Leading and Lagging Areas in Ontario: Huron County in the Provincial Context

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ABSTRACT

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Purpose:

- To assess the spatial distribution of the socio-economic diversity of the province.
- To highlight the relative position of Huron County compared to the rest of Ontario.

Objectives:

- To reduce the complexity of the observable socio-economic variables to a small and interpretable number of factors.
- For the 49 census divisions (including Huron) in Ontario, determine leading, neutral or lagging classification in the factors identified.

Method:

- Using a factor analysis statistical technique and 1991 census data, group the 40 variables into a manageable number of factors.
- For each census division determine the degrees of variability from the provincial average for the determined factors.
- Determine leading, neutral and lagging status by factors for each census division.

Results:

- Forty variables reduced to 4 factors that accounted for 75.8% of the calculated variability.
- The four factors identified are economic dynamics, socioeconomic stress, labour market participation and employment levels.
- Huron County leads in socioeconomic stress, and employment levels, is neutral in labour force participation, and lags in economic dynamics.
- Huron is part of a relatively homogeneous sub-region that includes Bruce and Perth.

Conclusions and Recommendations:

- The social economic reality of Ontario is multidimensional. Most census divisions lead in some factors and lag in others.
- The focus on one variable can produce a distorted interpretation of reality. The results raise several questions about the appropriateness of using unemployment indicators as a single measure to represent the conditions of the labour market.
- A similar analysis should be run at the census subdivision level.
- A similar analysis should be done with census data from other years.
- Further analysis should be conducted that would allow testing of the relationships between variables between variables based on predetermined models.

Copies of the Report:

Copies of the report can be obtained by contacting the Huron Business Development Corporation (5 19) 527-0305 or School of Rural Planning and Development, University of Guelph (5 19) 824-4120, ext. 215 1.

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Executive summary

In April 1997 a collaborative effort between the Huron Employment Resource Centre and a team of researchers at the University of Guelph was initiated. The author of the present research was retained in the summer to prepare this report. The purpose of the research is to assess the spatial distribution of the socio-economic diversity of the province, and to highlight the relative position of Huron County as compared with the rest of Ontario.

The analysis of economic and social spatial disparities has a long tradition. Recently this topic has encountered a renewed interest at the national level, in particular within the framework of the New Rural Economy project. The present research adopts, in part, the terminology and the methodology developed within the New Rural Economy project (Reimer 1997), a research endeavour initiated by the Canadian Rural Restructuring Foundation (CRRF).

The study applies a factor analysis statistical technique using Census of Canada 1991 data, at the Census Division (CD) level. The goal of factor analysis is to reduce the complexity of the observable socio-economic variables to a smaller and interpretable number of factors. Based on the results of the factor analysis, the 49 Census Divisions in Ontario are classified as leading, neutral or lagging on each of the factors identified.

This analysis is descriptive and static in nature. The results can represent a basis for regional planning and for further inquiry into causes of spatial diversity. The results are of interest for Huron County planners, policy makers and employment services, because they highlight the relative position of the County in the provincial context. However, the report has potentially a broader audience, since the methodology applied provides a picture of conditions in all the 49 Census Divisions in Ontario.

Key findings

- The 40 variables used in the analysis can be reduced to 4 factors. These four factors explain 75.8% of the variance in the data set, which represents a good result.
- The CDs that lead on the first factor (named Economic dynamics) tend to show high income, high employment and educational status, high dwelling value and cost and rapid population growth and high in-migration. The contrary holds for lagging CDs.
- The CDs that lead on the second factor (named Socio-economic stress) tend to show a high percentage of single-detached dwellings, low incidence of dwellings rented and low housing costs relative to the income level, a low incidence of poverty, low incidence of lone parent families and high percentages of males and females working at home.
- The CDs that lead on the third factors (named Labour force participation and age) show a low percentage of the elderly, a high percentage of young population, high participation rate and high percentage of families with two or more members in the labour force.
- The CDs that lead on the forth factor (named Unemployment levels) show low unemployment levels and a low percentage of families with one member only in the labour force.
- Huron County leads on Socio-economic stress and on Unemployment levels, while it lags on the Economic dynamics factor, and is in the neutral range on the Labour force participation and age factor.
- The concept of leading and lagging is multidimensional. The majority of CDs are leading on some of the dimensions and lagging on others, which indicates the complexity of the social and economic realities present in Ontario. The assessment of the social and economic performances of localities should consider these often diverging dimensions.

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1. Background

The analysis of spatial variation in economic and social characteristics has a long history. One of the major problems in this area of study has been the definition of appropriate indicators to monitor social, economic and environmental performances over time and to compare performance across geographic areas. At the international level the analysis of spatial disparities among rural areas has been addressed in a recent study carried out by the OECD (1994). In this study, particular attention was paid to the spatial dimension of rural development as well as to the idea that rural development is a multi-sectoral concept. This means that rural development deals with territorial differences in problems and perspectives, options and opportunities, and that it is concerned with a wide range of demographic, economic, social, and environmental issues.

For policy purposes, however, the major problem in Canada remains the definition of operative criteria for comparison of different areas. There exists a wide range of statistics disaggregated at the Census Division or Census Subdivision levels. Policy makers have devoted conspicuous efforts to defining the most appropriate indicators to measure concepts such as economic health, economic and social distress, stagnation, and more generally good economic and social performances.

On one hand, there is a general consensus that the use of single indicators provide a poor, when not distorted, representation of the reality. On the other hand, the use of a multitude of indicators can be difficult to manage and at the end can leave unsolved the basic question: to which indicator should priority be given when decisions have to be made? How can a complex set of indicators, which often move in contrasting directions, be reduced to meaningful information?

The application of multivariate statistical techniques represents a tool to support decision-making when these types of problems are faced. In regional analysis there has been an extensive use of multivariate techniques to define typology of areas. Recently in Canada, this approach has been followed by research conducted within the New Rural Economy Project (Reimer 1997). This research has used, among other techniques, a factor analysis to identify localities that are leading or lagging on socio-economic dimensions. The methodology adopted for the present research is in part based on the methodology developed by Reimer within the framework of the NRE project (Reimer 1997).

This research is primarily a descriptive analysis. It provides a picture of how the socio-economic condition of Huron County compares with the rest of Ontario at one point in time. The identification and the analysis of the underlying socio-economic dimensions and the comparison of relative performances can represent a useful tool for local and regional policy makers, and can facilitate the design of appropriate rural and regional policies.

The study should be of particular interest to community developers and policy-makers in Huron County, since it highlights the relative position of the county in the provincial context. However, the report has potentially a broader audience, since the methodology applied provides a classification of the CDs in Ontario. The results of this report can provide the basis for regional planning and for further inquiry into causes of spatial diversity, as for instance the study of why certain areas are leading on some socio-economic dimensions, and why other areas are lagging. Also it will be important to establish the relationship among the dimensions identified in the study.

1.1. The purpose and objectives of the research

The purpose of the research is to provide a better understanding of social and economic diversity and its spatial distribution in Ontario and in so doing highlight the relative position of Huron County as compared with the rest of Ontario. In particular, the objectives of the research are the following:

- to identify the leading and lagging Census Divisions in Ontario, on a number of social and economic dimensions, and highlight the relative position of Huron County, by applying a factor analysis;
- to cluster the Census Divisions that present similar performances on the dimensions identified;
- to map the results of the statistical analysis.

This study provides a descriptive picture of the relative position of Huron County within the socio-economic reality in Ontario. More generally, it provides a way to establish the relative position of each CD in the provincial context. As a study by the OECD (1994) suggests, the use of territorial statistics allows for comparison of economic and social systems which, at least potentially, have the same technologies at hand and which are faced with the same trends in global competition. For understanding development performance, comparing regions at a given point in time may be more instructive than comparing data for the same territory over different points in time.

1.2. Leading and Lagging: the meaning

Research focusing on comparative territorial analysis has used a variety of terms to define localities that present opposite performance on a certain indicator. In many cases the distinction has taken the form of a dichotomy. For instance successful and lagging or dynamic and lagging, or leading and stagnating regions. The terminology “leading” and “lagging” has been adopted within the New Rural Economy project, following the discussion in the OECD (Reimer 1997). The present research has borrowed this terminology, since this project and part of the methods adopted have developed within the perspective of the New Rural Economy project.

It is important, however, to explain the meaning of these terms in the context of this research. In particular, the following points have to be stressed. First, as used in this report the idea of leading and lagging refers to a relative measure of performance. This means that the results of this analysis do not set standards about what is “good” and what is “bad”. In this research the leading areas are those that are performing relatively well on certain dimensions (which will be measured through the factor scores). The lagging are performing relatively poorly as compared to the other areas. In this sense, comparison of places with relatively different performances can help understanding the reasons for these differences.

Second, the idea of leading and lagging is multidimensional. Most of the localities are not performing well with respect to all the dimensions identified, and most of the localities are not lagging on all the dimensions. Social and economic performances vary, often in opposite directions.

Finally, there is the most difficult task of determining what has to be considered "leading" and what has to be considered "lagging". In general, there is large agreement on the social value of some indicators. For instance, it is unanimously accepted that low unemployment and high average income and educational levels can be considered better conditions than high unemployment and low income and education.

However, there is no complete agreement on the social and policy value that should be assigned to many other indicators, as for instance the prevalence of primary sector employment or even youth migration. Different policy approaches have often judged these indicators in opposite ways.

Therefore, the definition of what is leading and what is lagging depends eventually on the social and political objectives of the decision-makers, which can in fact be in contrast with what has been defined as "leading" or "lagging" in the present report. This report, however, offers an indication about how the relevant indicators tend to vary and in which way these indicators are associated with other social and economic indicators. In this way, this research opens the inquiry into the value of analyzing data with this technique using the variables commonly available.

2. Procedures

The use of factor analysis to define the characteristics of communities is a common procedure in social science. There exists an abundant literature, which developed in particular in the 1960s and 1970s, on the application of factor analysis to measure spatial differences (Jonassen and Peres 1960; Thompson et al. 1964; King 1966; Rees 1971; Clark et al. 1974). Factor analysis has been used also in recent studies on regional diversity. For instance, in France it has been applied to develop a typology of agricultural areas (SEGESA 1992).

The set of statistical techniques that is included under that general name of "factor analysis" cannot be fully explained in this report. However, the following sections describe the logic and the basic concepts common to this set of techniques. The goal is to clarify the terminology used in the reminder of this report.

2.1. The key concepts of factor analysis

Official statistics provide us with a wide range of data on the socio-economic aspects of each locality. One of the major challenges for researchers and policy makers is to reduce this complexity to a manageable set of indicators that can be used to interpret reality. Factor analysis is a multivariate statistical technique that provides a solution to this type of problem. Factor analysis provides an answer to questions such as: can a small number of independent underlying factors explain the variability in many observable variables?

The main assumption of factor analysis is that a limited number of underlying factors can be used to explain complex phenomena. For instance, conceptual constructs such as economic health or social distress are not, in reality, observable. Nor they can be measured directly. We can think to these constructs as latent variables, underlying dimensions, or factors that are in some way

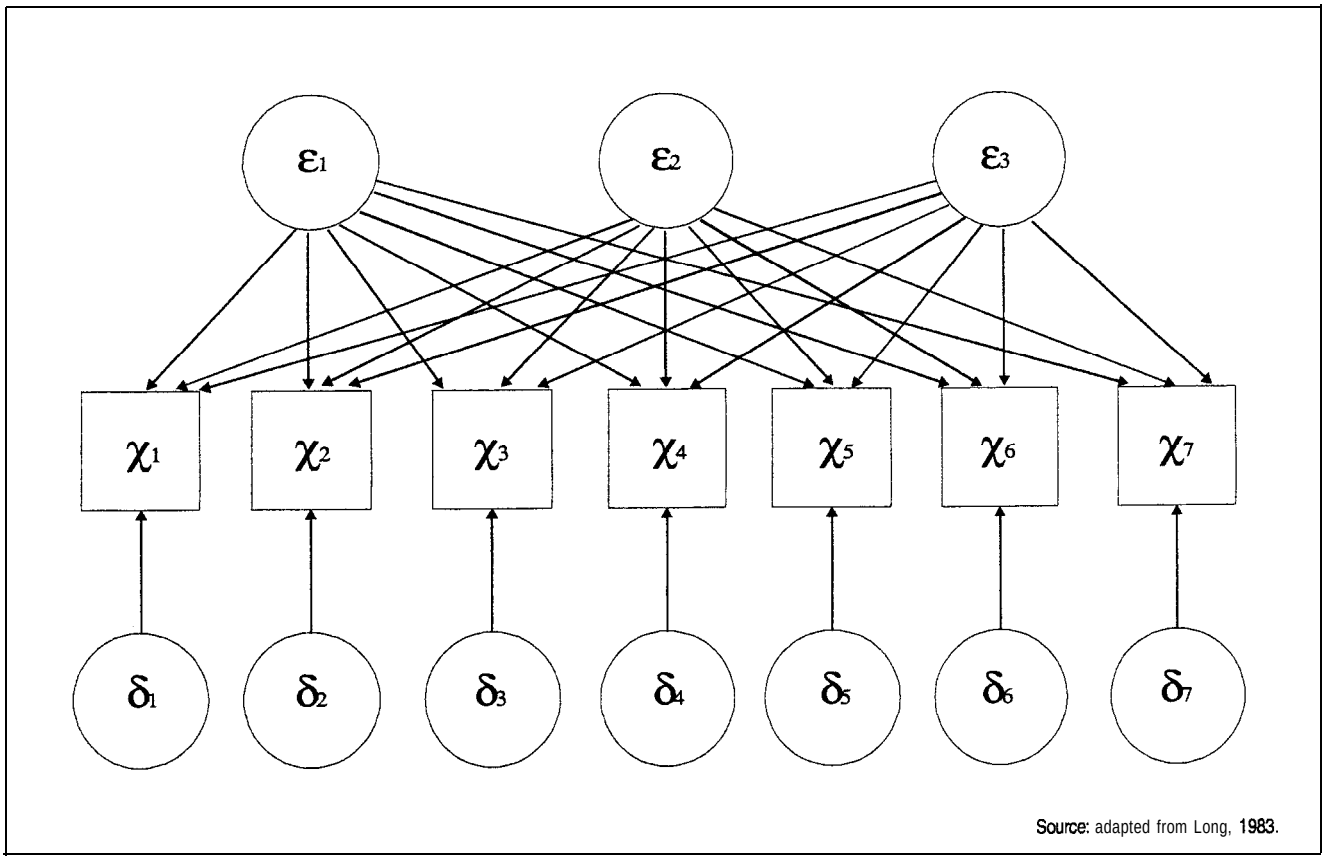
correlated to variables that are directly observable and measurable, such as the percentage of low income families, the average female income, the percentage of population growth, and the female unemployment rate.

Therefore, the goal of factor analysis is to obtain factors that explain the pattern of correlation among observed variables, through an analysis based on the correlation matrix of these variables (see Appendix II - Table A.5). The observed variables must present some degree of correlation for the factor model to be appropriate. The statistical procedure results in grouping those variables which are highly correlated among each other and not related to variables in other groups.

The main distinction in factor analysis techniques is between exploratory and confirmatory factor analysis. In the present research the analysis is exploratory in nature; that means that we will 'explore' the data in an attempt to recognize any non-random pattern or structure in the existing set of variables. We do not impose any *a priori* model of relationship between these variables, as would be done in confirmatory factor models.

Exploratory factor analysis can be illustrated graphically, following Long (1983). Figure 1.1 shows a general exploratory factor model. In this figure, the factors are represented by circles and the observed variables by squares. The straight line from a factor to the variable indicate the effect of the factor on the variable. In our model the factors are supposed to be uncorrelated with each other. Each of the factors labeled with ξ's affects each of the observed variables, contained in the boxes labeled with x. These factors are called common factors, since their effect is shared in common with more than one variable. The circle at the bottom of the figure, labeled with δ's, are called unique factors, or errors in variables, since their effect is unique to one variable.

In exploratory factor analysis unique factors are assumed to be uncorrelated with one another.



Source: adapted from Long, 1983.

Figure 1 .1 Exploratory factor analysis

The mathematical formulation of this general model appears similar to a multiple regression equation. Each variable can be expressed as a linear combination of factors, which is not actually observed.

$$x_1 = a_1 \xi_1 + a_2 \xi_2 + a_3 \xi_3 + \ldots\ldots + a, \xi_n + \delta$$

For instance, the variable Youth Migration (YM) can be expressed as a linear combination of the factors:

$$YM = a_1 (Factor\ 1) + a_2 (Factor\ 2) + \ldots\ldots + a,, (Factor\ n) + U$$

In this expression, Factor 1 to Factor n are the common factors (which are the ones that we will consider in this research). The U is the unique factor. To it is attributed that part of the variability of YM that can not be explained by the common factors. The proportion of the variance of a variable that is explained by the common factors is called the communality of the variable (see Appendix II -Table A.2).

The coefficients a_i are called factor loading. In simple terms the value of this coefficient describes the closeness of relationship between a variable and the factor. Since the variables are standardized the factor loading indicates how much weight is assigned to each factor. More precisely, the factor loadings are the standardized regression coefficients in the multiple regression equation with the original variable as the dependent variable and the factors as the independent variables. In the specific computation method applied in this research (principal component) the factor loading shows also the correlation between the factor and the variable. The higher the value of the factor loading (in absolute terms), the closer the relationship.

Ideally, we should have variables with a high loading on one factor and low loading on all the other factors. In this way, it is possible to identify the variable(s) that are closely related to each of the factors identified, and consequently, understand the nature of the factor.

To assess how well the factor model describes the original variables, we can compute the proportion of the variance of each variable explained by the model. Because in our model the factors are uncorrelated with each other, the total proportion of variance explained by the model is just the sum of the variance proportions explained by each factor (see Appendix II - Table A.2)

The final phase of factor analysis consists in computing the scores for each factor. This means that each unit of analysis (CD in this study) receives a factor score on each of the factors that have been identified (see next section for factor score computation method).

2.2, Computation methods applied

The software used for the analysis is the Statistical Package for the Social Sciences (SPSS). The factor analysis is performed with the principal component method. This method transforms the original set of correlated variables to a smaller set of uncorrelated factors. Factors are linear combinations of the original variables. The first principal component is the combination of variables that accounts for the largest amount of variance in the sample, and successive components explain progressively smaller portions of the total sample variance.

The cutoff value of the eigenvalues for factor extraction was 1. This means that only factors that account for variances greater than one are included in the final statistics.

The principal component method provides exact factor scores, as opposed to estimates obtained with other factor analysis computation methods. The general expression of the computation of the factor scores is:

$$F_{jk} = b_1 x_1 + b_1 x_2 + \ldots\ldots + b_n x_n$$

where F is the factor score j for the case k (here the case is the CD), x is the standardized value of the ith variable for the case k, and b_i is the factor score coefficient for the jth factor and the ith variable.

The rotation of the factor matrix was performed using the Varimax method. The procedure minimizes the number of variables that have high loading on more than one factor. Varimax rotation is the most commonly used of the orthogonal rotation methods, which assumes that factors are uncorrelated among each other.

2.3. The operational definition of Leading and Lagging

The definition of leading or lagging for each of the factors identified is based on the value of factor scores. The factor scores are standardized variables, that is their mean value is set equal to zero and the variance is equal to one. In general the value of the factor scores ranges from about -3 to +3. The value of factor scores is considered as the measure of relative performance on the particular dimension identified by the factor.

The cutoff values for the definition of leading and lagging are shown in Table 2.1. A Census Division is classified as leading on a factor if the value of the factor score is equal to or higher than 0.25. The definition of lagging is symmetrical. A Census Division is defined to be lagging on a factor if the value of the factor score is equal to or greater than -0.25.

To allow for variation in each of the factors identified, these two categories have been further disaggregated. Three sub-categories of leading CDs have been established. The sub-category leading I identifies the CDs with higher performance on the given factor, i.e. with a factor score equal or higher than 1.5. Leading II identifies the CDs a with factor score ranging from 1.49 to 0.75. Finally, the sub-category leading III includes the CDs that, within the leading group, present the lowest performances on the factor in question; for these the factor score ranges between 0.74 and 0.25.

Three sub-categories of lagging CD have been established in a symmetric way. The sub-category lagging I groups the CDs that, on a given factor, show the lowest performances, i.e. the factor score is -1.5 or lower. The CDs that show factor scores ranging from -0.75 to -1.49 have been classified in the group lagging II. Finally, the CDs that, within the lagging category, present the highest factor scores (from -0.25 to -0.74) have been included in the group lagging III.

The CDs that show factor scores in the range of -0.24 to 0.24 have been defined as neutral. Since the value of the factor score results from a linear combination of the observed variable values, the interpretation of these factor scores is not straightforward as for the leading or lagging CDs. Neutral values can be due to average values of all the variables that load on the factor, as well as

a combination of high and low values. This makes the interpretation of the factor more problematic.

Table 2.1. Operational definition of leading and lagging

Cut off value	*definition*
1.5 and over	leading I
0.75 to 1.49	leading II
0.25 to 0.74	leading I I I
-0.24 to 0.24	neutral
-0.74 to -0.25	lagging III
-1.49 to -0.75	lagging II
-1.5 and lower	lagging I

2.3. Clustering procedure

The results of the factor analysis have been clustered using simple counting criteria. Census Divisions have been grouped on the basis of the number of leading, lagging and neutral scores presented.

The use of this simple procedure is due in part to the constraints posed by the computation procedure used in the factor analysis. The principal component method, in fact, transforms the original set of correlated variables into a set of uncorrelated factors. Given the fact that factors are uncorrelated, the application of statistical clustering techniques could not produce significant results. As an alternative, a weighted clustering procedure, based on the factor scores, could have been adopted. However, this would have introduced a strong element of subjectivity in the analysis, which is avoided with a simpler counting procedure.

With the aggregation applied, it is possible to identify the CDs that are performing relatively well on all the dimensions defined in the factor analysis, the CDs that present low values on all the factor identified, and other CDs that present a mixed pattern in performance. However, no pattern of association between the different factors is evidenced.

2.4. Data source and variables used in the analysis

A total of 40 variables are used in the analysis. Of these, 39 were computed using Census of Canada 1991 data. One variable was computed using data from the SABAL database (Manufacturing and Small Business Survey). The variable from the SABAL database is the value added per worker in manufacturing, which refers to the year 1992-93.

Appendix I reports the operational definitions of the variables used in the present research. Their general nature may be gleaned from the list reported in Table 2.2.

All the data are at the Census Division (CD) level. This statistical unit of analysis corresponds to the County or the District. The analysis is performed on the 49 Census Divisions existing in Ontario, as shown on Map 2.1. No attempt was made to identify “rural” or “urban” CDs. At this stage of the analysis, and given the level of aggregation chosen, it was considered appropriate to include all the Ontario CDs in the study.

Table 2.2. Variables used in the factor analysis

	Variable
1	Percentage population change 1986 -1991
2	Percentage of population age less than 20
3	Percentage of population age 20-39
4	Percentage of population age 65 and over
5	Percentage of population age 5 and over in-migrant
6	Youth migration
7	Percentage low income economic families
8	Percentage low income unattached individuals
9	Percentage of lone parent census families
10	Fertility rate
11	Male unemployment rate
12	Female unemployment rate
13	Youth unemployment rate
14	Percentage of households with gross rent ≥ 30% of total income
15	Percentage of households with owner gross payments ≥ 30% of total income
16	Percentage of private dwelling rented
17	Percentage of private dwelling single-detached
18	Average value of dwellings (non farm dwellings)
19	Average gross rent
20	Percentage population 15-24 attending school full time
21	Population with schooling beyond secondary certificate as a percentage of the population age 20 and over
22	Percentage primary sector employment
23	Percentage manufacturing employment
24	Percentage dynamic services employment.
25	Percentage traditional services employment
26	Percentage non-market services employment
27	Percentage in intellectual and managerial occupations
28	Employment income as a percentage of total income
29	Male participation rate
30	Female participation rate
31	Percentage of families with one member only in the labour force
32	Percentage of families with two or more members in the labour force
33	Percentage males working at home
34	Percentage females working at home
35	Percentage males working in different CSD than that of residence
36	Percentage females working in different CSD than that of residence
37	Value added per worker in manufacturing
38	Average female income
39	Average household income
40	Percentage of households with incomes $60,000 and over

Map 2.1. Census Divisions of Ontario

3. Factor analysis results

Eight factors have been identified. Tables 3.1 and 3.2 show the factor loadings for the eight factors. These represent the correlation between the factor and the observed variables. The higher the value (in absolute terms), the closer the relationship between the factor and the variable. No loading less than 0.5 in absolute value is displayed on these tables (see Appendix II - Table A.3, A.4 for a complete output). As expected, however, most of the variables present high loading on only one factor. When a variable loads on two factors the lower value is indicated in brackets.

The first four factors - presented in Table 3.1 - explain 75.8% of the variance in the set of original variables. Each of the remaining four factors explains 5% or less of the variance. For this reason, the analysis presented in the remainder of the report is focused in particular on the first four factors.

The general implication that emerges from these results is that, as expected, the concept of leading and lagging is multidimensional. Given the computation procedure applied, if only one factor could account for the correlation among the original variables, the notion of leading or lagging could be shown using one single dimension. On the contrary, even to account for the economic characteristics of a locality, the factor analysis results in more than one single factor. Factors by definition are independent of one another, which indicates the composite and contrasting nature of the economic and social performances.

Most of the factor loadings are logically coherent and consistent with prevailing expectations; however, the structure of the matrix also reveals interesting patterns in the set of original variables. In the following sections the four main factors and the relative position of Huron County are discussed (factor scores are also reported for each CD in Appendix II - Table A.6 and A.7).

Table 3.1. Factor loading, Factor 1 to Factor 4

Variable	*Factor 1*	*Factor 2*	*Factor 3*	*Factor 4*
Percentage of explained variance	37.3	21.4	10.1	6.9
Average gross rent	.88459			
Average value of dwellings (non farm dwellings)	.88200			
Percentage population change 1986 -1991	.79088			
Percentage of primary sector employment	-.78232			
Average female income	.75722			
Percentage dynamic services employment	.75390			
Population with schooling beyond secondary certificate as a % of the population age 20 and over	.74640			
Average household income	.73899		(.55776)	
Youth migration	.72349			
Percentage of h/h with income $60,000 and over	.72190		(.61226)	
Percentage of households with owner gross payments ≥ 30% of total income	.71112			
Fertility rate	-.68023	(-.59809)		
Percentage in intellectual and manag. occupations	.65063			
Percentage of population age 5 and over in-migrant	.65096			
Percentage of private dwelling rented		94416		
Percentage of private dwelling single-detached		-.85772		
Percentage of h/h with gross rent ≥ 30% of total inc.		.79509		
Percentage of lone parent census families		.77744		
Percentage low income unattached individuals		.70395		
Percentage low income economic families		.68837		
Percentage females working at home		-.63200		
Percentage of population age 20-39		.61501	(.58725)	
Percentage males working at home		-.55657		
Percentage of population age 65 and over			-.87055	
Employment income as % of the total income			.82184	
Percentage of population less than age 20			.79116	
Male participation rate			.77040	
Percentage traditional services employment			-.66987	(-.51247)
Percentage of families with two or more members in the labour force			.59953	(57145)
Female participation rate			.58495	
Female unemployment rate				-.86954
Percentage of families with one member only in the labour force				-.76392
Youth unemployment rate				-.76019
Male unemployment rate				-.73934

Table 3.2 Factor loading, Factor 5 to Factor 8

Variable	*Factor 5*	*Factor 6*	*Factor 7*	*Factor 8*
Percentage of explained variance	5.0	3.7	3.1	2.7
Percentage females working in different CSD than that of residence	.88707			
Percentage males working in different CSD that that of residence	.86727			
Percentage non-market services employment		-.91215		
Percentage manufacturing employment		.83669		
Percentage population 15-24 attending school full time			.91525	
Value added per worker in manufacturing				.91839

3.1. Factor 1: Economic dynamics

Factor 1 has been named Economic dynamics. It encompasses 14 variables and it is the factor that accounts for the largest share of variance in the data set (37.3%). The variables that load on this factor are demographic, social, labour force and economic related. Leading CDs on this factor tend to have high costs for renting and values of dwelling, high income status, high educational status, high employment status, high employment in dynamic services and low employment in the primary sector, growing population dynamics due to a high level of in-migration, but low fertility rates.

Specifically, the variables that are positively related to this factor (i.e. high value of the variable are associated with high value of the score) are: Average gross rent (0.88), Average value of non-farm dwellings (0.88), Percentage population change 1986-1991 (0.79), Average female income (0.76), Percentage dynamic services employment (0.75), Population with schooling beyond secondary certificate as a percentage of the population age 20 and over (0.75), Average household income (0.74), Youth migration (0.72), Percentage of households with income $60,000 and over (0.72), Percentage of households with owner gross payments equal or greater than 30% of total income (0.71), Percentage of population age 5 and over in-migrant (0.65), Percentage in intellectual and managerial occupations (0.65).

Two variables are negatively related to the factor (i.e. high values of the variable are associated with low value of the score). These are: Percentage of primary sector employment (-0.78), and Fertility rate (- 0.68).

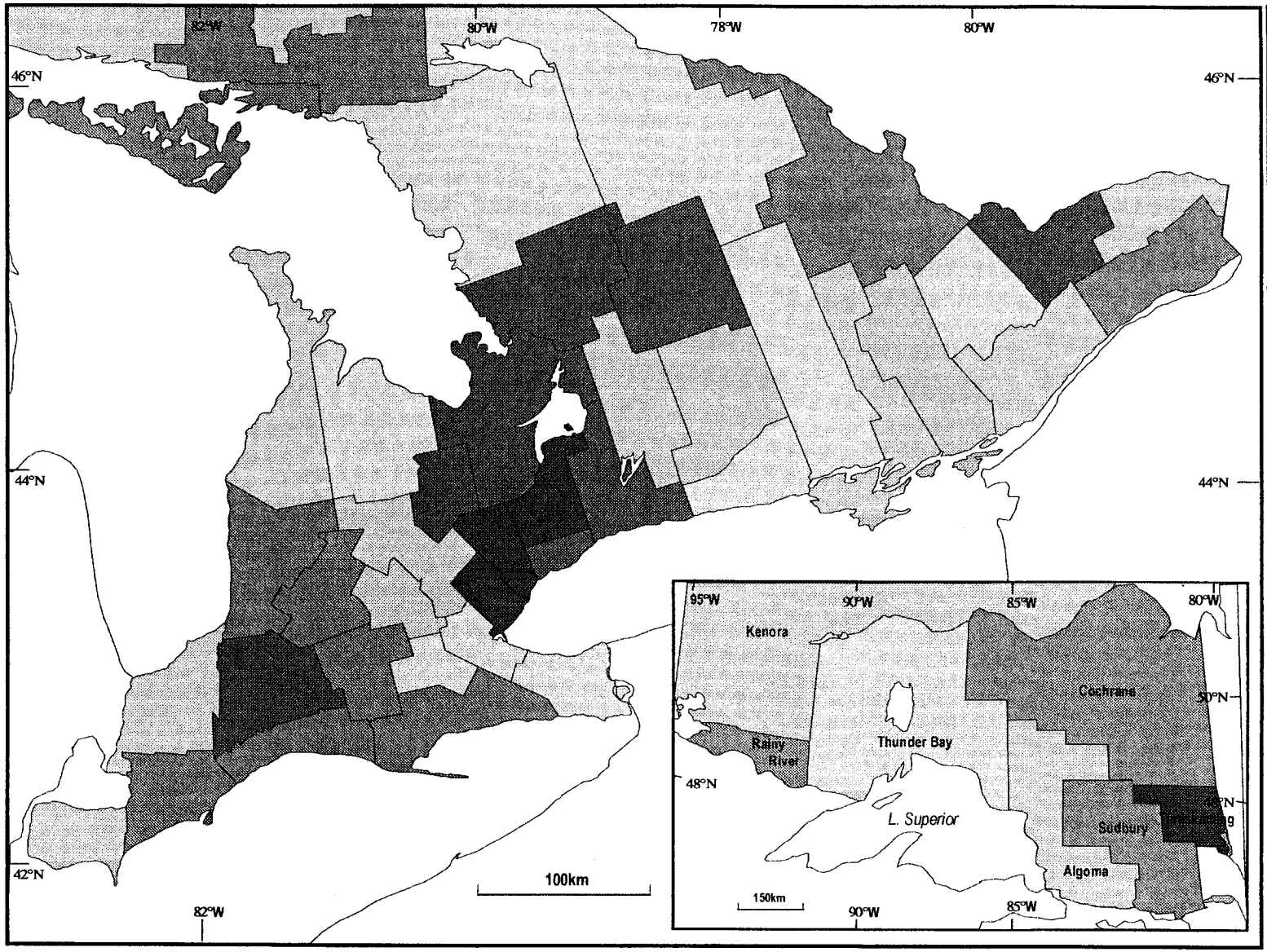
Table 3.1 shows the factor scores for the CDs of Ontario. The leading CDs on this factor are typically those dominated by urban centers, such as Toronto and the surrounding CDs, Ottawa-Carlton, Frontenac, Middlesex, and those with a small share of primary sector employment, that is the rural, non-agriculturally based areas such as Haliburton, Muskoka, Simcoe, and to a minor extent Dufferin. The later two are also on the margins of the Toronto Census Metropolitan Area.

The data shown in Table 3.3 (factor scores) are displayed spatially on Map 3.1. In this and the following maps, the three categories of leading CDs are indicated with green colors (the darkest being leading I), neutral in gray, and the three categories of lagging in red (the darkest being lagging I).

Among the four factors identified, the Economic dynamics factor is the one that presents the clearest spatial distribution. From the Map 3.1 emerges a core area surrounding Toronto and extended to the north with relatively high scores on this factor. The south-east and south-west of the province tend to have lagging scores on this factor, except for some of the urban-based CDs (Ottawa-Carlton, Middlesex). It is also interesting to note that the CDs dominated by urban centers with an old industrial base, such as Essex, Hamilton-Wentworth, and Niagara, are lagging or neutral on this factor. Also the north of the province shows lagging or neutral scores on this factor.

Huron County resides in the lagging category. This CD presents the second lowest score among the CDs of Ontario. In particular, the County shows a slow demographic dynamic; even if the fertility rate is high, the population change is among the lowest of the province, being also associated a with high level of youth out-migration. Determinant is also the high the percentage of primary employment (18.16%) dominated by the agricultural sector and low employment in the dynamic services. Finally, income and housing cost indicators are below the provincial average (see also Appendix - Table A. 1).

Map 3.1. Factor 1: Economic dynamics



lead
- > 1.5
- 0.75 to 1.49
- 0.25 to 0.74
- -0.24 to 0.24
- -0.74 to -0.25
- -1.49 to -0.75

lag
- < -1.5

leading:
high income, high employment status, high educational status, high dwelling values and costs, rapid population growth, high in-migration.

Table 3.3. Economic dynamics: leading and lagging CDs

code	Census Division	Factor 1: Economic dynamics	
19	York Regional Municipality	3.30	leading I
21	Peel Regional Municipality	1.97	
24	Halton Regional Municipality	1.97	
44	Muskoka District Municipality	1.46	leading II
18	Durham Regional Municipality	1.39	
46	Haliburton County	1.17	
06	Ottawa-Carleton Regional Municip.	1.14	
20	Toronto Metropolitan Municipality	1.06	
43	Simcoe County	1.02	
22	Dufferin County	0.83	
39	Middlesex County	0.81	
10	Frontenac County	0.59	leading III
15	Peterborough County	0.57	
30	Waterloo Regional Municipality	0.54	
23	Wellington County	0.43	
16	Victoria County	0.35	
26	Niagara Regional Municipality	0.17	neutral
49	Parry Sound District	0.17	
14	Northumberland County	0.13	
48	Nipissing District	0.12	
25	Hamilton-Wentworth Reg Municipality	0.08	
12	Hastings County	-0.10	
29	Brant County	-0.13	
58	Thunder Bay District	-0.18	
09	Lanark County	-0.21	
42	Grey County	-0.23	
53	Sudbury Regional Municipality	-0.25	lagging III
07	Leeds and Grenville	-0.29	
37	Essex County	-0.30	
11	Lennox and Addington County	-0.39	
13	Prince Edward County	-0.44	
38	Lambton County	-0.46	
02	Prescott and Russell	-0.62	
57	Algoma District	-0.63	
60	Kenora District	-0.63	
41	Bruce County	-0.64	
32	Oxford County	-0.75	lagging II
47	Renfrew County	-0.89	
28	Haldimand-Norfolk Reg Municipality	-0.90	
31	Perth County	-0.93	
34	Elgin County	-0.96	
01	Stormont, Dundas and Glengarry	-0.97	
59	Rainy River District	-0.99	
51	Manitoulin District	-1.01	
56	Cochrane District	-1.06	
36	Kent County	-1.08	
52	Sudbury District	-1.30	
40	**Huron County**	**-1.39**	
54	Timiskaming District	-1.52	lagging I

3.2. Factor 2: Socio-economic stress

Factor 2 has been defined as Socio-economic stress. It explains 21.4% of the variance in the data set. There are 9 variables that load on this factor. The interpretation of this factor, however, appears less straightforward than Factor 1. The reason is that Factor 2 appears more as a bipolar factor, with two major components, one housing related and the other social-poverty related. Although these two aspects are linked in several ways, the variables used in the analysis do not always overlap.

Leading CDs on this factor tend to present a low incidence of dwellings rented and of households with more than 30% of income paid in rent, a high incidence of single detached housing, a low incidence of low income families and individuals, a low incidence of lone parent families, a high incidence of females and males working at home, and a high fertility rate.

Specifically, the variables that load on this factor with a positive sign are: Percentage of private dwelling rented (0.94), Percentage of households with gross rent equal or greater than 30% of total income (0.79), Percentage of lone parent census families (0.78), Percentage of low income unattached individuals (0.70), Percentage of low income economic families (0.69), Percentage of population age 20-39 (0.61). Three variables load with a negative sign: Percentage of private dwellings single-detached (-0.86), Percentage of females working at home (-0.63), Percentage of males working at home (-0.56). Finally, the Fertility rate (-0.60) also affects this factor.

Table 3.4 shows the factor scores for the CDs of Ontario. On this table the sign of the factor scores has been reversed to make the table consistent with the others (original scores are reported in Appendix II - Table A.6). The data are displayed on Map 3.2.

In general, it appears that many of the urban CDs that presented leading values on Factor 1 tend to present lagging or neutral values on this factor. For instance, Toronto has a very low score on this factor, while it has the 8^{th} highest score on Factor 1. To a large extent, this is a reflection of the socio-economic dichotomies that characterize urban areas. Toronto records the highest percentage of low income economic families in the province (16.30%). High negative values are also registered in Ottawa-Carlton, Frontenac, and Hamilton-Wentworth, the first two of which shared with Toronto leading scores on Factor 1. The three largest urban centres in the province (Toronto, Ottawa and Hamilton) have the three highest negative scores on this factor.

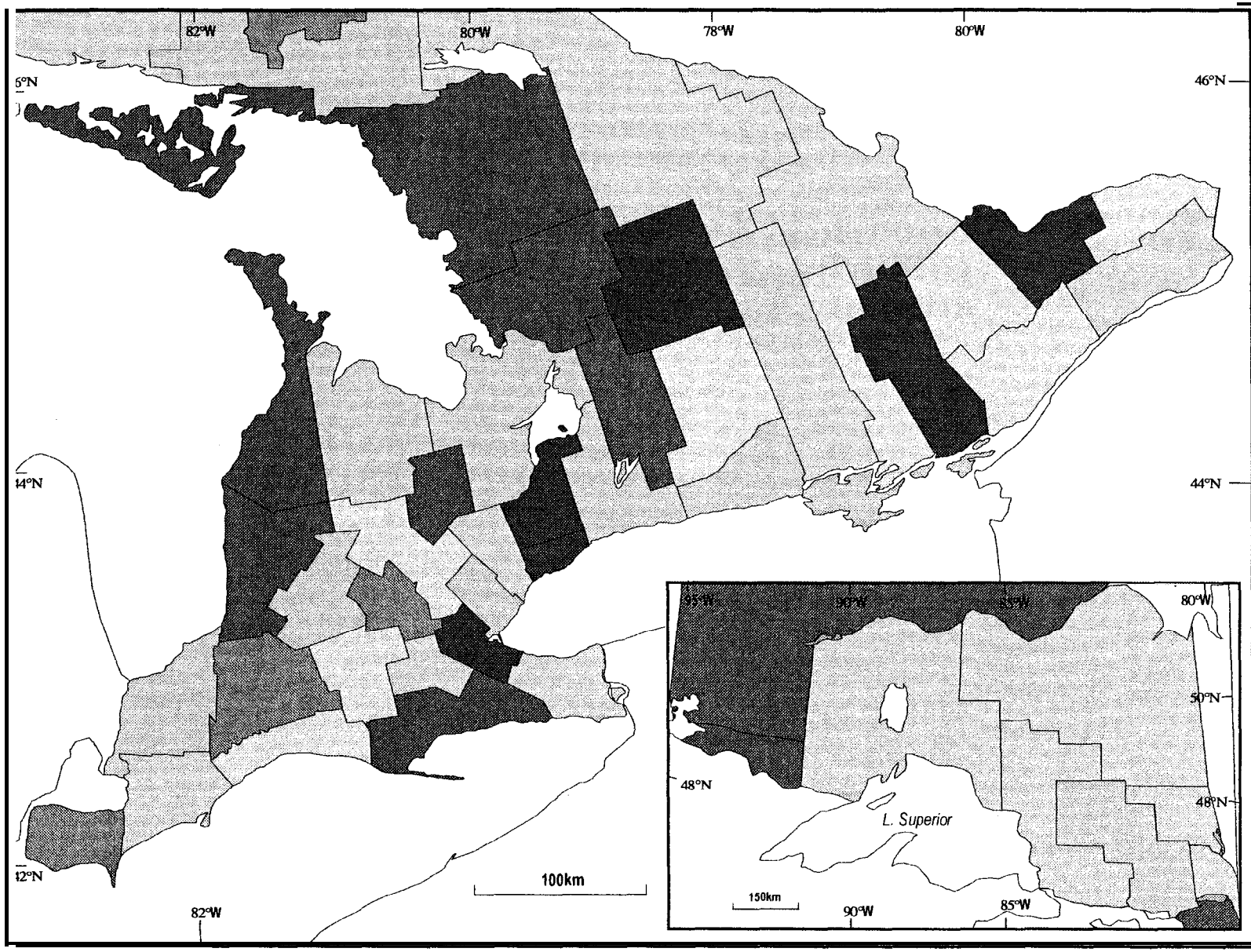
However, the low score is also due to the housing characteristics of urban areas (eg. high percentage of rented dwellings) and the low percentage of individuals working at home. Interestingly, then, the CD with the highest score on this factor, York Regional Municipality, also recorded the highest score on Factor 1.

Huron County has a leading score on this factor (6^{th} highest in the province), which describes well the social structure of the area. The County presents a low percentage of dwelling rented (23%) and an extremely high percentage of single-detached dwelling (82%). Also the indicators of poverty and social distress are well below the provincial average. Finally, as expected in an area with a strong agricultural base, the percentage of individuals working at home is high (see also Appendix I - Table A.l).

Table 3.4. Socio-economic stress: leading and lagging CDs *

code	Census Division	Factor 2: Soco Economic stress	
19	York Regional Municipality	1.92	leading I
46	Halibutton County	1.63	
41	Bruce County	1.48	leading II
51	Manitoulin District	1.37	
22	Dufferin County	1.23	
40	**Huron County**	1.20	
44	Muskoka District Municipality	1.14	
60	Kenora District	1.03	
49	Parry Sound District	0.95	
16	Victoria County	0.91	
59	Rainy River District	0.82	
28	Haldimand-Norfolk Reg Municipality	0.75	
42	Grey County	0.57	leading III
24	Halton Regional Municipality	0.55	
14	Northumberland County	0.51	
52	Sudbury District	0.50	
13	Prince Edward County	0.46	
43	Simcoe County	0.45	
31	Perth County	0.38	
38	Lambton County	0.38	
18	Durham Regional Municipality	0.35	
11	Lennox and Addington County	0.15	neutral
2	Prescott and Russell	0.02	
32	Oxford County	0.01	
34	Elgin County	0.00	
15	Peterborough County	-0.02	
9	Lanark County	-0.07	
7	Leeds and Grenville	-0.11	
23	Wellington County	-0.11	
21	Peel Regional Municipality	-0.3	lagging III
47	Renfrew County	-0.3	
56	Cochrane District	-0.31	
36	Kent County	-0.39	
54	Timiskaming District	-0.4	
26	Niagara Regional Municipality	-0.43	
58	Thunder Bay District	-0.47	
57	Algoma District	-0.64	
48	Nipissing District	-0.65	
1	Stormont, Dundas and Glengarry	-0.66	
12	Hastings County	-0.68	
29	Brant County	-0.72	
53	Sudbury Regional Municipality	-0.79	lagging II
37	Essex County	-0.84	
30	Waterloo Regional Municipality	-1.04	
39	Middlesex County	-1.25	
10	Frontenac County	-1.5	lagging I
25	Hamilton-Wentworth Reg Municipality	-1.78	
6	Ottawa-Carleton Regional Municip.	-2.04	
20	Toronto Metropolitan Municipality	-3.25	

Map 3.2. Factor 2: Socio-economic stress



ead > 1.5
0.75 to 1.49
0.25 to 0.74
-0.24 to 0.24
-0.74 to -0.25
-1.49 to -0.75
ag < -1.5

eading:
ow incidence of dwellings rented and of households with gross ent ≥ 30% of household income, high incidence of single detached housng, low incidence of low ncome families and individuals, low incidence of lone parent families, high incidence of females and males working at home.

• The sign of the factor scores have been reversed.

3.3. Factor 3: Labour force participation and age

Factor 3 has been named Labour force participation and age. The two component are closely related, in part because of the way the labour force participation rate is measured by official statistics. The factor explains 10.1% of the variance in the original data set. Seven variables load highly on this factor, and three others have some effect although they load more strongly on Factor 1 or 2.

The leading CDs on this factor tend to present a high percentage of young population and low percentage of elderly, high employment income as percentage of total income and a high labour force participation rate. With these characteristics is associated also a low percentage of employment in traditional services, as well as high income status.

The variables that load positively on this factor are: Employment income as a percentage of total income (0.82), Percentage of population less than age 20 (0.79), Male participation rate (0.77), Percentage of families with two or more members in the labour force (0.60), Female participation rate (0.58). The three variables shared with other factors and also loading positively are: Percentage of households with income $60,000 and over (0.61), Percentage of population age 20-39 (0.59), and Average household income (0.56).

Two variables load with a negative sign: Percentage of population age 65 and over (-0.87), and Percentage traditional services employment (-0.67).

The value of the participation rate variable is in part determined by the age structure of the locality. In fact, the participation rate is defined as the total labour force expressed as a percentage of the population 15 year of age and over (Statistics Canada 1993). The labour force is expressed as employed plus unemployed, while the remainder of the working age population is classified as not in the labour force (who is unwilling or unable to offer or supply their labour services under conditions existing in the labour market). Therefore a high percentage of elderly, usually included in the "not in the labour force" category, reduces the share of people classified as in the labour force and consequently the participation rate value.

Table 3.5 shows the factor scores for this factor, and these data are displayed on Map 3.3. Among CDs with highest score are the three that border the Toronto Metropolitan Municipality (Peel, York and Durham) which reflect closely the characteristics described above for the leading areas. On the other hand, the age structure (high percentage of people over 65), a low participation rate and the high percentage of employment in traditional services results in low factor scores for the CDs of Parry Sound, Muskoka and Haliburton.

Huron County is in the neutral category for this factor. It is important to bear in mind that factor scores are the result of a linear combination of variables. Therefore, neutral values are more difficult to interpret, because they can be due to high values for certain variables associated with low values for other variables or by a prevalence of average values.

In the case of Huron County, some of the variables that load on this factor present values close to the provincial average. Such is the case for the participation rate and the percentage of families with two or more members in the labour force. On the other hand, the variables related to the demographic structure indicate higher than average values for both percentage age 65 and over and percentage less than age 20. The coexistence of this demographic structure with high participation rate could be at least in part attributed to an aging farm population, an hypothesis that however it is not possible to test in this study. Finally, both the income related variables and the employment in traditional services present values below the provincial average (see also Appendix I - Table A. 1).

Table 3.5. Labour force participation and age: leading and lagging CDs

code	Census Division	Factor 3: Labour force participation and age	
19	York Regional Municipality	1.75	leading I
56	Cochrane District	1.69	
18	Durham Regional Municipality	1.66	
60	Kenora District	1.61	
21	Peel Regional Municipality	1.59	
22	Dufferin County	1.42	leading II
02	Prescott and Russell	1.37	
24	Halton Regional Municipality	0.94	
52	Sudbury District	0.91	
23	Wellington County	0.60	leading III
53	Sudbury Regional Municipality	0.60	
59	Rainy River District	0.58	
58	Thunder Bay District	0.50	
30	Waterloo Regional Municipality	0.47	
28	Haldimand-Norfolk Reg Municipality	0.45	
38	Lambton County	0.38	
34	Elgin County	0.36	
57	Algoma District	0.34	
54	Timiskaming District	0.27	
11	Lennox and Addington County	0.22	neutral
06	Ottawa-Carleton Regional Municip.	0.20	
36	Kent County	0.18	
47	Renfrew County	0.15	
37	Essex County	0.10	
32	Oxford County	0.08	
41	Bruce County	0.01	
31	Perth County	-0.02	
43	Simcoe County	-0.04	
40	**Huron County**	**-0.12**	
48	Nipissing District	-0.14	
09	Lanark County	-0.26	lagging III
01	Stormont, Dundas and Glengarry	-0.26	
29	Brant County	-0.31	
25	Hamilton-Wentworth Reg Municipality	-0.40	
14	Northumberland County	-0.46	
39	Middlesex County	-0.50	
07	Leeds and Grenville	-0.61	
10	Frontenac County	-0.65	
12	Hastings County	-0.66	
26	Niagara Regional Municipality	-0.72	
42	Grey County	-0.86	lagging II
20	Toronto Metropolitan Municipality	-0.95	
16	Victoria County	-1.03	
13	Prince Edward County	-1.13	
51	Manitoulin District	-1.19	
15	Peterborough County	-1.32	
49	Parry Sound District	-1.82	lagging I
44	Muskoka District Municipality	-2.01	
46	Haliburton County	-3.01	

3.4. Factor 4: Unemployment levels

Factor 4 has been named Unemployment levels. The factor explain 6.9% of the variance of the original data set. The CDs that have leading scores on this factor tend to present low unemployment levels and a low percentage of families with one member only in the labour force.

Specifically, the variables that load on it are different indicators of employment - Female unemployment rate (-0.87), Youth unemployment rate (-0.76), and Male unemployment rate (-0.74) - and another employment related variable, Percentage of families with one member only in the labour force (-0.76). Two other variables are shared with other factors: Percentage of traditional services employment (- 0.5 1), and Percentage of families with two or more members in the labour force (0.57).

An interesting result of the statistical analysis is that the unemployment indicators form a factor separated from the other variables. This suggests that, at least at this level of aggregation, unemployment rates are relatively independent from the other social or economic indicators.

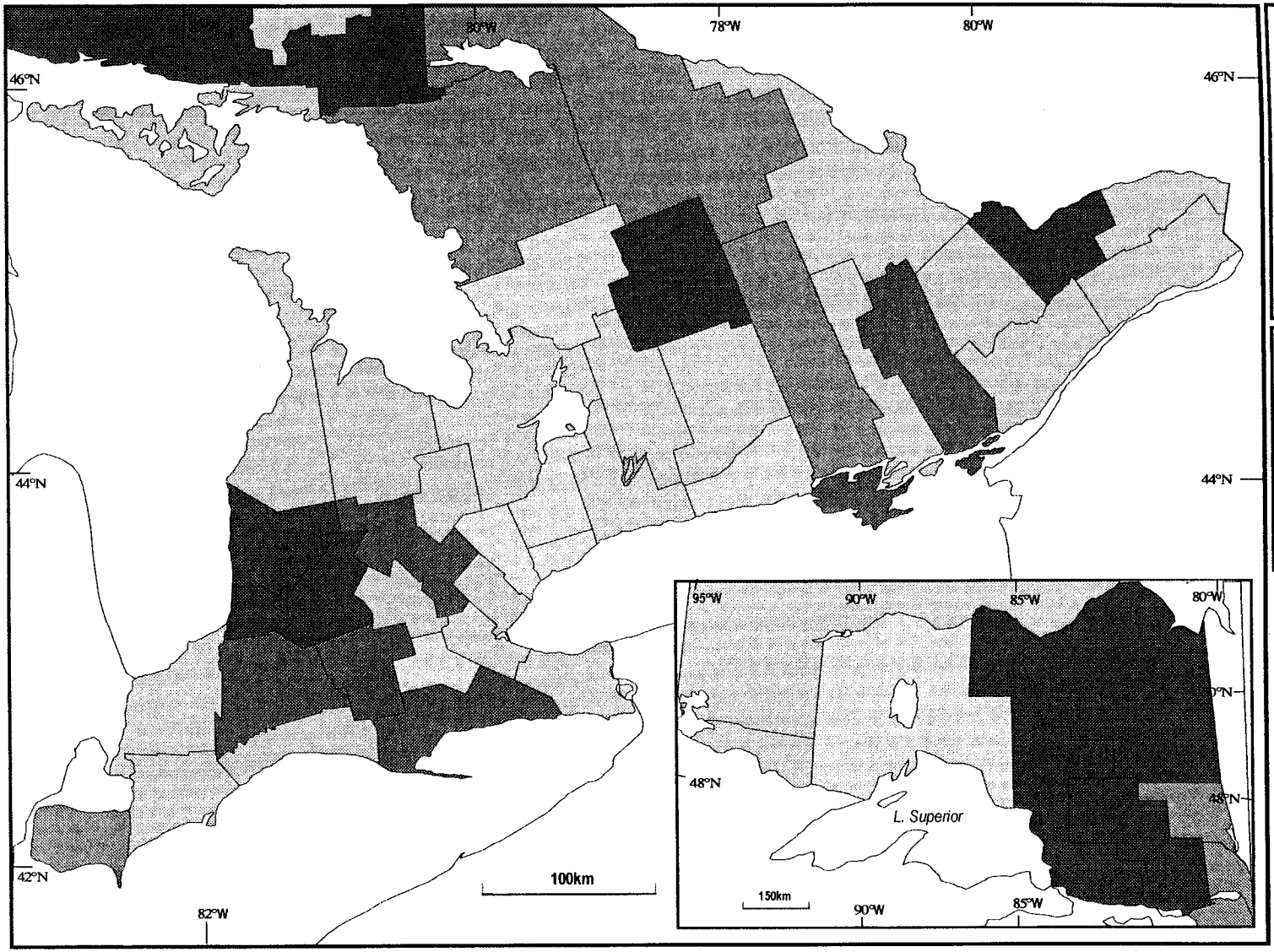
The factor scores are shown on Table 3.6 and displayed on Map 3.4. From these data emerges a prevalence of lagging areas in the central and northern part of the province. Also the more industrial CDs of Essex, Hamilton-Wentworth and Niagara record lagging scores on this factor. In contrast, the central south-west and south-east of the province are dominated by leading CDs on this factor.

Huron county is leading on this factor, with the second highest score in the province. The county presents in fact the lowest level of youth unemployment in the province and is close to the lowest level for male and female unemployment (see Appendix I - Table A. 1). The high level of youth out-migration presumably helps to account for the low level of youth unemployment.

Table 3.6. Unemployment levels: leading and lagging CDs

code	*Census Division*	*Factor 4: Unemployment levels*	
31	Perth County	2.56	leading I
40	**Huron County**	2.11	
06	Ottawa-Carleton Regional Municip.	1.59	
32	Oxford County	1.32	leading II
39	Middlesex County	1.18	
23	Wellington County	1.11	
28	Haldimand-Norfolk Reg Municipality	1.10	
13	Prince Edward County	1.01	
10	Frontenac County	0.97	
24	Halton Regional Municipality	0.69	leading III
07	Leeds and Grenville	0.68	
42	Grey County	0.68	
51	Manitoulin District	0.66	
41	Bruce County	0.63	
09	Lanark County	0.52	
01	Stormont, Dundas and Glengarry	0.41	
30	Waterloo Regional Municipality	0.37	
36	Kent County	0.34	
22	Dufferin County	0.30	
02	Prescott and Russell	0.26	
34	Elgin County	0.25	
14	Northumberland County	0.14	neutral
20	Toronto Metropolitan Municipality	0.11	
21	Peel Regional Municipality	0.04	
58	Thunder Bay District	-0.01	
29	Brant County	-0.02	
19	York Regional Municipality	-0.09	
44	Muskoka District Municipality	-0.23	
38	Lambton County	-0.27	lagging III
59	Rainy River District	-0.30	
43	Simcoe County	-0.30	
15	Peterborough County	-0.32	
11	Lennox and Addington County	-0.43	
60	Kenora District	-0.45	
53	Sudbury Regional Municipality	-0.49	
16	Victoria County	-0.50	
47	Renfrew County	-0.52	
25	Hamilton-Wentworth Reg Municipality	-0.62	
18	Durham Regional Municipality	-0.62	
26	Niagara Regional Municipality	-0.69	
12	Hastings County	-0.90	lagging II
49	Parry Sound District	-1.04	
54	Timiskaming District	-1.08	
48	Nipissing District	-1.21	
37	Essex County	-1.38	
57	Algoma District	-1.82	lagging I
46	Haliburton County	-1.84	
52	Sudbury District	-1.85	
56	Cochrane District	-2.09	

Map 3.4. Factor 4: Unemployment levels



leading:
low unemployment rates, low incidence of families with one member only in the labour force.

3.5. Factor 5 to Factor 8

The last four factors explain a small percentage of the total variance in the data set of variables. Each of them is related to one or two variables. The results of the factor scores for each of them are presented in the Tables 3.7 to 3.10, and discussed briefly below.

Factor 5 is related to the percentage of people (males and females) working in other than the CSD of residence. Specifically, the two variables that load on the factor are: Percentage females working in different CSD than that of residence (0.89), Percentage males working in different CSD that that of residence (0.87). This factor could represent the commuting pattern of the CD, and Huron County would result in the neutral range. However, the fact that these variables have resulted as a separate factor makes the result difficult to interpret. This, together with the differences of scale between north and south of the province would suggest that one should analyze these variables separately in further research.

Factor 6 is related to the structure of the employment. Two variables load on this factor, one with a negative sign - Percentage non-market services employment (-0.91) - and the other with positive sign - Percentage manufacturing employment (0.84). High scores on this factor tend to indicate CDs with a relatively high concentration of manufacturing employment and relatively low concentration of employment in non-market services. Huron again records a score in the neutral range.

Factor 7 and Factor 8 are both one-variable factors. The former is related to the variable Percentage population 15-24 attending school full time (0.91). The latter is related to the variable Value added per worker in manufacturing (0.92). Huron County is in the leading range for Factor 7, while it is in the lagging range for Factor 8.

Table 3.7. Factor 5—Working outside the CSD of residence

code	Census Division	Factor 5
02	Prescott and Russell	2.16
11	Lennox and Addington County	2.02
47	Renfrew County	1.65
13	Prince Edward County	1.35
09	Lanark County	1.20
20	Toronto Metropolitan Municipality	1.09
07	Leeds and Grenville	1.06
18	Durham Regional Municipality	1.06
14	Northumberland County	1.02
16	Victoria County	0.98
12	Hastings County	0.79
22	Dufferin County	0.79
49	Parry Sound District	0.76
54	Timiskaming District	0.61
34	Elgin County	0.58
41	Bruce County	0.47
06	Ottawa-Carleton Regional Municip.	0.45
52	Sudbury District	0.45
43	Simcoe County	0.43
01	Stormont, Dundas and Glengarry	0.30
10	Frontenac County	0.18
46	Halibut-ton County	0.12
25	Hamilton-Wentworth Reg Municipality	0.11
42	Grey County	0.00
19	York Regional Municipality	-0.02
28	Haldimand-Norfolk Reg Municipality	-0.03
21	Peel Regional Municipality	-0.13
24	Halton Regional Municipality	-0.16
40	**Huron County**	-0.21
37	Essex County	-0.25
32	Oxford County	-0.27
36	Kent County	-0.38
38	Lambton County	-0.39
23	Wellington County	-0.47
15	Peterborough County	-0.56
26	Niagara Regional Municipality	-0.58
30	Waterloo Regional Municipality	-0.58
53	Sudbury Regional Municipality	-0.64
29	Brant County	-0.68
60	Kenora District	-1.01
48	Nipissing District	-1.01
31	Perth County	-1.16
56	Cochrane District	-1.18
51	Manitoulin District	-1.25
59	Rainy River District	-1.36
57	Algoma District	-1.47
44	Muskoka District Municipality	-1.79
39	Middlesex County	-2.00
58	Thunder Bay District	-2.05