

Financing Municipal Government in New Brunswick, Canada, 1983-2003

Craig Brett, Canada Research Chair in Canadian Public Policy, Department of Economics, Mount Allison University, Sackville, New Brunswick E4L 1A7, Canada (email: cbrett@mta.ca)

Christina Tardif, Spatial Econometrics Laboratory, Faculty of Social Sciences, Mount Allison University, Sackville, New Brunswick E4L 1A7, Canada (email: ctardif@mta.ca)

Patrick Blagrove, Department of Economics, Mount Allison University, Sackville, New Brunswick E4L 1A7, Canada (email: pwblgrv@mta.ca)

Nelson Paterson, Department of Economics, Mount Allison University, Sackville, New Brunswick E4L 1A7, Canada (email: naptrsn@mta.ca)

ABSTRACT

This study describes the evolution of the two largest revenue sources for municipal government in New Brunswick. Since 1983, the real value of grants from the provincial government has declined, and municipalities have used property tax revenue to offset this decline. Most municipalities have been able to maintain, and even increase slightly, real revenue per household due to a combination of tax base growth and increases in the rate of property taxation. Some municipalities in the extreme northeast of New Brunswick experienced a decline in total revenue per household, due to slow growth in the local tax base and relatively slow growth in the municipal tax rate. Growth in municipal revenue per household was considerably slower than per capita growth in local receipts due to a marked reduction in household size. This reduction, too, was unevenly distributed over space, being most pronounced in the province's north.

RÉSUMÉ

Cet étude décrit l'évolution des deux sources de revenu les plus importantes pour les gouvernements municipaux du Nouveau-Brunswick. Depuis 1983, la valeur réelle des transferts du gouvernement provincial a diminué, et les municipalités ont dû utiliser le revenu de la taxe foncière pour compenser cette réduction. Grâce à la croissance de l'assiette fiscale et de l'augmentation du taux d'impôts fonciers, la plupart des municipalités ont pu maintenir, et même légèrement augmenter, leur revenu réel par ménage. Cependant, quelques municipalités dans l'extrême nord-est du Nouveau-Brunswick ont vu un déclin dans le revenu total par ménage, causé par une croissance modeste de l'assiette fiscale locale et une croissance relativement modeste du taux d'imposition municipal. La croissance du revenu municipal par ménage a été beaucoup plus modeste que la croissance des reçus locaux par habitant à cause d'une réduction marquée de la taille des ménages. Cette réduction a été distribuée de façon inégale dans le territoire provincial, étant plus prononcé dans le nord du Nouveau-Brunswick.

INTRODUCTION

Municipalities across Canada are expressing concern over their ability to generate sufficient revenue to enable them to provide an adequate level of local public services (Federation of Canadian Municipalities 2002). Despite being endowed with a diversified arsenal of revenue raising powers in the early years of Confederation, many municipalities are now reliant on a single tax, namely the tax on real property, for much of their revenue (Kitchen 2002). During the 1990s, fiscal restraint by the federal and provincial governments led municipalities to rely more heavily on local revenue sources, heightening concern over the narrow local tax base. Increased reliance on the property tax raised questions about the spatial distribution of access to municipal services. Property values are tied to locational advantages. Complete reliance on the property tax, therefore, would produce uneven access to revenue. Some municipalities could provide ample services at low tax rates, while others might have to charge high rates in order to maintain minimal public amenities.

The municipal sector in New Brunswick has not been insulated from these national concerns. Indeed, New Brunswick has been one of only two provinces in Canada that experienced a growth in property tax revenue as a share of all forms of taxation between 1971 and 2001 (Kitchen 2002, 333). Also, the Government of New Brunswick proposed, partially implemented, and then abandoned a new method of allocating grants to municipalities to take explicit account of, and possibly to attenuate, differences in the property tax base among locations. This system, adopted in 1997, was to be phased in from 1997 to 2001. However, the changes to the formula occurred at a time of decreasing overall provincial financial assistance to municipalities and growing concern over the ability of these municipalities to adjust to the changes in grants (Government of New Brunswick 2001, 23). The equalizing system was abandoned before the 2001 granting year, which was to be the year of most drastic transition from the old scheme to the new. In order to assess the desirability of an equalizing system of grants, and perhaps comment on the wisdom of the policy reversal in New Brunswick, it is necessary to gauge the degree of inequality in revenue generating capabilities among municipalities.

Recent studies of the spatial distribution of local public policies have often focused on questions of interactions among local governments in policy settings (Brueckner 2003). In the local property tax setting, this literature attempts to assess the degree to which policies are similar in neighbouring jurisdictions (Brett and Pinkse 1997), and the importance of local interactions in explaining the spatial pattern of local tax rates. Bordignon *et al.* (2003) conclude that local governments in Italy are more likely to set tax rates similar to those in nearby jurisdictions when there might be electoral consequences from not doing so. These consequences might be forthcoming if electors use information from nearby municipalities to inform their judgments on the appropriate level of taxation in their area. Brett and Pinkse (2000) analyze the extent to which fear of the loss of tax base through flight to nearby jurisdictions constrains policy makers to keep their tax rates in line with those of their neighbours. They find little evidence of tax base mobility in their study of local tax setting in British Columbia, even though there is a significant spatial pattern in property tax rates. The spatial pattern of changes in tax rates they discover is better explained by purely local responses to the evolution of the spatial pattern of tax bases.

An accurate picture of the evolution through space and time of the sources of local revenues, therefore, is key to understanding changes in the access to local services, to assessing the effects of changes in provincial government policies on local governments, and to evaluating the extent of interdependence among local policy makers. This study offers a description and analysis of the recent history of the major components of municipal revenue in New Brunswick. Its purpose is to identify and situate trends, rather than to offer a systematic explanation of local tax setting in New Brunswick or to use the New Brunswick experience to discriminate among competing theories of local political behaviour. Nevertheless, it helps to focus the quest for explanation by setting out the phenomena that must be explained.

LOCAL PUBLIC FINANCE IN NEW BRUNSWICK

There are two types of local administration in New Brunswick. Unincorporated, rural areas comprise a set of local service districts (LSDs). Basic local services, including garbage disposal, policing, road maintenance and fire protection, are provided by the provincial

government. These services are financed partly out of the general provincial coffers, and partly by a local property tax. The rate at which property is taxed varies among LSDs according to differences in the costs of providing services, the value of local property and the provision of optional services, such as street lighting. The provision of such additional services is decided by public meeting. The tax rates in local service districts are set by the provincial government.¹ The villages, towns and cities of New Brunswick are known collectively as its municipalities. Figure 1 demonstrates that only a tiny fraction of the land mass of New Brunswick is enclosed within municipal boundaries.

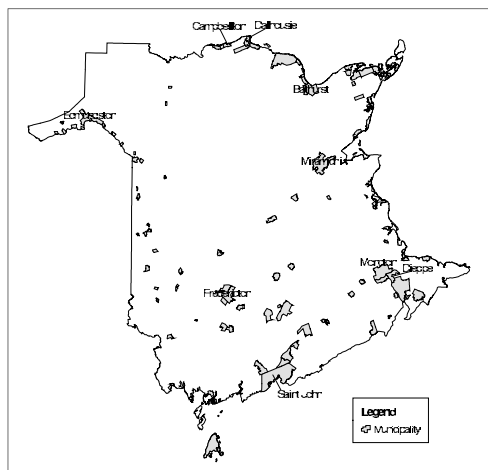


Figure 1. The Sparseness of Municipalities

Municipalities have councils and mayors, elected according to a calendar prescribed by provincial regulation. These councils have the power to set the rate of property taxation and to decide on the spending priorities of the municipal government. Provincial statute requires that all municipalities pay for policing. In addition, all municipalities provide fire protection, snow removal, road maintenance, and garbage disposal. Most, but not all, municipalities operate water and/or sewer systems. To varying degrees, municipalities offer recreational and cultural services and engage in activities to promote and manage local economic development. The primary sources of revenue for municipal operations are the property tax,

¹In 1995, a rural community (Beaubassin East) was established. This rural community is an amalgamation of pre-existing LSDs, with enhanced power over land use planning. It has no municipal council and no power to set taxes.

known as the warrant, and unconditional grants from the provincial government. Together, these sources comprised 86.5% of municipal operating revenue in 1983 and just over 89% of municipal operating revenue in 2003 (Government of New Brunswick 1984, 49; Government of New Brunswick 2003, 1). The remaining revenue was from a variety of smaller, targeted granting programmes and from fees, fines, and other local, non-tax sources.

Properties within municipal boundaries are subject to a two-part property tax. The provincial government charges a tax rate on the assessed value of property (currently \$1.50 per hundred dollars of assessed value for residential property and \$2.25 per hundred dollars of assessed value of non-residential property) that is constant across the province. Owner-occupied housing is exempt from this part of the property tax. The provincial government carries out assessments according to a common set of criteria that are designed to reflect market valuations of property. Municipalities are free to set their own tax rates on these same assessed values. Non-residential property is taxed at one-and-one-half times the residential rate. Owner-occupied housing is not exempt from the municipal component of the property tax. In some municipalities, service provision is spatially differentiated. For example, the town water mains might not extend all the way to the town boundary. In such a circumstance, the municipality sets a higher tax rate on properties served by the water mains than it does on those properties without municipal water services. The higher rates are commonly known as inside rates; the lower, as outside rates.²

In contrast to the recent history of local government in other provinces,³ there has been little change in the formal responsibilities of municipal governments in New Brunswick since the late 1960s. There have been a handful of municipal amalgamations and absorptions of former LSDs into nearby municipalities, but no comprehensive redrawing of municipal boundaries.⁴ Perhaps the most significant changes in provincial-municipal relations in New

²Recently, a small number municipalities have further differentiated their property taxes and list rates for named zones within town boundaries.

³Tindal and Nobes Tindal (2000, 211-226) offer a detailed account of the recent efforts of redefine the roles of local and provincial governments in other Canadian provinces.

⁴The largest such amalgamation occurred in 1995 when the city of Miramichi was created by combining

Brunswick over the study period have been alterations in the size of the unconditional grant to municipalities and in the procedures by which these grants are allocated among localities. The share of municipal operating revenue covered by the unconditional grant fell from 40.8% in 1983 to of 14.4% in 2003 (Government of New Brunswick 1984, 49; 2003, 1). There have also been several revisions to the system of grant allocation during this time. The procedure used in 1983 was established in 1974, and was based on the notion of a provincial share of municipal expenditure. The province's share increased with the proportion of provincial population residing in the municipality and with the total length of roads per unit of tax base in the municipality. The province also augmented its share for each inhabitant in excess of 5000. Starting in 1987, the explicit use of population in the calculation of the provincial share was abandoned. Instead, municipalities were divided into four groups according to a combination of population, per capita budget, municipal services provided, and urban characteristics. Municipalities with more roads per unit of tax base or lower tax base per capita than their respective group average were allotted a greater share of provincial support. The final grants paid were scaled in such a way as to ensure that the total grant paid to all members of group equalled the amount in a pre-assigned grant pool for that group. This system was phased in gradually from 1987 to 1989 in order to ease adjustment for those municipalities who were most adversely affected by the new formula. This method of allocating grants persisted until 1993, when the provincial government began allotting unconditional grants without explicit reference to a formula.

The formulaic approach to municipal assistance was re-introduced in 1997. The 1997 system takes a representative tax system approach to allocating grants, similar to the federal-provincial equalization formula.⁵ The goal of this system was to soften distinctions among municipalities in their fiscal capacities, rather than to arrive at an appropriate share of provincial expenditure. The unconditional grant was calculated so as to make up the difference between what a municipality's per capita warrant would be if it applied the average tax

five municipalities with four LSDs and parts of three other LSDs.

⁵Boadway (2002) gives an account of the general features of, and motivations for employing, representative tax system approaches to equalization.

rate for its group to its municipal tax base and its per capita net expenditure requirements. All other things equal, municipalities with fewer people per road kilometer were treated as having greater expenditure requirements. Per capita grant entitlement was to be calculated as the adjusted per capita expenditure requirement minus the average per capita warrant in the municipality's group. The new system included a redefined set of six groups. The total grant payable was to be the per capita entitlement, multiplied by population, and then rescaled so that total provincial expenditure on grants to municipalities did not exceed a pre-assigned total. This system was to be phased in from 1997 to 2001. However, the phase-in was halted in 2000, and the nominal value of unconditional grants were frozen at their year 2000 levels from 2001 until 2003.

DATA SOURCES

The unit of observation for this study is the municipality. The Government of New Brunswick (1983; 1988; 1993; 1998; 2003) publishes information on the budgets of each municipality in the province. The available data includes information on property tax collections, tax rates and other revenue sources, including the unconditional grant from the provincial government. The dollar value of the municipal portion of property tax revenue collected in a municipality is called that municipality's warrant. The warrant arising from a particular property is its contribution to the tax base multiplied by the published tax rate on that property. Accounting conventions and popular usage in New Brunswick are such that the term tax rate is reserved for the residential tax rate. Accordingly, the municipal tax base is defined as the value of residential property plus one-and-one-half times the value of non-residential property in that municipality. In this study, we concentrate on the average tax rate for a municipality, defined as the total warrant divided by the total tax base. For municipalities that have differentiated property tax rates, the average tax rate is a tax base weighted average of its published rates. We also track the evolution of the warrant, the tax base and the unconditional grant. The data reported on in this study are for the years 1983, 1988, 1993, 1998 and 2003. To adjust for inflation, dollar values are converted to 1997 constant dollars using the gross domestic product deflator for the province of New Brunswick

(Statistics Canada, 384-0036).

Whenever possible, we conduct our analysis on the 103 municipalities existing in New Brunswick in 2003. However, the exact matching of municipalities over two decades is infeasible in a few cases. One reason is that some municipalities have come into existence from former (portions of) LSDs. Three such municipalities (Le Goulet, Maisonnnette, and Sainte-Marie-Saint-Raphaél) were created between 1988 and 1993, while an additional two (New Maryland and Saint-Isidore) were formed between 1993 and 1998. Table 1 summarizes our sample size for each year. The second potential source of non-comparability is the occasional redrawing of municipal boundaries.

Table 1

Sample Sizes

year	1983	1988	1993	1998	2003
n	98	98	101	103	103

For each municipality with 2003 boundaries that resulted from an amalgamation of pre-existing municipalities occurring during the study period, we construct all aggregate variables (population, tax base, warrant, total revenue) for years prior to the amalgamation by adding the values for each municipality that was included in the amalgamation. For example, the amalgamated town of Tracadie-Sheila is given the sum of values for Tracadie and Sheila for the years in which these were separate municipalities. The average tax rate and number of persons per household are computed, respectively, by taking a tax-base-weighted average of the tax rates and a population-weighted average of the number of persons per household in constituent municipalities. An unavoidable limitation of this procedure is that it fails to account for the inclusion of former LSDs into redrawn municipal boundaries. The small population of most LSDs, however, ensures that this omission is unlikely to greatly alter the conclusions of our analysis.

Because of the great variation in size of municipalities, it is necessary to rescale the fiscal variables into comparable units. We choose to examine the evolution of local revenue sources

per capita and their respective changes per household. Population and household counts are taken from the Census of Canada (Statistics Canada 2004) for the census two years preceding the fiscal variables. Given the central role of population in grant calculations, it seems reasonable to look at the evolution of revenue sources per capita. On the other hand, the prominent role of property services in municipal expenditure renders per household analysis appropriate for gauging the evolution of revenue against changes in municipal need. As argued below, the evolution of funding, in particular changes in the tax base, looks different through these two lenses.

THE TIME PROFILE OF REVENUE CHANGE

We employ an exploratory data analysis technique to study the changes in the composition and level of municipal revenue from 1983 to 2003. For each variable of interest, we construct a time line of Tukey's (1977) box-and-whisker plots, drawn at five year intervals. Each boxplot depicts the five number summary (minimum, first quartile, median, third quartile, maximum) for each variable. Outliers are denoted by hollow circles.⁶ Figure 2 depicts the behaviour of the average number of persons per household among New Brunswick's municipalities over the study period. The trend is clearly toward smaller household size. Below, we will discuss the degree to which the intensity of this trend varied across New Brunswick.

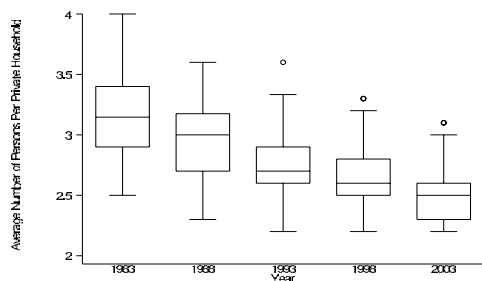


Figure 2. Trends in Persons per Private Household

As Figure 3 illustrates, total revenue per household was relatively stable throughout the earlier part the study period, with a slight lowering of revenue per household among the

⁶Outliers are defined as those observations that exceed the third quartile (or that fall below the first quartile) by more than 1.5 times the difference between the third and first quartiles.

top half of the revenue getters between 1993 and 1998 and increases at nearly all levels in the final five years of the study period. Given the downward trend in household size, total revenue per capita increased throughout the study period, dramatically so between 1998 and 2003. The positions of the medians closer to their respective first quartiles than to their third quartiles, together with the tendency for upper whiskers to be longer than lower whiskers, indicate that the distribution of total revenue is right-skewed; that is, there are relatively few high revenue municipalities and relatively many low revenue municipalities. This pattern prevailed throughout the entire study period.

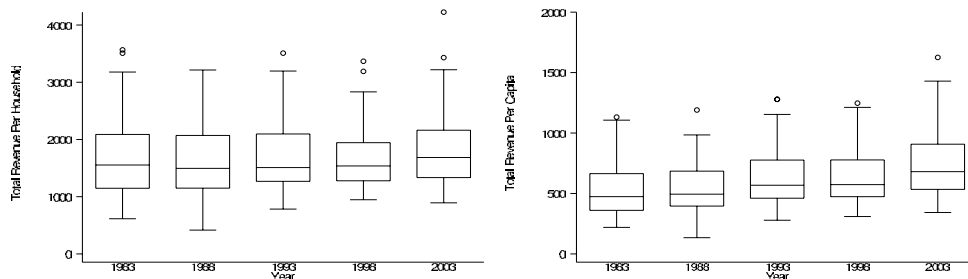


Figure 3. Trends in Municipal Total Revenue

The behaviour of the two primary revenue sources is tracked in Figures 4 and 5. The real value of the unconditional grant has declined steadily over the entire study period. Apart from a few outliers, the distribution of the grants has been rather symmetric and has become more compressed over time. These trends are apparent in both the per capita and per household data. By contrast, the warrant has been steadily rising, always heavily skewed and becoming more dispersed over time. The 2003 experience shows only a slight reversal of dispersion. The dominant trend over the study period is for municipalities to ratchet up local property tax revenue to replace withdrawn provincial grant support.

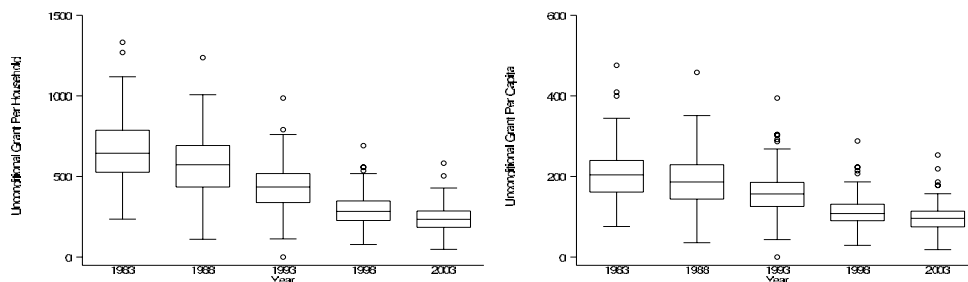


Figure 4. Trends in The Unconditional Grant

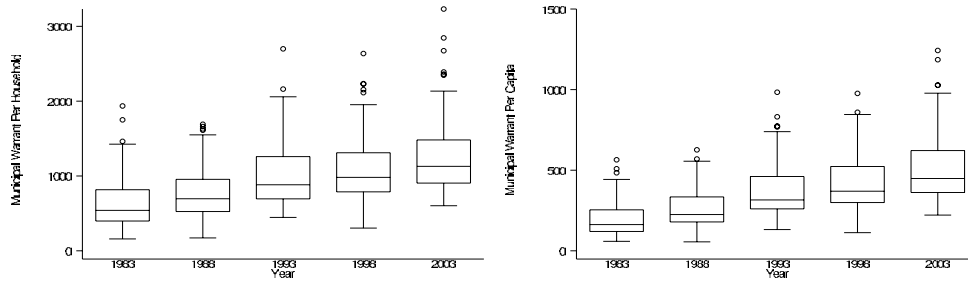


Figure 5. Trends in Municipal Warrants

How did municipalities manage to generate this additional property tax revenue? Figure 6 reveals that municipalities of most sizes have experienced growth in the tax base during the study period. Municipalities in the bottom half of the distribution of tax base per household experienced some decline during the mid-1990s, but these losses were more than recouped by 2003. The distribution of the tax base is more skewed than the distribution of the unconditional grant, especially in the years 1993 and 2003. It also seems that years of increased dispersion coincide with years of greatest growth in the tax base.

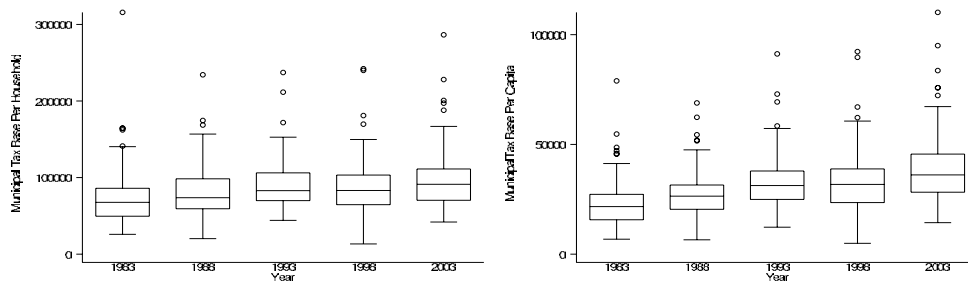


Figure 6. Trends in Municipal Tax Bases

Figure 6 does not, by itself, portray information on the rate of growth in municipal tax bases relative to overall economic growth. Provincial GDP grew by 65% from 1983 to 2003 (Statistics Canada, 384-0002), while the total municipal tax base grew by 59%. The comparable per household figures are 25% and 21%. The median per household tax base increased some 35% over the study period. On the whole, then, the municipal tax base has grown only slightly slower than provincial GDP. Because the tax base has not grown dramatically, the explanation for the sharp increase in the warrant must lie in property tax

increases.

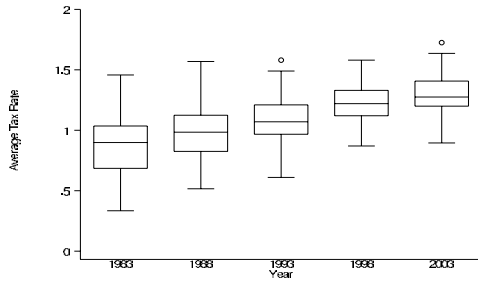


Figure 7. Trends in Average Tax Rates

Figure 7 confirms that this is so. There has been a steady increase in the median property tax rate, and an equally steady and more pronounced increase in the first quartile tax rate. Indeed, there has been a remarkable convergence of local property tax rates in New Brunswick toward the highest tax rates displayed at the beginning of the study period. Two possible explanations for this pattern of convergence immediately suggest themselves. Perhaps the slower growth of the tax rate among high-tax areas points to the existence of a tax ceiling, a level of taxation beyond which a municipal council dare not tread. Alternatively, the tax base may have grown more quickly among the province's cities — which have consistently shown the highest tax rates — than its more rural areas. This extra growth in the tax base would reduce the need to increase tax rates to maintain local services. In order to differentiate between these explanations, we need to look more closely at the spatial patterns of the changes in the variables of interest throughout the study period.

THE SPATIAL DIMENSION OF FISCAL ADJUSTMENT

We explore the spatial patterns of changes in municipal financing by constructing and interpreting a series of maps of New Brunswick. All maps are constructed in the same way. In the first instance, each municipality is represented by its geographical centroid. This seems a reasonable approximation, given the small area of most municipalities and their sparse distribution. (Recall Figure 1.) We focus solely on the spatial pattern of changes in revenue sources per household between 1983 and 2003, guided by our view that this is perhaps a better indicator of the evolution of funding relative to fiscal need than viewing

change through the per capita lens. Because of our focus on these long-horizon changes, this part of our study is limited to the 98 municipalities for which we can construct a full twenty-year history. For each variable of interest, the symbol used to display the value of that variable at a municipality is given a colour, hollow or shaded, to represent the sign of the change and a size that increases with the magnitude of the change. Because the symbol size is not strictly proportional to the magnitude of the change, these maps are not a tool with which to make detailed comparisons across locations. They do, however, convey impressions of the broad spatial patterns of changes in municipal finance. We begin by commenting on our maps, and conclude by presenting statistical tests of the significance of the spatial patterns displayed on the maps.

A contributor to the evolving fiscal reality of New Brunswick has been its changing demographic structure. Although provincial population grew slightly over the study period, many areas of the province experienced population decline. Figure 8 illustrates that population growth has been greatest in southeastern corner of the province, in and around Moncton, and in the south, around but not in, Saint John. Much of the northern, western and central portion of the province experienced population decline.

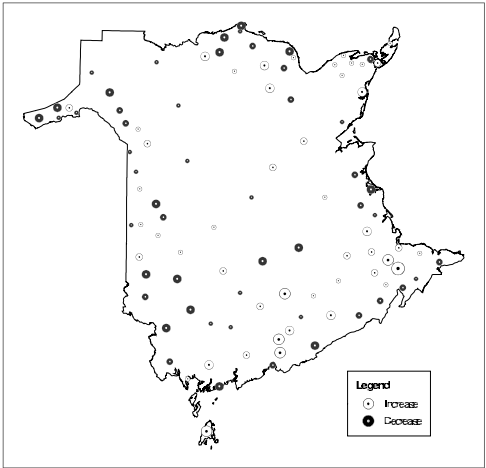


Figure 8. Relative Percentage Changes in the New Brunswick Population, 1983-2003

At the same time, household size fell everywhere in the province. An examination of Figure 9 reveals that the decline was sharpest in the northern part of the province. Should the

reduction in household size proceed faster than average, and the population grow slower than the average, then the number of household grows faster than the average. All other things equal, municipalities with these characteristics find their revenues per household growing more slowly than the provincial average. The extreme northeastern corner of the province displays exactly this combination of trends.

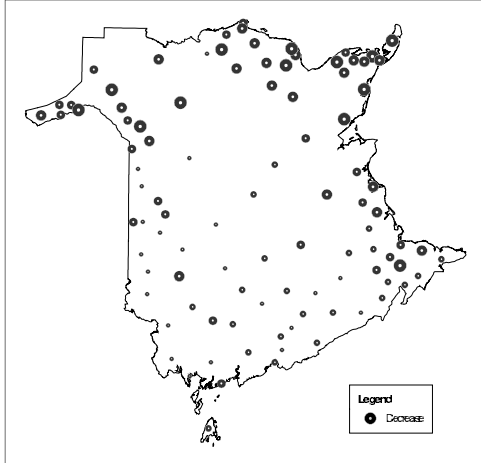


Figure 9. Relative Changes in Population Per Private Household, 1983-2003

Figure 10 confirms that revenue per household did, indeed, fall during the study period in the northeastern corner of New Brunswick. Municipalities in most other regions of the province, however, experienced an increase in total revenue per household. There are two clusters of municipalities with above average revenue growth: one in south of the province, the other along the border with the State of Maine. The former coincides with an area of robust population growth, while the latter does not. Population growth, it seems, is not a prerequisite for municipal revenue growth.

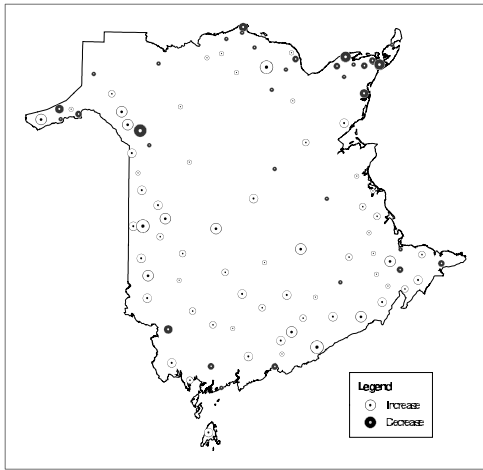


Figure 10. Relative Changes in Municipal Total Revenue per Household, 1983-2003

Figure 11 displays the spatial pattern of changes in the unconditional grant. Every municipality experienced a decline in the per household real value of the unconditional grant. Yet, there is a distinct spatial pattern to these declines. Indeed, had Figure 11 been rendered as a relief map with the magnitude of the decrease in grant used as measure of elevation, a pattern of rolling hills and valleys would have emerged.

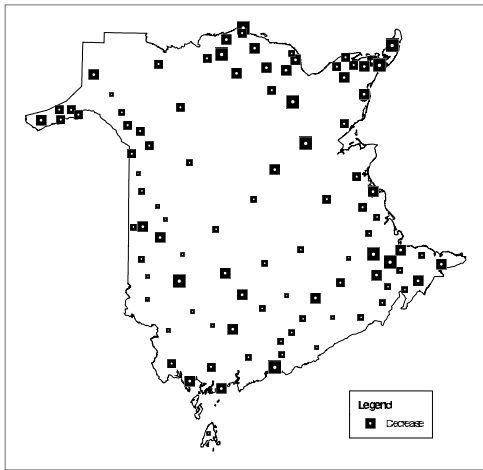


Figure 11. Relative Changes in Unconditional Grants per Household, 1983-2003

Declines were most pronounced in the north, southeast, and central-west regions of the province. In the north, the reduction in household size together with the importance of municipal population (not household counts) in determining the value of the unconditional

grant accounted for this decline. Elsewhere in the province, changes in the granting procedures figure more prominently in the explanation. Much of the relative decline in grants experienced in the southeast is explained by changes that occurred over the last ten years of the study period. During this time, the population of the southeast has grown much faster than the provincial average. At the same time, the value of the municipal grant has become less responsive to changes in municipal population. The freeze on grants, in particular, has prevented any response to population increases since 2000. Even without a reduction in household size, the value of the unconditional grant per household would have fallen in the southeast.

Just as all municipalities experienced a decline in the value of the unconditional grant, each and every municipality collected more tax revenue per household in 2003 than it did in 1983, even after adjusting for inflation. Figure 12 displays the spatial variation in these increases.

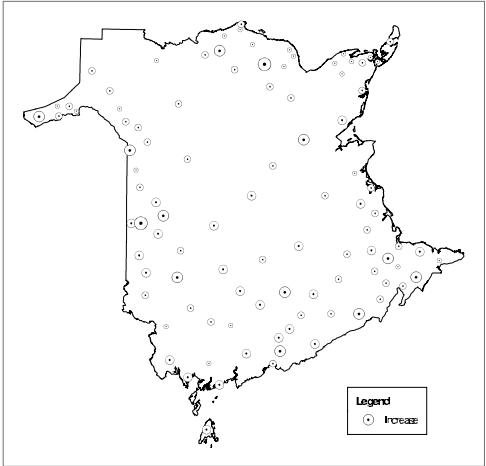


Figure 12. Relative Changes in Warrants per Household , 1983-2003

The pattern of changes in tax collections is less pronounced than the pattern in changes in grants, but there is the evidence of some clustering. The extreme northeast is a cluster of relatively slow growth in the warrant. The extreme northwest of the province might also be categorized as a similar cluster. The cluster of above average revenue growth near the border with Maine is also a cluster of growth in warrants. Elsewhere in the province, municipalities

with relatively large increases in tax collections are interspersed with municipalities that experienced more modest increases in property tax revenue.

Figures 13 and 14 display the spatial pattern of changes in the tax base and tax rates, respectively. Most municipalities experienced gains in tax base per household, but there is no striking spatial cluster of municipalities experiencing the greatest gains. Nor is there evidence of above-average growth in the tax base in cities. The extreme northeast stands out as an area with relatively small growth in the tax base. Given the spatial dispersion of growth in the tax base, the pattern of growth in the warrant must be generated by the pattern of tax rate increases.

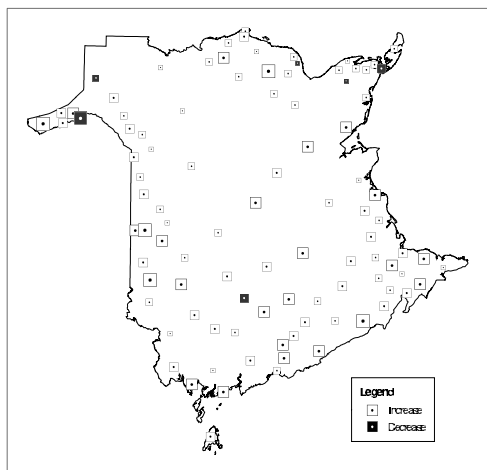


Figure 13. Relative Changes in Municipal Tax Bases per Household, 1983-2003

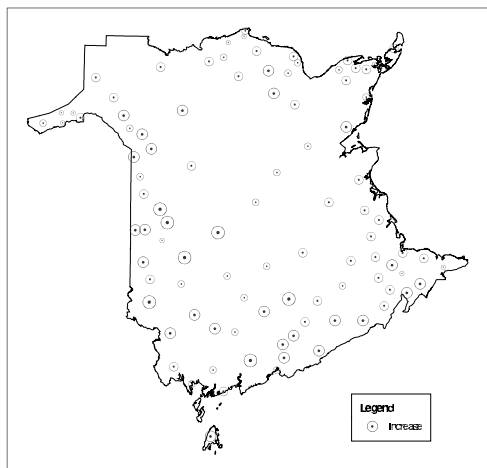


Figure 14. Relative Changes in Average Property Tax Rates, 1983-2003

Figure 14 reveals that there have, indeed, been clusters of growth in the municipal tax rate. Most notable is the cluster in the west, which coincides with the area of the west of the province that experienced the highest revenue growth. While this area had some municipalities with relatively buoyant tax bases, increasing tax rates certainly helped this area to increase its revenue from local sources. More generally, the pattern of tax revenue gains displayed in Figure 12 is broadly similar to the pattern of tax increases displayed in Figure 14. In particular, there is little indication that municipalities with the largest increases in the property tax rate have experienced lower growth in the tax base. Indeed, the correlation coefficient between the change in tax rate and the change in tax base is just 0.03.

The apparent lack of tax base elasticity does not imply that the real property tax is a constant stream of increasing tax revenue. If it were, the municipalities of the extreme northeast might have been able to increase their tax rates more than they did in order to compensate for their losses in total revenue per household. The key to understanding the constraints placed on this group is the fact that seven of the nine most northeasterly municipalities were situated in the top half of the 1983 tax rate distribution. It is reasonable to conjecture that the local councils in this area felt that their populations would not, or perhaps could not, bear a heavier tax burden. Beaudin (1999,80) argues that a general spirit of fierce competition exists among the villages of the Acadian Peninsula. Perhaps this spirit also extends to local tax setters.

The relative fiscal success of the central-west portion of New Brunswick appears to have gone largely unnoticed in the popular and scholarly literatures. Unlike the greater Moncton area in the southeast, this region of the province is not widely considered to be in a boom. Nevertheless, municipalities in this largely rural area of the province appear to have been able to call upon own-source revenue to cushion the blow from provincial grant cuts.

The statistical significance of our visual impressions is tested using the Moran (1950) *I*-statistic, commonly known as the spatial correlation coefficient. A positive value of the *I*-statistic indicates that the values of a variable at two highly proximate locations are more

likely to be similar to each other than are the values of that same variable at two randomly selected locations. This type of correlation manifests itself as spatial clustering, or, in topographical terms, as a series of rolling hills and valleys. A negative value of the spatial correlation coefficient indicates that large values of a variable are found near relatively small values of the same variable. A choropleth map of such a variable would resemble a checker board or a patchwork quilt. The construction of an I -statistic begins with a measure of the degree of proximity between two locations, known as a spatial weight. We denote the degree of proximity of a pair of municipalities, i and j , by w_{ij} . The formal properties of the I -statistic do not depend on the proximity measure used, but the actual results do differ. Thus, it is advisable to explore the sensitivity of results to different choices of spatial weighting procedures. The I -statistic is defined by the following formula:

$$[1] I = \left(\frac{n}{\sum_i \sum_j w_{ij}} \right) \left(\frac{\sum_i \sum_j w_{ij} (x_i - \bar{x})(x_j - \bar{x})}{\sum_i (x_i - \bar{x})^2} \right).$$

In this study, we present I -statistics based on the following definition of the spatial weights:

$$[2] w_{ij} = \begin{cases} 1/d_{ij}, & \text{if } d_{ij} \leq \bar{d} \\ 0, & \text{otherwise,} \end{cases}$$

where d_{ij} is the distance, measured in kilometres, between municipalities i and j along the primary highways of New Brunswick, and \bar{d} is some cut-off distance.⁷ Increasing the parameter \bar{d} increases the number of observations that contribute to the spatially weighted average at each point in space, thereby smoothing spatial differences.

Table 2 presents Moran statistics for the changes in several variables over the sample period, calculated for two choices of the cut-off distance, 75 km and 150 km.

⁷One municipality (Grand Manan) is an island. The ferry connecting Grand Manan to the remainder of the province is treated as part of the highway system.

Table 2

Spatial Correlation Coefficients

	I-statistic, 75km	I-statistic, 150km
Population (%) *	-0.0069 (0.5472)	0.0029 (0.2419)
Persons †	0.4936 (0.0005)	0.4056 (0.0005)
Total Revenue †	0.1215 (0.0035)	0.0816 (0.0010)
Unconditional Grant †	0.1397 (0.0020)	0.1326 (0.0005)
Warrant †	0.0329 (0.1414)	0.0040 (0.2244)
Municipal Tax Base †	0.0198 (0.2044)	-0.0038 (0.6662)
Property Tax Rate †	0.0949 (0.0130)	0.0375 (0.0395)

* percentage change between 1983 and 2003

† difference between per household values between 1983 and 2003

(simulated p-values in parentheses)

The p-values are computed using a simulation approach with 2000 re-samplings of the data, as implemented in the GeoDATM software package (Anselin *et al.* 2004). A standardized version of the *I*-statistic is known to possess a normal distribution in large samples, but using this large sample result to justify inference in small samples may be dangerous.⁸ Our calculations confirm the statistical significance of the spatial clustering patterns for changes in persons per household, total municipal revenues, the unconditional grant and average property tax rates. The relative sizes of the spatial correlation coefficients mirror the visual impressions created by Figures 8-14, with the highest value reported for changes in the number of persons per household. The smallest (and statistically insignificant) values of the Moran statistic are associated with the percentage change in population and the change in municipal tax base per household. These are exactly the variables for which no widespread spatial clustering took place.

⁸Fotheringham *et al.* (2000, 201-209) provide a description of simulation procedures used to construct p-values for Moran statistics and provide examples of non-normality of the Moran statistic in small samples.

CONCLUSION

Over the past two decades, the finances of municipalities in New Brunswick have undergone a remarkable transformation. Municipalities have turned to the local property tax to offset losses in the real value of unconditional transfers from the provincial government. The real property tax base grew at roughly the same rate as economic growth, indicating that municipalities might have been able to continue to meet their expenditure needs without tax increases had provincial support remained constant. Because the tax base did not grow faster than overall economic growth, most municipal councils were faced with two choices: make do with less revenue or raise taxes. Every municipality raised taxes, and some also made do with less revenue per household. At the same time, a remarkable decline in the average household size concentrated the burden of servicing household units on fewer individuals. To the extent that the costs of local services are driven by properties and not people, this points to added pressure on local coffers. Were it not for this cost pressure, the municipal tax base might be described as buoyant during the final five years of the study period.

The shift to more local responsibility for municipal funding has had an impact on the distribution of fiscal burden. New Brunswick has experienced the replacement of a more equally distributed source, the unconditional grant, with a more unequally distributed source, the local warrant. There is potential for the adverse distributional effects of this shift to be counterbalanced by a shift in the philosophy of the unconditional grant from appropriate sharing to equalizing fiscal capacity. This shift in philosophy has occurred, but the ever declining share of grant financing has meant that the overall distribution of municipal revenue resembles the distribution of the municipal warrant. The total size of provincial funding of local government and the manner in which this funding is distributed among municipalities play their respective roles in altering the distribution of fiscal capacity across New Brunswick.

The distributional effects of fiscal restructuring have certainly played out in space, with the largest gains in revenue occurring the southeast and in the new suburbs of the south, where population has steadily increased, and in the west, where tax rates have risen sharply. On the other hand, there has been revenue decline in the northeast, where the combination

of a stagnant tax base, a stable population, a dramatic reduction in household size and high initial tax rates have all played a part. The convergence of local tax rates means that the profile of local revenue will come to resemble even more closely the profile of tax bases.

Does the recent fiscal history of New Brunswick's municipalities point to an impending crisis in local public finance, or does it demonstrate the ability of municipalities to raise revenue from local sources when circumstances require? Kitchen (2002, 333-334) argues that across Canada there is little evidence that the local property tax base is not capable of generating sufficient revenue to cover municipal expenses in the short term. The time profile of municipal revenue in New Brunswick contains no evidence to dispute Kitchen's claim. Indeed, most municipalities have been successful in using the property tax to both maintain their previous own-source revenue and offset losses in grants. Even more striking is the lack of evidence that those municipalities that asked for the greatest increases in tax rates did so at the expense of growth in the municipal tax base. Yet, the spatial profile of fiscal change presents a warning on the horizon. There appears to be reluctance to increase property tax rates in some of the municipalities that already have relatively high property tax rates, suggesting a tax rate ceiling. The problem that local councillors face is uncertainty about how close to the ceiling they are and just how loud the pounding will be should they bump into it.

REFERENCES

- ANSELIN L., I. SYABRI and Y. KHO 2004 'GeoDa: An Introduction to Spatial Data Analysis' *Geographical Analysis* forthcoming
- BEAUDIN, M. 1999 *The State of the Regions: The Economic Region of Northeast New Brunswick* (Moncton: The Canadian Institute for Research on Regional Development)
- BOADWAY, R. 2002 'Revisiting Equalization Again: RTS vs Macro Approaches' *Institute for Intergovernmental Research Working Paper* 2002 (2) (Kingston: Queen's University) available online: <http://www.iigr.ca/pdf/publications/126_Revisiting_Equalization_.pdf>
- BORDIGNON, M., CERNIGLIA, F. and REVELLI, F. 2003 'In Search of Yardstick Competition: A Spatial Analysis of Italian Municipality Property Tax Setting' *Journal of Urban Economics* 54, 199-217

- BRETT, C. and J. PINKSE 1997 'Those Taxes are All Over the Map! A Test for Spatial Dependence of Municipal Tax Rates in British Columbia' *International Regional Science Review* 20, 131-151
- BRETT, C. and J. PINKSE 2000 The Determinants of Municipal Tax Rates in British Columbia' *Canadian Journal of Economics* 33, 695-714
- BRUECKNER, J.K. 2003 'Strategic Interaction Among Governments: An Overview of Empirical Studies' *International Regional Science Review* 26, 175-188
- FEDERATION OF CANADIAN MUNICIPALITIES 2002 'Long-Term Federal Infrastructure Program: A Proposal' unpublished webpage available online: <<http://www.fcm.ca/newfcm/Java/ninfrastructure.ca>>
- FOTHERINGHAM, A.S., C. BRUNSDON and M. CHARLTON 2000 *Quantitative Geography: Perspectives on Spatial Data Analysis* (London: SAGE Publications)
- GOVERNMENT OF NEW BRUNSWICK (1983) *Annual Report of Municipal Statistics* (Fredericton: Department of Municipal Affairs)
- GOVERNMENT OF NEW BRUNSWICK (1984) *Annual Report of Municipal Statistics* (Fredericton: Department of Municipal Affairs)
- GOVERNMENT OF NEW BRUNSWICK (1988) *Annual Report of Municipal Statistics* (Fredericton: Department of Municipal Affairs and Environment)
- GOVERNMENT OF NEW BRUNSWICK (1993) *Annual Report of Municipal Statistics* (Fredericton: Department of Municipalities, Culture and Housing)
- GOVERNMENT OF NEW BRUNSWICK (1998) *Annual Report of Municipal Statistics* (Fredericton: Department of Municipalities, Culture and Housing)
- GOVERNMENT OF NEW BRUNSWICK (2001) *A Vision for Local Governance in New Brunswick: Report of the Minister's Round Table on Local Governance* (Fredericton: Department of Environment and Local Government)
- GOVERNMENT OF NEW BRUNSWICK (2003) *Annual Report of Municipal Statistics* (Fredericton: Department of Environment and Local Government)
- KITCHEN, H.M. 2002 *Municipal Revenue and Expenditure Issues in Canada* (Toronto: Canadian Tax Foundation)

MORAN, P.A.P. 1950 'Notes on Continuous Stochastic Phenomena' *Biometrika* 37, 178-181

STATISTICS CANADA (2004) 'Census of Canada' unpublished webpage available online:
<<http://estat.statcan.ca>>

STATISTICS CANADA 'Implicit Price Indexes, Gross Domestic Product' *Provincial Economic Accounts*, Tables 384-0002 and 384-0036 (Ottawa: Supply and Services Canada)

TINDAL, C.R. and NOBES TINDAL, S. 2000 *Local Government in Canada* (Toronto: Nelson Canada)

TUKEY, J.W. 1977 *Exploratory Data Analysis* (Reading: Addison-Wesley)

ACKNOWLEDGEMENT

Financial assistance from The Canada Research Chairs Programme, The Canada Foundation for Innovation, The Social Sciences and Humanities Research Council of Canada, and the Bell Foundation is gratefully acknowledged. The comments of Frank Strain and Rob Summerby-Murray, and the assistance of Michelle Langlois are greatly appreciated.