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Résumé de l'article

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THE UNEVEN ECONOMIC DIVERSIFICATION OF SMALL AND MID-SIZED CANADIAN CITIES, 1971-2016

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Abstract:
Economic diversification is a long-standing public policy goal in Canada, driven by concerns about resource dependence and the need to remain innovative and competitive in a complex global economy. While considerable economic diversification of Canada's urban regions has been noted by a range of observers, the phenomenon remains only partially understood. We propose to study the economic diversification process using an entropy decomposition approach, with industrial composition data compiled from census responses between 1971 and 2016 for 125 small and mid-sized urban regions. We demonstrate that, while industrial concentration indeed declines for almost all regions studied during the study period, trends are highly variable between regions. In about half of regions, diversification was mainly driven by job loss in goods-producing industries rather than job growth in new activities, whereas among the other half of regions, diversification was weaker, but job growth was stronger. This suggests a need for caution in interpreting changes in industrial concentration indices as evidence of economic success stories.

Keywords: economic diversity; Canadian cities; regional development

INTRODUCTION

Economic diversification remains a central policy goal for many public actors. Diversification is often presented as a strategy for managing short-term and long-term risks: regional and national economies based on a limited number of exports are most vulnerable to both shocks and secular decline (Briguglio et al., 2009; Cole, 2010; Frenken, Van Oort & Verburg, 2007). Industrial composition can be understood on a continuum between diversification and specialization, which suggests tradeoffs. However, diversity can coexist with specialization and growth if the basket of specializations is itself diverse, generally an easier goal for urban areas with larger populations. Furthermore, the diversity of activities, ideas, and actors found in major cities may contribute to a positive feedback loop of innovation and diversification, suggesting that diversity begets diversification (Boschma, 2017). Given this dynamic, it is unclear what options are available to smaller regions with smaller knowledge-intensive sectors and more homogenous economies. As the gap only intensifies between large core economies and small peripheral economies, this is a growing concern.

Overall, Canadian urban regions have become considerably more diverse over the past fifty years. According to inequality measures of economic diversity, it is Canada's least diverse economies that have diversified the most (Shearmur & Polèse, 2005). However, diversification is multifaceted, and can be driven both by losses at the high end and by gains at the low end. As such, a contribution of this article is to provide an analytical framework which explicitly accounts for trends in both diversification and growth.

Following Frenken, Van Oort and Verburg (2007), we distinguish two main motivations behind diversification policies: one based on supporting innovation in dynamic regions, and the second targeting un-diverse regions facing decline. The three largest Canadian cities — Toronto, Montreal and Vancouver — are the most heavily specialized in knowledge-intensive business services (KIBS) such as finance, consulting and professional services. According to our preliminary analyses, their economies are the most diverse overall, but because of intensified specialization in KIBS, have not diversified since 1971. The next-largest urban regions, such as Ottawa, Edmonton and Quebec City, have similarly diverse economies and experienced mitigated diversification. However, Canada's largest cities have also experienced rapid growth in high-information sectors whose internal diversity may not be well captured by traditional measures: growth in new *products and services* does not always translate as growth in new *industries* (Brunelle, 2013), and the types of diversification which are the most important for the most advanced, diverse metropolitan regions may be better served by other analytical approaches.

At the other end of the spectrum, Canada is also home to many small, geographically isolated communities whose economies are based on primary industries, local services, and routine manufacturing (Shearmur & Polèse, 2005). Often, they are specialized in only one or a small handful of goods-producing industries. Superficially, these economies have diversified rapidly since 1971, a diversification which took several forms. Many jobs in goods-producing industries were replaced by those in the service sector, especially in local services. Growth in local services allowed small and mid-sized regions to largely catch up to major metropolitan centres in offering a broad range of services, but simply replacing tradable-sector jobs with local services does not protect a region's economic base from exposure to shocks. Other regions were able to diversify their manufacturing base or develop new specializations in tradable services, but this has not occurred homogeneously. Brown and Baldwin (2003) note that while there were substantial shifts in manufacturing employment out of the centres of the largest cities between 1976 and 1997, it was mostly towards the suburban fringes of those same cities or to immediately adjacent rural areas.

Small and mid-sized regions face challenges which fundamentally differ from those faced by the largest metropolitan regions. Diversification in these areas is limited by a variety of factors related to the threshold size of enterprises required to take advantage of economies of scale in a variety of activities, access to skilled labour and capital. Yet, paradoxically, many small and mid-size cities have also been the most successful in diversifying over the past fifty years, although we still lack a good understanding of the processes underlying the variety of diversification trajectories in these regions.

In this article, our main objective is to assess the diversification trajectories of Canada's mid-sized urban regions. What are the drivers of observed diversification in regional industrial composition? Are these trends the result of base activity growth, industrial decline, or both? Are these trends homogenous? We hypothesize that there is a complex landscape of regional diversification, with some areas diversifying mainly through employment growth and others mainly as the result of employment decline.

We characterize the major trends affecting the evolution of industrial composition in mid-size Canadian urban regions though an entropy decomposition methodology based on a panel comprising 127 industries across 125 mid-size urban areas in quinquennial periods between 1971 and 2016. Although the dynamics we describe may be specific to Canada, we believe that the analytical approach developed in this article will be generalizable to other contexts. Our results show that diversification can result both from job loss and growth, and we call for diversification to be understood as a nuanced, multifaceted and sometimes contradictory phenomenon.

The article first summarizes key themes of the existing literature on economic diversification and provides a brief overview of existing economic diversification policies in Canada. The next section presents an analytical framework for measuring diversity and attributing diversification to different dynamics of change over time. Results are then presented with a discussion of the dominant trends identified in diversification patterns, highlighting six main types of diversification trajectories and regions which express each of them. We then conclude by discussing implications for policy and future research.

BACKGROUND AND LITERATURE REVIEW

Diversification as Resilience Strategy and as Knowledge Economy Capacity

Economic diversification has seen a resurgence of interest since the Great Recession (Martin, 2012). While Canada's manufacturing sector has largely recovered since the recession, many industries remain vulnerable, given the joint trends of automation and an uncertain trade climate. Canada's petroleum sector has similarly recovered, though its future remains uncertain given the challenges of energy transition and enduring market access issues. Other resource industries in Canada have declined already (Polèse & Shearmur, 2006). There is a growing consensus that a diversity of activities enhances the capacity for resistance to various kinds of shocks (Brown & Greenbaum, 2017; Martin et al., 2016; Brunelle & Dubé, 2018). However, long-term economic renewal depends on the ability of regions to generate new local industries which both integrate into the existing economic base and provide a counterbalancing effect that limits exposure to external shocks (Martin & Sunley, 2015). This is a challenge for smaller, more homogenous regions: the regions which most need new export activities often have the least ability to develop them, and the long-run success of novel specialization paths has proven elusive (Martin & Sunley, 2006).

So far, research on links between diversification and economic growth has largely focused on its relation to knowledge spillover externalities: the transfer of knowledge to third-party firms as a result of activities in other nearby firms. One type of spillover, between firms within an industry, is today termed "Marshall-Allow-Romer" (MAR) spillovers following Glaeser et al. (1992). Nearby firms tend to share knowledge and create informal innovation networks, particularly when drawing from a common labour pool of skilled workers who interact with each other and move between firms (Rosenthal & Strange, 2004). A second type, between firms in *different* industries, is termed "Jacobs externalities" for urban theorist Jane Jacobs (Glaeser et al., 1992). According to this view, innovation does not only occur internally to a given industry, but also through the recombination of ideas from a variety of activities (Cole, 2010; Frenken, Van Oort & Verburg, 2007). This gives the largest metropolitan regions a considerable advantage over smaller regions. However, empirical evidence for their existence is mixed (Boschma et al., 2017; Wixe & Andersson, 2017). Both diversity and specialization have been empirically associated with innovation and job growth (Duranton & Puga, 2000; Frenken, Van Oort & Verburg, 2007), and large cities' innovation advantages may ultimately stem more from other factors (Rosenthal & Strange, 2004). Still, irrespective of the level of diversity which is optimal for growth, urban regions competing in the modern knowledge economy must be able to innovate, rapidly developing novel products and processes in order to remain competitive in the global marketplace, which makes the ability to *diversify* essential.

Diversification as Policy

Overcoming monoindustrial economic structures is a recurring theme in Canadian public policy discussion (Chambers & Ryan, 2009). However, considerable ambiguity persists around diversification policies. While it is often claimed that the list of diversification policies is "too long to enumerate" (Holden, 2011), there have been few, if any, systematic reviews of Canadian diversification policies, and academic studies generally focus on hypothetical policies rather than real ones.

In fact, the term "diversification" is often used interchangeably with concepts like "innovation" or even simply "development", and policies' concrete goals are often unclear. While Canada's federal economic development agencies are formally mandated to encourage economic diversification (Canada, 2019), in at least one case — the Western Economic Diversification Canada, WEDC — funding criteria do not require that projects contribute to diversification, and projects often support, rather than seeking to replace, the fossil fuel industry (Canada, 2018). In contrast, one Quebec provincial program explicitly targets diversification in the Mauricie and Centre-du-Québec regions, and program criteria prioritize new industries over legacy industries (Québec, 2019). Although Alberta has experienced growth from petroleum while the Mauricie region has experienced decline in goods-producing industries, this raises questions about whether the former policy is achieving its ostensible goals.

Even where policies are conscientiously designed and have clear goals, their impacts can be hard to assess, and their efficacy depends on factors largely outside the control of policymakers. Development trajectories depend substantially on the initial composition of activities, geographic location, and volatile international markets (Shearmur & Polèse, 2005; Duranton, 2011). Ambiguity about the underlying phenomena only adds to the confusion, which makes clarifying our understanding a priority.

DATA AND METHODOLOGY

In order to disaggregate the principal drivers of diversification, we employ an entropy decomposition approach which identifies, for each region and period, the industries which contributed, *ceteris paribus*, to a relative gain or loss of diversity in that region over that period. This allows us to classify each "event" — each incident of job growth or loss in a given industry, region, and time period — according to a four-way typology, based on whether it contributed to regional diversification. A typology of events in turn allows us to develop a typology of overall diversification trajectories, according to patterns we observed in the course of our analysis. We apply this approach to a panel dataset of 125 urban regions across nine census years between 1971 and 2016.

Measuring Industrial Diversity

We measure the historical evolution of urban areas' economic diversity using a Theil inequality index, which quantifies the extent to which some distribution is unequal — in our case, the extent to which the distribution of jobs between industries is unequal within each region. The additive decomposability of this index permits extremely fine-scale analysis: the contribution of each change in jobs for each industry, region, and pair of years can be precisely quantified for both diversification and job growth.

Our Theil index, a member of the general entropy (GE) family of indices, indicates the degree to which jobs are concentrated in the highest employing industry or industries. Lower values of the index therefore indicate a more diverse distribution, while higher values indicate that a region's industrial composition is more concentrated. The index takes the following form:

$$GE_T = k \sum_i EP_i \qquad (1)$$

$$EP_i = \frac{p_i}{\bar{p}} log \frac{p_i}{\bar{p}} \qquad (2)$$

Here, EP_i expresses the contribution of each industry to the index, p_i is the share of jobs in industry I, $\bar{p}$ is equal to $1/N$ where N is the number of industries, and k is a constant, $1/(N \, log \, N)$, used to normalize the index to values between 0 and 1. Intuitively, when p_i is greater than $\bar{p}$, the value of kEP_i is positive and contributes to concentration in the index; when p_i is less than $\bar{p}$, the industry has less than the average share of jobs, the value of kEP_i is negative, and value of the index is reduced, everything else being equal. When p_i exactly equals $\bar{p}$, kEP_i is zero, and if *all* industries have average employment, the index evaluates to zero, indicating perfect diversity as expected.

GE indices measure industrial diversity similarly to other inequality indices, such as the Herfindahl or Gini. We employ a GE-family index because of the ease with which they can be arbitrarily additively decomposed, since the index itself takes its value from a sum of terms for each industry (Attaran & Zwick, 1987). In particular:

Decomposition by subgroups: the index is equal to the sum of partial values ($p_i \, log \, (p_i)$) for arbitrary groups of industries, such as NAICS sectors. The original formula can be readily rewritten, with s indicating sectoral groups:

$$GE_T = k \sum_s \sum_{i \in s} EP_i \qquad (3)$$

Table 3. Industrial classification

	Sector	Example industries and NAICS codes	Number of industries
Highly tradable sectors	(1) Primary industries	Forestry and logging (113); Metal ore mining (2122)	8
	(2) Manufacturing	Meat product manufacturing (3116); Paper manufacturing (322)	46
	(3) Knowledge-intensive business services (KIBS)	Motion picture and sound recording industries (512); Legal services (5411)	16
Low-tradable sectors	(4) Public administration	Federal government public administration (911); Provincial and territorial public administration (912)	4
	(5) Local services	Construction (23); Grocery stores (4451); Hospitals (622)	53

Raw Data

Data were obtained from Statistics Canada based on quinquennial censuses from 1971 to 2016. After excluding 1976, the dataset includes nine census years. Data indicate the number of persons employed in 127 industries for each region, according to place of work. The ten largest regions were excluded, and 125 small- and mid-sized urban regions were retained for analysis. Each region corresponds to Statistics Canada 2006 census metropolitan area (CMA) or census agglomeration (CA) boundaries. Both CMAs and CAs aggregate local municipalities according to daily commuting flows, hence representing the most relevant units to account for independent local labour markets in Canada. The working population (4.4 million) of these 125 regions made up around a quarter of Canada's 2016 labour force of 18 million people.

Industries were classified based on a correspondence between Standard Industrial Classification (SIC) and North American Industrial Classification System (NAICS) codes, mainly corresponding to 3-digit and 4-digit NAICS codes. The industry classification system does not seem to have had a direct effect on the measured industrial composition inequality, but this possibility cannot be entirely excluded. The 127 industries in the sample were manually classified into five sectors: "tradable sectors" including (1) primary industries; (2) manufacturing; and (3) KIBS; and "non-traded sectors" including (4) public administration and (5) local services (see Table 3). This classification system does not perfectly distinguish tradable and non-tradable industries, but we believe it aids in identifying major trends, and specifically studying the changing roles of Canada's major international exports. We focus on export or base activities because of their central role in diversification policies, which seek to limit the potential harmful effects of supply and demand shocks in specific industries (Cole, 2010; Felix, 2012).

RESULTS

Diversification and Job Growth by Event Types and Major Industry Groups

Overall, the results show three dominant trends (Table 4). First, the relative decline of goods-producing industries, particularly in resource extraction and primary processing, contributed to loss-led diversification. Second, the expansion of KIBS contributed to growth-led diversification. Finally, the massive expansion of local services such as healthcare, construction, food service contributed to growth-led concentration. Regions expressed various combinations of these three trends (trends 1 and 2 frequently co-occurred with trend 3), but growth-led diversification tended to be lower in magnitude than either loss-led diversification or growth-led concentration. Consequently, diversification was driven mainly by job *loss*, whereas job *growth* tended to contribute to concentration.

The trends for each major sector are summarized in Table 5. In manufacturing and primary industries, net job creation was low and tended to drive diversification through a steep loss of relative job share. In local services, the trend tended towards concentration, driven by a few specific industries: healthcare, eldercare, food service and retail. This is not without consequence, given that the sector exhibits the greatest job growth in every region studied. In tradable services, job growth occurred in most regions, and while growth was lower in absolute terms than for local services, it generally contributed to diversification. In public administration, the trend was nearly always towards diversification, mainly through internal shifts of jobs from the larger federal government to provincial and local governments. While these trends were widely observed, there was considerable variation by region, particularly in the success regions had in adapting to a more service-intensive economy and in replacing declining tradable industries.

Table 4. Three dominant trends by major sector

	Trend 1: Loss-driven diversification (LDD) in goods-producing industries	Trend 2: Growth-driven diversification (GDD) in tradable services (KIBS)	Trend 3: Growth-driven concentration (GDC) in local services
Regions experiencing the trend	61 (49%)	96 (77%)	94 (75%)
Average job growth in the sector	5%	20%*	93%
Average change in diversity attributable to the sector	-0.030 (diversification)	-0.001* (diversification)	+0.010 (concentration)

*Growth tended to be higher but cause a concentrating effect in larger regions, affecting both averages

Table 5. Summary statistics of job growth and diversification by major sector

		Primary industries	Secondary industry	Local services	Public admin.	KIBS
Sector share of employment for all regions	1971	6.42%	21.85%	55.33%	8.99%	7.41%
	2016	3.72%	9.26%	66.35%	6.85%	13.82%
	Δ71-16	-2.70%	-12.59%	+11.03%	-2.15%	+6.41%
Job growth/loss, by region	Min.	-90.85%	-90.87%	+3.95%	-55.93%	-0.20%
	Med.	+20.83%	+0.49%	+129.44%	+72.15%	+209.22%
	Max.	+2483.60%	+741.16%	+866.37%	+457.75%	+2485.12%
Change in concentration/ diversification, by region	Min.	- 0.023	- 0.117	+0.106	- 0.011	- 0.058
	Med.	+0.007	- 0.012	+0.259	+0.022	- 0.044
	Max.	+0.707	+1,069	+0.673	+0.491	+0.019

Table 6. Summary statistics of job growth and diversification by trajectory

		Growth-driven div.	Loss-driven div.	Service rep.	Service-driven growth	Goods-driven growth	Goods rep.
Number of regions in group		23	32	30	27	8	5
Mean number of employees		32,000	21,000	43,000	58,000	20,000	10,000
Job growth/loss, by region	Min.	59.42%	-24.50%	31.32%	19.87%	48.91%	39.58%
	Med.	173.25%	25.81%	86.90%	137.47%	273.25%	69.17%
	Max.	519.34%	72.52%	235.63%	386.04%	854.44%	100.15%
Change in concentration/diversification, by region	Min.	-0.063	-0.117	-0.060	-0.076	-0.015	-0.047
	Med.	-0.023	-0.028	-0.018	-0.013	-0.012	-0.028
	Max.	-0.002	0.004	0.003	0.003	0.005	0.001

Diversification Trajectories

The six types of diversification trajectories described in Table 2 demonstrated markedly different trends in job growth and diversification. Results are presented in detail below and summarized in Table 6.

Loss-driven diversification

In about a quarter of regions studied, diversity was driven mainly by job loss, principally in manufacturing and primary industries (or both), and often in a single industry, such as pulp and paper or aluminum processing. While in most cases job creation in local services made up for job losses in other industries and the total employed population was higher in 2016 than 1971, few jobs were created in new economic base activities, and jobs created in food service, retail and eldercare do not typically fulfill the same function as tradable, economic base activities which bring income into a region. In some cases, typically isolated northern communities such as Prince Rupert and Kapuskasing, there was a net loss of jobs overall. Regions experiencing loss-driven diversification tended to be relatively isolated from major metropolitan centres.

Service Replacement

For the regions in the service replacement group, trends are broadly like those found in loss-driven diversification communities: "diversification" was driven mainly by job losses in manufacturing and primary industries. Service replacement regions are distinguished by the relatively higher job growth in KIBS, and sometimes other export industries, which was strong enough to cancel out job losses. In some service replacement regions, job growth in specific local services was strong enough to nearly cancel out the diversification effects of job loss, but these regions generally performed better than

loss-driven diversification regions: job growth was higher, particularly in industries of new specialization and export. Service replacement regions are mostly found in eastern Canada, and they include resource and manufacturing regions along with provincial capitals Charlottetown and Halifax.

Goods Replacement

Goods replacement regions are analogous to service replacement regions, but tradable sector job losses were compensated by growth in goods-producing industries rather than KIBS. In four out of five goods-replacement regions, goods-producing jobs replaced jobs lost in the federal government; three of five are adjacent to military bases and three of five are found in southern Saskatchewan. Tillsonburg is the exception, where diversification was mainly driven by job losses in agriculture but losses were exceeded by strong growth in manufacturing.

Growth-Driven Diversification

In about a fifth of regions, there was little or no net job loss in any of the five categories of industry, and both goods-producing industries and tradable services contributed to diversification. These regions accomplished two potentially contradictory objectives: strong job growth, and real diversification driven by growth in new activities. Employment in primary and manufacturing industries remained stable or grew, and there was strong growth in tradable services. These regions were mainly located in Quebec and British Columbia, with their growth being driven by mix of proximity to major cities (Abbotsford and Barrie), high-growth resource industries (Val-d'Or and Amos), and manufacturing growth combined with tradable service growth (Woodstock and Drummondville).

Goods-Driven Growth

Goods-producing growth regions, which tend to be found in Western Canada, experienced mixed diversification trends and high job growth, with job growth in goods-producing equal to or greater to growth in tradable services. Particularly in Alberta, regions such as Wood Buffalo (which includes Fort McMurray) and Lloydminster affected by the oil boom saw an overall loss of diversity concomitant with high job growth.

Service-Driven Growth

These regions saw high job growth in tradable services and little or no net job loss in goods-producing industries. The net effect on diversification tended to depend on the role of local services: where local services had a diversifying effect, the economies tended to diversify substantially overall, whereas in other regions, strong growth in specific tradable and/or local services mitigated diversification. This group includes regions with large university populations such as Guelph, London and Sherbrooke, six out of thirteen provincial and territorial capitals — Victoria, Regina, Whitehorse and Yellowknife, Fredericton and St. John's—along with smaller regional centres across the country.

DISCUSSION

Geographical Trends

The different types of diversification trajectories have markedly different patterns of geographical distribution across the country. Western and northern regions (Figure 1), particularly in Alberta and B.C., are more homogenous, more generally growth-oriented, and driven by the expansion of primary industries along with broader demographic growth. Eastern Canadian regions are more heterogeneous, and growth is more service-oriented (Figure 2). Many small and mid-sized regions in Ontario, Quebec and the Maritime provinces have seen strong growth in tradable services, to the extent that mid-sized cities like Guelph and Sherbrooke have become comparably specialized in KIBS to much larger metropolitan regions like Calgary or Winnipeg. Conversely, many smaller, more isolated centres historically dependent on primary and manufacturing industries have experienced relative or absolute decline, with few or no export industries making up for losses in goods-producing industries.

A variety of fundamental causes help explain the East—West divide. To some extent, it reflects the changing roles of different commodities in the world market. As Canada became less competitive in fishing and forestry and more competitive in the mining and petroleum sector, economies based on the former stagnated or declined while economies based on the latter boomed. However, it also stems from broader geographical and demographic trends affecting both Canada and the US, according to which the economic and demographic centres of gravity of both countries have been moving westward for decades if not centuries (Breau et al., 2019; Plane & Rogerson, 2015). Examining provincial patterns of job renewal, Brown (2005) found that even accounting for differences in industrial structure, the three westernmost provinces experienced the unusually high rates of job renewal between 1973 and 1996. While growth in Wood Buffalo (Fort McMurray) is clearly driven by the oil boom, the same cannot be said for Abbotsford and Kelowna. Finally, the eastern Canadian urban system appears to be much more affected by the disequalizing forces affecting urban systems in other rich countries (Storper, 2010; Brunelle, 2012): compared to western Canada, there are much clearer winners and losers, and the gap is growing. While the West is split between regions characterized by petroleum-driven growth and regions characterized by more diverse growth patterns, the East is split between regions with moderate growth driven by services and manufacturing and stagnant regions with little or no growth in tradable industries.

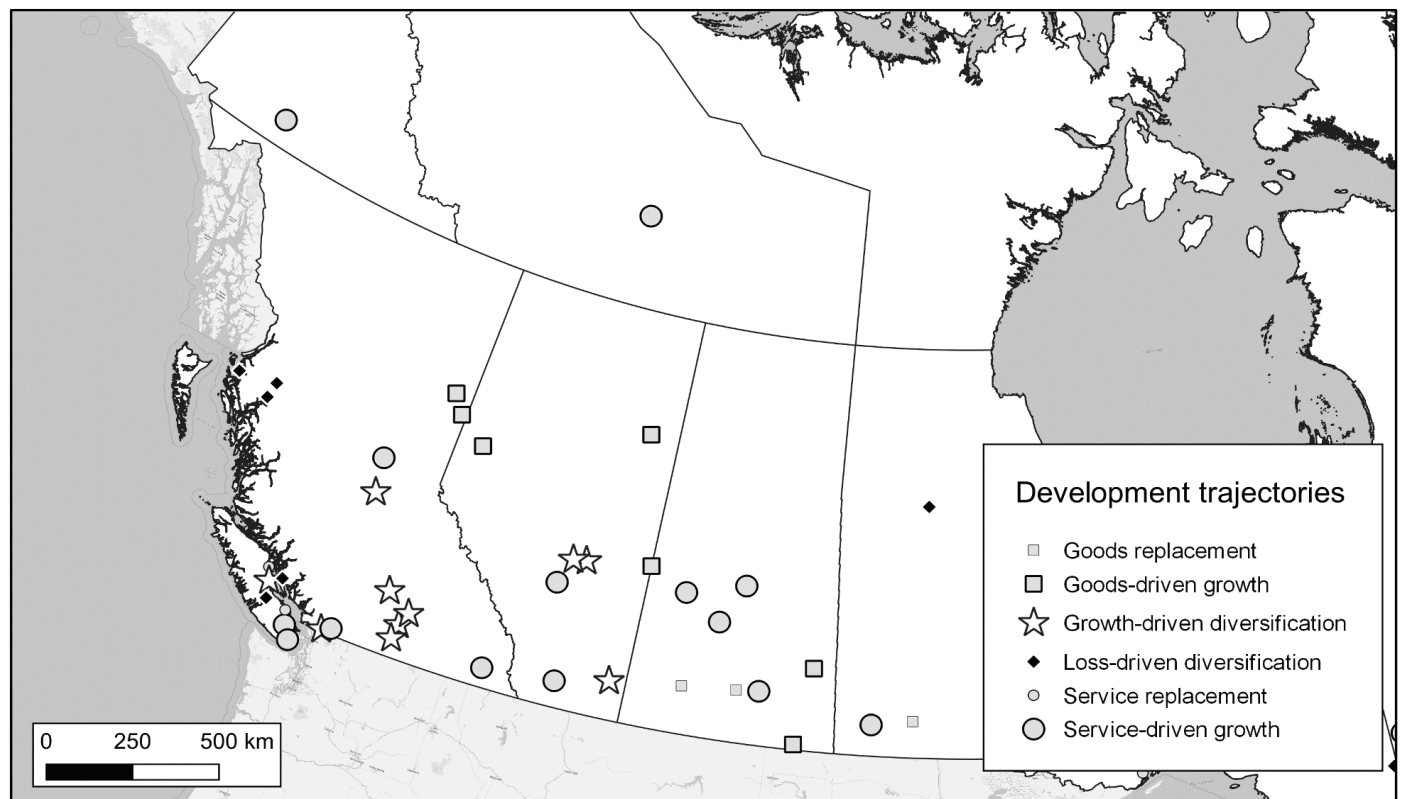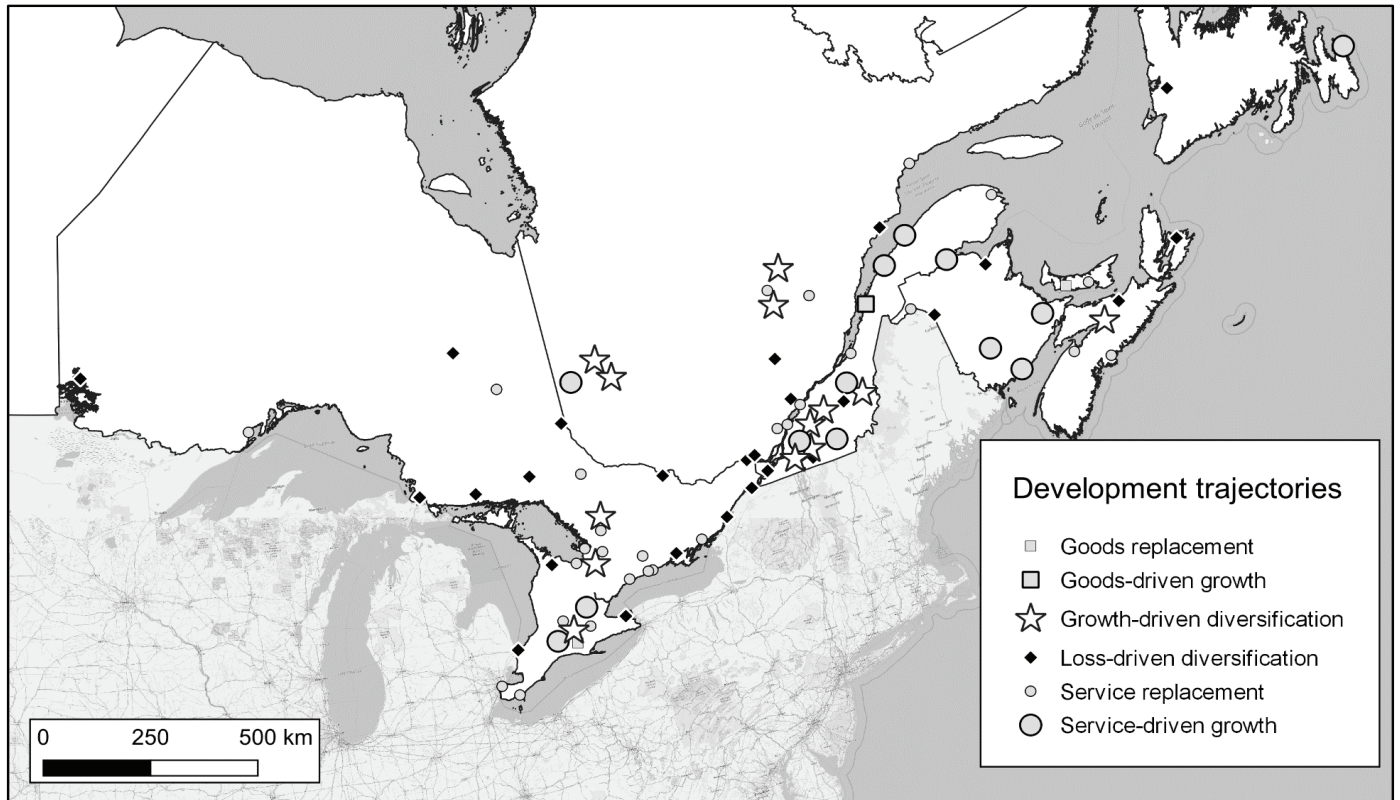**Figure 1.** Diversification trajectories in Western Canada

Figure 2. Diversification trajectories in Eastern Canada

Development trajectories

▫ Goods replacement
▢ Goods-driven growth
☆ Growth-driven diversification
◆ Loss-driven diversification
○ Service replacement
◯ Service-driven growth

0   250   500 km

Future Trends

While employment in primary industries declined sharply in some regions, for our study sample overall, employment in primary industries was largely stable: sharp growth in petroleum industry jobs largely offset job losses elsewhere in the primary sector. This is particularly true in agriculture, for which the share of employment basically remained unchanged between 1971 and 2016. While manufacturing has declined steadily in relative terms, in absolute terms, employment in the sector is essentially stable. Pressures towards offshoring and automation will continue to exist. However, neither is likely to lead to the wholesale disappearance of jobs in the sector, in part because shipping costs create a natural comparative advantage for near-to-market producers of certain goods, and in part because even within manufacturing, many non-routine tasks remain little susceptible to automation (Arntz, Gregory et al., 2016; Autor, 2015). According to this view, the manufacturing share of employment will eventually plateau, as it already has in agriculture. Assuming this is the case, the future role of goods-producing industries in economic diversification and development is likely to be less one of replacement by services than of ensuring continued competitiveness in as large as possible a variety of goods—a mix of both primary commodities and manufactured goods. In this sense, the dependence of much of Western Canada's economy on fossil fuels is a major strategic risk, and it is a risk which appears to be largely unaddressed by current federal and provincial economic policy.

The tradable services sector will likely continue to serve a dual role in Canada's economic diversification: not only are the services provided by the sector important export industries in and of themselves, but high-knowledge industries clearly have spinoff effects that encourage innovation within, and knowledge sharing between, other industries. For example, the knowledge intensity and technical complexity of Canada's petroleum industry, relative to countries like Saudi Arabia where oil drilling is less knowledge- and technology-intensive, is likely to have long-run spinoffs in a wide range of sectors such as geomatics and logistics, benefits which could far outlast the petroleum industry itself (Hawkins, 2017). In other words, knowledge economy services need to be understood not only as a means of bringing in revenue in a competitive global marketplace, but as a strategic sector necessary for the continued innovation and knowledge sharing which that global context requires for all industries, including in manufacturing and primary industries. Regions with underdeveloped knowledge sectors are thus at a major strategic disadvantage. This poses a dilemma for isolated regions which tend to have low employment in these industries, a dilemma without an obvious solution. If a solution is not found, while the Canadian economy overall continues to be highly dynamic, many peripheral regions will not, especially if growth slows or reverses in the mining and petroleum sector.

CONCLUSION

Far from a simple story of monotonous and homogenous diversification, Canada's small and mid-sized regions have experienced divergent development trends. While nearly all regions experienced lower industrial concentration, about half of the regions studied achieved this by means of job loss, typically in manufacturing and primary industries. In a quarter of regions, these losses were not offset by job growth in other tradable sectors. In the remaining half of regions, where job growth did drive diversification, it was mainly driven by tradable services. However, for nearly all regions, local services had a concentrating effect: because of very high job growth in specific industries such as food service, retail and healthcare, trends in local services made the overall industrial composition of jobs more highly unequal and thus less diverse.

The causal relationship between job growth and diversification does not appear to be strong in either direction, and many regions with the strongest job growth, such as oil towns in Alberta, had some of the lowest levels of diversification (Canada's three largest cities, excluded from the data set, experienced strong job growth and *negative* diversification). Other regions which experienced simultaneous growth and diversification may deserve a closer look, because diversification appears to be inversely proportional to initial diversity, suggesting that diversification is partly a process of "catching up" to the overall national economy. However, in most of these specific cases, such as the manufacturing cities of Drummondville, Granby or Victoriaville in southern Quebec, the local services which might be presumed to be catching up to the national economy contributed negatively to diversification. In the goods-producing industries that led diversification there, geographic distribution is patchy: even a large metropolitan economy does not need to specialize in aerospace manufacturing to be dynamic and diverse. In their industries of specialization, these three regions possess a large share of jobs relative to their size. One in sixteen Canadians who worked in "Other transportation equipment manufacturing" in 2016 worked in Granby, Quebec, which has fewer than 70,000 residents. In other words, regions where tradable-sector job growth is driving diversification are clearly doing more than just catching up.

Polèse (2009) attributes much of the success of this "industrial arc" in southern Quebec to a combination of two factors: a comparatively low-cost labour force with a solid educational base, and access to large markets elsewhere in Quebec, in Ontario and in the U.S. northeast. However, this combination of factors exists in cities which did not experience similar success, including in Quebec; regions which achieved the double success of diversification and growth often had neighbours which did not. Thus, location was neither necessary nor sufficient to achieve growth through diversification. If geography is not entirely destiny, local authorities may indeed have space to improve outcomes through public policy intervention, irrespective of geography if not necessarily irrespective of other starting circumstances. While it remains unclear which interventions are most effective—targeted investments in infant industries, skills development, more general investment incentives—and the issue is beyond the scope of this paper, strategy still appears to matter, and declining regions may indeed have grounds for optimism.

REFERENCES

Arntz, M., Gregory, T., & Zierahn, U. (2016). *The Risk of Automation for Jobs in OECD Countries: A Comparative Analysis*. OECD Social, Employment and Migration Working Papers.

Attaran, M., & Zwick, M. (1987). Entropy and Other Measures of Industrial Diversification, *Quarterly Journal of Business and Economics*, 26: 17–34.

Autor, D. H. (2015). Why Are There Still So Many Jobs? The History and Future of Workplace Automation, *Journal of Economic Perspectives*, 293: 3–30.

Boschma, R. (2017). Relatedness as Driver of Regional Diversification: A Research Agenda". *Regional Studies*, 513: 351–364.

Boschma, R., Coenen, L., Frenken, K., & Truffer, B. (2017). Towards a theory of regional diversification: combining insights from Evolutionary Economic Geography and Transition Studies, *Regional Studies*, 511: 31–45.

Briguglio, L., Cordina, G., Farrugia, N. & Vella, S. (2009). Economic Vulnerability and Resilience: Concepts and Measurements, *Oxford Development Studies*, 37: 229-247.

Breau, S., Toy, B., Brown, M., Macdonald, R. & Coomes, O. (2018). In the Footsteps of Mackintosh and Innis: Tracking Canada's Economic Centre of Gravity since the Great Depression, *Canadian Public Policy*, 44: 356-367.

Brown, L. & Greenbaum, R.T. (2017). The role of industrial diversity in economic resilience: An empirical examination across 35 years, *Urban Studies*, 54: 1347-1366.

Brown, W. M. (2005). Renewing Canada's Manufacturing Economy: A Regional Comparison, 1973-1996, *Growth and Change*, 36: 220-243.

Brown, W. M. & Baldwin, J. R. (2003). The changing geography of the Canadian manufacturing sector in metropolitan and rural regions, 1976–1997, *The Canadian Geographer*, 47: 116-134.

Brunelle, C. (2012). La concentration des fonctions à haut contenu en savoir dans le secteur de la production des biens : quel avenir pour les régions non métropolitaines du Québec ?, *Cahiers de Géographie du Québec*, 56158: 313.

Brunelle, C. (2013). The growing economic specialization of cities: Disentangling industrial and functional dimensions in the Canadian urban system, 1971-2006, *Growth and Change*, 44(3) : 443–473.

Brunelle, C., & Dubé, J. (2018). De l'importance de la proximité dans la capacité de résister aux chocs exogènes, *Revue d'Économie Régionale & Urbaine*, (5): 1155-1185.

Chambers, E. J., & Ryan, C. (2009). *Breaking the Boom and Bust: Exploring Thirty Years of Diversification in Western Canada* p. 35; J. Frost, S. Janzen, & J. Brisbois, Eds., 35.

Cole, S. (2010). The regional portfolio of disruptions, protection, and disasters, *Annals of Regional Science,* 442: 251–272.

Duranton, G. & Puga. D. (2000). Diversity and specialisation in cities: Why, where and when does it matter?, *Urban Studies*, 37: 533-555.

Duranton, G. (2011). California Dreamin': The Feeble Case for Cluster Policies, *Review of Economic Analysis*, 3l: 3–45.

Frenken, K., Van Oort, F., & Verburg, T. (2007). Related variety, unrelated variety and regional economic growth, *Regional Studies*, 415: 685–697.

Glaeser, E., Kallal, H. D., Scheinkman, J. A., & Shleifer, A. (1992). Growth in Cities, *Journal of Political Economy*, 1006: 1126–1152.

Government of Canada (2018). *Innovation funding and support.* Western Economic Diversification Canada. Site accessed 2019-07-26. Original url: https://www.wd-deo.gc.ca/eng/19640.asp.

Government of Canada (2019). *Canada's Regional Development Agencies*. Site accessed 2019-07-26. Original url: https://www.ic.gc.ca/eic/site/icgc.nsf/eng/h_07662.html.

Gouvernement du Québec (2019). *Fonds de diversification économique du Centre-du-Québec et de la Mauricie*. Site accessed 2019-07-26. Original url: https://www.economie.gouv.qc.ca/pages-regionales/diversification-economique-du-centre-du-quebec-et-de-la-mauricie/fonds-de-diversification-economique-du-centre-du-quebec-et-de-la-mauricie/.

Hawkins, R. (2017). "Industrial diversification and the evolving position of natural resources in the Canadian economy". In S. Mahroum & Y. M. Al-Saleh Eds., *Economic Diversification Policies in Natural Resource Rich Economies,* 9–36.

Holden, M. (2011). Who cares about baskets? We've got eggs! Diversification & Western Canada's Economic Future. *Honourable James A. Richardson Discovery Roundtables*. Canada West Foundation. Retrieved from www.cwf.ca

Martin, R., Sunley, P., Gardiner, B., & Tyler, P. (2016). How Regions React to Recessions: Resilience and the Role of Economic Structure, *Regional Studies*, 50: 561-585.

Martin, R. (2012). Regional Economic Resilience, Hysteresis and Recessionary Shocks, *Journal of Economic Geography*, 121: 1–32.

Martin, R., & Sunley, P. (2006). Path Dependence and Regional Economic Evolution, *Journal of Economic Geography*, 64: 395–437.

Martin, R., & Sunley, P. (2015). On the Notion of Regional Economic Resilience: Conceptualization and Explanation, *Journal of Economic Geography*, 151: 1–42.

Neffke, F., Henning, M., & Boschma, R. (2011). How Do Regions Diversify over Time? Industry Relatedness and the Development of New Growth Paths in Regions, *Economic Geography*, 873: 237–265.

Plane, D., & Rogerson, P. (2015). On Tracking and Disaggregating Center Points of Population, *Annals of the Association of American Geographers*, 105: 968-986.

Polèse, M. (2009). Les nouvelles dynamiques regionals de l'économie québécoise : cinq tendances, *Recherches sociographiques*, 50: 11-40.

Polèse, M., & Shearmur, R. (2006). Why Some Regions Will Decline: A Canadian Case Study with Thoughts on Local Development Strategies, *Papers in Regional Science*, 851: 23–46.

Rosenthal, S. S., & Strange, W. C. (2003). "Evidence on the Nature and Sources of Agglomeration". In *Handbook of urban and regional economics*, 4: 2119–2171.

Schumpeter, J. (1942). "Creative Destruction". *Capitalism, socialism and democracy* 825: 82-85.

Shearmur, R., & Polèse, M. (2005). Diversity and Employment Growth in Canada, 1971- 2001: Can Diversification Policies Succeed?, *Canadian Geographer / Le Géographe Canadien*, 493: 272–290.

Storper, M. (2010). Why Does a City Grow? Specialisation, Human Capital or Institutions?, *Urban Studies*, 4710: 2027–2050.

Wixe, S., & Andersson, M. (2017). Which types of relatedness matter in regional growth? Industry, occupation and education, *Regional Studies*, 514: 523–536.