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## Functional Specialisation of Metropolises in Canada

### Introduction

THE degree of urbanisation and the development of towns and cities into metropolises is often linked with the economic progress of the nation. The trend towards a greater concentration of the nation's population and industry into a few metropolitan centres is increasingly felt in various parts of the world. The genesis and growth of these metropolitan centres is the result of the vital role the metropolises play in a nation's economic scene and the essential functions they perform. With an increase in both number and size of metropolises, a territorial specialisation of labour gradually develops. This gives rise to a process of differentiation of functions among different metropolises with their gradual development. Functional differentiation of metropolises creates the necessity for some hierarchical control of certain functions. Nevertheless, all relatively large metropolises have some diversification of functions and some employment in every major non-agricultural industrial group. The growth and structure of metropolises is often determined by the strength of the economic activity on which they are essentially based. Over three quarters of the Canadian population lived in an urban environ-

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ment as of 1981. Statistics Canada defines urban population as all persons living in an area having a concentration of at least 1,000 inhabitants with a density of at least 400 persons per square kilometre. The degree of urbanisation in Canada ranges from 37.1 in Prince Edward Islands to 81.2 per cent in Ontario in 1980. The majority of the urban dwellers live in metropolitan areas across the country. The difference between urbanisation and metropolitanism is that, urbanisation may refer to any aspect of population agglomeration whereas metropolitanism refers to the organisational components that cities impose upon the process of urbanisation (Vance and Smith 1951).

Statistics Canada created Census Metropolitan Areas (CMAs) and Census Agglomerations (CA), which are typically different from the geo-political boundaries of cities. These CMAs and CAs are usually known by the name of their largest city and they contain whole municipalities. In 1971, a CMA was defined as the main market area and corresponded to a commuting field or zone where a significant number of people were able to travel daily to work places in the main built-up area. Generally, a CMA comprised (1) municipalities completely or partly inside the continuous built-up area and (2) municipalities lying within a twenty-mile radius of the limits of the continuous built-up area, if (a) the percentage of labour force in primary activities was smaller than the national average, and (b) the percentage of population increase for 1956-66 was larger than the average for the 1966 CMA. Occasionally, when only (a) or (b) was met, municipalities were treated as part of CMAs if they were accessed by a provincial or federal highway (Statistics Canada 1971).

Unfortunately, Statistics Canada changed its criteria for defining CMA in 1981, which makes comparison of 1971 and 1981 difficult. In the 1981 census, a CMA refers to the main labour market area of an urbanised core (or continuously built-up area) having 100,000 or more population. Thus the size of population has been considered as a criterion for delineating census metropolitan areas from other urban centres. The CMAs then comprise (1) municipalities completely or partly inside urbanised core; and (2) other municipalities if (a) at least 40 per cent of the employed labour force living in the municipality works in the urbanised core, or (b) at least 25 per cent of the employed labour force working in the municipality lives in the urbanised core (Statistics Canada 1981). Thus the CMA limits fall within or extend beyond the actual labour market area. These CMAs are typical creations of Statistics Canada and they differ from metropolitan areas generally considered by local authorities for planning purposes. Also these CMAs, as seen above, differ from census to census and thus there are no consistent and strict criteria adhered to by Statistics Canada in defining CMAs. In any case, CMAs include the major city and its urbanised fringe and thus are seen as vital nerves for urban economy and progress. The growth and development of CMAs is closely linked to economic activity. For example, the Ontario and Quebec economies are fairly diversified and the CMAs there experienced mixed growth rates dur-

ing the last intercensal decade (Dumas 1985).

The pattern of economic activity varies greatly in different metropolitan areas. The growth and development of metropolises is generally linked to the functions in which they specialise. For example, Calgary and Edmonton, both in the oil-rich province of Alberta, have recorded gains of 18 and 26 per cent growth respectively during 1976 to 1981 when the oil industry was booming. Thus some metropolises grow faster than others depending on the location, environment, resources and specialisation of functions through the technological capacity of the population. The export base hypothesis says that metropolises live by selling products or services to the outside world by which they pay for indispensable imports needed for the city. The growth of a metropolis may help extend its reach to the whole nation or to a very large portion of it for specialised services. Thus some metropolises specialise in one or more forms of economic activity, while others have a more or less diversified set of industrial structure. Generally, all metropolitan centers with a population size of 100,000 or more are expected to have some employment in each major sector. The relative importance of these industries can be observed through the difference in the number and proportion employed from one to the other metropolitan area. This variation forms a part of functional differentiation of CMAs.

The objectives of this paper are twofold : (a) to identify and describe the functional specialisation of CMAs in Canada, and (b) to observe some socio-economic and demographic characteristics of CMAs in relation to the functions they specialise in. This paper drawing data from the 1971 and 1981 Canadian censuses attempts to identify the functional specialisation of the metropolises in 1971 and in 1981, though one cannot strictly compare the trends due to definition change.

### **Past Studies**

Reiss (1951) considered export of goods and services that bring income to the community and identified the functional specialisation of American cities. He assumed that a high proportion of employed persons or a high per capita output in a given industry represents an export of the products or services of that industry and thus when a place met this criterion, he classified that place as functionally specialised in that category. Reiss also examined some of the demographic and socio-economic consequences of different functional specialisations of American cities. He concluded with the assertion that almost every aspect of a community's structure is related to its basic functions and the type of functional specialisation is an important determinant of structural differences among communities. Maxwell *et al.* (1972) computed the indices of industrial diversification based on the minimum requirement criterion devised by Ullman and Dacey (1960) for American cities of different size classes.

Bahl *et al.* (1971) used the same criterion to describe the functional specialisation of American cities. This method, however, has its own limitations. Pratt (1968) has conclusively shown that the concept of minimum requirements as devised by Ullman and Dacey inherently makes the assumption that every city exports almost all commodities and imports nothing whatsoever. This is an absurd notion of the economy of a metropolis in modern times and so this concept does not lead us in the right direction to classify metropolises,

Marshall (1975), using the 1961 Canadian census data, rejects the minimum requirement approach as absurd and bases functional categorisation of Canadian cities on two specialisation indices, namely the mean absolute deviation index, and the Gini index of concentration. Stone (1967), analysing the 1961 census data, identified the functions performed by various metropolitan areas in Canada. He recognised four major industry groups, i.e. wholesale trade, finance, insurance and real estate, business services, and fabricating industries as the principal indicators of the concentration of labour force in industries responsible for the performance of metropolitan functions. Stone computed location quotients and considered the first four highest location quotients for selected metropolitan areas and then identified functional specialisation by relating the first four location quotients to the four industry groups considered. The problem with Stone's method is the identification of industry groups in relation to specialisation. For example, Sudbury, in the province of Ontario which specialised in mining, cannot be classified as such in Stone's method. Thus Stone's method identifies only four industry groups as possible cases for functional specialisation, and it is very unrealistic to force or to ignore other specialisations. In this paper, we propose a new method of classifying metropolises and the method can be applied across the world for this purpose.

## **Data and Methods**

The present study utilises the data collected in the Canadian censuses of 1971 and 1981 for Census Metropolitan Areas. The study includes all the CMAs in 1981 and to make them comparable some corresponding CMAs were included besides CMAs of 1971. Ottawa has been treated in the analysis as two metropolitan areas, one covering the entire city area and the other, a part of the above (Quebec) area. Thus in all we have 25 CMAs for analysis in the present study. Since employment pattern in various industrial categories signals the city structure, it was decided to use the proportion of workers employed in various industry groups as a basic step in categorisation. Nine groups of industrial categories were identified and the percentage of workers employed in each industrial group was presented in Table 1 for 1971 and 1981. The maximum and minimum percentage of workers employed in each industrial category was determined along with the CMA in which it occurred in

TABLE 1 -PERCENTAGE DISTRIBUTION OF WORKERS EMPLOYED IN VARIOUS INDUSTRIAL CATEGORIES  
IN CMAs OF CANADA, 1971 AND 1981

<i>CMA</i>	<i>Agriculture</i>		<i>Mining</i>		<i>Manufacture</i>		<i>Construct</i>		<i>Tronsport</i>		<i>Trade</i>		<i>Finance</i>		<i>Community</i>		<i>Publ. Admn</i>	
	1971	1981	1971	1981	1971	1981	1971	1981	1971	1981	1971	1981	1971	1981	1971	1981	1971	1981
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
CANADA	5.2	6.7	1.8	1.6	18.9	19.8	6.4	6.2	8.0	7.9	16.6	14.7	5.3	4.2	28.9	23.7	7.5	7.3
1. Calgary	0.6	0.7	6.2	8.9	11.2	9.8	8.9	11.7	8.7	8.4	17.0	17.0	5.5	7.2	28.0	30.7	7.0	5.5
2. Chicoutimi	.9	2.2	0.2	0.6	24.5	21.7	4.8	6.4	6.2	5.5	13.3	16.3	2.6	3.8	26.4	31.9	8.4	5.7
Edmonton	1.8	1.3	1.9	26	11.4	11.1	84	10.7	9.3	93	17.3	18.1	4.4	63	27.6	30.7	10.4	9.6
4. Halifax	0.4	10	0.2	0.4	8.3	7.7	5.1	5.1	8.5	8.7	15.7	17.4	5.0	6.7	27.6	33.5	22.6	18.4
5. Hamilton	1.6	1.7	0.2	0.2	34.5	32.0	6.3	1.8	49	5.3	15.1	16.6	4.0	4.9	23.3	28.3	3.7	4.0
6. Kitchner	1.3	1.6	0.1	0.1	39.0	366	6.1	5.2	3.8	4.3	13.9	16.4	4.8	5.7	21.8	25.9	3.5	3.5
7. London	2.8	2.2	0.1	0.1	22.2	20.4	5.9	5.2	6.2	6.1	15.3	17.8	6.2	7.1	28.8	35.0	6.1	5.0
8. Montreal	0.4	0.5	0.2	0.1	25.6	23.6	47	43	9.5	9.7	15.0	17.4	5.7	6.3	24.5	30.5	5.2	5.6
9. Oshawa	1.3	1.1	O.V	0.2	39.2	34.5	49	4.6	5.3	7.1	14.2	358	3.4	5.3	21.3	25.0	4.9	5.0
10. Ottawa Hull	0.8	1.2	0.1	0.2	7.9	6.8	5.8	4.4	6.2	6.8	12.3	13.7	4.3	5.5	249	326	30.2	27.3
11. Ottawa (Que)	0.6	0.9	0.1	02	13.8	9.8	191	5.8	6.5	6.9	12.7	13.8	3.4	4.5	23.8	30.0	21.4	3.3
12. Qucbac	0.7	0.9	0.2	02	12.3	10.5	5.9	5.0	6.3	6.1	13.9	15.7	4.2	6.0	29.1	34.7	17.3	18.0
13. Regina	1.5	1.7	0.4	0.5	9.5	8.8	5.5	7.1	10.7	10.3	19.3	19.9	5.8	7.9	27.1	30.3	13.9	12.8

14. Saint John	0.9	1.0	0.1	0.1	16.3	15.4	6.6	8.1	124	12.8	18.0	18.5	4.6	5.6	26.2	30.2	7.3	66
15. Saskatoon	1.7	1.5	2.1	3.3	9.8	9.3	6.3	7.8	9.2	8.5	19.1	20.3	4.2	5.2	35.0	36.4	6.9	6.7
16. St. Catherine	2.3	28	0.3	0.3	33.0	30.7	5.6	5.4	6.2	6.0	13.5	15.5	3.0	4.0	25.0	29.5	4.2	4.3
17. St. John's	1.4	1.7	0.4	0.8	7.0	7.7	7.1	6.3	109	9.0	19.9	19.1	3.3	5.1	30.0	35.5	11.0	12.7
18. Sudbury	0.4	0.9	23.7	17.0	12.9	11.6	8.0	60	5.6	6.6	12.8	17.0	2.7	4.0	20.2	28.6	4.3	6.7
19. Thunder Bay	2.9	3.1	0.6	0.6	15.9	17.0	7.1	6.4	13.8	13.4	16.1	17.3	3.0	3.4	27.2	30.9	6.5	7.2
20. Toronto	0.7	0.6	0.3	0.3	25.4	23.8	6.2	5.4	7.5	8.0	16.7	18.1	6.8	8.5	24.1	29.6	5.4	5.1
21. Trois Riviers	0.8	1.1	0.1	0.1	28.1	24.4	5.2	5.0	7.0	7.5	13.9	15.5	3.5	4.0	27.9	32.8	4.7	5.7
22. Vancouver	2.2	2.1	0.7	0.5	16.6	14.6	6.8	6.8	10.5	10.6	18.1	19.1	5.9	7.2	26.9	32.6	4.7	5.7
23. Victoria	2.8	2.9	0.2	0.2	8.8	7.2	6.3	7.4	6.8	6.2	15.8	15.7	4.8	5.5	28.2	35.0	18.8	19.1
24. Windsor	1.2	1.4	0.4	33.1	30.0	5.1	5.4	5.4	5.9	5.9	14.8	16.1	4.0	4.3	24.5	30.3	4.1	4.2
25. Winnipeg	0.5	0.9	0.2	0.2	18.2	17.0	5.1	4.8	11.3	11.8	18.8	18.9	5.3	6.2	25.7	30.5	8.2	9.0

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1971 and 1981. Table 2 presents these percentages along with the percentage of workers employed in the nine categories for the nation as a whole.

TABLE 2—MAXIMUM AND MINIMUM PERCENTAGE OF WORKERS EMPLOYED IN THE NINE INDUSTRIAL CATEGORIES IN 1971 AND 1981

Category	1971			1981		
	Canada	Minimum	Maximum	Canada	Minimum	Maximum
Agricul.	5.2	0.4	2.9	6.7	0.5	3.1
		(Sudbury)	(Thunder Bay)	(Montreal)		(Thunder Bay)
Mining	1.8	0.1	23.7	1.6	0.1	17.0
		(Oshawa)	(Sudbury)	(Kitchner)		(Sudbury)
Manufact.	18.9	7.0	39.2	19.8	6.8	36.5
		(St. John)	(Oshawa)	(Ottawa Hul)		(Kitchner)
Construc.	6.4	4.7	9.1	6.2	4.3	11.7
		(Montreal)	(Ottawa Hul)	(Montreal)		(Calgary)
Transport	8.0	3.8	13.8	7.9	4.2	13.4
		(Kitchner)	(Thunder Bay)	(Kitchner)		(Thunder Bay)
Trade	16.6	12.3	19.8	14.7	13.7	20.3
		(Ottawa Hul)	(St. John)	(Ottawa Hul)		Saskatoon
Finance	5.3	2.6	6.8	4.2	3.4	8.5
		(Chicoutimi)	(Toronto)	(Thunder Bay)		(Toronto)
Community	28.9	20.2	35.0	23.7	25.0	36.4
		(Sudbury)	(Saskatoon)	(Oshawa)		(Saskatoon)
Pub. Admin.	7.5	3.5	30.2	7.3	3.5	27.3
		(Kitchner)	(Ottawa Hul)	(Kitchner)		(Ottawa Hul)

In order to focus on intercensus metropolitan differentials, the proportion employed in each CMA is then related to the corresponding national proportion in the industrial categories. This is achieved by considering the proportion employed in a particular industrial category in a CMA divided by the corresponding proportion for Canada as a whole. The resulting ratio indicates the extent in which the employment concentration (in the particular industrial category) for a CMA varies from that of Canada. In literature, this ratio is termed as *Location Quotient*. The interpretation of location quotient is quite simple; for example, a location quotient of one indicates that the proportion employed in a CMA is equal to the national proportion for that category.

Thus the location quotients for all CMAs and for all industrial categories were computed for 1971 and 1981. Table 3 displays the first four highest location quotients for each in 1971 and 1981.

The criterion for functional specialisation was devised based on the location quotients and the percentage of workers employed in each industrial group. More specifically, two types of criteria were applied for functional categorisation of metropolises in Canada. Thus a CMA is said to be specialised in a particular industrial function if (a) it has the highest or the second highest location quotient in that category and (b) it has the minimum percentage of employed labour force in that category. The minimum percentage of workers needed to be employed for being functionally specialised is set by considering the mean percentage of workers employed in CMAs, the standard deviation, and the national percentage of workers in that category. The following describes the criteria set for each industrial category for functional specialisation :

*Manufacturing.* A CMA is said to be functionally specialised in manufacturing if (a) 25 or more per cent of total employed workers are in manufacturing, and (b) manufacturing should have either first or second highest location quotient.

*Mining.* A CMA is said to be functionally specialised in mining if (a) 5 or more per cent of total employed workers are in mining industry, and (b) mining should have either first or second highest location quotient.

*Transport.* A CMA is said to be functionally specialised in transport industry if (a) 10 or more per cent of total employed labour force are employed in transport, and (b) transport should have either first or second highest location quotient.

*Trade.* A CMA is said to be specialised in trade if (a) 18 or more per cent of total employed workers are engaged in trade, and (b) trade should have either first or second highest location quotient.

*Finance.* A CMA is said to be functionally specialised in finance if (a) more than 5 per cent of total employed workers are in finance-related activities, and (b) finance should have either first or second highest location quotient.

*Community services.* A CMA is said to be specialised in community services-related industry if (a) more than 29 and 35 per cent of the total employed labour force are in community services in 1971 and 1981 respectively, and (b) community services should have either first or second highest location quotient.

TABLE 3-LOCATION QUOTIENTS REGARDING THE INDUSTRY-GROUP DISTRIBUTION OF THE  
LABOUR FORCE, CENSUS METROPOLITAN AREAS, 1971 AND 1981

<i>Metropolitan Areas</i>	<i>Industry showing the four Highest Location Quotients*</i>							
	<i>Highest</i>		<i>Second Highest</i>		<i>Third Highest</i>		<i>Fourth Highest</i>	
	<i>1971</i>	<i>1981</i>	<i>1971</i>	<i>1981</i>	<i>1971</i>	<i>1981</i>	<i>1971</i>	<i>1981</i>
<i>(1)</i>	<i>(2)</i>	<i>(3)</i>	<i>(4)</i>	<i>(5)</i>	<i>(6)</i>	<i>(7)</i>	<i>(8)</i>	<i>(9)</i>
1. Calgary	Mining (347)	Mining (5.49)	Constr (1.39)	Constr (1.87)	Transp (1.10)	Finance (1.75)	Finance (1.04)	Commun (1.30)
2. Chicoutimi	Manufac (1.29)	Commun (1.35)	Pub. Adm (1.12)	Trade (1.11)	Commun (0.91)	Manufac (1.10)	Trade (0.80)	Constru (1.03)
3. Edmonton	Pub. Adm (1.40)	Constru (1.71)	Constru (1.32)	Mining (1.59)	Transp (1-17)	Finance (1-51)	Mining (1.06)	Comm & Pub. Adm (1.30)
4. Halifax	Pub. Adm. (3.02)	Pub. Adra. (2.51)	Tramp (1.07)	Finance (1.60)	Fin.A Com. (0.95)	Commun (1.42)	Trade (0.94)	Trade (1.18)
5. Hamilton	Maaufac (1.82)	Constiuc (1.62)	Constru (0.99)	Commun (1.19)	Trade (0.91)	Finance (1-18)	Commun (0.81)	Trade (1.13)
6. Kitchner	Manufac (2.06)	Manufac (1.84)	Construe (0.95)	Commun (1.37)	Trade (0.90)	Finance (1.12)	Commun (0.84)	Trade (109)
7. London	Manufac (1.17)	Finance (1.71)	Finance (1.16)	Commun (1.48)	Commun (1.00)	Trade (1.21)	Construe (0.93)	Manufac (1.03)

8. Montreal	Manufac (1.35)	Einance (1.52)	Transp (1.19)	Commun (1.29)	Finance (1.08)	Transp (1.23)	Trade (0.90)	Manufac (1-19)
9. Oshawa	Manufac (2.07)	Manufac (1.74)	Trade (0.85)	Finance (1.27)	Constru (0.76)	Trade (1.07)	Commun (0.74)	Commun (1.06)
10. Ottawa Hull	Pub. Adtn. (4.05)	Pub. Adm. (3.72)	Constru (0.92)	Commun (1.38)	Commun (0.84)	Finance (1.32)	Finance (0.82)	Trade (0.93)
11. Ottawa (Que)	Pub. Adm. (2.87)	Pub. Adm. (3.46)	Construc (1.44)	Commun (1.26)	Commua (0.82)	Finance (1.08)	Transp (0.81)	Trade (0.94)
12. Quebec	Pub. Adm. (2.31)	Pub. Adm. (2.46)	Commua (1.01)	Commun (1.47)	Construe (0.93)	Finance (1.43)	Trade (0.83)	Trade (1.07)
13. Regina	Pub. Adm. (1.86)	Finance (1.89)	Transp (1.34)	Pub. Adm. (1.74)	Trade (1.16)	Trade (1.35)	Finance (1.09)	Transp (1-31)
14. Saint John	Transp (1.55)	Transp (1.63)	Trade (1.08)	Finance (1.35)	Construe (1.04)	Construe (1.29)	Pub. Adm. (0.98)	Commun (1.28)
15. Saskatoon	Commun (1.21)	Manufac (2.02)	Transp & Trade (1.15)	Commun (1.54)	Manufac (1.14)	Trade (1.38)	Construe (0.99)	Finance (1.26)
16. St- Catherine	Manufac (1.74)	Manufac (1.55)	Construe (0.87)	Commun (1.24)	Commnn (0.86)	Trade (1.06)	Trade (0.81)	Finance (0.95)
17. St. Joha's	Pub, Adm. (1.47)	Pub. Adm. (1.73)	Transp (1.36)	Commun (1.50)	Trade (1.19)	Trade (1.30)	Construe (1.12)	Finande (1.23)
18. Sudbury	Manufac (13.20)	Manufac (10.56)	Construe (1.25)	Commun (1.21)	Trade (0.77)	Trade (1.15)	Transp & Commun (0.70)	Finance (0.96)

(Table 3 *contd. on page 320*)

(Table 3 contd. from page 319)

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
19. Thunder Bay	Transp (1.73)	Transp (1.70)	Construc (1.12)	Commun (1.31)	Trade (0.97)	Trade (1.17)	Commun (0.94)	Constru (1.03)
20. Toronto	Manufac (1.34)	Finance (2.04)	Finance (1.29)	Common (1.25)	Trads (1.00)	Trade (1.23)	Construc (0.97)	Manufac (1.20)
21. Trois Rivieres	Manufac (1.48)	Common (1.38)	Common (0.97)	Manufac (1.23)	Trsnsp (0.87)	Trade (1.05)	Trade (0.83)	Finance (0.97)
22. Vancouver	Transp (1.32)	Finance (1.73)	Financ (1.12)	Commun (1.38)	Trade (1.09)	Transp (1.34)	Construc (1.06)	Trade (1.30)
23. Viotoria	Pub.Adm. (2.52)	Pub. Adm. (2.60]	Construc (0.99)	Commun (1.48)	Commun (0.98)	Finance (1.32)	Trade (0.95)	Constru (1.18)
24. Windsor	Manufac (1.75)	Manufac (1.52)	Trade (0.89)	Commun (1.28)	Commun (0.85)	Trade (1.09)	Constru (0.80)	Finance (1.03)
25. Winnipeg	Transp (1.42)	Transp (1.50)	Trade (1.13)	Commun (1.29)	Pub. Adm. (1.10)	Trade (1.28)	Finance (1.00)	Pub. Adm (1.23)

<sup>a</sup>Location quotient is defined as  $L_{15}/Li$ , where  $L_{15}$  is the percentage of labour fores in the  $i$ th industrial category for the  $j$ th metropolitan area and  $Li$ . be the corresponding figure for the nation a whole.

*Construction.* A CMA is said to be specialised in construction type industry if (a) more than 8 and 10 per cent of total employed labour force are employed in construction in 1971 and 1981 respectively, and (b) construction should have either first or second highest location quotient.

*Public Administration.* A CMA is said to be functionally specialised in public administration if (a) more than 20 per cent of the employed workers are in public administration, and (b) public administration should have either first or second highest location quotient.

## **Discussion of Results**

The criteria developed in the above section were applied to identify functional specialisation of CMAs in 1971 and 1981. Agriculture was not considered as an activity that CMAs can specialise in and thus agriculture was taken out from further analysis. Moreover, none of the CMAs had first or second highest location quotient in agriculture. Trade and community services had higher percentage of employed workers in almost all CMAs and so strict limits were set for a CMA to functionally specialise in these categories. On an average about 16 per cent of the employed labour force in CMAs were in trade with a standard deviation of 2.2 in 1971. According to the criteria set for specialising in trade, none of the 25 CMAs were found functionally specialised in trade in 1981. Table 4 displays the results of analysis in which CMAs were identified along with their functional specialisations.

Table 4 indicates that 96 per cent of the CMAs in 1971 and 76 per cent in 1981 have shown their functional specialisation in at least one of the industrial groups. Though many CMAs have considerably higher percentage of employment in more than one group of industries, only 16 per cent of the CMAs in 1971 and 4 percent of CMAs in 1981 have shown more than one form of functional specialisation. In 1971, Saint John and Winnipeg had specialisation in transport and trade whereas Vancouver showed specialisation in finance and transport, and Toronto specialised in manufacturing and finance. As expected, Ottawa Hull and Ottawa (Quebec) showed functional specialisation in public administration besides Halifax in 1971 and Victoria in 1981. All these CMAs are either provincial capitals or national capital. Sudbury and Calgary identified with mining and extract industry at both points of time, Similarly London, Toronto, and Vancouver consistently identified with finance function in 1971 and Regina joined this group in 1981. Surprisingly, Regina which was identified as functionally specialised in transport-related industry in 1971 came to be in the finance group in 1981. In the same way Victoria, which was not qualified to be functionally specialised in 1971 turned out to be specialised in two functions in.

TABLE 4—FUNCTIONAL SPECIALIZATION OF CENSUS METROPOLITAN  
AREAS OF CANADA IN 1971 AND 1981

<i>Functional Specialisation</i>	<i>CMAs in 1971</i>	<i>CMAs in 1981</i>
Manufacturing (More than 25% workers + other)	Chicoutimi, Hamilton, Kitchner, Montreal, Oshawa, St. Catherine, Toronto, Trois Rivières, Windsor	Hamilton, Kitchner, Oshawa, St. Catherine Windsor
Mining (More than 5%)	Sudbury, Calgary	Sudbury, Calgary
Finance (More than 5%)	London, Toronto, Vancouver	London, Regina, Toronto, Vancouver
Transport (More than 10%)	Regina, St. John's, Saint John, Thunder Bay, Vancouver, Winnipeg	Saint John, Thunder Bay Winnipeg
Community Service (More than 29 and 35% for 1971 and 1981)	Saskatoon, Quebec	Saskatoon, St. John's, Quebec, Victoria
Trade (More than 18%)	Saskatoon, Saint John, Winnipeg	—
Construction (More than 8% and 10% in 1971 and 1981)	Edmonton	Edmonton
Public Administration (More than 20%)	Ottawa Hull, Ottawa (Que), Halifax	Ottawa Hull, Ottawa (Que), Victoria

*Note:* Besides the percentage employed, other criteria as described in the text have been used in classifying the functional specialisation of CMAs in 1971 and 1981.

1981, namely public administration and community services. One important observation from this table is that between 1971 and 1981, many CMAs lost their dual functional specialisation and in fact about 24 per cent of CMAs have not displayed any functional specialisation in 1981. This trend is consistent with the general observation in the literature that as metropolises grow, they diversify more and thus are difficult to associate with one or another function. The change in definition between 1971 and 1981 might have also contributed to this trend.

In 1981, Toronto managed its functional specialisation in finance, but lost manufacturing specialisation. Only five CMAs consistently managed their functional specialisation in manufacturing between 1971 and 1981. These CMAs are Hamilton, Kitchner, Oshawa, St. Catherine, and Windsor. In this fashion the results of Table 4 can be interpreted and related to observe the functional specialisation at both points of time.

### **Functional Specialisation and Other Characteristics**

Table 5 displays some selected socio-economic and demographic characteristics of CMAs in 1971 and 1981. These characteristics are density per square kilometer, sex ratio, the percentage of population below age 20, percentage of population in labour force by sex, average family size along with average family income, and the percentage of population with a university degree. Table 5 indicates changes in density between 1971 and 1981. In making comparisons from 1971 to 1981, one should note that there was a definition change of CMAs that might have contributed to the differences. Some CMAs gained in density during the decade while some lost; notably Montreal and Saskatoon have registered some decline in density while Toronto increased its density. A record increase of density from 1971 to 1981 in Calgary can be observed from this table. The national capital region, Ottawa Hull has recorded substantial decline in density during the decade. The percentage of population below age 20 is often considered as an indication of the youthful nature of the city. The highest percentage of population below age 20 can be found in Chicoutimi (44.8 in 1971) and the lowest in Victoria (33.2 in 1971). These percentages have dropped further by 1981 as a result of falling fertility rates and general ageing of the population. Hereafter the discussion will be on CMAs that are identified as functionally specialised in one or another industrial category.

*Manufacturing Specialisation.* A total of nine CMAs in 1971 were identified as functionally specialised in manufacturing against five in 1981. CMAs in this category other than Kitchner, Oshawa, Toronto and Windsor had experienced decline of their densities; and, with the exception of Chicoutimi, all other had low sex ratios. Characteristically, they had a moderate percentage of population below 20 years of age (more than 36 per cent). Only Toronto and Montreal had more than 6 per cent of population with a university degree. The lowest percentage of the group is in St. Catherine. Toronto had the highest average family income both in 1971 and 1981; Trois Rivier had the lowest (\$ 8,992) in 1971. The highest percentage of males in the labour force is in Kitchner and the lowest in Chicoutimi. In 1981, five CMAs were found to be functionally specialised as manufacturing centres. In 1981, too, Toronto had the highest percentage of university graduates. All the CMAs in

TABLE 5-SOME SELECTED SOCIO-ECONOMIC CHARACTERISTICS OF CENSUS METROPOLITAN AREAS  
IN CANADA, 1971 AND 1981

CMA	Density Per sq. km.		Sex Ratio (M/F)		% Below Age 20		% in Labour Force				Av. Family Income (000)		Av. Family Size		% with Univ. Education	
							Males		Fe males							
	1971	1981	1971	1981	1971	1981	1971	1981	1971	1981	1971	1981	1971	1981	1971	1981
1. Calgary	999	1174	994	1035	39.7	30.5	83.0	87.2	46.6	63.7	10.9	335	3.6	3.1	7.70	13.2
2. Chicoutimi	317	119	1005	994	44.8	36.7	66.6	74.3	28.1	39.3	9.20	23.9	3.6	3.5	4.00	6.2
3. Edmonton	129	159	1006	1025	40.5	31.9	82.1	85.6	47.7	62.4	10.7	31.2	3.6	3.2	7.20	11.5
4. Halifax	321	111	977	960	39.0	32.0	80.3	800	44.0	55.4	10.2	25.9	3.7	3.2	7.50	12.1
5. Hamilton	439	399	988	966	37.5	29.9	81.3	80.0	41.0	52.6	10.7	28.2	3.5	3.2	4.60	7.9
6. Kitchner	340	349	986	9-0	38.2	32.8	869	82.7	49.1	59.0	10.7	27.0	3.5	3.2	5.40	8.5
7. London	158	177	955	934	36.8	30.0	81.0	81.0	47.2	58.3	10.8	27.1	3.5	3.1	6.40	11.0
8. Montreal	1026	1005	962	944	36.5	28.9	74.4	77.8	38.3	51.0	10.3	27.2	3.6	3.2	6.00	9.1
9. Oshawa	420	539	989	982	40.1	33.7	81.2	82.5	41.0	54.4	10.9	28.3	3.6	3.3	3.20	5.5
10. Ottawa Hull	337	180	968	946	39.0	30.6	79.8	80.2	45.9	58.3	12.0	30.6	3.7	3.2	9.70	15.1
11. Ottawa (Que)	270	109	1001	975	43.7	34.5	75.3	78.7	39.7	55.6	10.0	26.5	4.0	3.3	4.63	8.6
12. Quebec	530	204	938	931	37.4	30.1	71.5	77.4	36.3	49.7	10.1	27.3	3.9	3.3	6.40	9.9
13. Regina	168	197	960	951	39.2	33.3	80.5	82.1	47.7	59.2	9.6	29.4	3.6	3.2	6.10	9.6
14. Saint John	72	77	966	946	39.6	33.9	76.6	76.5	40.1	47.4	8.8	24.9	3.8	3.3	3.60	6.7
15. Saskatoon	1335	1264	949	931	38.9	32.0	78.7	81.5	44.4	57.8	9.5	28.1	3.6	3.2	8.00	11.3
16. St. Catherine	298	285	985	955	38.5	30.9	79.4	77.8	39.5	48.9	10.0	25.7	3.6	3.2	3.60	0.9

17.	St. John	157	137	977	956	43.6	36.5	72.9	76.1	38.7	51.9	8.5	25.6	4.1	3.6	4.10	8.4
18.	Sudbury	101	63	1073	992	43.6	35.9	82.5	75.8	37.3	49.9	11.7	26.0	3.9	3.4	3.80	6.3
19.	Thunder Bay	167	60	1019	1003	38.1	31.0	76.5	79.1	41.3	54.1	10.2	29.3	3.6	3.2	4.20	6.8
20.	Toronto	724	801	980	955	35.2	29.3	83.0	82.2	49.4	60.7	11.8	31.2	3.4	3.2	6.70	11.6
21.	Trois Riviers	594	386	929	953	38.3	29.7	69.9	73.6	33.6	43.7	9.0	23.1	3.9	3.1	4.10	7.0
22.	Vancouver	501	455	985	964	34.1	27.2	77.7	79.3	43.3	56.3	10.7	31.6	3.4	2.9	6.10	10.4
23.	Victoria	401	478	923	905	33.2	25.1	73.3	73.9	39.8	50.8	9.9	28.6	3.3	2.9	5.50	10.6
24.	Windsor	315	320	992	952	38.8	32.2	78.3	75.5	39.7	49.0	10.8	26.6	3.6	3.3	4.40	7.6
25.	Winnipeg	775	253	954	933	35.9	29.9	79.5	79.6	46.6	56.9	10.0	26.7	3.5	3.1	6.30	9.6

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this group had lower sex ratios, higher densities, higher percentage of population in labour force, and comparatively high average family incomes (more than \$25,000).

*Mining Specialisation.* Only two CMAs were functionally specialised in mining-related activity at both points of time. In 1971, Sudbury had the highest sex ratio among all CMAs and in 1981 Calgary took Sudbury's place. Both had a family income of more than \$10,000 and more than 80 per cent of males were in the labour force as of 1971. Surprisingly, Calgary had the highest average family income in 1981 and stood second for highest percentage of university graduates. It may be observed that though both these CMAs share the same functional specialisation, they differ greatly in other characteristics.

*Finance Specialisation.* Three CMAs, namely London, Toronto and Vancouver have been consistently associated with finance functional specialisation." Regina joined this group in 1981. In this group London and Toronto registered some increase in density while in Vancouver it declined. All CMAs in this group had an average family income of more than \$10,000 in 1971 and more than \$27,000 in 1981 with Vancouver topping the group. They had lower sex ratios, moderately low percentage of population below 20 years of age, considerably higher percentage of population in labour force, and higher percentage of population with university degrees.

*Transport Specialisation.* Transportation in general becomes a specialised function in a CMA that is a collection point for distribution to nearby places, or inter-transit terminals, where people and goods are shifted from one mode of transport to another. Saint John, Thunder Bay, and Winnipeg were the three CMAs which consistently showed functional specialisation in transport. Regina, St John and Vancouver joined this group in 1971. Thunder Bay and Saint John had very low densities, low percentage of population with university degrees, moderate family income, and above 75 per cent males in labour force. Thunder Bay had a high sex ratio. It conforms with the male dominated nature of transport-related employment.

*Public Administration Specialisation.* As expected, functional specialisation in public administration has been associated with the national capital and provincial headquarters in 1971 and 1981. In these two CMAs the government employs a substantial proportion of population. These CMAs were associated with moderate level density, low sex ratios, low percentage of population below 20 years of age, moderately high percentage of females in labour force, highest average family income in 1971, and a very high percentage of population holding university degrees. The demographic composition of these CMAs

was in general similar to that of other CMAs with some differences in socio-economic status. These centres have typically lower percentage of workers in manufacturing and other industrial categories.

## **Conclusion**

This paper categorises and identifies the functional specialisation of Canadian metropolises in 1971 and 1981 drawing data from censuses. It is an update of an earlier study of the 1961 census by Maxwell. Definitional changes from 1971 to 1981, however, make comparisons difficult and one should be cautious in interpreting the changes and relating the trends to other characteristics. Two types of criteria have been adopted for identifying the functional specialisation of various CMAs, namely location quotients, and the other based on minimum percentage of workers in a given category. In 1971, about 96 per cent of the CMAs were functionally specialised in at least one function and by 1981, this percentage was down to 76 per cent.

Manufacturing, mining, finance, transport and public administration are some of the specialisations found among CMAs. About nine CMAs in 1971 and five in 1981 were functionally identified with manufacturing. They have moderate percentage of population below age 20, lower sex ratios, higher densities, and higher percentage of population in active labour force. Only two CMAs are specialised in mining activity at both points in time. One of them—Sudbury—had the highest sex ratio and more than 80 per cent of males in active labour force. Finance specialisation is unique to three CMAs, two of which are in the province of Ontario. Vancouver in British Columbia, and Regina have joined this group. All of them have moderate family income, low sex ratio, low percentage of population below age 20, high percentage of population in labour force and higher percentage of university graduates. They are all seats of one or more universities with large enrolments. The three transportation metropolises are characterised by low density, low education, high sex ratio and low to moderate family income.

Most Canadian CMAs have experienced high growth during the decade, but it is not known how much of it was due to change in definitions. As a result of this tremendous growth, however, many CMAs diversified more in 1981 than in 1971, consistent with the existing literature that as CMAs grow and develop, they are more likely to diversify. Some of the socio-economic and demographic characteristics of different CMAs were discussed in relation to their functional specialisation. The economic activity of CMAs is found closely linked to growth and development. There is scope for adjusting the data to the 1971 boundaries of the CMAs and do the analysis for observing real trends in functional specialisation. In that event, it will be more exciting to study the characteristics in relation to the functions in which they specialise.

## References

- Bahl, R. W., Firestone and D. Phares, 1971, Industrial Diversity in Urban Areas : Alternative Measures and Intermetropolitan Comparisons, *Economic Geography*, 47, 414-23.
- Dumas, Jean, 1985, Current Demographic Analysis. Report on the Demographic Situation in Canada 1983, *Statistics Canada*, Catalogue 91-209E.
- Marshal, J. U., 1975, City Size, Economic Diversity, and Functional Type : The Canadian Case, *Economic Geography*, 51, 37-49.
- Maxwell, J. W., J. A. Oreig, and H. G. Meyer, 1972, The Functional Structure of Canadian Cities : A Classification^ Cites. In : Report M. Irving (ed.), *Canadian Geography*, Holt, Rinehart and Winston of Canada, Toronto.
- Frait, R. T., 1968, An Appraisal of the 'Minimum Requirements Technique, *Economic Geography*, 44, 117-24.
- Reiss, J. R., 1951, Functional Specialization of Cities. In : P. K. Hatt and J. R. Reiss (eds.), *Cities and Society*, The Free Press, New York.
- Statistics Canada, 1971, *Dictionary of the 1971 Census Terms*, Catalogue 12-540, 47.
- \_\_\_\_\_, 1981, *Census Metropolitan Areas with Components*, Catalogue 95-943, 6.
- Stone, L. O., 196, Urban Development^ In ^Canada,\* *1961 Census Monograph*, Dominion Bureau of Statistics, 187-96,
- Vance, R. B. and Sara Smith, 1951, Metropolitan Dominance and Integration. In : P. K. Hatt and J. R. ReissKeds.), *Cities and Society*, The Free Press, New York.
- Ullman, E. L. and M. F. Dacey, 1960, The Minimum Requirements Approach to the Urban Economic Base, *Papers and Proceedings of the Regional Science Association*, 6, 175-94.