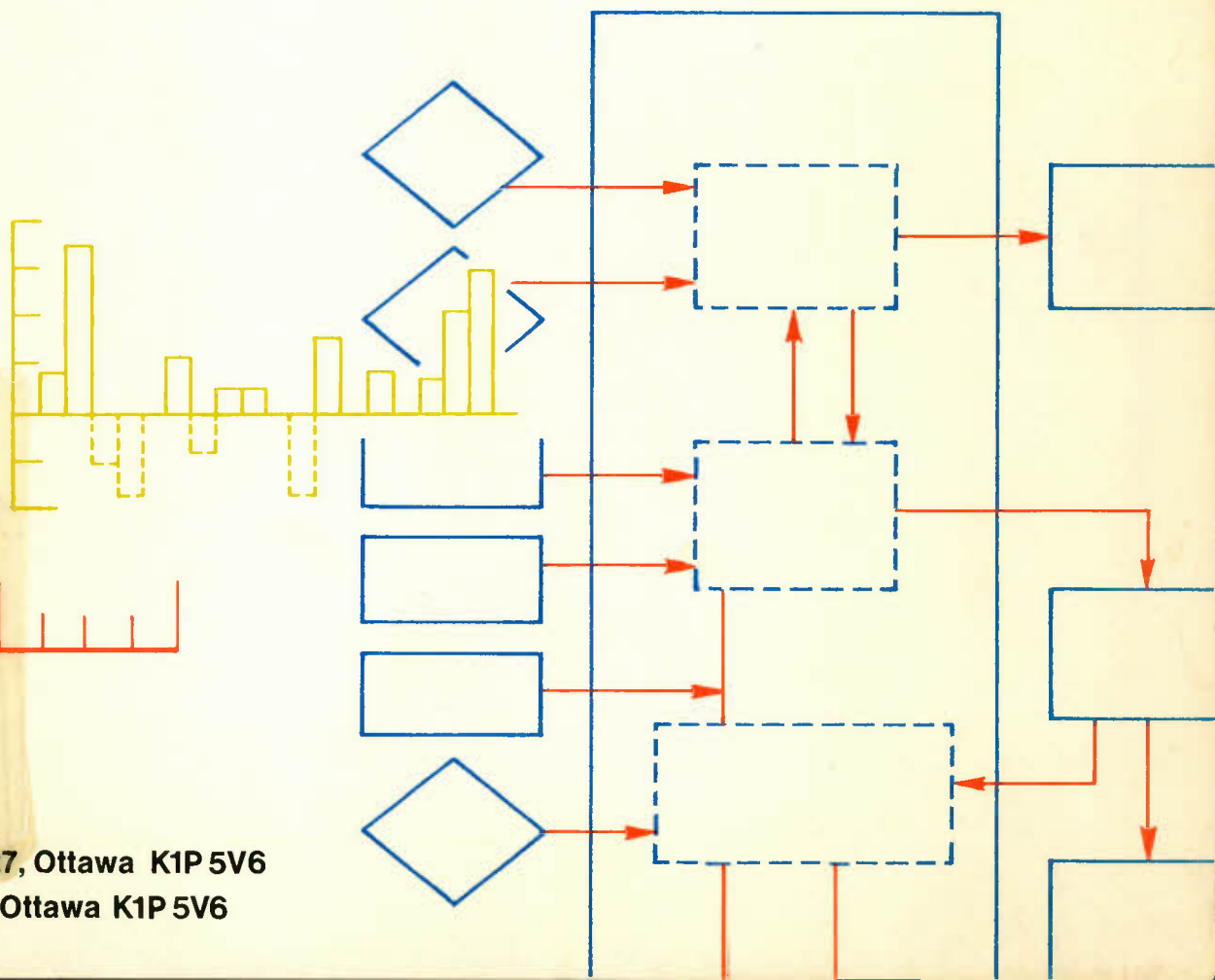
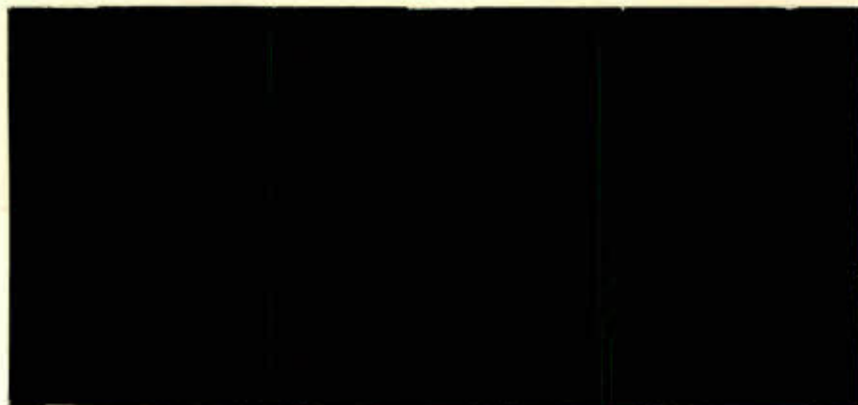




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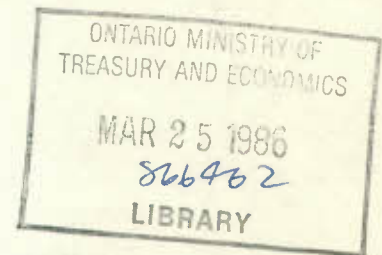
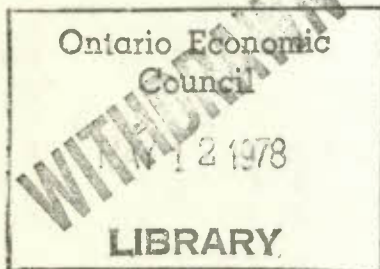
DISCUSSION PAPER NO. 112

Halifax-Dartmouth
Journey-to-Work Profile

Urban Paper No. 2

by

G. Betcherman, S. Gera,
P. Kuhn, and D. Paproski



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ABSTRACT*

This paper considers the residence location, job location, and attendant commuting patterns of the working labour force of this census metropolitan area. These location data, as well as supplementary socio-economic and demographic information, were gathered by the Census. While this data base, then, generally refers to conditions that prevailed on June 1, 1971, it nevertheless provides a unique "benchmark" for the analysis of the structure of this urban area.

The suburbanization of the residential population, particularly during the 1960s, coupled with the continued concentration of jobs on the Halifax peninsula, and especially, in the "Extended Central Business District, (ECBD), has led to a major northwest-southeast commuter flow from the northern mainland section of Halifax. The strong drawing power of the ECBD from *all* sections of the CMA has also given rise to congestion for commuter traffic originating on the southern mainland of Halifax due to the "bottleneck" created by the Armdale Rotary and in Dartmouth, due to the bridges across the Narrows. Despite the existence of three secondary employment areas in Dartmouth, job opportunities for the CMA as a whole are highly concentrated, while residential patterns are quite widely dispersed.

This report is not intended to provide a substitute planning document to those compiled locally; rather, it should be a useful, complementary input to local and regional planning and management.

- * This is the second study in the *Urban Papers* series which commenced with the development of models to explain residential and job location choices. See Surendra Gera and Peter Kuhn, *Residential and Job Location and the Journey-to-Work: A Review and Theoretical Perspective* (Economic Council of Canada, Discussion Paper No. 102, 1977).

RÉSUMÉ

Le présent document porte sur le lieu de résidence, le lieu d'emploi et sur les modalités du transport au travail de la population active occupée de cette région métropolitaine de recensement. Les données pertinentes, ainsi que des renseignements socio-économiques et démographiques supplémentaires ont été recueillis lors du recensement. Bien que ces données de base évoquent en général les conditions qui prévalaient au 1^{er} juin 1971, elles n'en fournissent pas moins un critère unique pour l'analyse de la structure de cette région urbaine.

L'exode de la population des quartiers résidentiels vers les banlieues, particulièrement au cours des années 60, ainsi que la concentration continue des emplois dans la péninsule d'Halifax, particulièrement dans le Centre des affaires élargi (C.A.E.), ont entraîné une grande circulation de banlieusards du nord-ouest vers le sud-est, à partir du secteur nord d'Halifax sur la terre ferme. Le fort pouvoir d'attraction du C.A.E. sur tous les secteurs de la région métropolitaine de recensement a aussi contribué à congestionner la circulation des banlieusards du secteur sud d'Halifax, à cause du "goulot d'étranglement" créé par le rond-point d'Armdale et des embouteillages à Dartmouth, occasionnés par les ponts enjambant les Narrows. Malgré l'existence de trois secteurs secondaires d'emploi à Dartmouth, les occasions d'emploi pour les gens de la région métropolitaine de recensement, dans son ensemble, sont fortement concentrées, tandis que les lieux de résidence sont largement dispersés.

Le présent rapport ne saurait remplacer, comme document de planification, ceux qui sont établis localement; il faut plutôt y voir une contribution complémentaire utile à la gestion et à la planification locales et régionales.

* Ce document constitue le second des *Cahiers urbains*, dont le premier portait sur l'élaboration de modèles servant à expliquer le choix des lieux de résidence et d'emploi. Voir Surendra Gera et Peter Kuhn, *Residential and Job Location and the Journey-to-Work: A Review and Theoretical Perspective*, Conseil économique du Canada, Document n^o 102, 1977.

ACKNOWLEDGEMENTS

The authors would like to express their appreciation for the co-operation of:

- local authorities in Halifax and Dartmouth for their provision of reports, land-use maps and other information,
- the Department of Civil Engineering, University of Waterloo (particularly Prof. B.G. Hutchinson and Mr. D.P. Smith) for providing road distance matrices for commuters in the CMA.
- the Graphic Arts Section of the Economic Council of Canada (particularly Mr. Y. D'Aoust) for the production of the maps contained in this report, and
- Miss J. Parisien, for typing the text.

The authors, however, bear responsibility for any errors of omission or analysis.

JOURNEY-TO-WORK: HALIFAX-DARTMOUTH CMA

Introduction

The journey-to-work is the single most important daily travel pattern in urban Canada and therefore, plays a major role in linking different parts of a metropolitan region.¹ The journey-to-work patterns are dictated, of course, by the physical and social character of the urban area. To some extent, however, these patterns, themselves, are significant determinants of future urban development. As a result, an understanding of the journey-to-work reality is of direct planning and management interest. Certainly, effective land-use and transportation policy decisions cannot be made without some consideration of where people live, where they work, and the attendant commuting flows.

This report provides a general description and analysis of the journey-to-work patterns in the Halifax-Dartmouth Census Metropolitan Area (CMA). The data is presented in a readily interpretable form in order that the study will be of direct use to elected, planning, and administrative officials and of interest to the general public. The full set of raw data will be available to planning officials upon request.

From the responses to the 1971 *Census of Population and Housing*, it is possible to ascertain the residential

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1. A survey in the Metropolitan Toronto region indicated that commuting between home and work accounts for 43 per cent of all trips. See Metropolitan Toronto Area Regional Transportation Study, *Toronto Area Regional Model Study: Modal Split*, Planning Branch, Ontario Department of Highways, December, 1970.

location of the employed labour force of Canada, as of June 1, 1971. In addition, the 1971 Census collected job location information on a national basis for the first time. The place of work question was asked on the "long form" (Census 2B) which was distributed to one-third of the population. From these responses, Statistics Canada subsequently compiled a data base which was mounted on a sample including one-third of those who had responded to the "long form". Thus, journey-to-work data, consisting of the place of residence and place of employment, was coded for one-ninth of the complete population. From this sample, full population estimates were made by Statistics Canada. This data and the estimates based thereon, then, make possible an analysis of the journey-to-work flows, as of June 1, 1971.²

This profile of commuting in the Halifax-Dartmouth CMA consists of three sections. The first provides a description of the study area and the statistical units which comprise it. The structure of the CMA is analyzed in terms of the distribution of jobs and residences and the average socio-economic characteristics of each district. The second section describes the flow of commuters and commuting distances within the study area. In the final

2. Technical details on sampling procedures, data quality, etc. are to be found in; J.K. Simpson, "Background Information on the 1971 Census Place of Work Data", *Characteristics Division Research Memorandum*, Place of Work Series, No. 71-PW-ZE, Statistics Canada, November 1974 and I. Zawadzinski, J.K. Simpson, and H. Puderer, "Information for Users of the 1971 Place of Work Data -- Census Tract Place of Work Data," *Characteristics Research Division Memorandum*, Place of Work Series, No. 71-PW-3, Statistics Canada, October 1975.

section, the conclusions emerging from the analysis are presented and issues related to future development in the CMA are discussed.

Section 1: The Halifax-Dartmouth CMA

In this section, various aspects of the Halifax-Dartmouth CMA are considered in order to provide a general description of the study area. After identifying the relevant geographical units of analysis, our discussion will turn to the structure of the municipalities of Halifax and Dartmouth which constitute the major part of the CMA. The various demographic and socio-economic characteristics of the relevant census tracts will be presented. Following this, the distribution of jobs and residences will be analyzed and major employment and residential areas will be identified.

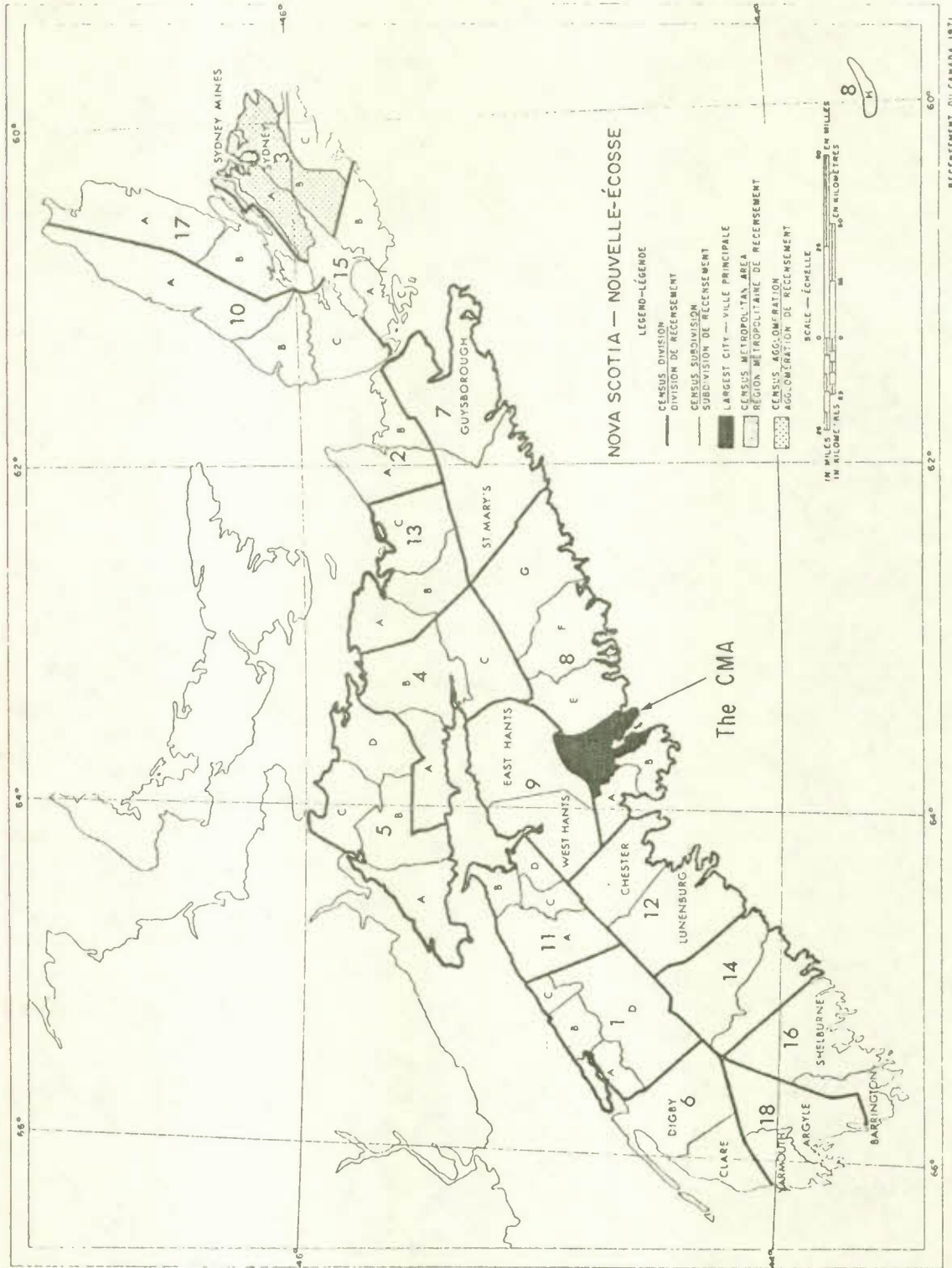
1.1 The Study Area and the Units of Analysis

In order to ensure that most of those workers employed in the Halifax-Dartmouth CMA were identified, all outlying Census Divisions (CDs)³ within a fifty-mile radius of the CMA have been searched. As Map 1 indicates, this fifty-mile "search area" includes most of Nova Scotia, other than Cape Breton Island. All commuters to the Halifax-Dartmouth CMA who lived within this radius, then, were included in the analysis.

3. Census divisions are geographical areas which, in the case of Nova Scotia, are drawn along country boundaries.

Map 1

THE HALIFAX-DARTMOUTH CMA IN THE 50-MILE SEARCH AREA
(Census Divisions)

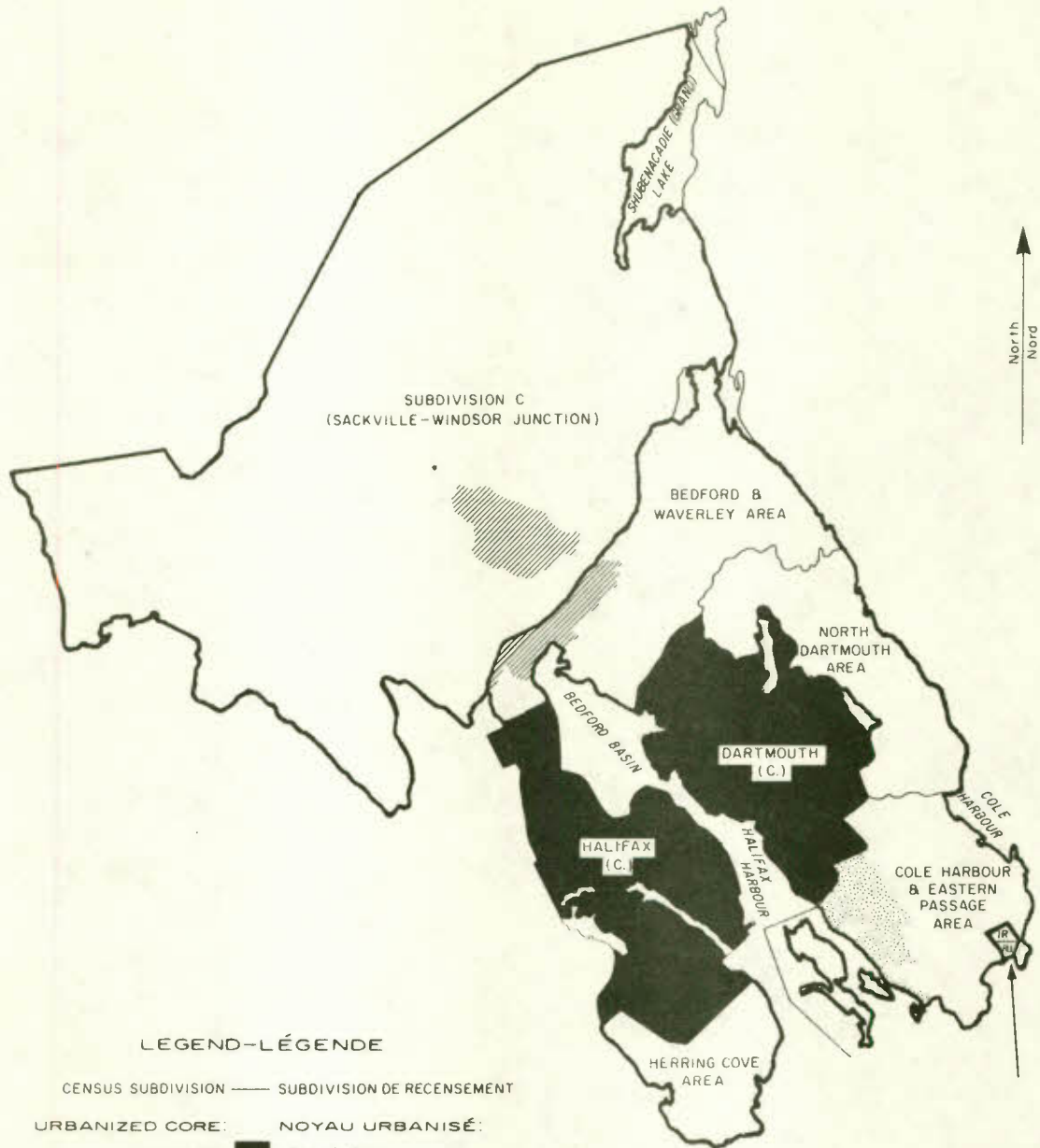


The Halifax-Dartmouth CMA is shown in Map 2 as it has been defined in the Census.⁴ It can be seen that, in addition to the municipalities of Halifax and Dartmouth, this area includes the Unofficial Census Tracts (UCTs) 120, 130, and 140.⁵ Map 3 focuses upon the municipalities of Halifax and Dartmouth within the CMA. The units of analysis in this core are Census Tracts (CTs) which are the smallest physical areas considered in this profile.⁶ Nonetheless, they are of significant size and the data on individuals are sufficiently aggregated to preserve confidentiality and to make the analysis manageable.

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4. In the 1971 Census, a census metropolitan area was defined by Statistics Canada as the main labour market of a continuous built-up area having a population of 100,000 or more. The main labour market area corresponds to a commuting field or a zone where a significant number of people are able to travel on a daily basis to "work places" in the main built-up area.
 5. In the 1971 Census, Unofficial Census Tracts represented those areas in a CMA which did not fullfil the defining criteria for Census Tracts. UCTs are generally low-density rural areas which surround the continuous built-up core of the CMA.
 6. Census Tracts are generally the smallest geographical areas for which data is available. The criteria used by Statistics Canada to delineate CTs in a CMA are as follows:
 - (1) a population between 2,500 and 8,000, except for tracts in the central business district and for institutional tracts, either of which may have a smaller population;
 - (2) an area as homogeneous as possible in terms of economic status and living conditions;
 - (3) boundaries that follow permanent and easily recognizable geographic features;
 - (4) a shape as compact as possible. Census tract bulletin, 1971, Census of Canada, Statistics Canada, Cat. No. 95-721 (CT-21A), May 1973.

Map 2

THE BOUNDARIES OF THE CMA
(Unofficial and Official Census Tracts)



LEGEND-LÉGENDE

- CENSUS SUBDIVISION — SUBDIVISION DE RECENSEMENT
- URBANIZED CORE: NOYAU URBANISÉ:
- Largest City Ville principale
- Remainder Le reste
- FRINGE: BANLIEUE:
- Urban Urbaine
- Rural Rurale

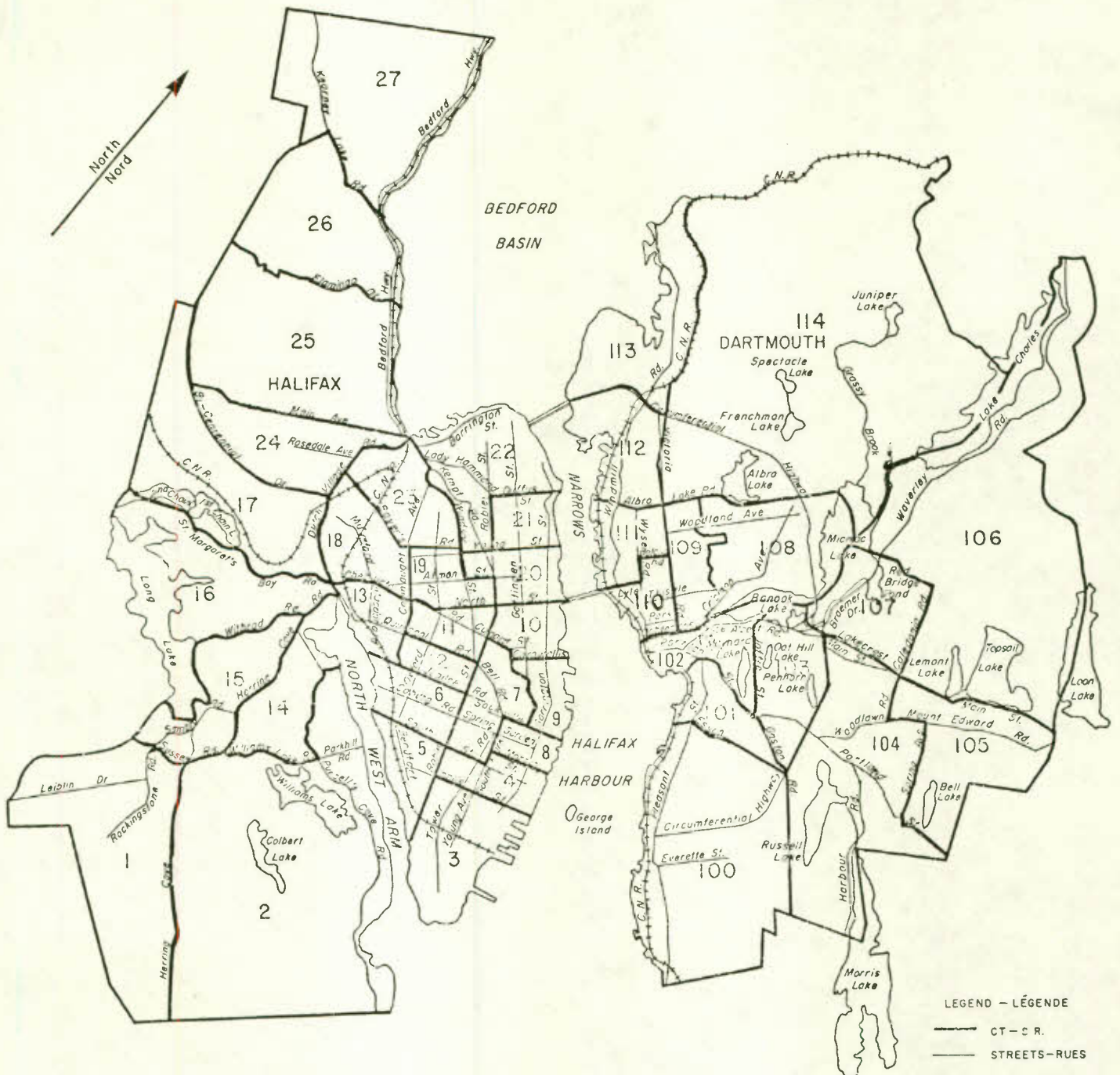
SCALE-ÉCHELLE

IN MILES 0 1 2 3 4 EN MILES

IN KILOMÈTRES 0 2 4 6 EN KILOMÈTRES

Map 3

OFFICIAL CENSUS TRACTS, 1971



CT - C.R.

STREETS - RUES

SCALE - ÉCHELLE

IN MILES 0 1/2 1 IN MILES
IN KILOMETRES 0 1/2 1 EN KILOMÈTRES

CENSUS OF CANADA, 1971
RECENSEMENT DU CANADA, 1971

This profile of commuting in the Halifax-Dartmouth CMA, then, will consider 54 geographical units: 27 CTs in the City of Halifax, 15 CTs in the City of Dartmouth, 2 UCTs in the "Outer Areas" of the CMA,⁷ and 10 CTs inland from the CMA.⁸ Although our tables contain the data for all 54 units, subsequent maps consider only the official CT area (Map 3) of the CMA. Details regarding street names, landmarks, and other labels are omitted from these subsequent maps in order to avoid clutter; the reader is asked to refer back to Map 3 for clarification, if necessary.

1.2 The Urban Structure: Characteristics of the Resident Population

In this sub-section, certain demographic and socio-economic characteristics of the urban core population of the Halifax-Dartmouth CMA will be discussed. This information is presented in Table 1 and Maps 4 to 13. It should be noted that these data record *average* characteristics for all individuals and census families in each CT in 1971 and, therefore, many distributional features regarding the nature of the resident population are not revealed.⁹ Nevertheless, averages are summary indicators and they can provide a general picture of the characteristics of the population residing in each CT.

-
7. UCT 140, which is an Indian reservation, is not considered since data have not been made available.
 8. CD 8 includes sections A, B, E, F, and G of Halifax county (shown in Map 1) but not sections C and D which comprise the CMA.
 9. More detailed information on the characteristics of groups within each CT could be provided to interested researchers by Statistics Canada.

Table 1
DEMOGRAPHIC AND SOCIO-ECONOMIC CHARACTERISTICS BY CENSUS TRACT/UNOFFICIAL CENSUS TRACT, 1971

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
	Population Density Persons/ Acre	Population Change 1971 over 1966	Life Cycle Index	Pre-1946 Housing Construction	Post-1960 Housing Construction	Average Family Income	Median House Value	Male White Collar Employment Rate	Male Unemployment Rate	University Degree
		(%)		(%)	(%)	(\$)	(\$)	(%)	(%)	(%)
1	1,908.00	23.9	8.42	5.4	37.1	9,714	20,448	43.72	8.0	4.81
2	1,264.92	31.0	8.66	20.6	43.0	10,187	19,458	41.84	5.2	8.50
3	3,396.25	9.6	14.20	50.3	28.2	15,817	43,654	65.10	8.6	21.27
4	20,297.14	9.7	12.98	54.6	26.5	8,766	32,143	46.07	10.0	10.65
5	7,296.67	2.8	15.95	53.4	6.1	21,028	45,087	77.14	6.0	27.11
6	11,135.90	- 8.0	15.41	70.7	9.7	14,278	35,655	70.64	9.7	21.14
7	4,263.64	-21.6	20.95	40.5	50.9	15,510	62,500+*	68.42	8.2	13.92
8	14,605.00	5.9	13.45	59.0	39.4	8,770	24,500	49.02	12.3	13.41
9	8,211.11	-18.1	12.81	71.2	20.1	5,986	16,591	19.82	14.5	2.60
10	25,280.00	-14.2	12.46	69.3	27.2	5,956	20,051	11.49	11.3	1.60
11	22,384.38	-10.7	15.36	82.9	4.3	9,090	23,188	38.76	6.6	4.21
12	20,938.89	- 7.1	14.83	87.8	1.7	12,875	30,479	58.85	8.1	15.25
13	10,713.33	- 6.9	16.59	61.1	10.6	16,845	31,792	68.72	4.8	12.61
14	4,857.89	15.7	10.50	28.3	25.7	9,611	22,185	40.22	8.6	5.49
15	4,112.05	6.3	10.83	42.0	18.3	7,716	16,277	29.88	11.5	2.41
16	2,533.33	2.5	11.17	27.3	26.6	10,493	23,360	51.72	7.2	10.65
17	1,624.32	11.8	11.31	18.3	29.9	13,967	33,915	60.28	1.4	15.53
18	9,444.44	- 8.7	12.74	5.6	23.0	12,599	31,557	62.85	4.6	13.29
19	21,021.88	-11.5	14.73	68.0	9.9	9,689	23,854	45.73	7.4	4.29
20	11,421.62	-19.4	13.88	81.1	10.9	7,362	20,455	23.21	7.3	2.04
21	18,353.12	- 8.4	11.89	58.8	11.2	8,009	20,597	33.33	9.1	1.85
22	6,172.34	-27.6	12.13	38.9	12.3	9,301	21,467	38.05	5.0	3.59
23	11,692.73	8.6	10.50	28.1	16.5	8,748	21,360	31.10	8.4	2.68
24	7,610.31	8.1	10.01	17.0	33.2	9,751	22,313	45.19	5.1	3.75
25	3,643.04	93.6	8.57	6.6	83.8	12,346	37,540	63.20	3.5	16.40
26	2,905.15	41.0	9.63	7.9	50.5	14,277	32,328	62.80	4.2	16.45
27	611.17	-11.0	10.31	23.4	10.9	10,804	28,188	49.15	4.9	4.48
100	1,470.22	-10.5	10.25	43.9	21.7	8,674	15,029	23.94	6.2	0.62
101	13,137.14	1.2	10.35	17.3	32.0	9,957	20,862	42.57	4.9	5.09
102	15,897.56	- 4.9	10.87	44.8	12.6	9,860	21,928	36.07	4.8	5.34
103	6,193.85	20.5	8.60	9.8	54.4	11,740	24,572	44.24	2.8	7.83
104	2,945.50	14.1	8.34	4.7	45.9	11,208	24,394	45.55	4.9	6.67
105	3,359.84	46.2	6.61	3.2	69.3	11,926	24,597	49.49	2.9	7.78
106	1,290.18	80.3	6.83	10.0	60.4	9,917	21,620	39.74	5.3	3.83
107	6,374.14	19.0	8.70	7.7	53.6	10,522	21,551	45.79	6.5	5.84
108	4,159.30	21.0	9.89	12.1	46.2	14,513	29,592	60.66	4.5	16.37
109	10,818.18	- 0.5	11.89	35.1	22.3	10,612	23,848	45.85	6.7	8.27
110	8,828.57	- 5.0	8.67	55.2	8.1	8,130	17,900	17.19	5.9	1.60
111	11,102.78	- 6.1	11.94	54.3	11.7	8,345	16,922	32.06	7.5	1.96
112	6,754.41	- 2.0	7.76	20.6	25.2	7,510	15,159	13.33	5.2	0.59
113	2,654.63	- 2.9	6.78	4.3	88.2	9,823	21,591	8.00	4.6	0.00
114	649.64	51.4	6.30	4.7	79.0	8,904	19,079	43.30	2.2	7.44
120	286.00 ¹	- 0.1	9.20	23.1	34.4	9,304 ¹	18,274 ¹	28.00 ¹	5.1	3.16
130	112.86	48.0	8.21	18.2	52.3	8,598	18,486	31.90	5.0	2.27
Av.				34.7	32.3				6.3	

*Too few observations for reliability.

1 Averages derived by ECC staff, weighted by population, for data from Canadian Urban Trends.

Source 1971 Census and ECC staff calculations (one decimal place figures), Canadian Urban Trends: Neighbourhood Perspective, Vol. 3 (Toronto: Copp Clark Publishing, 1977), pp. 29-37 (two decimal places figures).

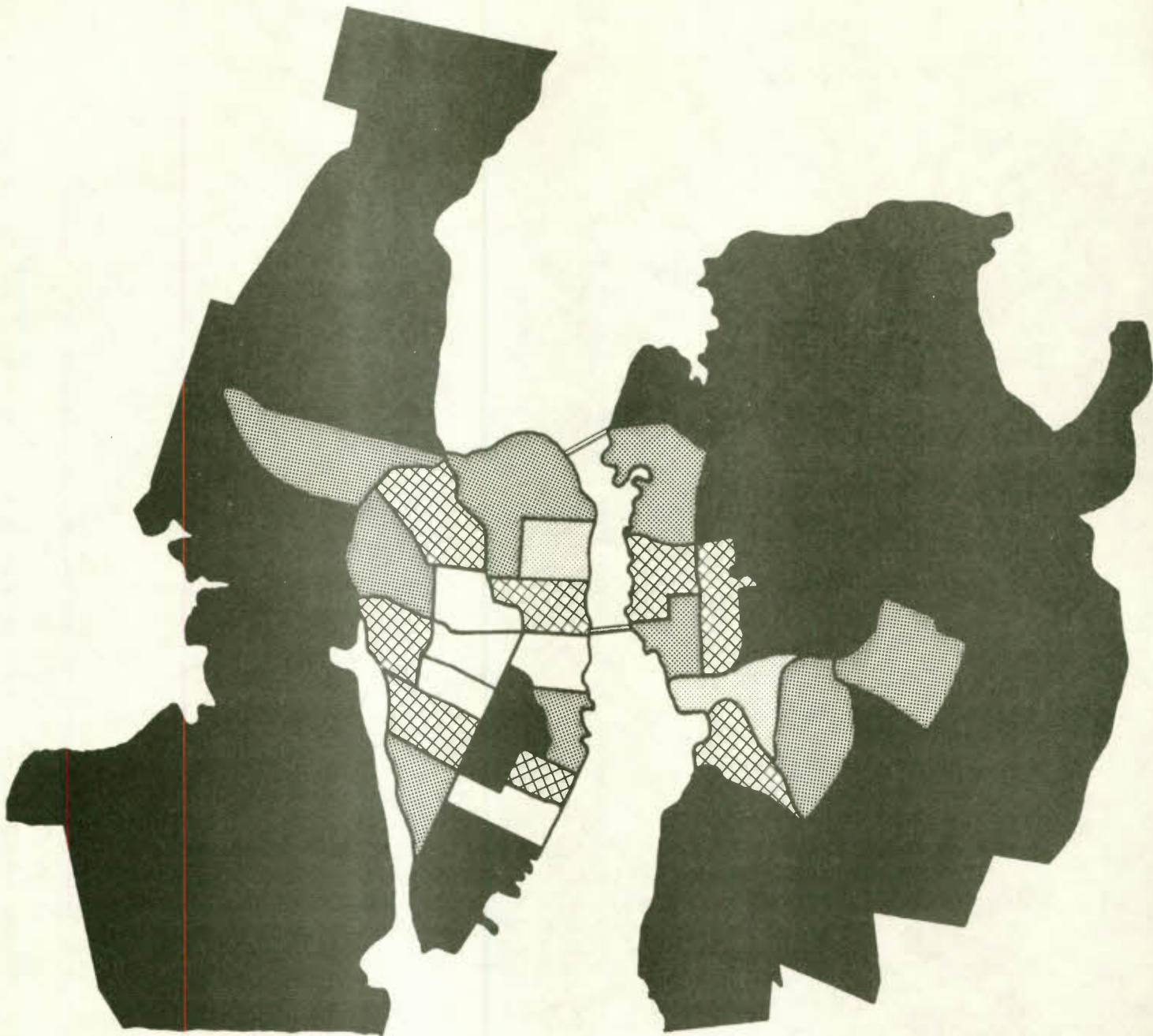
1.2.1 Demographic Characteristics

In 1971, the Halifax-Dartmouth CMA was the fourteenth largest census metropolitan area in Canada with a resident population of 222,637. This total included 122,035 people in the City of Halifax, 64,770 in the City of Dartmouth, and 35,382 in the Outer Areas of the CMA. The population of Halifax-Dartmouth, however, is not evenly distributed. This is illustrated in Map 4 which indicates the population density in 1971 in each CT. Five peripheral CTs in Dartmouth (CTs 100, 104, 105, 106, 114) and all but one of the CTs on the Halifax mainland (CTs 1, 2, 14-17, 24-27) had less than 5,000 residents per square mile. What Map 4 does not show, however, is that whatever population existed in these low-density CTs tended to be limited to local suburban or strip developments. As a result, there were relatively large stretches of unused land on the Halifax mainland and in the peripheral sections of Dartmouth. The most densely populated area, on the other hand, was the Halifax peninsula where five CTs had more than 20,000 residents per square mile.

In the years from 1966 to 1971, the number of residents in the CMA increased 6.1 per cent. From Map 5, we can see the rate of population growth in this period for each of the CTs in Halifax-Dartmouth. As would be expected, this map shows that the areas experiencing the highest growth rates have generally been the low-density, suburban regions of Halifax and Dartmouth. These increases in the peripheral areas would appear, to some extent,

Map 4

POPULATION DENSITY BY CENSUS TRACT, 1971
(Residents per square mile)



less than 5,000

5,000 to 9,999

10,000 to 14,999

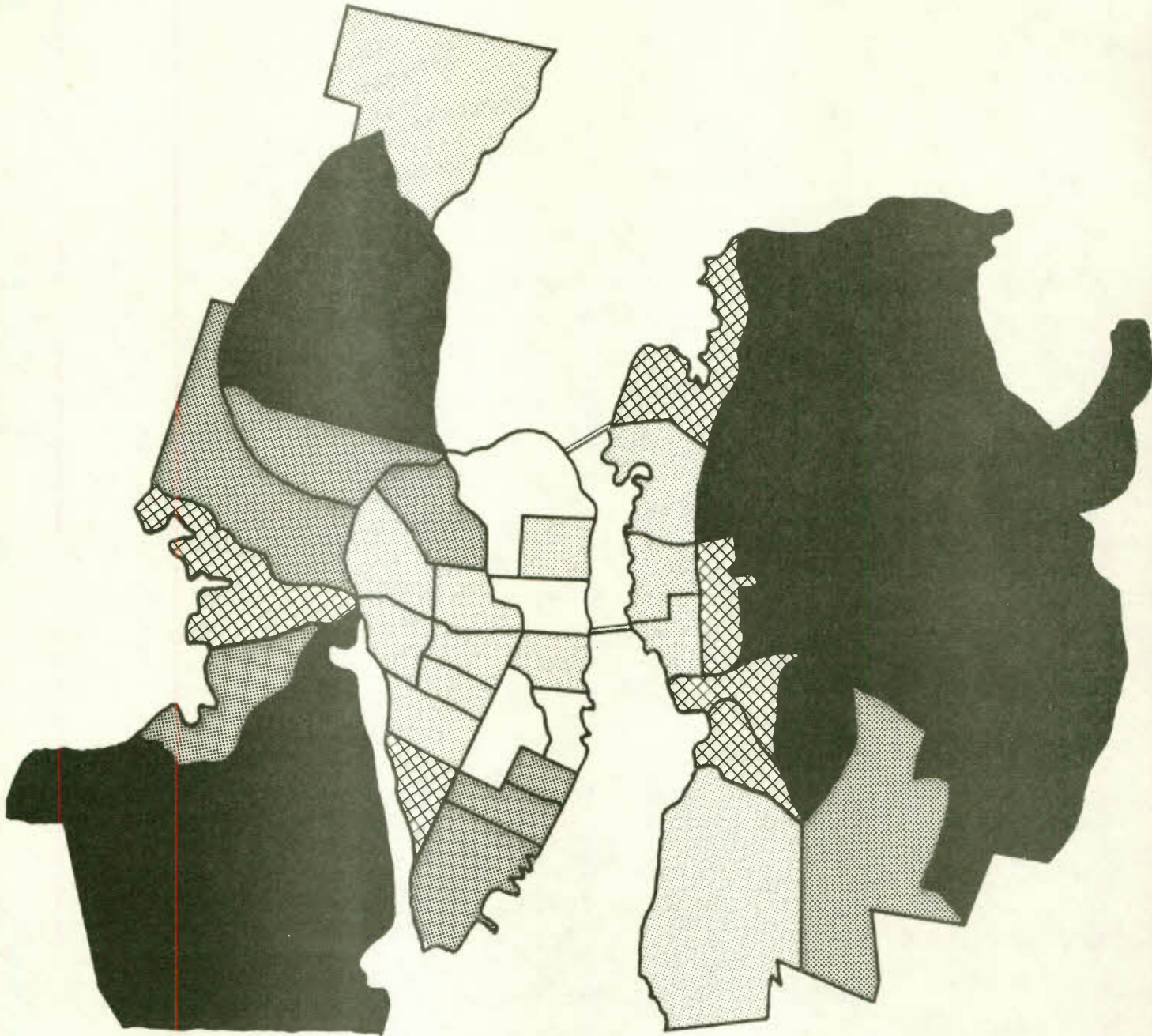
15,000 to 19,999

20,000 or more

Source: 1971 Census.

Map 5

POPULATION GROWTH BY CENSUS TRACT FROM 1966 TO 1971
(As a percentage of the 1966 population)



15.00% or greater

5.00% to 14.99%

between \pm 4.99%

-5.00% to -14.99%

-15.00% or less

Source: 1971 Census.

to have been the result of an outward migratory trend on the part of those previously residing in the older central core of Halifax. The decreasing population in the inner city supports this conclusion; of the seventeen CTs on the peninsula, twelve experienced population declines of more than 5 per cent over the period 1966-1971.

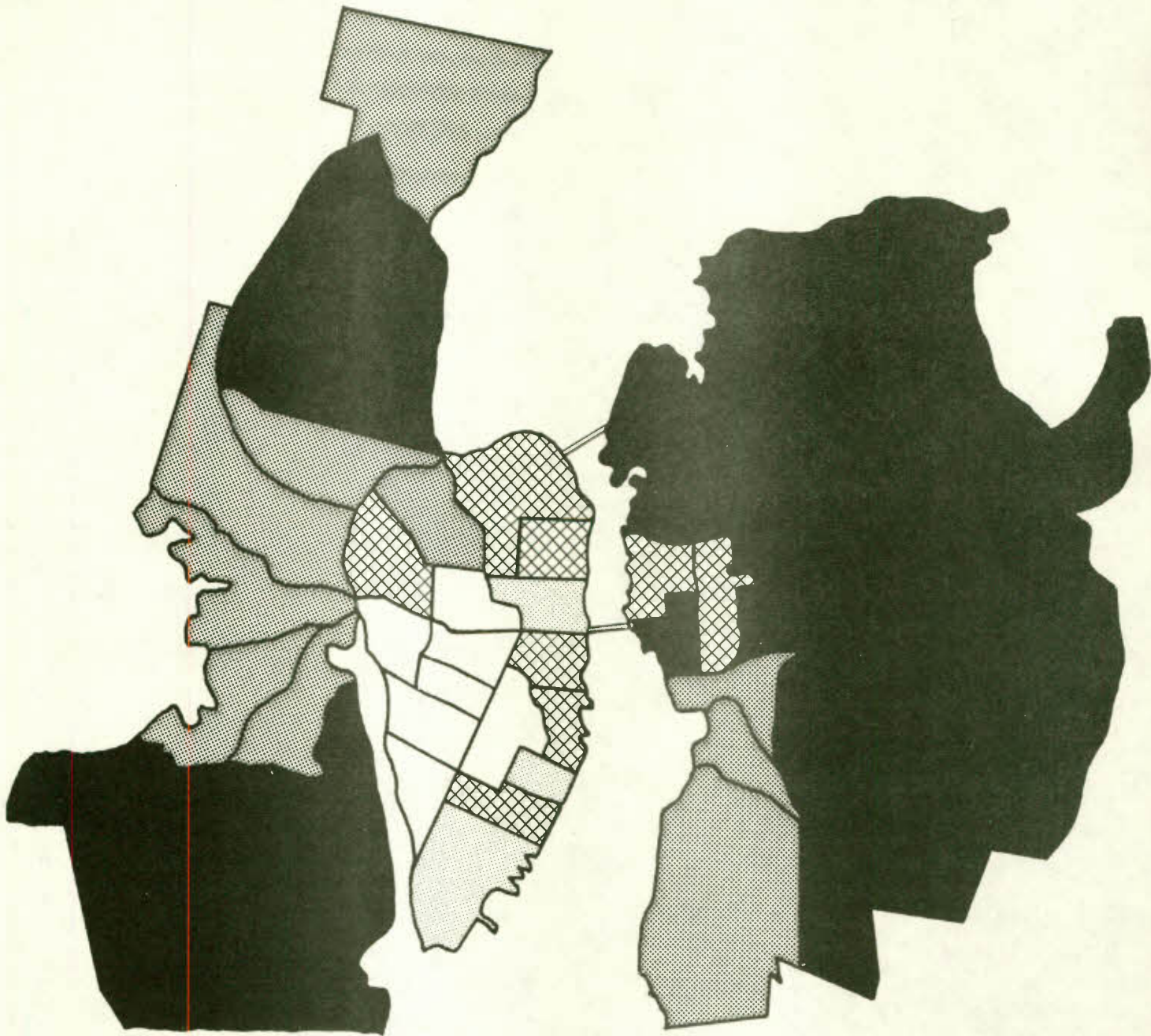
The suburban areas are particularly attractive as a place of residence for relatively young families at the child-rearing stage. This can be seen from the family life cycle index values for each CT which are presented in Map 6. This index employs information on age "to describe with a single measure the life cycle of the population of a neighbourhood or census tract".¹⁰ It should be noted that low values are associated with a population with a high proportion of young families while high values describe a predominantly mature family population. Map 6 indicates that the CTs with the youngest family make-up tended to be those in mainland Halifax and most of Dartmouth, particularly in the periphery. In contrast to this, all of the CTs in the Halifax peninsula, with the exception of CT 23, had family life cycle index values which were above the CMA average of 11.1.¹¹

10. D. Michael Ray (ed.), *Canadian Urban Trends*, Vol. 2, Ministry of State for Urban Affairs, 1976, p. 22.

11. This average comes from *ibid*, Vol. 2, p. 32.

Map 6

FAMILY LIFE CYCLE INDEX BY CENSUS TRACT, 1971



less than 10.00



10.00 to 11.49



11.50 to 12.99



13.00 to 14.99



14.50 or greater

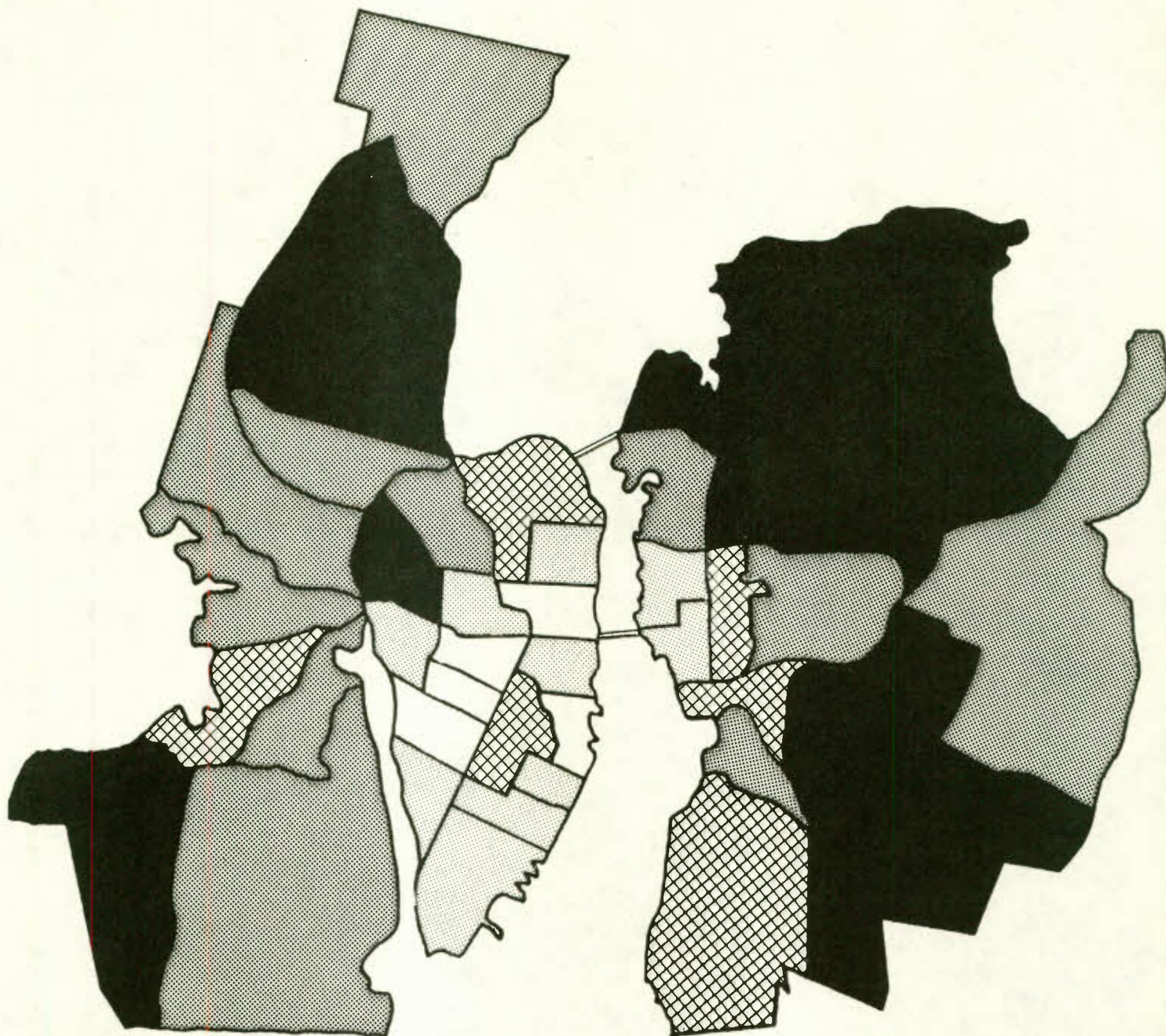
Source: 1971 Census.

In addition to greater land space, the major advantage of residing in suburban rather than central areas is newer housing. This is shown in Maps 7 and 8 which indicate the percentage of housing in each CT constructed before 1946 and after 1960, respectively. While some residences on the peninsula, most notably in CT 7, have been built since 1960, over 50 per cent of the housing in thirteen of the seventeen CTs in this area was constructed prior to 1946. On mainland Halifax, on the other hand, CT 15 is the only census tract in which at least 30 per cent of the housing was built before 1946. Similarly, the central CTs in Dartmouth tend to be characterized by significant proportions of pre-1946 housing while the majority of residences in the peripheral areas have been built since 1960.

To conclude this sub-section, we have seen that the existing urban phenomenon of population decentralization has also been occurring in Halifax-Dartmouth. Although the majority of the CMA's population remained in the high-density central area of the Halifax peninsula, it is evident that the greatest rates of growth were taking place in the periphery. These suburban developments, with their new housing and open spaces, have been particularly attractive for young families at the child-rearing stage.

Map 7

PRE-1946 HOUSING AS A PERCENTAGE OF ALL
HOUSING BY CENSUS TRACT, 1971



less than 10.00%

10.00% to 29.99%

30.00% to 49.99%

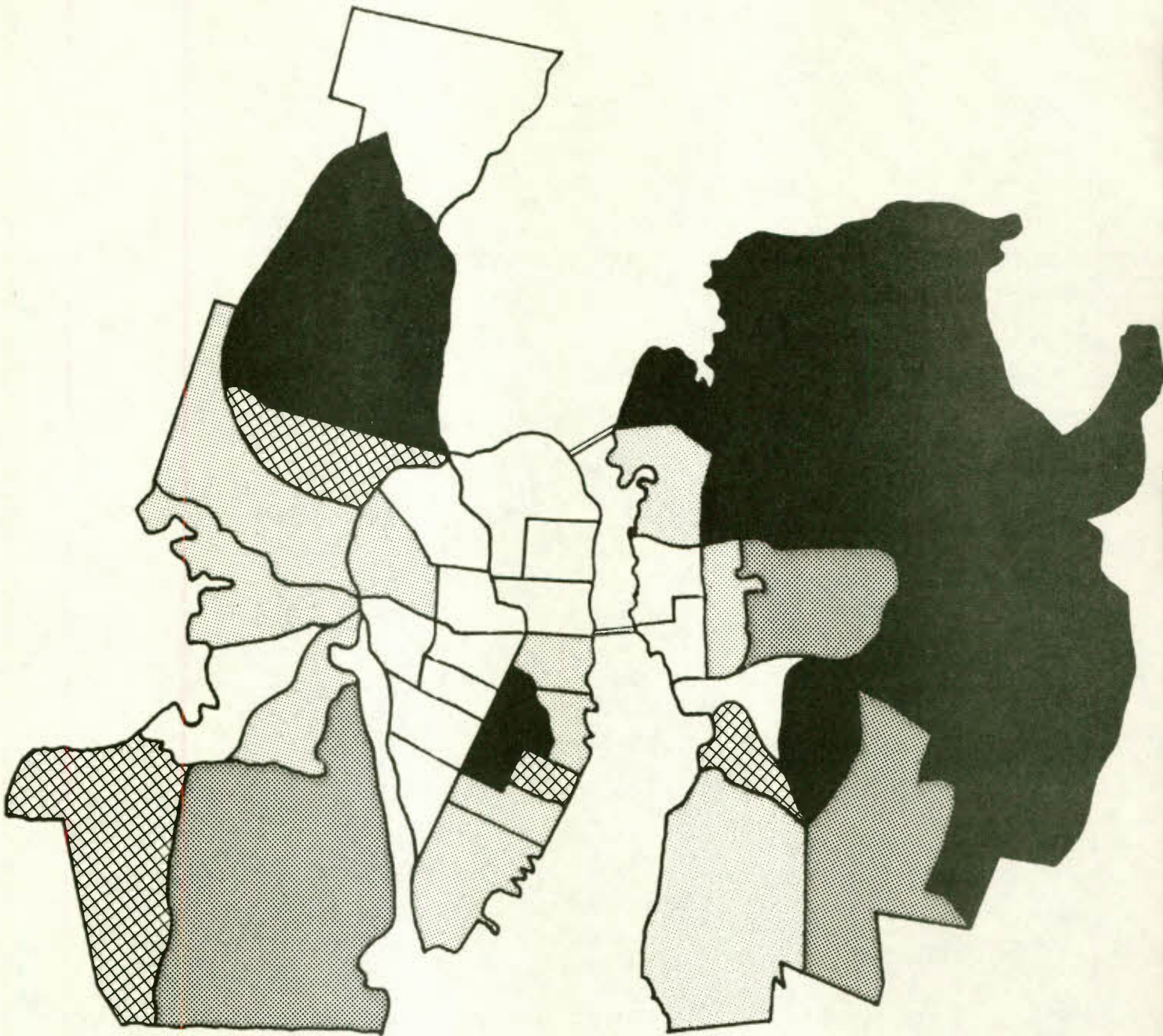
50.00% to 69.99%

70.00% or greater

Source: 1971 Census.

Map 8

POST-1960 HOUSING AS A PERCENTAGE OF
ALL HOUSING BY CENSUS TRACT, 1971



50.00% or greater

40.00% to 49.99%

30.00% to 39.99%

20.00% to 29.99%

less than 20.00%

Source: 1971 Census.

1.2.2 Socio-Economic Characteristics

The average family incomes in 1971 for the census tracts in the CMA are shown in Map 9. It can be seen that the major concentration of high income residents was in the southern part of the Halifax peninsula. This district includes four census tracts along the North West Arm (CTs 3, 5, 6, 13) and a fifth (CT 7) which extends inland. The average annual family incomes of each of these CTs exceeded \$14,000, ranging up to \$21,028 (CT 5). Earning levels for the remainder of the peninsula, however, were much lower as only CTs 12 and 18 had average family incomes which were greater than the CMA mean of \$10,176.¹² A wide variation in average income characterized the census tracts on the mainland, ranging from CT 26 which was in the highest category (above \$14,000) to CT 15 which was in the lowest (below \$8,000). In contrast to this, little variation existed within Dartmouth where thirteen of the fifteen CTs had average family incomes between \$8,000 and \$12,000.

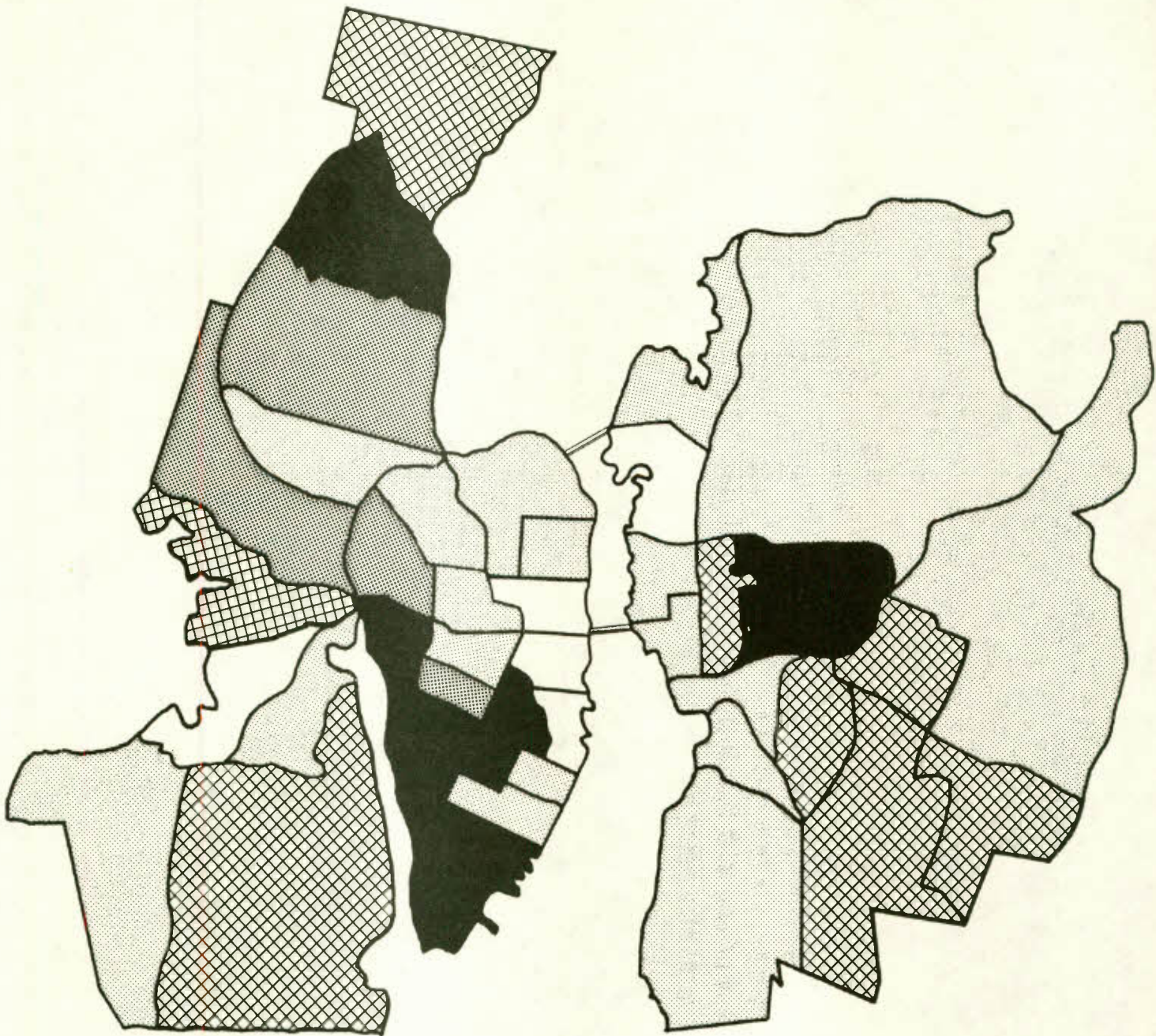
Another indicator of a census tract's prosperity is median house value¹³ which is shown in Map 10. As would be expected, income and house value exhibit very similar patterns. Generally, CTs which were in the upper two categories in average income are also in the upper two median house value classifications. Similarly, CTs which had low income rankings also tended to have relatively low median house values. It would appear

12. This figure comes from *Ibid*, Vol. 2, p. 39.

13. Only single, detached, owner-occupied, non-farm dwellings are considered in the calculation of this median.

Map 9

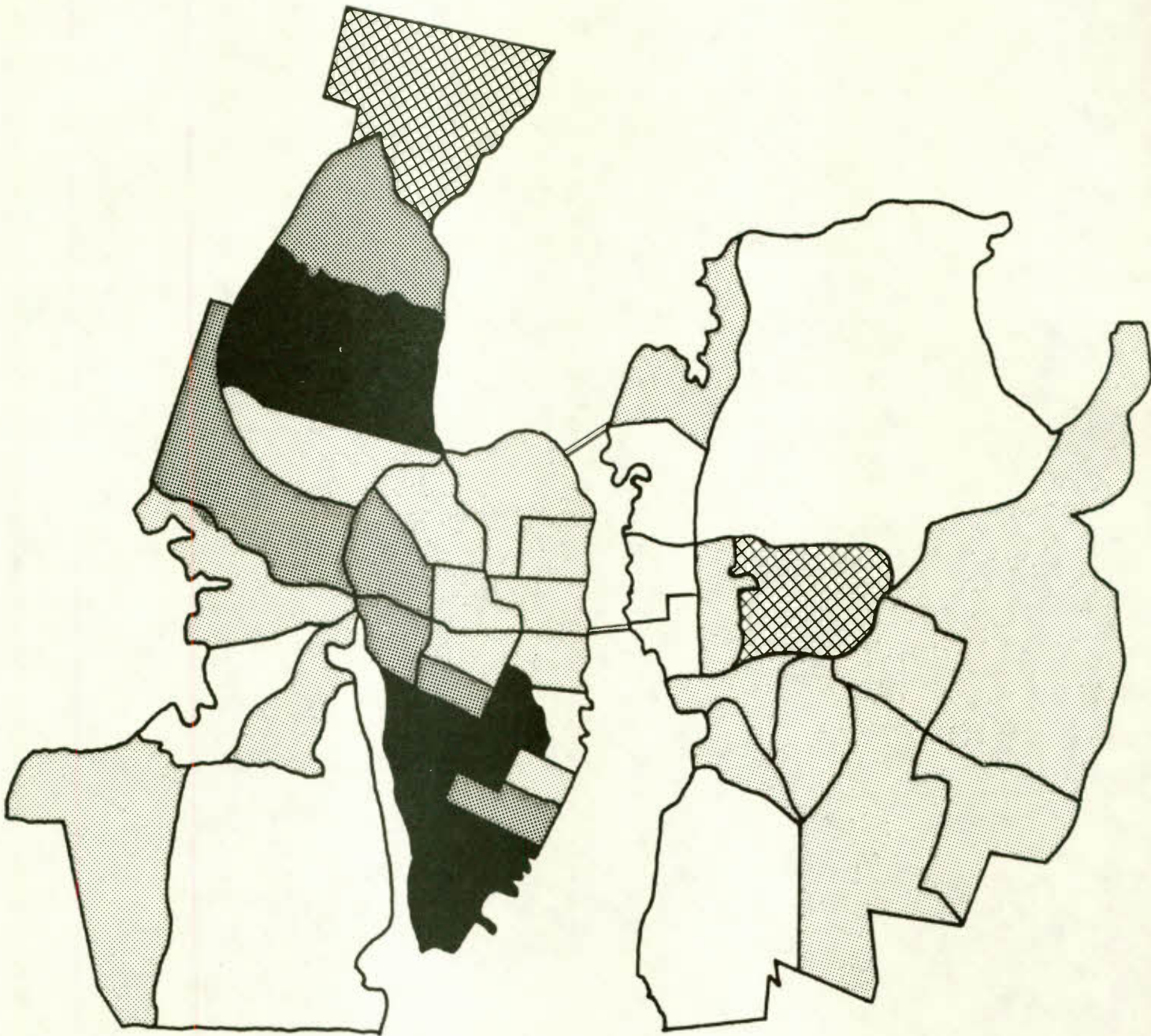
AVERAGE FAMILY INCOME BY CENSUS TRACT, 1971



Source: 1971 Census.

Map 10

MEDIAN HOUSE VALUES BY CENSUS TRACT, 1971



■ \$35,000 or greater

▨ \$30,000 to \$34,999

▧ \$25,000 to \$29,999

▩ \$20,000 to \$24,999

□ less than \$20,000

Source: 1971 Census.

likely that the two major exceptions to this general correlation are the result of the fact that, in part, housing values reflect land costs. That is, CT 4, in high land-rent downtown Halifax had an average income in the second lowest category but its median house value was in the second highest. CT 108 in Dartmouth on the other hand, was in the highest income category, although it fell into the third grouping with respect to median house value.

The percentage of male workers who are employed in "white collar" occupations¹⁴ is also an indicator of a population's essential economic character. These proportions, for each census tract, are shown in Map 11. As would be expected, a strong correspondence exists between average income, median house value, and the percentage of the male labour force which is employed in white collar jobs. For example, once again, the southern peninsula district between the harbour and the North West Arm (CTs 3, 5, 6, 7, 13) had the highest rankings with respect to this indicator. Moreover, the group of CTs running north west from this district (CTs 12, 17, 18, 25, and 26) also ranked well above average on white collar employment as it did

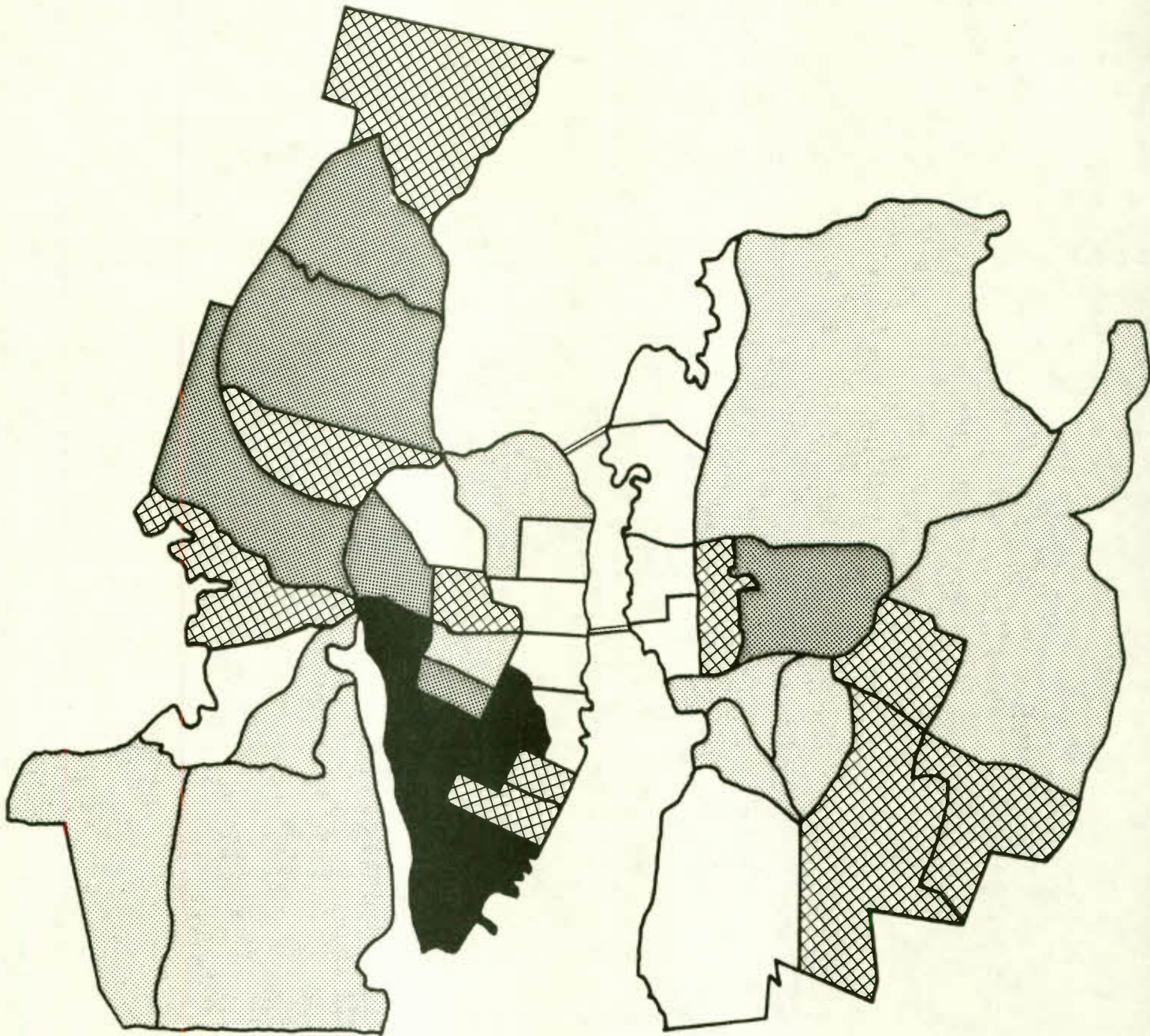
14. "White collar" occupations include the following census group aggregations:

- Group 11: Managerial, administrative and related fields;
- Group 21: Natural sciences, engineering and mathematics;
- Group 23: Social Sciences and related fields;
- Group 25: Religion;
- Group 27: Teaching and related fields;
- Group 31: Medicine and health;
- Group 33: Artistic, literary, recreational and related fields;
- Group 41: Clerical and related fields;
- Group 51: Sales.

See *Ibid*, Vol. 3, p. 6.

Map 11

MALE WHITE COLLAR WORKERS AS A PERCENTAGE OF THE
EMPLOYED MALE LABOUR FORCE BY CENSUS TRACT, 1971



65.00% or greater

55.00% to 64.99%

45.00% to 54.99%

35.00% to 44.99%

less than 35.00%

Source: 1971 Census.

on income and house value. Similarly, CT 108 was the only census tract in Dartmouth which was in the highest white collar employment category just as it was in income. Finally, with respect to this indicator, the northern peninsula district, CT 15 on the mainland, and much of eastern Dartmouth had low rankings once again.

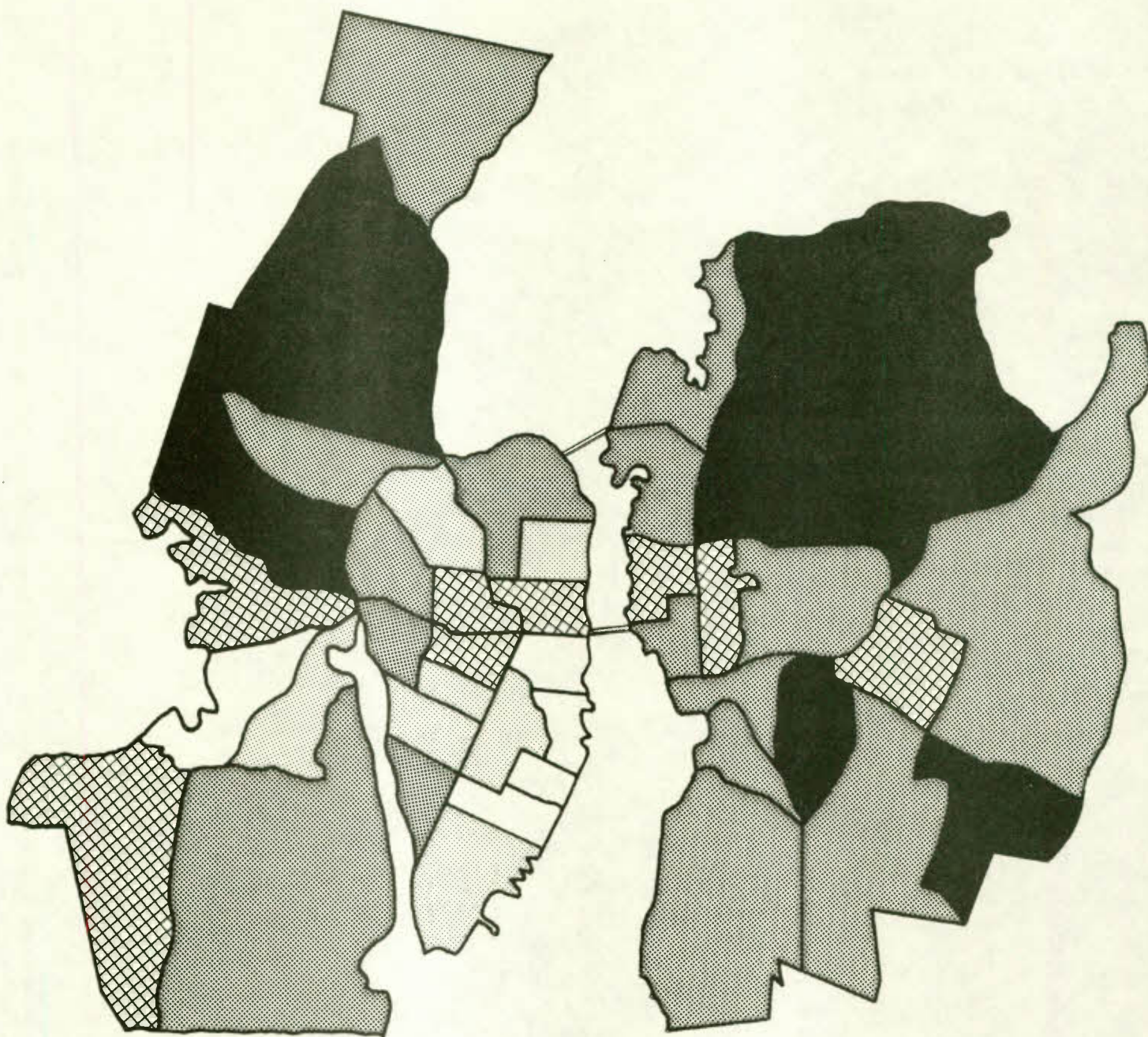
Map 12 shows the male unemployment rate for each census tract in Halifax-Dartmouth. Three CTs on the northern mainland (CTs 17, 25, and 26) and three in Dartmouth (CTs 103, 105 and 114) had rates below 4.5 per cent. The highest unemployment rates were found in four CTs on the peninsula (CTs 4, 8, 9 and 10) and CT 15 on the mainland. It is interesting to note that the prosperous southern peninsula district had unemployment rates varying from relatively low (CTs 5 and 13) to relatively high (CTs 3, 6, and 7).¹⁵ Finally, the unemployment rates in Dartmouth were unexpectedly low as no CT in this municipality had more than 7.5 per cent of its eligible work force unemployed.

The last socio-economic characteristic to be considered is education. The percentage of the total non-school adult population with university degrees has been employed as

15. The presence of the two major universities in CTs 3 and 6 may partially account for the relatively high unemployment rates in these CTs. The unemployment rate is calculated as those without work (in the week May 24-31, 1971) as a percentage of all males over fifteen years of age. As a result, it would appear probable that there were many students in these CTs who were included in the eligible work force but were not, in fact, actively seeking employment.

Map 12

MALE UNEMPLOYMENT RATE AS A PERCENTAGE OF THE
ELIGIBLE MALE LABOUR FORCE BY CENSUS TRACT, 1971



less than 4.50%

4.50% to 6.25%

6.26% to 8.00%

8.01% to 9.75%

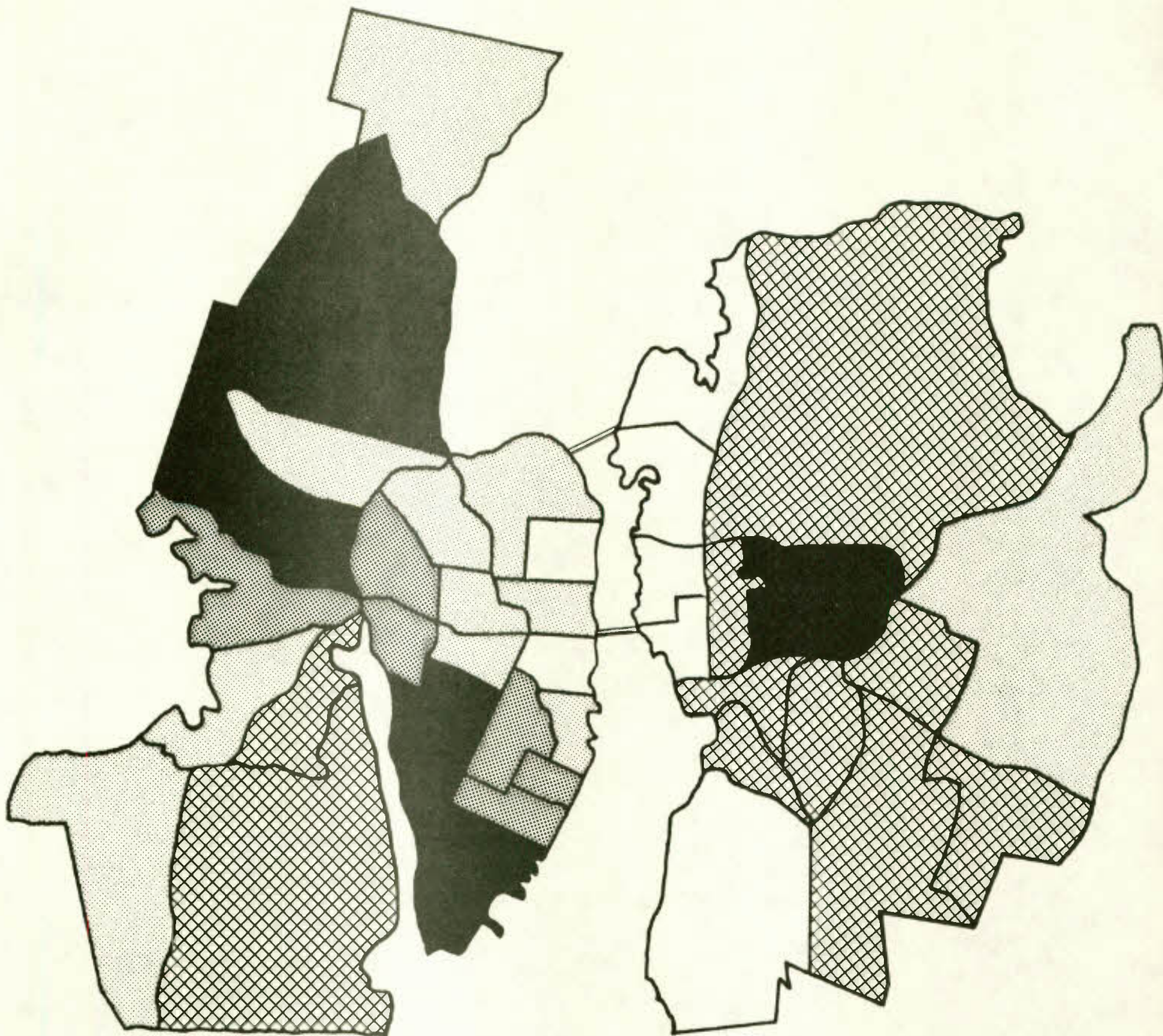
9.76% or greater

a proxy indicator for education and has been plotted, for each census tract, in Map 13. Generally, it can be seen that those CTs which were in the upper categories with respect to the preceding socio-economic characteristics (except unemployment) also had the highest percentages of university graduates. Similarly, those CTs with low income and occupational rankings tended to have small percentages of university graduates.

Generally, a strong correspondence exists among the socio-economic characteristics examined in this sub-section. With the exception of the male unemployment rate, these income, occupation, and education indicators clearly show the socio-economic makeup of the municipalities of Halifax and Dartmouth in 1971. The southern peninsula district (CTs 3, 5, 6, 7, and 13) was the most prosperous and had, on the average, higher employed and better educated residents than anywhere else in the urban region. Two other relatively high socio-economic areas can be identified: first, a group of CTs (12, 17, 18, 25, and 26) which extends, in a north-west direction, from the southern peninsula to the northern mainland and, second, CT 108 in Dartmouth. On the other hand, certain districts had consistently low rankings on these indicators; in particular, CT 15 on the mainland, a band of CTs on the peninsula along the Narrows and around the southern Bedford Basin coast (CTs 9, 10, 20, 21, 22, and 23) and a parallel strip across the water on the Dartmouth side (CTs 100, 101, 102, 110, 111, 112, and 113).

Map 13

UNIVERSITY GRADUATES AS A PERCENTAGE OF THE
NON-SCHOOL ADULT POPULATION BY CENSUS TRACT, 1971



15.00% or greater

10.00% to 14.99%

5.00% to 9.99%

2.00% to 4.99%

less than 2.00%

Source: 1971 Census.

1.3 The Urban Structure:
The Distribution of Jobs and Residence

Having discussed certain demographic and socio-economic characteristics of the urban area, we shall now examine the distribution of jobs and workers' residences in the Halifax-Dartmouth CMA. Table 2 shows the resident labour force, (RLF),¹⁶ the working labour force (WLF),¹⁷ the job ratio (WLF/RLF), and the surplus/deficit of jobs (WLF/RLF) for the major areas involved in the analysis.

Table 2
THE DISTRIBUTION OF JOBS AND WORKERS' RESIDENCES,
HALIFAX-DARTMOUTH CMA, 1971

	Employed Residents (RLF)	Number of Jobs Counted (WLF)	Job Ratio (WLF/RLF)	Surplus/Deficit of Jobs (WLF/RLF)
Halifax	52,995	58,800	1.11	+5,805
Dartmouth	24,445	12,925	0.53	-11,520
Outer Areas (UCTs 120 & 130)	12,585	9,165	0.73	-3,420
Census Divisions	102,970	0,000	0.00	0,000
Total	192,995	80,890	0.00	0,000

Source: Statistics Canada and estimates by the authors.

From Table 2, it can be clearly seen that jobs and workers' residences are not evenly distributed across the CMA. While the City of Halifax had a surplus of jobs, both Dartmouth

16. The 'resident labour force' (RLF_{CMA}) includes all working residents, regardless of the place of employment. As well, those who are known to be employed but have not stated a job location are also included in the RLF.
17. The 'working labour force' (WLF_{CMA}) includes all those 15 years of age or over residing within the CMA or the fifty-mile "search area" who have stated an exact work location in the CMA for the week prior to enumeration. It also includes persons who were temporarily absent from their usual job due to illness, vacation, strike, etc. Excluded from the WLF are those who did not or could not state a place of employment so that the CT/UCT of work could be specified within the CMA.

and the Outer Areas had a greater number of employed residents than jobs. In an aggregate sense, then, Halifax was a net receiver of workers while Dartmouth and the Outer Areas were basically suppliers of labour.

While the information presented in Table 2 provides an overview of the location of jobs and residences, a more detailed picture of the intra-urban system is necessary in order to gain a clear understanding of the journey-to-work patterns in the Halifax-Dartmouth CMA.

1.3.1 Job Location and the Designation of Employment Centres

We shall now describe, on a micro level, the pattern of job location in the Halifax-Dartmouth CMA. Table 3 indicates the resident labour force (RLF_i), the working labour force (WLF_i), the job ratio (WLF_i/RLF_i), and the proportionate distribution of jobs ($WLF_i/WLF_{CMA} \cdot 100$) for each geographical unit i considered in our analysis.¹⁸

From columns 3 and 4 of Table 3, the significant employment centres in the urban area can be identified. The job ratios (column 3) compare the number of jobs with the number of residents who were employed anywhere in the Halifax-Dartmouth CMA for each of the CTs and UCTs. A job ratio which exceeds one (i.e., a surplus of jobs over residents with employment) indicates that the geographical area was a net importer of labour. The percentage of the total CMA working labour force employed in each zone (column 4) is another indicator of the importance of each

18. Since we are interested in the census divisions (CDs) only as suppliers of CMA labour, Table 3 does not include their working labour force totals. As was mentioned earlier, no data are available for UCT 140.

Table 3
THE LOCATION OF RESIDENT WORKERS AND JOBS
HALIFAX-DARTMOUTH AREA, 1971

District (CT/UCT/ CD)	Resident Labour Force (RLF _i)	Working Labour Force (WLF _i)	Job Ratio (WLF _i /RLF _i)	WLF _i as a Percentage of the WLF _{CMA}
CT 001	1690	275	0.1627	0.3400
CT 002	2120	490	0.2311	0.6058
CT 003	1230	1225	0.9959	1.5144
CT 004	4050	3695	0.9123	4.5679
CT 005	865	90	0.1040	0.1113
CT 006	1995	1520	0.7619	1.8791
CT 007	965	6735	6.9793	8.3261
CT 008	1600	6870	4.2937	8.4930
CT 009	890	11450	12.8652	14.1550
CT 010	2760	5060	1.8333	6.2554
CT 011	3230	1405	0.4350	1.7369
CT 012	1795	985	0.5487	1.2177
CT 013	1430	295	0.2063	0.3647
CT 014	1440	280	0.1944	0.3461
CT 015	1260	285	0.2262	0.3523
CT 016	1060	230	0.2170	0.2843
CT 017	1075	240	0.2233	0.2967
CT 018	2470	3510	1.4211	4.3392
CT 019	3135	1230	0.3923	1.5206
CT 020	1825	4320	2.3671	5.3406
CT 021	2265	1430	0.6313	1.7678
CT 022	2470	3090	1.2510	3.8200
CT 023	2600	2535	0.9750	3.1339
CT 024	3180	525	0.1651	0.6490
CT 025	3655	700	0.1915	0.8654
CT 026	1535	185	0.1205	0.2287
CT 027	405	145	0.3580	0.1793
CT 100	1315	1925	1.4639	2.3798
CT 101	1965	535	0.2723	0.6614
CT 102	2660	2655	0.9981	3.2822
CT 103	1600	310	0.1937	0.3832
CT 104	2085	1450	0.6954	1.7926
CT 105	1365	255	0.1868	0.3152
CT 106	1860	310	0.1667	0.3832
CT 107	1295	170	0.1313	0.2102
CT 108	1220	115	0.0943	0.1422
CT 109	1905	250	0.1312	0.3091
CT 110	980	910	0.9286	1.1250
CT 111	1620	1400	0.8642	1.7307
CT 112	1505	530	0.3522	0.6552
CT 113	705	1725	2.4468	2.1325
CT 114	2365	385	0.1628	0.4760
UCT 120	6685	7145	1.0688	8.8330
UCT 130	5900	2020	0.3424	2.4972
UCT 140	0	0	0.0000	0.0000
CD 01	7460	0	0.0000	0.0000
CD 04	13395	0	0.0000	0.0000
CD 05	10545	0	0.0000	0.0000
CD 07	3610	0	0.0000	0.0000
CD 08	11365	0	0.0000	0.0000
CD 09	9160	0	0.0000	0.0000
CD 11	15435	0	0.0000	0.0000
CD 12	13085	0	0.0000	0.0000
CD 13	14690	0	0.0000	0.0000
CD 14	4225	0	0.0000	0.0000
Total	192995	80890		

Source: Statistics Canada and estimates by the authors.

CT/UCT as an employment centre. If all the 44 geographical units had an equal share of the CMA's jobs, there would have been approximately 1,840 persons (2.3 per cent of the WLF_{CMA}) working in each CT/UCT.

On the basis of these two indicators, then, the following criteria have been established for the designation of major employment areas.

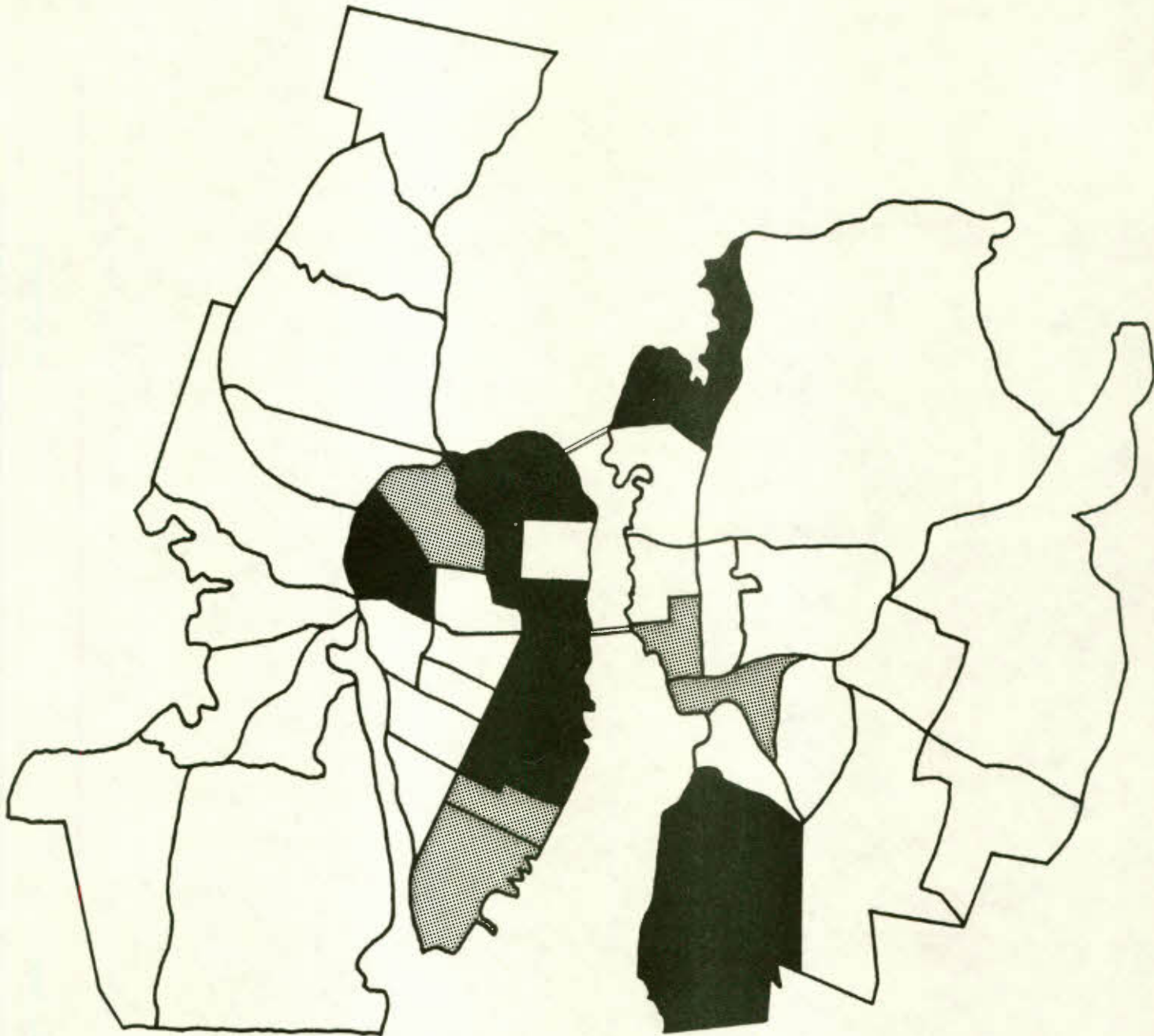
Criterion 1: A job ratio equal to or greater than one (i.e., $WLF_i/RLF_i \geq 1.0$)

Criterion 2: A working labour force equal to or greater than the CMA-wide CT/UCT average (i.e., $WLF_i/WLF_{CMA} \cdot 100 \geq 2.3\%$).

Maps 14 and 15 show the standing of each CT with respect to criteria 1 and 2, respectively. From these maps, it can be seen that there are eight CTs (7, 8, 9, 10, 18, 20, 22, and 100) which met both criteria and, therefore, are clearly to be designated as employment centres. In addition, four other CTs fulfilled one criterion and closely approached the other. CT 113 met the first criterion and was within 6 per cent of the second. CTs 4, 23, and 102 all fulfilled criterion 2 and although the job ratio of each was below unity, all were above .90. Since one must recognize that CT boundaries are somewhat arbitrary in that they may dissect continuous employment areas, and that the data tend to capture quantitative aspects of employment and not actual commuting conditions, these four CTs (4, 23, 102 and 113) have also been included as employment

Map 14

JOB RATIO BY CENSUS TRACT (WLF_i/RLF_i), 1971



1.00 or greater



less than 0.90

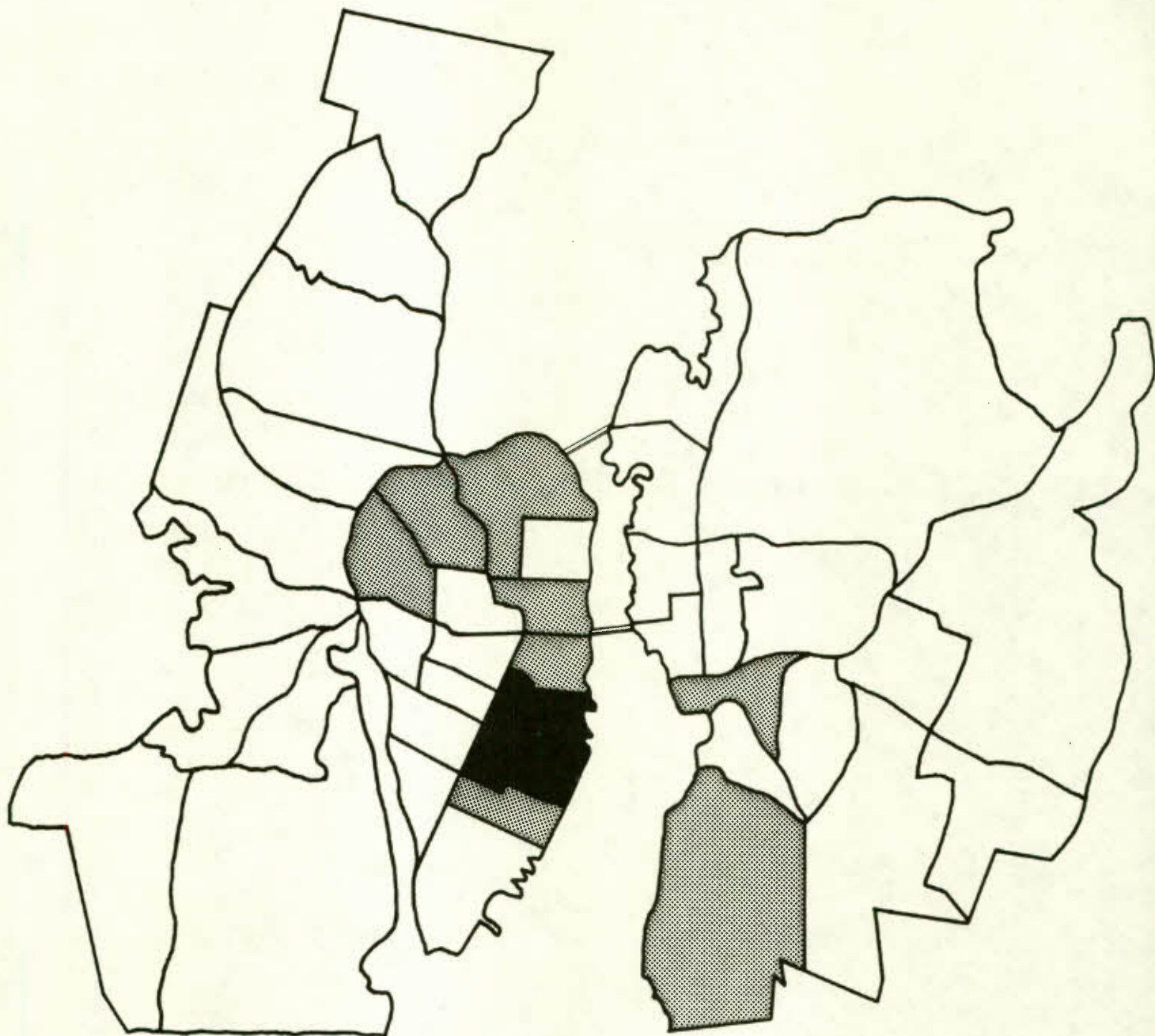


0.90 to 0.99

Source: Statistics Canada and estimates by the authors.

Map 15

THE DISTRIBUTION OF JOBS BY CENSUS TRACT, 1971
($WLF_i / WLF_{CMA} \cdot 100$)



8.00% or greater

2.20% to 7.99%

less than 2.20%

Source: Statistics Canada and estimates by the authors.

zones.¹⁹ These selections appear justified since CT 4 is clearly an extension of the Barrington Street commercial district, CT 23 has shopping centre developments parallel to those in the neighbouring CT 18, CT 102 represents "downtown" Dartmouth, and CT 113 is the major employment area in the north-west section of Dartmouth.²⁰

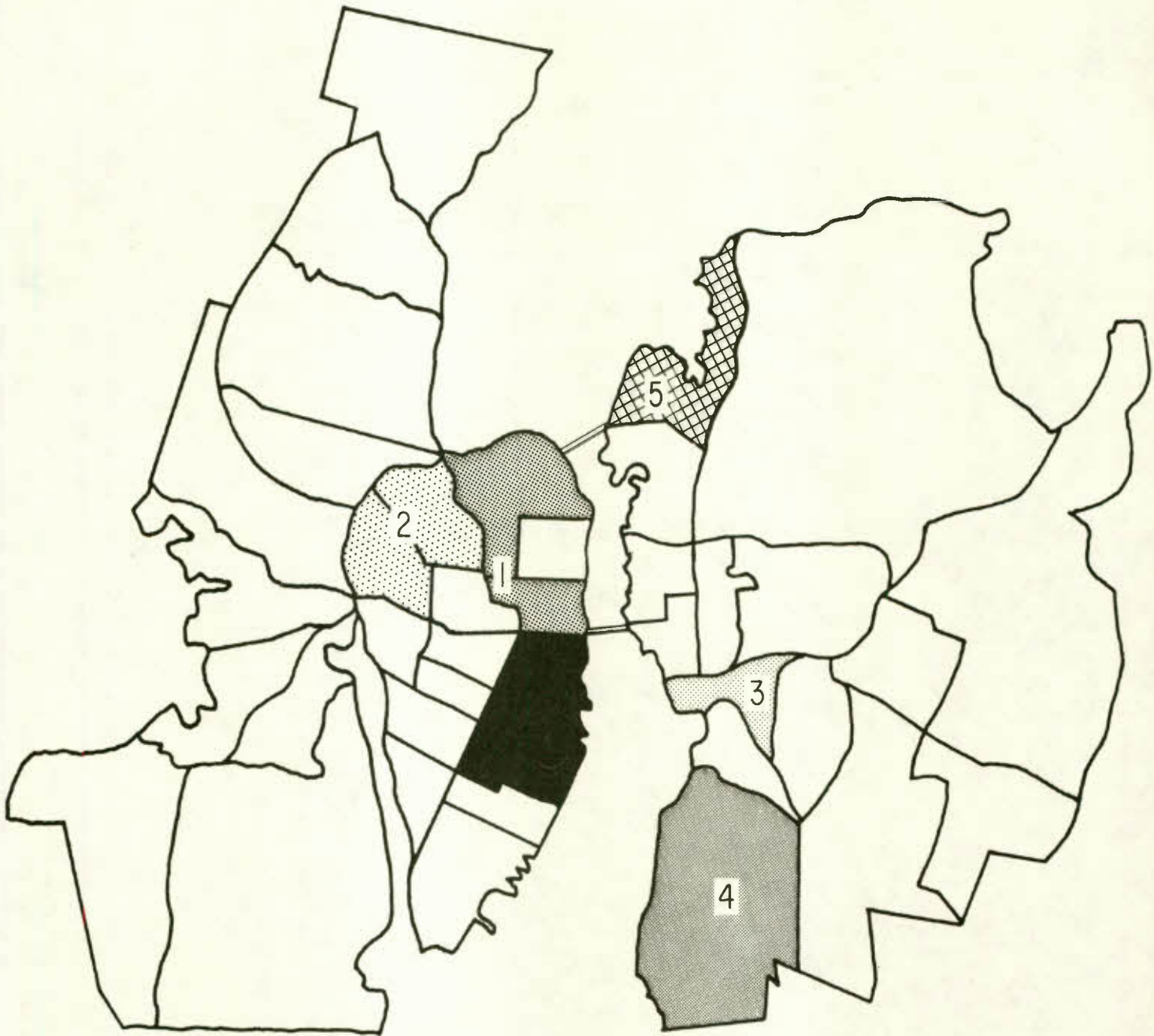
These twelve CTs, which have been designated as "work destinations" of analytical interest, can be seen to form six major employment areas (Map 16). Predominant among these is the "Extended Central Business District". While CTs 8 and 9 form what is commonly considered the "downtown heart" of Halifax-Dartmouth, this core can be logically extended to include the surrounding CTs 4, 7, and 10. In addition to being important job centres, these latter three CTs are adjacent to CTs 8 and 9. Moreover, parts of the downtown Barrington Street and Gottingan Street commercial areas do, in fact, extend into CTs 4 and 10. This Extended Central Business District (ECBD), consisting of five contiguous CTs, is the major employment centre in the urban area and accounted for 41.8 per cent of the jobs in the CMA in 1971.

19. The data may also contain significant "rounding" errors. Consult the sources mentioned in footnote 2.

20. Table 3 also indicates that a significant number of jobs were located in UCTs 120 and 130. Nevertheless, they will not be included as employment centres in the ensuing analysis. This is due to the fact that the data base specifies only the CT/UCT of employment which, given the extended spatial area of these UCTs, is of insufficient detail to analyze commuting flows to these districts.

Map 16

THE DESIGNATED EMPLOYMENT AREAS, 1971



ECBD

In addition to the ECBD, we will focus upon the commuting flows to five "Secondary Employment Areas" (SEAs) in the ensuing analysis. SEA 1, which is located to the north of the ECBD, consists of CTs 20 and 22. These two CTs are linked, in an employment sense, by the commercial and institutional development which extends along their western halves. Large shopping centre developments serving both the mainland and the peninsula are the major economic features of the contiguous CTs 18 and 23 which, together, comprise SEA 2. Finally, the designated employment CTs 102, 100, and 113 in Dartmouth are geographically separated from each other and, consequently, are considered as SEA 3, SEA 4, and SEA 5, respectively.

1.3.2 The Residential Distribution of the Labour Force

Having discussed the pattern of job location in the urban area, we now turn to the residential distribution, in 1971, of the Halifax-Dartmouth employed labour force. Certainly a basic indicator of the residential location pattern is the proportion of the CMA's working labour force living in each geographical unit. These percentages, which are shown in the first column of Table 4, reveal the relative importance of each CT, UCT, and CD as a supplier of CMA labour. If all of the 54 districts (42 CTs, 2 UCTs, and 10 CDs) were to have an equal residential share of the CMA's working labour force, approximately 1.85 per cent of the WLF_{CMA} (1,497 workers) would live in each CT/UCT/CD. From column 1 of Table 4, it can be seen that 11 CTs in Halifax (CTs 2, 4, 6, 11, 18, 19, 21, 22, 23, 24, and 25), 5 CTs in Dartmouth

Table 4
THE RESIDENTIAL DISTRIBUTION OF WORKERS EMPLOYED
IN THE HALIFAX-DARTMOUTH CMA, 1971

	(1)	(2)	(3)
	Percentage of the CMA's Working Labour Force Living in CT/UCT/CD	Outcommuters from CT/UCT/CD as a Percentage of the CMA'S Total Outcommuters	Percentage of the Working Labour Force of the ECBD and SEAs Supplied by CT/UCT/CD (excl. area residents)
<u>Halifax</u>			
1	1.79	1.88*	2.04*
2	2.21*	2.34*	2.60*
3	1.18	1.08	1.32
4	4.17*	4.15*	0.86
5	0.84	0.91	1.08
6	2.06*	2.01*	2.51*
7	0.85	0.54	0.12
8	1.45	1.10	0.25
9	0.77	0.59	0.07
10	1.73	1.62	0.42
11	3.25*	3.35*	4.28*
12	1.79	1.83*	2.33*
13	1.50	1.65	2.16*
14	1.38	1.42	1.63
15	1.06	1.14	1.17
16	1.05	1.06	1.23
17	1.25	1.35	1.60
18	2.81*	2.66*	2.85*
19	3.38*	3.58*	4.59*
20	1.62	1.54	1.72
21	2.38*	2.62*	3.39*
22	2.70*	2.69*	2.74*
23	2.68*	2.69*	2.69*
24	3.36*	3.70*	4.49*
25	3.85*	4.05*	4.64*
26	1.67	1.88*	2.04*
27	0.46	0.52	0.59
Subtotal	(52.23%)	(53.98%)	(55.41%)
<u>Dartmouth</u>			
100	1.33	1.00	0.67
101	1.87*	1.98*	1.99*
102	2.49*	2.28*	2.15*
103	1.52	1.64	1.73
104	1.99*	1.78	1.84
105	1.11	1.25	1.34
106	1.60	1.70	1.65
107	1.22	1.36	1.23
108	1.31	1.49	1.24
109	1.99*	2.17*	2.20*
110	0.98	1.03	0.97
111	1.65	1.55	1.52
112	1.42	1.50	1.34
113	0.71	0.74	0.77
114	2.48*	2.77*	2.62*
Subtotal	(23.67%)	(24.23%)	(23.28%)
<u>UCTs</u>			
120	6.55*	4.40*	4.68*
130	5.94*	5.00*	4.97*
Subtotal	(12.49%)	(9.40%)	(9.64%)
Total	(89.39%)	(87.61%)	(88.33%)
<u>CDS</u>			
01	0.14	0.16	0.11
04	0.26	0.33	0.29
05	0.13	0.15	0.14
07	0.39	0.10	0.04
08	6.67*	7.79*	7.93*
09	2.00*	2.33*	1.82
11	0.24	0.27	0.23
12	0.83	0.97	0.84
13	0.14	0.16	0.21
14	0.10	0.12	0.06
Subtotal	(10.61%)	(12.39%)	(11.67%)
Total	100.00	100.00	100.00

*Residential areas exceeding the CMA average.

Source: Statistics Canada, Place-of-Work-Place-of-Residence Matrix
tabulated for the Economic Council of Canada.

(CTs 101, 102, 104, 109, and 114), UCTs 120 and 130, and CD 8 (the non-CMA portion of Halifax County) and CD 9 (Hants County) all had a greater-than-average residential share of the CMA's working labour force. Map 17 highlights the CTs which exceed this average.

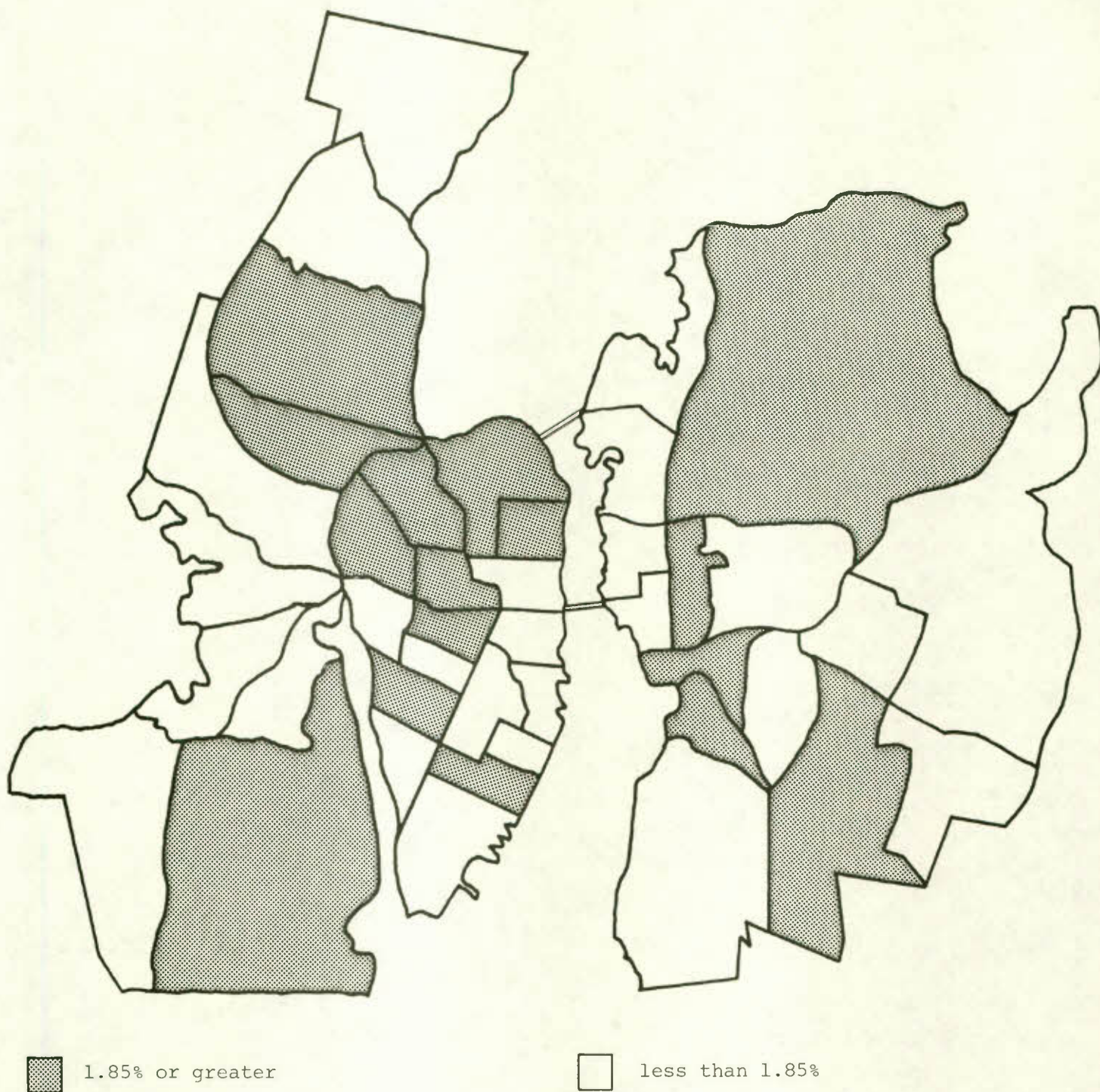
Another indicator of the pattern of residential location is the proportion of the CMA's outcommuters (OC_{CMA})²¹ residing in each geographical unit. For the purposes of a journey-to-work analysis, this measure can be seen as a more meaningful indicator of the residential distribution of workers than the preceding one as it considers only those who may contribute to the traffic/transportation problem. Column 2 of Table 4, then, indicates the number of residents in each district who commuted *out* of their home zone to jobs in the CMA as a percentage of all CMA outcommuters. Again, the average district would contain 1.85 per cent of the total and those CTs exceeding this threshold are indicated in Map 18. A comparison of Maps 17 and 18 reveals that CT 104 is the only census tract which was above average with respect to the first indicator but not the second while CTs 1, 12, and 26 had a greater-than-average share of the outcommuters but not the total working labour force.

The third measure used to assess residential significance considers the supply of workers employed in the CMA's six major employment areas (i.e., the ECBD and the five SEAs).

21. Outcommuters are those workers who are employed in a different geographical unit from that in which they reside.

Map 17

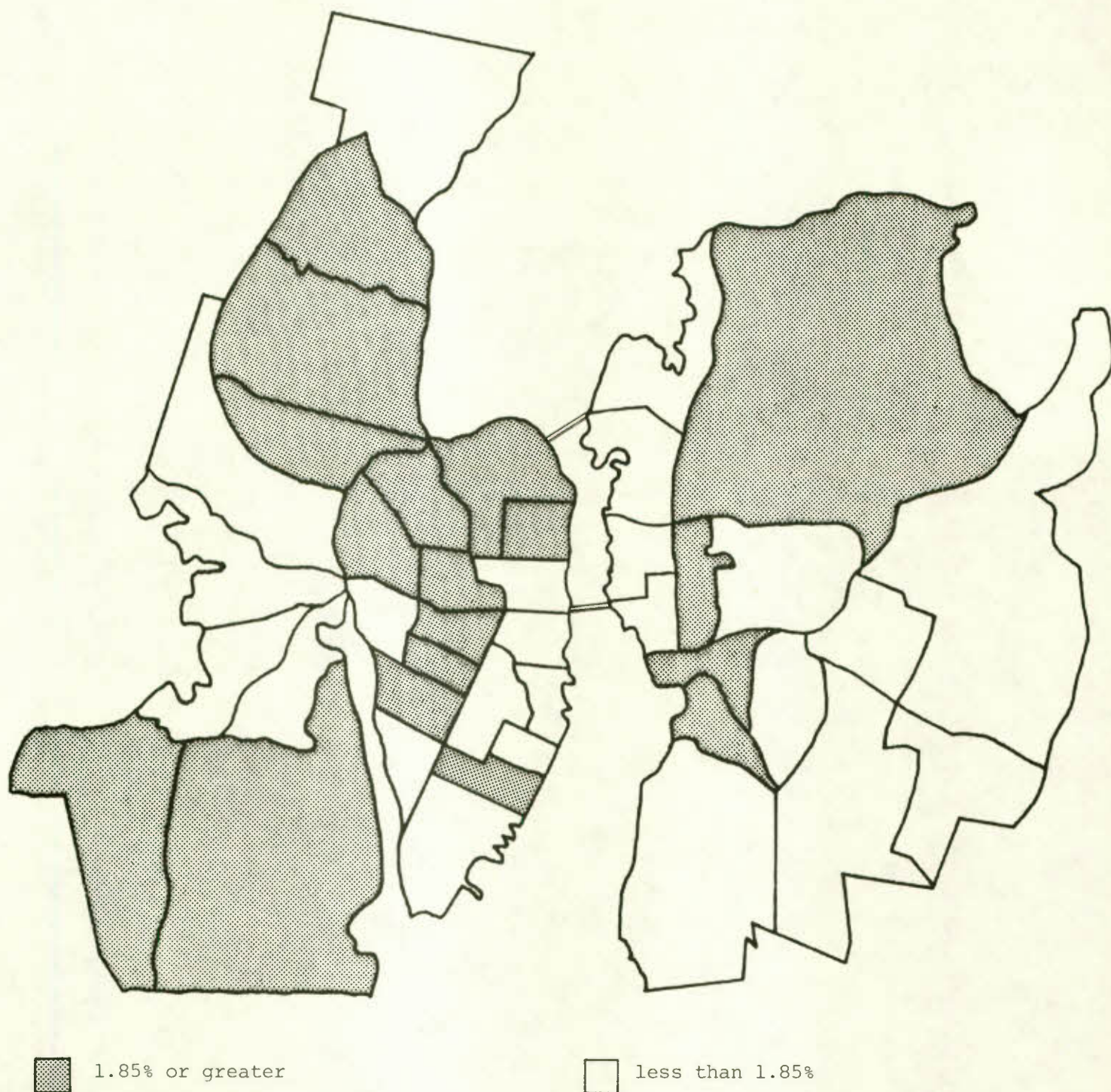
THE RESIDENTIAL DISTRIBUTION OF THE WORKING LABOUR FORCE OF THE CMA, 1971



Source: Statistics Canada and estimates by the authors.

Map 18

THE RESIDENTIAL DISTRIBUTION OF THE CMA'S OUTCOMMUTERS, 1971



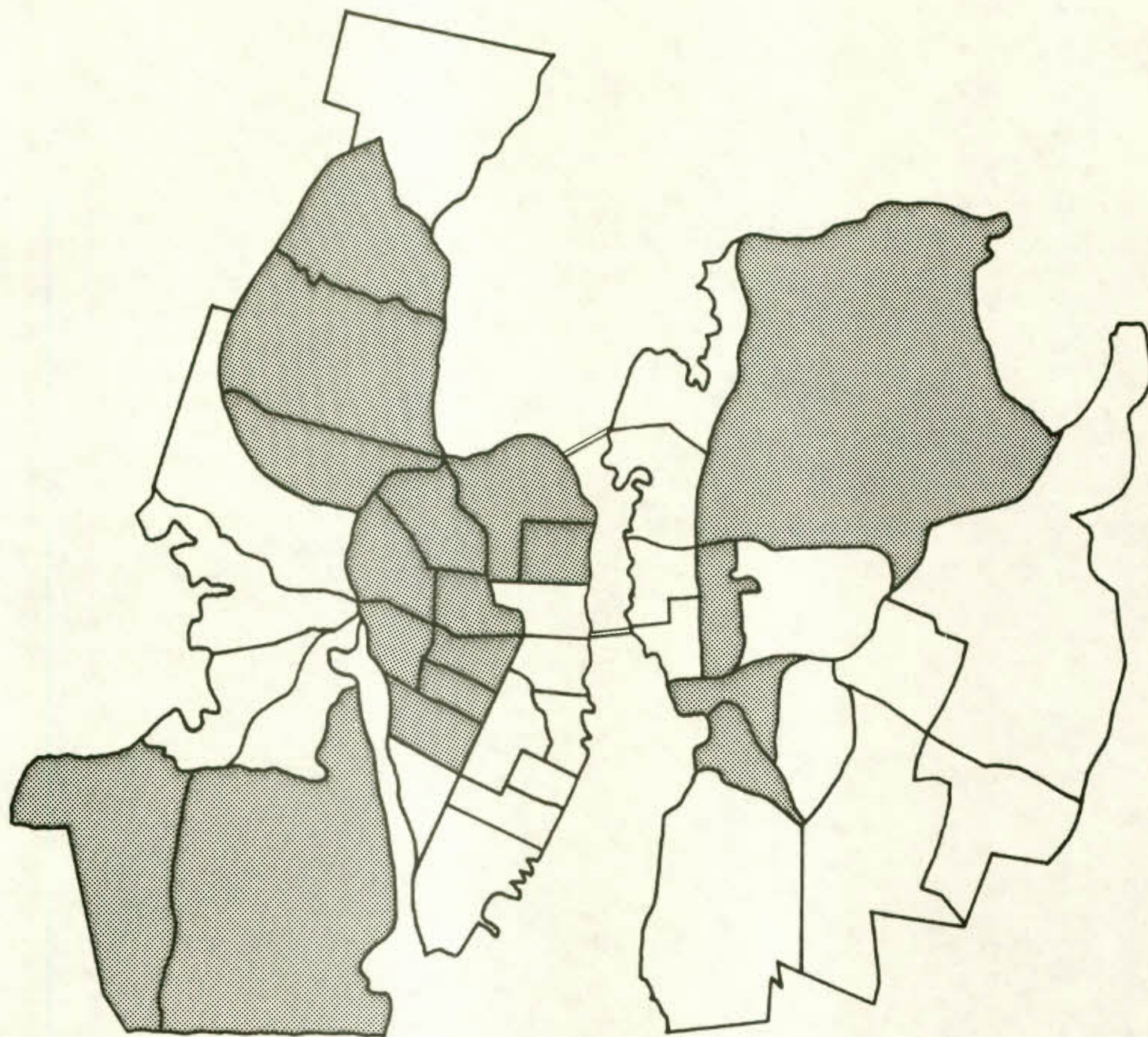
Source: Statistics Canada and estimates by the authors.

Assuming that congestion will normally be associated with the confluence of traffic flows in and out of the primary working centres, this indicator measures the importance of each CT/UCT/CD as the origin of commuting flows destined for the ECBD and the five SEAs -- areas which were likely to have traffic/transportation congestion. Since people who reside in the same employment area in which they work are assumed to be a minor factor in congestion, these workers are not included in the computation of this indicator. Column 3 of Table 4, then, shows the percentage of the combined WLF working in the six major employment areas (excluding those residing within these areas) supplied by each district. Once again, in the case of this indicator, the average district would contain 1.85 per cent of the CMA total and Map 19 highlights those CTs which exceeded this proportion. Generally, a strong correspondence exists between those CTs which were above average with respect to this criterion and those which exceeded the second indicator average. Only CT 4 was above average on the second but not the third while CT 13 exceeded the third threshold but not the second.

These three indicators attempt to capture different aspects of the pattern of the residential location of workers employed in the Halifax-Dartmouth CMA. While the first considers the general residential distribution of the total workforce, the second is concerned only with those workers who were employed in districts other than the home zone and the third is limited to workers who had jobs in the major employment areas.

Map 19

THE RESIDENTIAL DISTRIBUTION OF WORKERS EMPLOYED
IN THE MAJOR EMPLOYMENT AREAS, 1971



1.85% or greater



less than 1.85%

Source: Statistics Canada and estimates by the authors.

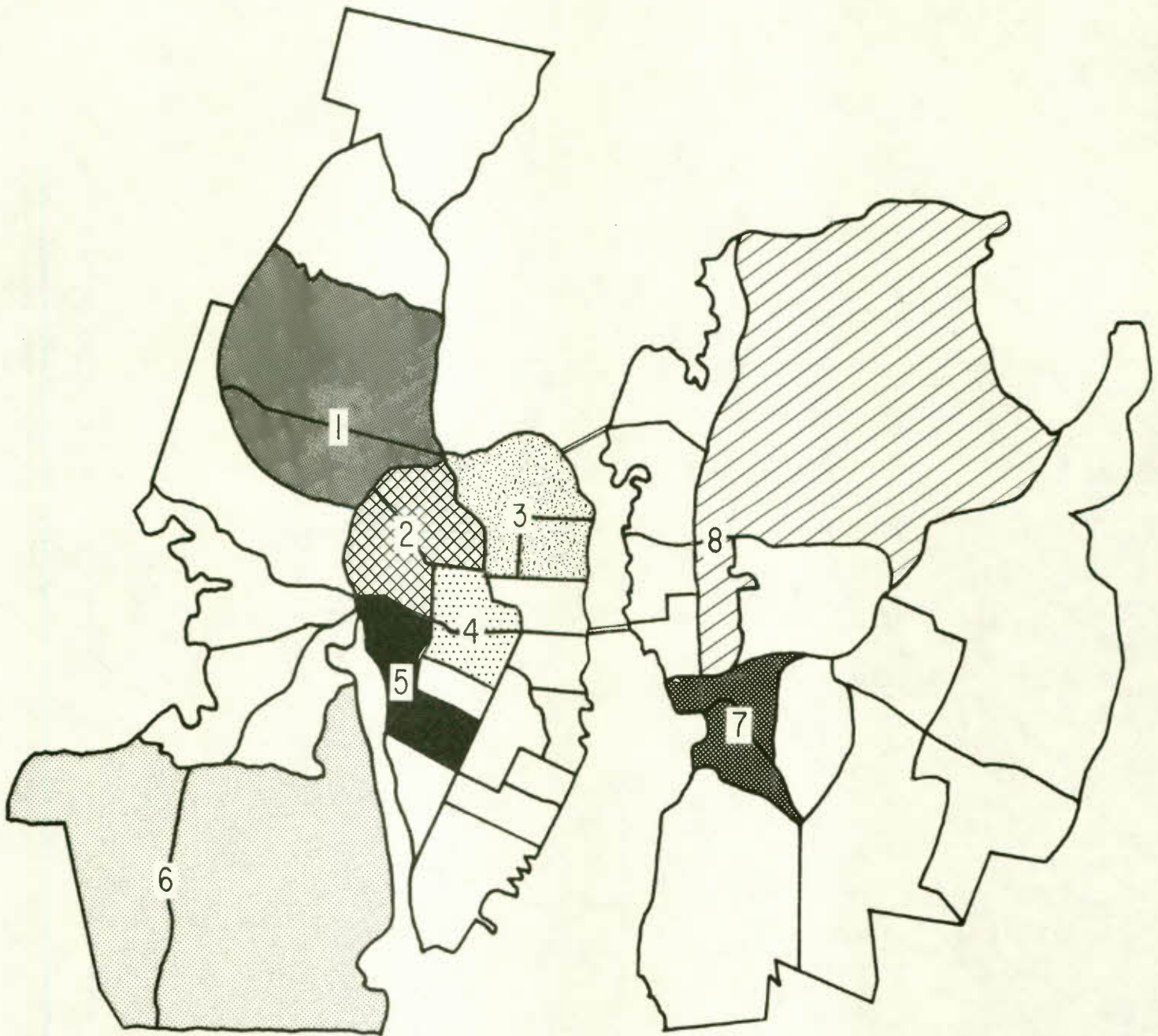
These three indicators, then, increasingly focus upon the principal residential districts which are of concern to urban transportation management. Together, they identify the most important suppliers of the CMA work-force. Accordingly, CTs which exceeded the 1.85 per cent average on all three measures must be considered significant origins for commutation. It can be seen, from Table 4, that the greatest concentration of important outcommuting areas is in the northern half of the peninsula (CTs 11, 18, 19, 21, 22, and 23) and extending onto the mainland (CTs 24 and 25). Although, on the basis of the above criteria, these eight census tracts are generally the most important suppliers of CMA labour, significant residential areas also exist in the southern peninsula (CT 6), the southern mainland (CT 2) and Dartmouth (CTs 101, 102, 109, and 114).

By including two other census tracts (CTs 1 and 13) which did not exceed the CMA average on all three indicators, these CTs can be seen to form eight "Major Residential Outcommuting Areas" (MROAs) which are shown in Map 20.²² The commuting patterns originating in these MROAs will be discussed in the following section. It should be mentioned, however, that some other census tracts may not have been significant suppliers of

22. Although CTs 1 and 13 did not exceed the CMA average on all three indicators of residential significance, they have been included in MROAs 6 and 5, respectively. CT 1, along with CT 2, forms the southern mainland district and, moreover, these two census tracts have resident populations which are socio-economically alike (Table 1). Similarly, CT 13 has been included with CT 6 to constitute MROA 5 which represents part of the prosperous southern peninsula residential district.

Map 20

THE MAJOR RESIDENTIAL OUTCOMMUTING AREAS, 1971



labour on a CMA-wide basis but, nonetheless, were important as residential sites for one or two major employment areas. As a result, the analysis of the specific journey-to-work patterns in the next section will not preclude the examination of commuting flows originating outside the MROAs.

Section 2: Commuting Patterns

Having concluded our examination of the urban structure, we now proceed to analyze the journey-to-work patterns in the Halifax-Dartmouth CMA in 1971. In this section, the commuting flows will be considered from two perspectives; the *demand* for labour by employment areas and the *supply* of labour from various places of residence. Finally, the commuting distances to the employment areas will be briefly discussed.

2.1 The Organization of the Journey-to-Work Data

The gross commuting flows, which form the empirical basis of the ensuing analysis, are presented in Table 5. The place of employment for the workers residing in each of the 54 relevant districts is indicated along the rows and, conversely, the columns record the residential location of workers employed in the home zone, "other residential" districts, the SEAs and the ECBD.²³ Table 6 present these gross flow data as a percentage

23. "Other Residential" districts are CTs and UCTs within the CMA which are not part of the ECBD or any of the SEAs. The final four columns in Table 5 also require some explanation. "Total Employed in CMA (excluding unstated)" represents all those who worked in the CMA and whose exact place of work was specified. "Total Employed in CMA (including certain unstated)" includes both those individuals working in the CMA whose exact place of work was known and those whose job location was not specified but who were known to work in the CMA. "Number Identified as Employed Outside the CMA" includes all those who were known to work outside the CMA and "Total" indicates the sum of these last two groups. This "Total" column, then, includes all those workers who provided an exact job location and those whose place of work was adequately specified to identify whether or not they were employed inside or outside the CMA. As a comparison with column 1 of Table 3 shows, however, the figures in this "Total" column are not equivalent to the resident labour force of each zone (RLF_i) which also includes those who were known to be employed but specified no work location at all. Finally it should be noted that, for those CTs (marked by an asterix) which are included in the ECBD or an SEA, the number working in the home CT are recorded in the first column *and* in the relevant employment area column; these data are *not* double counted, however, in the columns which indicate totals.

Table 5

GROSS COMMUTING FLOWS FROM THE PLACE OF RESIDENCE TO THE PLACE OF WORK, 1971

Zone A Residence Zone	(1) Number Employed in Home Zone	(2) Number Employed in Other Residential Zones	(3) Number Employed in ECBD	(4) Number Employed in SEA 1	(5) Number Employed in SEA 2	Zone B Work Place Zone					(8) Number Employed in SEA 5	(9) Subtotal of Number Employed in all SEAs	(10) Total Employed in CMA (excl. unstats)	(11) Total Employed in CMA (incl. certain unstats) ¹	(12) Number Identified as Employed Outside CMA	(13) Total (11 + 12)
						(6) Number Employed in SEA 3	(7) Number Employed in SEA 4	(7) Number Employed in SEA 4	(7) Number Employed in SEA 4	(7) Number Employed in SEA 4						
CT 001	145	380	590	125	200	0	0	0	0	0	10	335	1450	1605	80	1685
CT 002	170	440	830	185	110	10	0	0	0	0	45	350	1790	2000	110	2100
CT 003	200	150	565	35	0	0	0	0	0	0	0	35	950	1075	85	1160
CT 004*	500	460	2525	205	100	30	55	0	0	0	0	390	3375	3575	110	3685
CT 005	50	140	410	45	15	0	20	0	0	0	0	80	680	720	60	780
CT 006	270	255	995	40	60	20	5	0	0	0	20	145	1665	1765	90	1855
CT 007*	310	70	560	15	20	10	0	0	0	0	10	55	685	400	15	919
CT 008*	405	185	870	40	60	15	0	0	0	0	0	115	1170	1220	100	1320
CT 009*	210	90	500	30	0	0	0	0	0	0	0	30	620	715	45	760
CT 010*	270	280	925	130	60	0	0	0	0	0	0	190	1395	2200	190	2390
CT 011	305	375	1470	250	170	10	10	0	0	0	35	475	2625	2870	145	3015
CT 012	175	210	875	80	90	5	0	0	0	0	10	185	1445	1545	55	1600
CT 013	65	165	715	90	165	0	0	0	0	0	10	265	1210	1240	35	1275
CT 014	135	240	575	35	125	0	5	0	0	0	0	165	1115	1220	40	1260
CT 015	70	260	280	105	125	0	0	0	0	0	20	250	860	945	120	1065
CT 016	115	175	370	60	100	0	0	0	0	0	30	190	850	935	25	960
CT 017	75	205	500	95	115	10	0	0	0	0	10	230	1010	1075	30	1105
CT 018*	425	425	1020	265	550	0	0	0	0	0	10	825	2270	2385	45	2430
CT 019	255	395	1410	265	335	20	30	0	0	0	25	675	2735	2940	105	3045
CT 020*	245	215	650	315	100	0	0	0	0	0	30	445	1310	1670	55	1725
CT 021	110	275	1040	370	110	10	10	0	0	0	0	500	1925	2075	55	2130
CT 022*	315	465	1015	470	185	10	10	0	0	0	25	700	2180	2325	85	2410
CT 023*	305	380	845	355	565	0	0	0	0	0	20	940	2165	2360	60	2420
CT 024	160	520	1160	285	565	20	10	0	0	0	0	880	2720	2935	140	3075
CT 025	310	700	1445	310	315	10	15	0	0	0	10	660	3115	3335	80	3415

Table 5 Cont'd.

GROSS COMMUTING FLOWS FROM THE PLACE OF RESIDENCE TO THE PLACE OF WORK, 1971

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
Zone A Residence Zone	Number Employed in Home Zone	Number Employed in Other Residential Zones	Number Employed in ECBD in SEA 1	Number Employed in SEA 2	Number Employed in SEA 3	Number Employed in SEA 4	Number Employed in SEA 5	Subtotal of Number Employed in all SEAs	Total Employed in CMA (incl. certain unstatd)	Total Employed in CMA (incl. certain unstatd)	Number Identified as Employed Outside CMA	Total (11 + 12)
CT 026	45	380	585	120	165	10	35	340	1350	1410	60	1470
CT 027	10	100	210	10	35	0	5	50	370	385	10	395
CT 100*	380	390	160	10	30	85	20	525	1075	1185	100	1285
CT 101	140	465	435	90	30	130	45	470	1510	1760	50	1810
CT 102*	435	605	565	155	25	435	50	845	2015	2370	70	2440
CT 103	90	350	425	60	25	115	55	360	1225	1420	85	1505
CT 104	375	400	445	70	70	120	30	390	1610	1805	85	1890
CT 105	35	255	310	75	10	105	50	300	900	1105	60	1165
CT 106	120	425	385	45	10	125	75	365	1295	1470	70	1540
CT 107	50	380	270	75	30	100	30	290	990	1110	40	1150
CT 108	30	465	245	50	40	150	50	320	1060	1155	65	1220
CT 109	100	505	575	90	35	180	75	425	1605	1760	60	1820
CT 110	80	270	230	55	0	90	15	210	790	945	30	975
CT 111	265	380	275	125	90	100	50	415	1135	1555	35	1590
CT 112	110	430	325	155	20	55	40	285	1150	1405	35	1440
CT 113*	65	160	195	140	5	10	65	220	575	685	20	705
CT 114	90	725	705	185	35	90	110	485	2005	2185	90	2275
UCT 120	2245	925	1125	230	210	195	140	1000	5295	5910	230	6140
UCT 130	1335	1210	1365	440	275	40	125	890	4800	5270	210	5480
CD 01	0	60	30	0	0	20	0	20	110	135	6740	6875
CD 04	0	100	75	35	10	0	10	55	230	410	11995	12405
CD 05	0	40	35	0	20	0	0	30	105	175	9340	9515
CD 07	0	50	10	10	0	0	0	10	70	95	3070	3165
CD 08	0	1795	1995	650	500	255	125	1605	5395	6340	3925	10265
CD 09	0	790	355	235	95	75	50	470	1615	2075	6280	8355
CD 11	0	85	60	15	5	5	20	45	190	260	13980	14240
CD 12	0	295	215	70	25	0	65	165	675	920	10980	11900
CD 13	0	15	45	20	5	5	20	50	110	175	13370	13545
CD 14	0	50	30	0	0	0	0	0	80	100	3765	3865
CT Tot. 11595	16275	30970	6380	5380	2315	1800	1420	17295	72270	84385	3365	87750
Totals 11595	19555	33820	7415	6040	2670	1910	1710	19745	80850	95070	86810	181880

*Designates employment CTs.

Note: 1. This column includes all those in column 10 plus those whose place of work is not exactly specified but are known to be working in the CMA.

Source: Statistics Canada and estimates by the authors.

Table 6

RELATIVE COMMUTING FLOWS FROM THE PLACE OF RESIDENCE TO THE PLACE OF WORK, 1971¹

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
Zone A Residence Zone	Per Cent Employed in Home Zone	Per Cent Employed in Other Residential Zones	Zone B Work Place Zone					Per Cent Employed in all SEAs	Total Employed in CMA (excl. unstatd)	Number Identified as Employed in CMA as Percent of "Total"	Number Identified as Employed Outside CMA as Percent of "Total"	Total (11 + 12)
			Per Cent Employed in SEA 1	Per Cent Employed in SEA 2	Per Cent Employed in SEA 3	Per Cent Employed in SEA 4	Per Cent Employed in SEA 5					
CT 001	10.00	26.21	40.69	13.79	0.00	0.00	0.69	23.10	100.00	95.25	4.75	100.00
CT 002	9.50	24.58	46.37	6.15	0.56	0.00	2.51	19.55	100.00	94.79	5.21	100.00
CT 003	21.05	15.79	59.47	0.00	0.00	0.00	0.00	3.68	100.00	92.67	7.33	100.00
CT 004*	14.81	13.63	<u>74.81</u>	2.96	0.89	1.63	0.00	11.56	100.00	97.01	2.99	100.00
CT 005	7.35	20.59	60.29	2.21	0.00	2.94	0.00	11.76	100.00	92.31	7.69	100.00
CT 006	16.22	15.32	59.76	3.60	1.20	0.30	1.20	8.71	100.00	95.15	4.85	100.00
CT 007*	45.26	10.22	<u>81.75</u>	2.92	1.46	0.00	1.46	8.03	100.00	98.36	1.64	100.00
CT 008*	34.62	15.81	<u>74.36</u>	5.13	1.28	0.00	0.00	9.83	100.00	92.42	7.58	100.00
CT 009*	33.87	14.52	<u>80.65</u>	0.00	0.00	0.00	0.00	4.84	100.00	94.08	5.92	100.00
CT 010*	19.35	20.07	<u>66.31</u>	4.30	0.00	0.00	0.00	13.62	100.00	92.05	7.95	100.00
CT 011	11.62	14.29	56.00	6.48	0.38	0.38	1.33	18.10	100.00	95.19	4.81	100.00
CT 012	12.11	14.53	60.55	6.23	0.35	0.00	0.69	12.80	100.00	96.56	3.44	100.00
CT 013	5.37	13.64	59.09	13.64	0.00	0.00	0.83	21.90	100.00	97.25	2.75	100.00
CT 014	12.11	21.52	51.57	11.21	0.00	0.45	0.00	14.80	100.00	96.83	3.17	100.00
CT 015	8.14	30.23	32.56	14.53	0.00	0.00	2.33	29.07	100.00	88.73	11.27	100.00
CT 016	13.53	20.59	43.53	11.76	0.00	0.00	3.53	22.35	100.00	97.40	2.60	100.00
CT 017	7.43	20.30	49.50	11.39	0.99	0.00	0.99	22.77	100.00	97.29	2.71	100.00
CT 018*	18.72	18.72	44.93	<u>24.23</u>	0.00	0.00	0.44	36.34	100.00	98.15	1.85	100.00
CT 019	9.32	14.44	51.55	<u>12.25</u>	0.73	1.10	0.91	24.68	100.00	96.55	3.45	100.00
CT 020*	18.70	16.41	49.62	7.63	0.00	0.00	2.29	33.97	100.00	96.81	3.19	100.00
CT 021	5.71	14.29	54.03	5.71	0.52	0.52	0.00	25.97	100.00	97.42	2.58	100.00
CT 022*	14.45	21.33	46.56	8.49	0.46	0.46	1.15	32.11	100.00	96.47	3.53	100.00
CT 023*	14.09	17.55	39.03	<u>26.10</u>	0.00	0.00	0.92	43.42	100.00	97.52	2.48	100.00
CT 024	5.88	19.12	42.65	<u>20.77</u>	0.74	0.37	0.00	32.35	100.00	95.45	4.55	100.00
CT 025	9.95	22.47	46.39	10.11	0.32	0.48	0.32	21.19	100.00	97.66	2.34	100.00

(Per cent)

Table 6 Cont'd.
RELATIVE COMMUTING FLOWS FROM THE PLACE OF RESIDENCE TO THE PLACE OF WORK, 1971¹

Zone A Residence Zone		(1)	(2)	(3)	(4)	(5)	(6)	Zone B Work Place Zone		(8)	(9)	(10)	(11)	(12)	(13)
Per Cent Employed in Home Zone	Per Cent Employed in Other Residential Zones	Per Cent Employed in ECBD in SEA 1	Per Cent Employed in SEA 2	Per Cent Employed in SEA 3	Per Cent Employed in SEA 4	Per Cent Employed in SEA 5	Per Cent Employed in all SEAs unstatd)	Total Employed in CMA (excl. unstatd)	Number Identified as Employed in CMA as Percent of "Total"	Number Identified as Employed Outside CMA as Percent of "Total"	Total (11 + 12)				
(Per cent)															
CT 026	3.33	28.15	43.33	8.89	12.22	0.74	0.74	2.59	25.19	100.00	95.92	4.08	100.00		
CT 027	2.70	27.03	56.76	2.70	9.46	0.00	0.00	1.35	13.51	100.00	97.47	2.53	100.00		
CT 100*	35.35	36.28	14.88	0.93	2.79	7.91	35.35	1.86	48.84	100.00	92.22	7.78	100.00		
CT 101	9.27	30.79	28.81	5.96	1.99	8.61	11.59	2.98	31.13	100.00	97.24	2.76	100.00		
CT 102*	21.59	30.02	28.04	7.69	1.24	21.59	8.93	2.48	41.94	100.00	97.13	2.87	100.00		
CT 103	7.35	28.57	34.69	4.90	2.04	9.39	8.57	4.49	29.39	100.00	94.35	5.65	100.00		
CT 104	23.29	24.84	27.64	4.35	4.35	7.45	6.21	1.86	24.22	100.00	95.50	4.50	100.00		
CT 105	3.89	28.33	34.44	8.33	1.11	11.67	6.67	5.56	33.33	100.00	94.85	5.15	100.00		
CT 106	9.27	32.82	29.73	3.47	0.77	9.65	8.49	5.79	28.19	100.00	95.45	4.55	100.00		
CT 107	5.05	38.38	27.27	7.58	3.03	10.10	5.56	3.03	29.29	100.00	96.52	3.48	100.00		
CT 108	2.83	43.87	23.11	4.72	3.77	14.15	2.83	4.72	30.19	100.00	94.67	5.33	100.00		
CT 109	6.23	31.46	35.83	5.61	2.18	11.21	2.80	4.67	26.48	100.00	96.70	3.30	100.00		
CT 110	10.13	34.18	29.11	6.96	0.00	11.39	1.90	6.33	26.58	100.00	96.92	3.08	100.00		
CT 111	19.85	28.46	20.60	9.36	6.74	7.49	3.75	3.75	31.09	100.00	97.80	2.20	100.00		
CT 112	9.57	37.39	28.26	13.48	1.74	4.78	1.30	3.48	24.78	100.00	97.57	2.43	100.00		
CT 113*	11.30	27.83	33.91	24.35	0.87	1.74	0.00	11.30	38.26	100.00	97.16	2.84	100.00		
CT 114	4.49	36.16	35.18	9.23	1.75	4.49	3.24	5.49	24.19	100.00	96.04	3.96	100.00		
UCT 120	42.40	17.47	21.25	4.34	3.97	3.68	4.25	2.64	18.89	100.00	96.25	3.75	100.00		
UCT 130	27.81	25.21	28.44	9.17	5.73	0.83	0.21	2.60	18.54	100.00	96.17	3.83	100.00		
CD 01	0.00	54.55	27.27	0.00	0.00	18.18	0.00	0.00	18.18	100.00	1.96	98.04	100.00		
CD 04	0.00	43.48	32.61	15.22	4.35	0.00	0.00	4.35	23.91	100.00	3.31	96.69	100.00		
CD 05	0.00	38.10	33.33	0.00	19.05	0.00	9.52	0.00	28.57	100.00	1.84	98.16	100.00		
CD 07	0.00	71.43	14.29	14.29	0.00	0.00	0.00	0.00	14.29	100.00	3.00	97.00	100.00		
CD 08	0.00	33.27	36.98	12.05	9.27	4.73	1.39	2.32	29.75	100.00	61.76	38.24	100.00		
CD 09	0.00	48.92	21.98	14.55	5.88	4.64	0.53	3.10	29.10	100.00	24.84	75.16	100.00		
CD 11	0.00	44.74	31.58	7.89	2.63	2.63	0.00	10.53	23.68	100.00	1.83	98.17	100.00		
CD 12	0.00	43.70	31.85	10.37	3.70	0.00	0.74	9.63	24.44	100.00	7.73	92.27	100.00		
CD 13	0.00	13.64	40.91	18.18	4.55	0.00	4.55	18.18	45.45	100.00	1.29	98.71	100.00		
CD 14	0.00	62.50	37.50	0.00	0.00	0.00	0.00	0.00	0.00	100.00	2.59	97.41	100.00		
CT Tot.	16.04	22.52	42.85	8.83	7.44	3.20	2.49	1.96	23.93	100.00	96.17	3.83	100.00		
Totals	14.34	24.19	41.83	9.17	7.47	3.30	2.36	2.12	24.42	100.00	52.27	47.73	100.00		

*Designates employment CTS.

Note: 1. Figures indicating relative flows to employment areas from constituent CTS are underlined.

Source: Statistics Canada and estimates by the authors.

of the workers who reside in each zone and whose place of work is known (column 10 of Table 5). In addition, the relative importance of employment inside and outside of the CMA for each district's residents is indicated in columns 11-13. Similarly, these gross data are shown as a percentage of the working labour force of each major employment area in Table 7.

Certainly, the actual and proportional flow data (Tables 5, 6 and 7) are of *immediate* interest to transportation planners and managers. These data, however, cannot show the relative attraction exerted by the employment areas upon each residential district, independent of the size of the WLF of the employment area and the RLF of the residential district.²⁴ In light of this, we shall also employ the following index in our analysis of the journey-to-work patterns:

$$\text{Index 1} = \frac{a_{ij}/\text{RLF}'_i \cdot 100}{\text{WLF}'_j/\text{RLF}'_{\text{CMA}} \cdot 100}$$

where i and j represent the district of residence and the area of employment, respectively, and

24. As can be seen from the formula below, this index does not consider the RLF and the WLF, as defined in footnotes 16 and 17, but rather, the RLF' and WLF'. The RLF' $_i$ of a district is that figure in column 10 of Table 5 which is the "Total Employed in CMA (excluding unstated)". RLF' $_i$ is a sub-sample of RLF $_i$, then, as it does not include those resident workers who were employed outside the CMA or those who had an unspecified place of work. In the ensuing analysis of journey-to-work patterns, commuting origins and destinations must be known and, accordingly, RLF' will consistently be used to represent the resident labour force population. WLF' differs from WLF as the former only includes those working and residing within the CMA while the latter also considers workers employed in the CMA who live within the fifty mile "search area".

Table 7
THE RESIDENTIAL LOCATION OF WORKERS EMPLOYED
IN THE MAJOR EMPLOYMENT AREAS, 1971
(AS A PERCENTAGE OF THE WLF OF THE EMPLOYMENT AREA)¹

Zone of Residence	Employment Area					
	(1) FCHD	(2) SEA 1	(3) SEA 2	(4) SEA 3	(5) SEA 4	(6) SEA 5
<u>Halifax</u>						
CT 001	1.74	1.69	3.31	0.00	0.00	0.58
CT 002	2.45	2.49	1.82	0.37	0.00	2.63
CT 003	1.67	0.47	0.00	0.00	0.00	0.00
CT 004*	<u>7.47</u>	2.76	1.66	1.12	2.86	0.00
CT 005	<u>1.21</u>	0.61	0.25	0.00	1.05	0.00
CT 006	2.94	0.54	0.99	0.75	0.26	1.17
CT 007*	<u>1.66</u>	0.20	0.33	0.37	0.00	0.58
CT 008*	<u>2.57</u>	0.54	0.99	0.56	0.00	0.00
CT 009*	<u>1.48</u>	0.40	0.00	0.00	0.00	0.00
CT 010*	<u>2.74</u>	1.75	0.99	0.00	0.00	0.00
CT 011	4.35	3.37	2.81	0.37	0.52	2.05
CT 012	2.59	1.08	1.49	0.19	0.00	0.58
CT 013	2.11	1.21	2.73	0.00	0.00	0.58
CT 014	1.70	0.47	2.07	0.00	0.26	0.00
CT 015	0.83	1.42	2.07	0.00	0.00	1.17
CT 016	1.09	0.81	1.66	0.00	0.00	1.75
CT 017	1.48	1.28	1.90	0.37	0.00	0.58
CT 018*	3.02	3.57	<u>9.11</u>	0.00	0.00	0.58
CT 019	4.17	3.57	5.55	0.75	1.57	1.46
CT 020*	1.92	<u>4.25</u>	1.66	0.00	0.00	1.75
CT 021	3.08	4.99	1.82	0.37	0.52	0.00
CT 022*	3.00	<u>6.34</u>	3.06	0.37	0.52	1.46
CT 023*	2.50	4.79	<u>9.35</u>	0.00	0.00	1.17
CT 024	3.43	3.84	9.35	0.75	0.52	0.00
CT 025	4.27	4.18	5.22	0.37	0.79	0.58
CT 026	1.73	1.62	2.73	0.37	0.52	2.05
CT 027	0.62	0.13	0.58	0.00	0.00	0.29
Sub-Total	67.32	59.37	73.50	7.08	9.41	21.01
<u>Dartmouth</u>						
CT 100*	0.47	0.13	0.50	3.18	<u>19.90</u>	1.17
CT 101	1.29	1.21	0.50	4.87	<u>9.16</u>	2.63
CT 102*	1.67	2.09	0.41	<u>16.29</u>	9.42	2.92
CT 103	1.26	0.81	0.41	4.31	5.50	3.22
CT 104	1.32	0.94	1.16	4.49	5.24	1.75
CT 105	0.92	1.01	0.17	3.93	3.14	2.92
CT 106	1.14	0.61	0.17	4.68	5.76	4.39
CT 107	0.80	1.01	0.50	3.75	2.88	1.75
CT 108	0.72	0.67	0.66	5.62	1.57	2.92
CT 109	1.70	1.21	0.58	6.74	2.36	4.39
CT 110	0.68	0.74	0.00	3.37	0.79	2.92
CT 111	0.81	1.69	1.49	3.75	2.62	2.92
CT 112	0.96	2.09	0.33	2.06	0.79	2.34
CT 113*	0.58	1.89	0.08	0.37	0.00	<u>3.80</u>
CT 114	2.08	2.49	0.58	3.37	3.40	<u>6.43</u>
Sub-Total	16.40	18.59	7.54	70.78	72.53	46.47
<u>UCTs</u>						
UCT 120	3.33	3.10	3.48	7.30	11.78	8.19
UCT 130	4.04	5.93	4.55	1.50	0.52	7.31
Sub-Total	7.37	9.03	8.03	8.80	12.30	15.50
CMA Total	91.59	85.99	89.07	86.66	94.24	82.98
<u>CDs</u>						
CD 01	0.09	0.00	0.00	0.75	0.00	0.00
CD 04	0.22	0.47	0.17	0.00	0.00	0.58
CD 05	0.10	0.00	0.33	0.00	0.52	0.00
CD 07	0.03	0.13	0.00	0.00	0.00	0.00
CD 08	5.90	8.77	8.28	9.55	3.93	7.31
CD 09	1.05	3.17	1.57	2.81	0.79	2.92
CD 11	0.18	0.20	0.08	0.19	0.00	1.17
CD 12	0.64	0.94	0.41	0.00	0.26	3.80
CD 13	0.13	0.27	0.08	0.00	0.26	1.17
CD 14	0.09	0.00	0.08	0.00	0.00	0.00
Sub-Total	8.43	13.95	11.00	13.30	5.76	16.95
Total	100.00	100.00	100.00	100.00	100.00	100.00

* Designates employment CTs.

1. The percentage figures for the WLF of each employment area residing within its constituent CTs are underlined.

2. All totals do not add up to 100.00 due to rounding errors.

Source: Statistics Canada and estimates by the authors.

- a_{ij} = Number of outcommuters from i to j ;
- RLF'_i = Number of workers residing in district i whose place of work within the CMA is known (column 10 of Table 5).
- WLF'_j = Working labour force of employment area j residing within the CMA; and
- RLF'_{CMA} = Number of workers residing in the CMA whose place of work within the CMA is known (column 10 of Table 5).

This index, then, measures the *tendency* for residents of a given CT/UCT to commute to a certain employment area, *relative to* the proportion of those employed in the CMA (whose place of work is known) working in this area. Such information may provide some insights into the implications for commuting of future residential development.²⁵ Table 8 shows the computed values of this index which have been standardized in order to allow for effective comparison between employment areas.²⁶ A positive value indicates that the tendency for workers residing in CT/UCT i to work in employment area j was above the tendency for CMA residents as a whole to work there. Accordingly, the residential

25. The applicability of these commuting tendencies will depend, to some degree, upon the extent to which the socio-economic character of future residential developments approximates that of the current population.
26. The index values are standardized by employing the formula $\frac{X_{ij} - \bar{X}_j}{\alpha_j}$, where X_{ij} is the index value for commutation from i to j , \bar{X}_j is the mean index value for employment area j , and α_j is the standard deviation of index values for employment area j . By standardizing the index values, the mean and standard deviation for each employment area become zero and one, respectively. Thus, a standardized value of + 1.5 indicates that the commutation tendency from zone i to employment area j is 1.5 standard deviations above the CMA average. Since the six employment areas had different deviations with the unstandardized values, it is only with standardization that the "commuting tendencies" calculated from this index can be effectively compared across employment areas.

Table 8
COMMUTING TENDENCY FROM THE PLACE OF RESIDENCE
TO THE EMPLOYMENT AREAS, 1971¹

Residence Zone	Zone A		Zone B			
	(1) ECBD	(2) SEA 1	(3) SEA 2	(4) SEA 3	(5) SEA 4	(6) SEA 5
CT 001	-0.1534	0.0443	1.1440	-0.6924	-0.4643	-0.6551
CT 002	0.1672	0.3524	-0.0736	-0.5814	-0.4643	0.1412
CT 003	0.9071	-0.8429	-1.0520	-0.6924	-0.4643	-0.9561
CT 004*	<u>1.7731</u>	-0.4134	-0.5802	-0.5157	-0.1830	-0.9561
CT 005	<u>0.9534</u>	-0.3157	-0.7008	-0.6924	0.0435	-0.9561
CT 006	0.9232	-1.0733	-0.4783	-0.4536	-0.4125	-0.4318
CT 007*	<u>2.1648</u>	-1.1115	-0.5871	-0.4022	-0.4643	-0.3189
CT 008*	<u>1.7474</u>	-0.8906	-0.2355	-0.4376	-0.4643	-0.9561
CT 009*	<u>2.1023</u>	-0.6354	-1.0520	-0.6924	-0.4643	-0.9561
CT 010*	<u>1.2929</u>	0.1698	-0.3672	-0.6924	-0.4643	-0.9561
CT 011	0.7109	0.2066	-0.0209	-0.6167	-0.3986	-0.3742
CT 012	0.9680	-0.5100	-0.0604	-0.6236	-0.4643	-0.6541
CT 013	0.8854	-0.1683	1.1191	-0.6924	-0.4643	-0.5954
CT 014	0.4608	-0.9409	0.7329	-0.6924	-0.3869	-0.9561
CT 015	-0.6125	0.6892	1.2621	-0.6924	-0.4643	0.0589
CT 016	0.0069	-0.2364	0.8211	-0.6924	-0.4643	0.5844
CT 017	0.3443	0.1854	0.7608	-0.4956	-0.4643	-0.5240
CT 018*	0.0862	0.5930	2.8055	-0.6924	-0.4643	-0.7638
CT 019	0.4599	0.2363	<u>0.8981</u>	-0.5471	-0.2749	-0.5572
CT 020*	0.3507	<u>2.8163</u>	0.1634	-0.6924	-0.4643	0.0434
CT 021	0.5995	1.9493	-0.1422	-0.5892	-0.3746	-0.9561
CT 022*	0.1780	<u>2.3696</u>	0.2991	-0.6012	-0.3851	-0.4556
CT 023*	-0.2471	<u>1.4418</u>	3.1029	-0.6924	-0.4643	-0.5529
CT 024	-0.0429	0.3781	<u>2.2551</u>	-0.5463	-0.4009	-0.9561
CT 025	0.1683	0.2835	0.5580	-0.6286	-0.3812	-0.8160
CT 026	-0.0041	0.0925	0.8939	-0.5452	-0.3364	0.1755
CT 027	0.7537	-1.0193	0.4541	-0.6924	-0.4643	-0.3663
CT 100*	-1.6103	-1.3378	-0.6077	0.8793	<u>5.6391</u>	-0.1441
CT 101	-0.8242	-0.4338	-0.7357	1.0189	<u>1.5367</u>	0.3446
CT 102*	-0.8675	-0.1226	-0.8545	<u>3.5987</u>	1.0781	0.1269
CT 103	-0.4919	-0.6248	-0.7271	1.1736	1.0156	1.0036
CT 104	-0.8901	-0.7236	-0.3598	0.7891	0.6081	-0.1428
CT 105	-0.5060	-0.0074	-0.8751	1.6266	0.6868	1.4687
CT 106	-0.7721	-0.8805	-0.9290	1.2262	1.0023	1.5717
CT 107	-0.9108	-0.1435	-0.5695	1.3154	0.4949	0.3665
CT 108	-1.1457	-0.6573	-0.4512	2.1204	0.0243	1.1027
CT 109	-0.4280	-0.4973	-0.7048	1.5368	0.0198	1.0835
CT 110	-0.8069	-0.2538	-1.0520	1.5721	-0.1365	1.9064
CT 111	-1.2876	0.1777	0.0213	0.7965	0.1823	0.6786
CT 112	-0.8551	0.9173	-0.7751	0.2582	-0.2391	0.5620
CT 113*	-0.5360	2.8707	-0.9135	-0.3467	-0.4643	<u>3.9779</u>
CT 114	-0.4654	0.1532	-0.7741	0.1998	0.0954	<u>1.4385</u>
UCT 120	-1.2511	-0.7244	-0.4206	0.0396	0.2694	0.1979
UCT 130	-0.8451	0.1424	-0.1398	-0.5268	-0.4284	0.1805
Means	1.0129	0.9486	0.8876	1.0875	1.0797	1.1149
Standard Deviation	0.4133	0.6303	0.8437	1.5705	2.3253	1.1660

* Designates employment CTs.

1. Index values indicating commuting tendency to employment areas from constituent CTs are underlined.

Source: Statistics Canada and estimates and computations by the authors.

area i is said to be "overrepresented" in the working labour force (WLF') of the employment area j . Similarly, a negative value indicates a below-average tendency and, therefore, CT/UCT_i is said to be "underrepresented" in the workforce of employment area j . The significance of these values can be clearly seen from Table 8. As one would expect, CTs located within or close by an employment area tended to be overrepresented in that area's WLF' and have positive values which are often very high. On the other hand, CTs situated in other parts of the CMA from an employment area are generally characterized by negative values indicating an underrepresentation in the WLF' of the employment area.

2.2 The Journey-to-Work to the Major Employment Areas

In this sub-section, the journey-to-work patterns to the major employment areas will be discussed. The analysis will consider both the "employment pull" of the ECBD and the SEAs upon the CMA's residents and the residential distribution of the working labour forces of each of these centres.

(a) The ECBD

With over 40 per cent of the CMA's jobs, the ECBD, consisting of CTs 4, 7, 8, 9, and 10 was clearly the dominant employment centre in the urban area. Map 21(a), which provides a visual impression of the data presented in column 3 of Table 6, indicates that the ECBD exerted a significant attraction, as an employment centre, for workers residing throughout the CMA. With the exception of CT 100 in Dartmouth, at least 20 per cent

Map 21(a)

THE PERCENTAGE OF THE RESIDENT LABOUR FORCE OF
EACH CT EMPLOYED IN THE ECBD, 1971



20.00% or greater

5.00% to 12.49%

12.50% to 19.99%

less than 5.00%

Source: Statistics Canada and estimates by the authors.

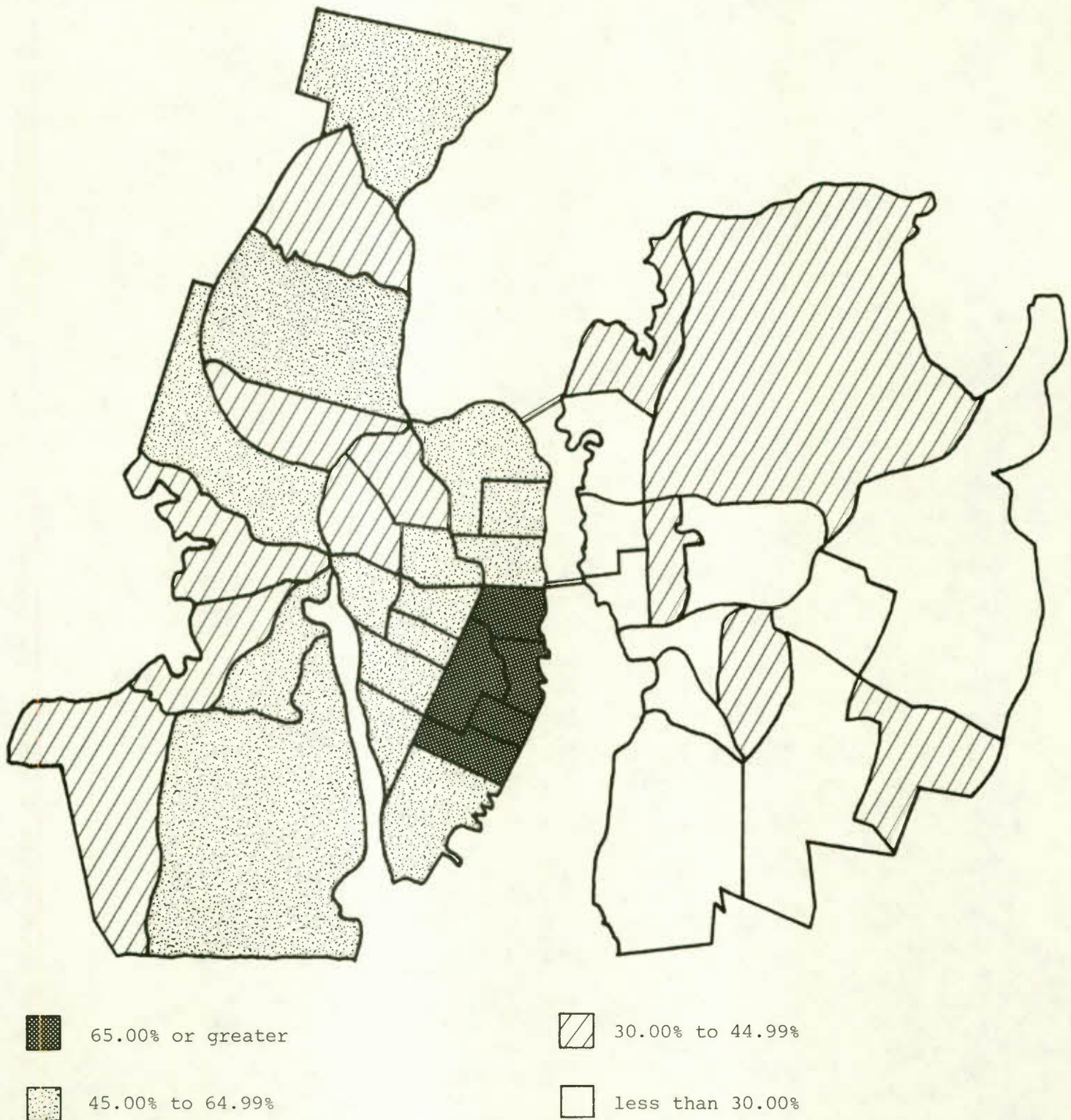
of the resident labour force of every census tract was employed in the ECBD. As we shall see below, none of the SEAs attracted the CMA resident workforce to the range and extent that the ECBD did.

While Map 21(a) clearly conveys the widespread importance of the ECBD as an employment centre, it does not adequately show the relative influence of the ECBD on the different CTs in Halifax and Dartmouth. As a result, Map 21(b), which provides more relevant detail for our purposes, has been included.²⁷ It is also based on the data presented in column 3 of Table 6; however, by employing higher percentage categories than Map 21(a), it enables one to consider the varying employment pull of the ECBD. From Map 21(b), it can be seen that the ECBD was generally more attractive as a workplace for Halifax residents than for those living in Dartmouth. This would appear to be due largely to the Narrows which impedes mobility between Dartmouth and the ECBD in Halifax. As would be expected, the employment pull of the ECBD was greatest for those workers residing in its constituent CTs and this influence tended to diminish in Halifax as the location of the resident labour force is increasingly removed from the ECBD. It should be noted, however, that this positive relationship between employment pull and geographical proximity did not exist for the census tracts in Dartmouth.

27. Map 21(a), with its category ranges, was included in order that comparisons regarding "employment pull" might be made between the ECBD and the SEAs, all of which are described by corresponding maps with the same categories as those employed in Map 21(a).

Map 21(b)

THE PERCENTAGE OF THE RESIDENT LABOUR FORCE OF EACH
CT EMPLOYED IN THE ECBD, 1971¹



1. This map considers the same data as Map 21(a) however different categories have been employed.

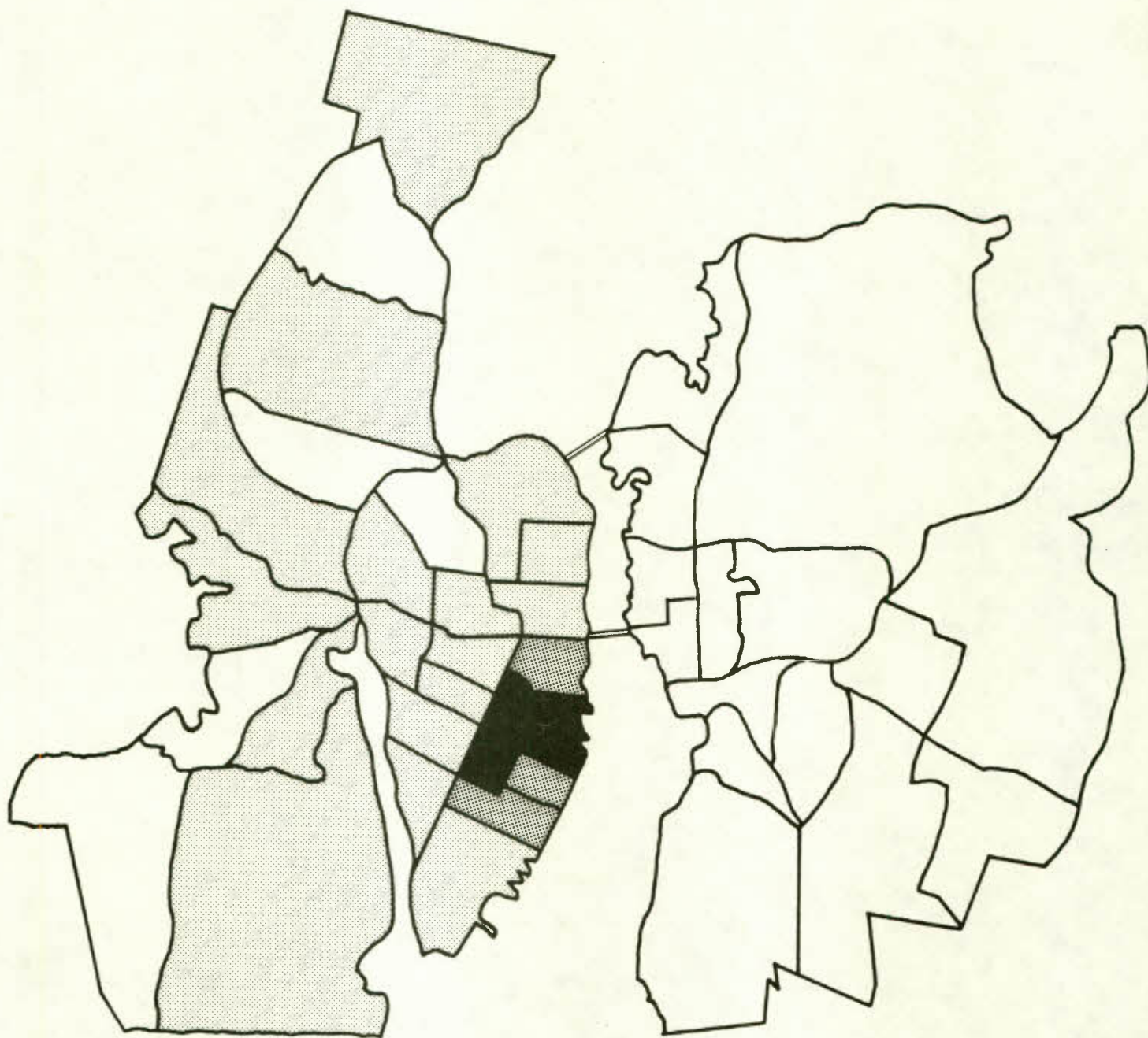
Source: Statistics Canada and estimates by the authors.

The standardized values derived from Index 1 (column 1 of Table 8) are visually represented in Map 22. From this map, it can be seen that the tendency to commute to the ECBD was above the CMA average for twenty-two of the twenty-seven CTs in Halifax. This overrepresentation was particularly evident for the residents of the peninsula where only CT 23 has a negative index value. Every CT in Dartmouth, on the other hand, was underrepresented in the working labour force of the ECBD.

Thus far, we have examined the journey-to-work to the ECBD in terms of the "pull" of this employment centre upon the resident labour forces of the CMA's districts. Map 23, which illustrates the data presented in column 1 of Table 7, considers the commutation to the ECBD from a different perspective; that is, the residential distribution of the ECBD's working labour force. Over two-thirds (67.8 per cent) of those working in this employment area lived in Halifax including 15.9 per cent which was supplied by the five constituent CTs. From Map 23, it can be seen that the residential location of ECBD workers was most significant in CTs with large resident labour forces. Since the ECBD exerted a strong employment pull on virtually all areas of the CMA, the size of the commuting flows to the employment centre were closely related to the number of workers residing in each CT. To state it simply, the residential distribution of the ECBD working labour force (column 1 of Table 7) approximated the residential distribution of the working labour force of the entire CMA (column 1 of Table 4).

Map 22

COMMUTING TENDENCY FROM EACH CT TO THE ECBD, 1971
(Based upon Index 1 calculations)



2.00 or greater



0.00 to 0.99



1.00 to 1.99

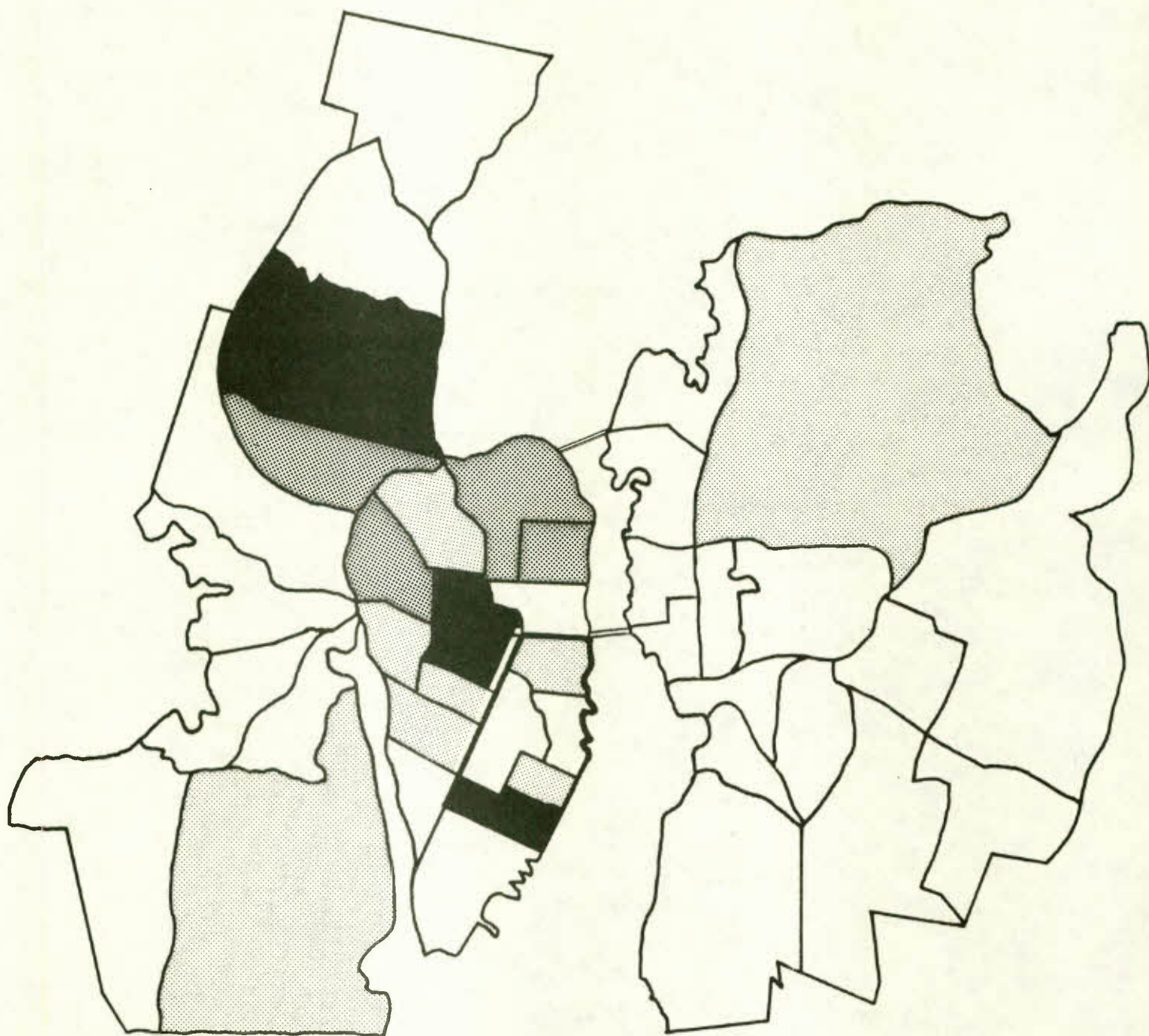


less than 0.00

Source: Statistics Canada and estimates by the authors.

Map 23

THE RESIDENTIAL DISTRIBUTION OF THE
WORKING LABOUR FORCE OF THE ECBD, 1971



4.00% or greater



3.00% to 3.99%



2.00% to 2.99%



less than 2.00%

Source: Statistics Canada and estimates by the authors.

This can be seen from Map 23 which shows that the major suppliers of ECBD workers were districts with large resident labour forces. Particularly significant were the CTs lying to the north and west of the employment centre. The importance of CT 2 on the southern mainland and CT 114 in north-east Dartmouth as suppliers of ECBD labour should also be noted. In addition Table 7 indicates that over 15 per cent of the ECBD workers resided in UCTs 120 and 130 and outside of the CMA, particularly in CD 8 (Halifax County). As column 1 of Table 4 shows, all of these CTs/UCTs/CDs supplied a greater-than-average share of the CMA's working labour force.

In conclusion, the ECBD is the most important employment centre in the CMA. As we have seen, it employed at least 20 per cent (and up to 80 per cent in some cases) of the resident labour force of all CTs except one. It is clear, however, that commuting to the ECBD was greater from Halifax than from Dartmouth. Moreover, the heaviest commuting flows came from the more populous CTs, particularly those located to the north and west of the ECBD on the peninsula and the northern mainland.²⁸

28. Much of the existing research on journey-to-work has found that workers employed in the central district are drawn from the entire urban area, albeit in a diminishing density as one moves outward from the core area. For one of the earliest and most significant statements of this theoretical conclusion, see J.D. Carroll, "The Relation of Homes to Work Places and the Spatial Pattern of Cities", *Social Forces*, Vol. 30, March, 1952, pp. 271-82. This general pattern does not apply to Halifax-Dartmouth where bodies of water appear to inhibit access of the ECBD from the south and east and, as a result, commuting from the north-west is predominant.

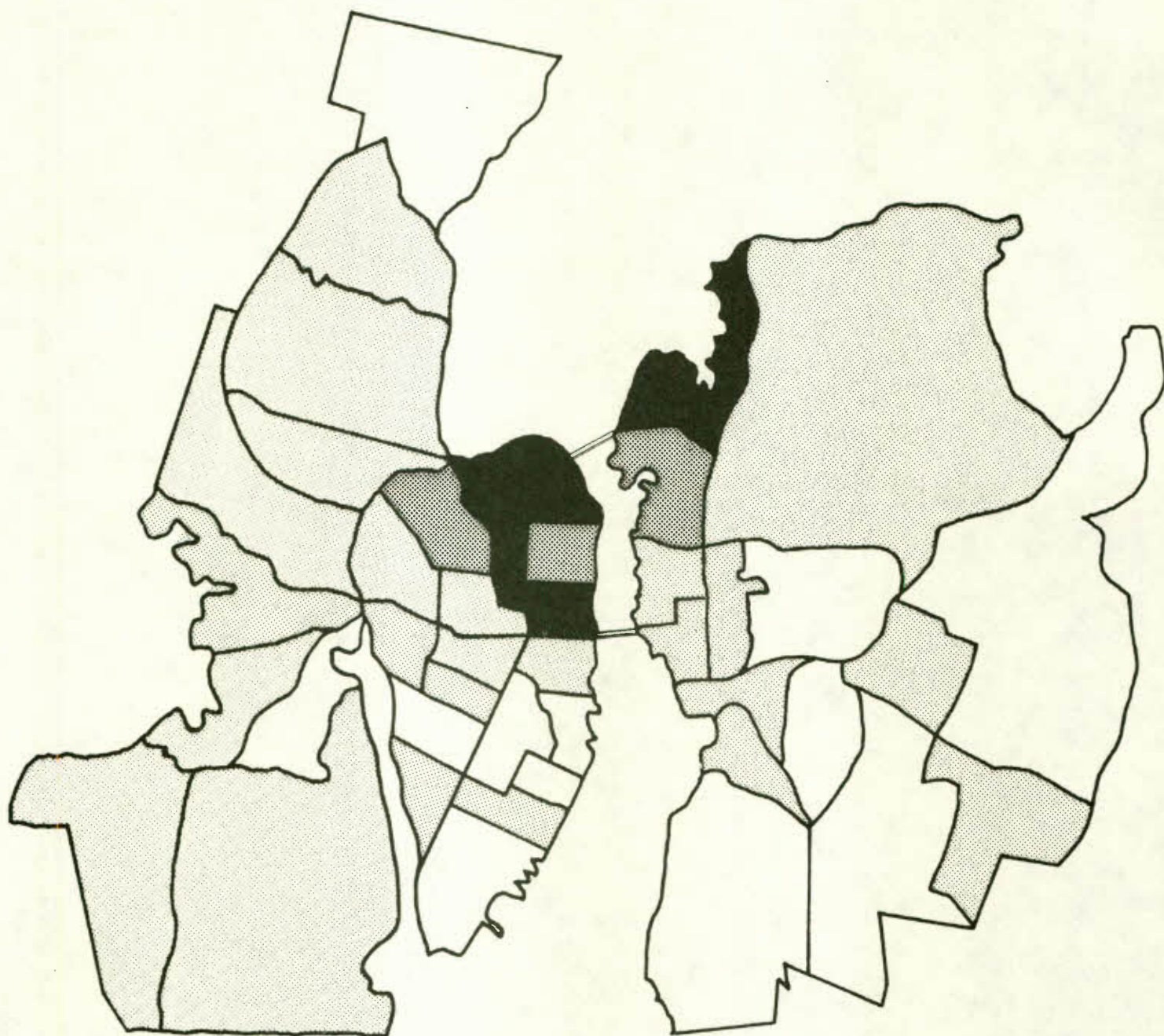
(b) SEA 1

SEA 1 (CTs 20 and 22) was the largest of the five SEAs with a working labour force of 7,415 (9.2 per cent of the CMA total). As we have mentioned, the predominant non-residential land use of this area is commercial and institutional. A comparison of Map 24 with Map 21(a) shows that the employment pull of this SEA was much narrower and weaker than that of the ECBD. While the latter drew at least 20 per cent (and usually considerably more) of the workers residing in all but one CT, only three CTs (the constituent CTs 20 and 22 and CT 113) sent more than 20 per cent of their RLF' to SEA 1. This employment centre also exerted a significant pull over the neighbouring CTs 21 and 23 and CT 112. The large relative flows from the Dartmouth CTs 112 and 113 indicates that access across the Narrows, particularly via the MacKay Bridge, was sufficiently convenient for commuting purposes. While SEA 1 was also a relatively important employment area for all of the CTs on the mainland (except CTs 14 and 27), it generally attracted a very small proportion of workers residing to the south in the ECBD and in the prosperous peninsula district made up of CTs 3, 5, 6, 7, and 13. Presumably, the weak employment pull of SEA 1 upon these areas can be explained by more convenient alternate employment opportunities and, in the case of the southern peninsula district, residents' qualifications which are inappropriate for jobs available in the employment centre.²⁹

29. Obviously, the correlation between residents' qualifications and jobs available can be a significant factor in determining the significance of commuting flows between two areas. Unfortunately, however, the availability of data is minimal regarding the former (see Section 1.2.2) and non-existent regarding the latter.

Map 24

THE PERCENTAGE OF THE RESIDENT LABOUR FORCE
OF EACH CT EMPLOYED IN SEA 1, 1971



20.00% or greater



5.00% to 12.49%



12.50 to 19.99%



less than 5.00%

Source: Statistics Canada and estimates by the authors.

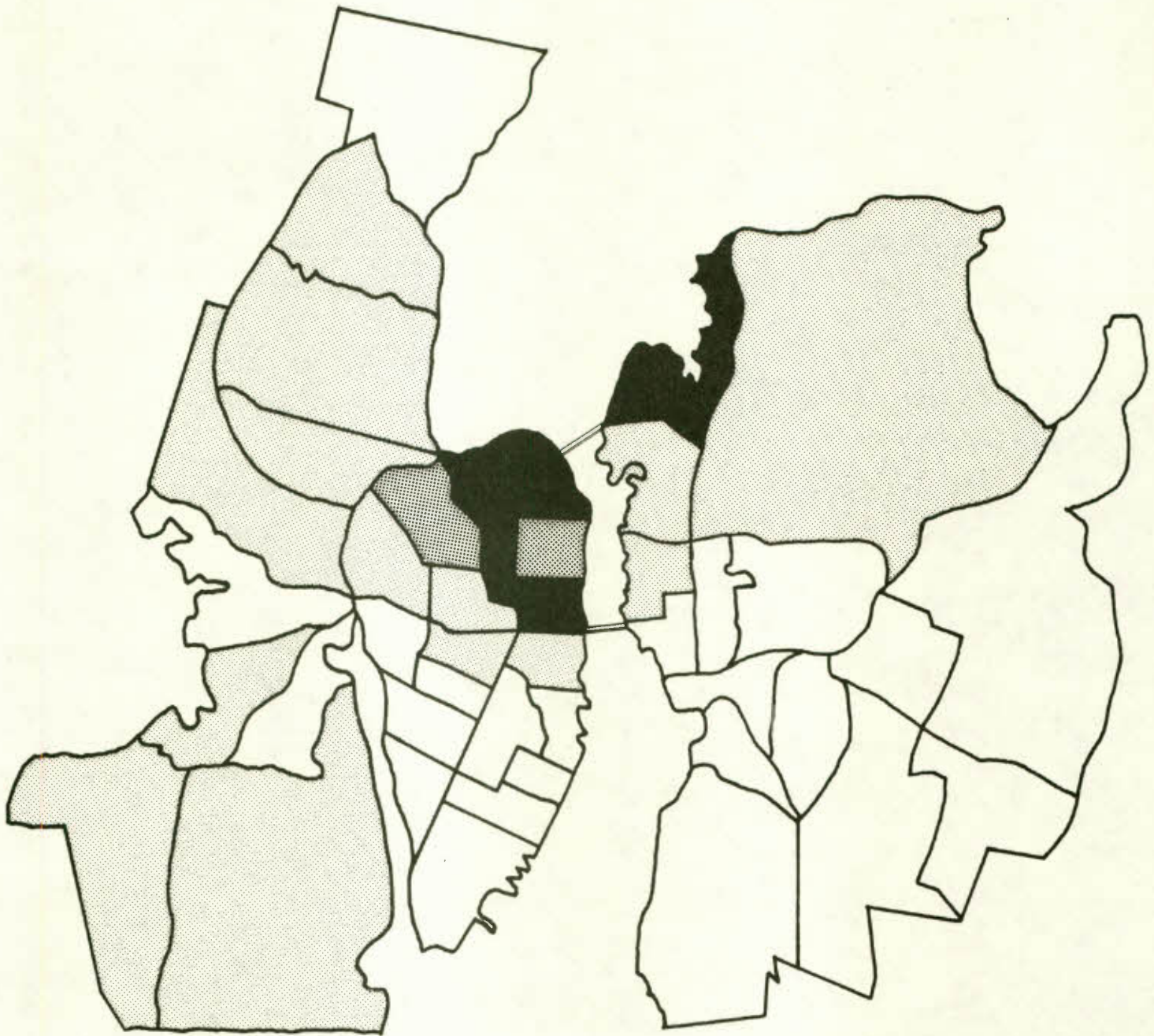
Map 25, which shows the Index 1 values (column 2 of Table 8), confirms that the influence of this SEA was greatest in the northern sections of Halifax and Dartmouth. Southern mainland CTs 1, 2, and 15, however, were exceptions to this overall pattern as the resident labour force of each was over-represented in the WLF of this SEA. The case of CT 2 is particularly noteworthy as the residents of that census tract were more likely to commute to SEA 1 than any other employment area including the ECBD, when the WLF of the employment area was controlled for. This attraction of SEA 1 for CT 2 residents was likely the result of a correspondence between job opportunities in the former and residents' qualifications in the latter.

Column 2 of Table 7, which indicates the residential distribution of the WLF of this employment area, shows that 58.4 per cent of those working in SEA 1 resided in Halifax. These data are visually presented in Map 26 which closely resembles the corresponding map for the ECBD (Map 23). Again, in the case of SEA 1, the residential concentration of the employment area's workers was greatest in the more populous CTs, particularly those on the northern peninsula and mainland (CTs 18 to 25).

In conclusion, SEA 1 was a significant employment centre for the northern sections of Halifax and Dartmouth. With the exception of a few CTs on the southern mainland, however, it drew very few workers from elsewhere in the urban area.

Map 25

COMMUTING TENDENCY FROM EACH CT TO SEA 1, 1971
(Based upon Index 1 calculations)



2.00 or greater



0.00 to 0.99



1.00 to 1.99

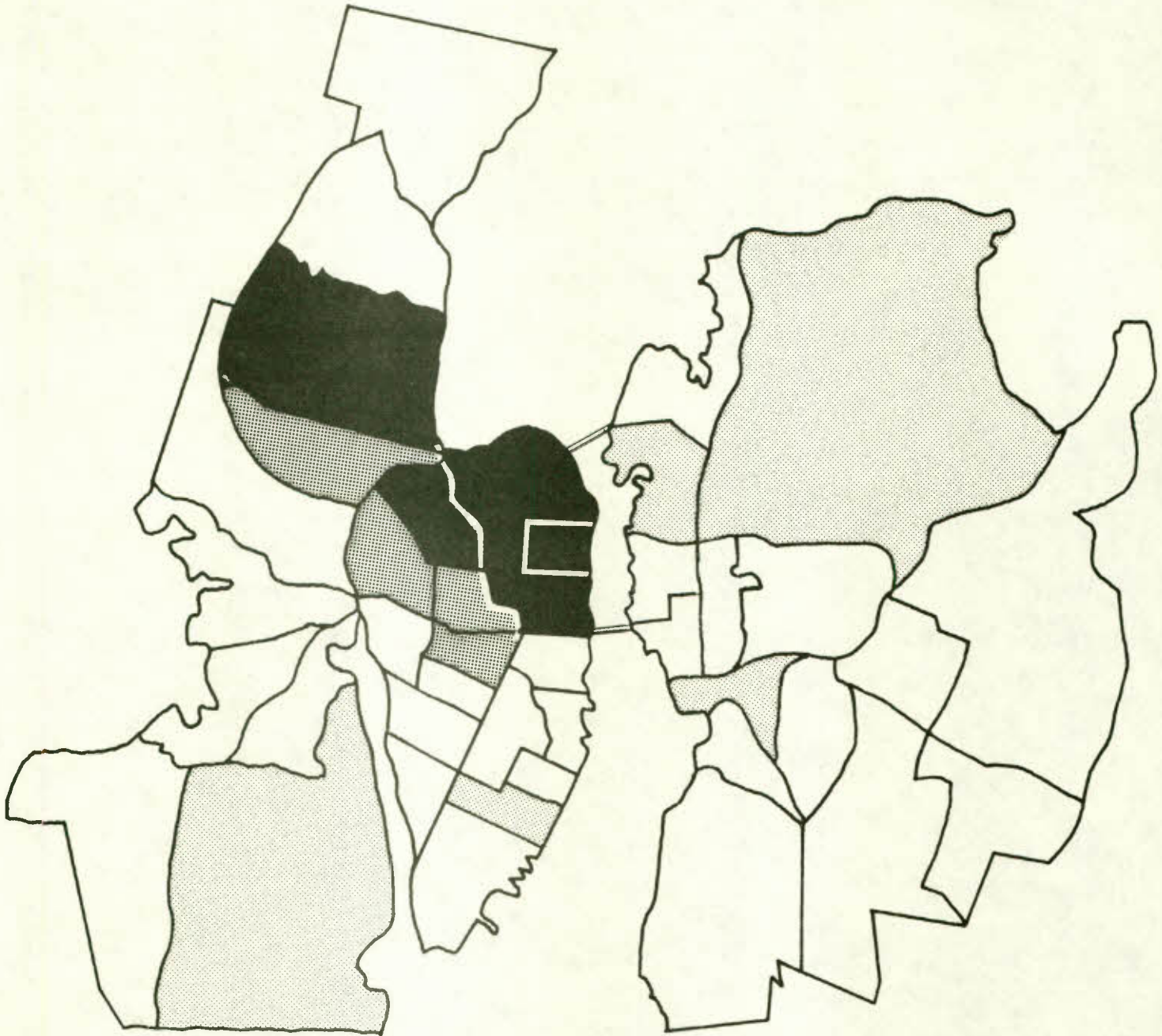


less than 0.00

Source: Statistics Canada and estimates by the authors.

Map 26

THE RESIDENTIAL DISTRIBUTION OF THE
WORKING LABOUR FORCE OF SEA 1, 1971



4.00% or greater



2.00% to 2.99%



3.00% to 3.99%



less than 2.00%

Source: Statistics Canada and estimates by the authors.

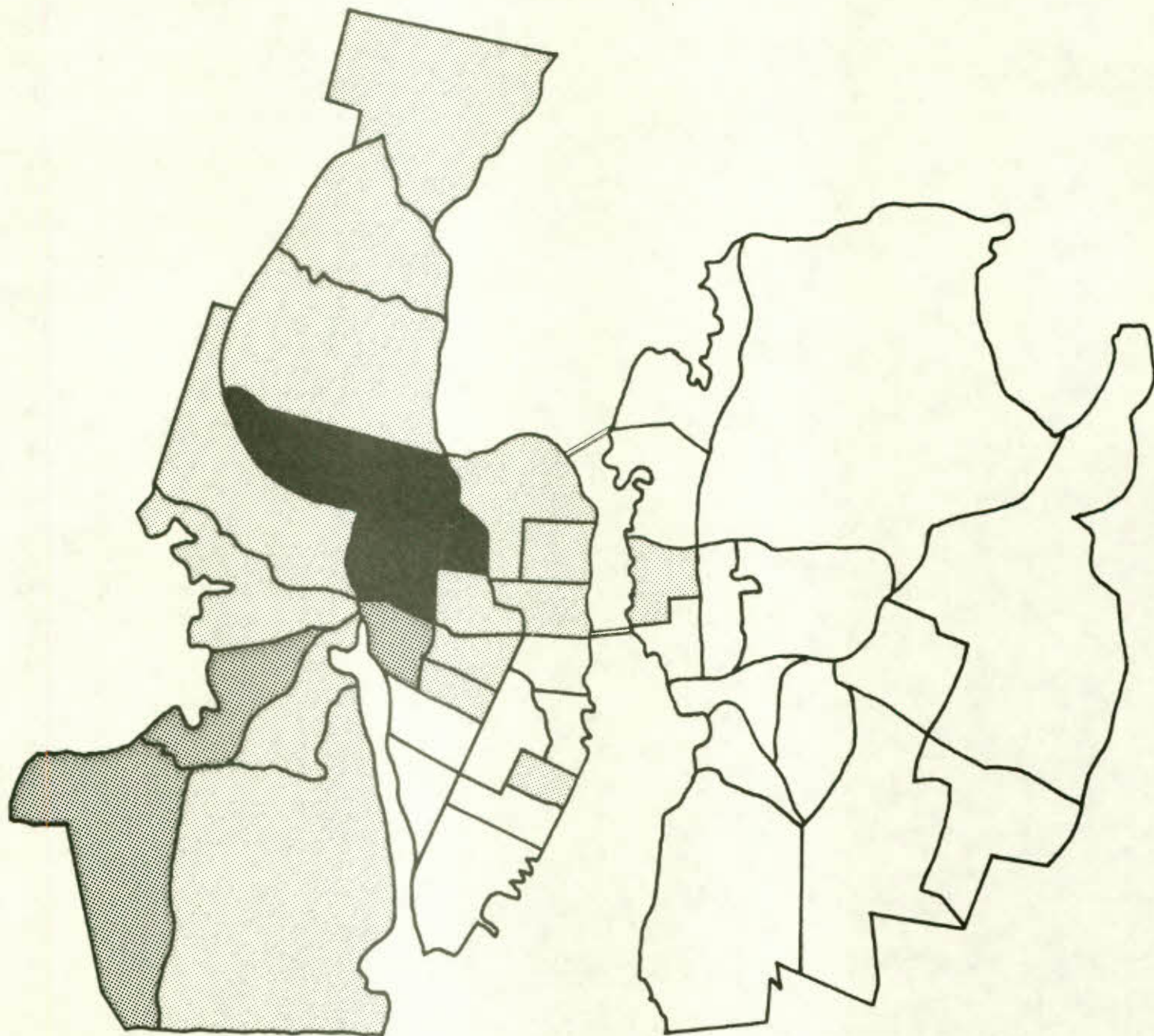
(c) SEA 2

SEA 2, which consists of CTs 18 and 23, had a working labour force of 6,040 (7.5 per cent of the CMA total). With two major shopping centre developments, the dominant non-residential land-use in this area is commercial. As can be seen from Map 27, much of the urban area was not very strongly influenced by job opportunities in this SEA. In particular, its employment pull upon Dartmouth and much of the southern Halifax peninsula was virtually negligible. This SEA exerted its greatest influence, as an employment centre, upon the resident labour forces of the two constituent CTs and CT 24. In addition, it was a relatively important workplace for mainland residents, particularly in the southern section (CTs 1 and 15) and for workers living in CT 13. The limited influence of SEA 2, as an employment centre, is confirmed by Map 28 which shows the Index 1 values (column 3 of Table 8). While the northern peninsula and much of the mainland was overrepresented in the SEA's working labour force, all of Dartmouth (except CT 111) and the southern peninsula were underrepresented.

From column 3 of Table 7, it can be seen that 73.5 per cent of those employed in this SEA resided in Halifax, including 18.5 per cent in the constituent CTs, while only 7.5 per cent lived in Dartmouth. As Map 29 shows, the heaviest incommuting flows to SEA 2 ran along radials extending to the north-east (CTs 24, 25, and 26) and the south (CTs 1, 14, 15, and 24) from the employment centre.

Map 27

THE PERCENTAGE OF THE RESIDENT LABOUR FORCE
OF EACH CT EMPLOYED IN SEA 2, 1971



20.00% or greater



5.00% to 12.49%



12.50% to 19.99%



less than 5.00%

Source: Statistics Canada and estimates by the authors.

Map 28

COMMUTING TENDENCY FROM EACH CT TO SEA 2, 1971
(Based upon Index 1 calculations)



2.00 or greater



0.00 to 0.99



1.00 to 1.99

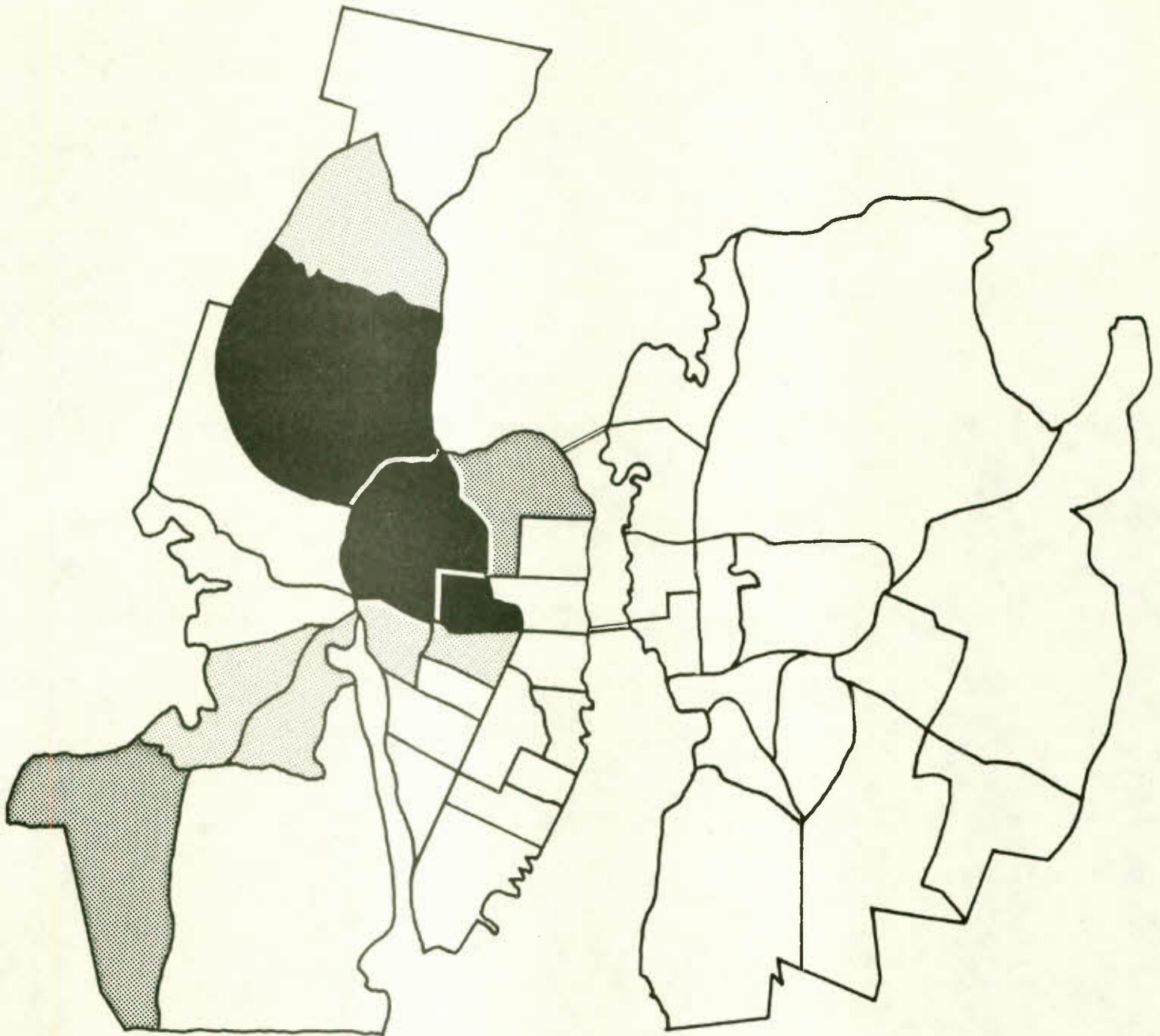


less than 0.00

Source: Statistics Canada and estimates by the authors.

Map 29

THE RESIDENTIAL DISTRIBUTION OF THE
WORKING LABOUR FORCE OF SEA 2, 1971



4.00% or greater

2.00% to 2.99%

3.00% to 3.99%

less than 2.00%

Source: Statistics Canada and estimates by the authors.

SEA 2, then, was a less important employment centre than either the ECBD or SEA 1. In addition to having fewer jobs, this SEA had an employment pull which was basically limited to certain CTs on the Halifax mainland and northern peninsula. The commuting flows from Dartmouth and the southern peninsula were consistently minimal.

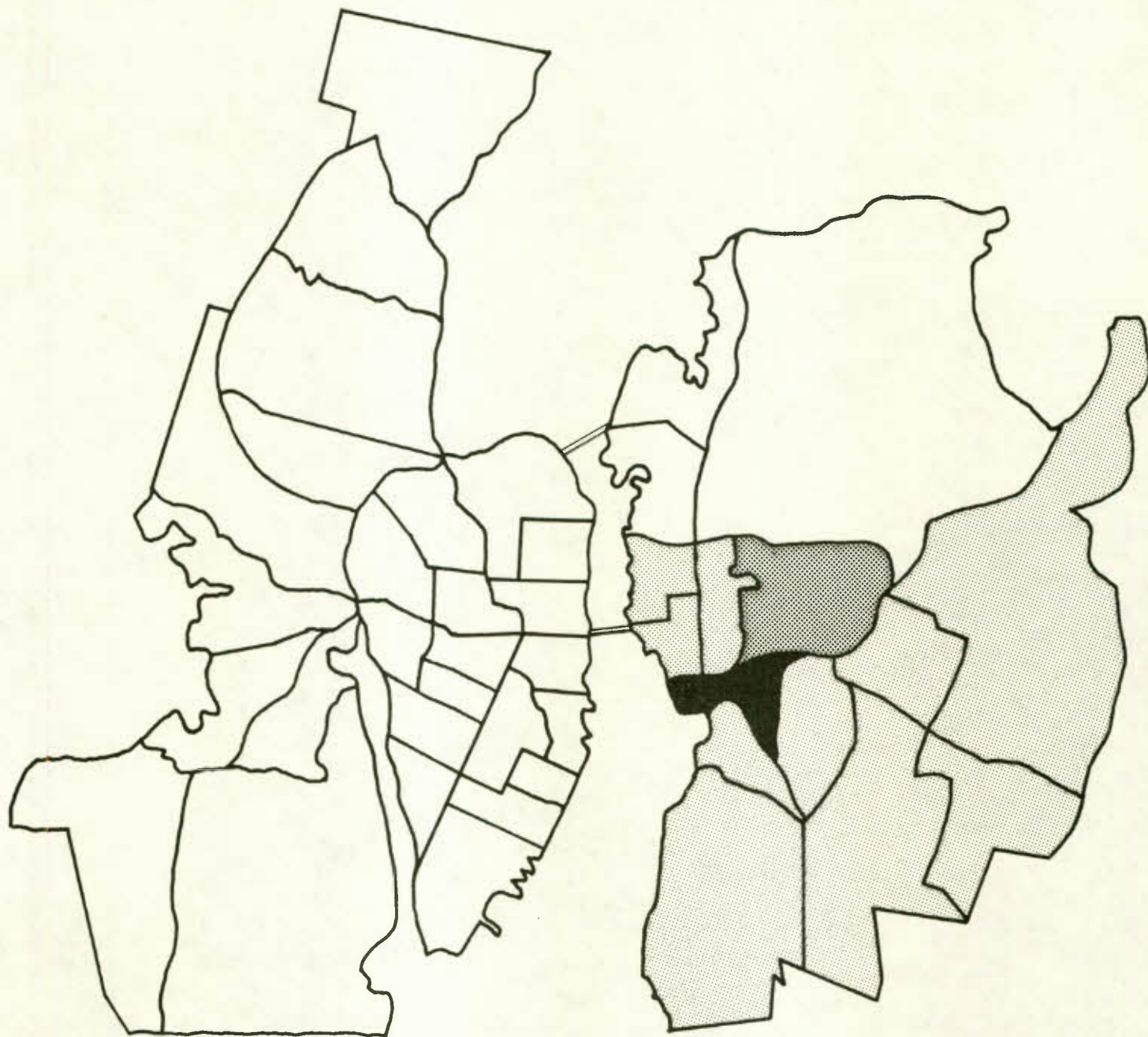
(d) SEA 3

SEA 3 (CT 102) represents the downtown district of Dartmouth and had a working labour force of 2,670 (3.3 per cent of the CMA). It is evident from Maps 30, 31 and 32 that the significance of this SEA, as an employment centre, was limited to Dartmouth. As column 6 of Table 6 indicates, no CT in Halifax sent more than 1.5 per cent of its resident labour force to this employment area. On the other hand, Map 30 shows that SEA 3 attracted at least 5 per cent of the workers residing in each of the Dartmouth census tracts except CTs 112, 113, and 114.

From column 4 of Table 7, it can be seen that 70.8 per cent of those employed in SEA 3 lived in Dartmouth. The remaining workers were residentially located in Halifax (7.1 per cent), the UCTs (8.8 per cent), and the census divisions (13.3 per cent). It is interesting to note that approximately one-tenth of the SEA's workers lived in Halifax County (CD 8) outside the CMA. Unfortunately, due to the level of data aggregation, the residential location of these workers within Halifax County cannot be ascertained. Within Dartmouth, all census tracts except CT 113 supplied at least 2 per cent of

Map 30

THE PERCENTAGE OF THE RESIDENT LABOUR FORCE
OF EACH CT EMPLOYED IN SEA 3, 1971



20.00% or greater

5.00% to 12.49%

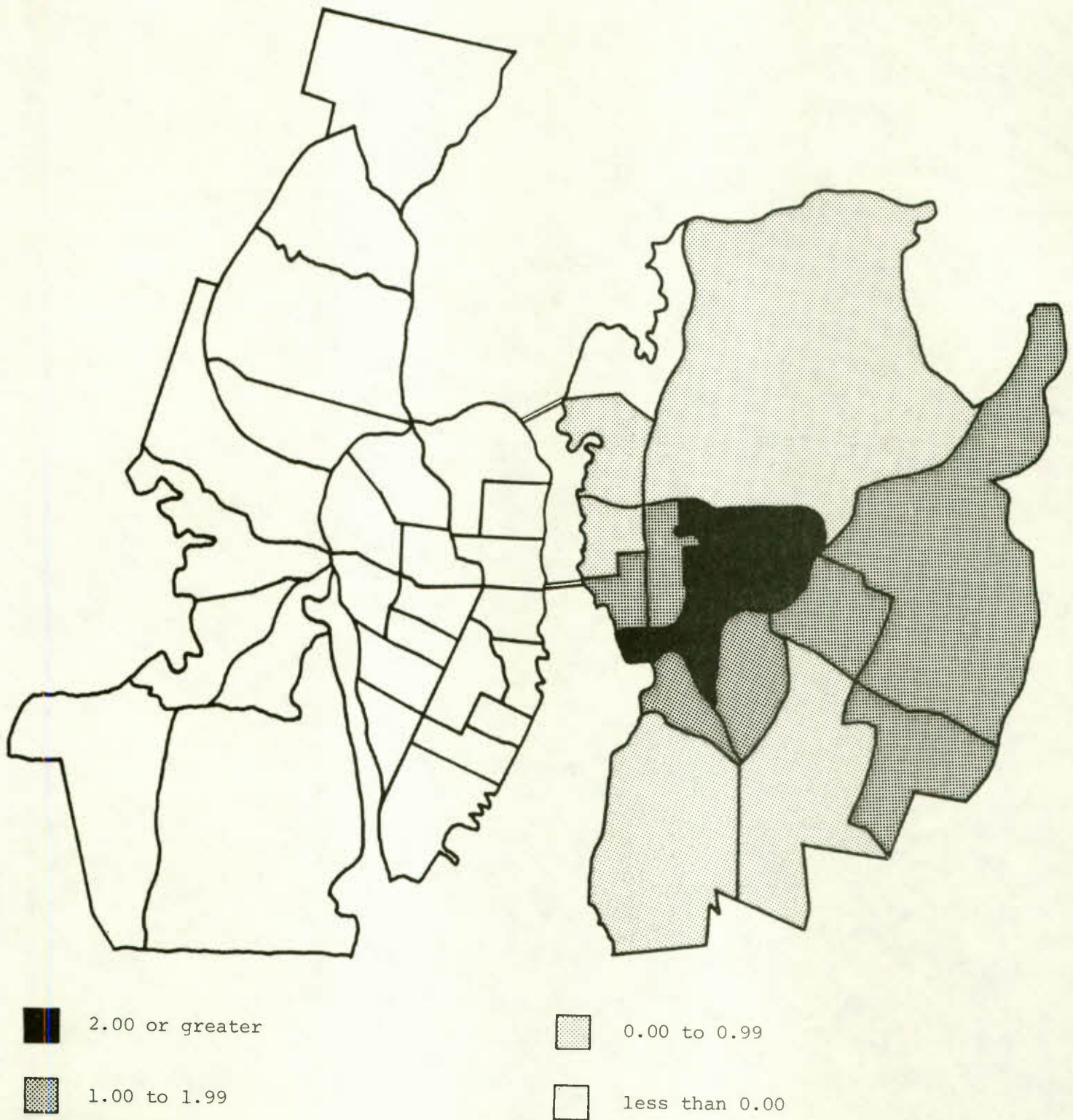
12.50% to 19.99%

less than 5.00%

Source: Statistics Canada and estimates by the authors.

Map 31

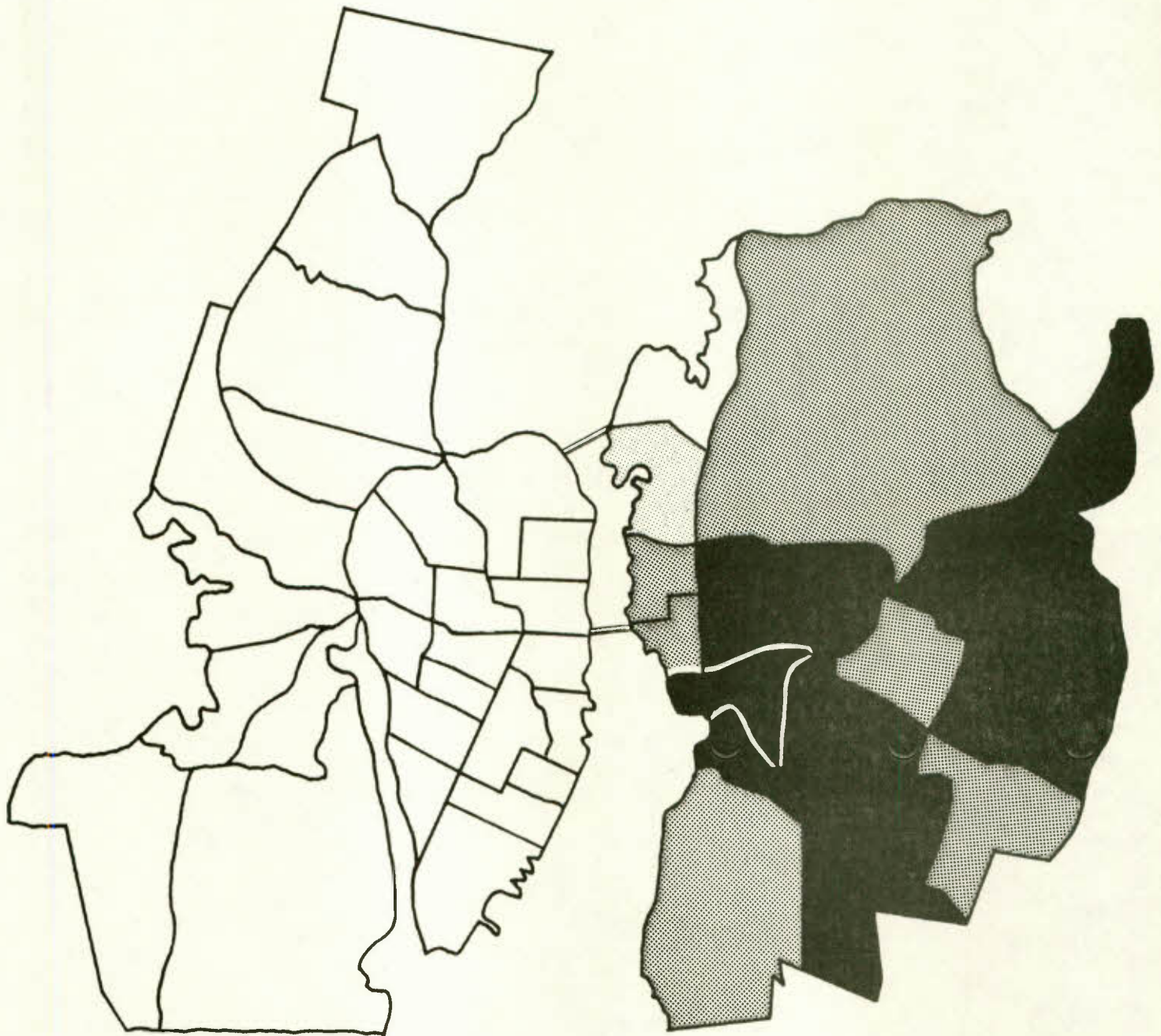
COMMUTING TENDENCY FROM EACH CT TO SEA 3, 1971
(Based upon Index 1 calculations)



Source: Statistics Canada and estimates by the authors.

Map 32

THE RESIDENTIAL DISTRIBUTION OF THE
WORKING LABOUR FORCE OF SEA 3, 1971



4.00% or greater



2.00% to 2.99%



3.00% to 3.99%



less than 2.00%

Source: Statistics Canada and estimates by the authors.

the WLF of SEA 3 (Map 32). Given this omnidirectional residential distribution in Dartmouth and the relatively low gross flows, commuting access to this SEA is not likely to be problematic.

While SEA 3 was an employment centre for virtually all of Dartmouth, then, the journey-to-work data indicate that it attracted almost no Halifax residents. As a result, it cannot be considered an important CMA commuting destination.

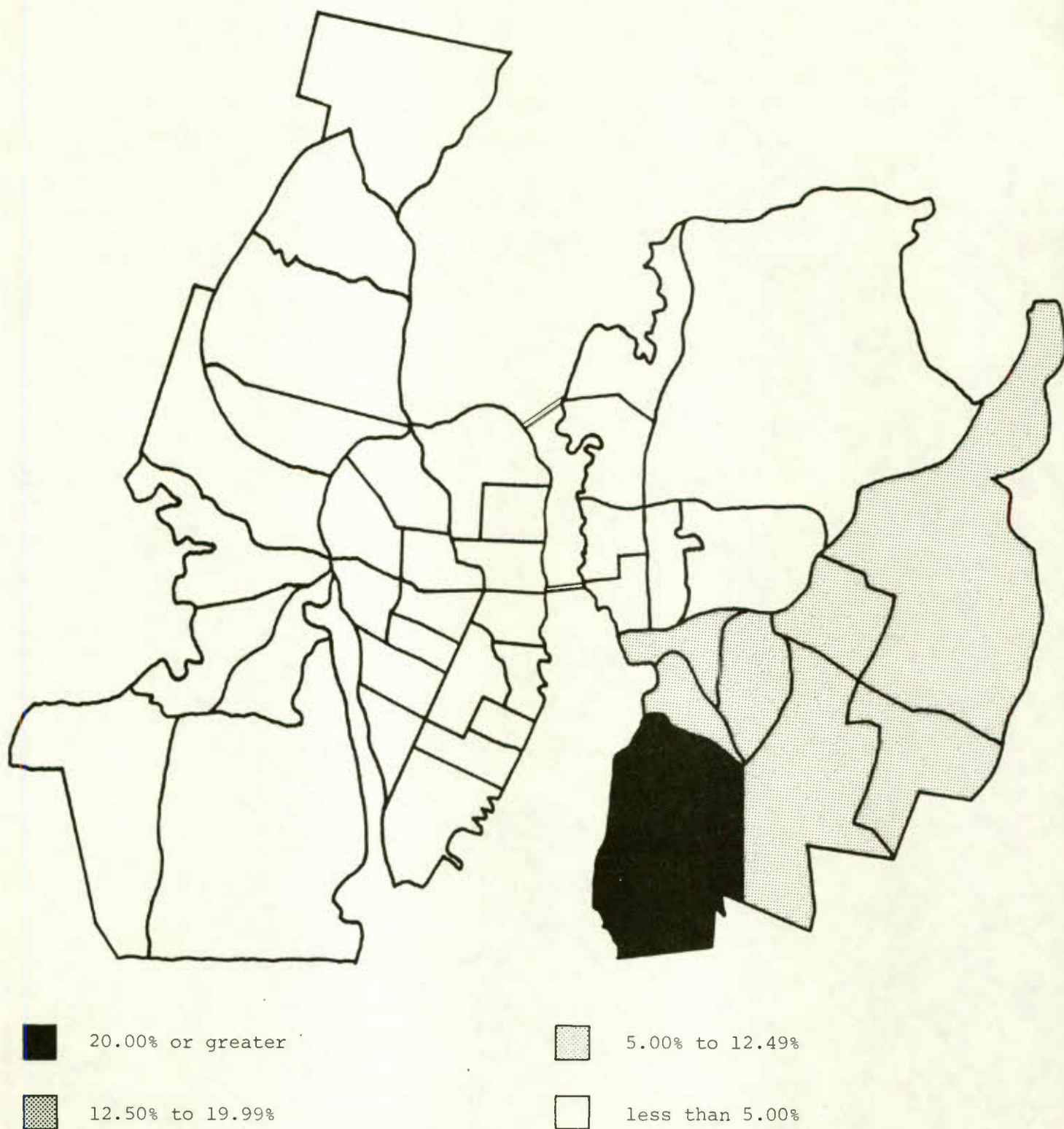
(e) SEA 4

SEA 4 (CT 100) had a working labour force of 1,910 which was 2.4 per cent of the CMA total. Maps 33, 34, and 35 indicate that, like SEA 3, the labour catchment area of this employment centre was primarily limited to the City of Dartmouth. From Map 34, which shows the Index 1 calculations, it can be seen that all of Halifax was underrepresented in the SEA 4 workforce. On the other hand, the commuting tendency from every CT in Dartmouth, except CTs 110, 112, and 113, was above the CMA average. The employment pull of this SEA was greatest for its own resident workers, 35.4 per cent of whom worked inside the CT. The other census tracts which sent at least 5 per cent of their resident force to SEA 4 are all located in southern and eastern Dartmouth (Map 33).

As was the case with SEA 3, over 70 per cent of the workers employed in this SEA lived in Dartmouth (column 5 of Table 7). The working labour force of this employment centre,

Map 33

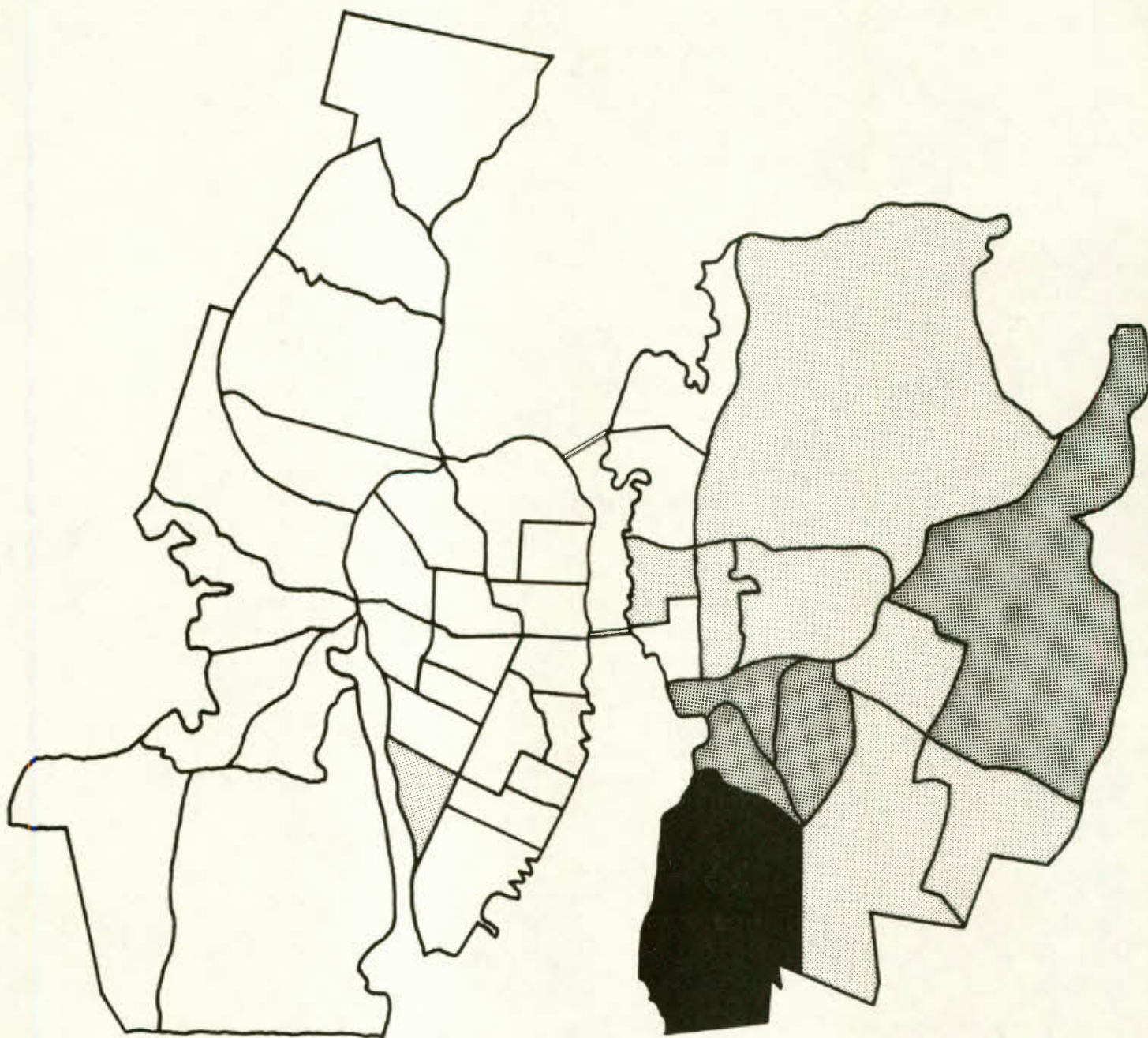
THE PERCENTAGE OF THE RESIDENT LABOUR FORCE
OF EACH CT EMPLOYED IN SEA 4, 1971





Source: Statistics Canada and estimates by the authors.


Map 34


COMMUTING TENDENCY FROM EACH CT TO SEA 4, 1971
(Based upon Index 1 calculations)



 2.00 or greater

 0.00 to 0.99

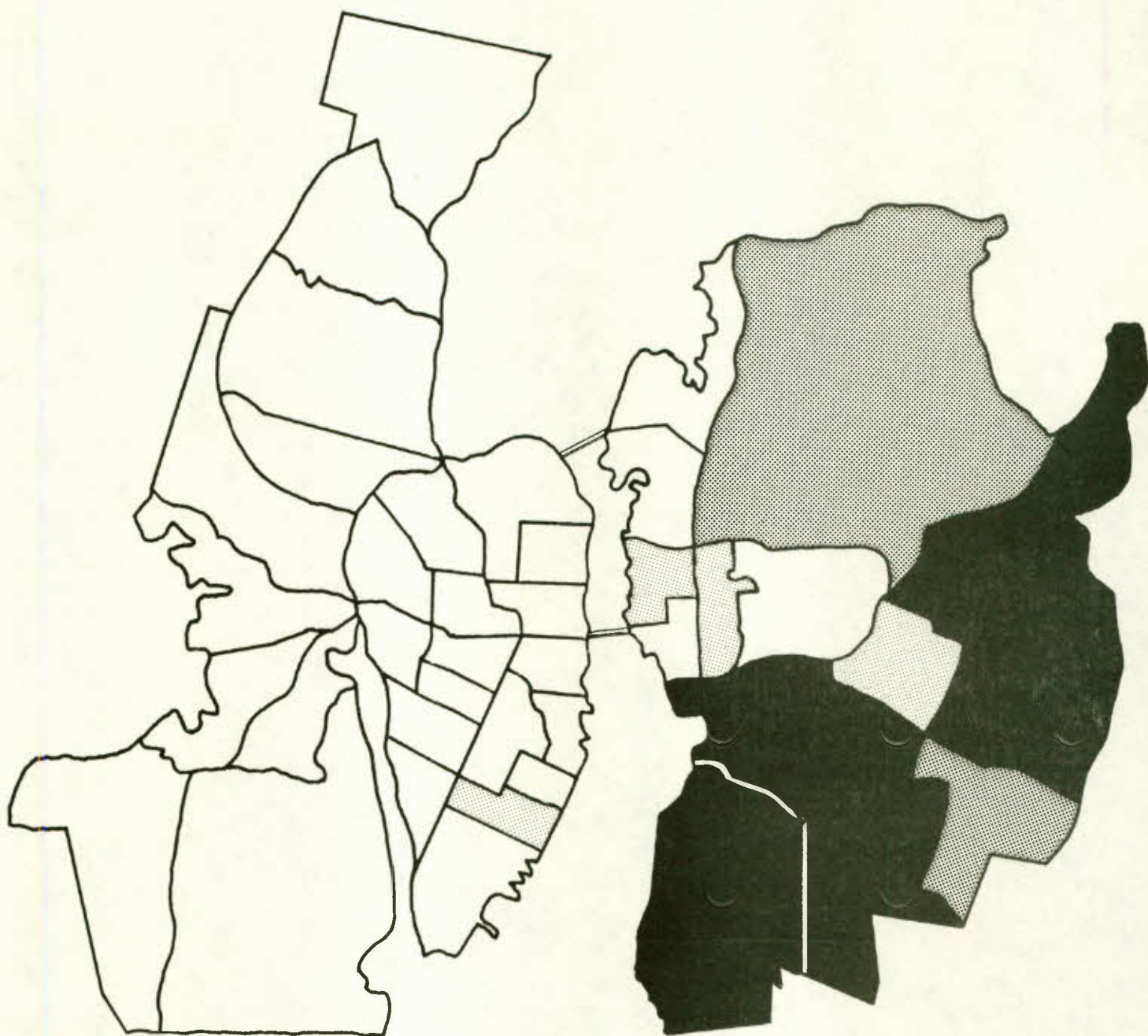
 1.00 to 1.99

 less than 0.00

Source: Statistics Canada and estimates by the authors.

Map 35

THE RESIDENTIAL DISTRIBUTION OF THE
WORKING LABOUR FORCE OF SEA 4, 1971



4.00% or greater



2.00% to 2.99%



3.00% to 3.99%



less than 2.00%

Source: Statistics Canada and estimates by the authors.

however, was not residentially distributed throughout the municipality to the extent which characterized the workforce of SEA 3. While Map 35 shows that the southern and eastern Dartmouth CTs were all important origins of SEA 4 labour, four of the north-west CTs (108, 110, 112, and 113) were not significant suppliers.

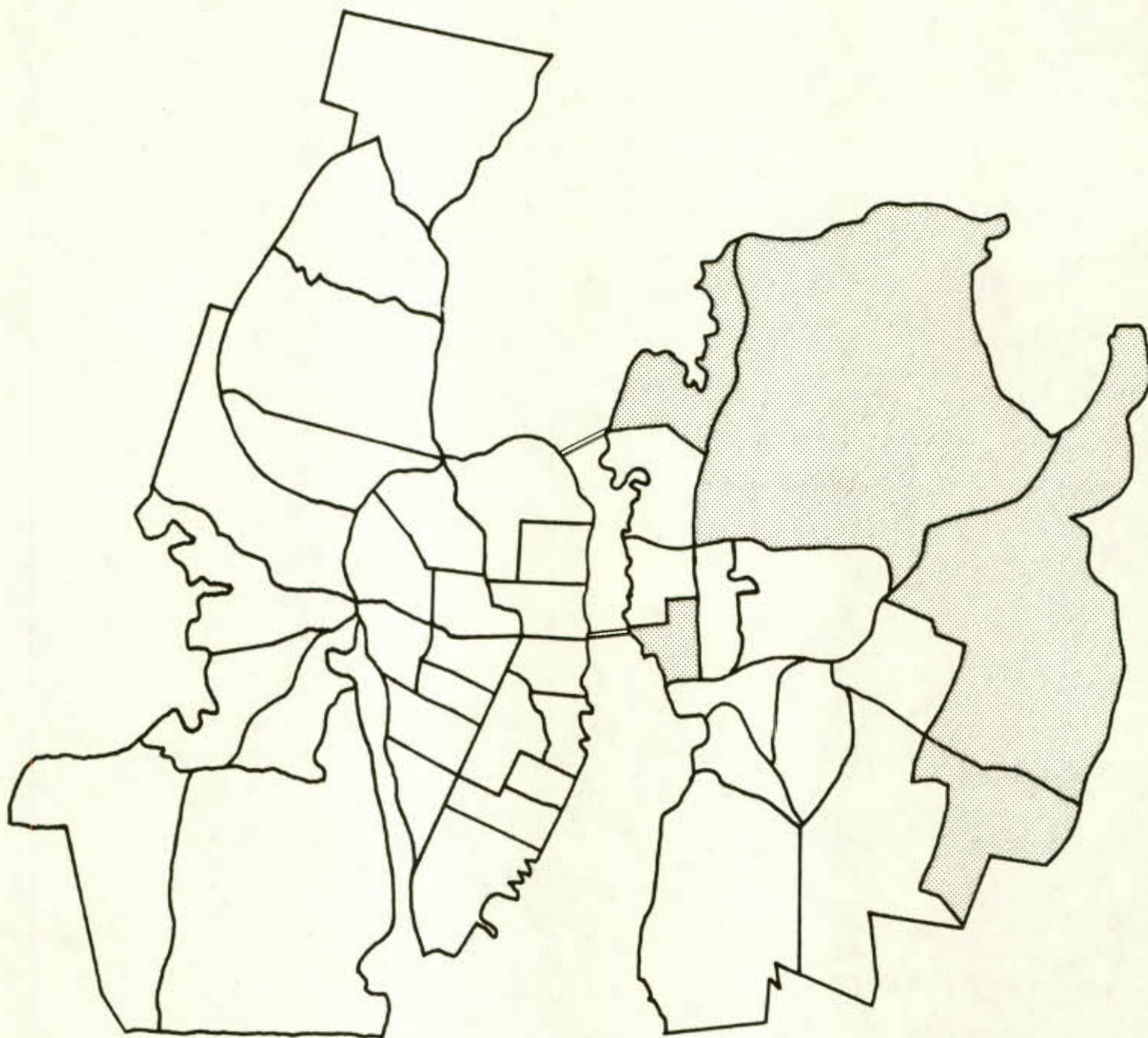
In conclusion, SEA 4 is similar to SEA 3 in the sense that both were important employment areas for Dartmouth residents only. While the latter attracted workers from throughout Dartmouth, however, the influence of SEA 4 was mainly limited to the southern and eastern sections of the city.

(f) SEA 5

SEA 5 (CT 113), with a working labour force of 1,710 (2.1 per cent of the CMA total), was the smallest of the six designated employment areas. The employment pull of this SEA was greatest upon the home zone as 11.3 per cent of the resident labour force of CT 113 worked in the employment area. As Map 36 shows, the only four other CTs (105, 106, 110, and 114), all located in Dartmouth, sent more than 5 per cent of their resident labour force to SEA 5. This very limited employment pull of SEA 5 could be expected given the area's small workforce. As a result, the Index 1 calculations are of particular interest as they indicate the commuting tendency *independent* of the employment area's working labour force size. These values, which are visually presented in Map 37, show a

Map 36

THE PERCENTAGE OF THE RESIDENT LABOUR FORCE
OF EACH CT EMPLOYED IN SEA 5, 1971



20.00% or greater



5.00% to 12.49%



12.50% to 19.99%

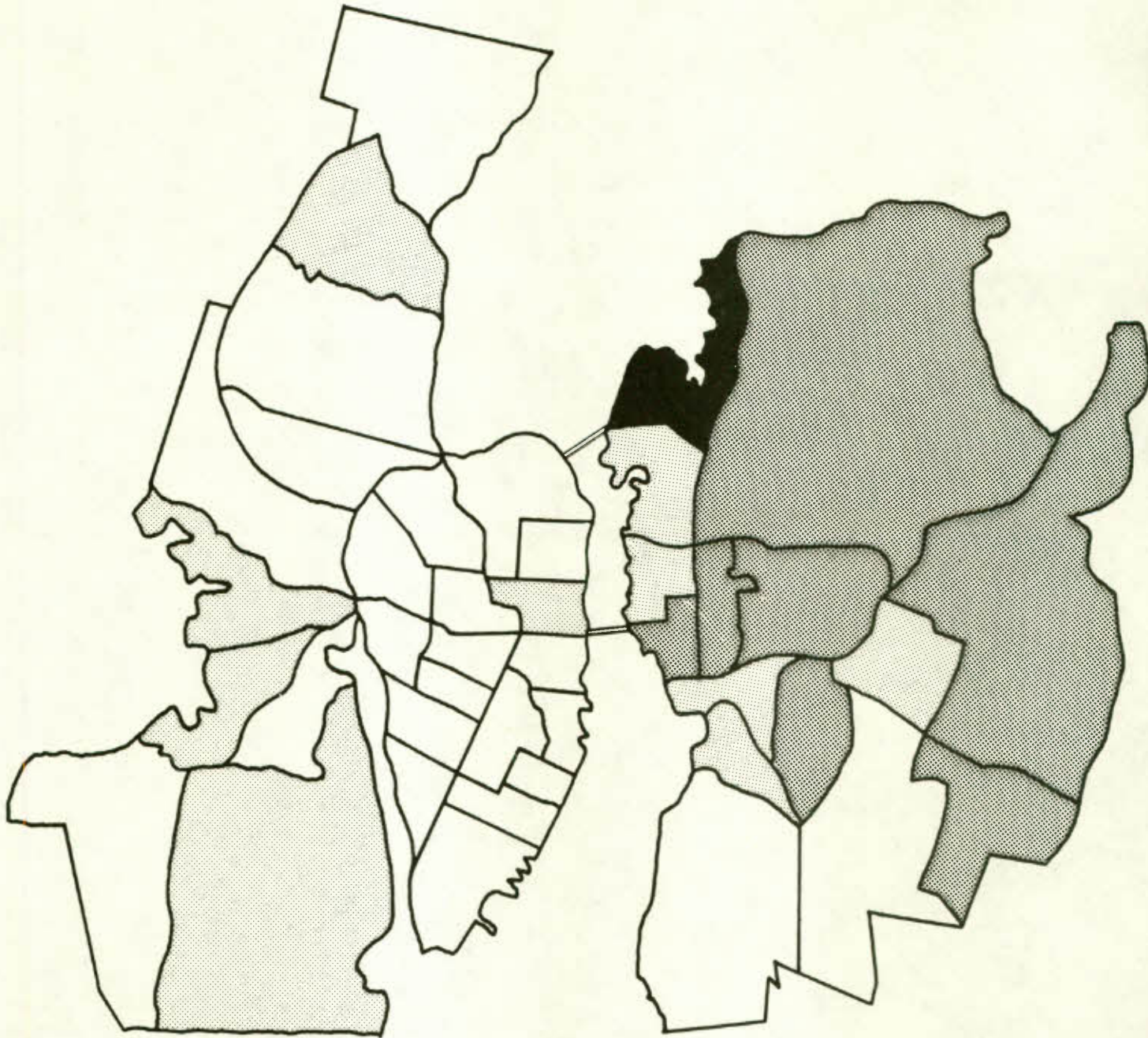


less than 5.00%

Source: Statistics Canada and estimates by the authors.

Map 37

COMMUTING TENDENCY FROM EACH CT TO SEA 5, 1971
(Based upon Index 1 calculations)



2.00 or greater

0.00 to 0.99

1.00 to 1.99

less than 0.00

Source: Statistics Canada and estimates by the authors.

surprising pattern of commutation to SEA 5. In addition to thirteen CTs in Dartmouth, there were five CTs in Halifax which were overrepresented in the SEA 5 workforce. Of these five CTs, four are on the mainland and, therefore, individuals residing in these districts and working in the employment area had to commute across the heavily travelled peninsula as well as the Narrows.

Unlike SEAs 3 and 4, the majority of workers employed in SEA 5 did not live in Dartmouth. As can be seen from column 6 of Table 7, this municipality supplied 46.5 per cent of the SEA's workers while Halifax, the UCTs, and the census divisions accounted for 21.0 per cent, 15.5 per cent, and 17.0 per cent, respectively. Those workers who did live in Dartmouth were generally residentially distributed throughout the city. No CT was the home for more than 6.4 per cent of the SEA's workforce and, as Map 38 shows, only three CTs (100, 103, and 107) supplied less than 2 per cent. Finally, this map again points out the unexpected flows from Halifax.

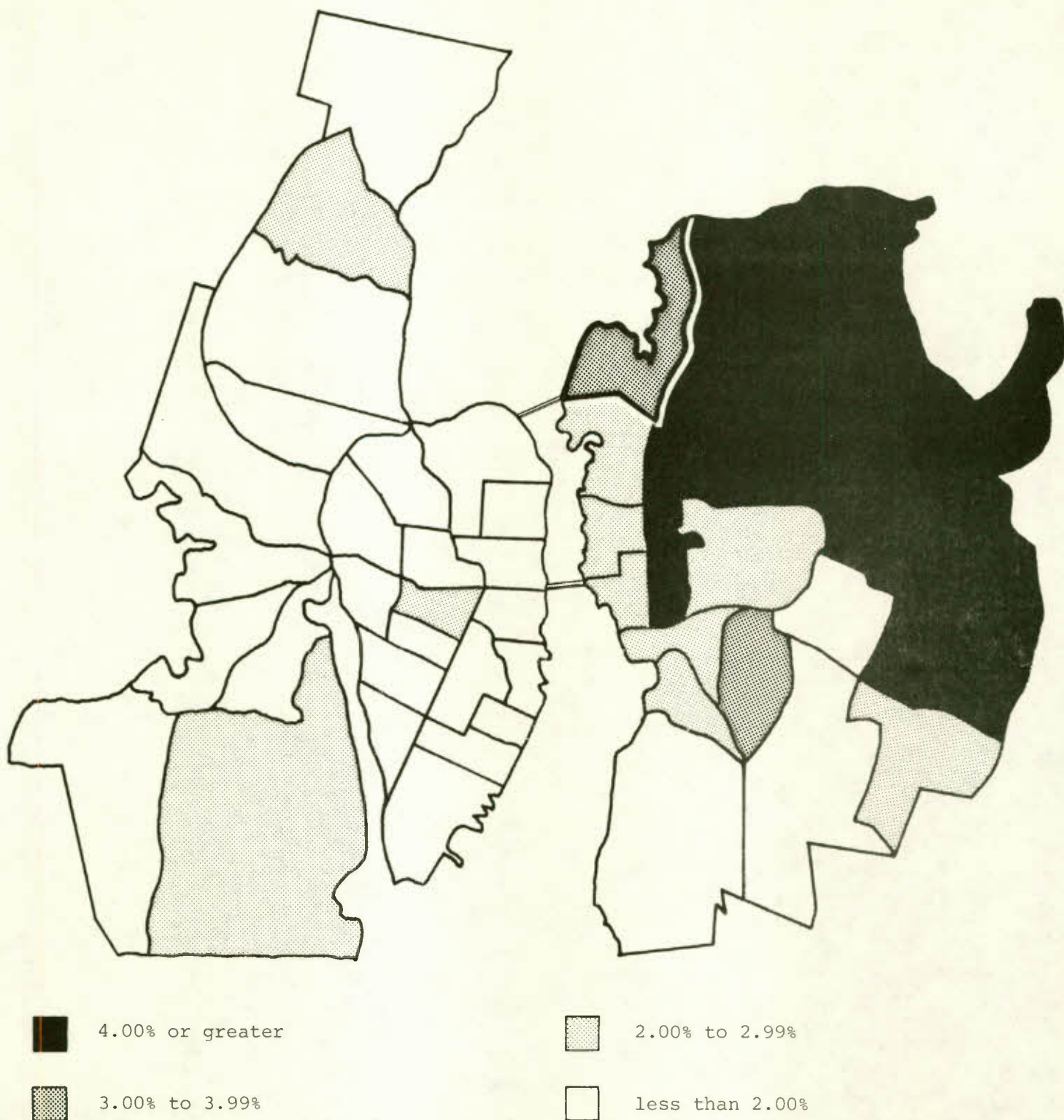
SEA 5, then, was the only employment centre in Dartmouth which received relatively significant commuting flows originating outside that municipality. Despite this, however, Dartmouth, and particularly its northern and eastern sections, was clearly the SEA's primary labour catchment area.

(g) Conclusion

To conclude this sub-section, we have seen that the dominant destination of commuting in the CMA was the Halifax

Map 38

THE RESIDENTIAL DISTRIBUTION OF THE
WORKING LABOUR FORCE OF SEA 5, 1971



Source: Statistics Canada and estimates by the authors.

peninsula where the ECBD, SEA 1, and SEA 2 are located. Although these three employment centres, to varying degrees, attracted workers residing throughout the CMA, over two-thirds (67.1 per cent) of their combined working labour force lived in Halifax. Clearly, the primary commuting corridor to these workplaces originated on the northern mainland and followed a south-east path to the city centre. While the journey-to-work terminated for many of these commuters in SEAs 1 and 2 on the northern peninsula, the majority continued on to the ECBD along with thousands of north peninsula residents who were also employed in the downtown area. Thus, this centrally-directed commutation from the north-west was the major contributor to the CMA's journey-to-work transportation demand. While three SEAs have been identified in Dartmouth, all had relatively weak employment pulls and, therefore, commuting access was not problematic.

2.3 The Journey-to-Work From Major Residential Areas

Having discussed the commuting patterns to the major employment areas in the Halifax-Dartmouth CMA, we shall now briefly examine the journey-to-work destinations of workers living in selected residential areas. In section 1.3.2, the residential distribution of the CMA workforce was considered and eight "Major Residential Outcommuting Areas" (MROAs) were identified. These MROAs, which are shown in Map 20, are the focii for this sub-section's analysis.

(a) MROA 1

As we saw in the previous sub-section, the major commuting corridor in the CMA runs in a south-east direction

from the northern Halifax mainland to workplaces on the peninsula. It would be expected, then, that the job locations of MROA 1 (CTs 24 and 25) residents would be heavily concentrated in the peninsula employment areas. Map 39 clearly shows that this was indeed the case as over three-quarters (76.1 per cent) of this MROA's outcommuters worked in the ECBD (48.6 per cent), SEA 1 (11.1 per cent), and SEA 2 (16.4 per cent), combined. It can also be seen from this map that the work destinations of the remaining outcommuters were well dispersed, as no other CT in Halifax or Dartmouth received more than 5 per cent of the out-flow from MROA 1.

(b) MROA 2

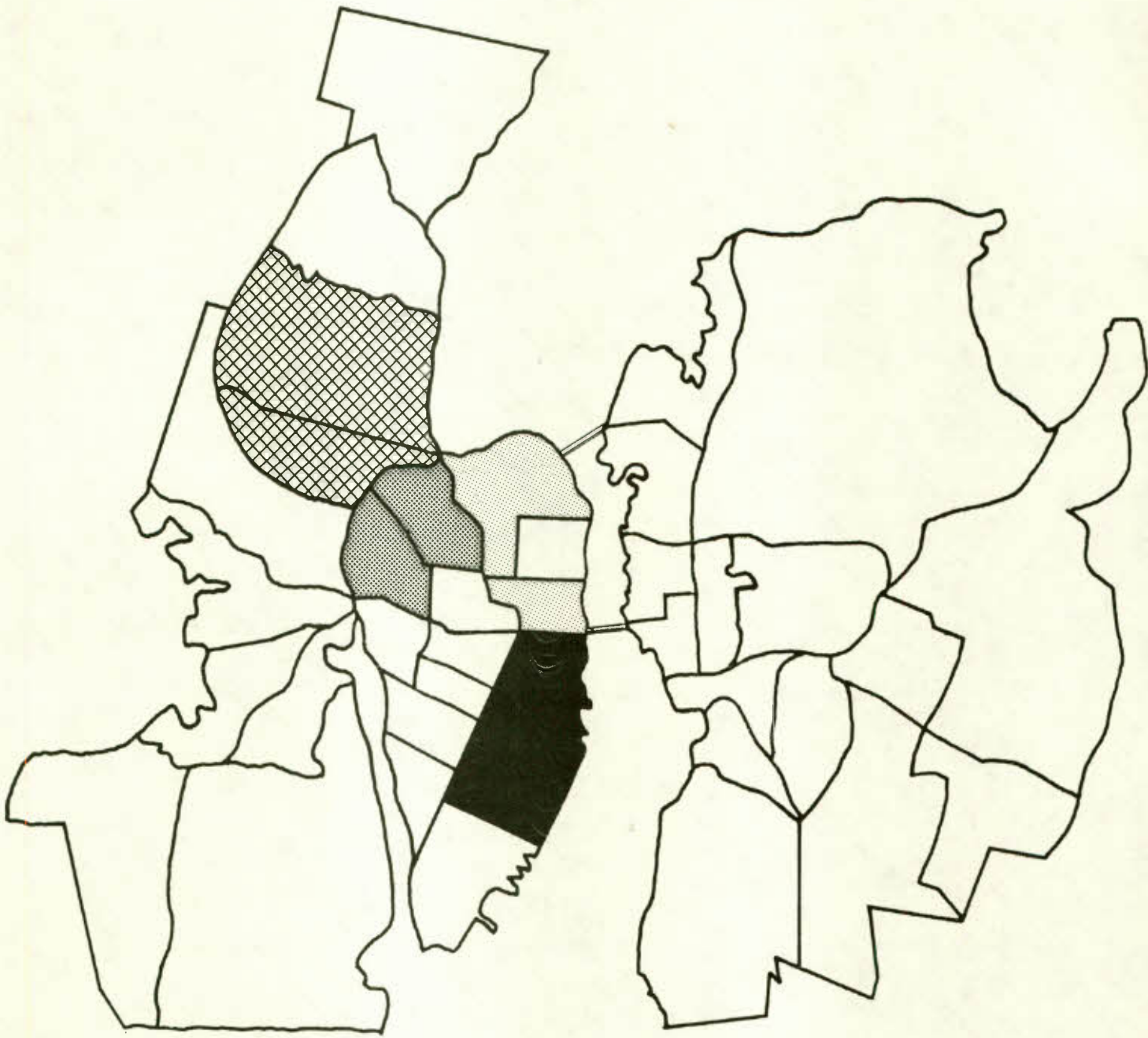
MROA 2 consists of CTs 18 and 23 and, therefore, occupies the same geographical area as SEA 2. As would be expected, a large proportion (25.1 per cent) of its resident labour force was employed within the MROA itself. From Map 40, it can be seen that the predominant destinations of MROA 2 out-commuters were the other employment areas on the peninsula. Over half (56.2 per cent) of these outcommuters worked in the ECBD while 18.7 per cent were employed in SEA 1. Certainly, geographical proximity and abundant job opportunities accounted for the attraction of the peninsula employment centres upon MROA 2 residents.

(c) MROA 3

Like MROAs 1 and 2, the job locations of MROA 3 residents were also concentrated on the Halifax peninsula. MROA 3

Map 39

THE JOB LOCATIONS OF THE MROA 1 OUTCOMMUTERS, 1971
(As a percentage of the total outcommuters)



30.00% or greater



15.00% to 29.99%



5.00% to 14.99%



less than 5.00%

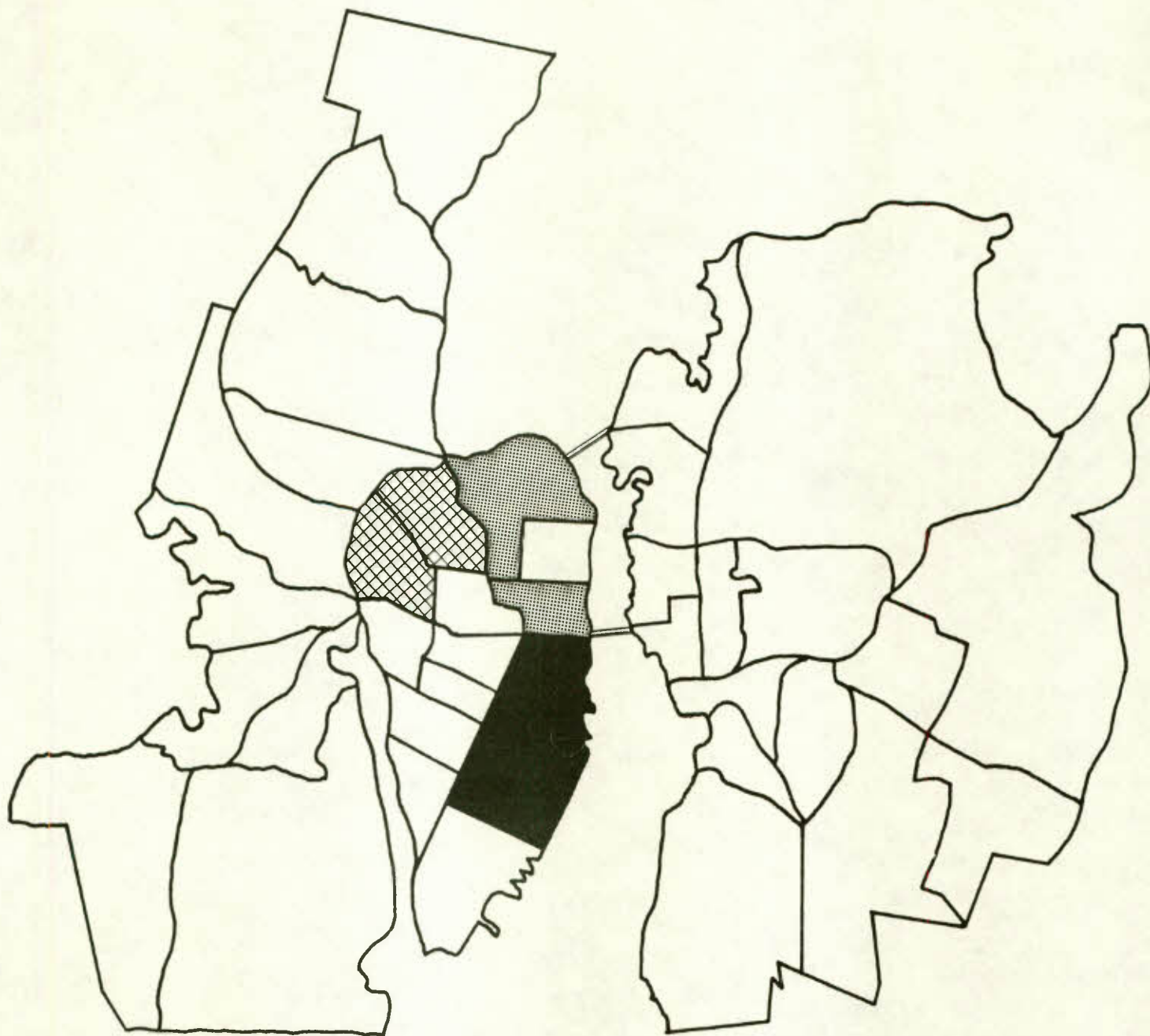


MROA

Source: Statistics Canada and estimates by the authors.

Map 40

THE JOB LOCATIONS OF THE MROA 2 OUTCOMMUTERS, 1971
(As a percentage of the total outcommuters)



30.00% or greater



15.00% to 29.99%



5.00% to 14.99%



less than 5.00%



MROA

Source: Statistics Canada and estimates by the authors.

consists of CTs 21 and 22 and, therefore, includes part of SEA 1 which is comprised of CTs 20 and 22. Over one-fifth (20.5 per cent) of the MROA 3 resident workers were employed in this employment centre. Map 41 shows that the major destination of the outflows originating in MROA 3 was the ECBD which received 58.3 per cent of its outcommuters. The neighbouring SEA 2 employed an additional 8.4 per cent of this residential area's outcommuters.

(d) MROA 4

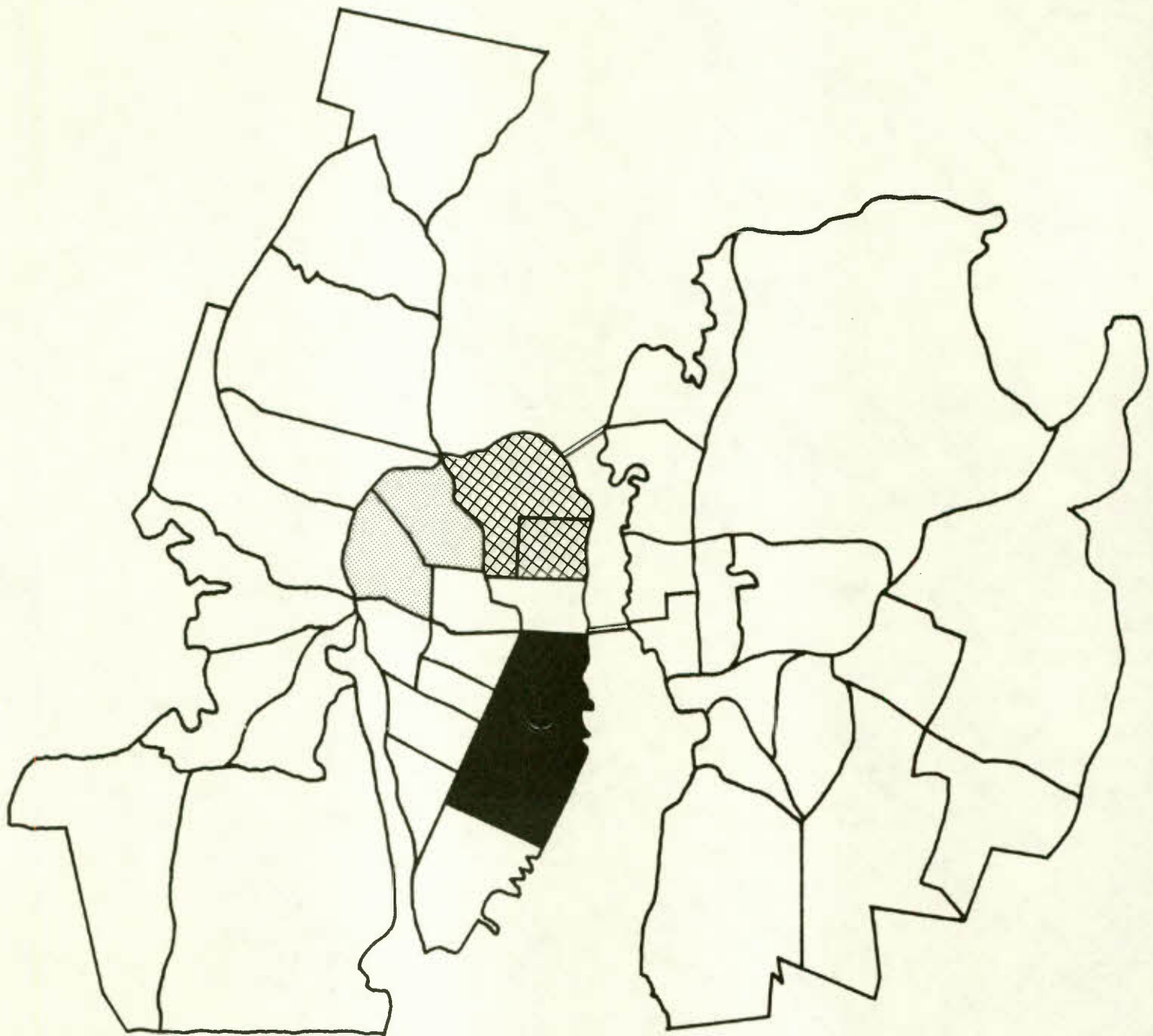
As can be seen from Map 42, the job locations of MROA 4 (CTs 11 and 19) residents were quite similar to those characterizing workers living in the MROAs previously discussed. Of the 4,800 MROA 4 outcommuters, 81.3 per cent had jobs in the three peninsula employment areas. Of particular importance was the ECBD which attracted 60 per cent of these outcommuters while SEA 1 and SEA 2 employed 10.7 per cent and 10.5 per cent, respectively. Certainly, the location of MROA 4 adjacent to each of these employment areas was an important factor in their predominance, as workplaces, for the MROA's residents. Given their geographical proximity and employment opportunities, it is not surprising that no other CT in Halifax or Dartmouth received more than 5 per cent of the outcommutation from MROA 4.

(e) MROA 5

MROA 5, consisting of CTs 6 and 13, represents part of the prosperous southern peninsula district. As Map 43 shows, the three employment centres on the peninsula were the predominant

Map 41

THE JOB LOCATIONS OF THE MROA 3 OUTCOMMUTERS, 1971
(As a percentage of the total outcommuters)



30.00% or greater



15.00% to 29.99%



5.00% to 14.99%



less than 5.00%

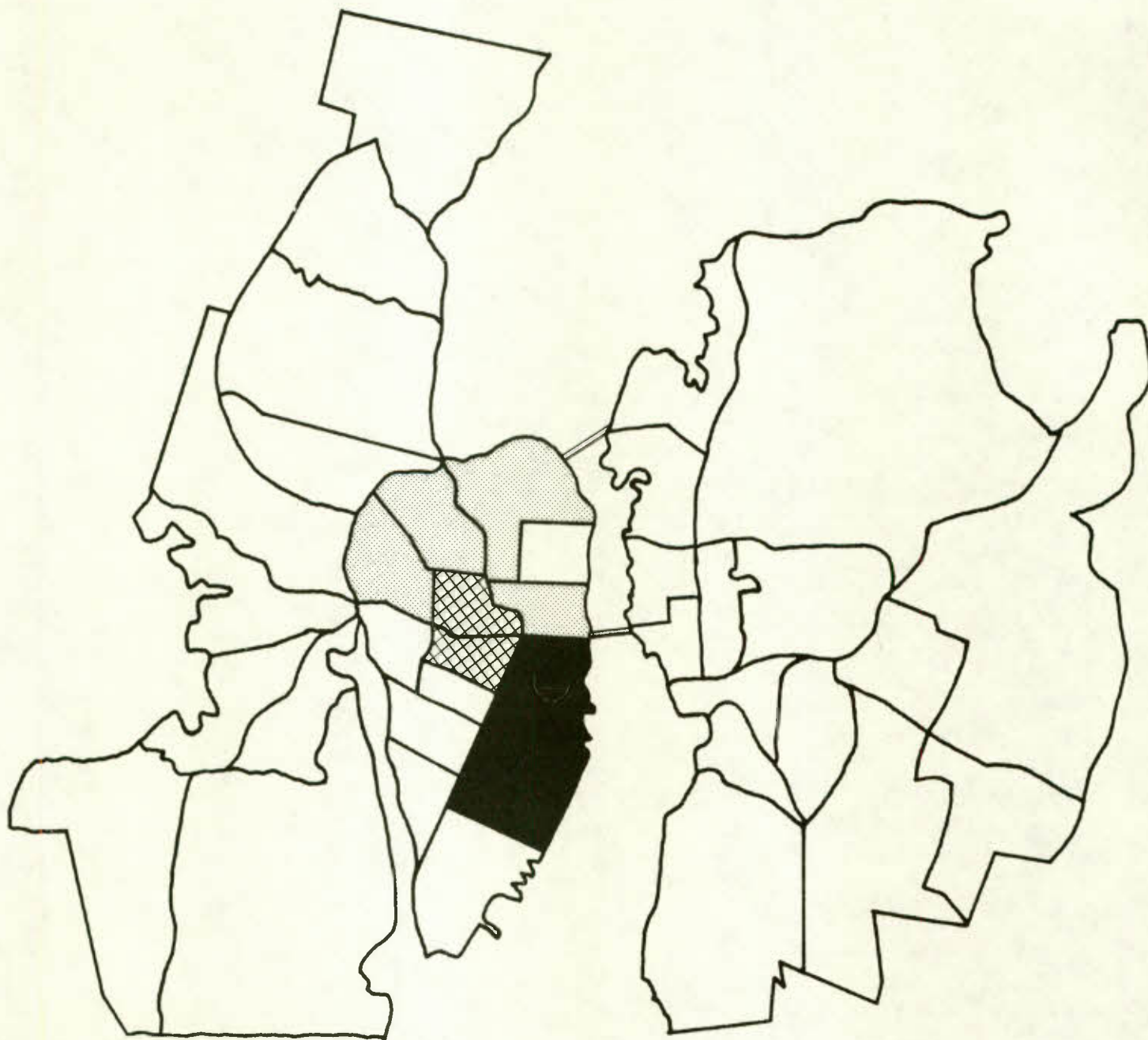


MROA

Source: Statistics Canada and estimates by the authors.

Map 42

THE JOB LOCATIONS OF THE MROA 4 OUTCOMMUTERS, 1971
(As a percentage of the total outcommuters)



30.00% or greater



15.00% to 29.99%



5.00% to 14.99%



less than 5.00%

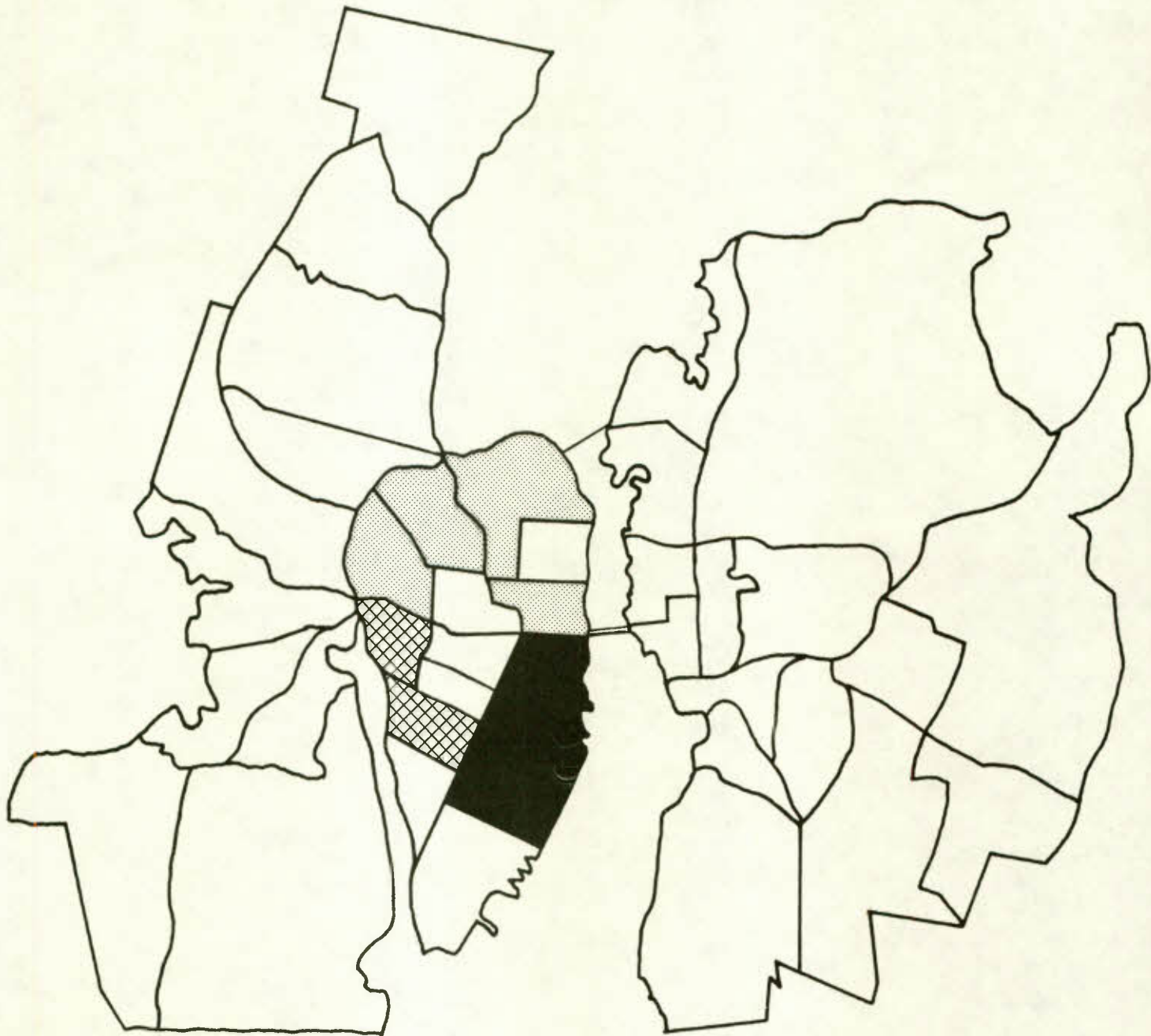


MROA

Source: Statistics Canada and estimates by the authors.

Map 43

THE JOB LOCATIONS OF THE MROA 5 OUTCOMMUTERS, 1971
(As a percentage of the total outcommuters)



30.00% or greater



15.00% to 29.99%



5.00% to 14.99%



less than 5.00%



MROA

Source: Statistics Canada and estimates by the authors.

commuting destinations for this MROA's resident workers. Of greatest importance was the ECBD which employed 67.3 per cent of the area's outcommuters while SEA 1 and SEA 2 attracted 5.1 per cent and 8.9 per cent, respectively. Combined, then, these three peninsula employment centres received 81.3 per cent of the MROA 5 outcommuters.

(f) MROA 6

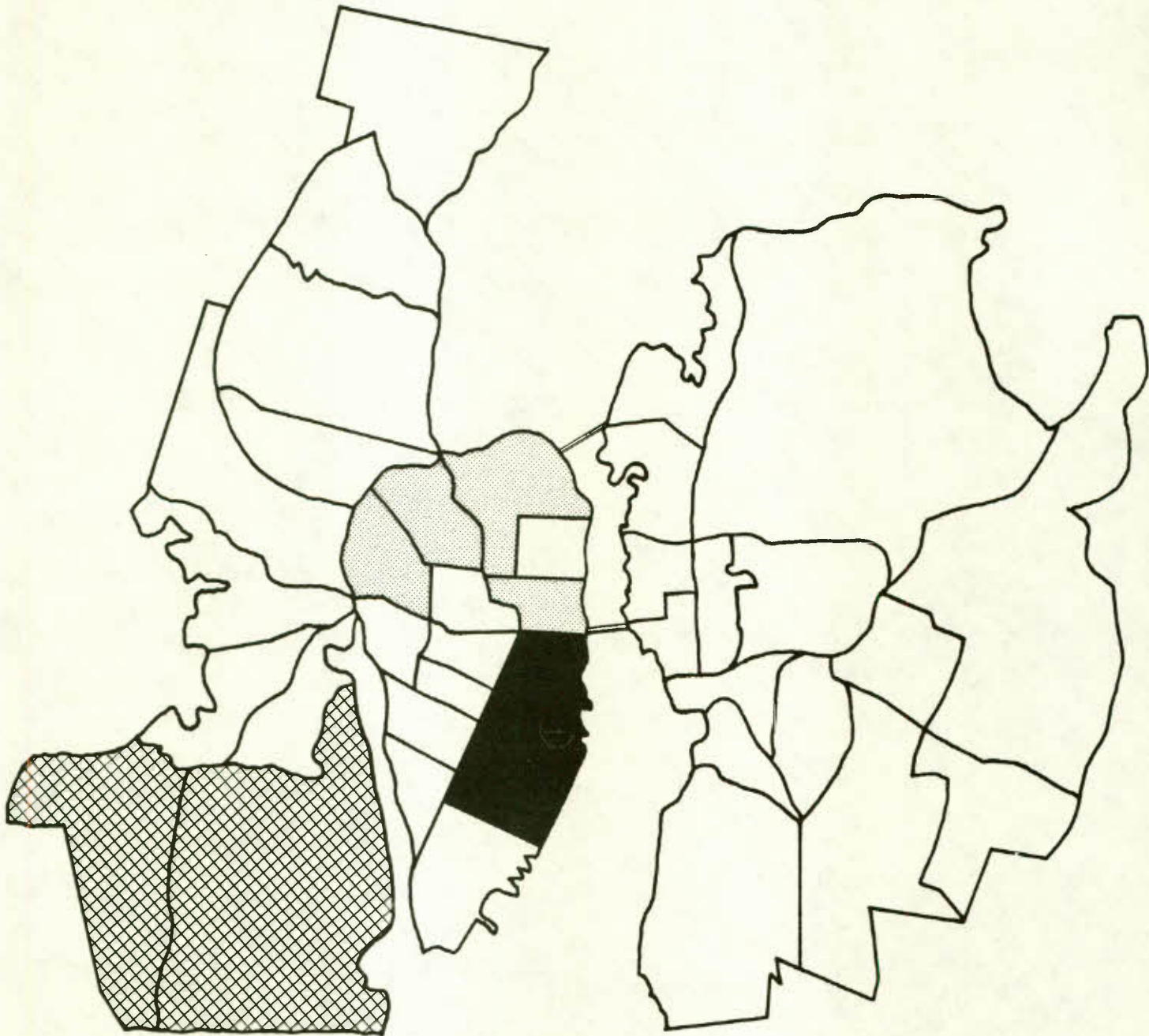
Like the other major residential outcommuting areas in Halifax, the vast majority (70.4 per cent) of the MROA 6 (CTs 1 and 2) outcommuters worked in the three peninsula employment areas. Almost half (48.6 per cent) of this outflow went to the ECBD while SEA 1 and SEA 2 received 10.6 per cent and 11.3 per cent, respectively (Map 44). Since most of this commutation from the south mainland enters the peninsula via the Armdale Rotary, this job location concentration may well give rise to traffic congestion at that point.

(g) MROA 7

MROA 7 consists of the Dartmouth CTs 101 and 102 and, therefore, includes SEA 3 which is represented by CT 102. The proportion of the MROA 7 resident workers who were employed in SEA 3 was 16.0 per cent. Again, in the case of this MROA, the ECBD was the major commuting destination as it attracted 33.9 per cent of the outcommuters from MROA 7. Map 45 shows that SEA 1 on the Halifax peninsula and SEA 4 in southern Dartmouth were also significant employment centres for this MROA as they received 8.7 per cent and 12.0 per cent of its outcommuters,

Map 44

THE JOB LOCATIONS OF THE MROA 6 OUTCOMMUTERS, 1971
(As a percentage of the total outcommuters)



30.00% or greater



15.00% to 29.99%



5.00% to 14.99%



less than 5.00%

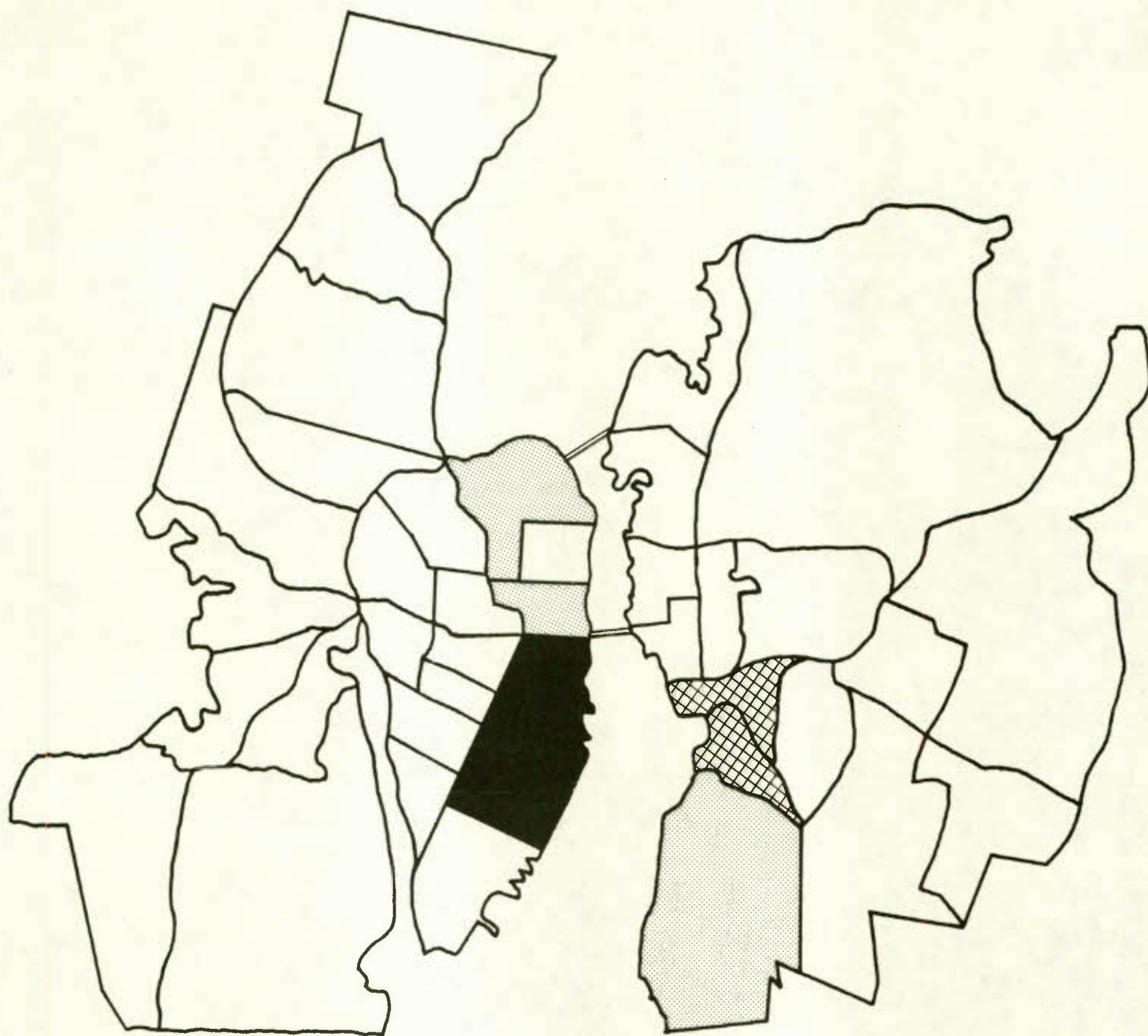


MROA

Source: Statistics Canada and estimates by the authors.

Map 45

THE JOB LOCATIONS OF THE MROA 7 OUTCOMMUTERS, 1971
(As a percentage of the total outcommuters)



30.00% or greater



15.00% to 29.99%



5.00% to 14.99%



less than 5.00%



MROA

Source: Statistics Canada and estimates by the authors.

respectively. Although the peninsula remained the most important commuter destination for MROA 7 residents, then, the rates of incommutation to the employment centres in this area were lower from MROA 7 than from any of the Halifax MROAs.

(h) MROA 8

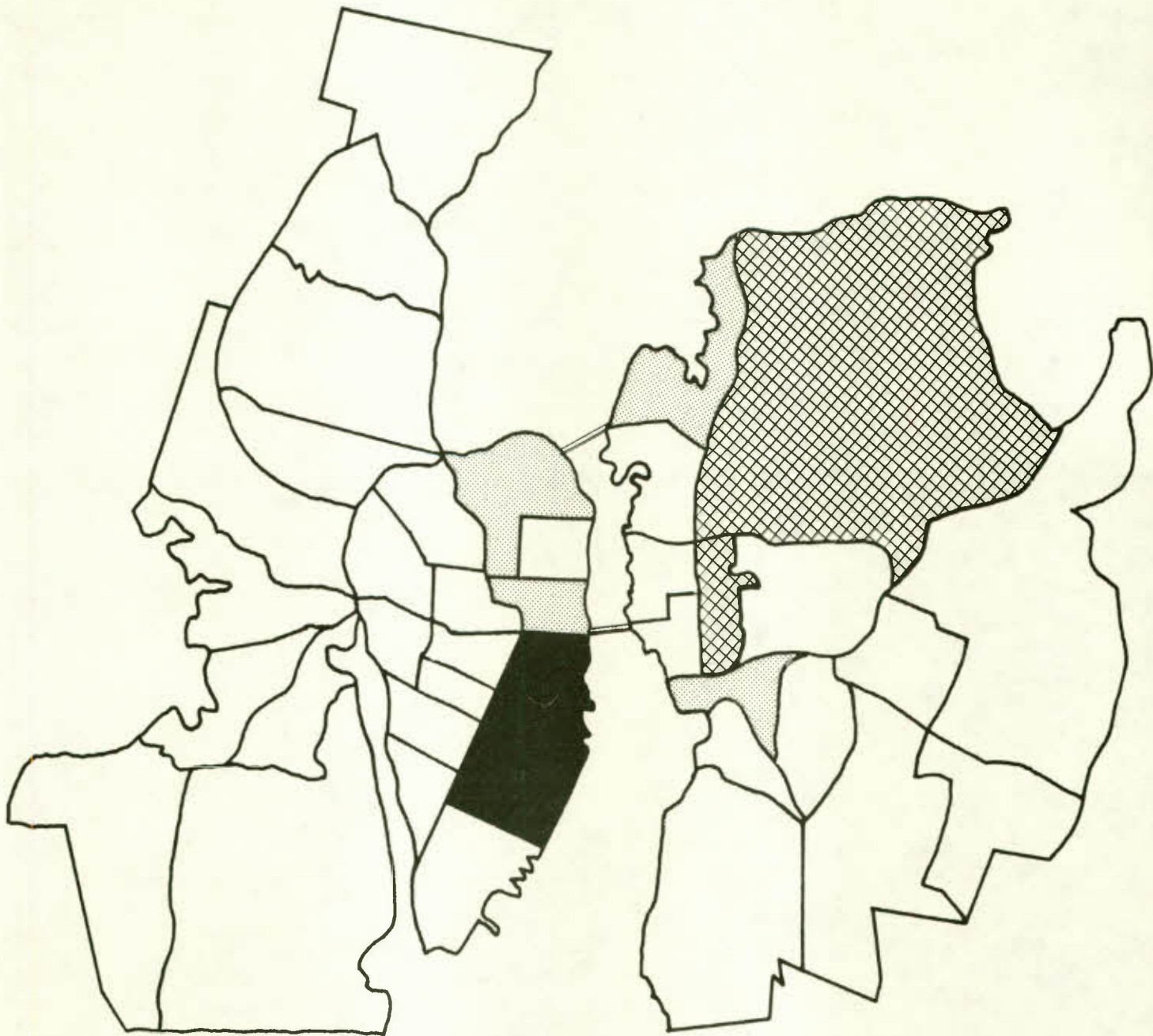
MROA 8 consists of the Dartmouth CTs 109 and 114. As Map 46 indicates, the job location pattern of this MROA's outcommuters was more widely dispersed than that characterizing any of the major residential outcommuting areas. Of the 3,420 MROA 8 outcommuters, 37.4 per cent worked in the ECBD and 8.0 per cent in SEA 1. Together, the three employment centres on the peninsula attracted 47.5 per cent of the MROA 8 outcommuters. In addition, the Dartmouth SEAs 3 and 5 were both important workplaces as they received 7.9 per cent and 5.4 per cent of the MROA's outcommuters.

(i) Conclusion

The brief analysis of the journey-to-work patterns from eight selected residential outcommuting districts in the urban area illustrates, once again, the concentration of employment-generating activity on the Halifax peninsula. This centralization of flow destinations was greatest for those commuters from the six Halifax MROAs. While the job location patterns of the Dartmouth MROA outcommuters were more widely dispersed, the dominant employment area was still the Halifax peninsula. While this concentration encourages certain economies of activity, it also may result in traffic/transportation congestion problems.

Map 46

THE JOB LOCATIONS OF THE MROA 8 OUTCOMMUTERS, 1971
(As a percentage of the total outcommuters)



Source: Statistics Canada and estimates by the authors.

2.4 Home Work Distances to the Major Employment Areas

As an aid to the interpretation of the preceding discussion, we conclude this section with information on commuting distances in Halifax-Dartmouth. The distances, in kilometres, between CT/UCT/CD centroids are presented in Table 9. Specifically, these centroids, which have been derived by Statistics Canada from the 1971 Census, are the residential centres of the census tracts. The actual distances between census tracts have been calculated by the Department of Civil Engineering of the University of Waterloo³⁰ and are based upon the shortest residential-arterial road path between centroids. These derived distances are extremely relevant given that air distances are misleading proxies for actual commuting distances in a physical setting such as the Halifax-Dartmouth urban area.³¹

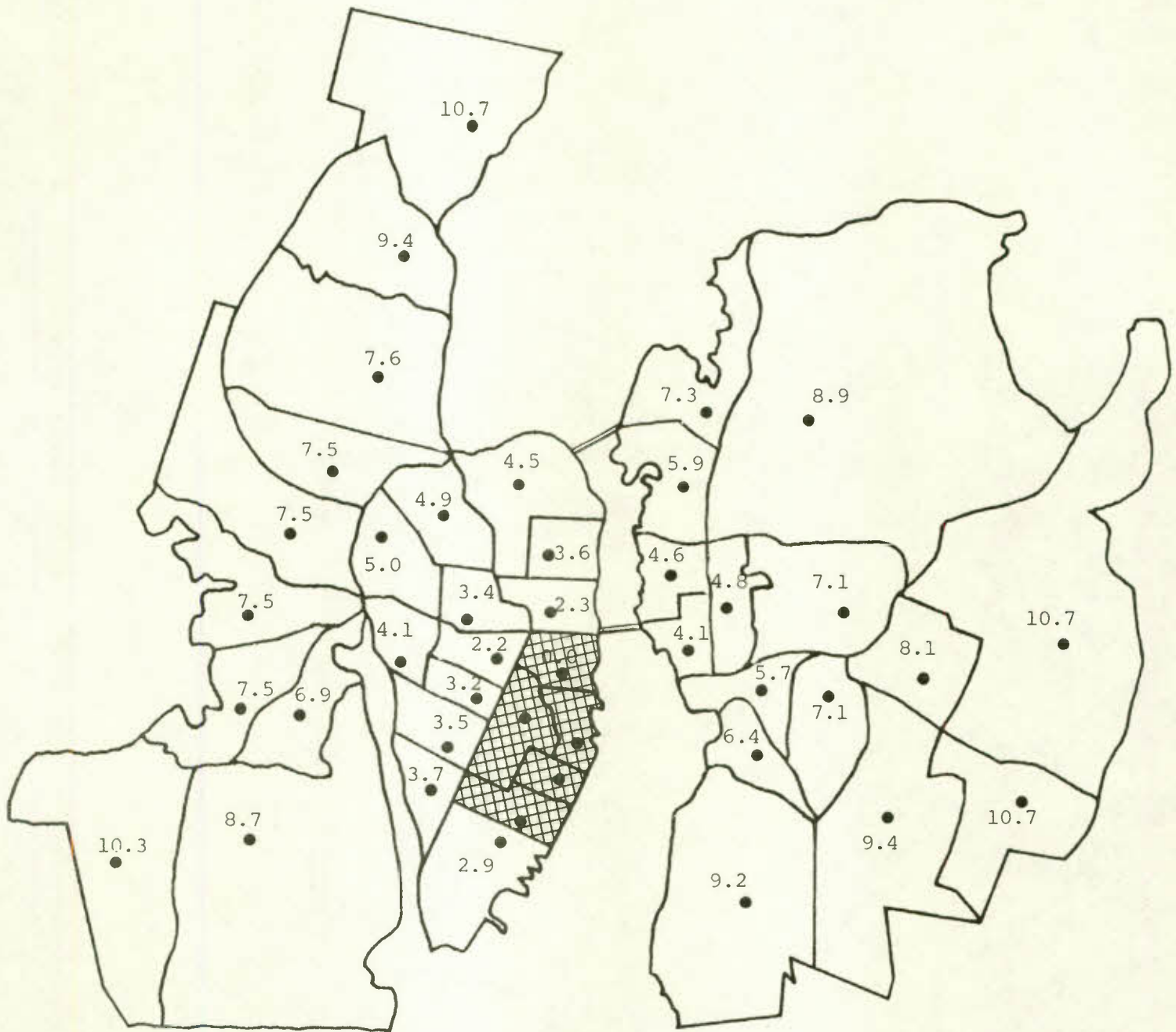
On the basis of the data presented in Table 9, the distances to each of the employment areas from all the census tracts are shown in Maps 47 to 52. These distances, then, refer to the *average* trip in kilometres, from the residential centre

30. The principal director of the project is Professor B.G. Hutchinson, Department of Civil Engineering, University of Waterloo, Waterloo, Ontario N2L 3G1.

31. It should be noted that this network of distances was *not* developed for traffic assignment purposes. Our purpose, as well as that of the University of Waterloo group, is to evaluate residential, employment, and commuting patterns rather than become involved in detailed street planning.

Map 47

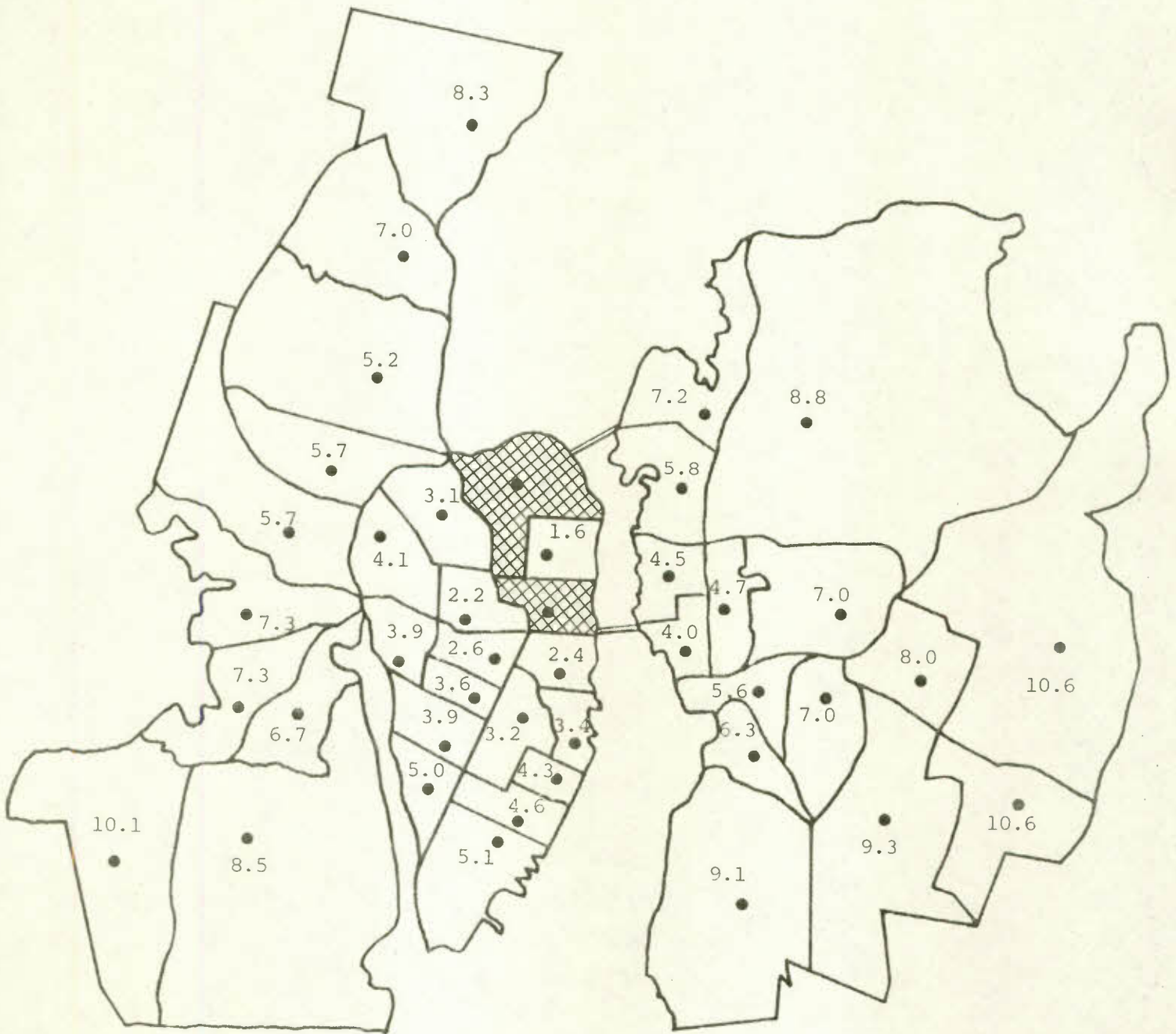
ROAD DISTANCE TO CENTROID OF CT 9
(Proxy for ECBD)
FROM CENTROID OF RESIDENT CT
(In kilometres)
(Distance within ECBD recorded as 0.0)
1971



Source: Department of Engineering, University of Waterloo, Waterloo, Ont.

Map 48

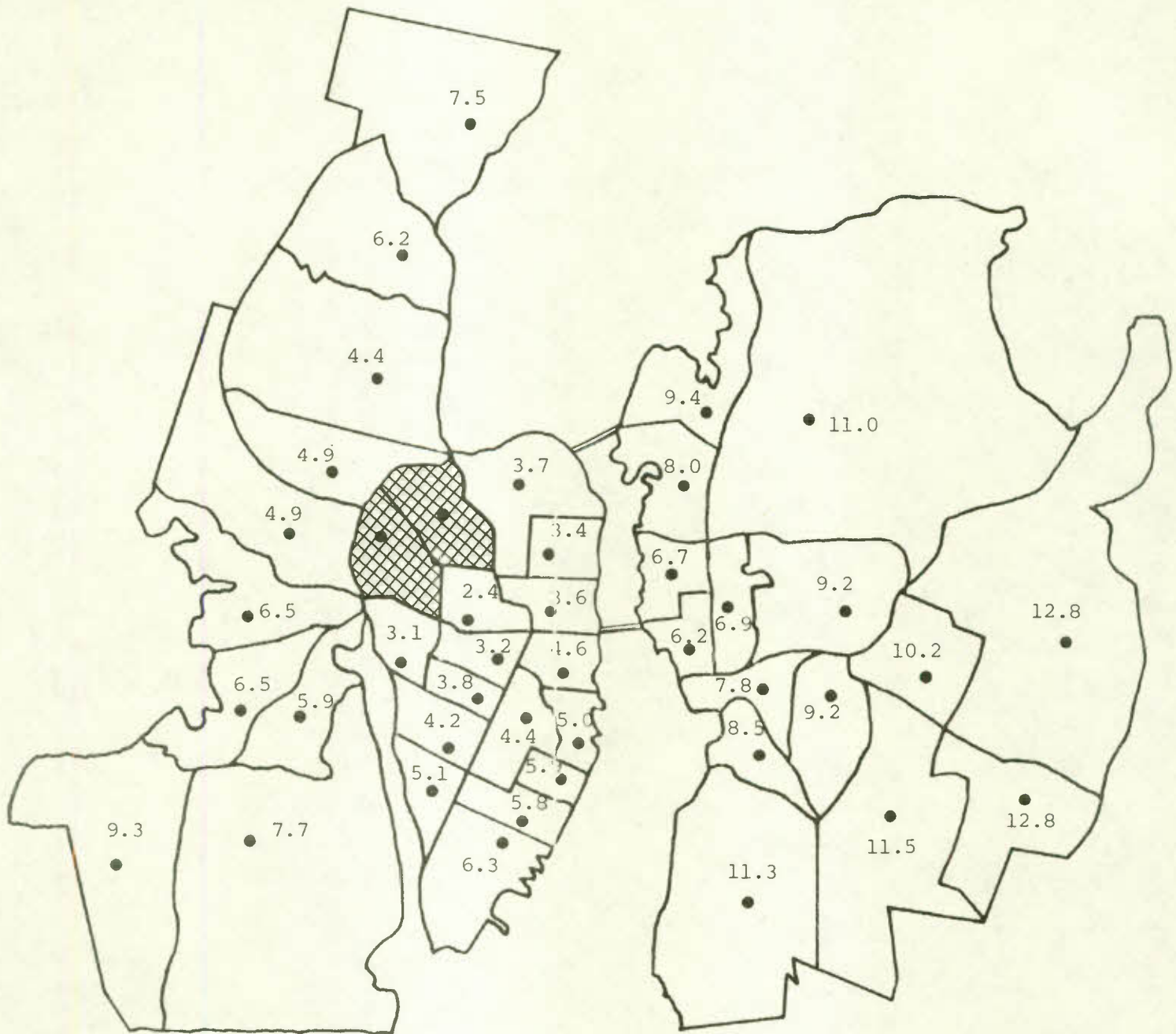
ROAD DISTANCE TO CENTROID OF SEA 1
FROM CENTROIDS OF RESIDENT CT
(In kilometres)
(Distance within SEA 1 recorded as 0.0)
1971



Source: Department of Engineering, University of Waterloo, Waterloo, Ont.

Map 49

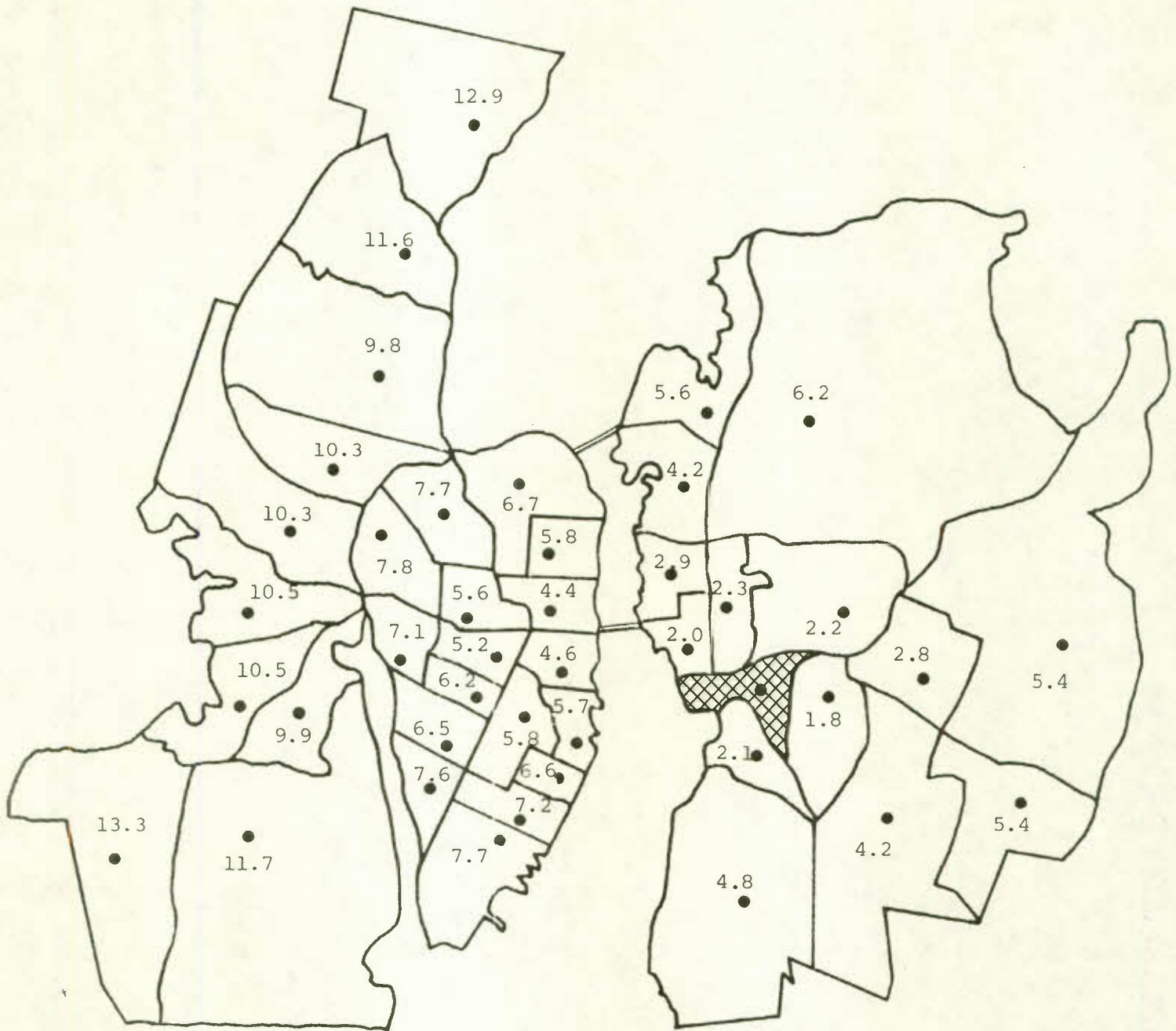
ROAD DISTANCE TO CENTROID OF SEA 2
FROM CENTROIDS OF RESIDENT CT
(In kilometres)
(Distance within SEA 2 recorded as 0.0)
1971



Source: Department of Engineering, University of Waterloo, Waterloo, Ont.

Map 50

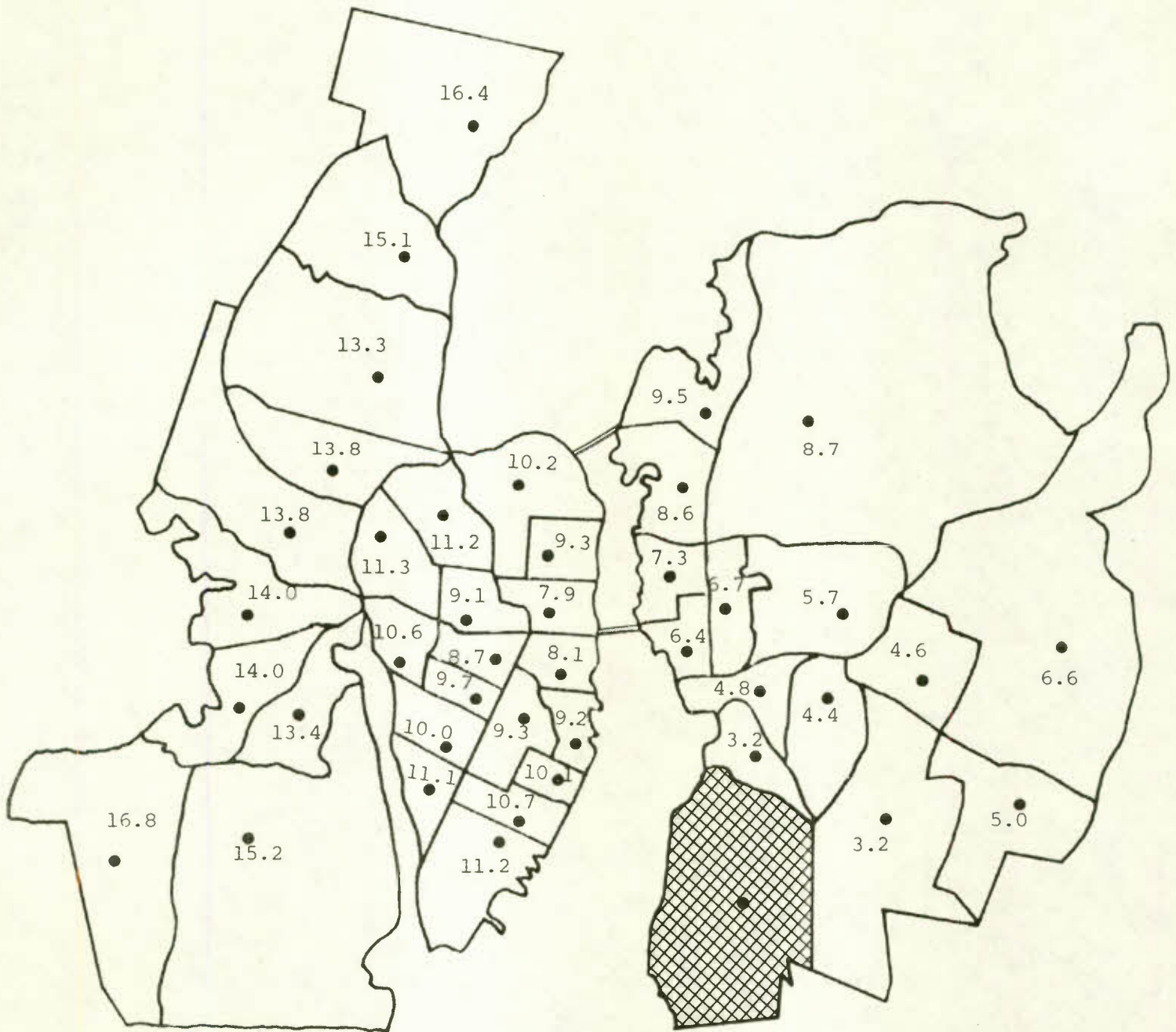
ROAD DISTANCE TO CENTROID OF SEA 3
FROM CENTROIDS OF RESIDENT CT
(In kilometres)
(Distances within SEA 3 recorded as 0.0)
1971



Source: Department of Engineering, University of Waterloo, Waterloo, Ont.

Map 51

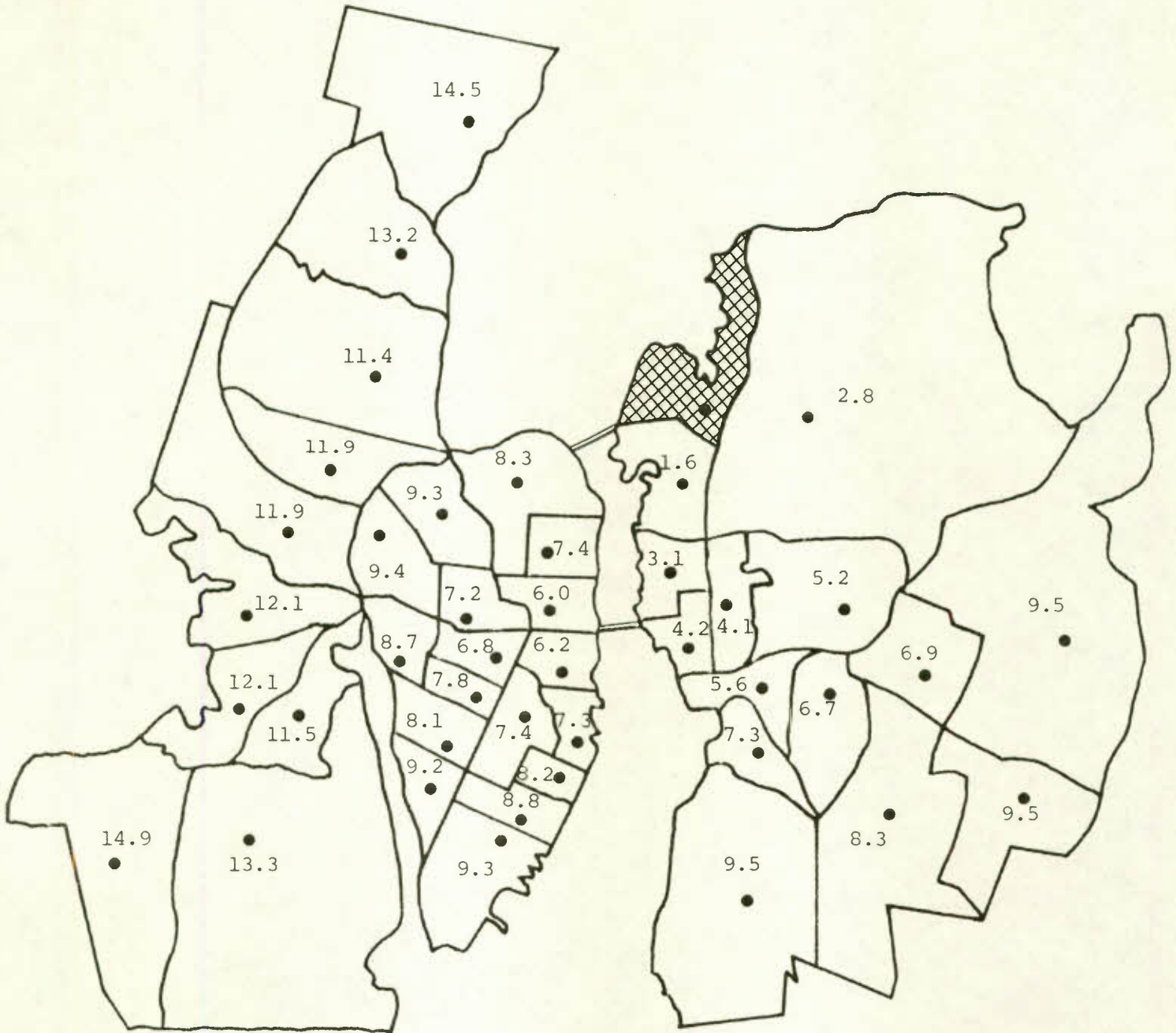
ROAD DISTANCE TO CENTROID OF SEA 4
FROM CENTROIDS OF RESIDENT CT
(In kilometres)
(Distances within SEA 4 recorded as 0.0)
1971



Source: Department of Engineering, University of Waterloo, Waterloo, Ont.

Map 52

ROAD DISTANCE TO CENTROID OF SEA 5
FROM CENTROIDS OF RESIDENT CT
(In kilometres)
(Distance within SEA 5 recorded as 0.0)
1971



Source: Department of Engineering, University of Waterloo, Waterloo, Ont.

of any CT to the centroid of the employment zone.³² As can be seen from these maps, distances within a single census tract or employment area are assumed to be zero.

Finally, it should be noted that while these recorded distances taken into account geographical eccentricities, they cannot completely reflect the time and other costs associated with road network bottlenecks. In conjunction with congestion costs estimates, however, these home-work distance data constitute a necessary set of information for an understanding of the urban system.

Section 3: Summary and Conclusions

In many respects, the urban structure, journey-to-work patterns, and the attendant commuting problems of the Halifax-Dartmouth CMA are similar to those characterizing other Canadian metropolitan areas. Stated simply, the on-going residential decentralization of the growing population and the continued concentration of employment-generating activity in the downtown area are acting to increase the CMA's total distance commuted daily and to aggravate congestion in the central core. Halifax-Dartmouth has, however, certain unique physical characteristics which also affect the nature of its commuting patterns. In this

32. In the case of the ECBD (Map 47), the recorded distances are to the centroid of CT 9 which is the "core" of the ECBD and, therefore, has been taken as the proxy centroid for the employment area as a whole. SEA 1 and SEA 2 (Maps 48 and 49) each consist of two census tracts and, consequently, the recorded distances have been calculated by averaging the distances to the centroids of their two constituent CTs, in each case.

section, the major conclusions which have emerged from our analysis of the journey-to-work in the Halifax-Dartmouth CMA will be presented.

The residential pattern of the employed labour force cannot be viewed solely from the perspective that people will situate their homes in order to have convenient access to their place of employment. Socio-economic characteristics of individuals and their families and the supply of different types of housing also combine to explain or determine this pattern. These latter factors have dictated the development of residential growth in the suburban areas of Dartmouth and mainland Halifax. Young families at the child-rearing stage have been particularly attracted to these districts with their new housing and relatively low land-rent costs. While the rate of population growth is highest in these suburbs, the Halifax peninsula and the central core of Dartmouth remain the most densely populated areas in the CMA. In comparison with the suburban districts, these central areas exhibit great variation with respect to socio-economic characteristics. The southern part of the Halifax peninsula is the most prosperous area in the CMA and the high income district in Dartmouth is adjacent, on the north-east, to that city's "downtown" area. On the other hand, despite some commercial and residential renewal, the areas north of the harbour and along both sides of the Narrows are populated by the lowest income groups with the least potential to realize upward social and economic mobility.

In contrast to the distribution of residences, the location of job opportunities within the CMA is very concentrated. Clearly, the focal point, from an employment perspective, is a small area of 3.9 square kilometres on the Halifax peninsula. Over 40 per cent of the CMA's jobs were located in this area which we have labelled the "Extended Central Business District". While no other zone approaches this district in importance as a workplace, the two most significant secondary employment areas are also situated on the peninsula. These two SEAs, which accounted for over 16 per cent of the CMA's jobs, are both located within five kilometres north-west of the ECBD. In addition, three employment areas can be identified in Dartmouth, although none provided more than 4 per cent of all the CMA's jobs. Clearly the ECBD and these five SEAs dominate the employment opportunities available in the urban area. In fact, approximately two out of every three jobs in the CMA were located within these six employment centres. There was little concentration with respect to the location of the remaining job opportunities in the CMA. In fact, no census tract, other than those in the specified employment areas, was the place of work for greater than 5 per cent of more than three other CTs' resident labour forces.

The ECBD is the only employment area in Halifax-Dartmouth which drew workers residing throughout the CMA. The "employment pull" of the ECBD is greatest upon its own residents and decreases as one moves outward from the "downtown" area.

This attraction, however, was not equal in all directions as those workers residing in the populous areas to the north-west of the ECBD on the peninsula and the Halifax mainland constituted the major inflow into this employment centre. The northern peninsula and mainland were also the primary origins for commutation to the other two Halifax peninsula employment areas. In addition, these SEAs employed significant numbers of workers residing on the southern Halifax mainland and in northern Dartmouth. Finally, the three secondary employment areas in Dartmouth primarily attracted their workers from residents of that municipality.

On the basis of our analysis of the journey-to-work patterns in the Halifax-Dartmouth CMA, the following emerge as the major issues associated with commuting within the urban area:

1. With the majority of the CMA's jobs located on the Halifax peninsula, access to this area is of fundamental importance within the overall commuting pattern. Moreover, with the expected continuation of the decentralization of the growing population away from the peninsula area, this issue will become increasingly critical in the future. While the accommodation of centrally-directed commuting flows destined for the downtown area is difficult for most urban systems, the situation is particularly problematic in the case of Halifax-Dartmouth. This is due, of course, to the natural barriers surrounding the peninsula which inhibit access from the three major outlying areas; the northern mainland, the southern mainland, and Dartmouth.

(a) The primary commuting corridor to the peninsula runs in a south-east direction from the northern Halifax mainland. Due to these relatively large flows and the limited number of access routes, congestion may well occur on the isthmus which connects the mainland to the peninsula. This potential commuting problem is aggravated by the dependence of mainland workers on the automobile. In an attempt to reduce congestion, steps are being taken to improve public transit service from the suburban areas. Northern mainland residents (particularly in census tracts 25 and 26) tend to be relatively prosperous, however, and as a consequence, strong incentives will be necessary to reduce their automobile dependency.

(b) Although the peninsula-bound inflows from the southern Halifax mainland are lighter than those from the north, this commuting corridor is still significant in the overall journey-to-work pattern. These flows from the southern mainland tend to funnel into the peninsula via the Armdale Rotary and may well cause severe traffic congestion. Again, this potential problem is aggravated by the high rate of automobile use on the part of the mainland residents.

(c) The other physical feature constraining access into the peninsula is the Narrows which requires Dartmouth commuters to direct their journey-to-work across the two bridges spanning this body of water. Although the attraction of peninsula workplaces is weaker for Dartmouth residents than for their Halifax counterparts, the flows across the Narrows to the ECBD and SEA 1 were significant.

2. As we have seen, then, the concentration of employment opportunities has resulted in heavy commuting flows into the centre of the urban area. These inflows, most notably from the north-west, deposit some workers in the northern peninsula SEAs; however, the majority continue on the ECBD. In addition, the journey-to-work of peninsula residents, who are strongly attracted to downtown jobs, greatly increases the traffic demand in the urban core. Consequently, congestion occurs in the downtown area during peak hours. Obviously, this problem can be at least partially alleviated with comprehensive public transit service.

3. In contrast to Halifax, commuting within Dartmouth is characterized by relatively light and diffuse traffic flows. Although certain SEAs have been identified in the municipality, none can be viewed as a major commuting destination. While this situation allows for the widespread use of automobiles without significant congestion problems, it does tend to render public transit costly and under-utilized.

4. As we have seen, most of low income districts are located in the central areas of Halifax and Dartmouth. The residents of these districts are situated close to abundant job opportunities, and, therefore, their journey-to-work distances and costs are low. Some relatively low income areas, (CTs 1, 14, 15, 24, 106, and 114), however, are located on the Halifax mainland and in the Dartmouth periphery. These CTs are not close to employment centres and, as a consequence,

a significant proportion of their residents must commute to jobs in the central core. As can be seen from Table 6, at least one-third (and ranging up to three-quarters) of those residing in each of these CTs worked in one of the peninsula employment centres. Certainly, the journey-to-work for these suburban residents poses problems. Time costs are high for those using public transit and financial costs are high for those who must rely on the automobile. One would expect, then, that this combination of low average income and high journey-to-work costs would result in high unemployment rates in these census tracts. Surprisingly, however, only CT 15 had more than 10 per cent of its eligible male labour force unemployed.

3.1 Future Residential Development Issues in the "Outer Areas"

The report has focused primarily upon the municipalities of Halifax and Dartmouth. It has not, however, specifically examined the "Outer Areas" of the CMA because data for this region are available to us only in a very aggregate form. Since the areas which are represented by UCT 120 and UCT 130 are very large, this data aggregation does not enable us to be adequately precise with respect to work/residence locations within them.³³

33. Some socio-economic and demographic data, comparable to that presented in Table 1, are available for the Bedford-Waverly Area of UCT 120. The source of this following information is the 1971 Census.

Population 1971	--	6,178	Average family income	--	\$10,310
Persons/acre	--	245.55	Median house value	--	\$20,444
Life cycle index	--	10.26	Male white collar rate	--	42.68
% population change			% University degree	--	3.16
1971 over 1966	--	+ 2.92			

And yet, these UCTs are of concern to city planners and administrators in Halifax and Dartmouth since housing is being developed in these two areas with some explicit encouragement by the Nova Scotia Housing Commission.³⁴ It appears, however, that this residential growth has no corresponding development of job creating activity. We have already seen, in Table 6 of this report, that the residents of these "Outer Areas" of the CMA are significantly attracted to job opportunities in the employment centres of Halifax and Dartmouth. Over 40 per cent of the workers residing in UCT 120, including Bedford, are employed in the ECBD and the five SEAs while over 45 per cent of the workers living in UCT 130, including Sackville, commute to jobs in one of these six employment centres. Clearly, then, an increase in the resident labour force of these UCTs without corresponding increases in local job opportunities will lead to even greater outcommutation from these areas -- or, possibly, employment and underemployment.³⁵

34. This has been indicated in correspondence from the City Manager of Halifax.

35. Certainly, problems associated with dispersed residential development and highly concentrated employment centres are not unique to Halifax-Dartmouth. If the "new" population in the Bedford and Sackville areas essentially represents a transfer from the densely populated areas of Halifax and Dartmouth, then it is possible that the employed individuals within this group may retain their jobs. Evidence suggests, however, that an increase in the distance to work encourages job transfers and, failing the availability of alternate jobs, possible unemployment. See A. Hecht, "The Journey-to-Work Distance in Relation to the Socio-Economic Characteristics of Workers", *Canadian Geographer*, Vol. XVIII, No. 4, 1974, pp. 367-378.

In addition to problems associated with the journey-to-work, residential dispersion normally leads to a greater reliance on the automobile as well as demands for new public services (roads, schools, water, sewers, and other community facilities) in the expanding areas and the under-utilization of these services in the areas being depopulated.³⁶ This is not to say that such development is without benefits. Clearly, if lower land prices and adequate building standards/requirements can be realized in suburbs of the two cities and in the "Outer Areas", housing prices should be relatively lower in these outlying zones. This will benefit families seeking better housing at the same private costs or equivalent housing at lower private costs. In addition, a *social* objective of adequate low-cost housing may be served for some of the population by a policy of dispersed housing development. The consequences to the individual and the society regarding objectives other than housing should also be considered. Clearly, the individual must balance the private costs (increased travel to work, decreased access to urban services and facilities, moving costs, etc.) against the increased benefits of improved housing value. It is also well known that there will be a tendency, upon the part of individuals who do move, to subsequently demand public services and amenities to a standard equivalent to or greater than those formerly available to them. As well, the "mover" will

36. See Map 5 for population growth/decline rates in the Halifax-Dartmouth census tracts.

generally petition to have the public sector reduce the travelling time/cost associated with the new home-work distances.

It follows, then, that a partial analysis of strategies and programs designed to improve the well-being of individuals with respect to one objective (housing, in this case) is not sufficient. Consideration must be given to the externalities (spill-over effects) as they affect other private and social objectives. This is the essence of comprehensive development planning. Since this report is neither a paid consultation nor an effort to become involved in detailed planning processes of the Halifax-Dartmouth area, we offer only a few suggested cost-benefit issues involved in the development of the "Outer Areas" for consideration at the local level and several broad strategy options (that may be operationalized at the local level) that exist at the city-region level.

Possible Costs and Benefit Issues Involved
in the Development of the "Outer Areas"

- | | |
|----------------------------|---|
| Possible Private Benefits: | Relatively lower cost housing for low income families -- Relatively lower density environment -- Relatively better access to open space. |
| Possible Private Costs: | Increased time/cost of job commuting -- Some loss of employment or employment income -- Some loss of access to public facilities and services -- Some loss of access to socio-cultural centres. |
| Possible Social Benefits: | Increased personal commitment to property maintenance -- Some decrease in social tension (short-and medium-term) -- Some decrease in demand for public facilities and services in the short-term. |

Possible Social Costs: Increased demand for dispersed public facilities and services in "new area" -- Under-utilization of existing public facilities and services in "depopulated area" -- Loss of part of the "tax base" of inner cities (partly offset by increases in the base in new areas) -- Social and structural deterioration in depopulated area -- Increased traffic congestion at confluences of existing road networks entering major employment areas -- Disappearance of open space, natural habitat and possibly agricultural land -- Deterioration of public transit (following loss in demand).

Possible Strategy Options

From the information base provided in the body of this report, city and regional planners should be able to consider alternate patterns of urban development with respect to certain quantifiable parameters which are subject to operationalization. Accordingly, the widespread consequences of the following strategy options should be formally evaluated.

- (a) Intensive development/redevelopment within built-up areas;
- (b) Directed growth along existing access corridors in a continuous outward pattern (i.e., no leap-frogging);
- (c) "Business as usual" -- private choice with minimal planning programs designed to account for externalities;
- (d) Planned matching of people and jobs in new development areas in order to circumvent transportation problems;
- (e) The "new towns" concept -- the maximization of home ownership/quality objectives and job concentration objectives (in existing employment areas) *with* the incorporation of rapid, low-cost mass transit to improve job accessibility.

From our analysis of the Halifax-Dartmouth CMA, a number of relevant observations can be made regarding residential development in the areas north of the Bedford Basin.

1. Like all CMA residents, workers living in Bedford and Sackville are highly dependent upon job opportunities in the employment centres of Halifax and Dartmouth. It follows, therefore, that barring deliberate job creation in these areas, the commuting trips from Bedford and Sackville to the employment centres will increase, both in absolute and relative terms, as the population grows.

2. In general, depopulation is occurring in low-income, relatively low-value housing areas on the peninsula and along the Narrows on the Dartmouth side. It appears that young, growing families and less affluent families are moving outward from these older districts to the suburban and outer areas with their improved housing opportunities.

3. As a consequence of residential decentralization, the public infrastructure needs to be expanded in the outlying areas while the existing services in the depopulated districts tend to become under-utilized.

4. Residential development in Bedford and Sackville, then, poses problems regarding issues such as intra-urban transportation, employment, and the development/maintenance of public services. In order to alleviate these problems and achieve relevant private and social objectives, it may be necessary to:

- (a) encourage job creation in the new areas;
- (b) encourage rapid, low-cost public transit from the peripheral residential areas to the existing employment centres;
- (c) subsidize existing infrastructure maintenance and operating services (including transit) in the low-income, older housing areas of Halifax and Dartmouth;
- (d) regulate outlying residential development *and* upgrade deteriorating housing in the older central districts with (in all probability) some subsidization of renewal and replacement.

Finally, it should be mentioned that these comments are not designed to evaluate detailed options for development in Halifax-Dartmouth. We simply are not familiar with all the multitude of factors which must be considered in any operational development plan. The issues and strategy options noted are offered as suggestions which do not exhaust the available alternatives. They do, however, strongly suggest the need to examine housing objectives in a wide perspective of social, economic, and environmental concerns, as well as from a viewpoint of individual and family well-being. At the least, the data being provided should be helpful to such political and administrative decision-making processes.

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