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Community innovation: innovation performance of manufacturing firms in Canadian communities

By Pierre Therrien (Industry Canada) and
Frances Anderson (Statistics Canada)

Science, Innovation and Electronic Information Division (SIEID)
7-A, R.H. Coats Building, Ottawa, K1A 0T6

Telephone: 1 800 263-1136

This paper represents the views of the authors and does not necessarily reflect the opinions of Statistics Canada.

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Contacts for more information

Science, Innovation and Electronic Information Division

Director Dr. F.D. Gault (613-951-2198)

Assistant Director Craig Kuntz (613-951-7092)

The Science and Innovation Information Program

Special Advisor, Science and Technology
Dr. Frances Anderson (613-951-6307)

Chief, Knowledge Indicators
Michael Bordt (613-951-8585)

Special Advisor, Life Sciences
Antoine Rose (613-951-9919)

Science and Innovation Surveys Section

Chief, Science and Technology Surveys
Antoine Rose (613-951-9919)

FAX: (613-951-9920)

E-Mail: Sieidinfo@statcan.ca

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Pierre Therrien (Industry Canada) and
Frances Anderson (Statistics Canada)

How to obtain more information:
National inquiries line: 1 800 263-1136
E-Mail inquires: infostats@statcan.ca

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Symbols

The following standard symbols are used in Statistics Canada publications:

.	not available for any reference period
..	not available for a specific reference period
…	not applicable
0	true zero or a value rounded to zero
0^s	value rounded to 0 (zero) where there is a meaningful distinction between true zero and the value that was rounded
^{p}	preliminary
^{r}	revised
x	suppressed to meet the confidentiality requirements of the Statistics Act
^{E}	use with caution
F	too unreliable to be published

NOTE: Due to rounding, components may not add to totals

Community innovation

Since early 2003, Statistics Canada's Science, Innovation and Electronic Information Division (SIEID) has been working in conjunction with Industry Canada's Marketplace Innovation Division to bring together existing indicators of community innovation and to develop new ones. This series of working papers on **Community innovation** highlights some of the results. While there are other initiatives to develop more detailed community-level data in Canada, the focus of this work is on innovation, technology-based firms, R&D and highly-qualified personnel.

In some cases, we have been able to generate community-level estimates from surveys that were not originally intended to provide them. In other cases, we have exploited and refined administrative datasets to extract reliable community-level data. Relevant innovation indicators have also been developed from existing sub-provincial datasets such as Statistics Canada's Census of Population Community Profiles data. The intent of these papers is propose indicators and to stimulate discussion.

Background and purpose

Policy makers and other economic development professionals are now strongly interested in better information on community innovation. While the theoretical aspects of regional and local systems of innovation are increasingly accepted as a pertinent conceptual framework to understand the innovation process, data development is still lagging.[1]

Several reasons explain the lack of reliable data at the community-level. On the one hand, it is difficult to measure certain core elements of any regional or local systems of innovation such as networking or common trust.

On the other hand, data collection for business data, in particular, has been usually undertaken to ensure reliable estimates at the national and provincial level. When disaggregating national and provincial data to the sub-provincial level, issues of the confidentiality and the reliability of the estimates are likely to arise. Surveying at the sub-provincial level is much more costly than surveying at the national and provincial level because much larger samples are required to assure reliable estimates.

Even though it is not possible to measure all aspects of the regional and local systems of innovation, some data has been available for a long time (such as data from the Census on occupations and education levels of workers at the community-level), while other indicators have been built recently. This working paper will analyse some of the more recently developed data from the 1999 Survey of Innovation which will be used to develop community-level indicators of innovation performance. More precisely, this working paper will present results of the community innovation performance by comparing the percentage of innovative establishments in Canadian communities to the national estimate. Trends by type of geographic area and by location will be briefly discussed.

Results

There are 140 communities in Canada with an urban core population of at least 10,000. Of these communities, 26 have an urban population core of at least 100,000 and are called Census Metropolitan Areas (CMAs), while the remaining 114 have urban core populations of at least 10,000 and not more than 99,999 and are called Census Agglomerations (CAs).[2]

Data is available from the 1999 Survey of Innovation on manufacturing firms[3] for all 26 CMAs and for approximately 50% of the CAs. Data is not available for the other 50% of the CAs either because there were too few or no establishments sampled in these CAs. This working paper will be based on the analysis of 88 communities with a sufficient number of observations.

1. For theoretical concepts of regional and local system of innovation, see for instance J. Niosi, "Regional Systems of Innovation: Market Pull and Government Push", in J. Holbrook and D. Wolfe (eds.) *Knowledge, Clusters and Regional Innovation*, McGill-Queen's University Press, 2002 and J. De La Mothe and G. Paquet (eds.), *Local and Regional Systems of Innovation*, Kluwer Academic Publisher, 1998.
2. See the section on geographical units at the end of the paper for a discussion of Statistics Canada's geographical classification system.
3. The term "firm" is used as an equivalent to the statistical unit of the analysis which is the "establishment". See note at the end of the paper for details.

Table 1: Community innovation as measured by percentage of innovative manufacturing establishments relative to the national estimate for selected communities, 1999

	Number of Communities	Percentage of Communities
Significantly above national estimate (+)	29	33%
Not significantly different from national estimate (=)	43	49%
Significantly below the national estimate (-)	16	18%
Total	**88**	**100%**

Source: Statistics Canada, Survey of Innovation 1999

Of the 88 communities (Table 1)[4], almost half of them (43) have a percentage of innovative manufacturing establishments not significantly different from the national estimate, while approximately 20% (16) are significantly below the national estimate and finally, one third (29) are significantly above the national estimate. Based on data from the 1999 Survey of Innovation, the national estimate of innovative manufacturing establishments is 81%.[5] Innovation is the introduction of a new or significantly improved product to clients or the introduction of a new or significantly improved process. Innovations can be a world first, a first in Canada or a first for the firm. The broadest type of innovation, first for the firm, is analysed in this study.

Table 2 shows that the size of the communities alone cannot explain the differences in the percentage of innovators in a community. Results show that there are several CMAs with percentages that are significantly below the national estimates (7 out of 26 CMAs) while several CAs have a significantly higher percentage of innovative establishments (22 out of 114 CAs). This result was also found in a study by Therrien (2003) where he finds that there is more variation in the percentage of innovative manufacturing establishments by industrial sector than by city size.[6]

Table 3 shows results of the 140 communities by province. In Newfoundland, the only community with data available is St. John's, and its percentage of innovative establishments is not significantly different from the national average. In Prince Edward Island, both communities, Charlottetown and Summerside, are significantly below the Canadian estimate. In Nova Scotia, Halifax has a percentage of innovators not significantly different from the national estimate while Cape Breton has a percentage that is significantly below the national estimate. Two communities – Truro and New Glasgow – have a percentage of innovators that is significantly higher than the national estimate. Results in Nova Scotia show, once again, that the percentage of innovators in a community is not only a matter of the size of the population, as the only CMA (Halifax) has a significantly lower percentage of innovators than the national estimate.

In New Brunswick, three communities (Saint John, Edmundston, and Fredericton) have a percentage of innovators not significantly different than the Canadian estimate. Moncton is the only community in New Brunswick with a significantly higher percentage of innovators than the national estimate.

Unlike communities in the Atlantic region, data are available for the majority of communities in the province of Québec (26 out of 33). While there are only 4 communities with a significantly lower percentage of innovators (Chicoutimi, Trois-Rivières, Sept-Iles, and Shawinigan), 13 have a percentage of innovators not significantly different from the national estimate, and finally 12 communities have a percentage of innovators significantly higher than the national estimate. In these communities with higher percentages of innovators, there are large CMA such as Montreal and Quebec City as well as smaller CAs such as Magog and Granby (estimated population in 2001 of 22,535 and 60,264 respectively).[7]

The striking figure for Ontario is that there is only one community (Stratford) with a percentage of innovators significantly lower than the Canadian estimate. There is, however, a larger proportion of communities without sufficient data in Ontario (14) than in Quebec (7). Among the CMAs, Ottawa, Oshawa, London, St. Catharines, Sudbury and Hamilton have a percentage of innovators that is not significantly different from the national estimate, whereas Toronto, Kitchener and Windsor have percentages of innovators that are significantly above than the national estimate.

In Manitoba and Saskatchewan, data allows for indicators for only few communities, and none of them has a significantly higher percentage of innovators than the national average. Winnipeg, the only community in Manitoba with enough observations to provide an indicator, has a significantly lower percentage of innovators than the Canadian estimate. Regina, Saskatoon and Moose Jaw have all a percentage of innovator not significantly different than the national estimate.

4. A hypotheses test was done to determine if the difference between the national estimate and the CMA or CA estimate was significant.
5. See the notes at the end a definition of innovative establishments and for a description of the methodology of the Survey of Innovation 1999.
6. See http://www.druid.dk/conferences/summer2003/Papers/THERRIEN.pdf or contact: therrien.pierre@ic.gc.ca
7. Statistics Canada, Census of Population 2001.

Table 2: Community innovation as measured by percentage of innovative manufacturing firms relative to the national estimate, for all census metropolitan areas and census areas, 1997-1999

	Number of CMAs	Percentage of CMAs	Number of CAs	Percentage of CAs
Significantly above national estimate (+)	7	27%	22	19%
Not significantly different from national estimate (=)	12	46%	31	27%
Significantly below the national estimate (-)	7	27%	9	8%
Not applicable (n.a.)	0	0%	52	46%
TOTAL	**26**[1]	**100%**	**114**[2]	**100%**

Source: Statistics Canada, Survey of Innovation 1999

1. Ottawa-Hull appears in counts twice for both parts in Ontario and Quebec.
2. CAs that cross provincial boundaries were counted in each province and CAs for which there were insufficient sample unites to produce an estimate were excluded.

In Alberta, one CA, Grande Prairie, has a significantly higher percentage of innovators than the national estimate, whereas the two CMA's in the province, Calgary and Edmonton, have significantly lower percentages than the national estimate. The five other communities, for which data is available, are not significantly different that the national estimate.

In British Columbia, only two communities – Kamloops and Williams Lake – have a significantly higher percentage of innovators than the national average. Vancouver, and Victoria, the two CMAs in the province both have percentage of innovators significantly lower than the Canadian average.

In summary, Central Canada (Quebec and Ontario) and Eastern Canada (Atlantic provinces) are more likely than the West to have communities with a percentage of manufacturing innovators that is significantly higher than the national estimates. Only 3 out of the 29 communities with a significantly higher percentage of innovators than the national average come from the West (one in Alberta and two in BC). However, one must note that factors not taken into account in this analysis, such as industrial composition and firm size, could explain these differences.

Concepts, definitions and data quality

Survey of Innovation 1999

This study uses data from the Statistics Canada 1999 Survey of Innovation. The survey provides data for 5,455 provincial-enterprises in the manufacturing sector, representing a total population of 9,303 (weighted population). A provincial-enterprise includes all establishments of a given enterprise in the same province in the same industry.[8] The survey was initially designed to provide national and provincial estimates according to definitions outlined in the OECD/Eurostat Oslo Manual.[9] An innovative firm is one that has introduced a new or significantly improved product or process in the three previous years (1997-1999). The broadest level of innovation is "first to the firm". The survey also collects data on "first to Canada" and "first to the world" innovation.

Modifications have been made to the database to allow the production of sub-provincial estimates by Census Metropolitan Area (CMA), the Census Agglomeration (CA) and Economic Region (ER).[10] First, using Statistics Canada Business Register, each provincial-enterprise, for which survey data was available, was broken-down into its component establishments. Using postal codes, the location of each establishment was assigned to specific geographic areas.

Second, the survey responses of the provincial-enterprise were assigned to each of its component establishments. This methodology assumes that the characteristics of each of the establishments within a provincial enterprise are the same. Tests were carried out to determine if the sub-provincial estimates derived solely from single-establishment provincial enterprises differed significantly from those which also included the multi-establishment enterprises. No significant differences were observed. A previous study[11] which analysed provincial enterprises, found similar results to this working paper. The percentage of innovators in Ontario and Quebec where higher than those in Eastern Canada which, in turn, were generally higher than in Western Canada: Ontario (83%), Quebec (82%), Prince

8. For more details on the methodology of the survey see: Susan Schaan and Brian Nemes, *Survey of Innovation 1999, Methodological Framework: Decisions Taken and Lessons Learned.* Statistics Canada, SIEID Working Paper No. 12, Catalogue No. 88F0006XIE, June 2002 and Susan Schaan and Brian Nemes, "Survey of Innovation 1999-Methodological Framework, Decisions Taken and Lessons Learned", in Fred Gault (ed.), *Understanding Innovation in Canadian Industry,* McGill-Queen's University Press, 2004.
9. OECD/Eurostat, *Proposed Guidelines for Collecting and Interpreting Technological Innovation Data (The Oslo Manual),* Paris, 1997.
10. For more details of the Statistics Canada's geographical classification system see: Statistics Canada, *1996 Standard Geographical Classification. Volume 1. The Classification*, Catalogue No. 12-571-XPB1996001, 1997.
11. Susan Schaan, Frances Anderson and Guy Sabourin, *Innovation in Canadian Manufacturing: Provincial Estimates,* Statistics Canada, SIEID Working Paper No.13, Catologue No. 88F0006XIE No.13, September 2001.

Edward Island (80%), Newfoundland (77%), Nova Scotia (77%), New Brunswick (74%), British Columbia (74%), Saskatchewan (74%), Alberta (74%) and Manitoba (73%).

Finally an establishment-weighting procedure was done to estimate the population of establishments. The target population thus shifts from provincial-enterprises with more than 19 employees and at least $250,000 in revenue to establishments affiliated with provincial-enterprises with more than 19 employees and at least $250,000 revenue.

Geographic units

Census metropolitan area (CMA)

A CMA is delineated around an urban core with a population of at least 100,000, based on the previous census. Once an area becomes a CMA, it is retained as a CMA even if the population of its urban core declines below 100,000.

Census agglomeration (CA)

Census agglomerations (CAs) are centred on urban cores with populations of at least 10,000 and not more that 999,999.

Number of CMAs and CA (1996)

Based on the Statistics Canada's, *1996 Standard Geographical Classification,* which was used in this study, there are 26 CMAs and 114 CAs. This results in 140 communities for which, based on the data from the Survey of Innovation 1999, it is possible to produce estimates for 88 communities.

SIEID Working Paper Series

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FAX: (613-951-9920); E-Mail: Sieidinfo@statcan.ca

Table 3. Innovation performance by community

Community by province	innov
1-Newfoundland	
001 ST. JOHN'S	=
010 GRAND FALLS-WINDSOR	n.a.
011 GANDER	n.a.
015 CORNER BROOK	n.a.
025 LABRADOR CITY	n.a.
2-Prince Edward Island	
105 CHARLOTTETOWN	-
110 SUMMERSIDE	-
3-Nova Scotia	
205 HALIFAX	=
210 KENTVILLE	n.a.
215 TRURO	+
220 NEW GLASGOW	+
225 CAPE BRETON	-
4-New Brunswick	
305 MONCTON	+
310 SAINT JOHN	=
320 FREDERICTON	=
328 BATHURST	n.a.
330 CAMPBELLTON (NB)	n.a.
335 EDMUNDSTON	=
5-Quebec	
330 CAMPBELLTON (QC)	n.a.
403 MATANE	+
404 RIMOUSKI	+
405 RIVIÈRE-DU-LOUP	+
406 BAIE-COMEAU	=
408 CHICOUTIMI-JONQUIÈRE	-
410 ALMA	=
411 DOLBEAU	n.a.
412 SEPT-ÎLES	-
421 QUÉBEC	+
428 SAINT-GEORGES	=
430 THETFORD MINES	+
433 SHERBROOKE	+
435 MAGOG	+
437 COWANSVILLE	+
440 VICTORIAVILLE	=
442 TROIS-RIVIÈRES	-
444 SHAWINIGAN	-
446 LA TUQUE	n.a.
447 DRUMMONDVILLE	+
450 GRANBY	+
452 SAINT-HYACINTHE	=
454 SOREL	=
456 JOLIETTE	=
459 SAINT-JEAN-SUR-RICHELIEU	=
462 MONTRÉAL	+
465 SALABERRY-DE - VALLEYFIELD	+
468 LACHUTE	n.a.
480 VAL-D'OR	=
485 ROUYN -NORANDA	n.a.
502 HAWKESBURY (QC)	n.a.
505 OTTAWA- HULL (QC)	=
515 PEMBROKE (QC)	n.a.

Community by province	innov
6-Ontario	
501 CORNWALL	+
502 HAWKESBURY (ON)	n.a.
505 OTTAWA-HULL	=
508 SMITHS FALLS	n.a.
512 BROCKVILLE	+
515 PEMBROKE (ON)	n.a.
521 KINGSTON	=
522 BELLEVILLE	+
527 COBOURG	n.a.
528 PORT HOPE	n.a.
529 PETERBOROUGH	+
530 LINDSAY	n.a.
532 OSHAWA	=
535 TORONTO	+
537 HAMILTON	=
539 ST. CATHARINES-NIAGARA	=
541 KITCHENER	+
543 BRANTFORD	+
544 WOODSTOCK	+
546 TILLSONBURG	=
547 SIMCOE	n.a.
550 GUELPH	=
553 STRATFORD	-
555 LONDON	=
556 CHATHAM	+
557 LEAMINGTON	n.a.
558 STRATHROY	=
559 WINDSOR	+
562 SARNIA	=
566 OWEN SOUND	n.a.
567 COLLINGWOOD	n.a.
568 BARRIE	=
569 ORILLIA	=
571 MIDLAND	=
575 NORTH BAY	=
580 SUDBURY	=
582 ELLIOT LAKE	n.a.
584 HAILEYBURY	n.a.
586 TIMMINS	n.a.
590 SAULT STE. MARIE	=
595 THUNDER BAY	+
598 KENORA	n.a.
7-Manitoba	
602 WINNIPEG	-
607 PORTAGE LA PRAIRIE	n.a.
610 BRANDON	n.a.
640 THOMPSON	n.a.
8-Saskatchewan	
705 REGINA	=
710 YORKTON	n.a.
715 MOOSE JAW	=
720 SWIFT CURRENT	n.a.
725 SASKATOON	=
735 NORTH BATTLEFORD	n.a.

Community by province	innov
8-Saskatchewan	
745 PRINCE ALBERT	n.a.
750 ESTEVAN	n.a.
840 LLOYDMINSTER (SK)	n.a.
9-Alberta	
805 MEDICINE HAT	=
810 LETHBRIDGE	=
825 CALGARY	-
830 RED DEER	=
833 CAMROSE	=
835 EDMONTON	-
840 LLOYDMINSTER (AL)	=
845 GRAND CENTRE	n.a.
850 GRANDE PRAIRIE	+
860 WOOD BUFFALO	n.a.
865 WETASKIWIN	n.a.
10-British Columbia	
905 CRANBROOK	n.a.
913 PENTICTON	=
915 KELOWNA	-
918 VERNON	=
925 KAMLOOPS	+
930 CHILLIWACK	-
932 ABBOTSFORD	=
933 VANCOUVER	-
935 VICTORIA	-
937 DUNCAN	n.a.
938 NANAIMO	-
940 PORT ALBERNI	n.a.
943 COURTENAY	n.a.
944 CAMPBELL RIVER	n.a.
945 POWELL RIVER	n.a.
950 WILLIAMS LAKE	+
952 QUESNEL	n.a.
955 PRINCE RUPERT	n.a.
960 KITIMAT	n.a.
965 TERRACE	n.a.
970 PRINCE GEORGE	=
975 DAWSON CREEK	n.a.
977 FORT ST. JOHN	n.a.

Symbols	
Significantly above national estimate	+
Not significantly different from the national estimate	=
Significantly below the national estimate	-
Not available	n.a.

Source: Statistics Canada, *Survey of Innovation 1999*