

Neighbourhood Inequality in Canadian Cities

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Abstract

In this paper, we use census tract data to analyse changes in neighbourhood income inequality and residential economic segregation in the eight largest Canadian cities during the 1980-95 period. Is the income gap between richer and poorer neighbourhoods rising? Are high and low-income families increasingly clustered in economically homogeneous neighbourhoods? The main results are an elaboration of the spatial implications of the well-documented changes that have occurred in family income and earnings inequality since 1980. We find that between neighbourhood family income (post-transfer/pre-tax) inequality rose in all cities driven by a substantial rise in neighbourhood (employment) earnings inequality. Real average earnings fell, sometimes dramatically, in low-income neighbourhoods in virtually all cities while rising moderately in higher income neighbourhoods. Social transfers, which were the main factor stabilizing national level income inequality in the face of rising earnings inequality, had only a modest impact on changes in neighbourhood inequality. Changes in the neighbourhood distribution of earnings signal significant change in the social and economic character of many neighbourhoods. Employment was increasingly concentrated in higher income communities and unemployment in lower income neighbourhoods. Finally, we ask whether neighbourhood inequality rose primarily as a result of rising family income inequality in the city as a whole or because families were increasingly sorting themselves into “like” neighbourhoods. We find that economic spatial segregation increased in five of the eight cities and was the major factor behind rising neighbourhood inequality in four cities. A general rise in urban family income inequality was the main factor in the remaining four cities.

Keywords: Neighbourhood, income inequality, low-income.

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Introduction

Fueled by William Julius Wilson's classic study of Chicago ghettos, *The Truly Disadvantaged* (1987), American researchers have returned during the past decade to concerns over neighbourhoods characterized by high rates of poverty, low labour force attachment, and negative outcomes thought to be associated with deteriorating economic and social conditions in these neighbourhoods. Works by Jargowsky (1997), Massey and co-authors (1988, 1990, 1993) and numerous others have tried to untangle the extent and causes of neighbourhood low-income and inequality in the U.S. A research program led by Gregory and Hunter (n.d.) has also documented a substantial rise in neighbourhood inequality in Australian cities over the past twenty years, as economic opportunities in lower socio-economic neighbourhoods deteriorated.

Canadian research on neighbourhood inequality tends to be sparse by American standards but points in the same direction. MacLachlan and Sawada (1997) use census tract data to show that inequality between neighbourhoods has risen in most Canadian cities since 1970. Hatfield (1997) shows that the percentage of low-income families living in neighbourhoods with high low-income rates rose between 1980 and 1990. A recent study of low-income in Canadian cities by the Canadian Council on Social Development (Lee, 2000) has also drawn attention to rising low-income rates in Canadian municipalities.

Canadian studies, like those in the U.S., have been enormously constrained by being limited to highly aggregated census tract data. Despite imaginative efforts to overcome this restriction (see *inter alia* Alba and Logan, 1992; Massey and Denton, 1993; Jargowsky, 1996), lack of access to the underlying micro-data has imposed serious restrictions for answering even the most basic questions (Jargowsky, 1997: 21-22). Micro-level data are necessary for estimating adequate aggregate accounts of the underlying neighbourhood distribution of income and its components as well as for estimating micro-behavioral models of "locational attainment" in the style of Alba and Logan (1992).

This paper provides an overview of the level and change in neighbourhood inequality in the eight largest Canadian cities over the 1980-95 period. The paper first asks to what extent neighbourhoods, as defined by census tracts, are dissimilar in terms of average family income, one from the other. The rise in neighbourhood inequality over the period is explored, and the contribution of changes in employment earnings and transfer payments to this rise is documented. To better understand the sometimes dramatic decline in employment earnings in neighbourhoods at the bottom of the income distribution, we also focus on changes in labour force status of neighbourhood residents. Finally, the paper asks whether the rise in neighbourhood inequality is driven primarily by the increase in family income inequality in the city as a whole or spatial reallocation of higher and lower income families among neighbourhoods (economic segregation).

The main results of this analysis might be thought of as an elaboration on the spatial implications of otherwise well-known trends in the distribution of earnings and income among Canadian families in the past several decades. The stylized facts of the period for Canada as a whole are that there has been a marked rise in inequality in the distribution of earnings among Canadian households since the 1970s but over most of the period this increase was offset by rising transfers to lower income households and rising taxes in middle and upper income households. Given the underlying correlation between family incomes and neighbourhood incomes, however, these changes are not randomly distributed among neighbourhoods. As a result, inequality in the distribution of total family income (market incomes + social transfers) among neighbourhoods has risen. Our results no doubt overestimate the change since census data do not allow us to include the offsetting effects of changes in taxation. In spite of this

overestimation, it is likely that the main points reported here would be similar (although more muted) were we able to replicate the analysis on more complete (after-tax) income data (see Appendix A for a discussion of city-level results before and after tax). Social transfers, which were the main factor stabilizing income inequality among all families, had only a modest impact on *changes* in neighbourhood inequality.

Irrespective of the actual change in post-tax and transfer neighbourhood income distribution, changes in the underlying the components of family income clearly signal a significant shift in the social and economic character of low and high-income neighbourhoods, particularly those associated with the neighbourhood distribution of employment and earnings. While social programs may reduce some of the change produced by changes in the distribution of earnings among households and neighbourhoods, the social character of neighbourhoods characterized by large and rising numbers of people with little or no attachment to the labour market has been altered. In Toronto, for example, employment rates of prime age adults (25-54) in low-income neighbourhoods declined from 75% to 60% between 1980 and 1995 and from 69% to 58% in Winnipeg.¹ For persons aged 60 or less, the share of total family income from earnings in low-income neighbourhoods declined from 85% to 65% in Toronto and from 79% to 56% in Winnipeg. In contrast, employment levels were relatively stable or rising in higher income neighbourhoods.

These patterns were reflected in neighbourhood earnings distributions. Employment earnings in lower income communities fell by between 11% and 33% (depending upon the city) over the 1980-95 period, while rising marginally in high-income neighbourhoods in most cities. Changes in the spatial distribution of employment and unemployment had a significant impact on many neighbourhoods.

As we show more formally below, rising neighbourhood inequality can result either from an increase in family income inequality in a city as a whole or because of a change in the correlation between family income and neighbourhood income (higher economic spatial segregation between families in different income classes). The general increase in income inequality among all households accounted for most of the change in neighbourhood inequality in the four largest metropolitan areas (Toronto, Montreal, Vancouver, and Ottawa-Hull) but economic segregation rose in five of the eight cities and played an important role in the increase in neighbourhood inequality in Edmonton, Calgary, Quebec City and, Winnipeg.

This paper is the first in a series on neighbourhood inequality and low-income neighbourhoods. After exploring the basics of these subjects, subsequent papers will go on to use micro-level modelling to ask what factors are associated with the changes outlined here.

Data Sources

The analysis covers the period 1980 to 1995 using data from the 20% sample of the Canadian Census for years 1981, 1986, 1991 and 1996. Since income data are reported for the previous calendar year, the income results are reported for 1980, 1985, 1990, and 1995. We focus on the eight largest Canadian Census Metropolitan Areas (CMAs): Montreal, Quebec City, Ottawa-Hull, Toronto, Winnipeg, Calgary, Edmonton, and Vancouver.

¹ Low and high-income neighbourhoods refer to results based on the neighbourhood decile distribution of income described below.

The Income Units

The income units and adjustments to income reflect standard practice in studies of economic well-being (Atkinson, Rainwater and Smeeding, 1995). Income is assessed on the basis of the economic family.² Our estimates of inequality, however, are based on the population-weighted distribution of income rather than a distribution weighted by households or families. Weighting by families (or households) rather than individuals implicitly gives persons in larger households smaller weights than persons living on their own (Hauser, 1997: 2) and the aim is to give equal importance to the well-being of each person irrespective of living arrangements.

Family incomes are adjusted with an equivalence scale to take account of economies of scale, and each individual is assigned the adult-equivalent adjusted (AEA) family income. This is essentially a *per-capita* income measure, adjusted for the economies of scale associated with family size, and hence results are not directly comparable to family or individual incomes that are not adult-equivalent adjusted.³ One shortcoming of census data for studies of this sort is the absence of information on the distribution of income after taxes. Changes in Canada's tax regime have had an equalizing effect on income inequality since 1980 that is simply not registered in the census distribution of income. Consequently, the rise in inequality in pre-tax income (which consists of earnings, other market income and social transfers) will overstate the increase that would be observed in the distribution of disposable (after-tax) income (see Appendix A).

We have analysed data for all CMAs but here only report results the eight largest CMAs, those that had a population of 500,000 or greater in the base year, 1980 for two reasons. First, neighbourhood segregation tends to emerge in larger cities where there is a possibility to create "niche neighbourhoods." Second, the availability of city-specific consumer price indices for the largest cities enables us to estimate changes in real as well as relative income levels at the neighbourhood level. Earnings and income are deflated using the city-specific CPIs.

Neighbourhoods

"Neighbourhoods" are defined at the level of the census tract. Census tracts (CTs) are small geographic units representing neighbourhood-like communities in CMAs. CTs are initially delineated by a committee of local specialists (for example, planners, health and social workers, educators) in conjunction with Statistics Canada. They typically consist of 3,000 to 6,000 persons. In 1995, between 50% and 65% of the tracts in any city had between 3,000 and 5,000 persons (Appendix Table B.1). Tract size is important since it will affect estimates of the share of inequality allocated "within" and "between" neighbourhoods. Had we adopted smaller areal units estimates of the *level* of neighbourhood inequality reported here would be larger.

The size distribution of tracts also raises issues of comparability within and between cities over time. Appendix Table B.1 shows that the tract distributions by size among cities are roughly comparable, although Toronto and Vancouver have more large CTs than other cities. The average size of CTs within cities varied from 4,000 to 5,000 in 1980 and 4,100 to 6,000 in 1995. Vancouver is the only city with a

² The economic family includes all individuals sharing a common dwelling and related by blood, marriage or adoption.

³ Results are sensitive to the choice of equivalence scales (Burkhauser, Smeeding and Merz, 1996). We use the "central variant" proposed by Wolfson and Evans (1990: 46-47) which assigns a weight of 1.0 to the first person and 0.4 to each additional person.

large increase in the size of CTs, rising from an average of 5,000 to 6,000 over the period. With the possible exception of Vancouver in 1995, there does not appear to be dramatic shifts in the distribution or average size sufficient to significantly influence the comparability of the results across cities or over time.

CMAAs grow over time, mainly through the addition of new suburbs. Since our aim here is not to study, in a longitudinal sense, changes in income levels in specific neighbourhoods (the topic of a related study) but rather changes in the distribution of income among neighbourhoods, we allow our results to reflect the impact of urban growth. Indeed, suburbanization which tends to create new and relatively homogenous neighbourhoods is one of the mechanisms through which economic segregation occurs.

Taking Account of Business Cycles

The fact that census data are collected only every five years in Canada makes it extremely difficult to separate true secular trends in income levels and inequality from fluctuations associated with the business cycle. Ideally, we would want census data collected at similar points in the business cycle when employment and unemployment levels are similar. Unfortunately, business cycles do not respect the requirements of national data collection agencies. The Canadian economy experienced two sharp recessions over the 1980-95 period, one in the early 1980s and the other in the early 1990s. The two recessions had very uneven impacts among cities however (Table 1).

Table 1: CMA Unemployment Rate				
	1980	1985	1990	1995
East				
Toronto	5.0	6.7	5.3	8.5
Montreal	8.8	11.7	10.1	11.3
Ottawa-Hull	7.7	8.3	5.9	9.8
Quebec	9.0	8.6	7.2	10.3
West				
Vancouver	5.3	13.2	7.1	8.3
Edmonton	4.1	12.0	7.9	8.9
Calgary	3.6	10.2	7.2	8.1
Winnipeg	5.8	8.7	7.8	8.2

The recession of the early 1980s had especially profound effects on the resource based economies of Western Canada. There, we would expect sharp increases in neighbourhood inequality (driven by the rising earnings inequality among individuals during a recessionary period) in the first half of the 1980s. The critical question is whether there was an offsetting decline over the subsequent decade.

In contrast, the 1990s recession had its largest impact in Eastern Canada and especially in the urban regions surrounding Toronto where recovery was still weak by 1995. For Toronto, Canada's largest urban area, one expects little change in the 1980s but a large shift in the first half of the 1990s. Changes in Ottawa-Hull and Quebec City suggest a similar pattern. In contrast, unemployment levels in Montreal shifted upward in the early eighties and have remained high since that time.

Given the four data points available, our ability to separate secular trends from fluctuations in the business cycles is less than ideal. Nationally, the 1985-95 period was closest to providing two years that are roughly comparable with respect to the business cycle but this was not necessarily the case for any particular city.

Neighbourhood Income Inequality: How Dissimilar are Neighbourhoods?

To clarify the issues involved in the measurement of neighbourhood inequality it is useful to begin with the standard accounting framework (Allison, 1978; Cowell, 1995) for decomposable inequality indices, I , as in:

$$(1) \quad I_T = I_W + I_B$$

so that total inequality for an urban area, I_T , is composed of a between-neighbourhood component (I_B) and a within-neighbourhood component (I_W). The share of total inequality accounted for by between-neighbourhood inequality, I_B , can be written as:

$$(2) \quad I_B = I_T - I_W$$

which highlights the fact that I_B can rise if I_T increases while I_W remains constant (income inequality within neighbourhoods is unchanged) or if I_W declines (neighbourhoods become more homogenous) while total inequality, I_T , is unchanged.

Summary inequality measures of this sort are useful for a number of purposes and we draw upon them later in the paper. However, like averages, they tell us little about where in the distribution change is occurring. A change in I_B , for example, might occur because incomes in higher income neighbourhoods are rising relative to middle income neighbourhoods or because incomes in low-income neighbourhoods are falling relative to middle income neighbourhoods. Our assessment of change will clearly depend on which of these changes is taking place.

Secondly, since the metric values of the usual inequality measures have no intuitive meaning, assessing whether differences or changes in levels are substantively important is difficult. It is well known, for example, that the share of total inequality accounted for by neighbourhood inequality using the usual summary indices is small (Jargowsky, 1996). In 1980, for example the between-neighbourhood component in Toronto measured by the Theil index was .040 accounting for about 18% of total inequality (Theil = .226) for the city as a whole⁴ (see Appendix Table B.2). By 1995, the between component had risen to .060 accounting for about 20% of total inequality. Is .04 a large or a small number? What does a change from .04 to .06 in neighbourhood inequality represent in terms of relative neighbourhood income levels?

To address these issues, we begin by describing the distribution of neighbourhood income with the conceptual analogue of the usual decile distribution of individual income. The neighbourhood deciles are created by ordering all census tracts by mean neighbourhood total family income (adult equivalent adjusted) from lowest to highest and then identifying the 10% of the population residing in the neighbourhoods with the lowest average family income, the 10% residing in the next poorest and so forth.⁵ This approach is equivalent to computing a distribution of *individuals*, by rank-ordering all

⁴ There is substantial within neighbourhood inequality. This suggests that knowing the neighbourhood in which a family lives is not a particularly good predictor of their family income. However, the cumulative resources available to a neighbourhood (or average family income) does vary significantly among neighbourhoods, and this influences the character and “neighbourhood effects” associated with the neighbourhood. More importantly, the variation among neighbourhoods in average income has been increasing, and that is the main focus of the paper.

⁵ To calculate exact deciles, the population of those census tracts that appear at the decile cutting points must be allocated among the higher and lower decile. Families in the CTs at the decile boundaries were randomly assigned to the two deciles so that exact deciles could be computed.

individuals in the city by the average income of their neighbourhood.⁶ The decile distribution allows us to examine trends in income levels among low, middle, and high-income neighbourhoods directly as well as to provide descriptive statistics on changes in the distribution and composition of sub-populations among richer and poorer neighbourhoods. At the bottom and top of the distributions, vingtiles (containing 5% of the population) are used.

Chart 1 shows the cumulative distribution of the population by neighbourhood income level in Toronto, Vancouver and Calgary in 1995. Neighbourhood income rises gradually over most of the distribution with sharp spikes at the top and, to a lesser extent, at the bottom. The ratio of mean income in the highest income (top 5 percent) neighbourhoods to the lowest (bottom 5 percent) neighbourhoods in 1995 ranged between 2.95 in Quebec City to 4.13 in Toronto (Table 2). As shown later (Table 3), estimates of inter-city differences in neighbourhood inequality measured by both the Gini and Theil indices indicate a similar pattern. Larger cities have higher neighbourhood inequality since they have sufficient populations to form more homogeneous, niche, neighbourhoods.

⁶ The neighbourhoods are population weighted in the decile distribution, so that small neighbourhoods do not receive the same weight in the distribution as large ones. If a neighbourhood is very rich or poor, it matters whether this is a very small or large neighbourhood, as in the end we are concerned with the number of *people* exposed to various “neighbourhood effects”.

Chart 1: Cumulative Distribution of Neighbourhoods, by Average Total Family Income, 1995

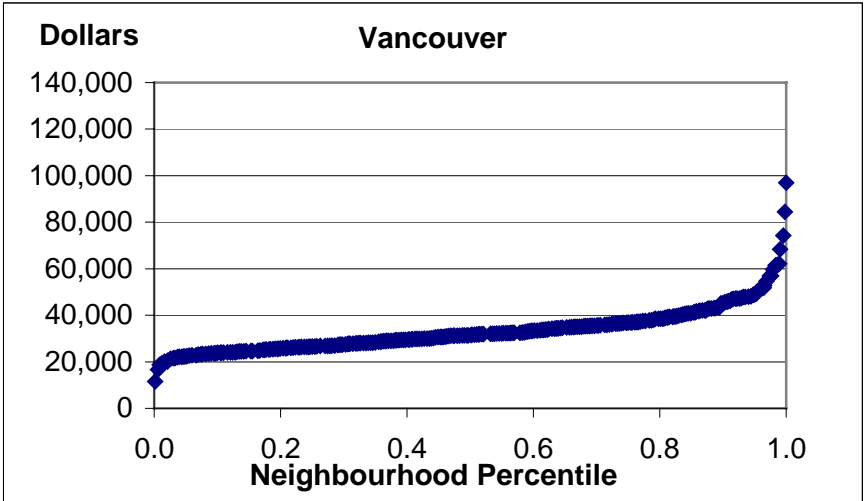
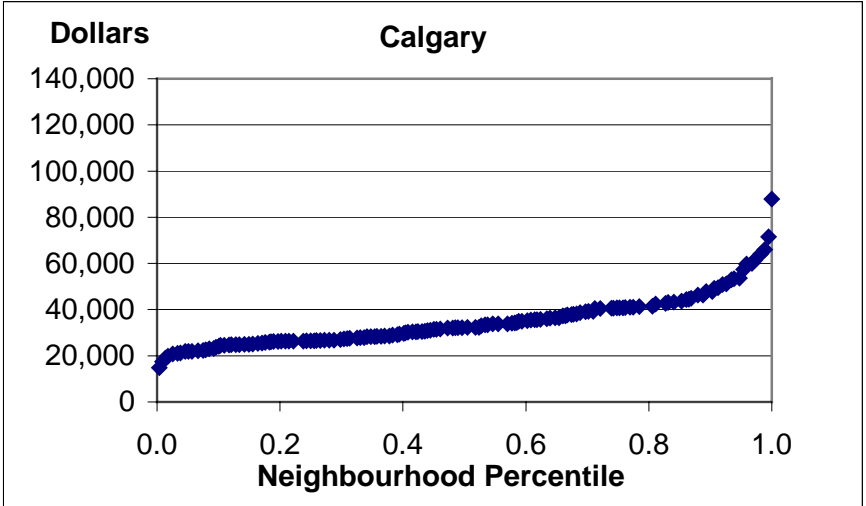
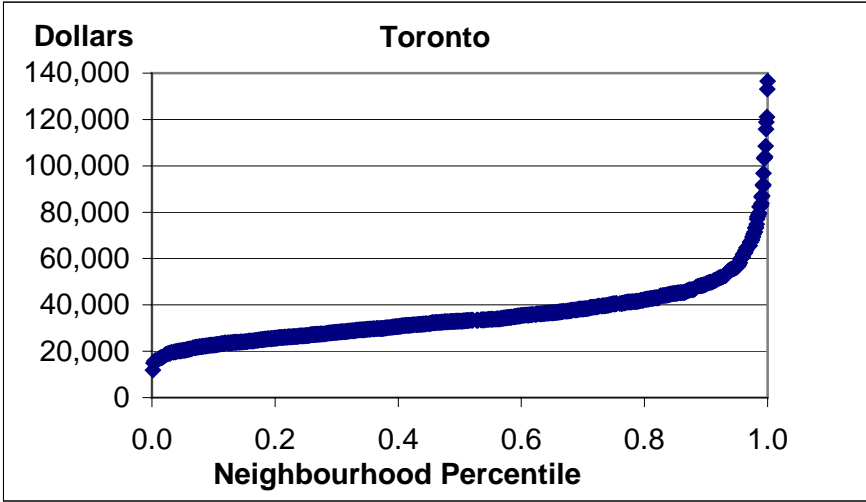


Table 2: Mean Family Income (AEA adjusted)* by Neighbourhood Deciles, 1995				
Percentile**	Quebec	Montreal	Ottawa-Hull	Toronto
	- Average Total Family Income - ('000s)			
0-5	\$16.4	\$15.0	\$18.9	\$18.2
5-10	19.3	17.9	23.1	21.7
0-10	17.9	16.5	21.0	20.0
40-50	27.9	27.1	33.7	32.0
50-60	29.2	28.7	35.9	33.9
90-100	44.4	50.4	52.7	63.9
90-95	40.2	42.6	47.9	52.4
95-100	48.5	58.2	57.6	75.5
	Ratio	Ratio	Ratio	Ratio
Ratio: 95-100/0-5	2.95	3.88	3.04	4.13
0-5/40-60	0.58	0.54	0.54	0.55
95-100/40-60	1.70	2.09	1.65	2.28
Percentile*	Winnipeg	Calgary	Edmonton	Vancouver
	- Average Total Family Income - ('000s)			
0-5	\$14.4	\$20.1	\$18.2	\$20.4
5-10	17.2	22.7	21.6	23.2
0-10	15.8	21.4	19.9	21.8
40-50	27.8	31.2	28.6	30.5
50-60	29.3	33.7	29.8	32.3
90-100	47.0	58.9	48.7	54.3
90-95	41.1	51.9	43.0	47.4
95-100	52.9	65.9	54.5	61.2
	Ratio	Ratio	Ratio	Ratio
Ratio: 95-100/0-5	3.64	3.27	3.0	3.0
0-5/40-60	0.51	0.62	0.63	0.65
95-100/40-60	1.84	2.03	1.87	1.94
* Adult-equivalent adjusted.				
** 0-5 represents the 5% of the population living in census tracts with the lowest average total family income.				

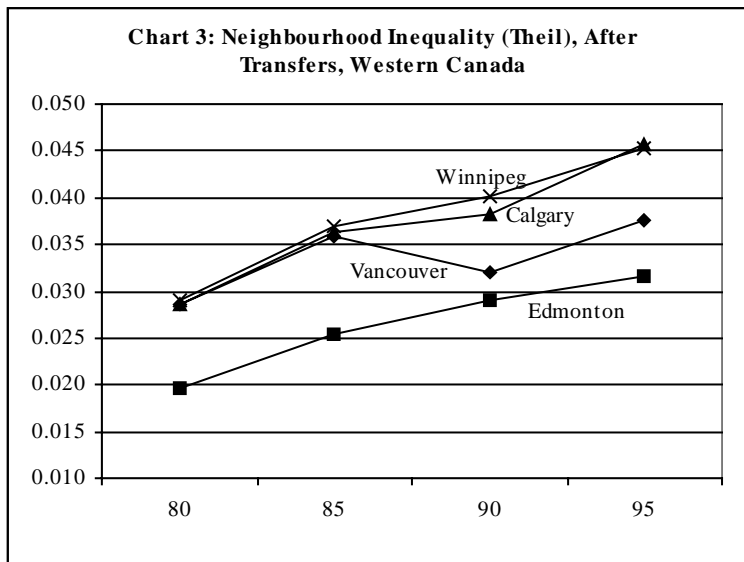
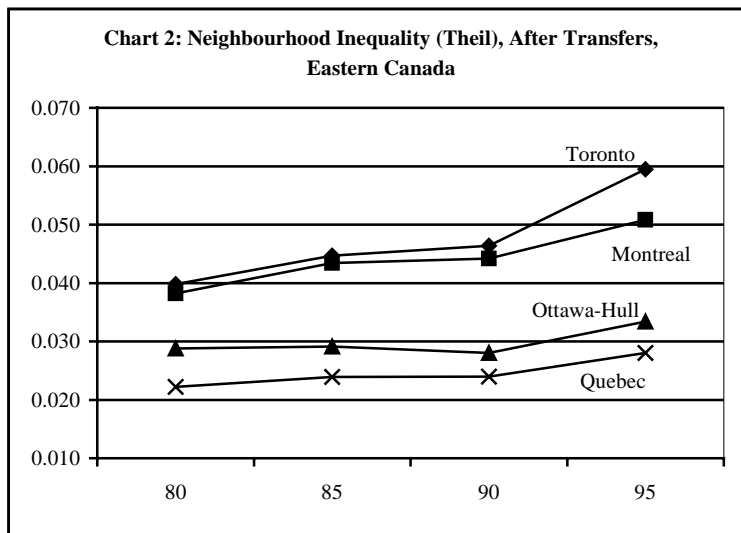
However, Toronto has the highest level of neighbourhood inequality not because low-income (bottom 5%) neighbourhoods are extremely poor relative to middle income neighbourhoods (5th and 6th deciles) but rather because high-income neighbourhoods are very rich relative to middle income neighbourhoods. In Toronto, the highest income neighbourhoods have 2.3 times the income levels of middle income neighbourhoods, much greater than any other city. Calgary is next at 2.0, and the lowest is Ottawa-Hull at 1.65. The ratio of low to middle income neighbourhood mean income in Toronto (.55) is similar to that in Montreal and Ottawa-Hull, lower than in Calgary, Edmonton and Vancouver but higher than in Winnipeg where mean income in the poorest is about 51% of that in middle income neighbourhoods.

The Rise in Neighbourhood Inequality

Neighbourhood inequality rose in all eight Canadian cities between 1980 and 1995 as indexed by both the Gini and Theil indices (Table 3).⁷ In most cities the inequality indexes rose more or less continuously between 1980 and 1995 with the exception of Ottawa-Hull, and Vancouver. Quebec City also displayed relatively little increase in inequality (see Charts 2 and 3). The cities with the largest *proportional* increases included Edmonton, Calgary, Winnipeg, and Toronto, where the Theil index increased by between 50% and 60% during the 1980-95 period and the Gini index by between 24% and 31%.

Table 3: Inequality in Average AEA Total Family Neighbourhood Income						
		1980	1985	1990	1995	% change 1980-95
Quebec	Theil	0.022	0.024	0.024	0.028	27%
	Gini	0.113	0.117	0.119	0.128	13%
Montreal	Theil	0.038	0.043	0.044	0.051	34%
	Gini	0.145	0.155	0.156	0.169	16%
Ottawa-Hull	Theil	0.029	0.029	0.028	0.033	14%
	Gini	0.134	0.131	0.129	0.143	7%
Toronto	Theil	0.040	0.045	0.046	0.060	50%
	Gini	0.148	0.157	0.160	0.183	24%
Winnipeg	Theil	0.029	0.037	0.040	0.045	55%
	Gini	0.125	0.144	0.152	0.163	30%
Calgary	Theil	0.029	0.036	0.038	0.046	59%
	Gini	0.127	0.147	0.153	0.167	31%
Edmonton	Theil	0.020	0.025	0.029	0.032	60%
	Gini	0.107	0.121	0.130	0.137	28%
Vancouver	Theil	0.029	0.036	0.032	0.038	31%
	Gini	0.125	0.142	0.136	0.147	18%

⁷ In the calculation of the inequality indices, neighbourhood weights are used, where the weight is the population of the neighbourhood.



These changes reflect both falling average income in low-income neighbourhoods, and except for Vancouver, rising income in higher income neighbourhoods (Table 4). Between 1980 and 1995, average neighbourhood total family income in the poorest neighbourhoods fell in all the eight cities (excluding Ottawa-Hull) by -8% to -18% while in the highest income neighbourhoods, average neighbourhood income rose from between 2% and 10%.

Decile	Quebec		Montreal		Ottawa-Hull		Toronto	
	1980-95	1985-95	1980-95	1985-95	1980-95	1985-95	1980-95	1985-95
Lowest*	-8.0%	-2.9	-12.3	-7.5	0.7	-6.4	-10.1	-11.3
2	-1.9	2.1	-7.0	-3.3	5.7	-3.1	-6.7	-8.9
3	0.1	2.3	-4.3	-1.7	7.8	-0.4	-5.1	-8.8
4	1.5	3.3	-1.5	-0.4	5.5	-2.3	-3.2	-6.5
5	2.7	3.3	-0.4	0.6	5.6	-1.5	-0.5	-3.9
6	3.7	5.2	0.5	0.9	5.6	-0.7	-0.5	-3.6
7	4.1	7.1	1.1	1.1	7.0	0.5	2.3	-1.6
8	1.6	5.2	1.5	2.3	7.6	2.5	5.8	1.1
9	2.7	6.0	2.3	2.5	8.6	2.2	6.9	1.4
Highest	5.2	5.4	4.0	2.0	8.9	1.3	10.5	2.4

Decile	Winnipeg		Calgary		Edmonton		Vancouver	
	1980-95	1985-95	1980-95	1985-95	1980-95	1985-95	1980-95	1985-95
Lowest*	-12.6	-11.0	-12.1	-6.5	-18.1	-7.9	-12.2	4.2
2	-7.9	-6.2	-10.1	-4.1	-11.1	-3.3	-13.2	-1.6
3	-2.7	-6.9	-10.3	-5.3	-9.9	-3.6	-11.1	-1.3
4	-1.3	-5.2	-8.0	-4.2	-9.2	-2.1	-10.2	-1.3
5	-0.2	-3.9	-2.5	1.7	-8.6	-1.2	-8.0	0.2
6	3.4	-2.9	1.4	4.6	-8.7	-2.1	-6.4	1.1
7	3.4	-1.2	5.2	5.2	-7.9	-0.4	-2.7	2.7
8	6.0	-0.8	5.2	4.0	-6.2	-1.3	-3.3	4.1
9	13.5	3.0	4.0	-1.2	-2.0	2.9	-2.3	3.2
Highest	10.0	-0.5	7.5	6.2	1.9	3.0	-3.7	2.0

* Change in the average total family income (adult equivalent adjusted) among the 10% of the population living in the census tracts with the lowest average family income.

Some of this change might be due to the fact that 1995 is in the middle of the 1990s business cycle, and 1980 is at the peak of a cycle (nationally at least). It is likely that poorer neighbourhoods are affected more by economic downturns than others, and hence some of this difference may be cyclical, rather than a long-term structural change in relative incomes. Two better years for comparisons are 1985 and 1995. The same general pattern is observed, although the changes are smaller. In virtually all cities (except for Quebec City), neighbourhoods in the bottom half of the income distribution saw their average family income fall, while in the top few deciles average incomes rose.

The Contribution of Earnings and Transfers to Rising Neighbourhood Inequality

Inequality in average family neighbourhood income can rise: (1) because average employment earnings are falling in low-income neighbourhoods relative to high-income neighbourhoods; (2) because of changes in the distribution of transfers among low and high-income neighbourhoods; or (3) because of the way income from other sources such as investments and pensions are distributed among neighbourhoods. It is well known that for Canada as a whole, employment earnings became more unequally distributed among workers during the 1980s in particular (Morissette, Myles and Picot, 1994; Beach and Slotsve 1996; Picot, 1998). Rising transfers, which are focused on people at the bottom end of the income distribution, tended to offset this rise in earnings inequality throughout the 1980s at least, resulting in little change in inequality in disposable family income (Wolfson and Murphy, 1998; Beach and Slotsve 1996; Picot and Myles, 1996).

Unlike trends in the population as a whole, rising inequality in the *neighbourhood* distribution of earnings over this period were, for the most part, not offset by rising transfers. This conclusion is illustrated here both in the underlying decile distributions and with a decomposition of changes in the Gini index by income source.

Consider first the percentage changes in total income and its major components (earnings and transfers) by neighbourhood decile shown in Table 5. To interpret the results in Table 5 it is sufficient to recall the basic arithmetic of income inequality. For neighbourhood inequality to remain stable requires constant percentage increases/losses in all deciles. If percentage changes in any particular income component are positively correlated with neighbourhood income level, that component contributes to rising inequality. Changes that are roughly proportional across all neighbourhood deciles make no contribution either to rising inequality or to offset rising inequality. As indicated in Table 5, percentage changes in earnings by neighbourhood decile were highly (and monotonically) correlated with neighbourhood income levels. In Toronto, for example, average earnings in the bottom decile neighbourhoods fell by 23% and rose by 16% in the highest income neighbourhoods. To *offset* these changes it would be necessary for proportional changes in transfers to work in the opposite direction—that is, percentage increases would have to be larger in low than in high-income neighbourhoods. In fact, however, percentage increases in transfers, while substantial, were always greater in the middle of the neighbourhood income distribution than at the bottom, and in some cities were higher at the top than the bottom of the distribution (e.g. Quebec, Montreal, Calgary, Vancouver. This partially reflects the fact that transfers to seniors (OAS/GIS and C/QPP) were rising over the period (Table 5, column 4) and seniors typically have little employment income. Percentage increases in transfers that typically go to working-age families (“other transfers”) including EI, child benefits, and social assistance were, in some cities somewhat larger in low than in high-income neighbourhoods but the neighbourhood differences were not great.

**Table 5: Percentage Change in Income Components Between 1980 and 1995
by CMA and Neighbourhood Decile**

DECILE	Percent Change in:					For 1995, Percent of Total Family Income from Transfers*	Average Employment Earnings** 1995
	Total Income (1)	Employment Earnings (2)	Total Transfers (3)	Transfers to Elderly (4)	Other Transfers (5)		
	(percentage change)					(%)	(1995\$)
Quebec City							
1	-8	-27	47	65	34	40	10,863
2	-2	-18	70	119	42	26	16,204
3	0	-10	66	48	77	21	19,631
4	2	-8	57	63	54	19	21,124
5	3	-5	60	48	68	17	22,541
6	4	-6	82	127	60	16	23,431
7	4	-7	92	150	66	14	24,899
8	2	-4	67	73	63	13	26,787
9	3	-3	72	73	72	12	28,057
10	5	1	74	97	55	9	35,999
all	2	-7	66	81	57	18	22,954
Montreal							
1	-12	-29	49	43	53	59	10,379
2	-7	-21	62	65	60	34	14,250
3	-4	-18	72	91	60	27	16,858
4	-1	-14	80	105	65	24	18,902
5	0	-12	83	99	73	21	20,542
6	1	-9	84	95	78	19	22,636
7	1	-8	89	110	76	16	24,238
8	2	-3	64	46	79	14	26,996
9	2	-3	79	75	82	12	30,175
10	4	1	83	94	72	9	40,080
all	-1	-9	73	80	68	23	22,506
Ottawa Hull							
1	1	-11	54	21	78	37	14,256
2	6	-9	73	126	50	27	18,995
3	8	-2	77	83	74	22	22,516
4	5	-3	76	78	75	17	24,961
5	6	-6	112	168	82	16	26,363
6	6	-8	150	245	93	14	27,265
7	7	2	60	67	55	12	31,375
8	8	8	66	54	76	9	34,922
9	9	6	83	103	70	9	37,184
10	9	14	38	39	37	7	42,070
all	7	1	75	85	69	17	27,991

* Only includes persons less than age 60, and hence excludes most of OAS, GIS and CPP/QPP. Here we are concerned with transfers such as EI, S.A., and child tax benefits.
** Adult equivalent adjusted per capita earnings.

**Table 5 (cont'd): Percentage Change in Income Components Between 1980 and 1995
by CMA and Neighbourhood Decile**

DECILE	Percent Change in:					For 1995, Percent of Total Family Income from Transfers*	Average Employment Earnings** 1995
	Total Income (1)	Employment Earnings (2)	Total Transfers (3)	Transfers to Elderly (4)	Other Transfers (5)		
	(percentage change)					(%)	(1995\$)
Toronto							
1	-10	-23	93	40	133	35	14,581
2	-7	-18	108	80	132	26	18,447
3	-5	-15	98	71	123	22	21,027
4	-3	-13	122	121	123	19	23,485
5	0	-10	133	149	120	16	25,848
6	-1	-5	105	92	116	14	28,516
7	2	-3	111	108	113	12	30,449
8	6	2	91	84	100	10	33,698
9	7	6	77	65	93	9	37,738
10	11	16	70	65	78	7	52,118
all	2	-4	100	84	117	17	28,590
Winnipeg							
1	-13	-30	78	32	126	45	9,819
2	-8	-18	63	37	97	27	14,729
3	-3	-10	66	41	103	19	17,855
4	-1	-14	121	147	98	17	19,243
5	0	-11	116	150	89	14	21,826
6	3	-8	89	92	86	13	22,084
7	3	-4	85	72	101	12	24,570
8	6	-3	131	191	84	10	26,715
9	13	8	85	97	72	8	31,480
10	10	13	48	43	54	6	38,864
all	3	-5	85	77	94	17	22,718
Calgary							
1	-12	-21	91	53	121	23	16,924
2	-10	-19	121	140	111	17	20,492
3	-10	-15	86	39	123	16	22,282
4	-8	-17	142	175	119	15	22,535
5	-2	-14	165	240	121	12	25,256
6	1	-3	79	63	93	11	28,214
7	5	-2	135	204	93	10	30,328
8	5	-1	137	248	84	8	34,726
9	4	-4	145	293	81	7	37,006
10	8	5	113	178	64	8	46,961
all	-1	-8	118	139	103	13	28,472

* Only includes persons less than age 60, and hence excludes most of OAS, GIS and CPP/QPP.
Here we are concerned with transfers such as EI, S.A., and child tax benefits.

** Adult equivalent adjusted per capita earnings.

**Table 5 (cont'd): Percentage Change in Income Components Between 1980 and 1995
by CMA and Neighbourhood Decile**

DECILE	Percent Change in:					For 1995, Percent of Total Family Income from Transfers*	Average Employment Earnings**, 1995
	Total Income (1)	Employment Earnings (2)	Total Transfers (3)	Transfers to Elderly (4)	Other Transfers (5)		
	(percentage change)					(%)	(1995\$)
Edmonton							
1	-18	-33	115	89	137	31	14,077
2	-11	-23	109	92	123	22	18,046
3	-10	-23	165	235	130	19	19,855
4	-9	-17	129	102	151	17	21,731
5	-9	-19	145	165	131	17	22,603
6	-9	-15	104	89	115	12	24,784
7	-8	-20	194	326	127	13	24,948
8	-6	-12	121	151	103	11	28,008
9	-2	-8	155	264	106	8	32,365
10	2	0	109	132	88	7	39,945
all	-7	-16	132	144	123	15	24,636
Vancouver							
1	-12	-21	57	23	86	30	16,223
2	-13	-18	40	13	70	22	19,006
3	-11	-20	61	54	68	20	20,348
4	-10	-13	46	19	76	18	22,883
5	-8	-13	61	55	67	15	24,711
6	-6	-12	72	87	60	14	26,199
7	-3	-7	67	74	62	12	28,796
8	-3	-8	79	96	63	11	30,123
9	-2	-6	59	63	53	10	32,909
10	-4	-5	67	78	51	8	41,738
all	-7	-11	59	51	67	16	26,294
* Only includes persons less than age 60, and hence excludes most of OAS, GIS and CPP/QPP. Here we are concerned with transfers such as EI, S.A., and child tax benefits.							
** Adult equivalent adjusted per capita earnings.							

We should be clear that we are speaking of the *change* in transfers over the period. In terms of *level*, lower income neighbourhoods clearly depend to a much greater extent on transfers than high-income neighbourhoods. Table 5 shows that in Montreal, for example, transfers accounted for 59% of family income in bottom decile households among persons under age 60 in 1995 while in the top neighbourhood decile the comparable figure was 9%. In Calgary, the numbers were 23% and 8% respectively. Hence, while the level of transfers is highly concentrated in low-income neighbourhoods, the *change* in transfers was widely dispersed, limiting their impact on rising neighbourhood inequality. Losses in employment earnings, in contrast, were dramatic and highly concentrated in low-income neighbourhoods.

To put more precise estimates on the impact of these changes on the neighbourhood distribution of income we draw on the decomposition of the Gini index by income source as formulated by Lerman and Yitzhaki (1985). The contribution of any particular income source (Q_k) to total inequality (G) can be partitioned into three factors: the Gini coefficient for the component (G_k), the share of that component in

the overall income package (S_k) and the correlation (see footnote) between the component and the overall income package (R_k) so that:⁸

$$(1) \quad G = \sum Q_k = \sum G_k \cdot S_k \cdot R_k$$

which simply stated means that overall inequality is determined by *inequality* in the distribution of the component itself, its *share* in the overall income package and its *covariation* with the remaining income components.

In this decomposition, as before, each observation (census tract) is weighted by its population. The income components are (1) average tract employment earnings,⁹ (2) average tract transfers usually associated with the retired population (including CPP/QPP, OAS and GIS), (3) the average neighbourhood value of other transfer income (including social assistance, EI payments, child tax benefits, family allowances, other transfers) and (4) other income (including investment income, private pension income, other income sources). Transfers are divided into two components so that transfers normally going to the retired population could be separated from those going to potential earners and their families.

The detailed decompositions for Toronto and Quebec City, two cities at the extreme, are shown in Table 6. Toronto has both the highest neighbourhood inequality (in 1995) and the largest increase over the period, while Quebec City had the lowest neighbourhood inequality, and the smallest increase over the period. Table 6 displays the values of all the components used in the decomposition, including the Gini, share and correlation coefficient (correlation between the component and total family income) for each component. Not surprisingly, neighbourhood earnings inequality rose in all cities in all years. In Toronto, the gini for neighbourhood earnings inequality rose from .135 to .204; in Quebec City from .126 to .166 (Table 6). Employment earnings constituted a declining share of total family income, falling from 85% to 81% in Toronto, and 86% to 78% in Quebec City. This would tend to reduce the impact of rising earnings inequality of family income inequality. However, this was more than offset by the significant rise in earnings inequality.

⁸ The “Gini correlation” (R_k) is a hybrid of the familiar Pearson’s R and the Spearman rank correlation coefficient and is calculated by taking the ratio of the covariance of income component k with cumulative distribution of final disposable income to the covariance of income component k with the cumulative distribution of component k . Like the conventional correlation it takes on value between -1 and $+1$ and R_k will be equal to 1 whenever the ranking of individuals on the particular component is identical to the ranking of individuals on total (disposable) income.

⁹ Including positive and negative earnings and income from both self-employment and paid employment.

Table 6: Detail Decomposition Results for Quebec City and Toronto

Factors for the Income Components												
	Earnings			Retirement-Related Transfers			Other Transfers			Other Income		
	Neighbourhood Gini	Share	Corr.	Neighbourhood Gini	Share	Corr.	Neighbourhood Gini	Share	Corr.	Neighbourhood Gini	Share	Corr.
Toronto												
1980	0.135	0.853	0.972	0.319	0.025	0.031	0.153	0.025	-0.808	0.464	0.097	0.891
1985	0.151	0.842	0.972	0.310	0.029	0.035	0.142	0.033	-0.813	0.463	0.096	0.954
1990	0.161	0.835	0.969	0.302	0.033	0.066	0.164	0.037	-0.755	0.448	0.095	0.840
1995	0.204	0.811	0.974	0.263	0.045	0.089	0.189	0.054	-0.862	0.421	0.091	0.838
Quebec City												
1980	0.126	0.857	0.967	0.321	0.031	-0.436	0.143	0.049	-0.824	0.413	0.063	0.705
1985	0.140	0.822	0.967	0.314	0.040	-0.343	0.128	0.063	-0.860	0.379	0.075	0.628
1990	0.147	0.819	0.967	0.330	0.043	-0.373	0.123	0.060	-0.767	0.345	0.078	0.539
1995	0.166	0.784	0.965	0.316	0.055	-0.328	0.123	0.076	-0.799	0.341	0.086	0.642

The Component of Neighbourhood Family Income Gini Due to:					
	Neighbourhood Family Income Gini	Employment Earning Comp. Q	Retirement-Related Transfers Comp. Q	Other Transfers Comp. Q	Other Income Component Q
Toronto					
1980	0.148	0.112	0.000	-0.003	0.040
1985	0.157	0.124	0.000	-0.004	0.038
1990	0.160	0.129	0.001	-0.005	0.035
1995	0.183	0.160	0.001	-0.009	0.031
Quebec City					
1980	0.113	0.104	-0.004	-0.006	0.018
1985	0.117	0.111	-0.004	-0.007	0.018
1990	0.119	0.116	-0.005	-0.006	0.015
1995	0.128	0.124	-0.006	-0.007	0.017

The summary results for all cities are shown in Table 7. This table displays the total contribution (Q_k) of each income component to changes in neighbourhood family income inequality. Not surprisingly, the earnings component contributes most of the change in neighbourhood inequality. Neighbourhood family income inequality rose because neighbourhood earnings inequality rose. The cities with the highest increase in neighbourhood inequality registered that position because they had the largest increase in neighbourhood earnings inequality. Typically, this change is offset by “other transfers” but the effect is not large. In Toronto, for example, changes in the level and distribution of “other transfers” (EI, child benefits, social assistance) offset about 12% (-0.006/0.049) of the increase in neighbourhood inequality that resulted from changes in the level and distribution of earnings. The effect is even smaller in many other cities.

Table 7: Decomposition of the Change in the Neighbourhood Gini, the Contribution of Four Income Components						
	Change in Neighbourhood Family Income Gini		Inequality Due to Change in Neighbourhood			
	Value	(%)	Employment Earnings Q	Retirement Transfers Q	Other Transfers Q	Other Income Q
Quebec						
1980-95	0.015	(13%)	0.019	-0.002	-0.001	-0.001
1985-95	0.011	(9%)	0.013	-0.001	-0.001	0.001
1990-95	0.009	(8%)	0.007	0.000	-0.001	0.003
Montreal						
1980-95	0.023	(16%)	0.024	0.001	-0.002	-0.001
1985-95	0.013	(8%)	0.013	0.001	-0.001	-0.001
1990-95	0.013	(8%)	0.016	0.001	-0.002	-0.001
Ottawa-Hull						
1980-95	0.009	(7%)	0.016	0.001	-0.003	-0.006
1985-95	0.012	(9%)	0.020	0.000	-0.004	-0.003
1990-95	0.014	(11%)	0.018	0.000	-0.003	-0.001
Toronto						
1980-95	0.036	(24%)	0.049	0.001	-0.006	-0.008
1985-95	0.027	(17%)	0.037	0.001	-0.005	-0.006
1990-95	0.024	(18%)	0.031	0.000	-0.004	-0.004
Winnipeg						
1980-95	0.038	(30%)	0.042	0.002	-0.005	0.003
1985-95	0.019	(13%)	0.020	0.002	-0.003	0.001
1990-95	0.012	(18%)	0.012	0.000	-0.003	0.002
Calgary						
1980-95	0.040	(31%)	0.034	0.002	-0.004	0.008
1985-95	0.020	(14%)	0.010	0.002	-0.001	0.009
1990-95	0.014	(9%)	0.009	0.001	-0.001	0.006
Edmonton						
1980-95	0.030	(28%)	0.031	0.001	-0.005	0.002
1985-95	0.016	(13%)	0.015	0.001	-0.002	0.000
1990-95	0.007	(5%)	0.009	0.000	-0.001	-0.001
Vancouver						
1980-95	0.023	(18%)	0.022	0.003	-0.004	0.002
1985-95	0.006	(4%)	0.004	0.002	-0.001	0.000
1990-95	0.012	(9%)	0.015	0.001	-0.002	-0.002

() % increase in Gini over the period.

Transfers to the retired were rising over the period, mainly due to the maturation of the Canada and Quebec Pension plans rather than growth in OAS/GIS benefits. The correlation between retirement transfers and neighbourhood income rose over the period and contributed modestly to higher neighbourhood inequality (Table 6). The contribution of changes in “other income” (mainly from investments) tended to vary among cities depending on whether the share of investment income in total income was rising or falling. Notably, changes in “other” (mainly investment) income made a substantial contribution to higher neighbourhood inequality in Calgary and lower neighbourhood inequality in Toronto.

The main conclusion then is that changes in neighbourhood earnings inequality were driving overall inequality, and rising transfers over the period had only a modest offsetting impact on the growth in earnings inequality among neighbourhoods. It may be that the social composition of very low-income neighbourhoods differs in systematic ways from middle income neighbourhoods so that transfers did not rise more quickly in the former when employment and earnings fall (e.g. more single persons or couples without children) than in the latter. This is a subject for further research.

Employment and Unemployment in Low and High-income Neighbourhoods

Change in the spatial distribution of employment earnings was significant over the period, and was the principle factor driving up neighbourhood inequality. To better understand the changes influencing employment earnings, we focus on employment rates (proportion of the population with a job) and unemployment rates among prime aged (25-54) workers in low and high-income neighbourhoods. Falling earnings in low-income neighbourhoods could be driven by lower hourly wages, fewer hours worked, or a rising share of the population that is not employed, or unemployed. The information necessary to determine the relative importance of each of these factors is not available in the census, but we can look at unemployment and employment (and thereby not-employed) rates. Ideally one would have annual measures of employment and unemployment, but we are restricted to measures of labour force status during the week the census is enumerated, typically late May and early June.

Given the changes observed in the neighbourhood distribution of earnings, changes in the distribution of employment and unemployment are as one would expect: unemployment became more concentrated in low-income neighbourhoods, and employment in high-income neighbourhoods. Table 8 shows that for the eight CMAs as a whole, the gap between the bottom and top neighbourhood deciles in the share of the population working was 14 percentage points in 1980 (66% vs. 80%) and by 1995 this gap had increased to 23 percentage points (61% vs. 84%). Employment rates in the bottom decile fell by 4.7 percentage points between 1980 and 1995 and rose by 4.3 percentage points in the top neighbourhood decile.

Table 8: Eight CMAs Combined, Employment and Unemployment Rate, by Decile, 25-54 Year Olds

Decile	Employment rate* 25-54 year olds						Unemployment rate 25-54 year olds					
					Percentage point change						Percentage point change	
	1980	1985	1990	1995	1980-95	1985-95	1980	1985	1990	1995	1980-95	1985-95
Lowest	66.3	64.8	65.3	61.6	-4.7	-3.2	11.2	15.4	17.3	18.9	7.7	3.5
2	72.6	72.0	73.6	70.8	-1.8	-1.2	8.1	10.7	12.7	13.4	5.3	2.7
3	74.2	74.5	76.5	74.2	0	-0.3	7.1	9.5	10.7	11.0	3.9	1.5
4	76.2	76.3	78.3	76.4	0.2	0.1	6.0	8.6	9.7	9.5	3.5	0.9
5	77.2	78.7	79.8	78.6	1.4	-0.1	5.6	7.6	8.5	8.4	2.8	0.8
6	79.7	79.4	81.0	80.2	0.5	0.8	4.5	7.1	7.9	7.3	2.8	0.2
7	79.9	81.2	82.1	81.1	1.2	-0.1	4.5	5.9	7.5	6.8	2.3	0.9
8	80.7	82.1	83.5	82.4	1.7	0.3	4.0	5.4	6.4	6.0	2.0	0.6
9	80.2	82.5	84.1	84.2	4.0	1.7	3.5	4.9	5.6	4.9	1.4	0.0
Highest	79.6	82.5	83.7	83.9	4.3	1.4	3.3	4.4	5.1	4.4	1.1	0.0
Ratio Highest /Lowest Lowest /Highest	1.20	1.27	1.28	1.36			3.4	3.5	3.4	4.3		

* Employed divided by the population.

Unemployment rose in all neighbourhoods but much more in the bottom decile (7.7 percentage points) than in the top (1.1 points). Averaged across the eight cities, in 1980 unemployment among prime aged workers in the poorest neighbourhoods was in the 11% range and by 1995 had reached almost 20%. During the same period unemployment went from 3% to 4% in the highest income neighbourhoods (top decile).

Much of the increase in relative *unemployment* in the lower income neighbourhoods occurred during the 1990-95 period. Table 10 shows the ratio of the unemployment rates in the lowest to highest neighbourhood deciles. Except for Edmonton, Calgary, and Toronto, the major increase in the relative unemployment rate occurred during the 1990s; the most striking example was Winnipeg, where ratio of unemployment in the bottom to the top neighbourhood decile was 4.2 in 1990, rising to 6.7 in 1995.

Decile	<u>Quebec City</u>		<u>Montreal</u>		<u>Ottawa-Hull</u>		<u>Toronto</u>	
	Percentage Point Change in:		Percentage Point Change in:		Percentage Point Change in:		Percentage Point Change in:	
	Employment Rate	Unemployment Rate	Employment Rate	Unemployment Rate	Employment Rate	Unemployment Rate	Employment Rate	Unemployment Rate
Lowest	3.6	4.3	-5.0	9.1	-4.5	4.7	-11.7	11.5
2	5.2	2.9	-0.6	5.4	1.3	2.5	-9.3	7.9
3	8.0	0.3	1.8	4.4	2.3	1.8	-8.2	7.3
4	7.8	0.9	2.9	3.2	2.8	1.6	-6.3	6.0
5	9.3	-0.4	3.7	2.3	1.4	3.1	-3.7	4.6
6	12.5	-1.3	4.7	1.3	1.1	1.5	-2.6	4.1
7	9.6	0.4	6.1	1.4	4.6	0.7	-2.3	3.4
8	10.4	-1.7	5.7	0.4	5.1	0.4	0.4	2.3
9	9.1	-1.0	6.2	0.4	3.2	1.5	0.7	2.1
Highest	11.2	-1.3	4.8	0.8	5.6	-0.6	3.5	1.6
Decile	<u>Winnipeg</u>		<u>Calgary</u>		<u>Edmonton</u>		<u>Vancouver</u>	
	Percentage Point Change in:		Percentage Point Change in:		Percentage Point Change in:		Percentage Point Change in:	
	Employment Rate	Unemployment Rate	Employment Rate	Unemployment Rate	Employment Rate	Unemployment Rate	Employment Rate	Unemployment Rate
Lowest	-13.2	9.8	-3.4	4.7	-7.1	6.6	-9.2	7.7
2	-3.8	3.9	0.7	3.0	-1.7	5.0	-4.0	5.4
3	1.4	1.4	-0.9	3.0	-2.4	5.3	-3.4	5.2
4	1.3	2.1	1.7	3.1	-0.5	3.1	0.2	3.0
5	2.6	1.1	1.5	2.4	-1.2	3.9	-1.2	3.6
6	2.9	1.8	0.2	2.5	2.5	2.4	0.5	2.8
7	5.4	0.3	1.7	2.1	1.6	3.4	1.8	1.5
8	7.5	0.1	4.9	1.8	2.2	3.2	1.8	1.6
9	8.0	-0.2	2.3	2.3	4.4	1.7	4.3	1.3
Highest	6.9	-0.4	7.0	1.4	5.8	1.2	4.1	1.0

Table 10: Ratio of Employment and Unemployment Rates in Highest and Lowest Income Community, 1980 to 1995, by City Population Aged 25 to 54

	Ratio of Employment Rates, Highest to Lowest Neighbourhood Deciles				Ratio of Unemployment Rates, Lowest to Highest Neighbourhood Deciles			
	1980	1985	1990	1995	1980	1985	1990	1995
Quebec	1.33	1.41	1.33	1.44	2.2	2.8	2.6	3.5
Montreal	1.29	1.35	1.36	1.49	3.2	3.4	3.1	4.4
Ottawa-Hull	1.18	1.21	1.24	1.36	2.8	2.4	2.8	4.5
Toronto	1.07	1.11	1.22	1.33	2.4	2.3	3.3	4.2
Winnipeg	1.13	1.21	1.40	1.50	3.2	3.2	4.2	6.7
Calgary	0.95	1.09	1.10	1.09	2.2	2.3	3.0	2.7
Edmonton	1.03	1.19	1.21	1.22	2.5	3.0	3.4	3.4
Vancouver	1.03	1.20	1.17	1.23	2.9	3.2	3.2	4.1

In contrast, relative *employment* ratios (top/bottom decile) rose almost as much or, in some cases, more in the 1980s than in the 1990-95 period (Table 10). Changes in relative employment levels during the 1980s were larger than in the 1990s in Toronto, Winnipeg, Edmonton, Calgary and Vancouver. Changing *employment* levels reflect changes in both unemployment and labour force participation rates, indicating a trend in relative levels of labour force attachment among high and low-income neighbourhoods over the entire period in these cities. Moreover, it is striking that among the eight cities only Quebec City shows evidence of a purely cyclical pattern in relative employment levels among high and low-income neighbourhoods.

The Role of Economic Spatial Segregation

There are two ways neighbourhood inequality can rise: (a) as result of an increase in inequality among all families (city-wide); and (b) due to changes in the way that low and high-income families are distributed among neighbourhoods. If low-income families increasingly tend to cluster in low-income neighbourhoods, and high-income families in high-income neighbourhoods (i.e. if the correlation between family and neighbourhood income rises), then neighbourhood inequality will rise even if city-wide inequality is not changing. Our aim in this section is to determine the extent to which the rise in neighbourhood inequality described above can be attributed to each of the two factors. Is neighbourhood inequality rising in Canadian cities as a result of a general increase in family income inequality or by changes in the propensity of high and low-income families to concentrate in neighbourhoods with other high and low-income families (economic spatial “segregation”).

To clarify the issues involved in the measurement of neighbourhood inequality and economic residential segregation it is useful to begin with the standard accounting framework (Allison, 1978; Cowell, 1995) for decomposable inequality indices, I , as in:

$$(1) \quad I_T = I_W + I_B$$

so that total inequality for an urban area, I_T , is composed of a between-neighbourhood component (I_B) and a within-neighbourhood component (I_W).¹⁰ Neighbourhood inequality, I_B , which is the focus of our analysis, can be written as:

$$(2) \quad I_B = I_T - I_W$$

To measure economic “segregation” (the underlying correlation between family income and neighbourhood income), Jargowsky (1996) computes a “neighbourhood sorting index” (NSI) by taking the ratio of the between-tract variance in household income to the total variance of household income, i.e. the share of total inequality accounted for by between-neighbourhood inequality or the ratio I_B / I_T .¹¹ In this paper we develop a very similar “neighbourhood economic segregation” index. The identity in (2) can be expressed in the following way:

$$(3) \quad I_B = I_T * (1 - I_W / I_T)$$

which highlights the fact that at the two extremes, inequality between neighbourhoods will rise if (1) total inequality among families (I_T) rises (while the share of total inequality accounted for by the within component does not change) or (2) if neighbourhoods become more internally homogeneous (i.e. I_W declines) *relative to* total inequality and $(1 - I_W / I_T)$ rises (i.e., “increased neighbourhood sorting” to use Jargowsky’s phrase).

The term $(1 - I_W / I_T)$ is the index of neighbourhood economic segregation used here. Note that this is equivalent to the neighbourhood sorting index used by Jargowski, except that he expressed it as I_B / I_T , rather than $(1 - I_W / I_T)$, but these two expressions are identical¹².

To better understand the “economic segregation index”, we note that the bracketed term in (3) varies between 0 and 1. If all neighbourhoods have the same mean family income (i.e., I_B is 0), and neighbourhoods have the same distribution of family incomes that is equal to the overall distribution (i.e., $I_W = I_T$), then the index (bracketed term in (3)) will have a value of zero. There is no sorting of families into low and high-income communities. At the other extreme, if there is no within neighbourhood variation, and all families in the neighbourhood have identical incomes, then one has maximum neighbourhood economic segregation, and the index value is 1. In between these values, *for a given level of total inequality (I_T)*, as neighbourhoods become more internally homogeneous regarding average family income (associated with increased sorting), I_W declines, and the index increases in value. Hence, the index is driven by the degree of internal homogeneity of the neighbourhoods relative to total inequality.

¹⁰ Using the decomposable Theil index, values for the within and among components are shown for the eight cities for 1995 in Appendix Table B.2. Note that the “within” neighbourhood inequality far outstrips the “among” inequality. Between 13% and 20% of the overall income inequality is accounted for by the “among” neighbourhood inequality, the remainder by the within.

¹¹ The variance is not considered a valid measure of inequality since it is not scale invariant. Accordingly, usual practice is to calculate the coefficient of variation (CV) by dividing the standard by the mean. When one takes the ratio of the between-tract standard deviation to the standard deviation for all households the mean cancels out so that Jargowsky’s neighbourhood sorting index is identical to the ratio of CV between neighbourhoods (a measure I_B) to total inequality (I_T). CV, however, is not a decomposable inequality measure; instead it is necessary to calculate CV^2 .

¹² $I_B / I_T = (I_T - I_W) / I_T = 1 - I_W / I_T$. The one difference between Jargowski’s neighbourhood sorting index and ours is that we use the Theil index as a measure of dispersion because it is decomposable, whereas he used the CV.

In the end, an increase in the “segregation” component in (3), the bracketed term, simply indicates that neighbourhoods are becoming more economically homogeneous relative to overall (total) city-wide inequality.¹³

While the accounting identity in (3) may appear trivial, placing an “economic segregation” index within the framework of this identity allows us to answer a question of considerable interest, notably the extent to which the rising inequality observed earlier is due to an overall increase in inequality among an urban population or to higher economic segregation among families. To answer this question, it is useful to express Equation (3) in log form as:

$$(4) \quad \ln(I_B) = \ln(I_T) + \ln(1 - I_W/I_T)$$

so that the overall change in I_B between any two points in time can be expressed as the sum of the change in its components as in:

$$(5) \quad \Delta \ln(I_B) = \Delta \ln(I_T) + \Delta \ln(1 - I_W/I_T)$$

Among the family of valid inequality measures, several lend themselves to decompositions of the sort implied in equations (1) – (5) including the Theil index (T) and the squared coefficient of variation (CV^2). Here we use the Theil index.

The “between” and “within” components of total city family income inequality are given in Appendix Table B.2., along with the value of the sorting index ($1 - I_W/I_T$). The index rose continuously in five of the eight cities (Quebec City, Montreal, Winnipeg, Calgary, and Edmonton) and rose in the 1990s in Toronto. Results in Table 11 show that rising economic segregation has contributed to rising neighbourhood inequality primarily in four cities, Quebec City, Winnipeg, Calgary and Edmonton. In these cities, the rise in neighbourhood inequality had more to do with changes in the way that families sort themselves into low and high-income neighbourhoods than the overall increase in family income inequality. In the four remaining cities the opposite was true, rising neighbourhood inequality was largely an offshoot of higher inequality among all families city-wide.

The increase in the segregation component simply indicates that inequality between neighbourhoods is rising faster than inequality among all families and that neighbourhoods are becoming more economically homogeneous relative to overall levels of inequality in an urban area. This is related to the rising neighbourhood concentration of employment (in higher income neighbourhoods) and unemployment (in lower income neighbourhoods). However, the fact that changes in the neighbourhood distribution of transfers offsets only a small share of the increase in neighbourhood inequality also plays a role. Comparison of the contribution of the “segregation effect” to neighbourhood inequality before and after transfers (Table 12) indicates that the segregation component plays a somewhat larger role in accounting for change in post-transfer than in pre-transfer neighbourhood inequality. This is because transfers had a significant impact on reducing total inequality (I_T), so that it did not rise much in most cities after transfers (see Appendix A). Hence this component played a less important role in increasing neighbourhood

¹³ Put another way, inequality between neighbourhoods is rising faster than total urban inequality. Although indexes such as these are often referred to as “neighbourhood sorting indexes”, for this index to increase there does not have to be an increase in sorting in the sense that there are physical moves of families among neighbourhoods. If family income in neighbourhoods change such that tracts become more internally homogeneous, then the sorting index will rise, even if no families move among neighbourhoods.

inequality after transfers than before. Transfers had less impact on reducing neighbourhood inequality, however.

	% Change in Neighbourhood Inequality ($\Delta \ln I_B$)	% Change in City-Level Family Income Inequality ($\Delta \ln I_T$)	% Change in Inequality Related to Economic Segregation ($\Delta \ln(I - I_W/I_T)$)
Quebec City			
1980-95	23.2%	4.6%	18.6%
1985-95	15.8%	1.9%	13.9%
Montreal			
1980-95	28.5%	21.1%	7.4%
1985-95	15.7%	11.6%	4.1%
Ottawa-Hull			
1980-95	14.8%	10.4%	4.5%
1985-95	13.8%	9.9%	3.8%
Toronto			
1980-95	40.2%	28.5%	11.7%
1985-95	28.6%	19.9%	8.7%
Winnipeg			
1980-95	44.5%	16.9%	27.6%
1985-95	20.7%	4.9%	15.9%
Calgary			
1980-95	46.9%	21.3%	25.5%
1985-95	22.8%	11.3%	11.5%
Edmonton			
1980-95	47.6%	16.5%	31.1%
1985-95	22.6%	1.3%	21.3%
Vancouver			
1980-95	27.4%	25.9%	1.5%
1985-95	4.6%	14.9%	-10.2%

	Before Transfers	After Transfers
Toronto	24%	29%
Montreal	18%	26%
Ottawa-Hull	17%	30%
Quebec City	47%	80%
Vancouver	13%	5%
Edmonton	49%	65%
Calgary	43%	54%
Winnipeg	48%	62%

Conclusion

Our main conclusions from this initial overview of neighbourhood income inequality in Canada's largest CMAs can be summarized as follows:

- The distribution of employment, unemployment and of employment income among neighbourhoods has changed dramatically since 1980. This was the driving force behind changes in relative neighbourhood economic conditions over the period.
- Relative to their impact on the distribution of income among all families, rising transfers had a modest impact in offsetting changes in the neighbourhood distribution of employment earnings.
- Neighbourhood inequality in total family income (post-transfer/pre-tax) increased over the period. Given the reduced impact of transfers on neighbourhood inequality (compared to family income inequality), it seems likely that although more muted than changes based on total family income, changes observed on an after-tax basis would not be qualitatively different (also see Appendix A). We do not have the data to confirm this, however.
- Not only did earnings and income disparities between high and low-income neighbourhoods rise, but "neighbourhood sorting" increased in five of the eight cities.

These results indicate that the relative stability in the distribution of family income observed at the national level conceals important changes in the relative economic position of neighbourhoods in Canada's major cities. In particular, the decline in employment among the population in the poorer neighbourhoods is noteworthy.

Appendix A: Has Urban Inequality Been Rising?

Nationally, family income inequality after taxes and transfers (disposable income) has been relatively stable since the 1970s (Wolfson and Murphy, 1998; Beach and Slotsve, 1996; Statistics Canada, 1998). Since the standard data source for these conclusions is the Survey of Consumer Finances, it is first of all instructive to consider whether we would draw similar conclusions from Census data.

Appendix Table A.1 shows results for family income distributions using the usual Statistics Canada reporting standard (i.e. distributions that are not adjusted for family size). The Census shows a 5.7% increase in the Gini over the 1980-95 period, only slightly greater than the 3.7% increase found in the SCF on a pre-tax basis. After tax data from the SCF shows no increase in disposable family income inequality. Our assumption is that were after-tax distributions available from the Census, the results would essentially confirm the typical findings from the SCF.

	1980	1995	Change	% Change
Census (before tax)	0.407	0.430	0.023	5.7%
SCF (before tax)	0.383	0.397	0.014	3.7%
SCF (after tax/transfer)	0.358	0.357	-0.001	----

Note: Not adult equivalent adjusted.

With respect to levels, comparisons between the SCF and Census¹⁴ suggest that the Census produces a greater concentration of families at both the upper and lower tail of the income distribution and hence higher values of standard inequality measures.¹⁵ It is well known that income surveys have reporting problems at both the upper and lower tails. The Census may provide a somewhat better measure because the reporting of income is mandatory and the SCF has fairly high non-response rates at the tails. Furthermore, reconciliation of aggregate incomes from various sources suggests that the census is closer to the national accounts aggregates than the SCF.

The question remains as to whether family income inequality rose on an after-tax basis in Canadian cities over the period. Our answer is a cautious “yes”. In Table A.2, we observe that the increase in total family income inequality (before taxes) was greater than that observed nationally. Nationally, the pre-tax Gini based on the Census increased 5.7% (or .023) during the 1980-95 period but between 7.9% and 10.6% in the three largest cities. The Theil index, which is more sensitive to change at the bottom of the distribution than the Gini, rose 12.6% nationally (based on Census data), and between 18% and 24% in three largest CMAs. In effect, increases in income inequality after transfers (but before taxes) was greater in the large CMAs than in the country as a whole.

¹⁴ Certification of Income Data, 1996, Income Statistics Division, Statistics Canada

¹⁵ At the lower tail, 5.5% of families had total family incomes less than \$10,000 in the Census, compared to 2.4% in SCF. At the upper tail, 14.2% of families had incomes greater than \$90,000 in the Census, compared to 12.8% in the SCF.

Appendix Table A.2: Percentage Change in Inequality Indexes, 1980-95 Three Largest Cities, Family Income						
	Montreal		Toronto		Vancouver	
	Percent Change in Index					
Not Adult-Equivalent Adjusted						
Gini						
Census (before tax)	7.9%	(0.033)	10.6%	(0.043)	8.1%	(0.034)
SCF (before tax)	10.6%	(0.040)	6.7%	(0.026)	4.8%	(0.019)
SCF (after tax)	8.2%	(0.028)	1.6%	(0.006)	-1.0%	(-0.004)
Theil						
Census (before tax)	18.4%	(0.056)	24.0%	(0.072)	19.0%	(0.060)
SCF (before tax)	23.0%	(0.055)	21.8%	(0.056)	12.4%	(0.033)
SCF (after tax)	17.4%	(0.034)	8.8%	(0.020)	-2.4%	(-0.006)
Adult-Equivalent Adjusted						
Gini						
Census (before tax)	9.7%	(0.034)	15.5%	(0.053)	12.9%	(0.045)
SCF (before tax)	12.3%	(0.039)	13.7%	(0.043)	9.9%	(0.032)
SCF (after tax)	7.2%	(0.020)	6.9%	(0.020)	2.3%	(0.007)
Theil						
Census (before tax)	23.5%	(0.052)	33.0%	(0.075)	29.6%	(0.066)
SCF (before tax)	24.6%	(0.042)	38.8%	(0.069)	29.2%	(0.052)
SCF (after tax)	15.4%	(0.020)	20.8%	(0.032)	9.4%	(0.015)
() indicates the absolute change in the index value (i.e. the rise in the Gini or Theil)						

When we measure inequality using adult equivalent adjusted income, inequality in post-transfer family income at the city level rises even more. In the three largest cities, inequality in (pre-tax) tax total family income measured by the Gini rises by 10% to 15% compared to 8% to 10% using unadjusted income.

Turning to SCF data where estimates of inequality in after-tax adjusted family income can be derived, Table A.2 shows that there was an increase in Montreal and Toronto and possibly Vancouver. While the SCF results are derived from a small sample, and we have not estimated confidence intervals for the estimates, the fact that the SCF displays increases in pre-tax tax inequality that are similar to Census estimates (based on very large samples) suggests that the SCF estimates are indicative of the actual trend.

These data suggest that inequality did rise in the larger cities although pre-tax income undoubtedly overestimates the increase. Moreover, we can be confident that neighbourhood inequality in the larger cities rose over the period. As shown in the text, rising transfers played a large role in reducing the impact of the increase in earnings inequality among all families but had a modest impact on the change in neighbourhood inequality.

Finally, we note that Census estimates of changes in earnings inequality show that: (a) Census results indicate somewhat larger increases in earnings inequality than the SCF for the country as a whole and (b) that changes in earnings inequality were significantly greater in the large CMAs than indicated by national figures. This is shown in Table A.3 where earnings inequality measured by the Theil index is calculated for “effective labour participants” (persons 18-64 with earnings greater than \$500 per year) following the definitions of Wolfson and Murphy (1998) for the country as whole with both SCF and Census data and for the CMAs with Census data for 1985 and 1995.

Table A.3 Earnings Inequality (Theil index) Among Effective Labour Force Participants, Canada and Eight CMAs, 1985-95			
	1985	1995	% Change
Canada			
SCF	0.293	0.295	0.7%
Census	0.318	0.336	5.7%
CMAs (Census)			
Quebec	0.274	0.290	5.8%
Montreal	0.287	0.322	12.2%
Toronto	0.324	0.364	12.3%
Ottawa-Hull	0.285	0.293	2.8%
Winnipeg	0.296	0.309	4.4%
Calgary	0.338	0.389	15.1%
Edmonton	0.311	0.342	10.0%
Vancouver	0.315	0.348	10.5%

Appendix B: Supplementary Tables

Appendix Table B.1: Percentage Distribution of CTs by population size of CT								
	<u>Quebec City</u>		<u>Montreal</u>		<u>Ottawa-Hull</u>		<u>Toronto</u>	
	1980	1995	1980	1995	1980	1995	1980	1995
< 1000	6.3	4.6	4.6	4.0	3.4	3.2	2.3	1.6
1000-1999	6.3	11.2	11.2	11.2	6.2	5.1	5.0	3.1
2000-2999	17.5	11.8	16.0	17.1	18.5	9.7	8.2	8.7
3000-3999	15.1	16.4	19.0	20.9	26.4	22.1	18.8	16.4
4000-4999	18.3	21.7	16.7	14.4	19.1	23.0	21.5	19.1
5000-5999	14.3	13.8	14.4	14.0	15.2	16.6	17.2	21.2
6000-6999	7.9	9.9	7.4	7.1	9.6	7.8	12.0	14.3
7000-7999	5.6	5.3	5.3	4.5	1.7	5.5	8.2	7.2
8000-8999	4.8	2.6	2.4	2.2	0.0	4.1	3.0	3.6
9000-9999	2.4	1.3	0.8	1.4	0.0	0.9	1.7	1.9
10000-10999	0.8	0.7	1.1	0.7	0.0	0.5	0.3	1.0
11000-11999	0.0	0.0	0.6	0.4	0.0	0.9	1.0	0.6
>= 12000	0.8	0.7	0.5	2.1	0.0	0.5	0.8	1.5
Number of Neighbourhoods	126	152	658	759	178	217	600	807
Average Size of Neighbourhood	4,430	4,330	4,220	4,310	3,940	4,580	4,925	5,220
	<u>Winnipeg</u>		<u>Calgary</u>		<u>Edmonton</u>		<u>Vancouver</u>	
	1980	1995	1980	1995	1980	1995	1980	1995
< 1000	6.0	5.1	0.9	0.0	4.3	2.6	2.9	1.0
1000-1999	3.0	4.5	10.4	10.5	1.4	4.2	3.7	1.3
2000-2999	20.1	17.2	16.5	17.6	10.0	10.6	8.2	3.7
3000-3999	21.6	22.3	27.8	26.1	17.9	25.9	12.2	10.1
4000-4999	17.9	17.8	23.5	16.3	26.4	22.8	19.6	16.4
5000-5999	11.9	16.6	9.6	16.3	18.6	15.9	21.6	18.5
6000-6999	10.4	10.8	4.3	3.3	15.0	9.5	18.4	18.1
7000-7999	3.0	3.2	4.3	3.9	3.6	3.7	8.6	15.8
8000-8999	3.7	1.9	0.0	1.3	0.7	2.6	2.9	8.7
9000-9999	0.7	0.0	0.9	1.3	2.1	0.0	1.6	2.7
10000-10999	0.7	0.6	1.7	3.3	0.0	1.1	0.4	1.0
11000-11999	0.7	0.0	0.0	0.0	0.0	0.5	0.0	0.3
>= 12000	0.0	0.0	0.0	0.0	0.0	0.5	0.0	2.3
Number of Neighbourhoods	134	157	115	153	140	189	245	298
Average Size of Neighbourhood	4,270	4,180	5,050	5,320	4,600	4,500	5,040	6,070

Appendix Table B.2: Decomposition of the Theil Index, 1980-95

	Total family Income Inequality (I_T)	Among Neighbourhood (I_B)	Within Neighbourhood (I_W)	$\left(1 - \frac{I_W}{I_T}\right)$
Quebec City				
1980	0.194	0.022	0.172	0.113
1985	0.200	0.024	0.176	0.120
1990	0.181	0.024	0.157	0.132
1995	0.203	0.028	0.175	0.138
Montreal				
1980	0.220	0.038	0.182	0.172
1985	0.242	0.043	0.198	0.182
1990	0.243	0.044	0.198	0.185
1995	0.272	0.051	0.221	0.188
Ottawa-Hull				
1980	0.207	0.029	0.178	0.140
1985	0.208	0.029	0.179	0.139
1990	0.206	0.028	0.178	0.136
1995	0.230	0.033	0.196	0.148
Toronto				
1980	0.226	0.040	0.186	0.177
1985	0.247	0.045	0.202	0.182
1990	0.264	0.046	0.218	0.174
1995	0.301	0.060	0.242	0.196
Winnipeg				
1980	0.194	0.029	0.165	0.149
1985	0.219	0.037	0.182	0.169
1990	0.219	0.040	0.179	0.183
1995	0.230	0.045	0.184	0.200
Calgary				
1980	0.227	0.029	0.198	0.127
1985	0.251	0.036	0.214	0.147
1990	0.243	0.038	0.205	0.156
1995	0.281	0.046	0.235	0.163
Edmonton				
1980	0.201	0.020	0.181	0.099
1985	0.234	0.025	0.208	0.111
1990	0.221	0.029	0.192	0.131
1995	0.237	0.032	0.205	0.135
Vancouver				
1980	0.226	0.029	0.197	0.128
1985	0.252	0.036	0.216	0.142
1990	0.248	0.032	0.216	0.129
1995	0.263	0.038	0.225	0.144

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