Estimating Community Labour Market Indicators Between Censuses

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The Local Employment Planning Council (LEPC)

Local Employment
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Conseil local de planification
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PART I: INTRODUCTION AND THE OBJECTIVES OF THE PROJECT

The Local Employment Planning Council (LEPC) for the Thunder Bay District, supported by the North Superior Workforce Planning Board, is being piloted to improve labour market conditions in local communities. The regional LEPC supports the improvement of labour market conditions in local communities through:

1. Providing labour market information and intelligence,
2. Supporting integrated planning by serving as a central point of contact and key facilitator for linking employers, service providers, other government and community stakeholders to identify and respond to labour market and workforce development challenges and opportunities,
3. Acting as a service coordinator for employers and addressing their workforce development needs,
4. Collaborating with community stakeholders to develop projects related to research and piloting of innovative approaches,
5. Working with provincial and community organizations, including other LEPCs, to identify and share best practices.

The regional LEPC is required to create an annual community labour market planning report, which will help to inform the Ministry regarding service delivery based on solid evidence.

In order to fulfill its objectives and mandates, the LEPC for the Thunder Bay District requires detailed on-time information about labour market conditions in the various communities it serves. However, the necessary data and information are not readily available at the present time. During census years, detailed labour market information is available for most communities. However, in the years between each census, labour market information is available only at the aggregate regional level that includes Thunder Bay Census Metropolitan Area (CMA). The lack of data makes it difficult to prepare informed planning procedures for service providers, students, their families and potential employers.

In general, one cannot assume that the labour market indicators provided by the census are valid for the entire period between the two censuses. Apart from natural demographic changes, significant changes can occur during the years between the two censuses. Mills close, mines fail to get a permit, businesses close or new investment is made. All these changes, that are mostly unpredictable and can be regarded as external shocks, affect the basic labour market indicators in local communities. In general, shocks to any community in Northwestern Ontario has the potential to influence local labour market conditions in all communities. There is a need for a model that not only predicts local labour market conditions in each community based on its relationship with trends in the Thunder Bay CMA, but is also capable of adjusting local labour market conditions based on events and shocks happening in any of the Northwestern Ontario communities.

1.1 Objectives of the Present Project

The main objective of the present project is to develop a tool that allows community level census indicators namely participation rate, employment rate and unemployment rate by gender to be estimated. This would apply to the total population, Aboriginal population and Francophone population on a regular basis at the small community levels in non-census years, thereby making it possible to provide that information with greater frequency and accuracy. In addition, users need to be able to obtain changes to the above three indicators as communities experience growth or decline in their employment. Finally, the program would allow users to obtain total employment and income impacts of changing local employment.

The above objectives have been achieved by developing a computer program based on a statistical model capable of estimating various indicators during non-census years and calculating the impact of changing local employment. The program is capable of incorporating new information as it becomes available while being presented in a user-friendly manner. The users are asked to enter new information on labour market indicators in Thunder Bay CMA for which data is available on a monthly basis, as well as information on any significant changes in their local economies (e.g. changes in employment resulting from an opening of a new mine or a closure of a mill). Then, the program calculates various labour market indicators taking into account the new information.

The report is organized in 5 parts.

Part I provides an introduction and outlines project objectives.

Part II defines various labour market indicators, discusses their relationship and examines various sources of data, their similarities and differences.

Part III examines trends in various indicators in Northwestern Ontario, Thunder Bay district and Thunder Bay CMA and estimates their correlation coefficients. In addition, this part examines the numerical differences between various sources of data.

Part IV presents population trends in the 35 communities included in the project. It also provides various labour market indicators for the 35 communities based on the 2011 National Household Survey (NHS). Part IV also shows the average employment earnings and earnings of full-time and full-year workers in the 35 communities based on the 2011 NHS. These earnings are used in the program to estimate the economic impact of changes in employment in each community.

Part V provides a short description of the methodology and the model and provides steps the users need to take to access the program. Part V also discusses the type of information available to the users.

PART II: LABOUR MARKET INDICATORS

This part of the report defines various labour market indicators, discusses their relationship and examines various sources of data, their similarities and differences.

2.1. Defining Various Labour Market Indicators

The three indicators estimated in the present project are labour force participation rate, employment rate and the unemployment rate. This section defines these indicators and discusses their inter-relationships.

2.1.1. Labour Force Participation Rate

The total working-age population in a community can be grouped into those who participate in the labour force and those who do not. We can write the total working-age population as:

Population 15+ = Those who participate in the labour force + Those who do not

From those who participate in the labour force, some find employment and the rest remain unemployed. Therefore, labour force is defined as the sum of the number of persons employed and the number of individuals unemployed. It is written as:

Labour Force = Employed population + Unemployed population

Thus, the labour force participation rate is a measure of the proportion of a region's working-age population that actively participates in the labour market, either by working or looking for work. It measures the size of the supply of labour available to participate in the production of goods and services, relative to the working age population. The breakdown of this active population by gender and age class provides a clear profile of the labour force in a community.

The labour force participation rate is calculated as follows:

Participation Rate (%) = 100 [Labour Force / Population 15+]*

The participation rate indicates the size and the composition of a community's human resources and is often used to forecast the future labour supply in a community and to formulate employment and training policies. This indicator can also be used to compare the labour market behaviour of different segments of the population.

The labour force participation rate is influenced by employment opportunities as well as other demographic and socio-economic factors such as age structure, gender, education level, marital status, place of residence, and other factors that may affect an individual's capacity to work. The labour force participation rate has generally been lower for females than for males in each age category. However, the gap between male and female participation rates has been closing during

the past 20 years.[1] The labour force participation rate usually rises as economic conditions improve and declines during recessionary periods.

The labour force participation rate is also used to calculate the non-participation rate in a community, which equals 100 minus the labour force participation rate.

2.1.2. Employment-to-Population Ratio

The employment-to-population ratio is defined as the proportion of a country's working-age population that is employed. It is defined as:

Employment rate (%) = 100* [number of people employed / population 15+]

A high employment rate suggests that a large proportion of a community's population is employed. A low employment rate suggests that a large share of a community's working-age population is not involved in market-related activities, because they are either unemployed or not participating in the work force. The employment rate tends to increase during economic booms and decline during recessionary periods.

In some sense, the employment rate reflects the ability of an economy to create employment. It shows the share of the working-age population that is contributing to the production of goods and services. In that sense, the employment rate is a more useful indicator of a community's economic condition than unemployment or participation rates. Employment rates are often a basis for comparing labour markets across different regions.

When broken down by gender, the employment rate provides information on gender differences in the labour market activities. Some argue that the employment rate is gender biased because it has a tendency to undercount women whose work is not considered "employment". Women are often the primary child caretakers and are responsible for different tasks at home which prevents them from seeking employment outside of their home. However, Statistics Canada provides information on the average hours spent by women on housekeeping and maintenance activities that can be used to value the work women perform at home.

2.1.3. The Unemployment Rate

The unemployment rate is probably the most wildly quoted and best-known labour market indicator as it reflects the lack of employment at the regional level. It is defined as the proportion of the labour force that does not have a job but is available and actively looking for work. It is measured as:

Unemployment rate (%) = 100* [number of unemployed people / labour force participants]

The unemployment rate is perhaps the most informative labour market indicator showing the overall performance of the labour market. It is a measure of a region's unutilized labour supply.

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[1] Statistics Canada, Labour Force Survey, various issues.

Unemployment rates by different groups, defined by age, sex, occupation or industry, are used in identifying groups of workers and sectors most vulnerable to joblessness. The aggregate unemployment rate does not tell us about the type of unemployment – whether it is cyclical and short-term or structural and long-term. This is important when developing plans to reduce unemployment.

The unemployment rate can be used to track business cycles. When the rate is high, the regional economy may be in recession. Similarly, a low rate of unemployment may indicate a recovering and growing economy.

The unemployment rate is also used to study issues of gender differences in labour force behaviour and outcomes. The unemployment rate has historically been higher for women than for men. In general, women are more likely than men to exit and re-enter the labour force for family related reasons. Also, there is a general "crowding" of women into fewer occupations than men. Thereby women may find fewer opportunities for employment.

Changes in unemployment rates reflect the net effect of flows into unemployment and flows out of unemployment. Examination of the rate and speed at which workers move in and out of unemployment provides essential information for targeting labour market policies regarding certain groups of workers or to make adjustments according to which aspect of the unemployment dynamics dominate in a particular region. Tracking the behaviour of inflows and outflows during recovery or recessionary periods provides us with valuable information that can be used to develop labour market policies.

A low regional unemployment rate does not necessarily indicate economic growth. One potential issue with the aggregate unemployment rate is that it does not include the discouraged workers who are without a job, but not actively looking for employment because they have gotten discouraged by lack of job opportunities. Similarly, part-time workers are regarded as employed even if they prefer to work full-time but cannot find full-time jobs.

A bit of manipulation can show that the unemployment rate (UR), participation rate (PR) and employment rate (ER) are closely linked. We can show that:

UR = [PR – ER] / PR

Therefore, having an estimate of the participation and employment rates, one can easily calculate the unemployment rate in a community.

These indicators can also be used to estimate other indicators such as the standard of living indicator defined as income per person. Using employment income as a measure of labour productivity, one can estimate the standard of living indicator as:

Standard of living indicator = Employment Income per worker x ER

2.2. Sources and Accuracy of Data on Labour Market Indicators

The three readily available sources of data on labour market indicators are Census/National Household Survey (NHS), Labour Force Survey (LFS) and Taxfilers data. These sources often provide numerically different values for different indicators. The differences relate to sampling errors and non-response errors as well as sample size differences.

Therefore, it is important to examine the differences between the estimates provided by these sources in order to be able to evaluate the accuracy of different results.

2.2.1. Census / National Household Survey

The Census Program consists of two parts. The first part consists of a short questionnaire with a basic set of questions related to age, sex, marital status and mother tongue, and are distributed to 100 percent of households. The second component consists of a long questionnaire (referred to as the National Household Survey in 2011) and are distributed to a 20 percent sample of households. Completing the census questionnaires is mandatory. The sample results are then weighted to represent the total population. The weight for each sample household is basically the ratio of total households to the sampled households. Statistics Canada randomly rounds the data and also suppresses certain geographic areas with a population below a specified size for confidentiality purposes. The overall response rate of the census is usually more than 95% which makes it the most reliable source of data.

In 2011, the data collected by the mandatory long-form census questionnaire was collected as a part of the voluntary NHS that distributed the long questionnaire to a 33 percent sample of households. Two types of questionnaires were used for the NHS. One questionnaire for the self-administered collection method and the second questionnaire for collection on Indian reserves and remote areas where 100 percent of the households were invited/interviewed by a Statistics Canada enumerator.

Due to the voluntary nature of the survey, the NHS survey suffered from non-response bias. With about a 33 percent sampling and a response rate of 68.6 percent, Statistics Canada estimates that about 21 percent of the Canadian population participated in the NHS. Therefore, due to the non-response bias, the data reported as a part of the 2011 NHS is less reliable than the Census data collected and reported in other Census years.

2.2.2. Labour Force Survey (LFS)

The LFS provides estimates of various labour market indicators on a monthly basis. The survey covers the civilian population 15 years of age and older. It covers all the provinces and the territories but excludes persons living on reserves and other Aboriginal settlements, institutionalized population and households in remote areas with low population density.

The monthly LFS covers about 56,000 households in Canada, which provides labour market information for approximately 100,000 individuals. The survey covers 15,860 households in Ontario. Non-response to the LFS averages about 10% of eligible households. The sample size

used is subject to change to ensure data as well as budget requirements. The subset of the sample is allocated to each province, the territories, Census Metropolitan Areas, economic regions and employment insurance regions.

The monthly LFS estimates are rounded to the nearest hundred and any estimate for areas below a minimum population of 1500 in Ontario is not released.

Given that the LFS is a sample survey, the estimates are subject to both sampling error and non-sampling errors. Sampling errors are measured using coefficients of variation for LFS estimates which is a function of the standard error and the size of the estimate. Non-sampling errors are related to the coverage errors, non-response errors, response errors, interviewer errors, coding errors and other types of processing errors. Given the sample size and potential errors, the LFS data, while timely, is less reliable than the census data.

2.2.3. Taxfiler Data

Taxfiler data is also referred to as "Annual Estimates for Census Families and Individuals" and is compiled by Statistics Canada's Income Statistics Division from samples of unincorporated and incorporated tax returns. Taxfiler data consists of four sets of tables relating to:

- Family Data
- Neighbourhood Income and Demographics
- Seniors
- Financial and Charitable Donors

Tables related to neighborhood income and demographics provide information on various labour market indicators at the community level. Postal Codes are the basic geographic units used by Taxfiler data. The data are available at Postal geographic scales which is based on six-digit Postal Codes and Census geographic scales. The postal geographic scales cover the following areas:

1. Postal walk
2. Other postal walk
3. Urban forward sortation area (residential area)
4. Rural route
5. Suburban service
6. Rural postal code (within city)
7. Other urban area (non-residential within city)
8. City total (a.k.a. postal city)
9. Rural postal code (not in city)
10. Other provincial total
11. Province or territory total
12. Canada

Census geographic scales provide information on the following regions:

1. Census division
2. Federal electoral district
3. Census metropolitan area
4. Census agglomeration
5. Economic region
6. Census tract

Examination of the data reveals that the demographic information contained in Taxfiler data does not always correspond to the Census information on various Census subdivisions.

PART III: TRENDS IN AGGREGATE REGIONAL INDICATORS

Part III examines trends in various indicators in Northwestern Ontario, Thunder Bay district and Thunder Bay CMA and estimates their correlation coefficients. In addition, this part examines the numerical differences between various indicators based on different sources of data.

3.1. Labour Force Participation Rate

Based on the Labour Force Survey Data, Figure 1 shows labour force participation rates for Northwestern Ontario and its sub-regions during 2001-2014.

Figure 1: Labour Force Participation Rates

Regional Participation Trends (%)

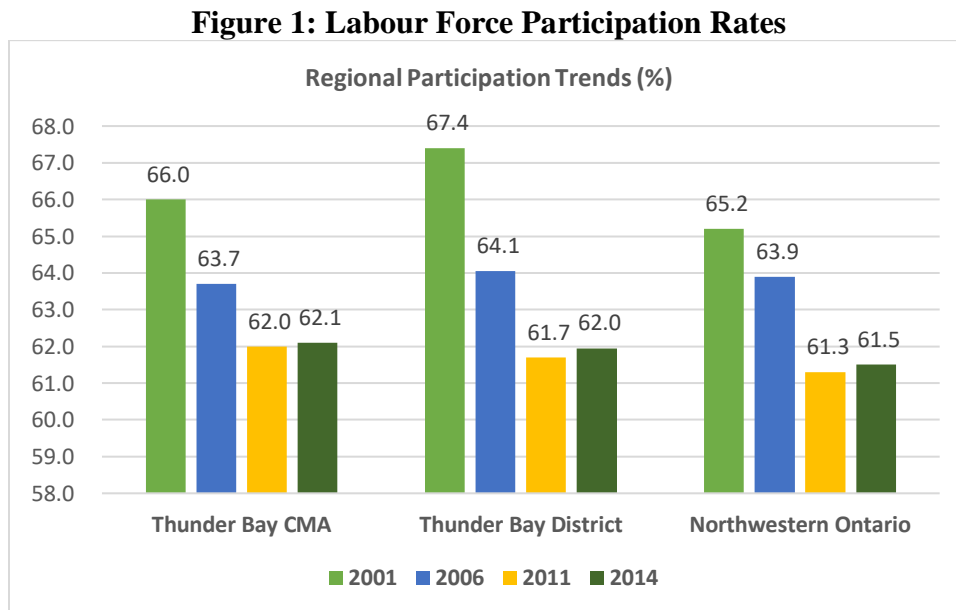| Region	2001	2006	2011	2014
Thunder Bay CMA	66.0	63.7	62.0	62.1
Thunder Bay District	67.4	64.1	61.7	62.0
Northwestern Ontario	65.2	63.9	61.3	61.5

Figure 1 shows that the labour force participation rate has declined during 2001-2014. The correlation coefficient between the participation rate in Thunder Bay district and Thunder Bay CMA equals 99.9 percent which is extremely high and statistically not different from 100 percent. Note that the correlation coefficient varies between negative and positive one. The value of unity suggest perfect correlation. The correlation coefficient between the participation rate in Thunder Bay CMA and Northwestern Ontario equals 97.3 percent which is very high. It is clear that these regions are subject to the same economic shocks and therefore exhibit the same trends in their labour force participation rate.

Based on the Labour Force Survey, Figure 2 shows trends in the labour force participation rate of men and women in Thunder Bay CMA.

Figure 2: Labour Force Participation Rate by Gender
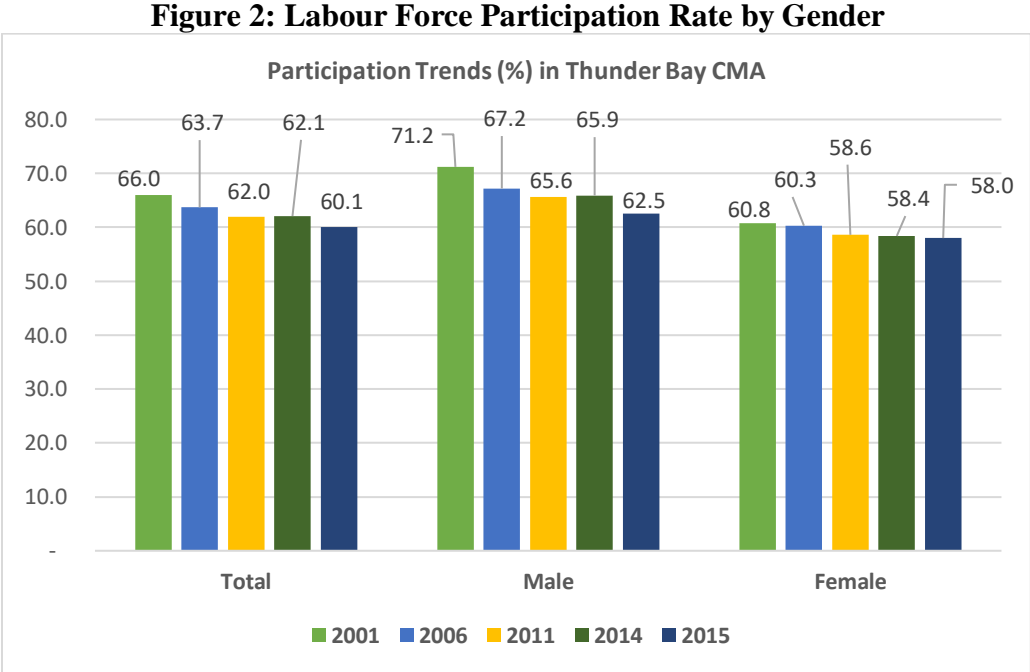
Figure 2 shows that the negative trend in the labour force participation rate is also evident when examining the participation rates by gender. Figure 2 also shows that the participation rate among women has been lower than that among men but the gap has been narrowing. The gap equaled 10.4 percent in 2001 but declined to 4.5 percent in 2015. The same narrowing of the gap between men and women can be observed in the national data.

Figure 3 compares the labour force participation rate in Thunder Bay CMA obtained from various sources in 2011. It shows that the Taxfiler data consistently over-estimates the participation rate for both men and women compared to the Labour Force Survey and NHS.[2] On the other hand,

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[2] People who get T4 slips really have to file and so the proportion of filers who are employed will look higher.

NHS data and the Labour Force Survey estimates appear to be quite close to each other. They are identical for total population, however the NHS estimate is slightly lower for men but slightly higher for women compared to the Labour Force Survey estimates.

Figure 4 compares the labour force participation rate in Thunder Bay District by source of data in 2011. Again, it shows that the Taxfiler data over-estimates the participation rate compared to the Labour Force Survey and NHS. On the other hand, NHS data and the Labour Force Survey estimates appear to be quite close to each other.

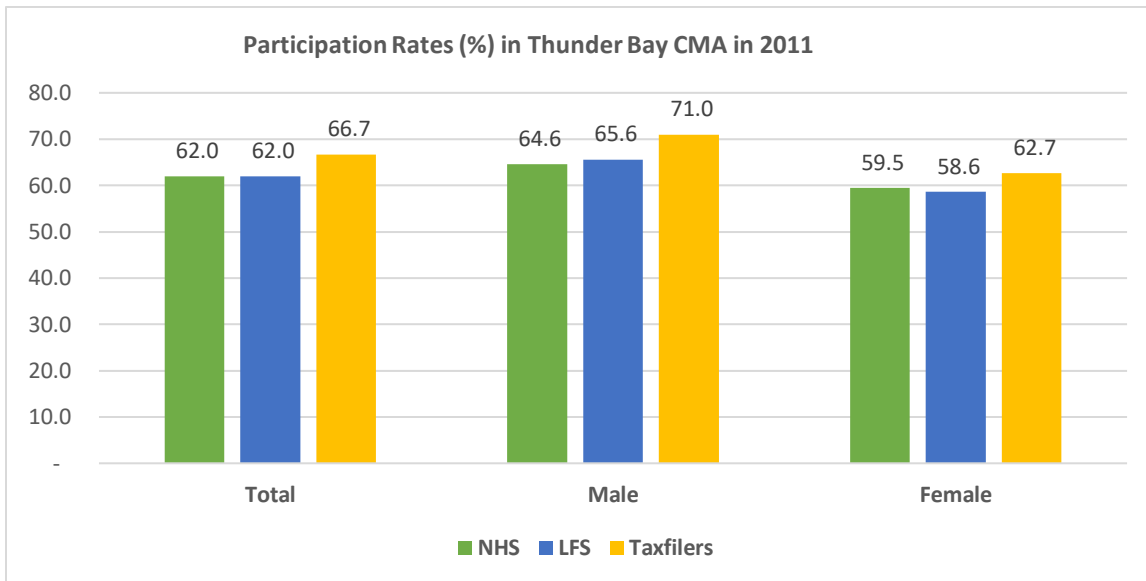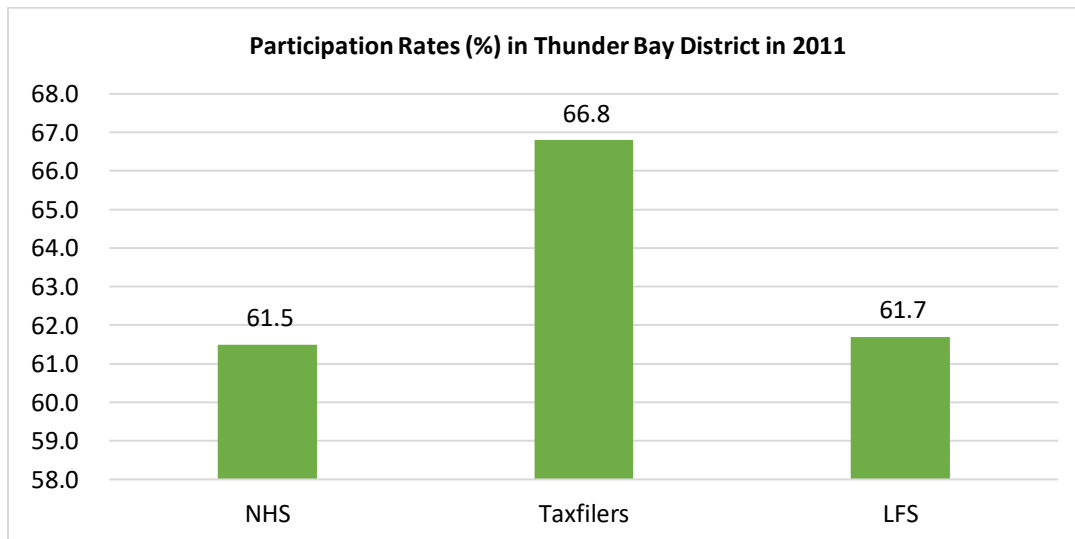**Figure 3: Labour Force Participation Rate by Source of Data**

Figure 4: Labour Force Participation Rate in Thunder Bay District

3.2. The Employment Rate

Using Labour Force Survey information, Figure 5 shows trends in the employment rate in Northwestern Ontario and its sub-regions during 2001-2015.

Figure 5: Employment Rate Trends during 2001-2015
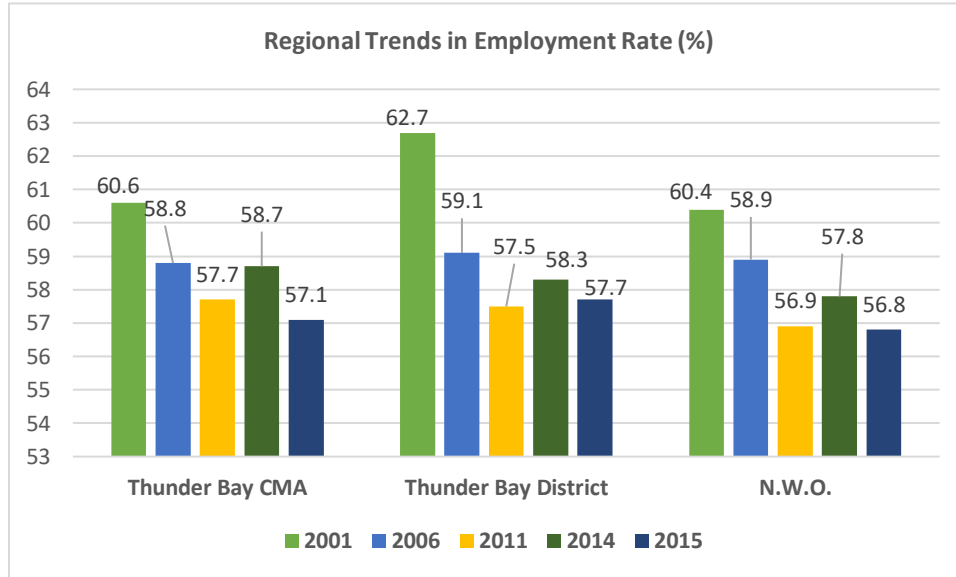
Figure 5 shows cyclical trends in the employment rate during 2001-15. The rate declined during 2001-2011, increased during 2011-14 and declined again in 2015. The correlation coefficient between the employment rate in Thunder Bay CMA and Thunder Bay district equals 93.9 percent, which is quite high. Moreover, the correlation rate between the employment rate in Thunder Bay CMA and Northwestern Ontario equals 96.4 percent. In other words, the employment rate in various regions within Northwestern Ontario are highly correlated. Labour mobility moves the rates towards equality in various sub-regions in Northwestern Ontario.

Using 2006 Census and 2011 NHS data, Figure 6 shows the employment rate by gender in Thunder Bay District during 2006-2011. Comparing data in Figures 5 and 6 shows that the Labour Force Survey estimates are higher than the Census and NHS estimates.

Figure 6 shows that the employment rate has declined during 2006-2011. The decline is more pronounced among men than women. Also, the gap between the employment rate of men and women has narrowed during 2006-2011. It equaled 5.6 percent in 2006 and declined to 3.2 percent in 2011.

Figure 6: Employment Rate by Gender during 2006-2011

Employment Rate (%) in Thunder Bay District

(2006 = green, 2011 = blue)

- Total: 2006 = 58.5, 2011 = 56.0
- Male: 2006 = 61.4, 2011 = 57.7
- Female: 2006 = 55.8, 2011 = 54.5
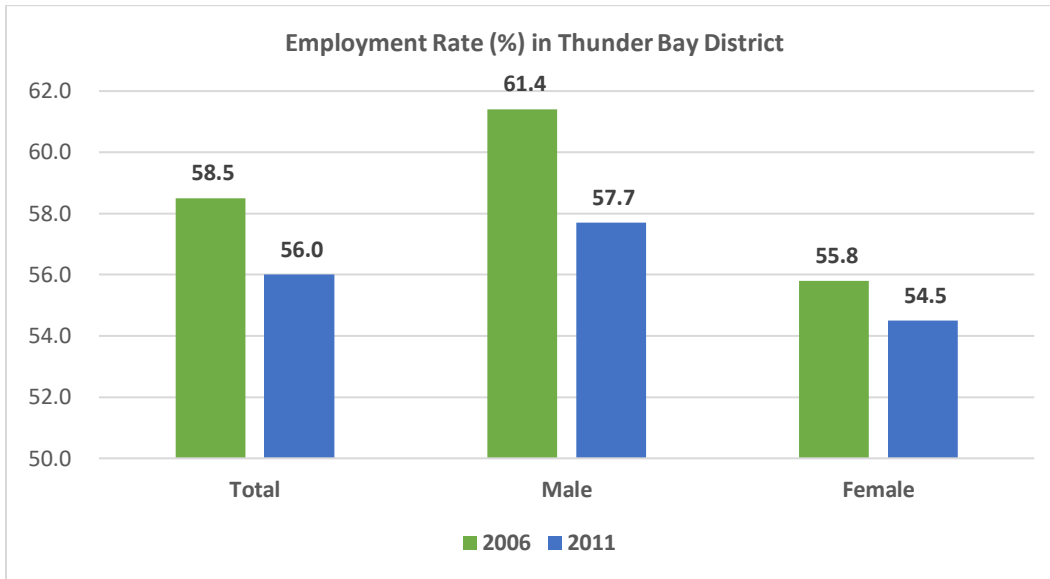
Figure 7 shows the employment rate by gender based on Census/NHS and Labour Force Survey during 2006-2011. Overall, the employment rate for women is lower than that among men. But the gap has declined significantly during 2006-2011. The estimates for both LFS and Census are almost identical for the total population in 2006. For 2011, the LFS estimate for total population is greater than the NHS estimate. The Census estimate for men is greater than the LFS estimate in 2006 but lower than the LFS estimate in 2011. In general, the employment rate has declined during 2006-2011.

Figure 7: Employment Rate by Source of Data

Employment Rate by Source of Data in Thunder Bay CMA

(Census/NHS = green, LFS = blue)

- Total (2006): Census/NHS = 58.7, LFS = 58.8
- Total (2011): Census/NHS = 56.8, LFS = 57.7
- Male (2006): Census/NHS = 61.9, LFS = 60.6
- Male (2011): Census/NHS = 58.4, LFS = 60.7
- Female (2006): Census/NHS = 55.8, LFS = 57.3
- Female (2011): Census/NHS = 55.3, LFS = 55.0
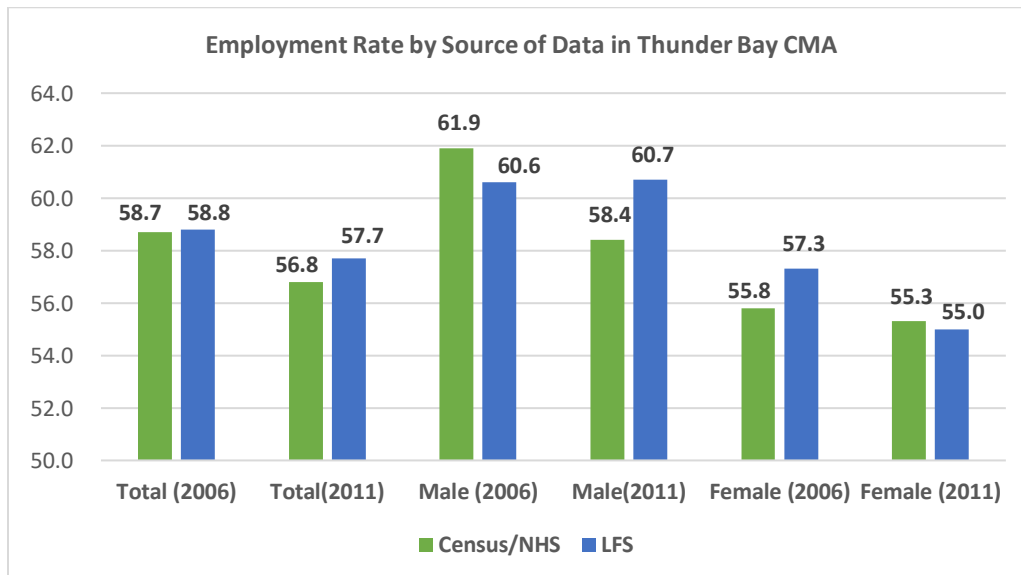
3.3. The Unemployment Rate

Using the Labour Force Survey estimates, Figure 8 shows the unemployment trends in Northwestern Ontario and its sub-regions during 2001-2015.

Figure 8: Unemployment Rate in Northwestern Ontario and Sub-Regions
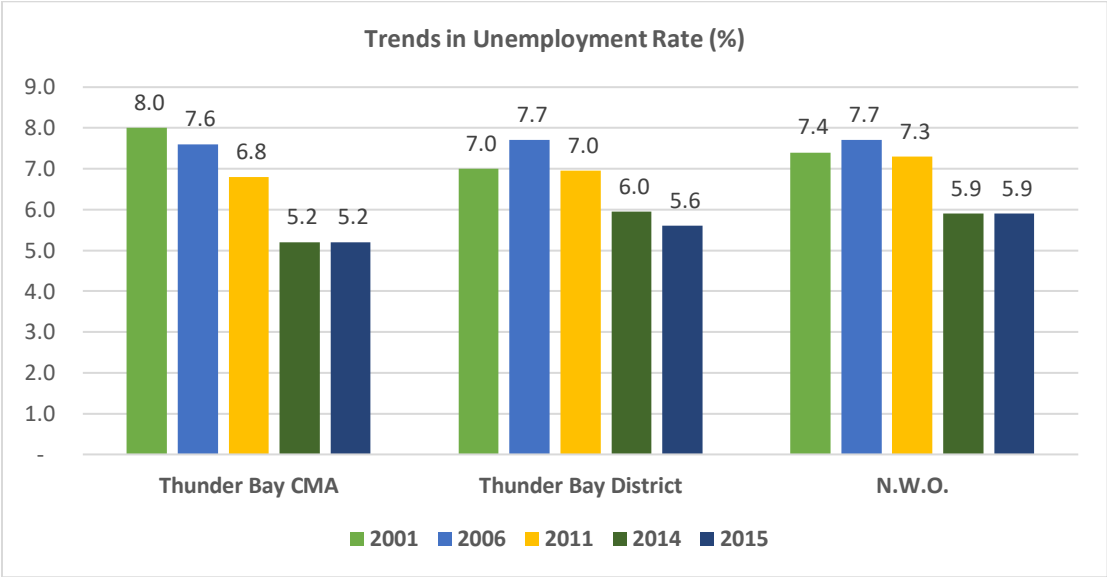
Figure 8 shows that the unemployment rate declined steadily in Thunder Bay CMA during 2011-2015. The unemployment rate rose from 2001 to 2006 in Thunder Bay district but declined steadily thereafter. The same trend can be observed in Northwestern Ontario. The correlation coefficient between the unemployment rate in Thunder Bay CMA and that in Thunder Bay district equals 90.3 percent, which is quite high. Similarly, the correlation coefficient between the unemployment rate in Thunder Bay CMA and that in Northwestern Ontario equals 95.4 percent. In other words, the unemployment rate in the above three regions are highly correlated given labour mobility and the inter-relationship between the three regions.

Figure 9 shows the unemployment rate based on the Census/NHS and Labour Force Survey in Thunder Bay CMA during 2006-2011. The unemployment rates based on LFS are greater than the Census estimates for total and male population but smaller than the census rate for women in 2006. The LFS estimates are consistently lower than the NHS estimates in 2011. Figure 9 also shows that the unemployment rate among women is lower than that among men during 2006-2011.

Figure 9: Unemployment Rate by Source of Data
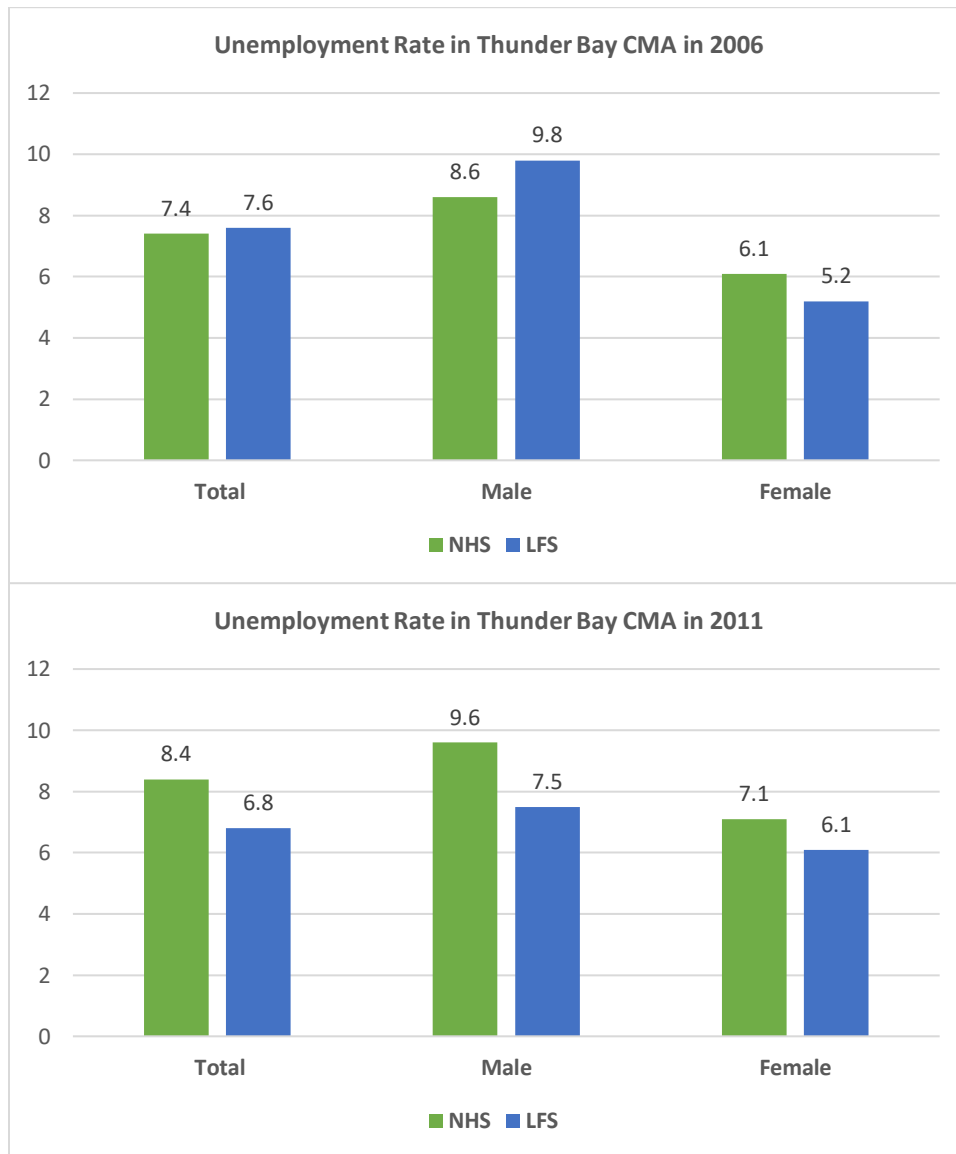
Overall, examination of the available data from various sources suggests that all three indicators move together in various regions in Northwestern Ontario. The correlation coefficients among them are quite high. Therefore, knowledge of one can be used to forecast the others. At the same time, we observe significant differences between the estimates provided by different sources. These differences are due to different sampling strategies, different sample sizes used and different sampling errors.

PART IV: CHARACTERISTICS OF THE COMMUNITIES IN THE STUDY

Using Census/NHS data, Table 1 shows the total population of the communities included in the present project.

Table 1: Population Trends

Region	2001	2006	2011
Thunder Bay CMA	121,986	122,907	119,145
Thunder Bay District	150,860	149,063	143,385
Animbiigoo Zaag'igan Anishinaabek (Lake Nipigon Ojibway)	N.A.	N.A.	N.A.
Aroland First Nation	346	325	361
Biigtigong Nishnaabeg (Ojibways of the Pic River First Nation)	346	383	395
Biinjitiwaabik Zaaging Anishinaabek (Rocky Bay First Nation)	197	154	182
Bingwi Neyaashi Anishinaabek (Sand Point First Nation)	N.A.	N.A.	N.A.
Conmee	748	740	775
Dorion	442	379	335
Eabametoong First Nation (Fort Hope)	N.A.	N.A.	N.A.
Fort William First Nation	599	909	860
Gillies	522	544	470
Ginoogaming First Nation	231	175	167
Greenstone	5,662	4,906	4,680
Kiashke Zaaging Anishinaabek (Gull Bay First Nation)	N.A.	N.A.	N.A.
Lac des Mille Lacs First Nation	N.A.	N.A.	N.A.
Long Lake #58 First Nation	382	417	367
Manitouwadge	2,949	2,300	2,395
Marathon	4,416	3,863	3,030
Marten Falls First Nation	N.A.	N.A.	N.A.
Neebing	2,049	2,184	1,985
Neskantaga First Nation (Lansdowne House)	N.A.	N.A.	N.A.
Nibinamik First Nation (Summer Beaver)	N.A.	N.A.	N.A.
Nipigon	1,964	1,752	1,600
O'Connor	724	720	675
Oliver Paipoonge	5,862	5,757	5,725
Pawgwasheeng (Pays Plat First Nation)	65	79	75
Red Rock	1,233	1,063	945
Red Rock Indian Band	N.A.	N.A.	N.A.
Schreiber	1,448	901	1,125
Shuniah	2,466	2,913	2,700
Terrace Bay	1,950	1,625	1,455
Thunder Bay	109,016	109,140	105,950
Thunder Bay, Unorganized	6,223	6,585	5,830
Webequie First Nation	N.A.	N.A.	N.A.
Whitesand First Nation	N.A.	247	311

Table 1 shows that Thunder Bay CMA's population has declined by 2.3 percent during 2001-2011. Thunder Bay district's population declined by 4.9 percent during the same period. The population of the City of Thunder Bay declined by 2.8 percent during 2001-2011. Other communities in Northwestern Ontario have followed the same population trends. Declining population reflects slow economic growth, primarily in the forestry and mining industries in the region. The population of the smaller communities have also fluctuated during 2001-2011 primarily due to the sampling errors caused by a relatively high non-response rate in many smaller Aboriginal communities during the Census/NHS years.

Table 2 shows the participation rate (PR), employment rate (ER) and the unemployment rate (UR) in various communities based on the 2011 NHS. As mentioned above, the unemployment rate is related to the participation and employment rates and thus can be directly calculated assuming the other two rates are reported correctly. The fourth column of Table 2 shows the reported unemployment rate based on the 2011 NHS. The last column of Table 2 calculates the unemployment rate using the following formula:

UR = 100 x [PR – ER] / PR

Table 2 shows the estimated unemployment rate, calculated based on the above identity, and the reported unemployment rates for the communities. Table 2 also highlights that the estimated and reported unemployment rates for larger communities are almost identical. The discrepancy that exists for some of the smaller communities is related to the fact that there are errors in calculating various indicators in the NHS data due to small sample size and thus relatively large standard errors of the estimates.

Table 2 shows that the participation rate varies significantly among various communities. It equals 62 percent in Thunder Bay CMA and 61.5 percent in Thunder Bay district. It ranges from low 30s in some Aboriginal communities to high 70s in Conmee and O'Conner.

Table 2 also shows the employment rate varies greatly from community to community. Overall, it equals 56.8 percent in Thunder Bay CMA and 56 percent in Thunder Bay district. It varies from low 20s in some Aboriginal communities to about 70 percent in Conmee, Gillies and O'Conner.

Table 3 shows the average employment income of those who worked full-time, part-time, full-year or part-year and those who worked full-time and full-year in 2010 dollars. Table 3 shows that the average earnings equaled $40,363 while the full-time and full-year earnings equaled $56,292 in Thunder Bay CMA in 2010. Again, there exist a significant variation among earnings in different communities. The average overall earnings ranges from $13,592 in Long Lake 58 First Nation to $47,900 in Shuniah. The average full-time and full-year earnings ranges from $23,122 in Long Lake 58 First Nation to $72,309 in Marathon.

In estimating the economic impact of changing employment in various communities, we assumed that the employment earnings of individuals who are hired or laid off would equal to the average employment earnings in the respective communities.

Table 2: Labour Force Indicators Based on the 2011 National Household Survey

Region	PR (%)	ER (%)	UR (%) Reported	UR (%) Calculated
Thunder Bay CMA	62.0	56.8	8.4	8.4
Thunder Bay District	61.5	56.0	8.9	8.9
Animbiigoo Zaag'igan Anishinaabek (Lake Nipigon Ojibway)	N.A.	N.A.	N.A.	N.A.
Aroland First Nation	59.1	34.1	38.5	42.3
Biigtigong Nishnaabeg (Ojibways of the Pic River First Nation)	62.1	55.2	5.6	11.1
Biinjitiwaabik Zaaging Anishinaabek (Rocky Bay First Nation)	58.6	37.9	29.4	35.3
Bingwi Neyaashi Anishinaabek (Sand Point First Nation)	N.A.	N.A.	N.A.	N.A.
Conmee	76.1	68.7	9.8	9.7
Dorion	52.5	45.9	9.4	12.6
Eabametoong First Nation (Fort Hope)	N.A.	N.A.	N.A.	N.A.
Fort William First Nation	49.6	42.3	14.7	14.7
Gillies	73.2	69.0	7.7	5.7
Ginoogaming First Nation	60.0	36.0	33.3	40.0
Greenstone	64.3	56.0	13.0	12.9
Kiashke Zaaging Anishinaabek (Gull Bay First Nation)	31.4	25.7	-	18.2
Lac des Mille Lacs First Nation	N.A.	N.A.	N.A.	N.A.
Long Lake #58 First Nation	50.9	32.1	37.0	36.9
Manitouwadge	48.8	45.6	7.1	6.6
Marathon	68.6	63.7	6.8	7.1
Marten Falls First Nation	N.A.	N.A.	N.A.	N.A.
Neebing	68.4	62.1	9.6	9.2
Neskantaga First Nation (Lansdowne House)	N.A.	N.A.	N.A.	N.A.
Nibinamik First Nation (Summer Beaver)	N.A.	N.A.	N.A.	N.A.
Nipigon	54.3	50.4	7.3	7.2
O'Connor	75.8	69.4	8.5	8.4
Oliver Paipoonge	69.3	59.3	14.4	14.4
Pawgwasheeng (Pays Plat First Nation)	46.2	23.1	33.3	50.0
Red Rock	51.6	42.6	17.5	17.4
Red Rock Indian Band	58.1	51.2	12.0	11.9
Schreiber	72.4	67.3	7.6	7.0
Shuniah	62.6	59.3	5.2	5.3
Terrace Bay	60.2	56.3	5.7	6.5
Thunder Bay	61.3	56.4	8.0	8.0
Thunder Bay, Unorganized	57.3	50.0	12.8	12.7
Webequie First Nation	N.A.	N.A.	N.A.	N.A.
Whitesand First Nation	37.1	31.4	N.A.	15.4

Table 3: Average Employment Income of population 15-64 Years of Age by Work Activity in 2010 Dollars

Region	Full-Time or Part-Time	Full-Time & Full-Year
Thunder Bay CMA	40,363	56,292
Thunder Bay District	39,969	56,713
Animbiigoo Zaag'igan Anishinaabek (Lake Nipigon Ojibway)	N.A.	N.A.
Aroland First Nation	16,772	26,539
Biigtigong Nishnaabeg (Ojibways of the Pic River First Nation)	32,020	41,610
Biinjitiwaabik Zaaging Anishinaabek (Rocky Bay First Nation)	N.A.	N.A.
Bingwi Neyaashi Anishinaabek (Sand Point First Nation)	N.A.	N.A.
Conmee	27,269	38,294
Dorion	37,905	61,417
Eabametoong First Nation (Fort Hope)	N.A.	N.A.
Fort William First Nation	26,429	38,518
Gillies	36,428	57,597
Ginoogaming First Nation	N.A.	N.A.
Greenstone	35,715	57,606
Kiashke Zaaging Anishinaabek (Gull Bay First Nation)	N.A.	N.A.
Lac des Mille Lacs First Nation	N.A.	N.A.
Long Lake #58 First Nation	13,592	23,122
Manitouwadge	41,874	65,893
Marathon	45,868	72,309
Marten Falls First Nation	N.A.	N.A.
Neebing	34,548	48,850
Neskantaga First Nation (Lansdowne House)	N.A.	N.A.
Nibinamik First Nation (Summer Beaver)	N.A.	N.A.
Nipigon	35,780	53,770
O'Connor	34,719	53,258
Oliver Paipoonge	40,364	56,332
Pawgwasheeng (Pays Plat First Nation)	N.A.	N.A.
Red Rock	37,422	63,891
Red Rock Indian Band	N.A.	N.A.
Schreiber	39,510	69,059
Shuniah	47,900	64,356
Terrace Bay	32,817	60,448
Thunder Bay	40,567	56,487
Thunder Bay, Unorganized	40,958	58,875
Webequie First Nation	N.A.	N.A.
Whitesand First Nation	16,323	30,621

PART V: METHODOLOGY AND THE MODEL

Statistics Canada undertakes the Labour Force Survey (LFS), i.e. a household survey, on a monthly basis. However, due to the small sample sizes, they do not release any labour market indicators for the 35 census subdivisions (CSDs) listed in Table 1. In addition to the LFS, the Canadian Census publishes detailed labour market indicators at very geographically disaggregated levels including the 35 CSDs listed above. However, the census is done every five years. Therefore, during the non-census years, labour market information is only available at identifiable Economic Regions, districts and Census Metropolitan Areas. The challenge is to use the LFS information, that is regularly available, to forecast labour market indicators for the 35 communities during the non-census years.

To obtain various indicators at the CSD level, one needs to estimate the determinants of various labour market indicators in different CSDs in Thunder Bay district. We also need to estimate the relationship between the determinants of labour market indicators in various communities and those in the Thunder Bay CMA and use those estimated relationships to forecast indicators for each of the 35 CSDs in the non-census years.

To achieve the above objectives, we estimated the following models using detailed 2001 and 2006 Censuses as well as the 2011 National Household Survey (NHS) and the 2011 NHS micro-data file. The data include detailed information on various CSDs in Ontario, Northern Ontario, Northwestern Ontario and Thunder Bay district.

PR = f(AB, FR, Post-secondary, Tourism, Forestry, Mining, Public, Dummy)

ER = f(AB, FR, Post-secondary, Tourism, Forestry, Mining, Public, Dummy)

Where PR is the participation rate and ER is the employment rate, AB and FR represent the percentage share of the Aboriginal and Francophone populations in each community. Post-secondary represents the percentage of the population 15 years of age and older who have post-secondary education. Tourism, Forestry, Mining and Public variables represent the percentage share of employment in accommodation and food services, forestry, mining and public sectors in each community. The latter variables are influenced by the state of the economy in each community that are directly correlated with the economic environment in Northwestern Ontario, Thunder Bay district and Thunder Bay CMA. The Dummy variable takes the value of unity if the community is an Indian reserve.

For the sake of brevity, we only report the estimated regressions for 2011 for the total population in Northwestern Ontario and Thunder Bay district, which are the main focus of the present study. Tables 4 and 5 show the estimated regressions for Northwestern Ontario using detailed data obtained from the 2011 NHS. The number of CSDs in the sample equals 91.

Table 4: Regression Results for Participation Rate in Northwestern Ontario (R^2 = 0.54)

Variables	Coefficients	T-Statistics
Aboriginal	-0.1036	3.11
Francophone	-0.2586	0.95
Post-secondary	0.2912	2.95
Tourism	0.6199	2.59
Forestry	0.3861	3.40
Mining	0.0187	1.65
Public	0.0652	1.25
Dummy	1.3091	1.49
Constant	59.7449	12.43

Table 5: Regression Results for Employment Rate in Northwestern Ontario (R^2 = 0.64)

Variables	Coefficients	T-Statistics
Aboriginal	-0.09912	3.59
Francophone	-0.2096	1.02
Post-secondary	0.2891	3.84
Tourism	0.0402	1.75
Forestry	0.2688	1.99
Mining	0.0899	1.74
Public	0.0361	1.19
Dummy	1.2059	0.65
Constant	35.157	8.57

Tables 4 and 5 show that the participation and employment rates in various CSDs in Northwestern Ontario are negatively and significantly related to the share of the Aboriginal population in the community. The share of the Francophone population does not appear to have a significant impact on the participation and employment rates. The share of the population with a post-secondary education has a positive and significant impact on the participation and employment rates in various CSDs. All proxies for the economic environment have a positive impact on the participation and employment rates. The only exception appears to be the level of public employment which does not appear to influence the participation and employment rates in the communities. The dummy variable does not appear to have any significant influence on the two indicators. This may be related to the fact that the regression equations already include the share of the Aboriginal population in each community.

Tables 6 and 7 show the estimated results for Thunder Bay District based on detailed 2011 NHS data. The number of CSDs in the regressions equal 30.

Table 6: Regression Results for Participation Rate in Thunder Bay District ($R^2 = 0.71$)

Variables	Coefficients	T-Statistics
Aboriginal	-0.1565	2.10
Francophone	-0.2478	0.61
Post-secondary	0.4454	3.27
Tourism	0.1506	0.27
Forestry	0.2853	1.89
Mining	0.1306	1.49
Public	0.0527	0.03
Dummy	12.189	2.07
Constant	58.827	7.93

Table 7: Regression Results for Employment Rate in Thunder Bay District ($R^2 = 0.80$)

Variables	Coefficients	T-Statistics
Aboriginal	-0.1134	2.54
Francophone	-0.1767	1.10
Post-secondary	0.2859	3.15
Tourism	0.1841	0.46
Forestry	0.4302	1.87
Mining	0.1285	1.72
Public	0.0195	0.53
Dummy	0.002	0.15
Constant	39.33	6.37

Tables 6 and 7 show that the share of the share of the Aboriginal population is negatively and significantly related to the participation and employment rate in a community. The share of the Francophone population does not appear to significantly influence the participation and employment rates in the communities. Unlike what we found for Northwestern Ontario, the share of employment in the tourism sector does not appear to influence employment and participation rates in Thunder Bay district. The share of the public sector employment does not appear to influence the participation or employment rates in Thunder Bay district either. The only economic variables that significantly impact the participation and employment rates appear to be forestry and mining employment. This is understandable given the fact that the forestry and mining sectors are the two main engines of economic growth for many communities in Thunder Bay district.

The above models include two sets of factors. The first factors, namely the share of the Aboriginal and Francophone populations as well as the percentage of those with post-secondary education, are assumed to remain relatively constant during the non-Census years. On the other hand, the economic variables are subject to the cyclical variations of the regional economy. As we saw above, the economic indicators in Thunder Bay CMA and Thunder Bay district are highly correlated. Examination of the data reveals that, as expected, the economic cycles in the 35 CSDs

in Thunder Bay district are also highly correlated with those in Thunder Bay CMA. We have assumed that the percentage changes in the level of employment in the forestry and mining sectors in various CSDs in Thunder Bay district are proportional to those in the Thunder Bay CMA and Thunder Bay district. For example, when the forestry industry recovers in Thunder Bay district, it positively affects all 35 CSDs depending on their share of employment in that industry. When employment in the forestry or mining sectors in Thunder Bay CMA increases, the participation and employment rates rise as well. To estimate the impact of forestry and mining employment on the participation and employment rates, we estimated the above models in logarithmic forms. Results reveal that one percentage change in the level of employment in the forestry and mining industries will result in 0.0452 and 0.071 percentage change in the participation rate, respectively. Similarly, one percentage change in forestry or mining employment results in 0.1147 and 0.0015 percentage change in the employment rate in the Thunder Bay district, respectively. Using the above relationships, one can use information on the participation and employment rates in Thunder Bay CMA or Thunder Bay district to forecast the likely change in the level of participation and employment rates in the 35 CSDs given their current level of demographic variables.

The above relationships are programmed in such a way that the user is only required to input information from the Labour Force Survey for Thunder Bay CMA. Based on that information and the characteristics of the 35 communities based on the 2011 NHS, the program calculates the participation, employment and the unemployment rates for each community.

Complications arise when a region experiences positive or negative economic shocks such as a new investment project leading to job creation, opening of a new mine or closure of an existing operation. Obviously these shocks will impact various labour market indicators and thus have to be taken into account when they occur. The model will allow for inclusion of new information on the number of new jobs created or destroyed in a community. The users are given the opportunity to provide information on the number of jobs created or destroyed and thereupon the model will incorporate the new information and estimate a new set of indicators for the community as well as the economic impact of changes in the level of employment.

To ensure that the estimated relationships are statistically sound, we subjected them to a series of statistical tests including in-sample and out-of-sample forecasting. For example, we use the estimated relationships to forecast indicators for years for which we have data and check how close the estimated indicators are to the actual data. We also check for changes in the relationships caused by economic shocks such as closure of a mill or an opening of a mine. As mentioned above, the estimated relationships will allow for inclusion of any unforeseeable changes that may occur in the future.

Having ensured the statistical validity of our estimates, the model is computerized in a format that is easily accessible to all users. The users can access the information by taking the following steps:

Step 1: User selects the community of interest from a list of 35 CSDs plus Thunder Bay district.

Step 2: After selecting a community, user is given the following eight (8) choices/options.

1) Population Statistics for each community: 2001-2011.

2) Community Labour Market Indicators for total population (total, Aboriginal, Francophone) 15 years of age and older during 2011-2015.

3) Community Labour Market Indicators for men (total, Aboriginal, Francophone) 15 years of age and older during 2011-2015.

4) Community Labour Market Indicators for women (total, Aboriginal, Francophone) 15 years of age and older during 2011-2015.

5) Estimating Labour Market Indicators for Total Population for 2016 and beyond.

If this option is selected, the user is requested to provide/input data for the Participation and Employment rates for Thunder Bay CMA in percentage form, i.e., 62.1 meaning 62.1%. Then, the program calculates participation rate, employment rate and unemployment rate for the total population, Aboriginal population and Francophone population in the selected region.

6) Estimating Labour Market Indicators for men 15 years of age and older for 2016 and beyond. Same procedure as number 5 above.

7) Estimating Labour Market Indicators for women 15 years of age and older for 2016 and beyond. Same procedure as number 5 above.

8) Estimating the economic impact (i.e. on employment rates and unemployment rates, total employment & income impacts) of changing employment wherein impacts are based on the average employment income in each community. Once this option is selected, the user is asked to provide an estimate of the number of jobs created (with positive sign) or destroyed (with negative sign) and thereby the program calculates the impact of changing employment on the employment and unemployment rates as well as the income and employment impact of the change.

PART VI: APPENDIX

Guide to our Employment Calculator

Just as all politics are local so too is all employment. In census years we can secure a great deal of information about local communities throughout the Thunder Bay region. In between census years, it is very difficult to measure changes in those smaller northern communities. It is possible, however, to estimate those changes. This is what our "Employment Calculator" does. In non-census years there are reliable measures readily available for the Thunder Bay Census Metropolitan Area. Our smaller communities are not immune to changes in the economy of Thunder Bay, and in many cases changes in its economy reflect changes in the areas surrounding it. We can, in fact, identify historical relationships between population, labour market and economic indicators in our smaller communities to this larger unit. Using those historical trends we have developed community specific formulas to estimate workforce indicators in the years ahead, before the next census data is released.

Our calculator also includes, for reference, actual recorded data from 2001 to 2016 included in either the Census or the National Household Survey (2016). This tool may be accessed at www.employmentcalculator.ca

Population

If you pick your community in the left hand box, and "population statistics" in the right hand box you can get historical data on both total population, and the breakdown for two subgroups – Francophones and Aboriginal communities.

Labour Market Indicators

This portion of the calculator uses the reported labour market indicators (employment, unemployment, participation rate) in the Thunder Bay CMA to estimate changes in those same measures for smaller communities in our region. It also allows you to estimate those numbers for the male and female population, or for the population as a whole and to look at those three groupings separately for the Francophone and Aboriginal populations in our communities. For these numbers we caution you that for our smallest communities the estimates can vary widely as the result of small changes and so these numbers should be used with extra caution. If you look at the years 2011 and 2015, we have done the calculations for you. In the years 2016 and beyond you will need to get the most recent data on the participation and employment rate for the Thunder Bay CMA and enter them in the appropriate boxes. Then the estimates for your community for that same period will be auto-generated.

Economic Impact

If a new employer is coming to town, or thinking of coming to town, or one is leaving, selecting "economic impact" will allow you to estimate what effect this change will have on your community's employment and unemployment rates, the direct income that might be generated or lost, the direct/indirect/induced income and employment impact that likely will be felt. These are, of course, estimates, and should be used as such – but this tool gives decision makers a handy tool to understand quickly the magnitude of the impact that job losses or gains may have on their community.

To get these economic estimates choose your community name on the right, "economic impact" on the left, and then input the number of estimated new jobs or job losses as the result of a potential change.