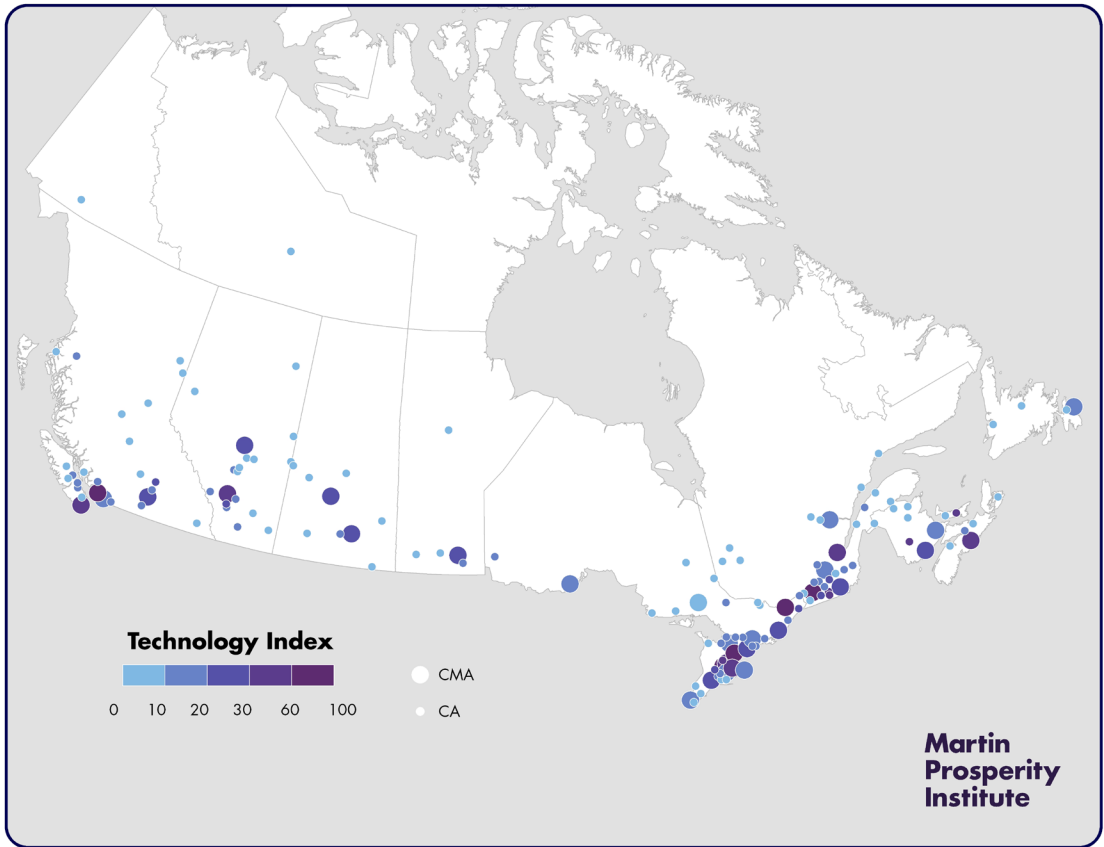
Exhibit 9: The Canadian Technology Index

Topping the list is Kitchener-Waterloo. The region performs especially well on ICT manufacturing and patents. It is home to the University of Waterloo, which is recognized for generating highly sought after computer science graduates, as well as its strong linkages to industry. It also has a longstanding history of producing top tech companies. Rounding out the top five are Toronto, Ottawa-Gatineau, Montréal, and Vancouver, with Calgary in sixth place. These are large metros that are major centres for ICT services. They also attract the lion's share of venture capital investment for tech startups. Ottawa-Gatineau has persisted as a major player in ICT manufacturing despite the demise of Nortel, its flagship company in the 2000s. It is second only to Kitchener-Waterloo in inventiveness, measured by patents per capita. Rounding out the top 10 are Victoria, Quebec City, Halifax, and Guelph. The worst performers on the Canadian Technology Index are again cities and towns that are located in the periphery and typically depend on resource extraction for their economic base.

	Overall Rank (147)	City-region	Province/ Territory	ICT mfg. LQ	ICT services LQ	Patents per 10,000 population	Venture Capital (millions)	Tech Index
Top 10 large city-regions	1	Kitchener-Waterloo	ON	7.72	1.15	12.05	31.8	**100.0**
	2	Toronto	ON	1.60	1.66	2.12	324.7	**84.7**
	3	Ottawa-Gatineau	ON/QC	2.22	1.72	6.08	141.4	**82.6**
	4	Montréal	QC	1.17	1.48	1.40	379.5	**82.2**
	5	Vancouver	BC	0.88	1.36	2.20	345.7	**77.4**
	7	Calgary	AB	0.79	1.35	1.83	169.0	**57.4**
	8	Victoria	BC	0.90	1.49	1.27	19.6	**43.8**
	10	Québec City	QC	1.08	1.27	1.20	22.0	**39.4**
	13	Halifax	NS	1.15	1.13	0.68	5.4	**33.2**
	14	Guelph	ON	1.38	0.92	1.89	5.1	**33.1**
Bottom 10 large city-regions	37	St. John's	NL	0.39	0.65	0.63	—	**18.4**
	40	Moncton	NB	0.29	0.65	0.43	0.8	**17.5**
	43	Brantford	ON	0.77	0.48	0.78	—	**16.7**
	46	Saguenay	QC	0.21	0.61	0.51	1.7	**16.4**
	49	Peterborough	ON	1.32	0.36	0.81	—	**16.2**
	52	St. Catharines-Niagara	ON	0.62	0.46	0.74	—	**15.5**
	53	Trois-Rivières	QC	0.32	0.57	0.30	2.2	**15.4**
	58	Abbotsford-Mission	BC	0.19	0.54	0.54	—	**14.7**
	78	Thunder Bay	ON	0.19	0.35	0.44	—	**10.3**
	97	Greater Sudbury	ON	0.08	0.30	0.26	—	**7.9**

Exhibit 10: Top and bottom 10 large city-regions on the Canadian Technology Index

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Tolerance

Tolerance is a less well-recognized, but still important component of economic growth. Places that have a higher level of tolerance tend to be more open to new ideas and more welcoming to newcomers who have different backgrounds. Higher levels of tolerance also help to attract and retain talent.

To get at this, we introduce the Canadian Tolerance Index comprised of measures of openness or tolerance: the foreign-born share of the population; the concentration of gay and lesbian people; and the bohemian index, which measures the concentration of artists, musicians, and cultural creatives, another indicator of openness.

Exhibit 11 maps the Canadian Tolerance Index across Canada's city-regions, while *Exhibit 12* lists the top and bottom 10 metro areas on it.
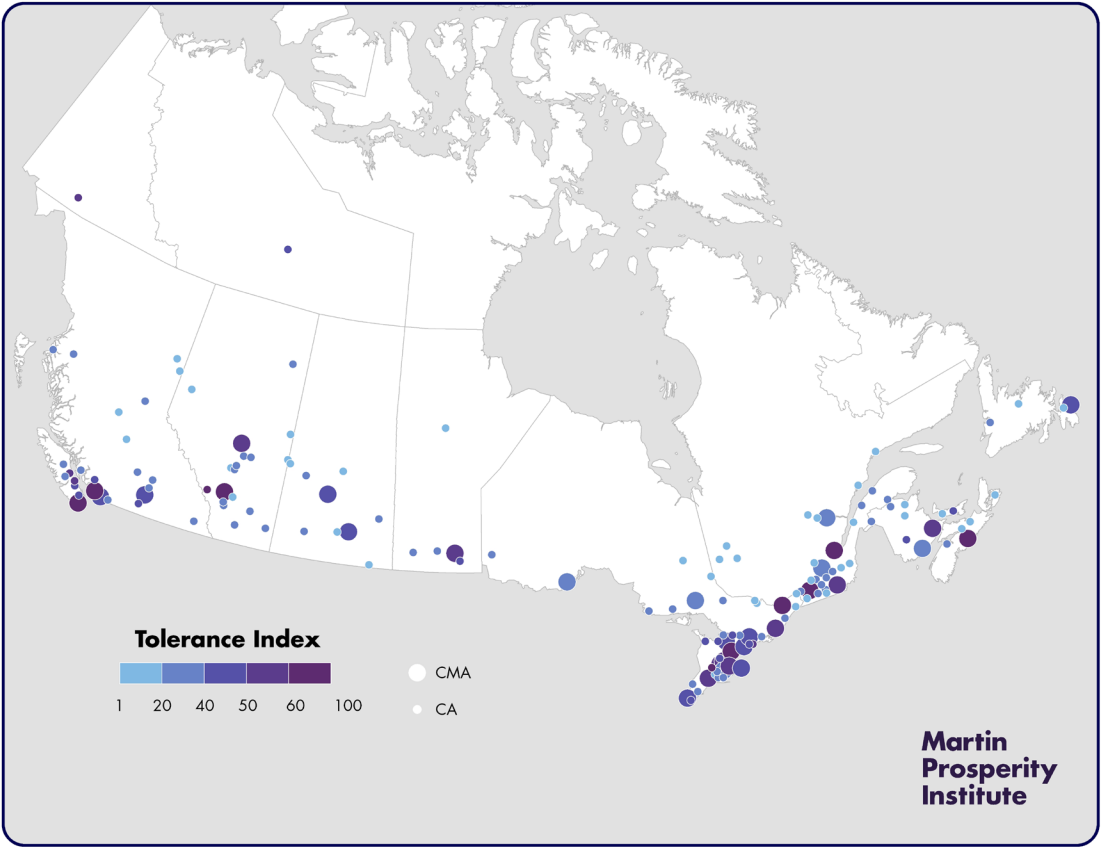
Exhibit 11: The Canadian Tolerance Index

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	Overall Rank (147)	City-region	Province/ Territory	Boho Index	Gay and Lesbian Index	Melting Pot Index	Tolerance Index
Top 10 large city-regions	1	Vancouver	BC	1.49	1.46	1.94	**100.0**
	2	Toronto	ON	1.43	1.20	2.23	**97.4**
	3	Montréal	QC	1.48	1.53	1.09	**87.1**
	4	Victoria	BC	1.28	1.61	0.87	**80.7**
	5	Ottawa-Gatineau	ON/QC	1.28	1.42	0.94	**77.4**
	7	Calgary	AB	0.85	1.08	1.27	**65.4**
	8	Halifax	NS	0.98	1.55	0.39	**64.7**
	10	Québec City	QC	1.05	1.43	0.21	**60.2**
	11	Edmonton	AB	0.75	1.06	0.99	**58.0**
	12	Hamilton	ON	0.86	0.81	1.14	**57.2**
Bottom 10 large city-regions	38	Saskatoon	SK	0.68	0.85	0.52	**43.6**
	39	Barrie	ON	0.83	0.64	0.59	**43.2**
	41	Peterborough	ON	0.75	0.82	0.40	**42.6**
	46	St. John's	NL	0.82	0.91	0.15	**41.7**
	48	Trois-Rivières	QC	0.71	0.94	0.13	**39.9**
	51	Thunder Bay	ON	0.60	0.74	0.44	**38.0**
	53	Brantford	ON	0.71	0.54	0.55	**37.6**
	58	Saint John	NB	0.50	0.90	0.21	**35.7**
	60	Saguenay	QC	0.52	0.99	0.05	**35.5**
	64	Greater Sudbury	ON	0.54	0.68	0.30	**33.0**

Exhibit 12: Top and bottom 10 large city-regions on the Canadian Tolerance Index

The country's three largest city-regions — Vancouver, Toronto, and Montréal — top the Canadian Tolerance Index. Each scores highly on the presence of a strong arts and culture workforce and sizeable gay and lesbian populations. Toronto and Vancouver are home to large foreign-born populations while Montréal lags somewhat on this measure, partly due to Québec's distinct immigration policies. Victoria is fourth, Ottawa-Gatineau fifth, while Calgary, Halifax, Québec City, Edmonton, and Hamilton round out the top 10. Smaller metros, like Stratford and Canmore, also rank highly on the Canadian Tolerance Index. Stratford is home to a major annual theatre festival and hosts many related activities, like theatrical training. Canmore is next door to Banff, a hub for creative and cultural communities. The worst performers on the Canadian Tolerance Index tend to be smaller, more remote resource economies with small foreign-born populations.

The Canadian Creativity Index

We now combine all 3Ts together in our overall Canadian Creativity Index, a composite measure of creative-competitiveness that combines the Canadian Talent, Canadian Technology, and Canadian Tolerance Indexes (the appendix provides full details on the data and methodology for the Canadian Creativity Index).
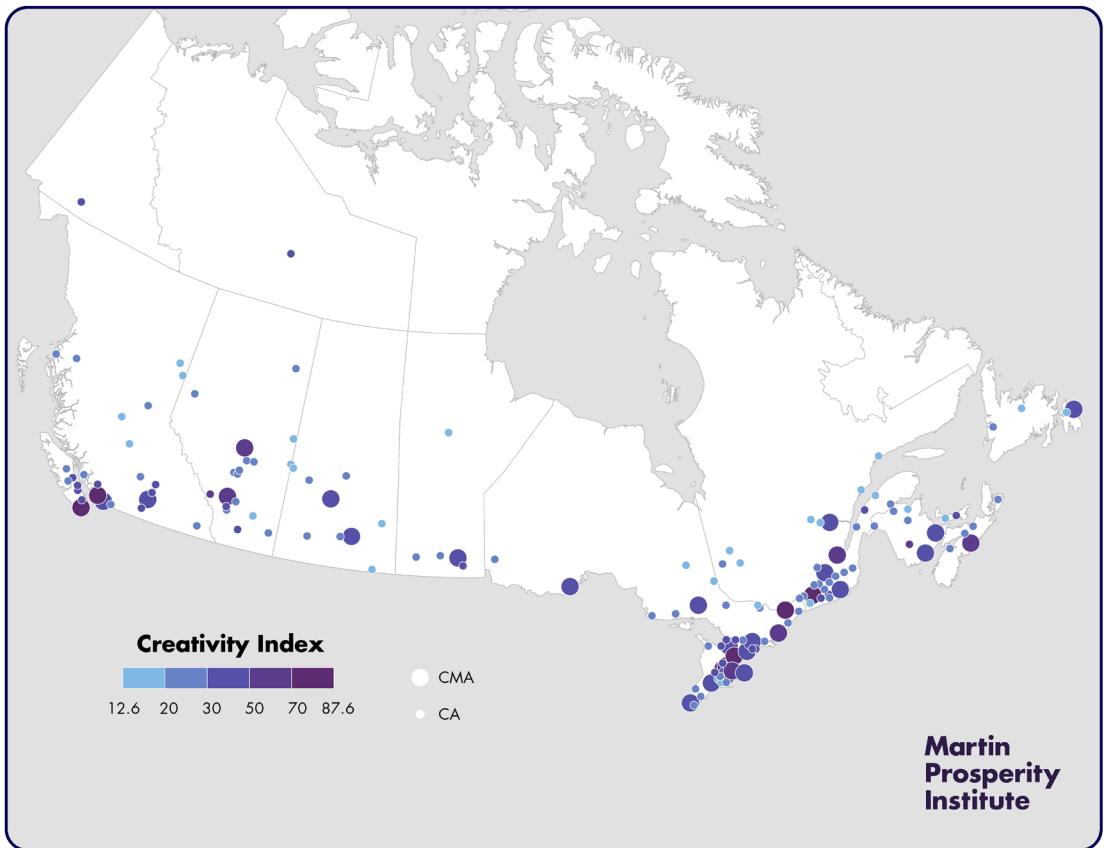

Exhibit 13: The Canadian Creativity Index

Overall Rank (147)	City-region	Province/ Territory	Talent Index	Tech Index	Tolerance Index	Creativity Index
Top 10 large city-regions						
1	Toronto	ON	80.9	84.7	97.4	**87.6**
2	Ottawa-Gatineau	ON	100.0	82.6	77.4	**86.7**
3	Vancouver	BC	79.6	77.4	100.0	**85.7**
4	Montréal	QC	73.5	82.2	87.1	**80.9**
5	Kitchener-Waterloo	ON	69.2	100.0	55.2	**74.8**
6	Victoria	BC	85.6	43.8	80.7	**70.0**
7	Calgary	AB	79.2	57.4	65.4	**67.3**
8	Guelph	ON	93.0	33.1	56.8	**61.0**
10	Halifax	NS	78.6	33.2	64.7	**58.8**
11	Québec City	QC	72.6	39.4	60.2	**57.4**
Bottom 10 large city-regions						
37	Peterborough	ON	57.1	16.2	42.6	**38.6**
41	Trois-Rivières	QC	55.6	15.4	39.9	**36.9**
42	Saint John	NB	51.7	22.3	35.7	**36.6**
43	St. Catharines-Niagara	ON	45.5	15.5	48.4	**36.5**
46	Abbotsford-Mission	BC	43.4	14.7	48.6	**35.6**
47	Barrie	ON	42.3	19.6	43.2	**35.0**
48	Thunder Bay	ON	54.8	10.3	38.0	**34.4**
52	Saguenay	QC	48.0	16.4	35.5	**33.3**
57	Brantford	ON	38.6	16.7	37.6	**31.0**
58	Greater Sudbury	ON	51.2	7.9	33.0	**30.7**

Exhibit 14: Top and bottom 10 large city-regions on the Canadian Creativity Index

Exhibit 13 maps how Canada's city regions stack up on the Canadian Creativity Index, while *Exhibit 14* lists the top and bottom 10 performing large metros on it.

Toronto tops the Canadian Creativity Index, followed by Ottawa-Gatineau, Vancouver, Montréal, and Kitchener-Waterloo. Rounding out the top 10 are Victoria, Calgary, Guelph, Fredericton, and Halifax. Canada's five largest metros occupy one of the top seven spots. Edmonton (in 14th place) is the only city-region with a population over one million that does not crack the top 10. Each city-region in the top 10 is home to a major research university, and half of them are political capitals of a province, or in the case of Ottawa, for the country as whole. The cities at the bottom of the table are typically smaller centres with more traditional resource and manufacturing economies.

How the 3Ts Go Together in Canada

The 3T model suggests that not only are each of the individual Ts important to local economic development on their own, but that they are part of a package. Previous studies found that having a high degree of one of the variables is generally accompanied by high degrees of the other two.[15] Keeping the caveat in mind that correlation does not equal causation, we now look at the relationship between these 3Ts across Canada's city-regions.

Talent and Technology

Let's start with the connection between technology and talent. The two are positively correlated, ($R^2 = 0.407$) as *Exhibit 15* shows. This relationship makes intuitive sense, as the tech industry requires highly skilled workers and one would expect to find greater amounts of each in the same places. The line slopes upward, indicating the positive relationship between technology and talent. Kitchener-Waterloo, Toronto,
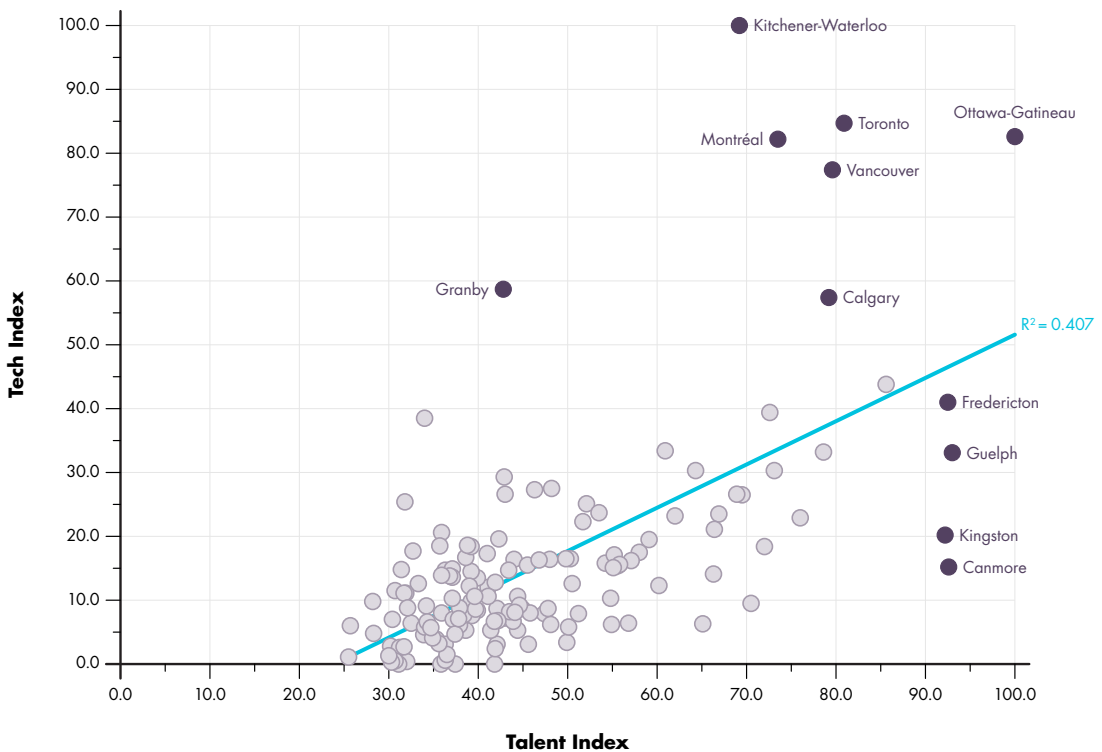

Exhibit 15: Talent and Technology

Ottawa-Gatineau, Montréal, and Vancouver are all far above the trend line. This suggests that, while talent is important to the technology sector, these places have additional attributes that support a vibrant technology industry like high quality research universities, and other components of an innovation ecosystem.[16] Conversely, talent alone is not enough to support a strong technology sector. Scoring above 90 on the talent index, four cities — Fredericton, Guelph, Kingston, Canmore — lag significantly on the Technology Index. These tend to be smaller places that lack the institutional components and critical mass necessary for a robust local technology industry.

Talent and Tolerance

We now turn to the connection between talent and tolerance. The two are closely correlated ($R^2 = 0.571$). In fact, they have the strongest correlation of any pair of the 3Ts. There is a close connection between highly skilled workers and diverse, tolerant locations.

As *Exhibit 16* shows, Canada's three largest city-regions — Toronto, Vancouver, and Montréal — score the highest on tolerance, but sit below the trend line in relation to talent. They are the country's gateway cities, absorbing the majority of immigrants. They are also home to vibrant arts and culture sectors, as well as gay and lesbian communities. Their high talent score is diluted somewhat by the sheer size of their populations. Conversely, Ottawa-

Exhibit 16: Talent and Tolerance

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Gatineau, Calgary, Halifax, Fredericton, Kingston, Guelph, and Canmore sit above the line, with Talent Index scores that are higher than their Tolerance Index would predict.

Technology and Tolerance

The 3T model suggests that tech firms and workers are drawn to places with higher levels of tolerance and openness. Technology and tolerance are also positively correlated ($R^2 = 0.489$).

As *Exhibit 17* shows, Kitchener-Waterloo, Toronto, Montréal, Vancouver, Ottawa-Gatineau, and Calgary are all above the trend-line. These city-regions all perform better on technology than their tolerance scores would indicate. On the other hand, Victoria, Halifax, Stratford, Canmore, and Whitehorse, are stronger on tolerance than technology.

The Size Effect

We now look at the connection between creative-competitiveness and size. Dating back to Jane Jacobs, many have noted how large places have more advantages when it comes to innovation and economic growth.[17] We find a close connection between population and the overall Canadian Creativity Index ($R^2 = 0.585$). As seen in *Exhibit 18*, the fitted line slopes upward and to the right.

Larger city-regions have certain built-in advantages when it comes to economic development. They tend to have more universities and talent-generating institutions and are also able to offer more higher paying jobs and creative class employment opportunities. They are often gateway cities that attract immigrants and tend to be home to significant arts and culture

Exhibit 17: Technology and Tolerance

and gay and lesbian communities. High levels of talent and tolerance are also associated with the technology sector, as it has high demands for skilled labour. The challenge for Canada is finding effective economic development strategies for smaller communities that do not possess energy resources. Without built-in advantages of either scale or energy, such places will need to find innovative ways to compete in a global knowledge-based economy.
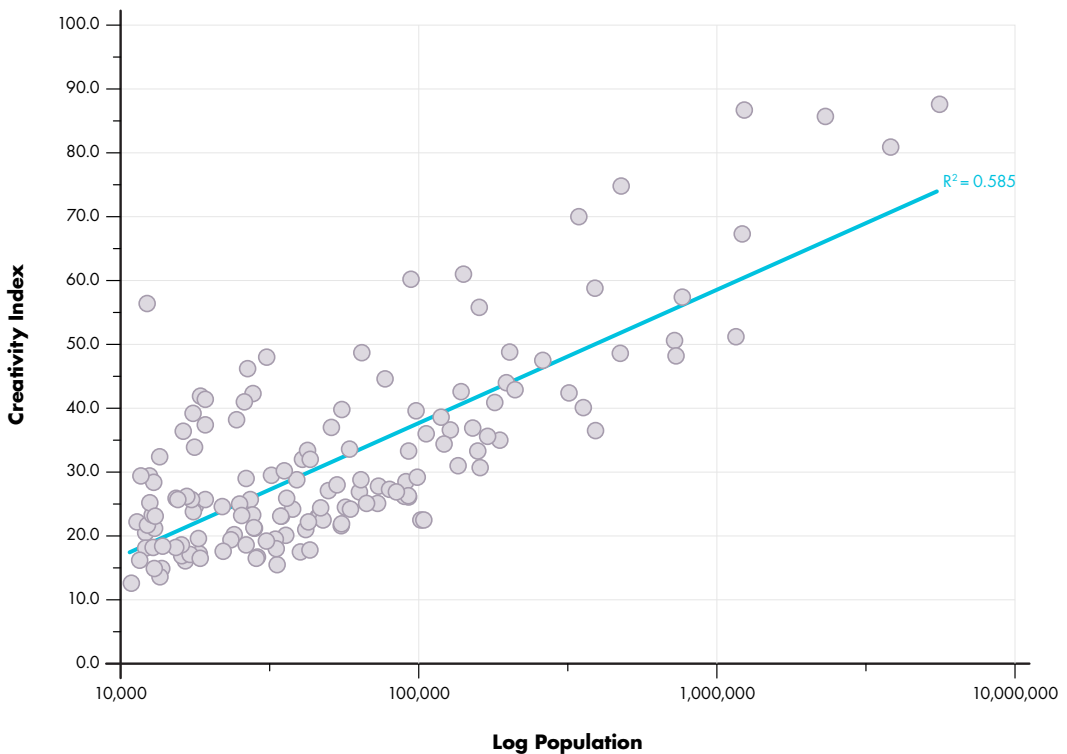

$R^2 = 0.585$

Exhibit 18: Size and Creativity

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Comparing Canada's Two Economic Models

We now turn to a comparison of Canada's two economic models — one based on resources, the other on knowledge and ideas.

Exhibit 19 charts the geography of Canada's energy economy based on the location quotients of employment in the oil and gas industry. *Exhibit 20* supplements this, showing the 20 leading centres for oil and gas production based on these oil and gas LQs. The major centres are in the West, mainly around resource extraction-focused places like Wood Buffalo (Fort McMurray) and headquarter and service locations like Calgary. In the East, the energy economy is focused in Sarnia, Saint John, NB and St. John's, NL. Somewhat surprising is the absence of Edmonton from the top 20, although it does land in 21st, with a respectable LQ of 2.24.
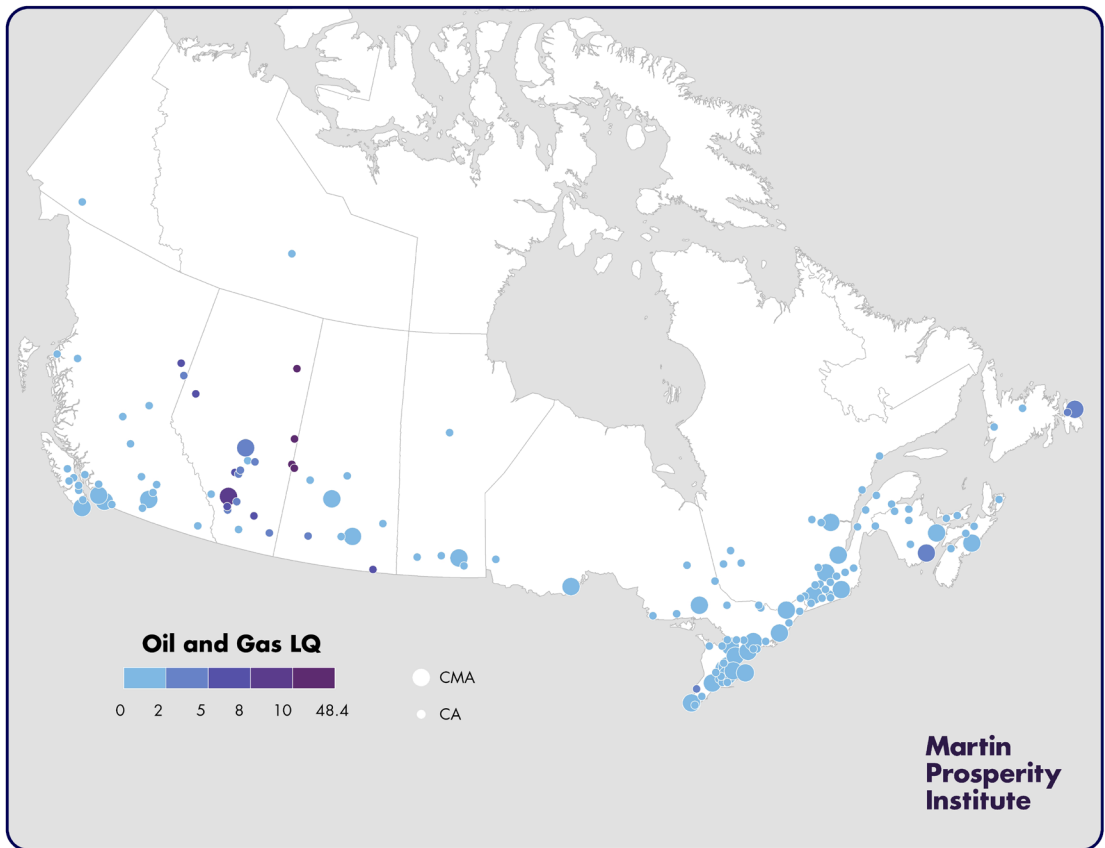

Exhibit 19: The Geography of Canada's Oil and Gas Economy

Rank	City-region	Province/Territory	Oil & Gas LQ
1	Wood Buffalo	AB	48.45
2	Cold Lake	AB	13.73
3	Lloydminster	AB/SK	10.43
4	Calgary	AB	8.44
5	Sylvan Lake	AB	7.74
6	Fort St. John	BC	7.49
7	Brooks	AB	6.81
8	Okotoks	AB	6.23
9	Estevan	SK	5.53
10	Grande Prairie	AB	5.02
11	Medicine Hat	AB	4.54
12	Sarnia	ON	4.41
13	Lacombe	AB	3.71
14	Strathmore	AB	3.61
15	Saint John	NB	3.35
16	Dawson Creek	BC	3.21
17	Camrose	AB	3.14
18	Swift Current	SK	2.55
19	Red Deer	AB	2.52
20	High River	AB	2.34

Exhibit 20: Canada's Top 20 Centres for the Oil and Gas Industry
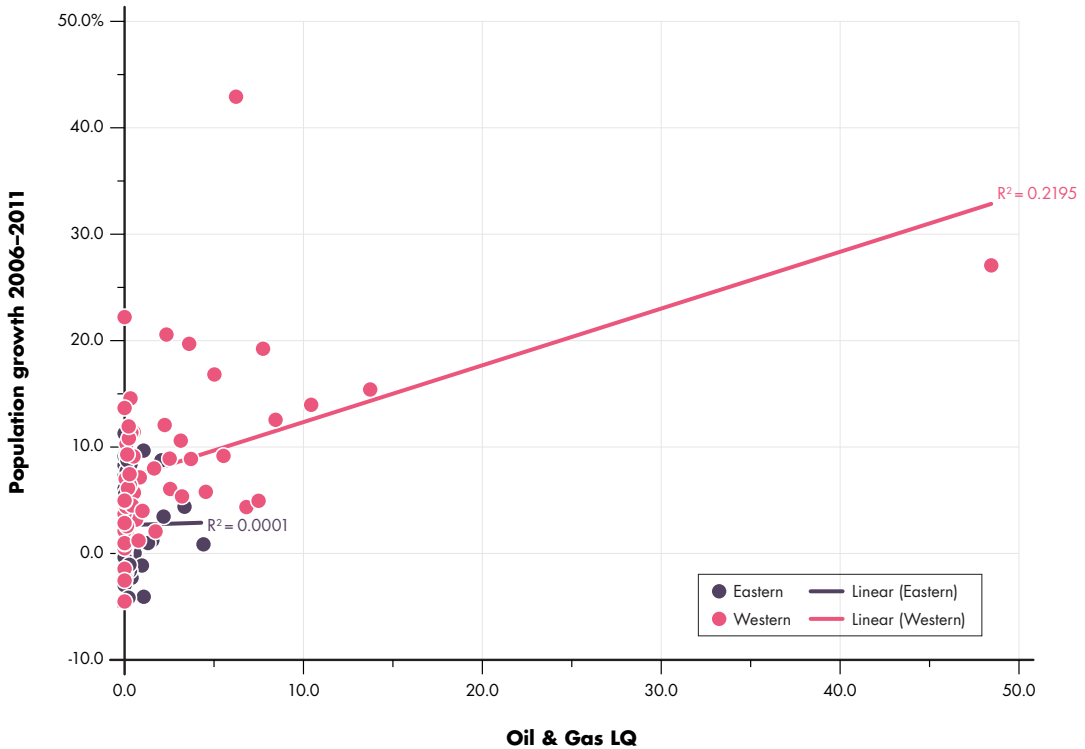
Canada's Urban Competitiveness Agenda

Exhibit 21: Oil and Gas Employment Compared to Population Growth

Exhibit 21 divides the country into two halves — Eastern Canada and Western Canada — and compares how the oil and gas industry is related to population growth in each region. The blue data points and trend line are for the east, orange for the west.

It is striking how different the correlations are for the two halves of the county. The correlation coefficient is positive and significant (R^2 = 0.2195) for Western Canada and not significant for Eastern Canada. In other words, the oil and gas industry is connected to population growth in the western half of the country, but not in the eastern half.
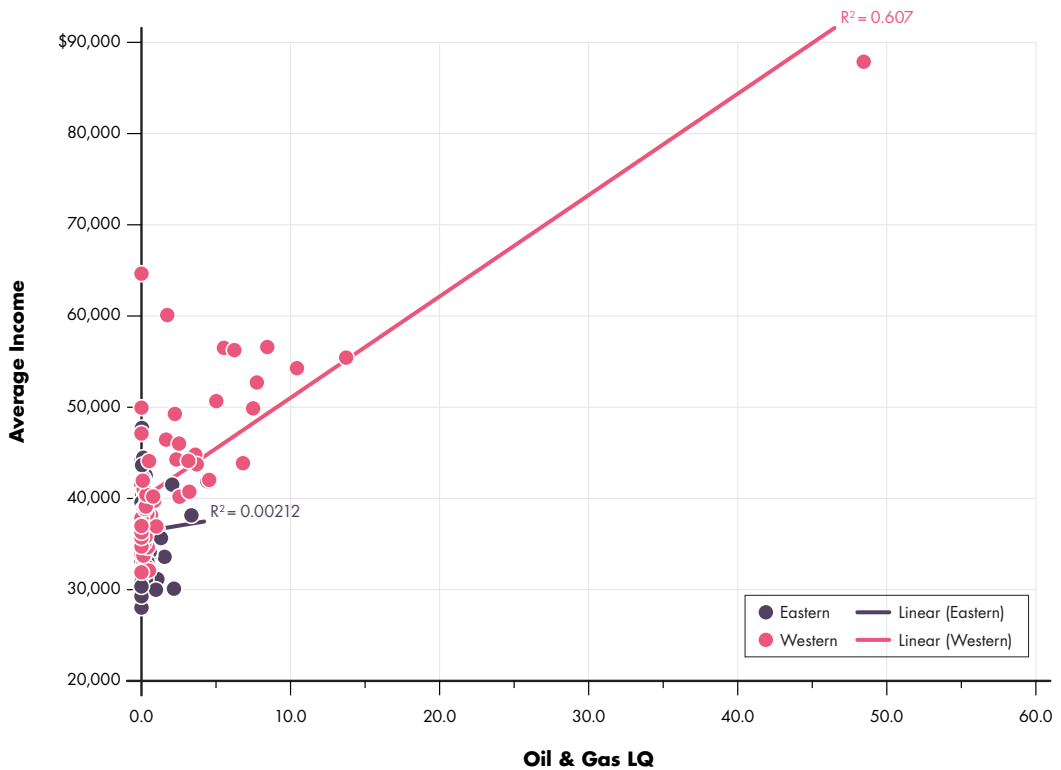
Canada's Urban Competitiveness Agenda

Exhibit 22: Oil and Gas Employment Compared to Income

Exhibit 22 plots the connection between oil and gas employment and the growth of income for Eastern and Western Canada. The pattern is even more pronounced; the two are closely correlated in Western Canada ($R^2 = 0.607$) and, again, not at all in Eastern Canada.
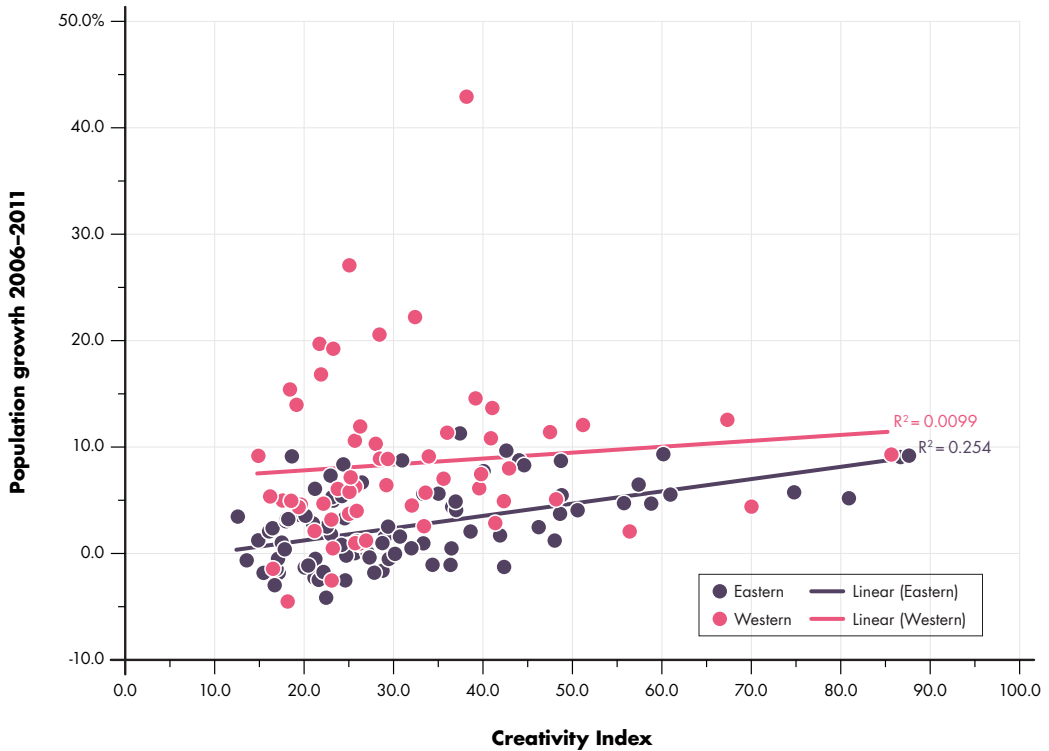
Exhibit 23: Creativity and Population Growth

We now turn to Canada's second economic model based on knowledge and creativity and economic growth. *Exhibit 23* shows the connection between creativity (measured by the Canadian Creativity Index) and population growth in Eastern and Western Canada. The two are modestly connected in Eastern Canada ($R^2 = 0.254$) and not at all in Western Canada.
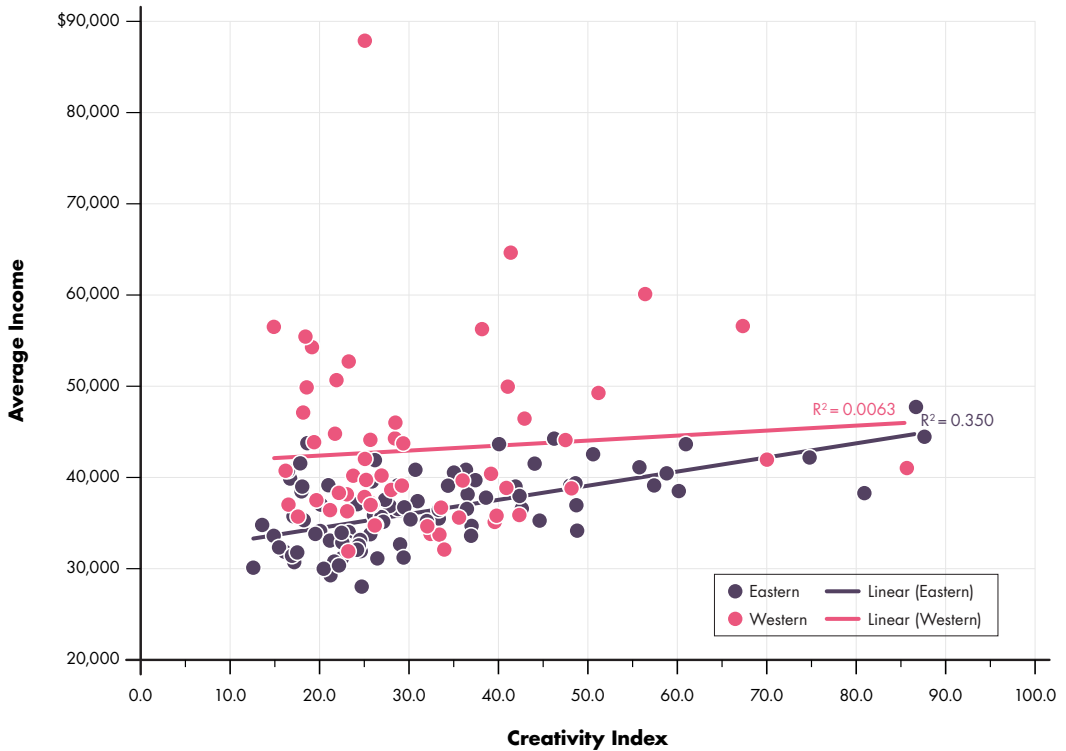
Exhibit 24: Creativity and Income

How does the pattern look for income as opposed to population? *Exhibit 24* charts the connection between the Creativity Index and income in Eastern and Western Canadian city-regions. Again, the two are positively correlated in Eastern Canada ($R^2 = 0.350$) and not at all in Western Canada.
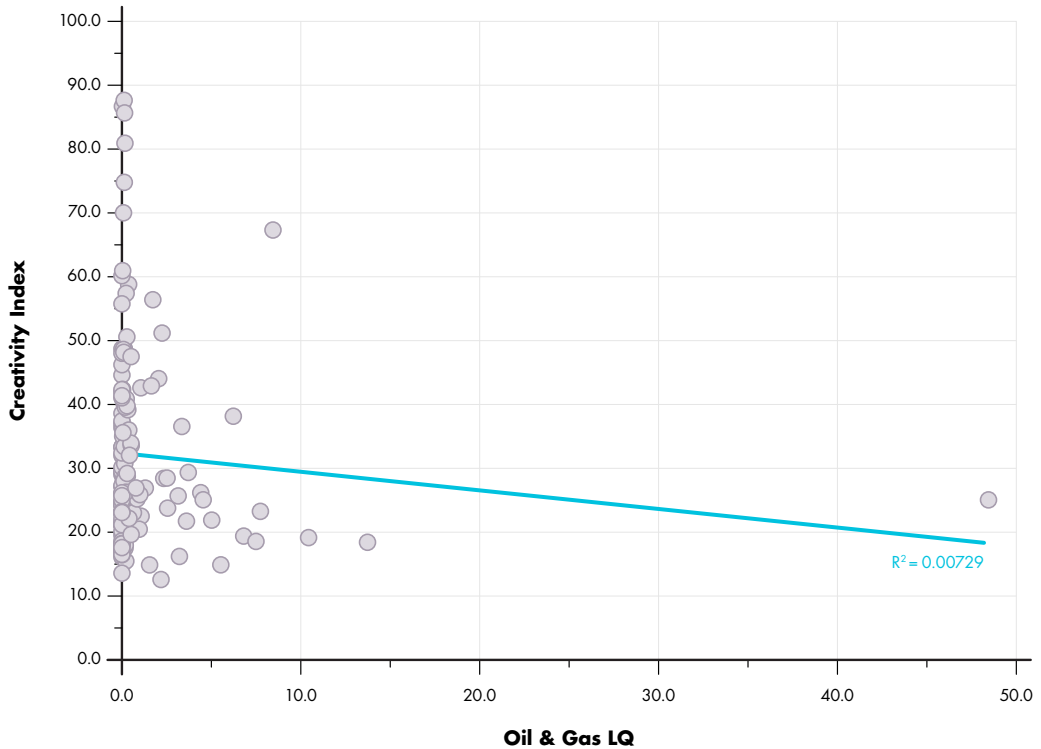
Canada's Urban Competitiveness Agenda

Exhibit 25: Creativity and Canada's Resource Economy

We now turn to the connection between creativity and the centres of Canada's resource economy. *Exhibit 25* plots the relationship between oil and gas employment and the Canadian Creativity Index. The data points clustered along the y-axis are the places that have no energy economy while the ones that emerge along the x-axis are the oil and gas centres. Calgary is the outlier at the top of the graph — scoring high on both. Wood Buffalo (Fort McMurray) is the data point on its own to the right of the graph, with far and away the highest amount of oil and gas employment but a weak creative economy. What this scatter graph confirms is that there is basically no systematic correlation between the energy economy and the creative economy. This is good news because it means that one doesn't *necessarily* crowd out the other.

Conclusion

The Canadian economy is at a crossroads. Historically, the national economy was largely defined by its ability to extract and export natural resources. This has intensified over the past decade with a surge in oil prices and the rapid development of the energy sector. As our analysis has shown, the result is a country built on two separate economic development models, progressing at different speeds: the energy economy of the West and the knowledge economy of larger city-regions mainly in the East.

A narrative has emerged that puts energy and resources at the centre of the nation's economic development and economic future. Even more troubling, Canada has neglected the development of its knowledge-based economy that is concentrated in an around its dense urban centres. This is a step backward and an unfortunate mistake.

The fact of the matter is that Canada is one of the few nations in the world that has been able to combine these two pillars of resource-based and knowledge-driven economic growth. Embracing one economic model doesn't mean abandoning the other. Calgary provides an interesting and useful example of what can happen when the two models are combined. It has been the one of the fastest growing cities over the past decade and is among the leaders on highest

average income. It is a leading centre of the oil and gas economy (with a location quotient of more than five, indicating a concentration five times the national average) and the creative class makes up nearly 40 percent (38.7 share) of its workforce, fourth in the nation and ahead of Toronto.

The oil and gas industry is not *necessarily* a constraint on the creative economy, but in the past decade or so it has come to dominate thinking around economic development policy-making. It is time to use the resources from the energy economy to build a more secure future as an urban knowledge economy. We can also use talent and technology to deepen and expand the resource economy.

The key is to stop neglecting and starting investing in stronger, denser more connected cities, the central organizing unit of the knowledge economy. Cities exist because they are where people come together for exchange. Throughout much of history this involved trading one physical thing for another. Today, cities concentrate talent and sit at the centre for the exchange of the knowledge and ideas that drive leading edge industries such as software development, finance, biotechnology, design, and media.

The good news is that many of Canada's cities have solid foundations, and perform well in international rankings. Long standing neglect however, has led to a number of growing problems. Transportation, housing affordability, and inequality are all issues that are holding back our cities. And a big part of why they haven't been properly addressed is that cities have relatively little power in the national political system. We propose five pillars that can form the basis of a strong national urban policy. Together, they would go a long way to increasing Canada's global competitiveness and lifting the living standards of its people in the future.

- *Density:* Density and clustering are the key drivers of innovation and productivity. It is time to align zoning and building codes and housing and transportation planning so we can build a new infrastructure that maximizes density.

- *Infrastructure:* The knowledge economy turns on the ability to efficiently and quickly move people, goods, and ideas. Canada's major cities face troubling levels of congestion and remain over-dependent on the car. It's time to shift infrastructure spending from roads and highways to transit—subways and light rail to knit our major cities together and connect them to their outlying suburbs; high speed rail between our larger cities and metros.

- *Affordable Housing Closer to Jobs:* Housing has become increasingly unaffordable in many of Canada's largest cities, especially at the urban core. The population has spread outward in the quest for more affordable housing. But sprawling development is at odds with the clustering that drives innovation and knowledge-based growth. Sprawl also generates real costs in terms of waste, energy, traffic congestion. We need to build more compactly and provide affordable housing for the young people and families who increasingly cannot afford to live in large urban centres.

- *Better Urban Jobs:* Urban centres are home to two kinds of jobs: high paying tech, professional, and creative ones and many more low-wage, insecure service jobs in food service, health care, and retail. Canada needs to make an effort to upgrade and increase the productivity of service jobs by making them more creative. It is also time to establish a geographically-indexed minimum wage, which recognizes the tremendous differences in living costs in big cities.

- *A New Federalism for Cities:* It is time to give cities the taxing and spending powers they require. Cities must be given more control over their own destinies if they are to prosper in the 21st century.

No doubt selling oil to the world has improved Canada's bottom line. But as the recent oil price decline reminds us, the good times do not last forever. Despite centuries of resource booms and busts we tend to have a pretty short memory. All Canadians want to see their cities and nation grow and their living standards rise.

The only way to create a secure economic future is to build a more vibrant knowledge and creative economy around the 3Ts of economic development — technology, talent and tolerance. Canada has made substantial investments in technology, generates and attracts great talent from all over the world, and is one of the most tolerant and diverse nations in the world.

The key to harnessing these three economic factors lies in its cities. It is time to abandon the narrative that future prosperity lies in the wide open and naturally abundant frontiers of the West and understand that the key to the nation's future economic well-being lies in the human-built resource of its cities.

If we are serious about our economic future, we have to stop neglecting and start investing in the urban knowledge economy organized around and propelled by our cities.

Appendix: Data, Indexes, and Methodology

Here we describe the data and methodology for out our indexes and analysis.

The Canadian Talent Index: The Canadian Talent Index is comprised of three variables. The percentage of the workforce employed in creative class occupations indicates the share of local jobs that involve non-routine and knowledge intensive activities. The percentage of the working age population with a university degree is a general measure of educational attainment. PhDs per 1,000 people is a narrower measure that indicates demand for very highly skilled workers. All of the data in the Talent Index comes from the 2011 National Household Survey. These three variables are combined in equal weights to produce the talent index.

The Canadian Technology Index: The Canadian Technology Index is based on four variables. Innovation is measured as patents per 10,000 people. This figure is an annual average for the years 2005–2014 divided by the population figure from the 2011 census. The original source of the data is the United States Patent and Trademark Office as cleaned and coded for Canadian geographies by Dieter Kogler, University College Dublin. Venture capital is measure as the average amount of investment for the years 2005, 2010 and 2013. The original source of the data is Thomson-Reuters as originally compiled for the Martin Prosperity Institute.[18] Local employment in information and communication technology (ICT) sectors are used in two of the variables. Location quotients are used to measure ICT manufacturing and ICT services. A location quotient compares the local share of ICT employment to the national share of ICT employment. For example, if ICT employment comprised 4 percent of the local economy and 2 percent of the national economy the location quotient would be 2.0. A straightforward way of interpreting this figure is that an LQ of 2.0 means that ICT employment is twice as common locally as it is nationally. Conversely, a location quotient of 0.5 means that ICT employment is half as common locally as it is nationally. High location quotients are general indicators of specializations in local economies. The data used to calculate the ICT manufacturing LQ and ICT services LQ are from the 2011 National Household Survey.

The Canadian Tolerance Index: The Canadian Tolerance Index is comprised of three indicators: the concentration of the population that is foreign-born (melting pot), the concentration of gay and lesbian people, and the concentration of artistic and cultural occupations (the Boho Index). All three are measured as location quotients and are based on data from 2011 National Household Survey. It is intended to be a measure of a city's openness. For CMAs, all three of the variables are indexed and averages using equal weights. For CAs, the index omits the gay and lesbian LQ.

The Canadian Creativity Index: The Canadian Creativity Index is an equally weighted composite of the Canadian Talent Index, the Canadian

Technology Index, and the Canadian Tolerance Index. The Exhibit below lists the key measures that comprise it.

Other Key Variables

Oil and Gas Employment: We measure Canada's resource-based economy as the location quotient of oil and gas employment. This includes the following sectors based on their NAICS codes: oil and gas extraction (2111), petroleum and coal product manufacturing (3241); and pipeline transportation (486). The data are from the 2011 National Household Survey.

Population Growth: Population growth from 2006–2011 is from the 2011 Census of Population.

Income: Average annual income data is from the 2011 National Household Survey.

Geographical Units

The geographical units used in the analysis are census metropolitan areas (N = 33) and census agglomerations (N = 114) as defined by Statistics Canada for the 2011 Census of Population and National Household Survey. Census metropolitan areas (CMA) are collections of municipalities with a population of at least 100,000 residents. Census agglomerations (CA) are collections of municipalities with a population between 10,000 and 100,000. In both cases, municipalities are grouped together based around the daily commuting patterns of residents. In the final section of the report, Eastern cities (N = 89) are compared to Western cities (N = 58). The dividing line between these two sets is the Ontario-Manitoba border.
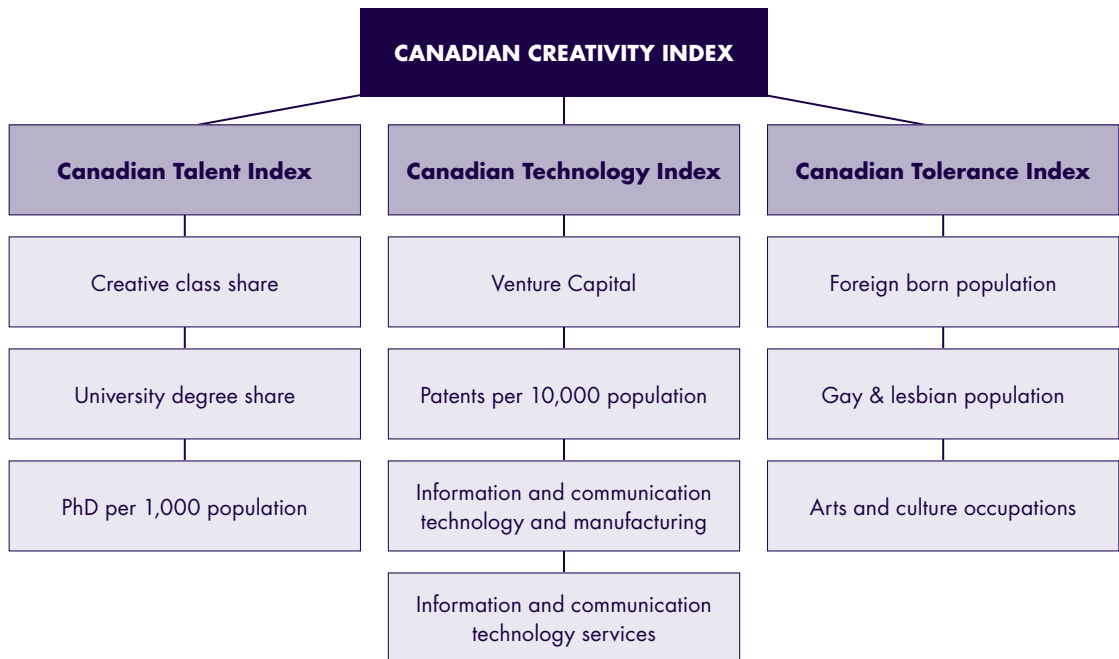

CANADIAN CREATIVITY INDEX

Canadian Talent Index	Canadian Technology Index	Canadian Tolerance Index
Creative class share	Venture Capital	Foreign born population
University degree share	Patents per 10,000 population	Gay & lesbian population
PhD per 1,000 population	Information and communication technology and manufacturing	Arts and culture occupations
	Information and communication technology services	

Exhibit A: Components of the Canadian Creativity Index

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Name	Description	Source	Time period	N
Creative class	Percent of labour force in creative class occupations	National Household Survey	2011	147
University degree	Percent of working age population (16–64) with a bachelor's degree or higher	National Household Survey	2011	147
PhDs	Persons with earned doctorates per 1,000 population	National Household Survey	2011	147
Talent Index	**Index of above three variables**	**See above**	**See above**	**147**
Venture capital	Total venture capital invested in millions of dollars (average of three years)	Thomson-Reuters	2005; 2010; 2013	147
Innovation	Annual average number of patents granted by the United States Patent and Trademark Office per 10,000 resident population	USPTPO; Dieter Kogler, University College Dublin	2005–2014	147
ICT Manufacturing	Information and communications technologies (ICT) manufacturing employment location quotient	National Household Survey	2011	147
ICT Services	Information and communications technologies (ICT) services employment location quotient	National Household Survey	2011	147
Tech Index	**Index of above four variables**	**See above**	**See above**	**147**
Foreign Born	Foreign born population location quotient	National Household Survey	2011	147
Gay & Lesbian	Same-sex couple location quotient	National Household Survey	2011	33
Arts & Culture	Art and culture occupations location quotient	National Household Survey	2011	147
Tolerance Index	**Index of above two (census agglomerations) or three (census metropolitan areas) variables**	**See above**	**See above**	**147**
Creativity Index	**Average of Talent Index, Tech Index, Tolerance Index**	**See above**	**See above**	**147**
Oil & Gas LQ	Employment in oil & gas sectors location quotient	National Household Survey	2011	147
Average income	Average individual income (all sources)	National Household Survey	2010	147
Population change, 2006–2011	Percent population change from 2006 to 2011	Census of Population	2006–2011	147

Exhibit B: Summary of Variables and Data

Endnotes

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8   Roger Martin, "There Are Still Only Two Ways to Compete," *Harvard Business Review*, April 21, 2015, https://hbr.org/2015/04/there-are-still-only-two-ways-to-compete.

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11   Robert J. Barro, "Economic Growth in a Cross Section of Countries," *The Quarterly Journal of Economics*, 106, 2, 1991, pp. 407–43; Barro, *Determinants of Economic Growth: A Cross-Country Empirical Study*, Cambridge, MA: MIT Press, 1997; Edward L. Glaeser and Albert Saiz, "The Rise of the Skilled City," *Brookings-Wharton Papers on Urban Affairs*, 2004, 1, 2004, pp. 47–105; N. Gregory Mankiw, Paul M. Romer, and David N. Weil, "A Contribution to the Empirics of Economic Growth," *The Quarterly Journal of Economics*, 107, 2, 1992, pp. 407–37; Jacob Mincer, *Schooling, Experience and Earnings*, New York: Columbia University Press for the National Bureau of Economic Research, 1974.

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15   Richard Florida, "The Economic Geography of Talent," *Annals of the Association of American Geographers*, 92, 4, 2002, pp. 743–55; Richard Florida and Roger Martin, *Ontario in the Creative Age*, Toronto: Martin Prosperity Institute, 2009, http://martinprosperity.org/media/pdfs/MPI%20Ontario%20Report%202009%202nd%20Ed.pdf.

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