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151 Slater Street, Suite 710  
Ottawa, Ontario K1P 5H3  
613-233-8891, Fax 613-233-8250  
csls@csls.ca

CENTRE FOR THE  
STUDY OF LIVING  
STANDARDS

THE LABOUR MARKET AND ECONOMIC  
PERFORMANCE OF CANADA'S FIRST NATIONS  
RESERVES: THE ROLE OF EDUCATIONAL  
ATTAINMENT AND REMOTENESS

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Andrew Sharpe and Simon Lapointe

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## Abstract

The goal of this report is to investigate the relationship between educational attainment, remoteness, and labour market and economic performance at the reserve level for Aboriginal Canadians. The report uses reserve-level data on average earnings, GDP per capita, labour market indicators and distance to a service centre for 312 reserves. Using descriptive statistics, simple correlation and multiple regression analysis, the report draws conclusion on four important questions. First, the report finds that a higher level of educational attainment, on average, has a positive effect on the labour market performance of a reserve. Then, a positive link is found between educational attainment and economic performance (average earnings and GDP per capita). Also, the report finds evidence that remoteness of a reserve plays a role in its labour market and economic performance. Specifically, reserves situated near urban centres fare better than the ones in rural/remote areas and those not connected by road to a service centre all year long (special access). However, when controlling for characteristics of reserves, the very remote reserves seem to fare better than expected in comparison to urban reserves. Yet, when an instrumental variable is used to account for the possibility that educational attainment is endogenous in the model, the remoteness of a reserve appears to play no role in determining reserve labour market or economic performance. Finally, the report also analyses the role of governance on labour market and economic performance. It finds that better governance is correlated to better labour market performance, higher average earnings and higher GDP per capita.

# The Labour Market and Economic Performance of Canada's First Nations Reserves: The Role of Educational Attainment and Remoteness

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# The Labour Market and Economic Performance of Canada's First Nations Reserves: The Role of Educational Attainment and Remoteness

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## Executive Summary

The objective of this report is to provide information and economic analysis to Indian and Northern Affairs Canada (INAC) to facilitate the development of policies that are more effective at promoting higher levels of educational attainment for Aboriginal Canadians. In order to achieve this objective, it is important to understand the nature and magnitude of the relationship between educational attainment, remoteness of reserves, labour market indicators and economic outcomes of the Aboriginal population residing on Indian reserves. This study will seek to accomplish this by using reserve specific data to study measures of labour market and economic performance. In particular, the report answers the following questions:

1. Is a higher level of educational attainment for the Aboriginal population residing on reserves associated with, on average, higher labour market participation and employment rates, as well as lower unemployment rates?
2. Is a higher level of educational attainment for the Aboriginal population residing on reserves associated with greater average earnings for these individuals and greater GDP per capita for these reserves?
3. How does the remoteness of a reserve affect the relationship between educational attainment and the labour market and economic outcomes on reserves?
4. How does the quality of reserve governance affect the economic and labour market performance of the reserve?

To provide answers, three analytical methods are used: descriptive statistics accompanied by charts, simple correlation analysis, and multiple regression analysis. The data are from the 2006 Census Aboriginal Population Profiles, by reserve. A total of 312 reserves had data available for every variable in this analysis. Data for remoteness are from INAC, in three categories: reserves near service (urban) centres, rural/remote reserves (which are connected to a service centre by road all year long) and special access reserves (which are not connected by road to a service centre all year long).

## Descriptive Statistics

The statistics show that reserves located near urban centres fare on average better on labour market indicators and economic outcomes. These reserves have a higher participation rate and employment rate, as well as a lower unemployment rate. Educational attainment is also higher on these reserves. In particular, 49.7 per cent of the population aged 15 and over on reserves situated near urban

centres has a certificate, diploma or degree, compared to 38.8 per cent of the population on rural and remote reserves and only 23.3 per cent on special access reserves.<sup>1</sup>

This report also finds that all reserves fared poorly relative to the national average on all indicators. For example, only two reserves had unemployment rates lower than the national average of 6.6 per cent in 2006. The highest unemployment rate was 66.7 per cent, ten times the national average. The situation was not as dramatic when considering the participation and employment rates, but the vast majority of the reserves were under the national averages for these indicators as well. Moreover, all reserves were found to have average earnings and GDP per capita under the national average. The lowest GDP per capita for a reserve was \$2,047, or twenty times lower than the national average. The low GDP per capita estimates are not surprising, however, given the low average earnings and employment rates.

The same observations can be made about educational attainment. Indeed, almost all reserves have a lower percentage of their populations that have a diploma, certificate or degree compared to the overall Canadian population. While 76.2 per cent of Canadians aged 15 and over have a diploma, certificate or degree, some reserves have less than 10 per cent of their population with some sort of completed education. Only one reserve had higher than average educational attainment, with 76.9 per cent of the population having a diploma, certificate or degree.

## Correlation Analysis

The second step of the analysis was to calculate and evaluate the correlation coefficient between different sets of labour market, education and remoteness variables. These simple correlation coefficients do not account for the effect of other variables on the relationship, and should therefore be interpreted with caution. However, they provide some general idea of the relation between two variables.

There was a positive relationship between educational attainment and economic outcomes. This relationship is widely documented in the economics literature, and is confirmed in this data set. The correlation coefficient between the percentage of the population with a diploma, certificate or degree, and average earnings is 0.35, while it is 0.48 with GDP per capita. The report also found a positive relationship between educational attainment and the employment rate (0.57), and the participation rate (0.58). The correlation coefficient was negative between education and the unemployment rate (-0.23).

The remoteness of the reserve was negatively correlated to economic outcomes, labour market indicators and educational attainment. The relationship was stronger for education. The correlation coefficient was -0.56 between the percentage of the population with a certificate, diploma or degree, and the remoteness index. The relation was weaker with the participation rate (-0.21), employment rate (-0.19) and unemployment rate (0.04). The association with the average earnings (-0.09) and GDP per capita (-0.13) was also quite weak.

## Multiple Regression Analysis

This report employs reserve-level data in the multiple regression analysis. The advantage of this methodology is the *ceteris paribus* interpretation of the estimated coefficients. Although this method

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<sup>1</sup> The population with a certificate, diploma or degree is defined as the population that has achieved at least a high school certificate or its equivalent (which includes those who have achieved a certificate, diploma or degree from a trade school, college or university).

assumes a causal relationship which may not actually be the case, the regression coefficients can be interpreted as the effect of a specific independent variable on the dependent variable, when holding the effect of all other independent variables constant. Two rounds of regressions were estimated: the first uses the full sample, and the second uses a smaller sub-sample that contains data on governance.

In the first set of models, five dependent variables were used: participation rate, employment rate, unemployment rate, average earnings and GDP per capita. The independent variables varied depending on the specific model estimated, but included the percentage of the population with high school diploma as their highest educational attainment, the percentage of population with a university diploma, certificate or degree, two remoteness indicator (dummy) variables, one for rural/remote and special access reserves respectively (reserves located near urban centres were considered as the base case), and nine provincial indicator variables (Alberta was considered the base case). Regressions were estimated both with and without the provincial variables, and it was found that the provincial variables were relevant.

The two education variables had a significant relationship with all the dependent variables used. In particular, increasing the percentage of the population with at most high school by one point would increase the participation rate by 0.34 percentage points, while the coefficient for university education was not significant. However, an increase of one point in the percentage of the population with a university degree would translate into a 0.52 point increase in the employment rate. The result for high school education was almost the same as with the participation rate (0.33 points). As expected, it was also found that education had a negative effect on the unemployment rate. An increase of one point in the percentage of the population with completed university degree would decrease the unemployment rate by 0.81 points. For high school education only, the effect is not statistically significant.

These estimates may seem small, but considering the low starting point of most Aboriginal reserves in terms of educational attainment, the small increases could translate into large gains for the reserve population. On average, 2.9 per cent of the reserve population aged 15 and over had a completed university education in 2006, compared to 18.1 per cent of the overall Canadian population aged 15 and over. If the reserve population would reach the current average proportion of university degree holders observed for Canadians, it would translate into a 7.9 point increase in the employment rate and a 12.3 point decrease in the unemployment rate. Obviously, the numbers provided in this analysis are only indicative, but it shows the importance of Aboriginal Canadians increasing their educational attainment.

Educational attainment was also found to have a significant positive effect on average earnings and GDP per capita. Again, the effect was larger for university education than for high school education only. In particular, an increase of one point in the percentage with a completed university degree would increase average earnings on the reserve by \$305 per year, while a similar increase in the percentage with high school only would increase average earnings by \$84. If the on-reserve Aboriginal population had the same proportion of university degree attainment as the Canadian average, the effect on average earnings of reserves would be an increase of \$4,629. The effect on GDP per capita was found to be even larger: the estimated coefficient for university degree attainment was \$373, while it was \$115 for high school education. The potential growth resulting from closing the gap in university education for the Aboriginal population alone represents \$5,670 in GDP per capita on reserves.

The results from the analysis of remoteness were not as strong. Indeed, only four out of the ten coefficients estimated were statistically significant. In the regression with employment rate as the dependent variable, the indicator variable for special access reserves had a significant and positive

coefficient (5.69). This implies that special access reserves (which are not connected to a service centre by a road year round) have employment rates that are on average 5.69 points higher than reserves near an urban centre, holding all other variables constant. In this regression, the coefficient on the other remoteness variable (remote/rural reserves) was not statistically significant. For the model with participation rate as the dependent variable, the impact of being a special access reserve on participation was positive (5.61) as expected. In addition, both special access and rural/remote reserves had higher GDP per capita than urban reserves, holding all else constant.

The coefficients of the remoteness variables in the models with unemployment rate and average earnings as dependent variables were found to be statistically insignificant. Therefore, no conclusions can be drawn as to the effect of remoteness on these two variables. It is important to note that these results do not necessarily indicate that remoteness has no effect on labour market and economic performance, for the statistical tests used in this report may not have been powerful enough to detect a nuanced relationship.

This report also estimates additional models using a governance variable based on research done by the Frontier Centre for Public Policy. This governance index was available for 46 of the 312 reserves, in the provinces of Alberta, Saskatchewan and Manitoba. Governance was found to have a positive and statistically significant effect on the two economic outcome variables and the three labour market indicators (at the 5 or 10 per cent level of significance, depending on the variable). An increase of one point on the governance index (which is out of 100) would translate into a \$189 increase in GDP per capita and a \$123 increase in average earnings on reserves. The effect on the employment rate would be 0.54 points, while the coefficient on governance was 0.49 for the participation rate and -0.26 for the unemployment rate.

To account for the strong possibility that the models estimated suffer from endogeneity in the educational attainment variable, an instrumental variable regression is estimated where education is instrumented by two language variables. In comparison to the OLS results, the main differences with the instrumental variable results are the finding that average earnings are not related to educational attainment, and that the remoteness variables have no significant relationships with the dependent variables, with one exception (remote/rural reserves have higher unemployment rates than urban reserves). This shows that the OLS regressions are potentially biased.

To summarize, this report finds that educational attainment has a strong relationship with the two economic performance variables and the three labour market indicators considered, although the direction of causality is not clear. The economic and labour market outcomes of reserves differ by remoteness index, but it is impossible to draw strong statistical conclusions for all dependent variables. Finally, governance was found to have a significant effect on all five variables.

Further research would be necessary to investigate the relationship between the remoteness of a reserve and its economic performance. To do so, better data would be needed at the reserve level for all variables. In particular, the data could be expanded to include a greater number of reserves. Also, data on place of work and mobility should be included. Furthermore, the Governance Index, or a similar index, should be expanded to include reserves out of the Prairies provinces.

# The Labour Market and Economic Performance of Canada's First Nations Reserves: The Role of Educational Attainment and Remoteness

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## I. Introduction<sup>2</sup>

The objective of this report is to provide information and economic analysis to Indian and Northern Affairs Canada (INAC) to facilitate the development of policies that are more effective at promoting higher levels of educational attainment for Aboriginal Canadians. In order to achieve this objective, it is important to understand the nature and magnitude of the relationship between remoteness of reserves, measures of educational attainment, labour market indicators and economic outcomes of the Aboriginal population residing on Indian reserves. This study will seek to accomplish this by using reserve specific data to study measures of labour market and economic performance.

Building on earlier work from the Center for the Study of Living Standards (CSLS) on Aboriginal education and labour market and economic performance (Sharpe, Arsenault and Lapointe, 2007; Sharpe *et al.*, 2009; Tsiroulnitchenko and Hazell, 2011; Sharpe and Arsenault, 2010), this report will address the following questions:

1. Is a higher level of educational attainment for the Aboriginal population residing on reserves associated with, on average, higher labour market participation and employment rates, as well as lower unemployment rates?
2. Is a higher level of educational attainment for the Aboriginal population residing on reserves associated with greater average earnings for these individuals and greater GDP per capita for these reserves?
3. How does the remoteness of a reserve affect the relationship between educational attainment and the labour market and economic outcomes on reserves?

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<sup>2</sup> Andrew Sharpe is the Executive Director of CSLS and Simon Lapointe was an economist at CSLS at the time of writing and is currently at the Library of the Parliament of Canada. The views expressed in papers funded by the Education Branch are the authors' and do not necessarily reflect the opinions of Indian and Northern Affairs Canada or of the federal government. The goal of these papers is to encourage broad participation in discussion and debate on important public policy issues. The authors would like to thank Ali Ghanghro for help in the writing of this report and Kathleen Keenan, Director General of the Education Branch of Indian and Northern Affairs Canada for financial assistance for this report. The authors also want to acknowledge the contribution of Eve Tsiroulnitchenko to the data development for this project; three anonymous INAC officials, Bert Waslander and Alexander Murray for their comments; and Richard Mueller and other participants at a session at the annual meeting of the Canadian Economics Association in Quebec City on May 28, 2010 for comments and suggestions. E-mail: Andrew Sharpe at [andrew.sharpe@csls.ca](mailto:andrew.sharpe@csls.ca) or Simon Lapointe at [lapointe.simon@gmail.com](mailto:lapointe.simon@gmail.com).

4. How does the quality of reserve governance affect the economic and labour market performance of the reserve?

The report will use data from the 2006 Canadian Census at the reserve level. Data were available for a total of 312 reserves. While many past reports have looked at these issues (especially education) from a micro-data perspective, this dataset allows for the inclusion of a geographical dimension to the evaluation of these questions.

Given the limited employment opportunities on many reserves, there may be a reduced incentive for the Aboriginal population residing on reserves to complete secondary and post-secondary education, especially if these individuals plan to remain on the reserves. The reduced incentive to achieve higher education could also be directly related to the remoteness of the reserve. In addition, there are a number of barriers facing individuals living on reserves that may impede the completion of secondary and post-secondary education. These barriers include: poor quality of on-reserve educational facilities (reflecting both inadequate funding and poor governance structures); long distances to post-secondary educational institutions; inadequate financing for post-secondary education; low parental and community expectations related to the educational attainment of children; and limited parental resources for fostering a home environment conducive to educational success.

This report is organized as follows: the next section provides a brief background of the relationship between educational attainment and labour market indicators and economic outcomes. Section 3 discusses the data sources that are used in the analysis. Section 4 discusses descriptive statistics on educational attainment and labour market and economic performance from the reserve-level data. Section 5 provides a discussion of the correlations between educational attainment and labour market performance, economic outcomes and the remoteness of reserves. Section 6 undertakes a multiple regression analysis to examine the role of remoteness and educational attainment on labour market and economic performance of on-reserve Aboriginal Canadians. Section 7 summarizes and concludes.

## II. Background

Two relationships will be analyzed in this report. The first one, the relationship between educational attainment and economic performance, has been the subject of many studies. The second, namely the relationship between the remoteness of communities and economic and labour market outcomes, is less studied. This section will provide some background information on both relationships, in order to put this report in context.

### The Link between Educational Attainment and Economic Performance

As modern economies rely ever more heavily on information, human capital – the stock of knowledge, skills, and abilities embodied in individual workers – is becoming an increasingly important factor of production. Human capital comprises both innate abilities and the skills acquired through education and experience. Since education can be actively promoted (particularly through government policy intervention), it has received considerable attention from researchers.

Human capital is not directly measurable, so one must use proxies to quantify it. The most common proxies for human capital are measures of educational attainment, such as the highest degree obtained or the number of years of schooling. It is assumed that the more formal education a person experiences, the more human capital he or she will accumulate. In this report, the analysis will use the highest level of education obtained (high school, college and trades, university) as a proxy for human capital.

According to human capital theory, formal schooling raises earnings because it enhances skills, making workers more productive and more valuable to employers. However, it is possible that the observed correlation between earnings and education, after controlling for other measurable influences on earnings, reflects the contribution of unobserved influences like innate ability, perseverance, and ambition. Therefore, achieving higher levels of formal education may only be a signal for these desirable qualities, and may not necessarily directly affect productivity or earnings. These arguments are often used in the signaling theory.

A large number of studies based on natural experiments have recently been carried out using data on sources of variation in education, such as those arising from compulsory schooling laws. These studies provide strong evidence that policy interventions that increased the educational attainment of certain groups many years ago had large beneficial effects on the subsequent lifetime earnings of these individuals. This body of research suggests that the rates of return to investments in education are high and, in particular, that the return to incremental investments in education among disadvantaged groups may well exceed the average return in the overall population.

The returns to education for Aboriginal Canadians were investigated empirically by Frénette (2008). In this paper, the returns in terms of unemployment reductions, as well as wages increases, were examined for three Aboriginal groups: those living off-reserves, on-reserves, and in northern communities. In terms of unemployment, the author's findings suggest that returns to university education for Aboriginal students living on reserves and in northern communities (both male and female) are higher than for Aboriginal students living off-reserve. In turn, the returns are higher for them than for Non-Aboriginal students. In contrast, the returns to high school education are highest for Aboriginals living

off-reserve, while they are similar for Non-Aboriginals and Aboriginals living on reserve and in northern communities.

Repeating the analysis with wages, Fr nette found that returns to university education are lower for Aboriginal students living on reserves compared to Non-Aboriginals and Aboriginals living off-reserve. The returns to high school education are similar across all groups, with the exception of male Aboriginal students in northern communities, for whom the returns are higher. Overall, Fr nette concludes that there is no evidence that Aboriginal students benefit less from pursuing higher education. Furthermore, the author's findings do not indicate that returns to education for Aboriginals living on reserves and in northern communities are significantly lower than for other individuals. However, the analysis did not take into account those that came from remote communities that permanently moved away once their education was completed.

In addition to a direct effect on individual earnings, education provides additional returns in the form of:

- knowledge spillovers for the rest of the community (i.e. learning from others);
- non-market external benefits such as reduced criminal activity;
- improved health; and
- intergenerational effects, such as those on child development, health and education, which are associated with the educational attainment of parents.

This report aims to build on previous research by analyzing the robustness of this relationship at the reserve level. Relative to the rest of the Canadian population, there may be less incentive for the Aboriginal population residing on reserves to complete secondary and post-secondary education, especially if these individuals plan to remain on reserves, given the limited employment opportunities on many reserves. In addition, a number of barriers facing individuals living on reserve may impede the completion of their secondary and post-secondary education. These barriers include: poor quality on-reserve educational facilities (reflecting both inadequate infrastructure and personnel funding, and poor governance structures); long distances to post-secondary educational institutions; inadequate financing for post-secondary education; low parental and community expectations related to the educational attainment of children; and limited parental resources for fostering a home environment conducive to educational success.

## **The Effect of Remoteness on Educational Attainment**

Remoteness of reserves certainly exacerbates some of these barriers. First, reserves that are in the most remote locations are farther from post-secondary educational institutions. This distance is greatest for reserves that are not connected to urban centres by road all year round. In these cases, the cost of moving to a city, as well as returning back to the reserve after or during the study period, are greater because students must use a plane.

Richards and Scott (2009) highlights additional barriers to education for Aboriginal people. They examine in greater detail the effects of school quality, family socio-economic conditions (which affect family expectations), government funding, and cultural factors. In general, Aboriginal families may put less value on education. Also, they may not trust the current education system, especially if there is no integration with Aboriginal culture, particularly because of the legacy of residential schools.

The remoteness of reserves could also affect the quality of the educational facilities. It is difficult to recruit well-qualified teachers to work on a reserve that is hundreds of kilometers away from a city or disconnected from the urban centres of the province.

If the barriers to education are greater for remote reserves, it is expected that fewer people on these reserves will pursue post-secondary education or even secondary education. In addition, those that choose to pursue post-secondary education may not return to the reserve, resulting in the emptying of reserves of the most educated members. If only those who place little value on formal education remain on the reserve, this would also contribute to the low community expectations in terms of education.

Richards and Scott (2009) also discuss financial incentives as a barrier to education. It has been suggested that Aboriginal people on reserve, since they normally do not have access to a strong labour market, experience easier access and relaxed regulations for social assistance (Richards and Scott, 2009).<sup>3</sup> This reality could discourage students on reserves from attending school, as the knowledge that welfare is available and that employment opportunities are limited reduces the incentive to work for educational qualifications. In other words, if Aboriginal students do not expect to find employment after graduation from school that is more attractive than the jobs they could have had before graduation, they may choose to drop out and apply for social assistance. This theory is strengthened by the observation that social assistance dependence is much greater among on-reserve Aboriginal people than in the Canadian population at large (Richards and Scott, 2009). Since weak labour markets are a common characteristic of remote reserves, it could be expected that this dynamic is stronger as reserves are farther from the employment opportunities offered by urban centres.

In a recent report by the Frontier Centre for Public Policy, Quesnel (2010) argues that remoteness of reserves makes it difficult to sustain economic development and growth. The report argues that geographical isolation is one of the major problems for reserves, since it not only creates severe limits to job creation, but it also increases the cost of living compared to other reserves that are closer urban centres.

To summarize, the remoteness of reserves has a double effect on economic performance. First, it creates a barrier for higher educational attainment, as Aboriginal students need to move far from their families to attend college or university. This substantially increases the cost of higher education for Aboriginal students. Also, the isolation of reserves may make it more difficult to hire high quality teaching personnel, potentially reducing the quality of the teaching done on reserve.

The second effect of remoteness comes from the limited employment opportunities. Employment on reserves is often limited to low-skill jobs in local stores, restaurants or other services. Residents of reserves closer to urban centres, on the other hand, can obtain employment in that town or city, which means they have access to a greater range of employment opportunities.

It is easy to see that both of these effects reinforce each other. Young Aboriginal students on reserves have low incentives to complete school, especially university, due to the lack of employment opportunities on the local labour market. However, those that do complete higher education often choose to move to cities to find suitable work, thereby draining the reserve of their skilled workers. This hypothesis is supported by previous research for industrialized countries such as Canada, which indicates

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<sup>3</sup> Indeed, regulations governing the access to social welfare depend on the characteristics of the region. Regions with a weak labour market have relaxed regulations (Richards and Scott, 2009)

that highly educated workers, tend to be more mobile (Globerman and Shapiro, 2008). Migration of skilled Aboriginal workers is expected to be more prevalent as the remoteness of the reserve of residence increases. Therefore, the remote reserves will struggle to build an educated workforce, which limits the attractiveness of that reserve to potential employers, which further reduces the incentive to complete higher education for young Aboriginals on reserves (Richards and Scott, 2009).

Remoteness may also directly affect economic well-being. White and Maxim (2007) analyze this question, using the Community Well-Being Index. By matching reserves with non-reserve remote communities, they find that well-being decreases as isolation increases. Waslander and Reza (2008) also discuss these issues.

## The Effect of Governance

Another variable that could greatly affect the level of economic development of reserves is governance. Good governance is seen as a major determinant of economic development by researchers and international organizations alike. For example, the World Bank views “good governance and anti-corruption as important to its poverty alleviation mission.”<sup>4</sup> The World Bank Institute group on governance defines this concept as “the traditions and institutions by which authority in a country is exercised for the common good. This includes (i) the process by which those in authority are selected, monitored and replaced, (ii) the capacity of the government to effectively manage its resources and implement sound policies, and (iii) the respect of citizens and the state for the institutions that govern economic and social interactions among them.”<sup>5</sup> The OECD similarly defines good governance as governance characterized by “participation, transparency, accountability, rule of law, effectiveness, equity, etc.”<sup>6</sup>

More closely related to Aboriginal people is the Harvard project on American Indian Economic Development, founded in 1987. A major finding of this research into governance is that “institutions matter” for economic development. According to this research group, First Nations can improve governance by “adopt[ing] stable decision rules, establish[ing] fair and independent mechanisms for dispute resolution, and separat[ing] politics from day-to-day business and program management.”<sup>7</sup> The Harvard project has generated a vast literature on this topic. An example is a paper by Cornell and Kalt (1998), which explores the reasons why successful reserves in the United States are not necessarily the ones with highest educational attainment or access to financial capital. According to them, “economic development on reservations is first and foremost a political problem” (Cornell and Kalt, 1998). To support this conclusion, the authors propose a “nation-building” model of economic development,

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<sup>4</sup> World Bank Institute on Governance and Anti-Corruption, <http://web.worldbank.org/WBSITE/EXTERNAL/WBI/EXTWBI/GOVANTCOR/0,,menuPK:1740542~pagePK:64168427~piPK:64168435~theSitePK:1740530,00.html>. Accessed May 16, 2010.

<sup>5</sup> “What is our approach to governance?” World Bank Institute on Governance. <http://web.worldbank.org/WBSITE/EXTERNAL/WBI/EXTWBI/GOVANTCOR/0,,contentMDK:20678937~pagePK:64168445~piPK:64168309~theSitePK:1740530,00.html>. Accessed May 16, 2010.

<sup>6</sup> “Good Governance”, OECD Glossary. <http://stats.oecd.org/glossary/detail.asp?ID=7237>. Accessed May 16, 2010

<sup>7</sup> “Overview of the Harvard Project”, Harvard Project on American Indian Economic Development. <http://www.hks.harvard.edu/hpaied/overview.htm>. Accessed May 16, 2010

incorporating many elements of good governance such as stable institutions and policies, and the separation of politics from day-to-day business decisions.<sup>8</sup>

In Canada, the Institute on Governance (IOG) has published many research reports on Aboriginal governance. For example, Graham (2010) provides a list of eleven elements of the current Aboriginal governance system that impedes on economic development. The list includes the collective land holding system, the small size of many communities, varying levels of human rights, and the dependence of communities on transfers from the federal government. Other reports (Graham and Bruhn, 2008 and 2009) explore the link between taxation (or the lack thereof) and good governance. There is a growing international literature on the connections between taxation and quality of governance in developing countries (Moore, 2007). The argument in Graham and Bruhn (2009) is that the lack of taxation on Indian reserves explains in part why some of these communities suffer from less than optimal governance structures. The IOG also published many reports that address specific modes of governance (for example, Graham (2007) and Bruhn (2009)).

In addition, Colin Helin argues that younger Aboriginal generations are growing skeptical of their local governments, in which “Chiefs play a political game for the sole purpose of keeping the gravy train of benefits and perks flowing to their families and supporters” (Helin, 2006:151). Furthermore, the recent incidents at the First Nations University showed that governance in Aboriginal institutions needs reforms. After accusations of mismanagement from a senior employee, the First Nations University saw its funding cut by the federal government. An internal report now recommends granting more independence to the University from its governing body. This recommendation was further supported by Saskatchewan Chief Guy Lonechild, who thinks it was “consistent with our belief that removing politics as much as possible from the institution is what we want. And it could be a model for other institutions – not having leaders serve on the Board of Governors” (Globe and Mail, March 8, 2010, A4).

On a more pessimistic note, Graham and Levesque (2010) survey the international literature on governance reform, and conclude that such reforms rarely increase the quality of governance. The authors thus propose to look at reforms that not only address symptoms of bad governance, but also deeper causal factors. While this paper does not bring specific solutions to the governance problem, it does highlight the important fact that improving governance in Aboriginal communities is a complicated task that needs to take into account the background of specific communities.

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<sup>8</sup> This finding is consistent with other research on the role of institutions in economic development, such as Acemoglu *et al.* (2001) and Rodrik *et al.* (2004).

### III. Data Sources

The study uses data from the Aboriginal Population Profiles based on the 2006 Census cross sectional, reserve-level data associated with the Aboriginal identity population<sup>9</sup> aged 15 years and older residing on 312 Indian reserves and Indian Settlements in Canada.<sup>10</sup> Unless otherwise stated, all descriptive statistics and inferences made in this report are for the Aboriginal residents of these reserves aged 15 and older. These 312 reserves were selected based on the availability of data for the indicators used in the report. This sample of Indian reserves and Indian Settlements represents 78.2 per cent of the total Aboriginal population residing on reserves in Canada in 2006 (241,325 out of 308,490 individuals) (Statistics Canada, 2006). Details concerning the shares of this sample that correspond to specific provinces and territories are provided in Table 1. Saskatchewan has the most reserves in the sample, followed by Ontario, Manitoba and British Columbia.

**Table 1: Number of Reserves in the Sample and the Sample Size in terms of the Relevant Population in 2006**

Province/ Territory	Number of Reserves that meet the data requirements	Aboriginal population residing on reserves in 2006 that meet the data requirements	Total Aboriginal population residing on reserves in 2006	Sample size (in population counts) as a percentage of the total Aboriginal population residing on reserves in 2006 (Per Cent)
NFL	2	1,435	1,435	100.0
PEI	0	0	400	0.0
NS	9	7,415	7,980	92.9
NB	8	5,955	7,005	85.0
QC	26	31,895	33,810	94.3
ON	59	35,485	47,515	74.7
MB	53	52,350	56,765	92.2
SK	65	42,120	49,015	85.9
AB	38	36,890	41,275	89.4
BC	44	23,240	51,055	45.5
YK	0	0	1,970	0.0
NWT	8	4,540	10,260	44.2
NU	0	0	n/a	n/a
CAN	312	241,325	308,490	78.2

Sources: Columns 1-2: Statistics Canada, 2006 Aboriginal Population Profiles.  
Column 3: 2006 Census topic-based tabulations Cat. No. 97-558-X2006006.

Any investigation of the relationship between changes in the average level of education attainment of the on-reserve Aboriginal population and the economic growth of reserves requires a measure of economic activity or production. For this purpose, a proxy has been used in the form of the 2005 estimates of Gross Domestic Product (GDP) per capita based on average annual earnings of the

<sup>9</sup> The data from the Aboriginal Population Profiles include First Nations, Métis and Inuit individuals. However, since the report is focusing on reserves, the vast majority of the population included in this report is of North American Indian (First Nations) identity.

<sup>10</sup> There are almost 3,000 reserves in Canada. However, full data was only available for 312 of them. Of the rest, some had no population, some declined to participate in the Census, while some were too small to be included in the dataset. Indeed, Statistics Canada does not disclose detailed information for reserves with a population under 250. Of the reserves that are not enumerated in the Census, the majority are located near urban centres. Given the proximity of these reserves to large labour markets and post-secondary institutions, the educational attainment of these reserves is likely above the average for reserves observed in the Census data,

reserve. Details concerning the methodology used to obtain estimates of reserve-specific GDP per capita are provided in Appendix 1.

Average earnings, defined as the average employment income for persons aged 15 years and older that worked in 2005, are also used in the analysis. Data on average earnings were retrieved from the Aboriginal Population Profiles for each reserve. It should be noted that this variable does not necessarily reflect the rate of pay on reserve, but the extent to which people worked for pay in 2005. Therefore this variable can indirectly reflect limited labor market opportunities or the difficulty in finding full-time, full-year work.

To assess the existing trends in the labour market on these reserves, three indicators have been used: labour force participation rate, the employment rate and the unemployment rate. All three are based on data collected from responses during the 2006 Census Reference week.

In addition, reserve-specific remoteness categories have been used to ascertain the effect that the remoteness of a reserve has on the relationship between education attainment and labour market and economic outcomes for the on-reserve Aboriginal population. Specifically, this analysis uses the remoteness classification developed and assigned to Indian bands by Indian and Northern Affairs Canada (INAC). This remoteness classification is comprised of four geographic zones. These are defined as follows:

- Zone 1 (Urban): Indicates a geographic zone where the First Nation is located within 50 km of the nearest service centre with year-round road access.
- Zone 2 (Rural): Indicates a geographic zone where the First Nation is located between 50 and 350 km from the nearest service centre with year-round road access.
- Zone 3 (Remote): Indicates a geographic zone where the First Nation is located over 350 km from the nearest service centre with year-round road access.
- Zone 4 (Special Access): Indicates a geographic zone where the First Nation has no year-round road access to a service centre and, as a result, experiences a higher cost of transportation (INAC, 2008).<sup>11</sup>

Due to a very small number of reserves in Zone 3 (only 10), this report has grouped Zone 2 and Zone 3 together for the analysis.<sup>12</sup> The following categories have been used:

- Remoteness Index 1: Corresponds to Zone 1 of the INAC classification.
- Remoteness Index 2: Corresponds to Zone 2 and Zone 3 of the INAC classification.
- Remoteness Index 3: Corresponds to Zone 4 of the INAC classification.

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<sup>11</sup> Under this classification, Zone 4 is further divided into 6 sub-zones that indicate the distance from a service centre (Indian and Northern Affairs Canada, 2008).

<sup>12</sup> Appendix 2 shows the detailed descriptive statistics for the four INAC zones. Interestingly, reserves in Zone 3 have better outcomes on several labour market indicators than the other zones. The reason for this finding is not clear, but the authors suspect a selection effect. Indeed, while these reserves are situated far away from urban centres (similarly to reserves in Zone 4), governments have built roads to access them. The reason for this must be proximity of these reserves to important resources or other points of interests. For example, four out of the ten reserves in that zone are Cree reserves located near the large hydro-electric dams in Quebec. These resources probably provide employment to the Aboriginal communities nearby.

The key characteristic of Remoteness Index 2 is therefore that there is year-round access to a service centre, whereas reserves with Remoteness Index 3 are not connected to a service centre all year long.

**Table 2: Distribution of the Reserves by Provinces and Remoteness Index**

	Remoteness Index 1	Remoteness Index 2	Remoteness Index 3	Total
Alberta	16	20	2	38
British Columbia	25	14	5	44
Manitoba	3	34	16	53
New Brunswick	5	3	0	8
Newfoundland	0	1	1	2
Nova Scotia	4	5	0	9
Northwest Territories	0	3	5	8
Ontario	18	21	20	59
Quebec	10	11	5	26
Saskatchewan	10	52	3	65
Canada	91	164	57	312

Table 2 shows the distribution of the reserves in this sample by the remoteness index and by province. The highest number of reserves with a remoteness index of 1 are in British Columbia (25) followed by Ontario (18) and Alberta (16). For remoteness index 2, most of the reserves are in Saskatchewan (52) followed by Manitoba (34) and Ontario (21). For Remoteness Index 3, Ontario (20) and Manitoba (16) have the most reserves. Indeed, the vast majority of special access reserves in this sample are in Manitoba and Ontario.

Finally, this report will use data on the quality of governance on the reserves, specifically, the Governance Index estimated by the Frontier Centre for Public Policy (FCPP, 2009). In recent years, this group has published a report in which they rated reserves in Manitoba, Saskatchewan, and Alberta on 5 categories: elections, administration, human rights, transparency, and economy. The data were collected through a survey that asked respondents who lived on reserves to rate the reserve's administration in each of the 5 categories. Visits were made to 68 First Nations,<sup>13</sup> resulting in a sample size of 5,106 Aboriginal Canadians living on reserves. A short questionnaire was given to 4,635, while 471 individuals received the longer questionnaire. The list of questions from both forms is given in Appendix 5.

A score out of 100 is calculated for each reserve in every category, and the overall score of a reserve is calculated as a weighted average of the 5 component scores. In particular, the elections, human rights, and transparency components were each given a weight of 22 per cent of the total score, while the administration and economy components were each given a weight of 17 per cent. For the purpose of this report, only the overall score was used. A total of 46 reserves had both earnings and education data as well as a governance index score. The scores vary between 45.9 and 73.2, with an average of 60.0. It is important to note that reserves that are at the low end of the spectrum on this governance index are not

<sup>13</sup> There was an initial selection of 97 First Nations. However, surveyors were unable to access many of these reserves either due to the refusal of the bands' administration or due to lack of accommodation on the reserve. Also, some reserves did not provide the answers in time for the publication of the Index. Finally, reserves with less than 20 responses were excluded from the survey.

necessarily the worst reserves in terms of governance. Indeed, many reserves refused to participate and it is possible that governance is worse in these other reserves.

## **IV. A Portrait of Canadian Indian Reserves**

The socio-economic conditions of Aboriginal Canadians living on reserves are generally worse than the rest of the Canadian population. They suffer from higher unemployment, lower income, and lower educational attainment, as documented by Sharpe, Arsenault and Lapointe (2007) and Sharpe *et al.* (2009). This section will provide an overview of the socio-economic conditions prevailing on reserves categorized by the Remoteness Index, and will use the indicators discussed in the previous section to compare reserves with the national averages.

### **Labour Market, Education and Economic Indicators of Aboriginal and Non-Aboriginal Population**

Outcomes related to the labour market, economy and educational attainment of the Aboriginal reserve populations are worse than those of the Non-Aboriginal population of Canada. Previous research has highlighted these findings (Sharpe *et al.*, 2008; Hull, 2005). This section of the report will compare the situation of Aboriginal Canadians to that of Non-Aboriginals, and the situation of those on reserves to that of those living off-reserve. Compared to the Non-Aboriginal population, in 2006 the Aboriginal population had a lower participation rate (63.0 per cent vs. 66.9 per cent), a lower employment rate (53.7 per cent vs. 62.7 per cent) and a considerably higher unemployment rate (14.8 per cent vs. 6.3 per cent). In addition, relative to non-Aboriginals, Aboriginals had lower averages earnings in 2005 (\$26,154 versus \$36,616) and a poorer performance in all educational indicators in 2006 (56.3 per cent vs. 76.9 per cent for the completion of a certificate, degree or diploma at the secondary level or higher, 21.8 per cent vs. 25.7 per cent for high school education and 5.8 per cent vs. 18.5 per cent for university education).

The focus of this paper is on the Aboriginal population living on reserves, almost all of whom belong to the First Nations population. As seen from Table 3, the on-reserve First Nation population fared worse in all economic, labour market, and education indicators in comparison to the First Nations population living off-reserve.

It must be noted that this report will focus on the total Aboriginal population living on reserves. Differentiation will not be made between the First Nations population and total Aboriginal population<sup>14</sup>.

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<sup>14</sup> We do this because virtually all the Aboriginal population living on reserves are North American Indians (First Nations identity).

**Table 3: Economic, Educational and Labour Market indicators of the Aboriginal and Non-Aboriginal Population 15 years and older in Canada.**

	Total Aboriginal Population	First Nation Population		Inuit	Métis	Non- Aboriginal Population
		On-reserve	Off- reserve			
Participation rate in 2006	63.0	52.0	63.8	61.3	70.1	66.9
Employment rate in 2006	53.7	39.0	55.0	48.9	63.1	62.7
Unemployment rate in 2006	14.8	24.0	9.3	20.3	10.0	6.3
Average Annual Earnings per Employed Worker in 2005 (2005 dollars)	26,154	19,236	26,187	26,486	26,861	36,616
Percentage of the population with a certificate, degree or diploma in 2006	56.3	40.2	61.5	39.3	65.4	76.9
Percentage of the population with a high school as the highest level of education, 2006	21.8	14.8	24.1	13.5	25.6	25.7
Percentage of the population with a trades certificate as the highest level of education, 2006	11.4	9.6	12.0	9.5	13.1	10.8
Percentage of the population with a college certificate or diploma as the highest level of education, 2006	14.5	10.1	15.9	12.0	16.9	17.4
Percentage of the population with a university certificate or diploma below the bachelor's degree as the highest level of education, 2006	2.8	2.7	2.8	1.5	2.8	4.5
Percentage of the population with a university certificate or degree (above the bachelor's degree) in 2006	5.8	3.0	6.8	2.7	7.0	18.5

Sources: Statistics Canada, 2006 Aboriginal Population Profiles.

Census topic-based tabulations Cat. No. 97-558-X2006006.

Note: Average Earnings for Off-reserve First Nation Population is calculated using a weighted average of Urban and Rural areas. Weights are based on the number of employed persons.

## Labour Market Indicators on Reserves

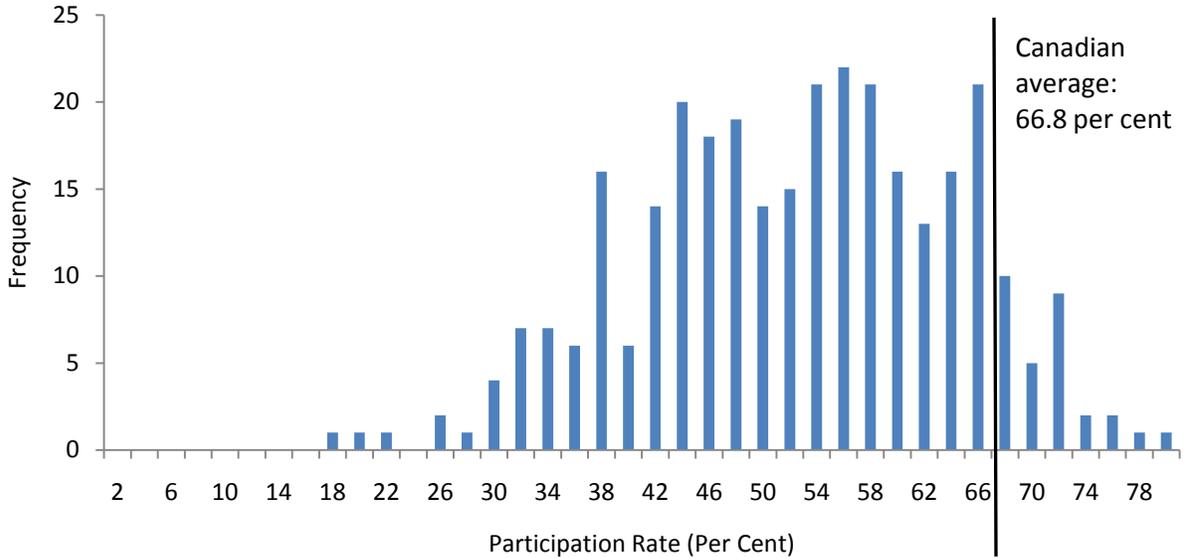
As highlighted in the literature (Sharpe, Arsenault and Lapointe, 2007), the participation rate of Aboriginal Canadians is lower than that of the overall Canadian population, especially on reserves. Chart 1 illustrates, through a histogram, the distribution of reserves by participation rate. One can immediately note that the rate is lower than the Canadian average of 66.8 per cent for the vast majority of reserves. In 2006, the lowest participation rate on a reserve was 17.3 per cent, while the highest rate was 79.3 per cent (Table 4).

**Table 4: Means, Medians and Ranges for Levels of Education Attainment, Labour Market Indicators, GDP per capita, and Remoteness, Population 15 years and older, 312 Selected Reserves, 2005/2006**

	<b>Mean</b>	<b>Median</b>	<b>Standard Deviation</b>	<b>Minimum</b>	<b>Maximum</b>
Participation rate in 2006	51.5	52.6	11.7	17.3	79.3
Employment rate in 2006	38.7	37.5	11.2	14.3	71.9
Unemployment rate in 2006	25.5	25.0	9.9	0.0	66.7
Average Annual Earnings per Employed Worker in 2005 (2005 dollars)	18,482	18,035	4,002	9,353	35,956
GDP per capita (2005 dollars)	13,832	12,674	5,931	2,047	36,499
Percentage of the population with at least a high school certificate in 2006	39.1	38.2	15.6	2.2	76.9
Percentage of the population with a high school certificate or equivalent in 2006 (as their highest educational attainment)	14.5	14.0	5.8	3.0	31.6
Percentage of the population with a trades certificate in 2006 (as their highest educational attainment)	9.4	9.2	5.4	0.0	27.3
Percentage of the population with a college certificate, diploma or degree in 2006 (as their highest educational attainment)	9.7	8.2	6.5	0.0	34.6
Percentage of the population with a university certificate or diploma below bachelor's degree in 2006	2.6	2.4	2.5	0.0	14.8
Percentage of the population with university education at the bachelor's degree or above in 2006	2.9	2.8	2.4	0.0	14.3

Source: Statistics Canada, 2006 Aboriginal Population Profiles  
Means are not weighted

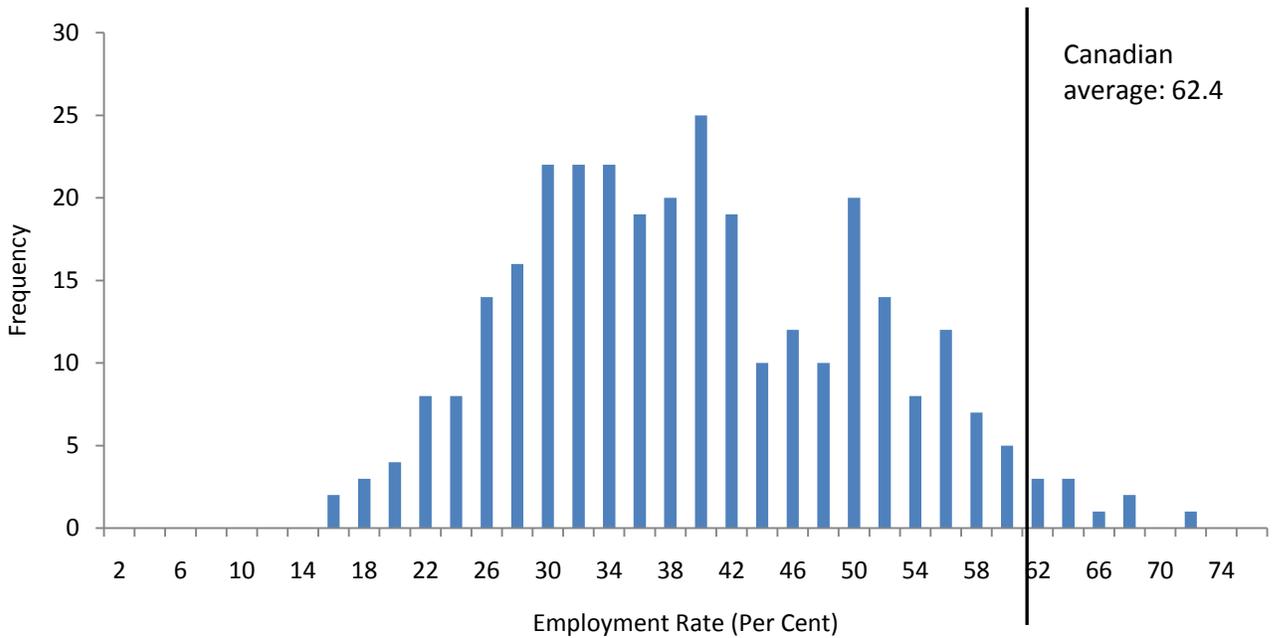
Chart 1: Histogram of Participation Rate by Reserve, Canada, 2006



Source: Statistics Canada, 2006 Aboriginal Population Profiles and Census 2006, Topic-Based Tabulations

As Chart 2 illustrates, the vast majority of reserves (about 95 per cent) had employment rates below the Canadian average in 2006. The lowest employment rate was 14.3 per cent, while the highest was 71.9 per cent.

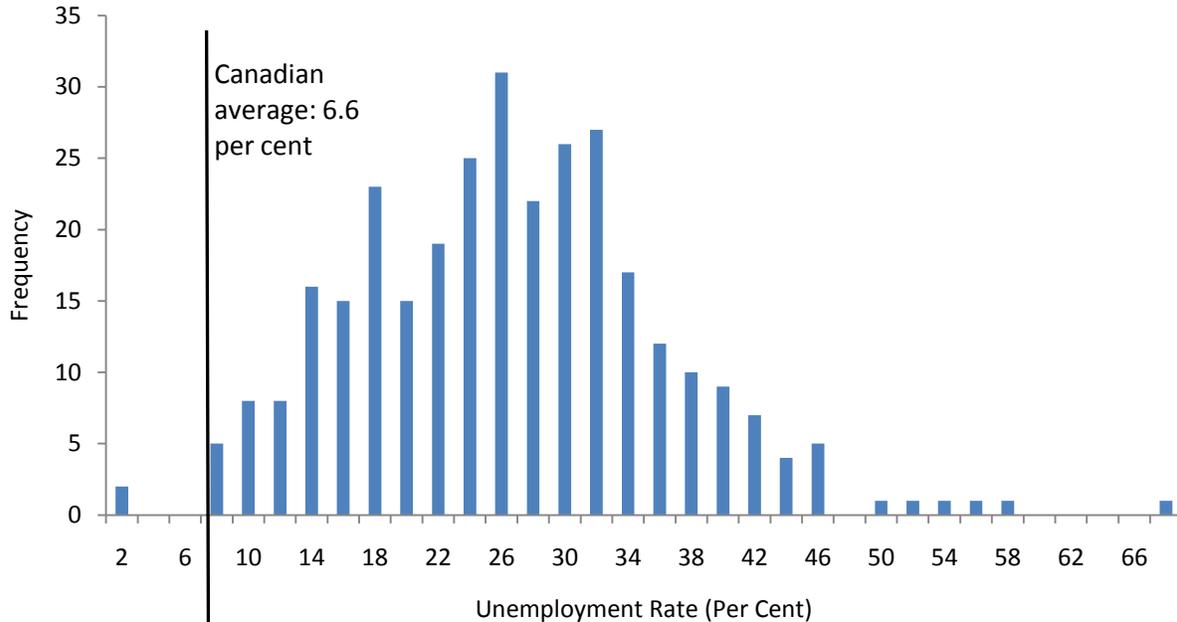
Chart 2: Histogram of Employment Rate by Reserve, Canada, 2006



Source: Statistics Canada, 2006 Aboriginal Population Profiles and Census 2006, Topic-Based Tabulations

Chart 3 illustrates the distribution of the unemployment rate of the 312 Canadian reserves that were included in this analysis. It also includes a line at the Canadian average unemployment rate of 6.6 per cent in 2006. It shows that only two reserves had an unemployment rate lower than the Canadian average. Most reserves had rates between 22 and 32 per cent, but some reserves had particularly high rates, the maximum being 66.7 per cent.

Chart 3: Histogram of the Unemployment Rate by Reserve, Canada, 2006

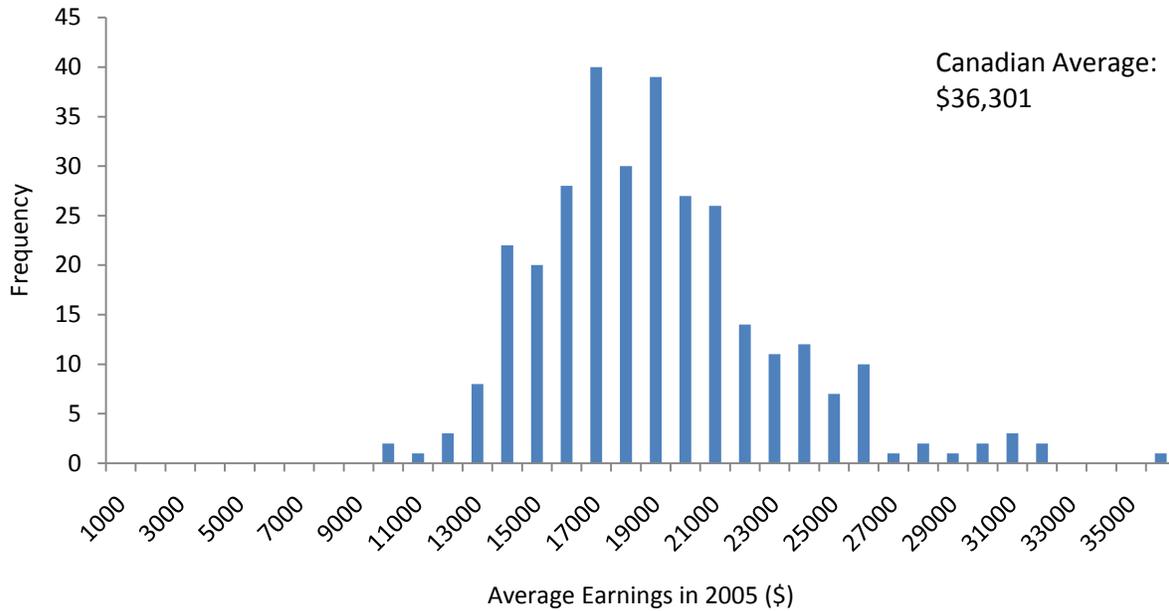


Source: Statistics Canada, 2006 Aboriginal Population Profiles and Census 2006, Topic-Based Tabulations

## Economic Outcomes on Reserves

Chart 4 illustrates the distribution of the reserves according to average earnings in 2005, along with a line representing the Canadian average of \$36,301. One observation immediately stands out from this chart, and it is that all of the 312 reserves have average earnings lower than the Canadian average. Most reserves were in the range of \$15,000 to \$21,000. In addition, although many reserves have particularly low incomes, only few have markedly high incomes above \$25,000 (up to almost \$36,000).

Chart 4: Histogram of Average Earnings by Reserve, Canada, 2005

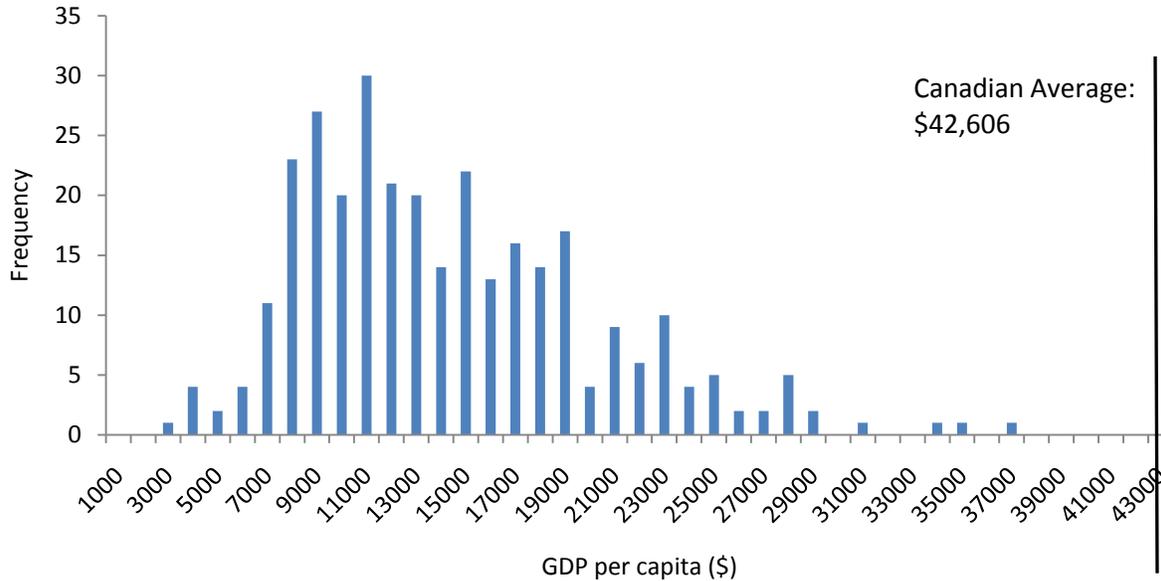


Source: Statistics Canada, 2006 Aboriginal Population Profiles and Census 2006, Topic-Based Tabulations

The same observation can be made about GDP per capita (Chart 5). Indeed, all reserves have a GDP per capita in 2005 lower than the national average of \$42,606. The reserve with the lowest GDP per capita had \$2,047<sup>15</sup> while the highest GDP per capita was \$36,499. These facts are not surprising, given the low average earnings and employment rates on reserves, as these factors are both determinants of GDP per capita.

<sup>15</sup> Note that this does not signify that average income is very low. In particular, the estimates for GDP per capita, which excludes transfer payments, are based on the average earnings of the population that worked in 2005, divided by the total population.

Chart 5: Histogram of GDP per Capita by Reserve, Canada, 2005



Source: Sharpe and Tsirolnitchenko (2010) and Census 2006, Topic-Based Tabulations

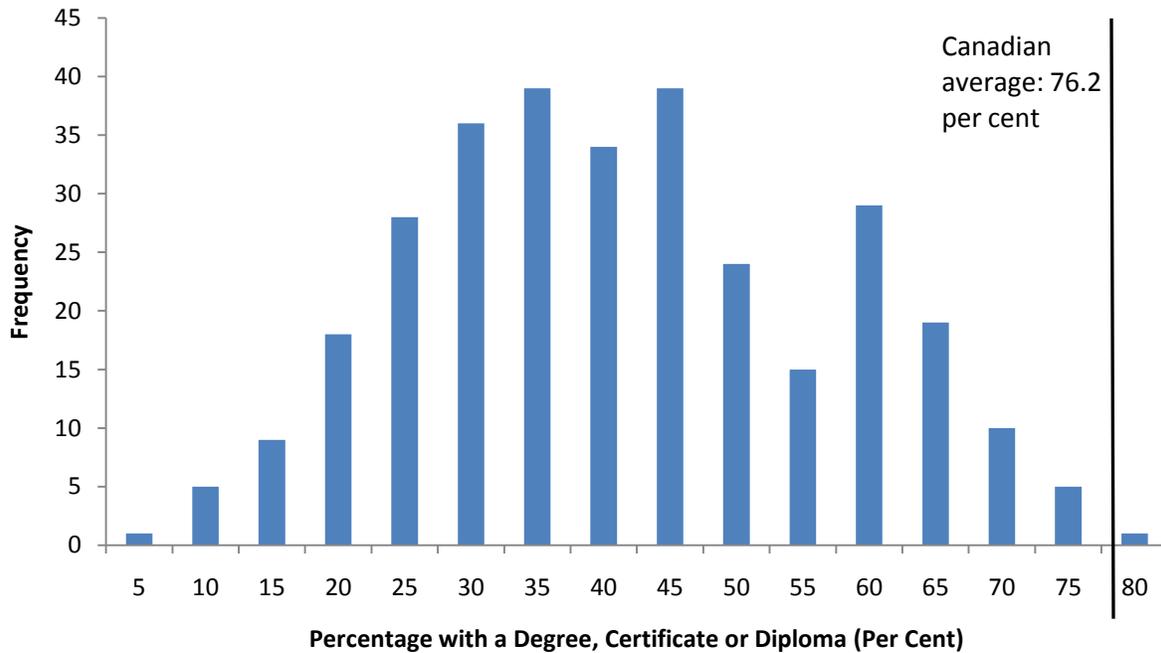
## Educational Attainment on Reserves

The poor performance of reserves with regards to the labour market is complemented by lower educational attainment than is observed for the overall Canadian population. Indeed, 76.2 per cent of Canadians aged 15 and over had a diploma, certificate or degree from a high school, college, trade school or university. Only one reserve had a better result than that, with 76.9 per cent of its population holding a certificate, diploma or degree.<sup>16</sup> The reserve with the worst result had just 2.2 per cent of its population 15 and over in this category of educational attainment.<sup>17</sup> Most reserves have a percentage of persons with diplomas, certificates or degrees between 25 and 45 per cent (Chart 6).

<sup>16</sup> Eel River 3 reserve in Manitoba.

<sup>17</sup> The population 15 and older with a certificate, diploma or degree is defined as the population that has achieved at least a high school certificate or equivalent (which includes those who have achieved a certificate, diploma or degree from a trade school, college or university).

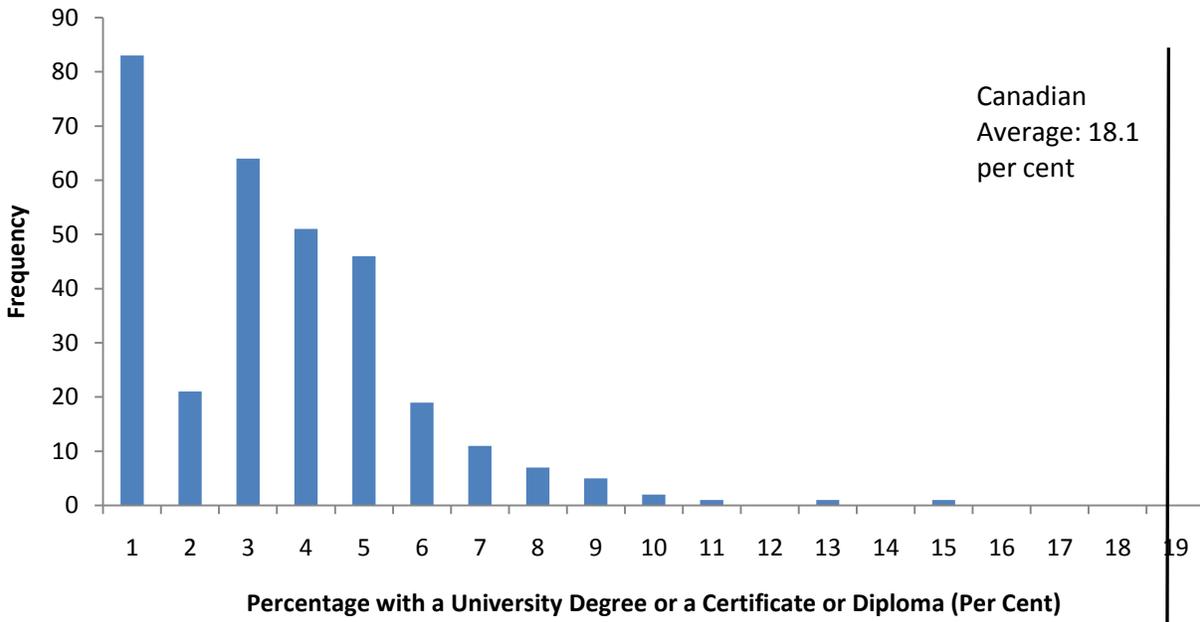
**Chart 6: Histogram of Educational Attainment by Reserve, Percentage of the Population 15 years and older with a Diploma, Certificate or Degree, Canada, 2006**



Source: Statistics Canada, 2006 Aboriginal Population Profiles and Census 2006, Topic-Based Tabulations  
 The numbers on the horizontal axis represent the upper limit of the respective bin (i.e. 5 corresponds to 0-5, 10 to 5-10, 15 to 10-15, etc.)

The distribution of reserves in terms of the share of the population with the highest level of education (a university degree or certificate) is different, as more reserves are in the lower spectrum. Compared to the average level for Canada (18.1 per cent), the average for these reserves is extremely low at 2.9 per cent. Indeed, for 85 per cent of the reserves, at most 6 per cent of the population has a university degree or a certificate.

**Chart 7: Histogram of Educational Attainment by Reserve, Percentage of the Population 15 years and older with University Certificate or Degree, Canada, 2006**



Source: Statistics Canada, 2006 Aboriginal Population Profiles and Census 2006, Topic-Based Tabulations

## Effect of Remoteness

Table 5 summarizes the labour market and education characteristics of Aboriginal reserves in Canada, by remoteness category index. It must be noted that among the 312 reserves with sufficient data, there are 91 reserves (29 per cent) classified as near urban centres (Index 1), 164 (53 per cent) as rural and remote (Index 2) and 57 (18 per cent) as needing special access (Index 3). Appendix 2 shows detailed statistics for each zone.

This preliminary exercise seems to indicate that the remoteness of a reserve is highly associated with its labour market success and educational attainment. The least remote reserves (those near urban centres) perform far better than the rural/remote and special access reserves with respect to educational attainment, economic outcomes, and labour market indicators.

Participation in the labour market is more than six percentage points higher on reserves near urban centres (56.0 per cent) compared to rural/remote reserves (49.8 per cent), and special access reserves (49.5 per cent). The difference in the employment rates is similar, at 43.3 per cent for reserves near urban centres (50 kilometers or less), 36.3 per cent for rural/remote reserves and 38.1 per cent for special access reserves. The unemployment rate in urban reserves is 23.3 per cent, almost the same as in special access reserves (23.5 per cent), but much lower than on rural reserves (27.4 per cent).

It is interesting to note that the special access reserves have a higher employment rate and a lower unemployment rate than the rural/remote reserves. The reason for this is unclear and further work would be needed to explain this paradoxical observation.

Table 5: Summary of the Characteristics of Population on Reserves in Canada, by Remoteness

	Index 1 (Urban) (N=91)	Index 2 (Rural and Remote) (N=164)	Index 3 (Special Access) (N= 57)	Weighted Average of Index 2 and 3	All Reserves
Participation Rate for Aboriginal Population in 2006	56.0	49.8	49.5	49.7	51.5
Employment Rate for Aboriginal population in 2006	43.3	36.3	38.1	36.8	38.7
Unemployment Rate for Aboriginal population in 2006	23.3	27.4	23.5	26.4	25.5
Average Earnings per Employed Worker for the Aboriginal population in 2005	19,042	18,336	18,007	18,251	18,482
GDP per capita in 2005	15,520	12,921	13,758	13,137	13,832
Percentage with a certificate, diploma or degree in 2006	49.7	38.8	23.3	34.8	39.1
Percentage with High school certificate or equivalent in 2006 (as highest level)	16.2	14.9	10.5	13.8	14.5
Percentage with trades certificate in 2006 (as highest level)	12.5	9.4	4.8	8.2	9.4
Percentage with a college certificate or diploma in 2006 (as highest level)	14.0	8.8	5.2	7.9	9.7
Percentage with a university certificate or diploma below a bachelor's degree in 2006 (as highest level)	3.5	2.6	1.1	2.2	2.6
Percentage with University bachelor's degree or above in 2006 (as highest level)	3.7	2.9	1.7	2.6	2.9

Average earnings are higher on reserves situated near urban centres, at \$19,042 in 2005.<sup>18</sup> Average earnings were lower on rural/remote reserves, at \$18,336, and on special access reserves, at \$18,007.

Using a methodology developed by the Centre for the Study of Living Standards (Tsiroulnitchenko and Hazell, 2011), which is outlined in Appendix 1 of this report, average earnings were used to derive per capita GDP. The highest GDP per capita was found in the urban reserves at \$15,520, followed by \$13,758 for special access reserves and \$12,921 for rural/remote reserves.

Educational attainment differences between the types of reserves are large. While 49.7 per cent of Aboriginal Canadians on reserves near urban centres have a certificate, diploma or degree, 38.8 per cent do on rural/remote reserves and only 23.3 per cent on special access reserves.

There is one important paradoxical observation to note when analyzing these data on remoteness. While the population on special access reserves does have lower educational attainment on average compared to the urban and rural/remote reserves, this fact does not translate into these reserves having the

<sup>18</sup> The average earnings for reserves in a given index category is calculated as the average of the average earnings by reserve.

lowest labour market success and worst economic outcomes. Indeed, the GDP per capita on this type of reserve is actually higher than rural and remote reserves, which have higher average educational attainment. Also, average earnings and the participation rate are virtually the same in both types of reserves, while the unemployment rate is lower in special access reserves and the employment rate is higher. As mentioned briefly above, the reason for these observations is unclear. Further work is needed to explain the apparent paradox, perhaps with an improved measure of remoteness.

## Provincial Differences

There is significant variation between provinces for all indicators on reserves (Table 6). The lowest average participation rate of reserves by province is in Saskatchewan, at 42.8 per cent, while the highest is in Newfoundland, at 70.0 per cent.<sup>19</sup> This corresponds to a difference of 27.2 points between the minimum and maximum. The spread is lower for the average provincial employment rate, at 17.8 points. For this indicator, Saskatchewan has the lowest, at 30.5 per cent, while the highest rate is in Ontario (48.3 per cent). Given that unemployment rates are calculated based on the labour force, and not the entire working age population like the other two labour market indicators, the spread of 19.9 points in this indicator should be considered large. The highest average unemployment rate is in Newfoundland, at 37.0 per cent while the lowest is in Ontario, at 17.1 per cent. The second highest rate was 30.0 per cent in New Brunswick, indicating that Newfoundland was somewhat of an outlier.<sup>20</sup>

In Nova Scotia, 8.0 per cent of the population on the reserves included in this analysis had completed university. This was 6.2 points higher than the percentage in Alberta, at only 1.8 per cent. For completion of high school only, the percentage was lowest in the Northwest Territories, at 10.1 per cent. The highest proportion was in New Brunswick, at 21.0 per cent, resulting in a spread of 10.9 percentage points in this indicator.

The relatively remote Northwest Territories had the highest average earnings in this analysis at \$26,232 in 2005, as shown in Table 6. The lowest average earnings were in Manitoba (\$16,906). The Northwest Territories are an outlier for this indicator, since the second highest average earnings are in Quebec at just \$19,854.

In terms of GDP per capita, in 2005, the highest average was unsurprisingly in the Northwest Territories, at \$24,908. Again, this figure was an outlier, given that the second highest GDP per capita was in Newfoundland, at only \$18,540. The lowest average GDP per capita was in Saskatchewan, at \$9,198.

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<sup>19</sup> However, the averages for Newfoundland are somewhat misleading as only two reserves could be included in the data.

<sup>20</sup> Again, with only two reserves in Newfoundland, averages for that province are misleading.

Table 6: Provincial Averages of Indicators for Selected Reserves, 2005/2006

	Employment Rate	Participation rate	Unemployment Rate	Average Earnings per Employed Worker in 2005 (\$)	Percentage who have High School as the highest completed education	Percentage who completed university	GDP per capita in 2005 (\$)
British Columbia	41.5	56.0	26.9	19,255	18.8	2.9	16,246
Alberta	37.8	52.1	27.4	19,222	10.6	<b>1.8</b>	13,762
Saskatchewan	<b>30.5</b>	<b>42.8</b>	28.9	17,233	15.9	2.8	<b>9,198</b>
Manitoba	31.8	44.5	28.1	<b>16,906</b>	11.7	2.7	10,212
Ontario	<b>48.3</b>	57.9	<b>17.1</b>	18,815	15.6	2.9	16,706
Quebec	44.2	56.7	23.3	19,854	11.9	3.1	18,139
New Brunswick	43.9	63.4	30.0	17,655	<b>21.0</b>	5.9	14,965
Newfoundland	43.5	<b>70.0</b>	<b>37.0</b>	16,977	11.0	4.5	18,540
Nova Scotia	41.2	53.8	23.6	17,911	16.9	<b>8.0</b>	13,932
Northwest Territories	43.3	59.9	27.4	<b>26,232</b>	<b>10.1</b>	2.3	<b>24,908</b>
Canada	38.7	51.6	25.5	18,482	14.5	2.9	13,832
Difference between maximum and minimum	17.8	27.2	19.9	9,325	10.9	6.2	15,710

Source: Statistics Canada, 2006 Aboriginal Population Profiles  
Note: Numbers in bold are the minimums and maximums.

These provincial differences suggest that the province of residence captures unobserved factors, such as geography, social norms or political circumstances, that vary by province and that affect the living standards of Aboriginal persons living on reserves. For this reason, provincial variables will be included in the regression analysis done later in this report.

## V. Correlation Analysis between the Economic Outcomes, Educational Attainment and Labour Force Indicators

This section will focus on estimating degrees of correlation at the reserve level between educational attainment indicators, economic outcomes (as measured by GDP per capita and average earnings of the reserve), labour market outcomes (in the form of participation rate, employment rate and unemployment rate), and the category of remoteness of the reserve, as described in a previous section of this report. Correlation coefficients measure the degree to which two variables are linearly related. They vary between -1 and 1, with a negative number indicating a negative relationship.

The results of the correlation analysis in Table 7 represent exploratory analysis and should be interpreted with caution. In particular, it must be noted that this analysis does not account for other factors that could influence or shape the relationship between educational attainment and the indicators for labour force participation, economic outcomes or remoteness. Also, these coefficients can only detect linear relationships. Nevertheless, they provide a useful first look at the relationships in the data. Scatter plots depicting each correlation coefficient are contained in Appendix 3. The scatter plots for the Remoteness Index are not constructed as this variable is discrete and the graphical representation is less interesting.

A strong and positive relationship between educational attainment and earnings is among the most well established relationships in the social sciences. The wage regression equation developed by Mincer (1974) describes the ‘human capital model’ and demonstrates the link between the wages of an individual and the human capital accumulation in terms of the skills acquired by the worker (education and experience). Using this model, studies have often used education and work experience as proxies for human capital accumulation. With regards to this report, the important conclusion is that human capital accumulation, in the form of education, plays an important role in increasing the living standards of a population through higher earnings.

From Table 7, it can be seen that there is a positive relationship between the average educational attainment and earnings of a reserve. The correlation coefficient between average earnings in 2005 and the percentage of individuals with a certificate, diploma or degree at the secondary or post-secondary level is 0.35. The correlation between having high school education as the highest education level achieved and average earnings (0.10) was found to be weaker compared to the association between university education and average earnings (0.17).

This relationship is further explored with an alternative economic outcome, GDP per capita on individual reserves in 2005. All correlation coefficients between education and GDP per capita are higher than the corresponding coefficient between education and average earnings. The result was 0.48 for at least a high school education and GDP per capita, 0.23 for at most a high school education and GDP per capita, and 0.26 for university education and GDP per capita.

It must be noted that the human capital model does not account for unobserved factors such as worker’s innate ability and ambition or the quality of schooling. There is a possibility that workers with greater ability and motivation may be more successful even in the absence of additional education (Riddell, 2006). Similarly, the correlation coefficients presented here do not take into account other variables affecting the relationship between earnings and education, such as the quality of schools on reserves or governance quality. For this reason, the correlation between earnings and education should not be interpreted as a causal relationship. In addition, the remoteness of a reserve could play an important

role in the relationship between economic outcomes and education. For example, there is a possibility that the impact of higher education on income will be mitigated if the reserve is remote and there are limited economic opportunities on the reserve.

**Table 7: Correlation Coefficients between Economic Outcomes, Educational Attainment, Remoteness and Labour Market Indicators**

	% On-reserve population with a Certificate, Diploma or a Degree	% On-reserve population with a High school Certificate or Diploma as Highest Level of Education	% On-reserve population with a University Degree	GDP per capita of the Reserve in 2005	Average Annual Earnings of the Reserve in 2005	Remoteness Index
Participation Rate (%) in 2006	0.58	0.31	0.24	0.70	0.38	-0.21
Employment rate (%) in 2006	0.57	0.32	0.29	0.76	0.45	-0.19
Unemployment rate (%) in 2006	-0.23	-0.15	-0.22	-0.45	-0.34	0.04
Average Annual Earnings of the Reserve in 2005	0.35	0.10	0.17	0.78	1.00	-0.09
GDP per capita of the Reserve in 2005	0.48	0.23	0.26	1.00	0.78	-0.13
Remoteness Index 1, 2, 3	-0.56	-0.32	-0.27	-0.13	-0.09	1.00

Source: Statistics Canada, 2006 Aboriginal Population Profiles.

Note: Data on average earnings refer to individuals aged 15 and older with employment income at any point during the year (wages and salaries, net income from a non-farm unincorporated business and/or professional practice, and/or net farm self-employment income).

In general, higher levels of education increase employment opportunities and earnings potential for individuals. In turn, attractive labour market opportunities and economic incentives encourage the labour market participation of the educated. As a result, labour market indicators such as the employment rate and participation rate are generally positively associated with educational attainment and persons with higher education generally run a lower risk of being unemployed (Sharpe and Arsenaault, 2010). These dynamics are also observed for reserves. The correlation analysis shows that the participation and employment rates are positively associated with the educational attainment of the Aboriginal population, while the unemployment rate is negatively associated with higher education.

The correlation between the percentage of individuals with a diploma or degree at the secondary or post-secondary level and employment rate is 0.57. The magnitude of the correlation coefficient between the employment rate and education is higher for the percentage of the population with only a high school diploma (0.32) compared to those who have a university degree (0.29).

The size of the correlation coefficient between the participation rate and the percentage of population with a high school education only (0.31) is also larger than the correlation coefficient between the participation rate and university education (0.29). Again, the correlation is higher when considering the percentage of population with at least high school (0.58).

The correlation coefficient between the unemployment rate of a reserve and the percentage of the population with at least high school is -0.23. The association between the unemployment rate with university education (-0.22) is stronger than the correlation between the unemployment rate and the high school diploma only variable (-0.15).

Labour market indicators were also found to be positively correlated with economic outcomes, with the GDP per capita of reserves having a stronger association than annual average earnings of reserves. The correlation coefficient was 0.70 between GDP per capita and the participation rate, while it was slightly higher, at 0.76, between GDP per capita and the employment rate. For the average earnings, the correlation coefficients were lower at 0.38 for participation rate and 0.45 for employment rate. Unemployment was found to be negatively correlated with both GDP per capita (-0.45) and average earnings (-0.34).

The third set of analyses examined the remoteness of reserves. The results show that the remoteness of a reserve, when described by the Remoteness Index, is negatively associated with educational attainment. The correlation coefficient between the percentage of the population with a diploma or degree at the secondary or post-secondary level and remoteness is -0.56. Looking at the specific educational categories, the negative relationship was stronger for the high school diploma only variable (-0.32) than the university variable (-0.27). It is important to note that university graduates from more remote reserves may be moving towns or cities due to a lack of desirable opportunities on the reserve.

The remoteness of a reserve is also negatively correlated with all the labour force indicators and economic outcome variables, except the unemployment rate (0.04). The correlation coefficient is larger for the participation rate (-0.21) and employment rate (-0.19) than for average annual earnings (-0.09) and GDP per capita (-0.13), where the magnitude of the correlation coefficient is small and the relationship is weak.

## VI. Regression Results

In this section, the report presents the results of a series of multiple regressions estimated using the data described earlier. The advantage of the multiple regression method is the *ceteris paribus* interpretation. The regression coefficients can be interpreted as the effect of a specific independent variable on the dependent variable, when holding the effect of all other independent variables constant.

The regressions were estimated using an Ordinary Least Squares (OLS) approach, and are subject to the usual caveats applying to this approach.<sup>21</sup> Some related variables, such as the proximity to natural resources or other unobservable characteristics of reserves, are not included in the regression. If excluded variables such as these are correlated with both the dependant and independent variables, the coefficients would suffer from omitted variables bias. However, due to lack of additional data, it is impossible to address this source of error. For this reason, the results of this section should be interpreted with caution.

All of the estimated models make use of “dummy variables” (for the provinces and Remoteness Index). These variables are equal to either one or zero, and, seeing the regression as the estimation of a best-fit line, should be interpreted as a change in the intercept. For example, if a regression with the participation rate as the dependent variable has the coefficient on “British Columbia” equal to 2.1, then, holding all else constant, the participation rate in that province is 2.1 percentage points higher than the base case. When including a set of dummy variables, one of the variables must be omitted. In this report, the variables for Alberta and Remoteness Index of “1” have been omitted. These variables therefore represent the base case.

Five main regressions are estimated in this section with the following dependent variables:

- Labour Force Indicators
  - Participation Rate (2006)
  - Employment Rate (2006)
  - Unemployment Rate (2006)
- Economic Outcomes
  - Average Earnings (2005);
  - GDP per capita (2005);

The independent variables for the regressions are:

- Percentage of the population with a high school diploma as the highest level of educational attainment achieved;
- Percentage of the population with a trades certificate as the highest level of educational attainment achieved;
- Percentage of the population with a college diploma, certificate or degree as the highest level of educational attainment achieved;

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<sup>21</sup> For example, it is unclear whether education affects economic and labour market outcomes, or if these outcomes are actually factors in the decision of pursuing further education. Also, OLS is a linear model, but it could be the case that the real model is non-linear. Finally, there could be some variables that affect both the independent and dependent variables, but that are unobserved and thus not included in the model. These variables would cause what is commonly referred to as “omitted variables bias,” effectively causing the results presented to be erroneous.

- Percentage of the population with university diploma, certificate or degree below the bachelor's degree level as the highest level of educational attainment achieved;
- Percentage of the population with university diploma, certificate or degree, at the bachelor's degree or above;
- Two dummy variables for Remoteness Index values 2 and 3 respectively (Remoteness Index value of 1 is omitted and so becomes the base case);
- Nine provincial dummy variables (Alberta is omitted and is thus in the base case);
- Governance Quality Index (for a sub-sample only).

As mentioned earlier in this report, there is great variation in the educational attainment, labour market indicators, average earnings, and GDP per capita on reserves across provinces. This gives reason to believe that the provincial variables capture local political, social or geographical conditions that are correlated with both the dependent and independent variables, thus motivating their inclusion in the regression.<sup>22</sup>

Additional regressions are estimated using an additional independent variable: the Governance Index. As mentioned earlier in this report, this indicator is estimated by the Frontier Center for Public Policy, and is only available for the provinces of Alberta, Saskatchewan and Manitoba (FPCC, 2009). Therefore, these regressions will be estimated using only a sub-sample of 46 reserves for which data on governance were available. It is expected that good governance will have a positive effect on the employment and participation rates, average earnings and GDP per capita. Similarly, the sign on the unemployment rate is expected to be negative.

## Labour Market Indicators

First, the results from the regressions using labour market indicators as dependent variables are considered. Table 8 summarizes the results of the regressions with the participation rate as the dependant variable.

A first observation from this regression is that educational attainment does have a statistically and economically significant positive relationship with the participation rate. Increasing the percentage of the population with a high school diploma (as their highest level of completed education) by one percentage point would be associated with an increase in the participation rate of 0.34 percentage points. Similarly, an increase of one point in the percentage of the population with college education would be associated with an increase in the participation rate of 0.65 points, and for trades education an increase of 0.48 points. However, the regression does not find any statistically significant relationship for university education and the participation rate.

The variable for special access reserves has a highly significant coefficient, at 5.61, indicating that these reserves have a participation rate higher than reserves located near service centres, once we control for differences in educational attainment and province. The variable for remote/ rural reserves has a statistically insignificant coefficients (i.e. not different from zero).

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<sup>22</sup> Models without provincial variables were estimated by the authors. Using a variety of model selection tools (Akaike Information Criteria, Bayesian Information Criteria, Adjusted R-square), the conclusion was that provincial variables were relevant to the model and should be included in the analysis.

Four provinces and territories had statistically significant coefficients in this regression: Saskatchewan, Manitoba, Nova Scotia and Newfoundland. Three of them had negative coefficients (Saskatchewan, -9.53; Manitoba, -6.10; and Nova Scotia, -6.84), indicating that participation rates on reserves are lower in these provinces, holding all else constant, than in Alberta. Newfoundland has a positive coefficient, at 12.87.

**Table 8: Results of the Regressions with Participation Rate as the Dependant Variable**

	Participation rate	
	Coefficients	Robust Standard Errors
Percentage with High School Diploma as Highest Level of Education	0.34***	0.107
Percentage with Trades certificate or diploma as Highest Level of Education	0.48***	0.124
Percentage with College certificate or diploma as Highest Level of Education	0.65***	0.098
Percentage with University certificate or diploma below the bachelor's degree as Highest Level of Education	0.22	0.199
Percentage with University Bachelor's Degree or above	0.10	0.244
Remoteness Index (2)	1.86	1.144
Remoteness Index (3)	5.61***	1.917
British Columbia	-2.03	2.194
Saskatchewan	-9.53***	2.027
Manitoba	-6.10***	2.174
Ontario	-0.27	2.035
Quebec	0.78	2.549
New Brunswick	0.46	3.424
Nova Scotia	-6.84**	2.996
Newfoundland	12.87***	2.930
Northwest Territories	2.40	2.862
Intercept	36.23***	2.406
Number of observations		312
R-squared		0.544
Adjusted R-squared		0.520
F test		28.19***

The results for the regression with the employment rate are similar (Table 9). In this case, the coefficient on special access reserves (Remoteness Index of 3) is also statistically significant. Remote/rural reserves have a coefficient that is statistically insignificant, and therefore no conclusions can be drawn about them. This finding, along with the finding that Remoteness Index 2 is statistically insignificant, indicates that, after controlling for education and province, reserves that are not connected by a road to a service centre all year long will tend to have higher employment rates than reserves with Remoteness Index 1 or 2. However, the focus should be on the fact that, once education is accounted for, rural/remote and special access reserves appear to do no worse than reserves close to urban centres.

The estimates of the coefficients on the education variables have the expected positive sign. The effect of university education (bachelor's degree or higher) is strong, at 0.52. This means that an increase of one point in the percentage of the population with university education translates into a 0.52 point increase in the employment rate. To put this in perspective, it is interesting to remember that the percentage of Aboriginal population on reserves that have completed university (at the bachelor's degree level) is 2.9 per cent. If this population had the university completion rate of the Non-Aboriginal population in Canada, 18.1 per cent of them would have a university degree. This increase of 15.2 points in educational attainment would thus translate in a 7.9 percentage point increase in the employment rate, bringing this population to an average employment rate of 46.6 per cent (remembering that this number is only for illustrative purposes, as it is difficult to prove the direction of causality). College education has an even stronger effect on the employment rate, with the coefficient estimated at 0.62. The estimate for high school education is also statistically significant, but relatively lower than for university education, at 0.33. The result for a trades certificate is similar, at 0.38, while university education below the bachelor's degree level is not significant.

**Table 9: Results of the Regression with Employment Rate as the Dependent Variable**

	<b>Employment Rate</b>	
	<b>Coefficients</b>	<b>Robust Standard Error</b>
Percentage with High School Diploma as Highest Level of Education	0.333***	0.096
Percentage with Trades certificate or diploma as Highest Level of Education	0.376***	0.111
Percentage with College certificate or diploma as Highest Level of Education	0.623***	0.092
Percentage with University certificate or diploma below the bachelor's degree as Highest Level of Education	0.095	0.214
Percentage with University Bachelor's Degree or above	0.515**	0.222
Remoteness Index (2)	0.470	1.052
Remoteness Index (3)	5.685***	1.743
British Columbia	-2.456	1.975
Saskatchewan	-7.699***	1.709
Manitoba	-5.161***	1.721
Ontario	3.807**	1.823
Quebec	2.219	2.387
New Brunswick	-5.403*	2.911
Nova Scotia	-6.729**	2.724
Newfoundland	-0.685	3.473
Northwest Territories	-0.453	2.255
Intercept	23.530***	1.982
Number of observations	312	
R-squared	0.579	
Adjusted R-squared	0.556	
F test	29.89***	

Five provinces and territories had statistically significant coefficients in this regression: Saskatchewan, Manitoba, Ontario, New Brunswick and Nova Scotia. Four of them had negative coefficients (Manitoba, New Brunswick, Nova Scotia and Saskatchewan), indicating that employment rates on reserves are lower in these provinces than in Alberta, holding the other control variables constant. The lowest coefficient is in Saskatchewan, at -7.70, followed by Nova Scotia (-6.73), New Brunswick (-5.40) and Manitoba (-5.16). The other province had a positive coefficient (Ontario with 3.81).

Table 10 shows the results for the unemployment rate. As predicted by the descriptive statistics, the coefficients on the remoteness variables are not significant. This indicates that after controlling for education and province, the location of the reserve has no relationship with the unemployment rate. Alternatively, there could be an effect of remoteness that is not captured by the model in this paper.

As in the previous regressions, estimates for education show that some levels of education are significant. The estimated coefficient on university education at the bachelor's degree is -0.81, much larger than the one for college, the only other significant variable, at -0.27. The estimate on the completion of university (at the bachelor's degree level) would correspond to a decrease of 12.3 points in the average unemployment rate, to a rate of 13.2 per cent, if the on-reserve Aboriginal population analyzed in this report achieved the university completion level of Non-Aboriginal Canadians.

Only three provincial variables have significant coefficients in this regression: New Brunswick, Newfoundland and Ontario. Ontario has a negative coefficient of -6.31, indicating a lower unemployment rate in that province than in Alberta. New Brunswick had a positive coefficient, at 8.95, while Newfoundland also had a positive coefficient of 13.3.

Table 10: Results of the Regression with Unemployment as the Dependent Variable

	Unemployment Rate	
	Coefficients	Robust Standard Error
Percentage with High School Diploma as Highest Level of Education	-0.138	0.106
Percentage with Trades certificate or diploma as Highest Level of Education	-0.015	0.120
Percentage with College certificate or diploma as Highest Level of Education	-0.265**	0.105
Percentage with University certificate or diploma below the bachelor's degree as Highest Level of Education	0.211	0.285
Percentage with University Bachelor's Degree or above	-0.806***	0.221
Remoteness Index (2)	1.786	1.266
Remoteness Index (3)	-2.785	2.172
British Columbia	2.333	2.247
Saskatchewan	1.772	1.660
Manitoba	1.091	1.667
Ontario	-6.305***	1.756
Quebec	-2.185	2.421
New Brunswick	8.951***	2.683
Nova Scotia	2.446	3.433
Newfoundland	13.292**	6.454
Northwest Territories	3.569	2.250
Intercept	31.59***	2.434
Number of observations	312	
R-squared	0.295	
Adjusted R-squared	0.257	
F test	13.45***	

## Economic Performance Indicators

Table 11 shows the results of using reserve-specific average annual earnings per employed worker as the dependent variable. Education plays a positive and statistically significant role on the average earnings on reserves. The estimated model shows that a one percentage point increase in the reserve population with a high school diploma only causes the average earnings to increase by \$84, while an increase in the reserve population with a bachelor's degree by one percentage point increases the average earnings by \$305. Similarly, a one-point increase in the percentage of the population with a college certificate or diploma increases average earnings by \$162, while the two other education categories (trades and lower level university) have no significant effect on earnings.

The two remoteness variables have statistically insignificant coefficients, and thus it is impossible to conclude that remoteness has any relationship with the average earnings of the reserves.

Using Alberta as the base case, five provinces have a negative statistically significant coefficient, indicating that average earnings in these provinces are lower than in Alberta once other factors are controlled for. These provinces are Saskatchewan, Manitoba, Ontario, New Brunswick and Nova Scotia. The coefficient on the variable for Northwest Territories is positive and significant, while the coefficients on the remaining provinces are not statistically significant.

**Table 11: Results of the Regression with Average Earnings as the Dependent Variable**

	<b>Average Earnings per Employed Worker</b>	
	<b>Coefficients</b>	<b>Robust Standard Error</b>
Percentage with High School Diploma as Highest Level of Education	84.29*	48.93
Percentage with Trades certificate or diploma as Highest Level of Education	-7.38	47.67
Percentage with College certificate or diploma as Highest Level of Education	161.52***	52.24
Percentage with University certificate or diploma below the bachelor's degree as Highest Level of Education	-35.02	78.00
Percentage with University Bachelor's Degree or above	304.52***	101.16
Remoteness Index (2)	685.75	513.45
Remoteness Index (3)	1066.72	790.52
British Columbia	-1201.36	1,049.88
Saskatchewan	-2,352.89**	1,022.54
Manitoba	-2,534.79***	880.83
Ontario	-2,109.27**	893.21
Quebec	-44.91	1,097.96
New Brunswick	-4,393.63***	1,045.33
Nova Scotia	-4,078.07**	1,845.68
Newfoundland	-3745.16	2,610.22
Northwest Territories	5,691.85***	1,480.55
Intercept	16,024.99***	991.40
Number of observations		312
R-squared		0.290
Adjusted R-squared		0.251
F test		8.71***

Table 12 shows the results using reserve-specific GDP per capita as the dependent variable. The results from this regression show that education has a positive and statistically significant impact on the GDP per capita of the reserve. It indicates that a one percentage point increase in the reserve population with a high school diploma translates in a \$115 increase in the GDP per capita. College and university education have a greater effect on GDP. A one-point increase in the percentage of the population that have a bachelor's degree or above is associated with an increase in GDP per capita of \$373, while the same increase in the proportion of the population with a certificate or diploma from a college is associated with an increase in GDP per capita of \$360. The other two education variables have no significant effect on GDP per capita.

The categorical variables for remoteness are both statistically significant and positive, indicating that remote/rural reserves and special access reserves have higher GDP per capita than urban reserves. The effect is greater for special access reserves (\$2,570) than for remote and rural reserves (\$1,233).

Using Alberta as the base case, the provincial effects for Quebec and Northwest Territories are positive and statistically significant. In other words, everything else held constant, on average, GDP per capita is higher on reserves in these provinces than in Alberta. The effect is particularly strong for Northwest Territories, at \$8,105. The effects for Saskatchewan, Nova Scotia, Manitoba and New Brunswick are statistically significant but negative. The regional effects for British Columbia and Ontario are statistically insignificant.

**Table 12: Results of the Regression with GDP per Capita as the Dependent Variable**

	GDP per Capita	
	Coefficients	Robust Standard Error
Percentage with High School Diploma as Highest Level of Education	114.95**	56.78
Percentage with Trades certificate or diploma as Highest Level of Education	42.91	54.90
Percentage with College certificate or diploma as Highest Level of Education	360.23***	59.79
Percentage with University certificate or diploma below the bachelor's degree as Highest Level of Education	-19.37	96.45
Percentage with University Bachelor's Degree or above	372.96***	129.58
Remoteness Index (2)	1,233.46**	595.36
Remoteness Index (3)	2,750.13***	833.90
British Columbia	332.6	1,330.48
Saskatchewan	-4,634.58***	1,187.39
Manitoba	-3,566.81***	1,111.06
Ontario	-283.22	1,159.84
Quebec	2,993.27**	1,382.64
New Brunswick	-3,599.77**	1,403.92
Nova Scotia	-4,202.98**	1,911.17
Newfoundland	1,945.69	1,454.64
Northwest Territories	8,104.84***	1,422.53
Intercept	7,424.27***	1,117.70
Number of observations	312	
R-squared	0.577	
Adjusted R-squared	0.554	
F test	40.25***	

### Note on Special Access Reserve Results

The fact that conditions in the labour market of special access reserves are, according to the regression results, better than other reserves is puzzling. One possible explanation is that the remoteness

indicator used in this paper is not well constructed. Indeed, it is not clear what can constitute a service centre. While some reserves may be close to a big city, others in the same category may be close to a relatively small town. Improved data would certainly contribute to a better understanding of the effect of remoteness.

However, our findings could also be explained by competition from the villages or towns close to the reserves. To take a simple example, assume two similar reserves, A and B. Reserve A is located 75 km away from the closest town, and is connected by a road, while reserve B is at the same distance but does not have the benefit of a year round road. Residents of reserve A can thus commute to the town to shop, see their doctor or eat at a restaurant. Workers at these businesses could be residents of the reserve, but they are probably mostly non-Aboriginal individuals living in the town. Residents of reserve B, on the other hand, must provide the services they need by themselves on the reserve. While there may be non-Aboriginal individuals providing services on the reserves (such as doctors), most of the jobs created by these businesses will be filled by Aboriginal individuals. It is easy to see that, in this example, there will be less competition for service jobs in the special access reserve, thereby increasing employment through self-sufficiency.

Another explanation for why special access reserves, controlling for education and province, have higher GDP per capita is the fact that wages on special access reserves are higher than on less remote reserves due to the high cost of living associated with living and working in very remote regions. Many organizations provide workers in very remote areas with Northern allowances, which is income in addition to their salary to mitigate the effects of higher prices and geographical isolation on their standard of living. For example, an Aboriginal teacher working on a special access reserve will earn a higher wage than if she worked on an urban reserve. These higher wages would undoubtedly result in higher GDP per capita on special access reserves when educational and provincial effects are accounted for.

Although it is not currently possible to check whether these hypotheses hold in our data, these hypotheses do provide possible explanations to the seemingly unintuitive results obtained.

There is also a possible statistical explanation for the peculiar findings concerning the effects of remoteness on labour market and economic performance, which is that the model suffers from endogeneity in one or more of the explanatory variables, specifically in the educational attainment variables. To try to remedy this potential problem, regressions are estimated where two language variables are used as instruments for educational attainment. This is shown in the Instrumental Variables Estimation section to come.

## Governance

As mentioned earlier, data on governance are available from the Frontier Centre for Public Policy (FCPP 2009) for 46 of the 312 reserves. All of these reserves are located near urban centres (Index 1) or in rural/remote areas (Index 2) of Alberta, Manitoba and Saskatchewan. This section discusses the estimation of a multiple regression model which includes governance as an independent variable. Similar to the analysis in the previous section, these models will also control for the effects of education, remoteness and province.

**Table 13: Results of Regression using Labour Market Indicators as Dependent Variables, and Including Governance as Explaining Factor**

	Labour Market Indicators		
	Employment Rate	Participation Rate	Unemployment Rate
Percentage with a Diploma, Degree or Certificate	0.50***	0.61***	-0.17**
Remoteness Index (2)	0.82	1.95	0.22
Governance	0.54**	0.49*	-0.26*
Manitoba	-4.52	-6.87*	-1.55
Saskatchewan	-10.47***	-13.15***	2.73
Constant	-12.76	-0.04	49.23***
Number of observations	46	46	46
R-squared	0.39	0.44	0.17
Adjusted R-squared	0.29	0.37	0.07
F test	5.15	8.09	1.36
Akaike Information Criteria	840.69	331.67	298.30

Note: \*\*\* p<0.01, \*\* p<0.05, \* p<0.1, Robust standard errors. Alberta and Remoteness Index of 1 were omitted.  
Source: Statistics Canada, 2006 Aboriginal Population Profiles and FCPP 2009.

Table 13 shows the estimated impact of governance on the labour market indicators. The estimated models also include variables for education, remoteness, and provincial effects. Good governance has a positive and a significant impact on both the employment and participation rate. A one point increase in the governance index<sup>23</sup> would lead to an increase of 0.54 points in the employment rate and 0.49 points in the participation rate. To put this in perspective, if the worst reserve in terms of governance in the sample reached the level of the best reserve in the sample, then there is a theoretical possibility of increasing its employment rate by 14.7 percentage points and its participation rate by 13.4 percentage points, holding all other factors constant. As expected, better and improved governance also leads to a lower unemployment rate. A one point increase in the governance index would lead to a 0.26 point decrease in the unemployment rate. Again, for the lowest-rated reserve, the unemployment rate could be reduced by 7.1 percentage points if it achieved the score of the best-rated reserve.

As in the previous analysis, education has a statistically significant impact in all three of these models, while the variable for the remoteness index is statistically insignificant. The coefficient for Saskatchewan was negative and significant in the models that have the employment and participation rate as the dependent variable, while Manitoba had a negative effect for the participation rate only. This means

<sup>23</sup> A one point increase in this index could come from a variety of sources. Appendix 5 lists all the questions asked in the survey that was used to construct this index.

that, according to the regression results, reserves in Saskatchewan will have lower employment rates and participations rates than reserves in Alberta, holding the values of the control variables constant. This holds for reserves in Manitoba as well, but only for the participation rate.

**Table 14: Results of the Regression with Economic Outcomes as Dependent Variables, and Including Governance as an Explaining Factor**

	Economic Outcomes	
	GDP per capita	Average Earnings per Employed Worker
Percentage with a diploma, certificate or degree	238.8***	110.1***
Remoteness Index (2)	-25.4	512.7
Governance	188.5**	122.5*
Manitoba	-1,610.2	-1,330.8
Saskatchewan	-5,201.0***	-1,967.4*
Constant	-6,719.8	6,874.4
Number of observations	46	46
R-squared	0.56	0.39
Adjusted R-squared	0.50	0.29
F test	11.32	5.15
Akaike Information Criteria	861.1	840.6

Note: \*\*\* p<0.01, \*\* p<0.05, \* p<0.1, Robust standard errors. Alberta and Remoteness Index of 1 were omitted.  
Source: Statistics Canada, 2006 Aboriginal Population Profiles and FCPP 2009.

Table 14 shows the estimated impact of governance on the economic outcomes of the reserves. The first model uses GDP per capita as the dependant variable. It is found that a one point increase on the governance index leads to an increase of \$189 in GDP per capita (Table 14). As stated earlier, the average score on governance for this sample is 60. Therefore, if the reserves could achieve the score (on average) of the best reserve in the sample (73.2), the result on GDP per capita would be an increase of \$2,495. Obviously, the index used is only one measure of governance, and achieving a perfect system of governance may not be a feasible goal. However, this analysis shows that governance does have a strong association on the economic well-being of reserves. The governance index has a similar effect on average earnings, with a coefficient of \$123, further supporting this conclusion. The increase in earnings by one index point would translate to \$1,624 if the reserves achieved on average the score of the highest scoring reserve. However, the statistical significance level is lower for average earnings, at 10 per cent, compared to 5 per cent for GDP per capita.

In this model, as in the previous analysis, education is found to have a positive impact on both economic outcomes. In particular, GDP per capita would increase by \$239 for each percentage point increase in the percentage of population with a certificate, diploma or degree. For average earnings, the estimated coefficient is somewhat lower, at \$110. The model was also estimated with two education variables instead (high school and university). However, the inclusion of these two variables gave

insignificant results on all the other variables, indicating either problems in the data (from the small sample or high multicollinearity) or that governance is not an important factor.<sup>24</sup>

Using reserves near urban centres as the base case, the variable for Remoteness Index 2 is statistically insignificant in both models. It is therefore impossible to conclude from this model that remoteness has any impact on the well-being of reserves. The provincial effects of Manitoba are statistically insignificant in both models, while the provincial effects of Saskatchewan are negative in both models.

The statistics for this very limited sample show that improving governance on reserves should lead to better economic outcomes and better labour market conditions. However, without better data covering more reserves, it is difficult to draw strong conclusions.

## Instrumental Variables Estimation

Endogeneity occurs when at least one of the independent variables is correlated with the error term of the regression (which captures the effects from all variables not present in the regression equation). It can occur for a variety of reasons, such as measurement error or omitted variables. In this paper, the educational variables could be considered endogenous because the direction of the causation between education and the labour market and economic outcome variables is not clear. This potential endogeneity problem would result in the education variables being correlated with the error term of the regression and would bias the coefficient estimates.

One popular method to correct for endogeneity is to use instrumental variables. This econometric method requires one or more additional variables that are correlated with the endogenous (troublesome) variable, but that do not directly affect the dependent variable. In the case of this paper, the instruments chosen must therefore be correlated with educational attainment, but must not have any direct effect on the labour market and economic variables used as dependent variables.

There are several methods that can be used to estimate an instrumental variables (IV) regression. This report will use the Two-Stage Least Squares (2SLS) estimator.<sup>25</sup> As the name implies, this method consists of two stages. First, the instruments and the other exogenous variables are regressed on the troublesome variable. Then, the fitted values of the troublesome regressor from the first stage are used in the second stage to replace the actual values of that variable. Most statistical packages include the 2SLS estimator.

It can be difficult to prove the validity of an instrument. Furthermore, the choice of the instrument is constrained by the availability of data. In the case of Aboriginal Canadians, not much data are available outside of the Census. The chosen instruments are thus also from the Census, and are related to the knowledge of Aboriginal languages. They are: the percentage of the Aboriginal population that know an Aboriginal language; and the percentage of the Aboriginal population that have an Aboriginal language as their mother tongue.

The main argument behind the selection of these instruments is that communities that have a better grasp of official languages should have a greater percentage of persons with at least a high school

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<sup>24</sup> An example of this problem is included in Appendix 4 (Table 17) for GDP per capita.

<sup>25</sup> For a brief introduction to the theory behind this estimator, see Murray (2006).

diploma. Since most Aboriginal students attend school in French or English, a good knowledge of these languages should correlate with a higher rate of graduation. To use these two proposed variables as instruments, the paper assumes that communities with a greater proportion of the population with knowledge of Aboriginal languages are also communities in which the usage of English or French is rarer, and thus that the ability in these two languages is lower.

There is a great variation in the degree of knowledge of heritage languages. While in some reserves virtually everyone speaks an indigenous language, there are reserves in which no individuals speak the language of their ancestors. In general, reserves that are more remote have a greater percentage of Aboriginal language speakers.

Using the census data, it seems that the hypothesis that educational attainment is negatively correlated with the knowledge of an aboriginal language is plausible. Indeed, the correlation coefficient between the percentage of the population that know an Aboriginal language and the percentage of the population with a certificate, diploma or degree is  $-0.58$ , while the coefficient between the percentage of the population that speak an Aboriginal language as their mother tongue and the same education variable is  $-0.57$ .<sup>26</sup> It was impossible to use the educational attainment variables broken down as in the main section, because it would be impossible to find an instrument for each category. The models have also been tested using the proportion of the population with a university degree, and the proportion with a certificate, diploma or degree from high school, college or university.

Conversely, it is unlikely that the knowledge of an Aboriginal language provides any direct benefit on the labour market, especially for reserves closer to urban centres, which constitute the majority of the sample. A quick look at the data seems to indicate that this hypothesis is reasonable: the correlation coefficients between the language variables and the labour market and economic success variables are between  $-0.25$  and  $0.04$ . Further tests of the validity and strength of the instruments will be presented following the results.

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<sup>26</sup> The two instruments are highly correlated, which could cause problems of multicollinearity in the first stage regression. The model was tested with only one instrument at a time, and the results did not change.

Table 15: Results of Instrumental Variable Regression using Economic Performance Indicators as Dependent Variables

	Economic Outcomes	
	GDP per capita	Average Earnings per Employed Worker
Percentage of the population with at least a certificate, diploma or degree	161.3***	37.5
Remoteness index of 2	660.2	143.2
Remoteness index of 3	1699.4	-481.1
British Columbia	-31.4	-501.1
Manitoba	-3,454.8***	-2,073.5***
New Brunswick	-3164.3	-2631.1
Newfoundland	2,910.5*	-2,287.40
Nova Scotia	-3,699.6**	-2,257.30
Northwest Territories	9,941.6***	7,229.8***
Ontario	811.30	-653.40
Quebec	2,922.4**	415.60
Saskatchewan	-5,285.2***	-2,159.2***
Intercept	8,076.5***	17,949.5***
Number of observations	46	46
R-squared	0.56	0.39
F test	11.32	5.15

Note: \*\*\* p<0.01, \*\* p<0.05, \* p<0.1, Robust standard errors. Alberta and Remoteness Index of 1 were omitted.

First, it's worth noting that with this method the coefficients on the remoteness variables are not significantly different from zero in either of the two regressions above. This seems to indicate that, opposite to the results found in the OLS models, remoteness has no effect on GDP per capita.

The results obtained for educational attainment were also quite different from the results obtained with the OLS regression. In particular, a higher percentage of the population with a certificate, diploma or degree is not associated with higher average earnings. The relation is still present between education and GDP, however, with the coefficient significant at 161.3 (Table 15). This is slightly higher than the coefficient obtained in the OLS regression for high school education only, but less than half the coefficients found on college and university education.

Even though the IV model may be better, it could still be difficult to interpret the findings with a causal relationship, due to omitted variables, for example. In particular, the omitted variables problem is magnified when using an IV method, as the estimation must also be cautious of omitted regressors that are correlated with the instruments that are not present in the OLS equation. We therefore limit ourselves to interpreting the results as correlations. The main advantage of the IV method is that it exposes the bias present in the OLS models.

As a sensitivity analysis, the model was tested with a variable combining the percentage of the population with certificates, diplomas or degrees from high school, college or university (not including trades certificates, or diplomas below the bachelor's degree level in university). Again, a greater percentage of the population with education was not associated with greater average earnings, while the

coefficient in the model with GDP per capita was higher, at 218.1. The coefficients on the remoteness variables were not significantly different from zero. A test was also conducted using only university education at the level of the bachelor's degree or above, but the instrument was found to be weak, and thus the results should be considered unreliable.

**Table 16: Results of Instrumental Variable Regression using Labour Market Performance Indicators as Dependent Variables**

	Labour Market Indicators		
	Participation Rate	Employment Rate	Unemployment Rate
Percentage of the population with at least a certificate, diploma or degree	0.42***	0.35***	-0.07
Remoteness index of 2	1.15	-0.64	2.76*
Remoteness index of 3	4.29	3	-0.01
British Columbia	-2.8	-2.2	1.09
Manitoba	-7.14***	-5.33***	0.08
New Brunswick	-0.35	-3.68	5.01
Newfoundland	13.29	1.63	9.8
Nova Scotia	-8.36**	-5.13	-2.2
Northwest Territories	4.7	2.92	0.52
Ontario	0.19	5.71***	-9.11***
Quebec	0.78	2.96	-3.33
Saskatchewan	-10.94***	-8.34	1.2
Intercept	37.34***	26.49***	28.25***
Number of observations	312	312	312
R-squared	0.538	0.561	0.248
F test	21.02***	23.12***	7.44***

Note: \*\*\* p<0.01, \*\* p<0.05, \* p<0.1, Robust standard errors. Alberta and Remoteness Index of 1 were omitted.

Interestingly, in the unemployment rate regression, the coefficient on the remoteness index of 2 is positive and significantly different from zero, albeit only at the 10 per cent level. This is different from the OLS model, in which the coefficient was not significantly different from zero. In the other two models above, the coefficients on the remoteness variables are not significantly different from zero. In the OLS regressions, positive coefficients were obtained for a remoteness index of 3, both in the participation and employment rates regressions.

The coefficients on the educational attainment variable are significantly different from zero in the models using the participation rate (at 0.42) and the employment rate (0.35) (Table 16). However, the regression finds no relation between the unemployment rate and education. In the OLS model, there was a relationship between the unemployment rate and the percentage of the population with a university degree or college certificate or diploma.

As mentioned earlier, the regressions were also estimated using a combination of high school, college and university education. In this case, the coefficients obtained were only slightly higher than the ones described above using the aggregate (including, for example, trades certificates). In particular, the

coefficient on this educational variable was 0.47 using the employment rate as a dependent variable and 0.57 using the participation rate (both significant at the 1 per cent level). In this model, there was a positive and significant relationship (at the 5 per cent level) between a remoteness index of 2 and the unemployment rate, with a coefficient of 2.78.

It is possible to test for the validity and strength of the instruments used. For every model estimated, a test of over-identifying restrictions was conducted. This test is often used to determine whether instruments are valid or not. While this test alone does not allow for an unequivocal validation of the instruments, it does help in proving their validity when combined with other measures. In particular, this test assumes that at least one instrument is valid. The null hypothesis of this test is that all instruments are valid; therefore, if the null hypothesis is not rejected, it provides credibility to the model. This test was successfully passed in every specification, as the null hypothesis was never rejected.<sup>27</sup> A problem with this test is that it is more useful when the various instruments rely on different rationales (Murray, 2006). Therefore, further research should look at additional and different instruments.

Another concern when estimating an instrumental variable model is that the instruments can be weak. This occurs when the instruments are poorly correlated with the endogenous variable. This can lead to a larger bias in the estimates, and confidence intervals that are too narrow. As was already mentioned above, the correlation between the language variables and the percentage of the population with a certificate, degree or diploma is high. The correlation is also high (about -0.56) between the language variables and the percentage of the population with a certificate, diploma or degree from high school, college or university. However, when considering university degrees alone, the correlation is much lower (at about -0.23). Therefore, the first-stage regressions were estimated along with a test to determine if the instruments are weak.

The null hypothesis of the test (Stock and Yogo, 2005) is that the instruments are weak. In the models with all certificates, diplomas or degrees, or with a combination of high school, college and university only, the instruments were not found to be weak, as the null hypothesis was rejected. However, in the model using university degrees, the null hypothesis could not be rejected, and thus the instrument could be weak. Therefore, the coefficients obtained by using university education in the model could be biased and could be considered statistically significant when in fact they are not.

These results indicate that the coefficients obtained by using all types of education are the most relevant. They are also similar to those found using high school, college or university only. In comparison to the OLS results, the Instrumental Variable approach finds that average earnings are not related to educational attainment,<sup>28</sup> and that the remoteness variables have no significant relationships with the dependent variables, except in one case (rural/remote reserves have higher unemployment rates than urban reserves).

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<sup>27</sup> The p-values of the tests were between 0.50 and 0.99, except for the models using average earnings, in which the p-values were much lower (between 0.20 and 0.30). This could indicate that the validity of the instrument is lower in the models using the average earnings of the reserve as the dependent variable. Detailed results are available from the authors.

<sup>28</sup> A regular OLS regression using the same combined educational attainment variable shows that there is a positive relationship between a higher proportion of the population with formal education and the average earnings on the reserve. In the IV regression, this relationship has disappeared.

The main difference between the OLS results and the instrumental variable results is that in the latter results the remoteness variables have no statistically significant impacts on reserve labour market or economic performance. This shows that the OLS regressions are potentially biased. Thus, the finding that being a special access reserve has beneficial impacts on many of the dependent variables, once differences in educational attainment and province are controlled for, is questionable. More analysis needs to be done before any firm conclusions can be made concerning the conditional effects of remoteness on the labour market and economic performance indicators studied here.

## VII. Conclusion

The goal of this report was to understand the nature and magnitude of the relationship between the remoteness of reserves and the educational attainment, labour market indicators, and economic outcomes of the Aboriginal population residing on Indian reserves. It did so by analyzing reserve-level data from the 2006 Census on 312 reserves across Canada. This dataset allowed the paper to include geographical variables in the analysis.

Descriptive statistics have shown that the living conditions on reserves are much worse than in the rest of the country. In particular, almost all reserves have a higher unemployment rate, a lower participation rate, and a lower employment rate than the Canadian average. Also, average annual earnings and GDP per capita were lower than the Canadian average on all reserves. Educational attainment is also much lower on reserves than in Canada overall. From this starting point, the report analyzed the reserve-level data to find ways to increase the well-being of reserves. This report has tried to answer four main questions, as mentioned in the introduction:

1. Is a higher level of educational attainment for the Aboriginal population residing on reserves associated with, on average, higher labour market participation and employment rates, as well as lower unemployment rates?
2. Is a higher level of educational attainment for the Aboriginal population residing on reserves associated with greater average earnings for these individuals and greater GDP per capita for these reserves?
3. How does the remoteness of a reserve affect the relationship between educational attainment and the labour market and economic outcomes on reserves?
4. How does the quality of reserve governance affect the economic and labour market performance of the reserve?

Table 17: Summary of Regression Results for Five Dependent Variables (Estimated Coefficients)

Independent Variables	Participation rate in 2006	Employment rate in 2006	Unemployment rate in 2006	Average Annual Earnings per Employed Worker (2005 dollars)	GDP per capita (2005 dollars)
Percentage with High School Diploma as Highest Educational Attainment	0.34	0.33	-	84.29	114.95
Percentage with Trades certificate or diploma as Highest Level of Education	0.48	0.38	-	-	-
Percentage with College certificate or diploma as Highest Level of Education	0.65	0.62	-0.27	161.52	360.23
Percentage with University certificate or diploma below the bachelor's degree as Highest Level of Education	-	-	-	-	-
Percentage with University Bachelor's Degree or above	-	0.52	-0.81	304.52	372.96
Remoteness Index (2)	-	-	-	-	1,233.46
Remoteness Index (3)	5.61	5.69	-	-	2,750.13
Governance Index	0.49	0.54	-0.26	122.5	188.5

Note: "-" means that no significant effect was found, therefore no conclusion can be drawn about these relationships. Governance Index coefficients were estimated using separate regressions on a smaller sub-sample.

The report found that at the reserve level, a higher level of educational attainment was associated with higher labour market participation rate and employment rate, and a lower unemployment rate. The correlation between the education and labour market variables was clear: higher educational attainment is associated with better labour market success. This conclusion was reinforced by the results of the regression analysis, as highlighted in Table 17. A one point increase in the percentage of the population with a high school diploma (as their highest level of education) increases the participation rate by 0.34 points (holding all else constant), the employment rate by 0.33 points, but had no effect on the unemployment rate. The relationship was even stronger with university education. Indeed, a one point increase in the percentage of population with a bachelor's degree (complemented by a one point decrease in those who have not completed high school) would increase the employment rate by 0.52 points and reduce the unemployment rate by 0.81 points. College education is also associated with higher participation rates (0.65 points) and employment rates (0.62 points), as well as lower unemployment rates (0.27 points). Considering the low educational attainment of Aboriginal Canadians on reserves, the potential for improvement in labour market outcomes is large if educational attainment increases, assuming that the improvements in education drive improvements in labour market conditions and not the other way around.

The answer to the second question is also positive: higher educational attainment is associated with higher average earnings and GDP per capita. An increase of one point in the percentage of the population with only a high school diploma would increase the average earnings of the reserve by \$84 and its GDP per capita by \$115. The effect of university education at the bachelor's degree level or above is greater. Indeed, an increase of one point in this indicator could increase average earnings by \$305 and GDP per capita by \$373. The current gap in university education (bachelor's degree or above) between

on-reserve Aboriginal and the other Canadians is 15.2 percentage points. If Aboriginal Canadians on reserves would reach the educational attainment of Non-Aboriginal Canadians, and have a similar percentage of their population with completed university degree, it could translate into an increase of \$5,670 in the GDP per capita on reserves (holding everything else constant).<sup>29</sup> This makes the strong assumption that improvements in education drive improvements in average earnings and GDP per capita.

As mentioned earlier in the report, geographical isolation can contribute to low average educational attainment. Educational attainment on reserves is low on average, but it was shown that long distance to urban centres may directly and indirectly exacerbate the barriers to quality education. This was also observed in the data. Remote/rural reserves connected to service centres have a lower average educational attainment than reserves near urban centres, while special access reserves have the lowest average educational attainment.

Remoteness can also affect the labour market and economic outcomes of reserves. In particular, it is believed that the remoteness of a reserve acts as an impediment in the development of a robust labour market. The limited labour market opportunities as a result of remoteness not only results in low completion rates for secondary and post-secondary education, but also deprives the reserve of the most skilled workers who migrate to urban centres in search of better opportunities.

An interesting observation from the analysis in this report was the higher employment and participation rates in the special access reserves compared to the rural and remote reserves. Special access reserves, on average, also benefit from higher GDP per capita than some less remotes reserves despite their much lower average educational attainment. The regression estimates also confirm these findings, with positive coefficients for the special access reserves. These positive coefficients indicate that, controlling for education and province, special access reserves have higher participation and employment rates and higher GDP per capita than reserves close to urban centers and rural/remote reserves.

Finally, the report analyzed the effect of governance structures on the well-being and labour market conditions of reserves. It was found that better governance increased the employment rate and the participation rate, decreased the unemployment rate, and increased average earnings and GDP per capita. These findings were estimated using only a small sub-sample of the data.

The analysis and the discussion in this report clearly show the positive impact of educational attainment and highlight its influence on labour force indicators and economic outcomes in the light of a key barrier, namely remoteness. Further research should be conducted to test the robustness of the relationship explored in this paper between education and economic and labour market outcomes with a larger data set that has information on a greater number of reserves.

A better indicator of remoteness could also provide a better understanding of the role of this variable in determining educational attainment and labour market outcomes. The indicator used in this analysis was based on the distance to a service centre, while not taking into account the size of that centre. While some reserves may be situated close to a larger city, others may only be close to a small town. Further work on this subject is also needed to understand the paradox of special access reserves (higher employment rates and lower unemployment rates). Finally, an expanded index of governance quality, in

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<sup>29</sup> Note that this number is meant to illustrate the order of magnitude of the estimated coefficients. More advanced models, and possibly better data would be needed to prove without doubts that there is a causal effect between average education and GDP per capita on reserves.

terms of both greater coverage of reserves and improved survey design, is desirable to allow researchers to explore its effect on well-being.

Further work should also include additional control variables. The mobility of Aboriginal workers on reserves, both in terms of commuting (working off-reserve while living on reserve) and in terms of moving permanently should be explored. Data on these indicators are available from the Census, and could be tabulated at the reserve level and included in the research.

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## Appendix 1: General Approach to Estimating Gross Domestic Product for Reserves

There are two main approaches to estimating Gross Domestic Product. These are the expenditure-based approach and the income-based approach. Based on the data available for on-reserve population, particularly at the community-level, the latter approach is the more practicable one, for the purposes of this report. Under the standard income-approach of estimating GDP, five sources of private and public sources of income are summed. These are: (i) rents, (ii) interest income, (iii) profits of corporate and unincorporated businesses and dividends, (iv) wages and salaries (and security benefits), (v) corporate income taxes and taxes less subsidies on production and imports. While it is not the only component, employment income is an important element of GDP. In 2005, total earnings of the general population accounted for 48 per cent of national GDP. It follows that key determinants of aggregate earnings in a given year play an important role in the shaping the GDP statistics for that year.

The main assumption behind the estimation procedure for on-reserve GDP by province and territory is that the share of total earnings in GDP for the general population at the national level is the same as the share of total reserve earnings in reserve GDP at the national, provincial/territorial and reserve level.

It is important to note that this assumption means that a dollar of employment income earned by an average Aboriginal person residing on a reserve is associated with as much economic activity as a dollar earned by an average individual in Canada. Implicit in this assertion is the assumption that a unit of labour generates equal value added anywhere in Canada (e.g. on and off reserve). That is, the population residing on and off reserves is assumed to share equally in the rents and profits from production.

This estimation technique can yield overestimates of reserve GDP in some cases and underestimates in others. For example, differences in government subsidies, support to businesses, and transfer programs specific to private businesses operating on and off reserves would generate either overestimates or underestimates of GDP for reserves. In a province/territory where the Aboriginal identity population residing on reserves tends to work off-reserve, the GDP estimates for reserves in this province/territory would be overestimated, holding all else constant. At the same time, the non-Aboriginal population (approximately 10 per cent of the total reserve population) that is residing and working on reserves generates economic activity that is not included in the GDP estimates. Exclusion of this economic activity results in an underestimation of reserve GDP, holding all else constant. It is also important to note that these considerations can partially offset each other.

The general methodology used to derive GDP estimates can be summarized as follows:

1. Total earnings for the on-reserve Aboriginal population were obtained from Census data at the provincial/territorial or reserve level;
2. The share of total earnings in GDP at the national level was then calculated based on total earnings for the general population and Canadian GDP in 2005;
3. Assuming that earnings represent a good proxy for economy wide value-added, total earnings associated with the Aboriginal population residing on reserves in a given geographical area (a reserve, province/territory or Canada) was divided by the share of

total earnings in GDP at the national level, in order to obtain reserve GDP at the level of the reserve, province and territory, and for the country as a whole.

In addition to the limitations presented by the issue of data availability, two main analytical caveats arise from this general approach to obtaining estimates of reserve-specific GDP. These are:

1. The analysis does not control for on-reserve/off-reserve place of work as it relates to the Aboriginal population residing on reserves;
2. Estimates of GDP presented in this report are earnings-based and only account for profits, rents and other elements of the income-based approach to measuring GDP (otherwise known as Gross Domestic Income) by assuming that the share of these components in GDP is identical for all reserves in Canada and equal to the national share of these components in total GDP.

## Appendix 2: Medians, Standard Deviations and Ranges for Levels of Education Attainment, Labour Market Indicators, and GDP per capita, by Reserve Remoteness, 2006

	Median	Standard Deviation	Min	Max
<b>Urban (1)</b>				
Participation rate in 2006 Census Reference week (%)	57.80	10.24	26.70	76.00
Employment rate in 2006 Census Reference week (%)	44.30	10.72	20.20	66.30
Unemployment rate in 2006 Census Reference week (%)	22.73	9.43	7.09	55.20
Average Annual Earnings in 2005 (2005 dollars)	18,947	3,764.48	9,404.00	30,050.00
GDP per capita (2005 dollars)	15,410	5,761.65	3,314.59	34,316.79
Percentage of the on-reserve population with at least a high school certificate in 2006 (%)	53.80	14.26	17.46	76.92
Percentage of the on-reserve population with a high school certificate or equivalent in 2006 (%)	16.46	5.93	4.08	31.58
Percentage of the on-reserve population with a university certificate or degree in 2006 (%)	3.74	2.59	0.00	14.29
<b>Rural (2)</b>				
Participation rate in 2006 Census Reference week (%)	50.00	11.39	17.30	79.30
Employment rate in 2006 Census Reference week (%)	34.50	9.93	14.30	61.80
Unemployment rate in 2006 Census Reference week (%)	28.10	8.91	10.34	57.66
Average Annual Earnings in 2005 (2005 dollars)	17,338	4,058.02	11,452.00	35,956.00
GDP per capita (2005 dollars)	11,306	5,551.91	2,046.55	36,499.00
Percentage of the on-reserve population with at least a high school certificate in 2006 (%)	37.84	12.67	11.94	71.76
Percentage of the on-reserve population with a high school certificate or equivalent in 2006 (%)	15.38	5.18	4.48	31.13
Percentage of the on-reserve population with a university certificate or degree in 2006 (%)	2.78	2.39	0.00	12.94
<b>Remote (3)</b>				
Participation rate in 2006 Census Reference week (%)	61.80	18.43	21.60	72.30
Employment rate in 2006 Census Reference week (%)	51.10	16.36	19.60	64.70
Unemployment rate in 2006 Census Reference week (%)	16.05	7.74	9.22	33.32
Average Annual Earnings in 2005 (2005 dollars)	20,427	5,240.27	11,628.00	27,005.00
GDP per capita (2005 dollars)	22,784	8,593.45	8,514.33	30,096.98
Percentage of the on-reserve population with at least a high school certificate in 2006 (%)	34.55	11.30	17.65	50.60
Percentage of the on-reserve population with a high school certificate or equivalent in 2006 (%)	9.90	6.29	3.64	23.53
Percentage of the on-reserve population with a university certificate or degree in 2006 (%)	2.73	1.22	0.00	3.92
<b>Special Access (4)</b>				
Participation rate in 2006 Census Reference week (%)	47.70	11.34	25.20	75.00
Employment rate in 2006 Census Reference week (%)	37.50	11.59	17.00	71.90
Unemployment rate in 2006 Census Reference week (%)	23.64	11.53	0.00	66.70
Average Annual Earnings in 2005 (2005 dollars)	17,230	3,864.49	9,353.00	27,199.00
GDP per capita (2005 dollars)	13,672	5,575.44	5,065.53	27,364.04
Percentage of the on-reserve population with at least a high school certificate in 2006 (%)	21.21	10.78	2.17	46.15
Percentage of the on-reserve population with a high school certificate or equivalent in 2006 (%)	9.38	5.00	3.03	23.58
Percentage of the on-reserve population with a university certificate or degree in 2006 (%)	1.75	1.79	0.00	6.25

Source: Statistics Canada, 2006 Aboriginal Population Profiles.

## Appendix 3: Scatter Diagrams

Chart 7: Percentage of the Aboriginal population aged 15 and older residing on a given reserve with a certificate, diploma or degree in 2006 and reserve-specific GDP per capita for 2005, Canada

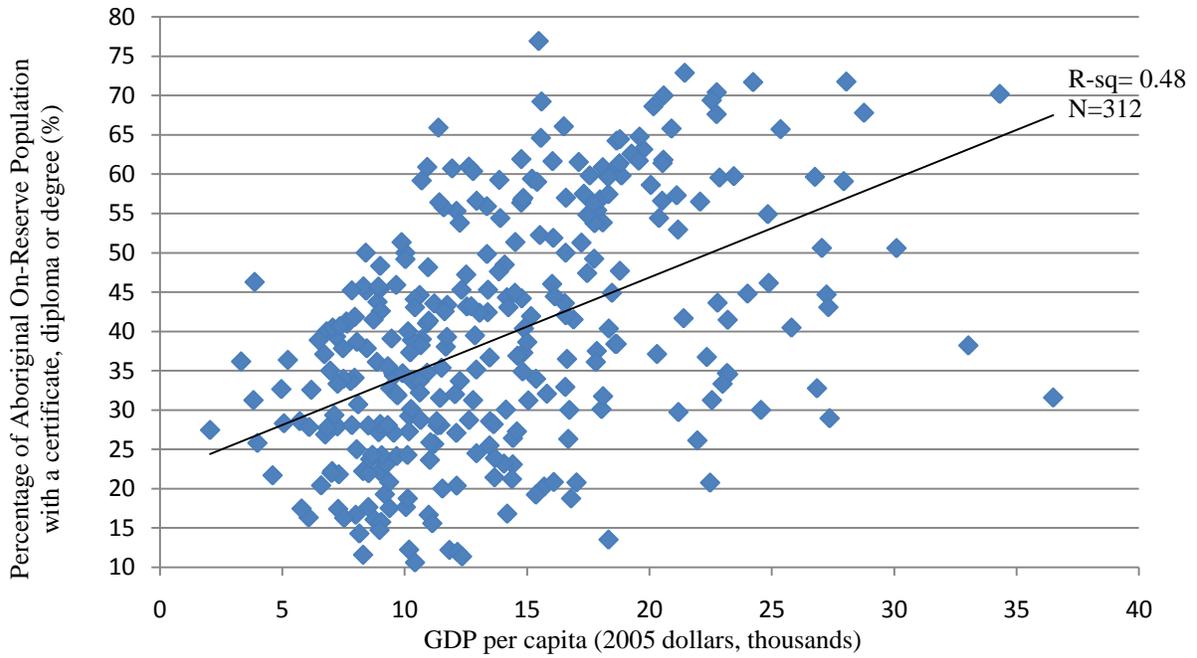


Chart 8: Percentage of the Aboriginal population aged 15 and older residing on a given reserve with a high school certificate or equivalent in 2006 and reserve-specific GDP per capita for 2005, Canada

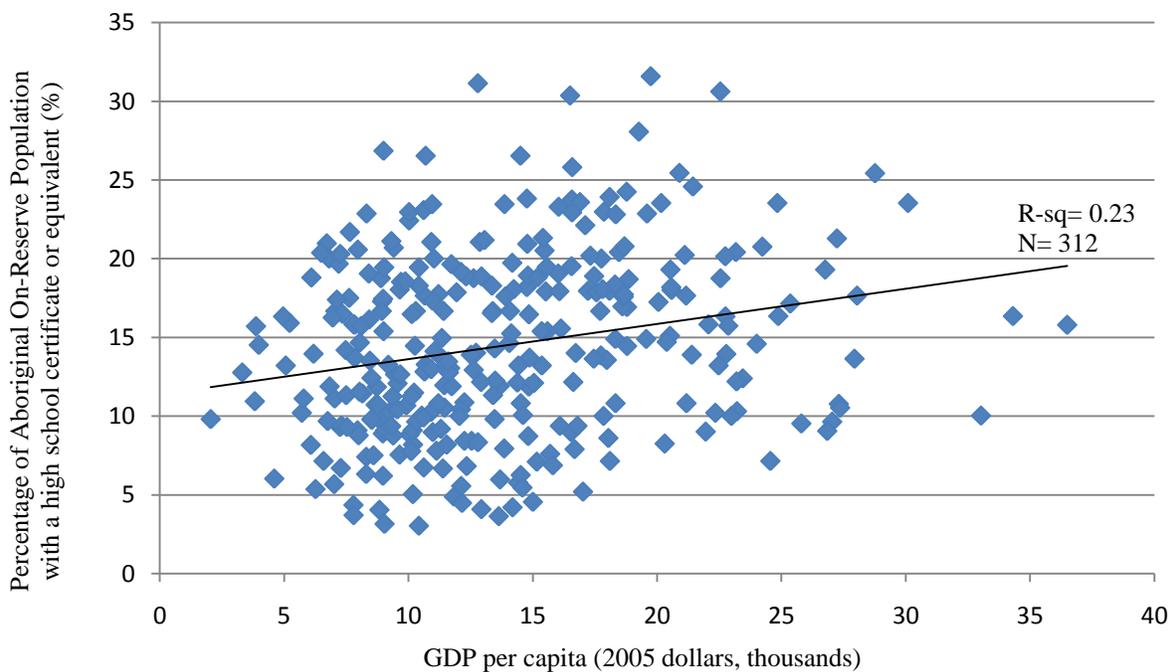


Chart 9: Percentage of the Aboriginal population aged 15 and older residing on a given reserve with a university certificate or degree in 2006 and reserve-specific GDP per capita for 2005, Canada

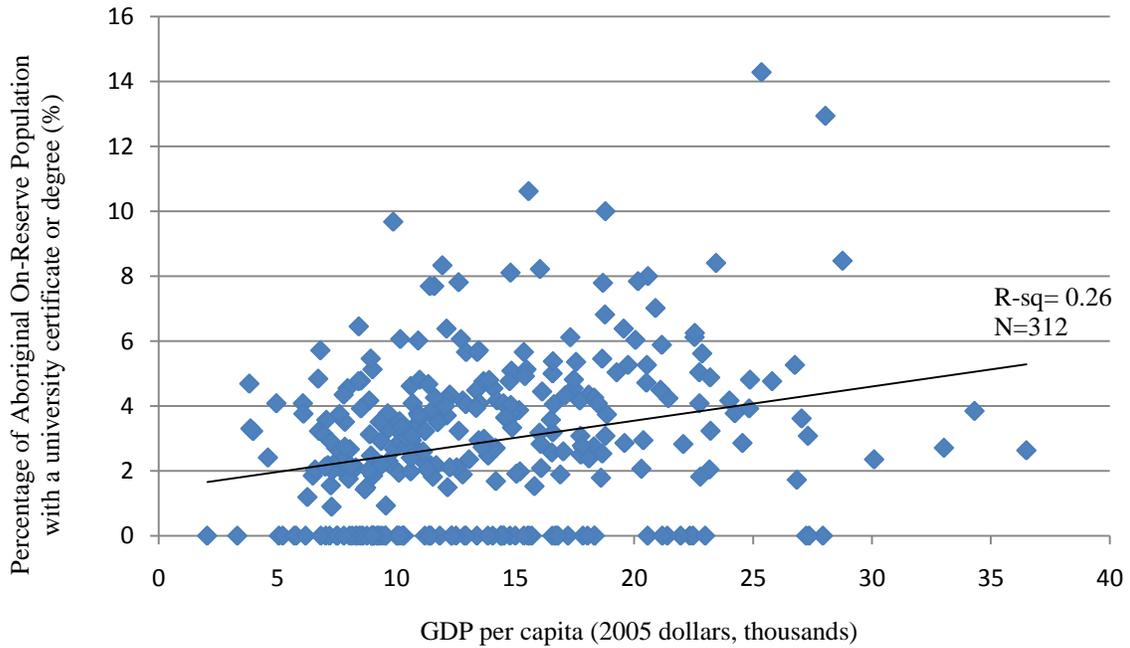


Chart 8: Percentage of the Aboriginal population aged 15 and older residing on a given reserve with a certificate, diploma or degree in 2006 and average annual earnings for the reserve in 2005, Canada

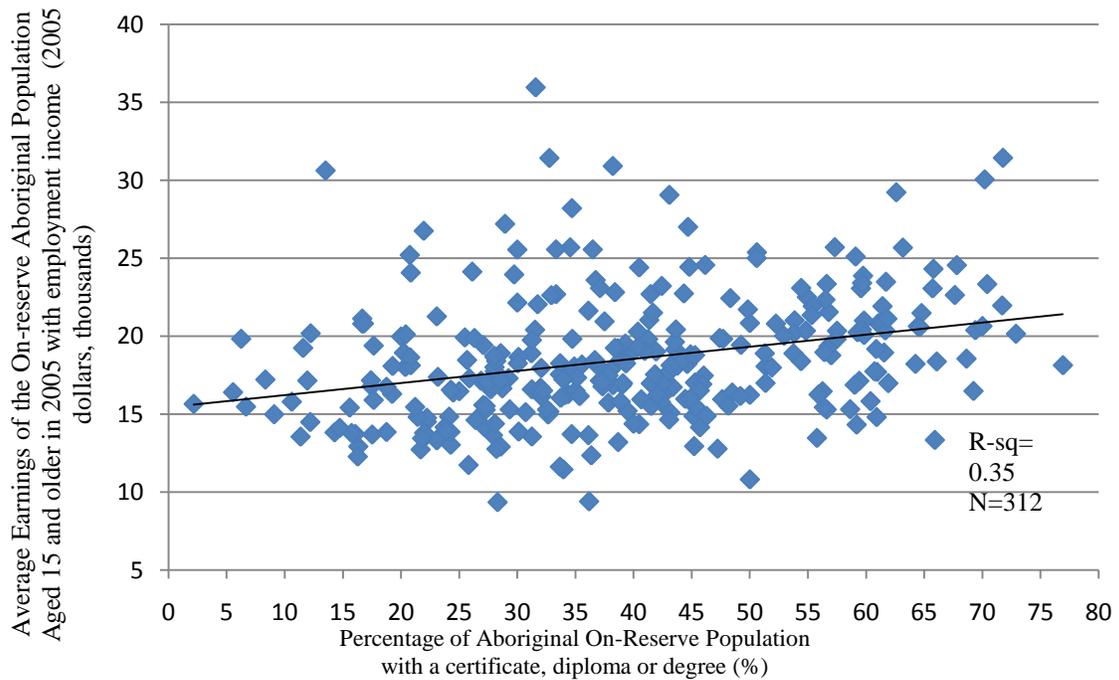


Chart 9: Percentage of the Aboriginal population aged 15 and older residing on a given reserve with a high school certificate or equivalent in 2006 and average annual earnings for the reserve in 2005, Canada

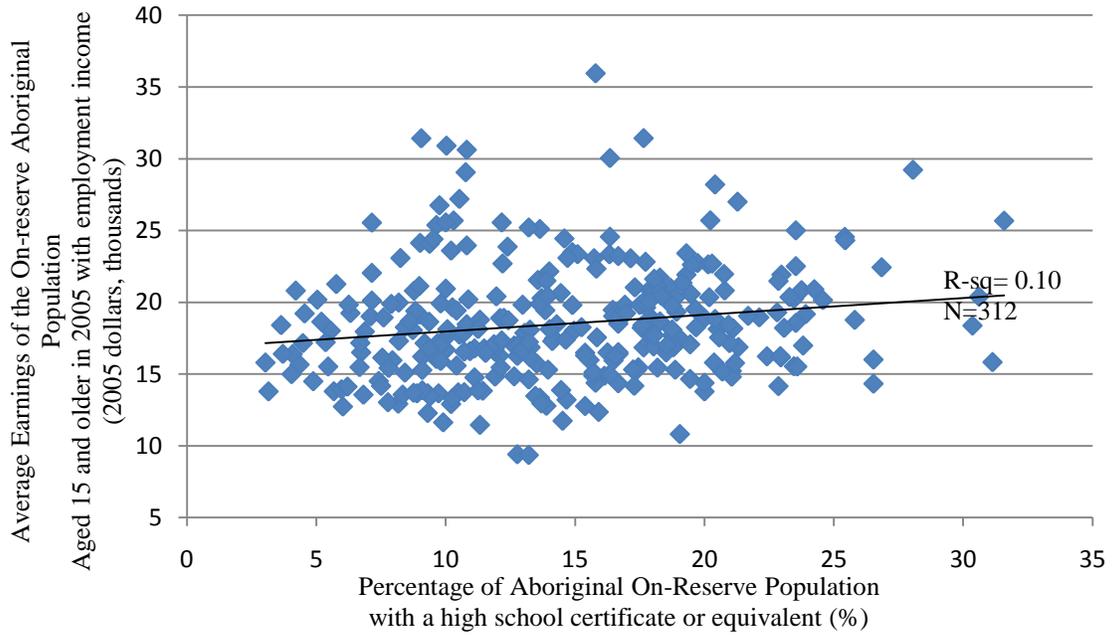


Chart 10: Percentage of the Aboriginal population aged 15 and older residing on a given reserve with a university certificate or a degree in 2006 and average annual earnings for the reserve in 2005, Canada

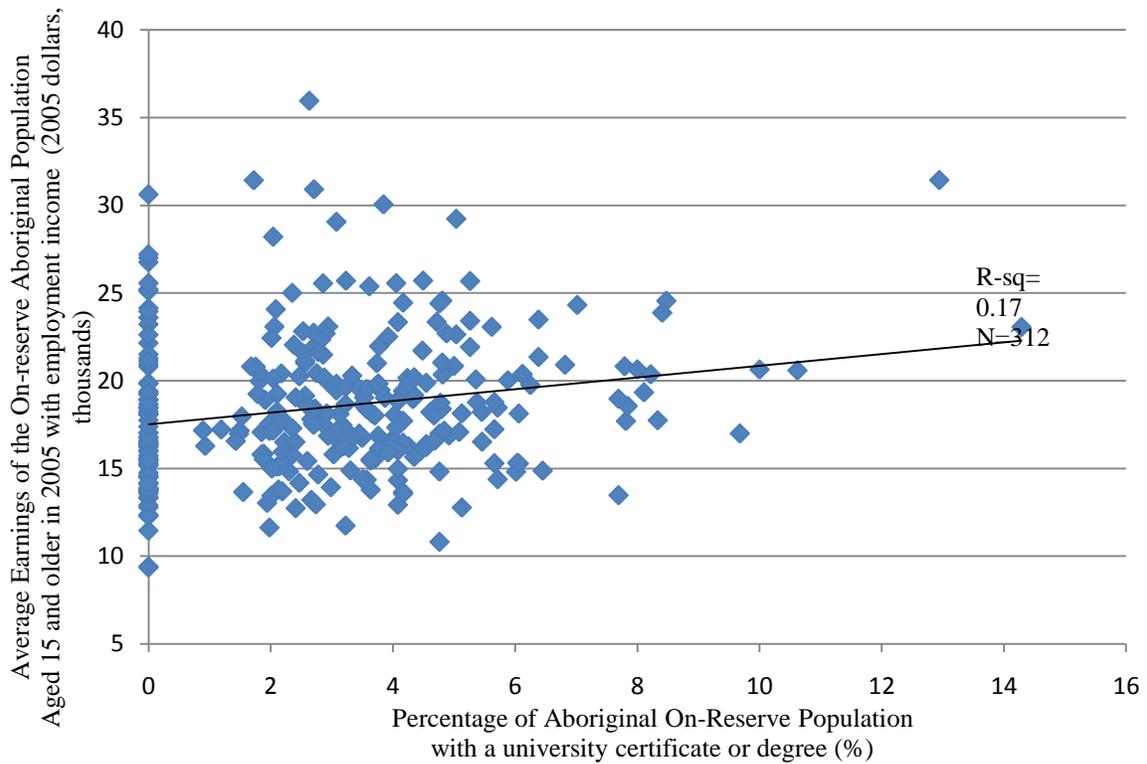


Chart 11: Participation Rate for the On-reserve Aboriginal Population Aged 15 and older in 2006 Census Reference Week and Percentage of Aboriginal On-Reserve Population Aged 15 and older with a certificate, diploma or degree

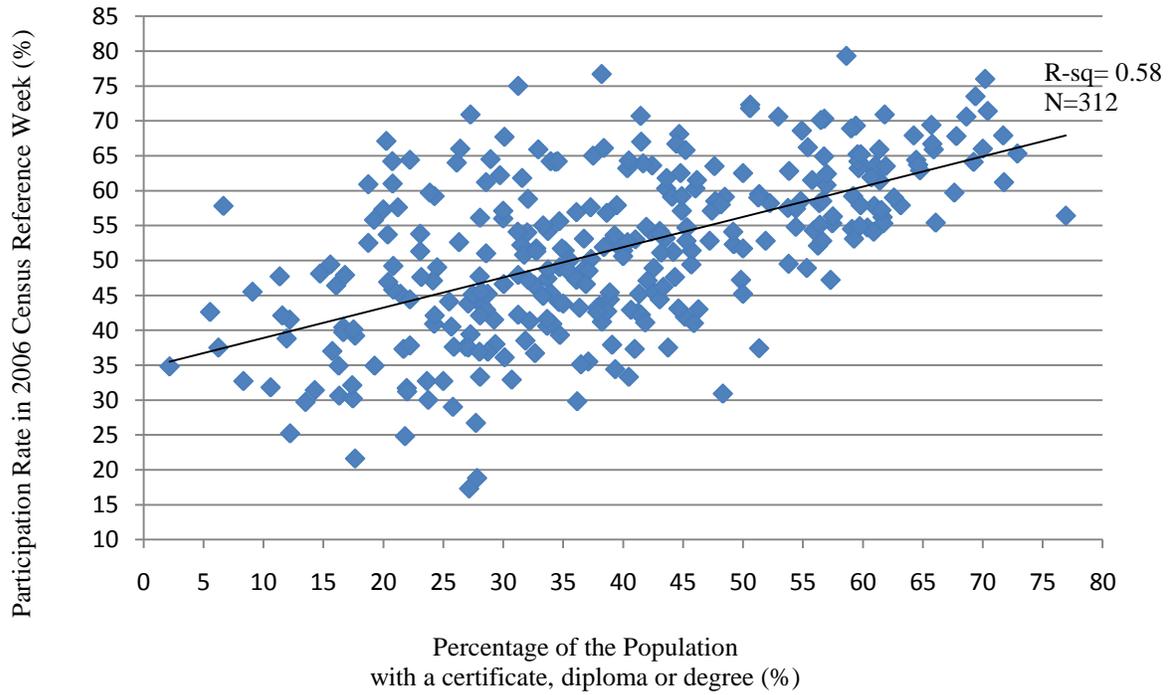


Chart 10: Participation Rate for the On-reserve Aboriginal Population Aged 15 and older in 2006 Census Reference Week and Percentage of Aboriginal On-Reserve Population Aged 15 and older with a high school certificate or equivalent

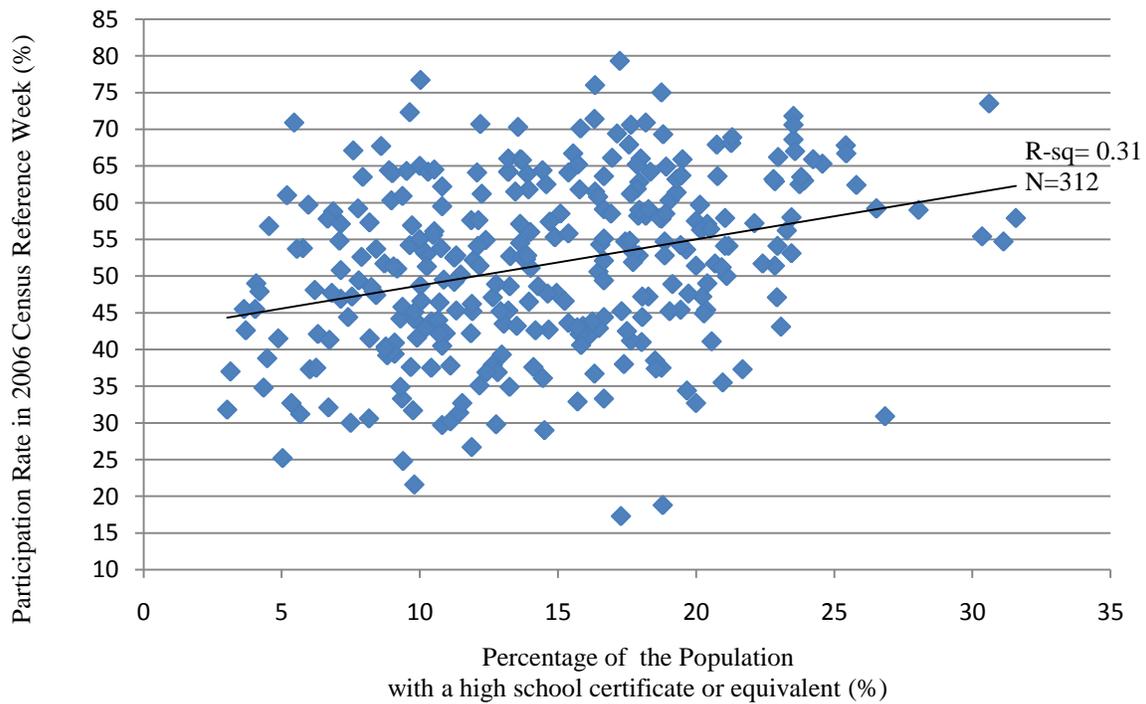


Chart 11: Participation Rate for the On-reserve Aboriginal Population Aged 15 and older in 2006 Census Reference Week and Percentage of Aboriginal On-Reserve Population Aged 15 and older with a university certificate or degree

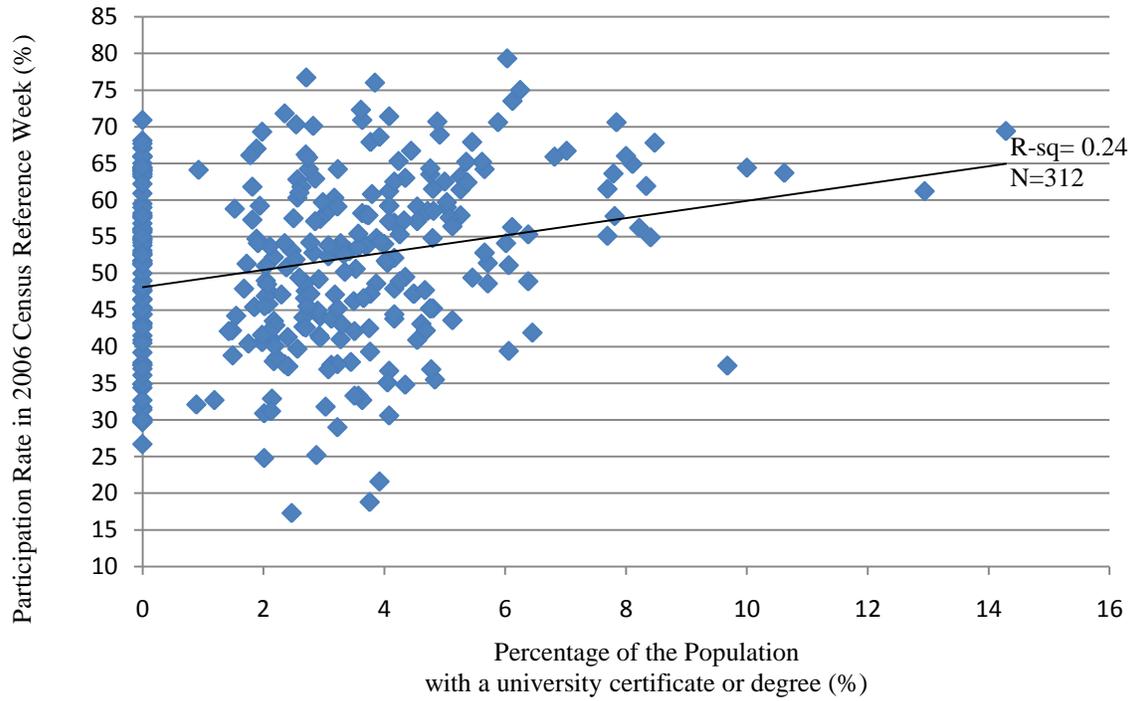


Chart 12: Employment Rate for the On-reserve Aboriginal Population Aged 15 and older in 2006 Census Reference Week and Percentage of Aboriginal On-Reserve Population Aged 15 and older with a certificate, diploma or degree

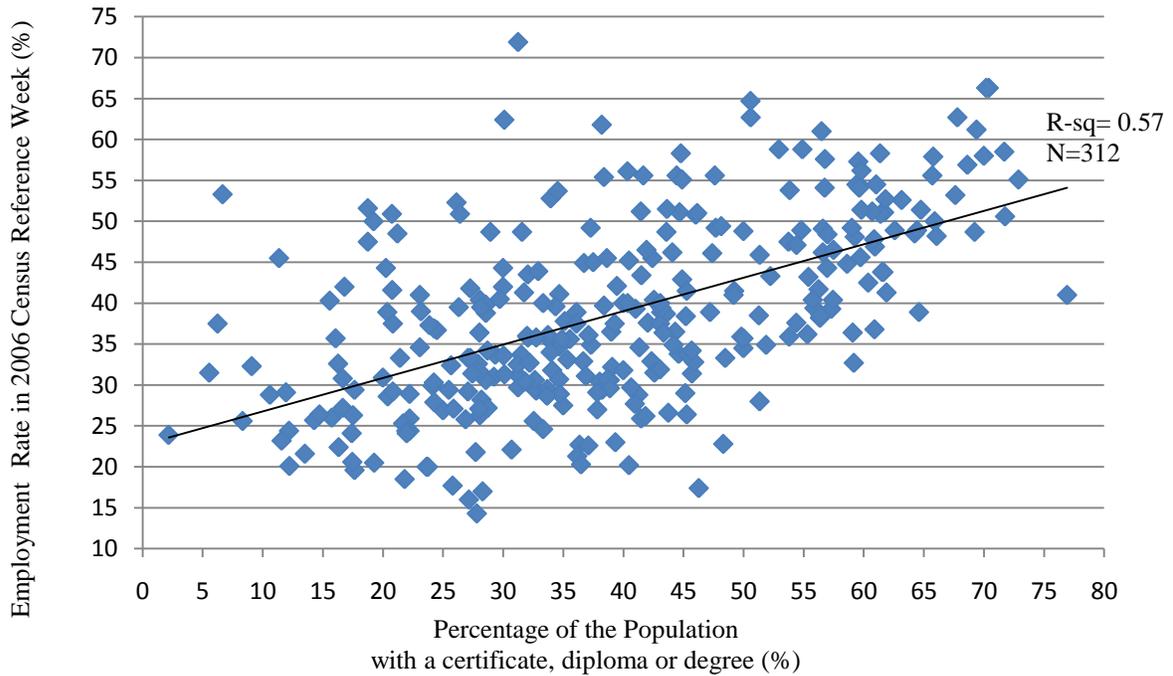


Chart 13: Employment Rate for the On-reserve Aboriginal Population Aged 15 and older in 2006 Census Reference Week and Percentage of Aboriginal On-Reserve Population Aged 15 and older with a high school certificate or equivalent

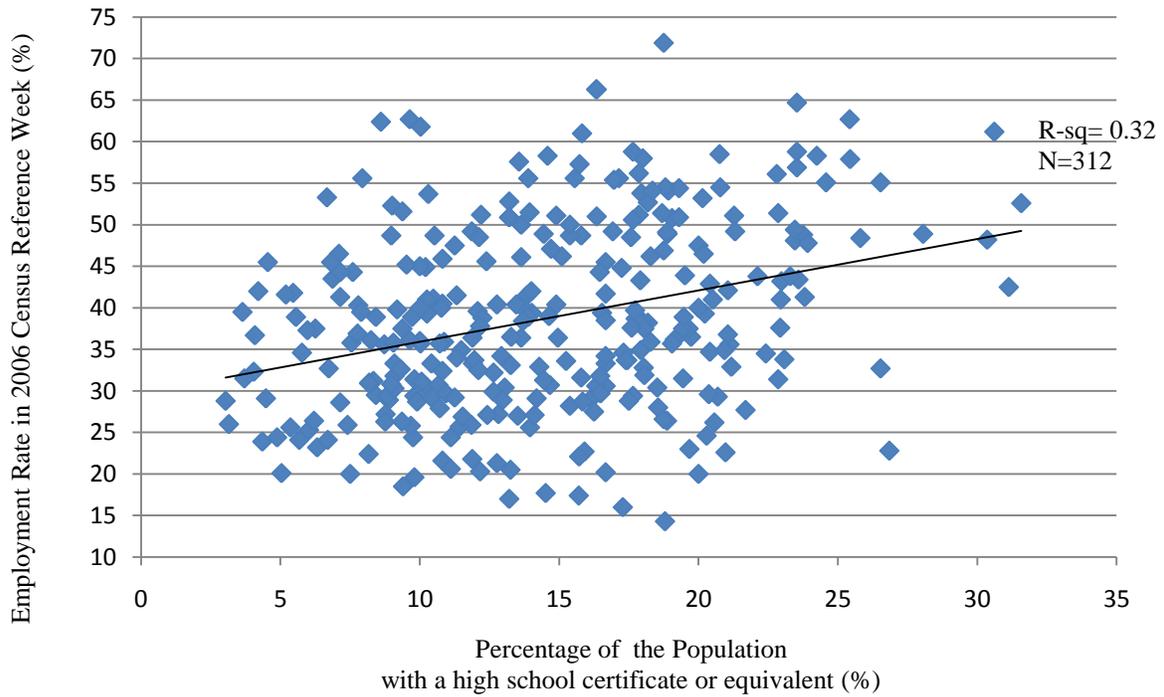


Chart 14: Employment Rate for the On-reserve Aboriginal Population Aged 15 and older in 2006 Census Reference Week and Percentage of Aboriginal On-Reserve Population Aged 15 and older with a university certificate or degree

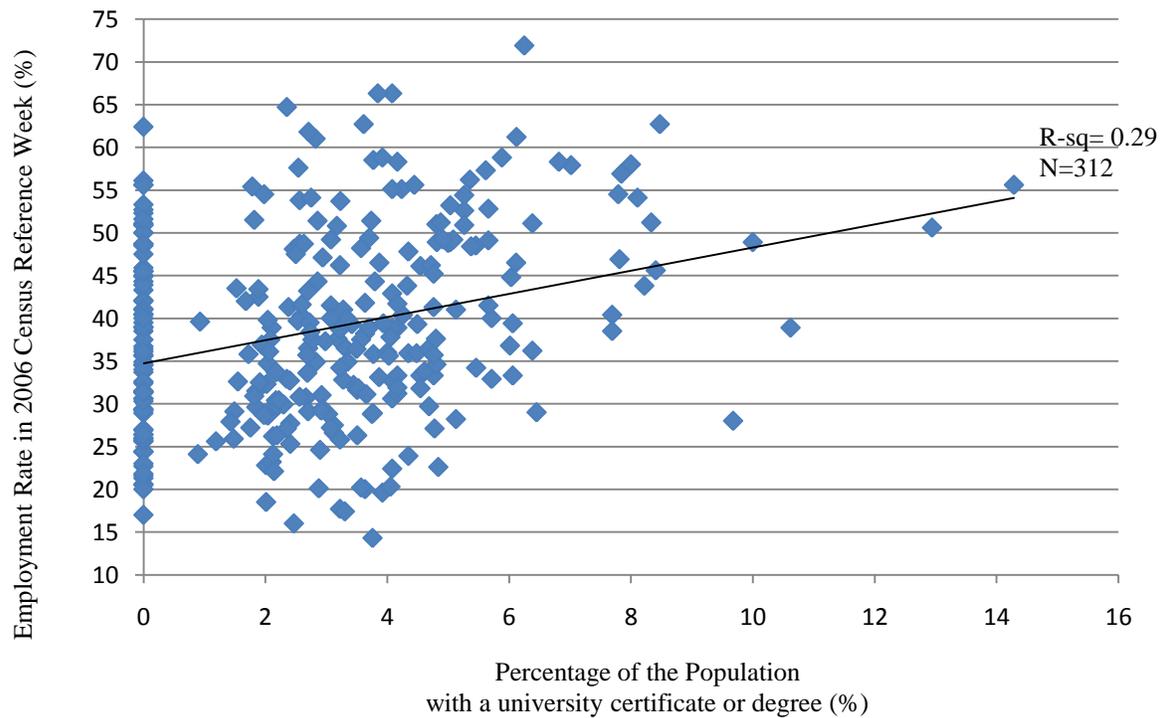


Chart 15: Unemployment Rate for the On-reserve Aboriginal Population Aged 15 and older in 2006 Census Reference Week and Percentage of Aboriginal On-Reserve Population Aged 15 and older with a certificate, diploma or degree

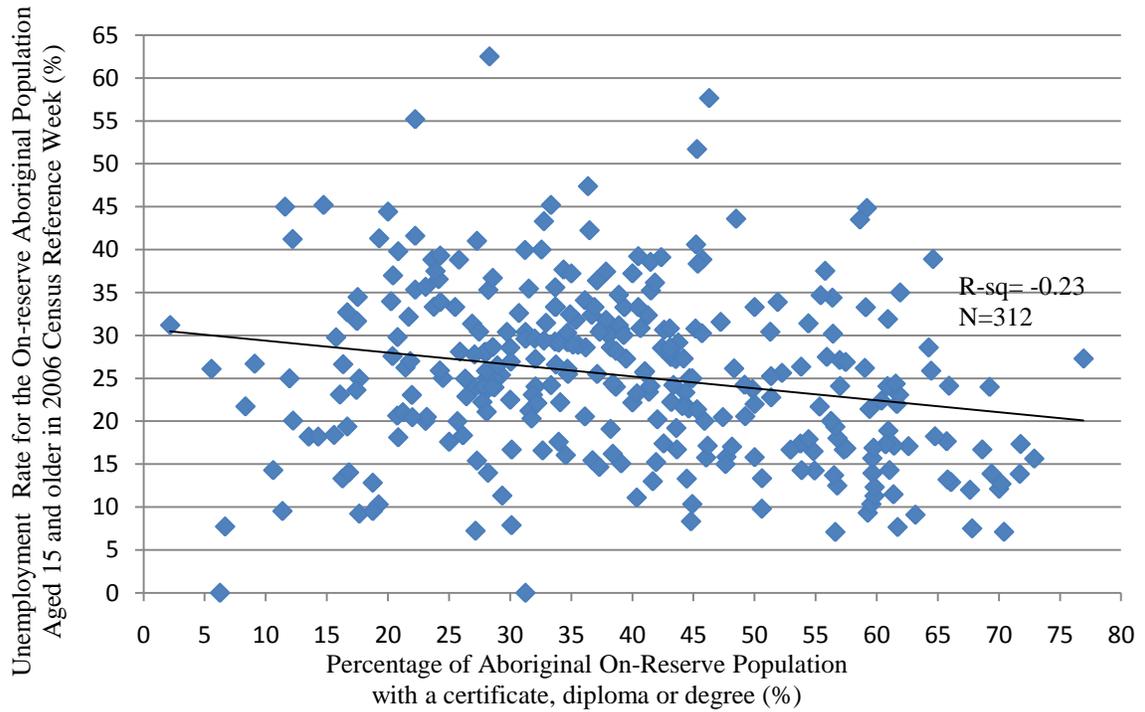


Chart 16: Unemployment Rate for the On-reserve Aboriginal Population Aged 15 and older in 2006 Census Reference Week and Percentage of Aboriginal On-Reserve Population Aged 15 and older with a high school certificate or equivalent

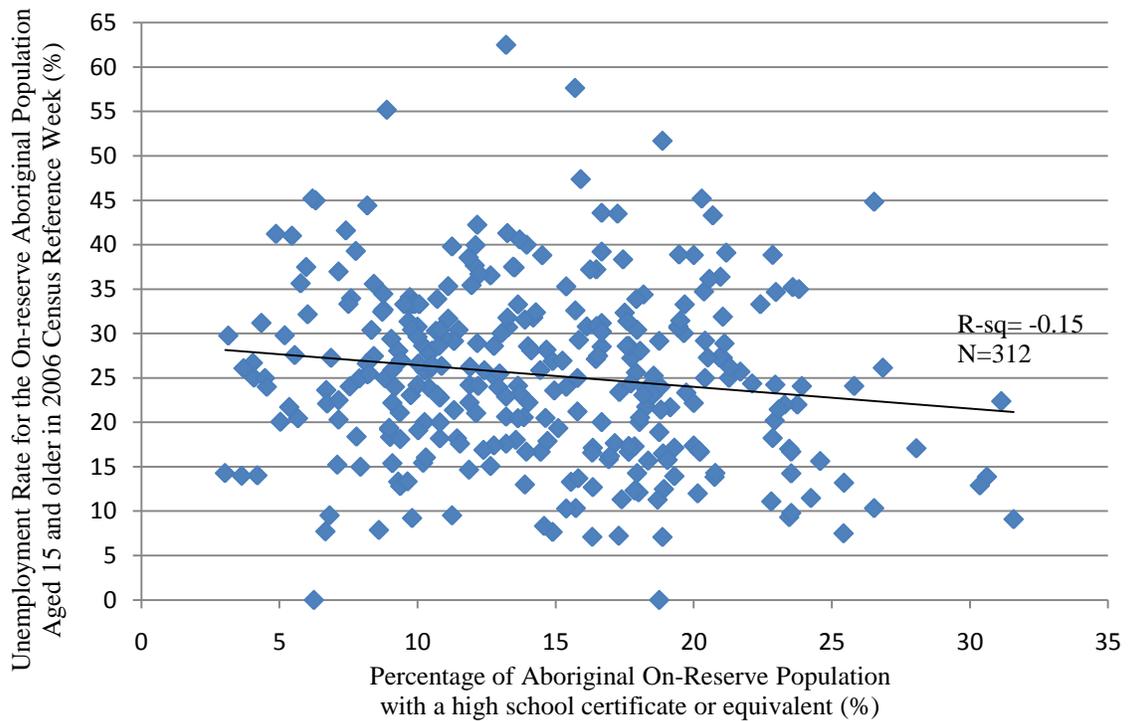


Chart 17: Unemployment Rate for the On-reserve Aboriginal Population Aged 15 and older in 2006 Census Reference Week and Percentage of Aboriginal On-Reserve Population Aged 15 and older with a university certificate or degree

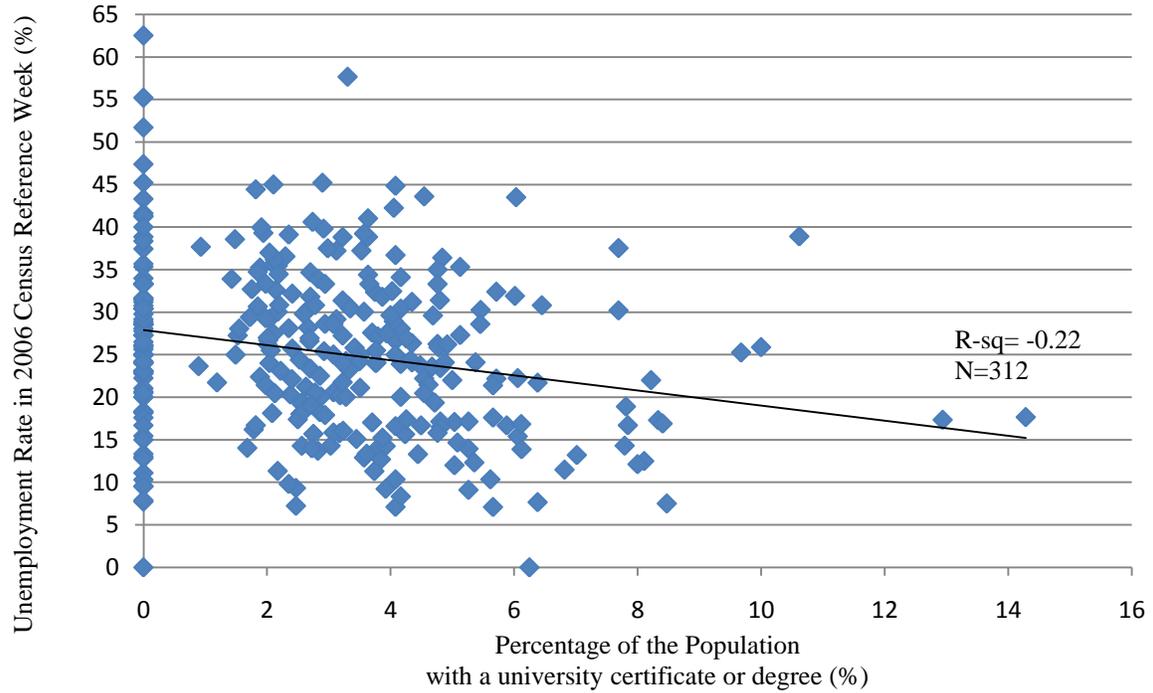


Chart 17: Participation Rate for the On-reserve Aboriginal Population Aged 15 and older in 2006 Census Reference Week and Percentage of Aboriginal On-Reserve Population Aged 15 and reserve-specific GDP per capita for 2005, Canada

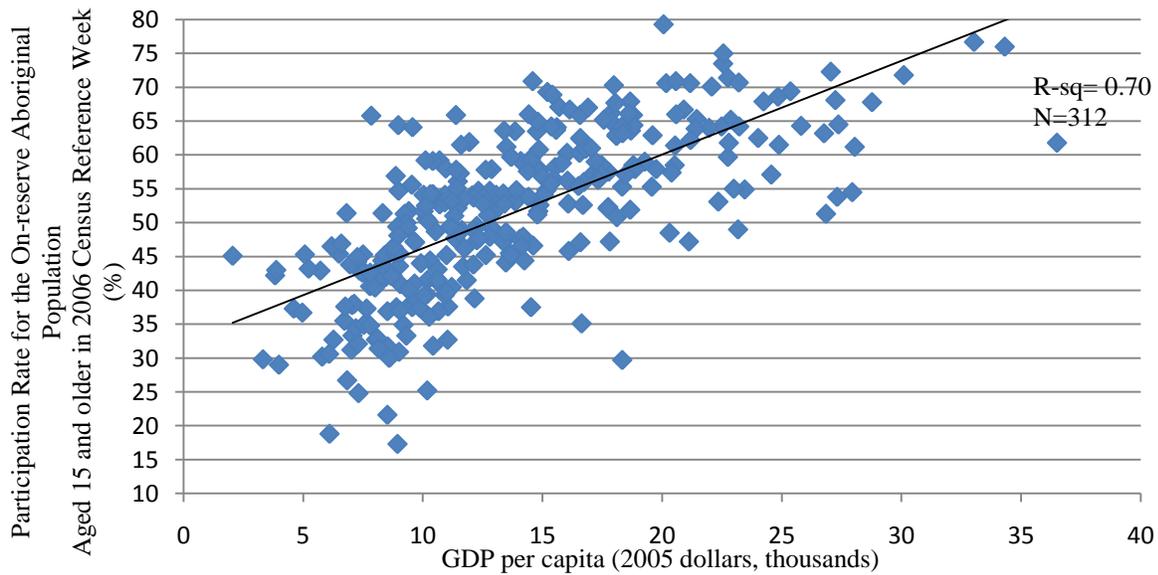


Chart 18: Employment Rate for the On-reserve Aboriginal Population Aged 15 and older in 2006 Census Reference Week and Percentage of Aboriginal On-Reserve Population Aged 15 and older and reserve-specific GDP per capita for 2005, Canada

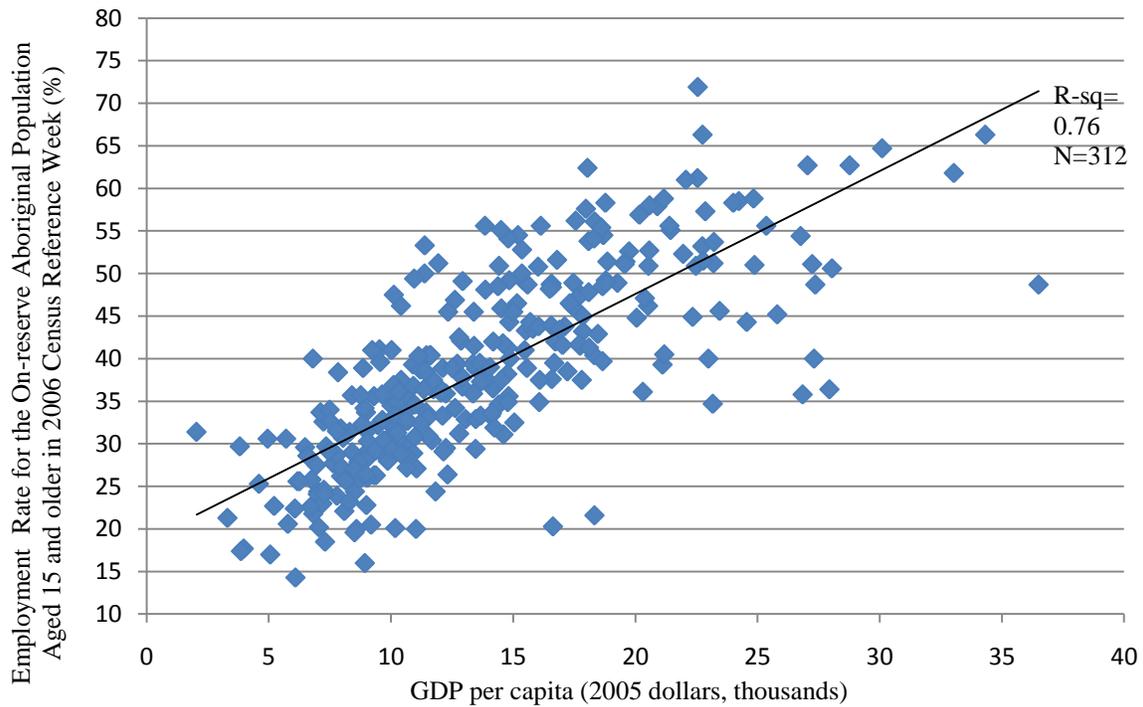
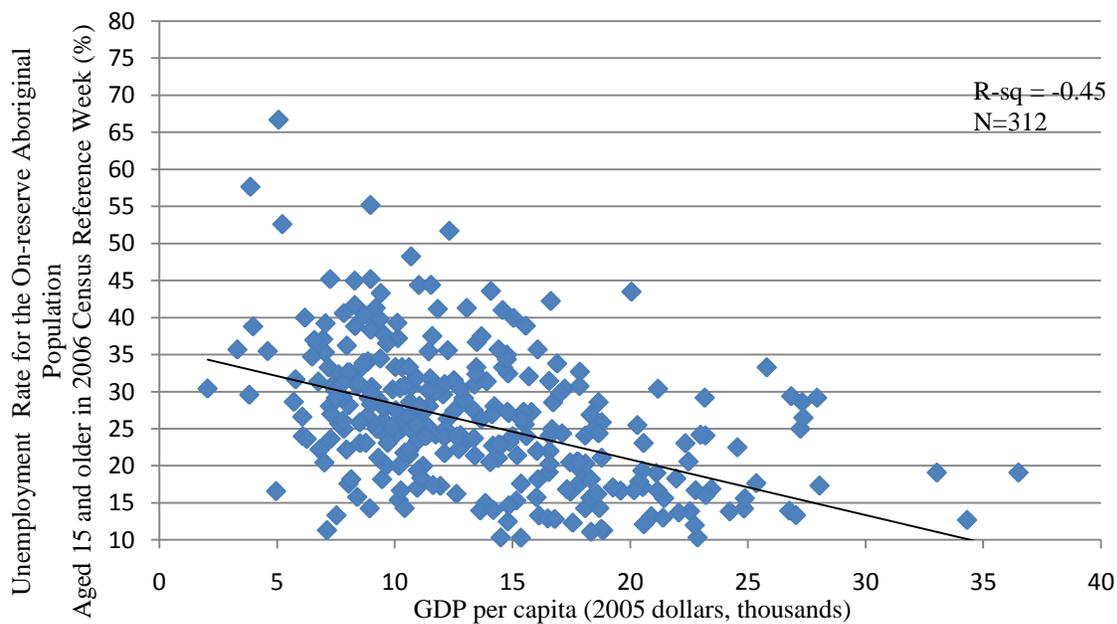
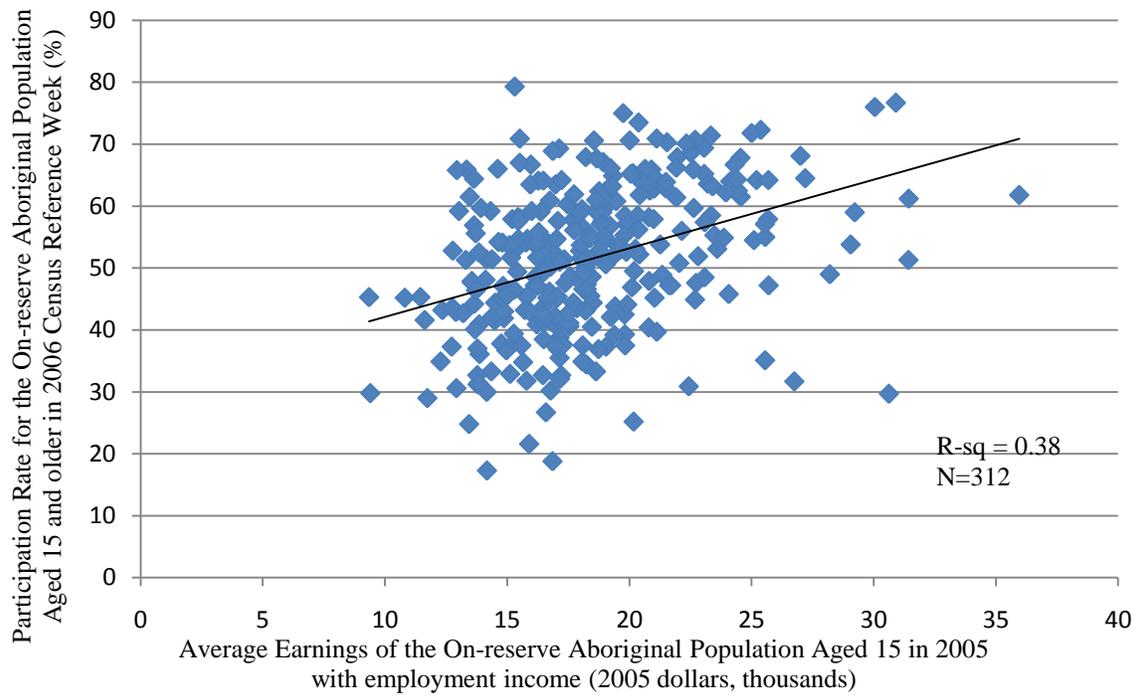


Chart 19: Unemployment Rate for the On-reserve Aboriginal Population Aged 15 and older in 2006 Census Reference Week and Percentage of Aboriginal On-Reserve Population Aged 15 and reserve-specific GDP per capita for 2005, Canada



**Chart 20: Participation Rate for the On-reserve Aboriginal Population Aged 15 and older in 2006 Census Reference Week and Percentage of Aboriginal On-Reserve Population Aged 15 and older and reserve-specific average annual earnings in 2005, Canada**



**Chart 21: Employment Rate for the On-reserve Aboriginal Population Aged 15 and older in 2006 Census Reference Week and Percentage of Aboriginal On-Reserve Population Aged 15 and reserve-specific average annual earnings in 2005, Canada**

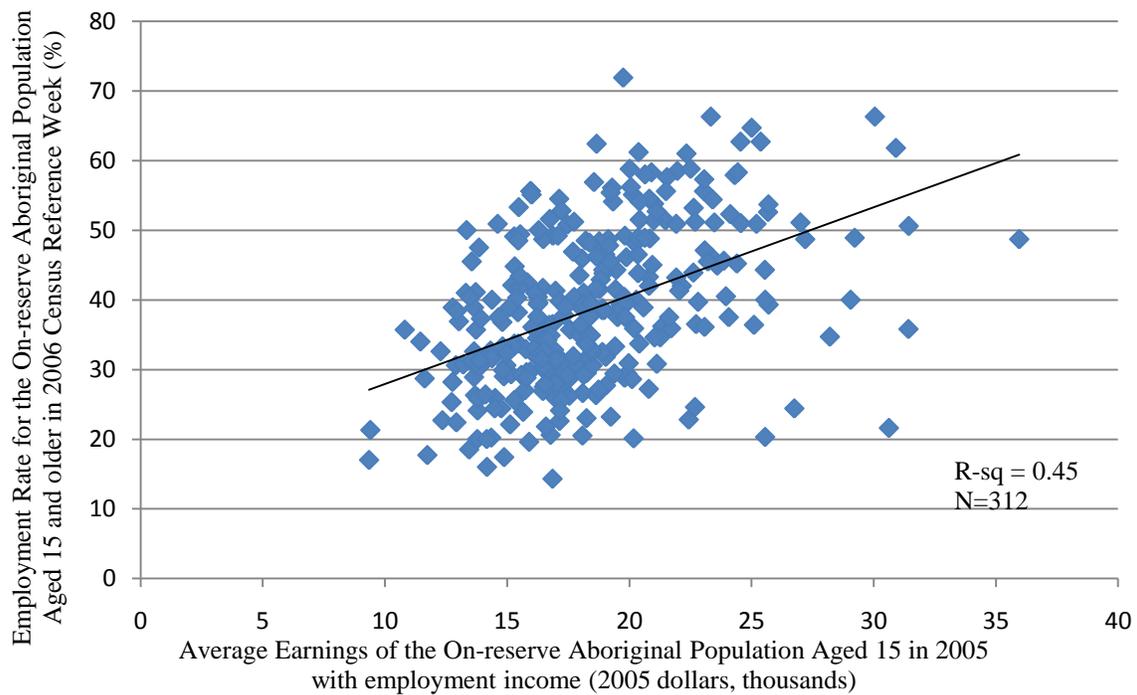


Chart 22: Unemployment Rate for the On-reserve Aboriginal Population Aged 15 and older in 2006 Census Reference Week and Percentage of Aboriginal On-Reserve Population Aged 15 and older and reserve-specific average annual earnings in 2005, Canada

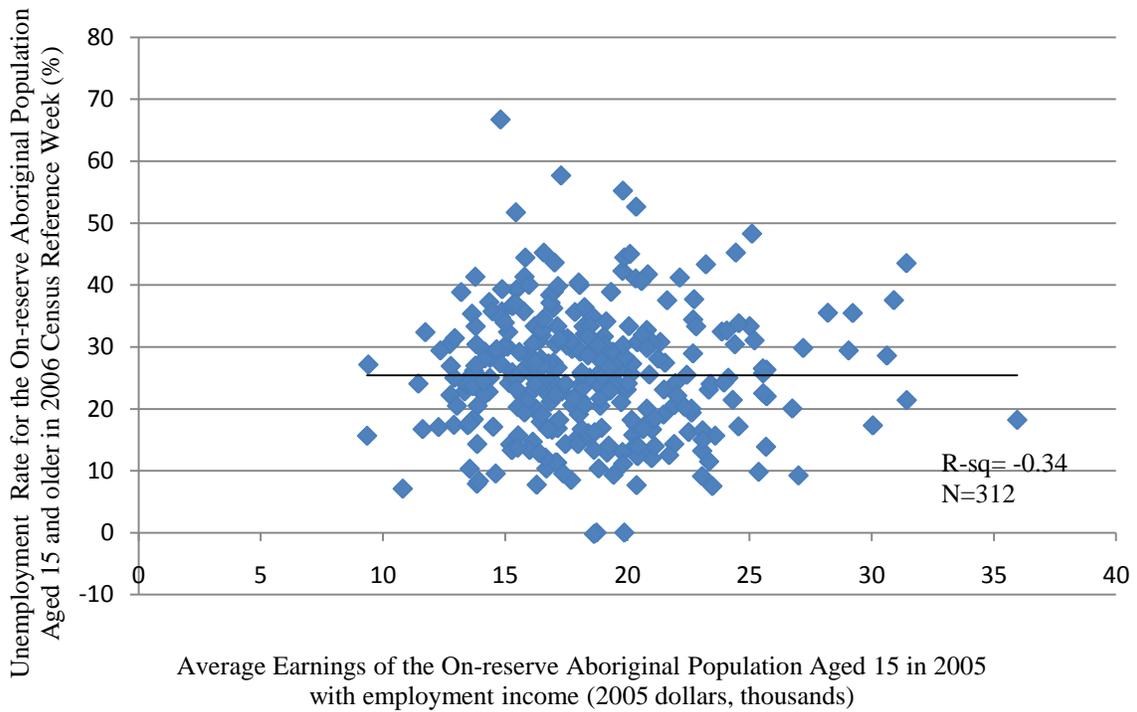
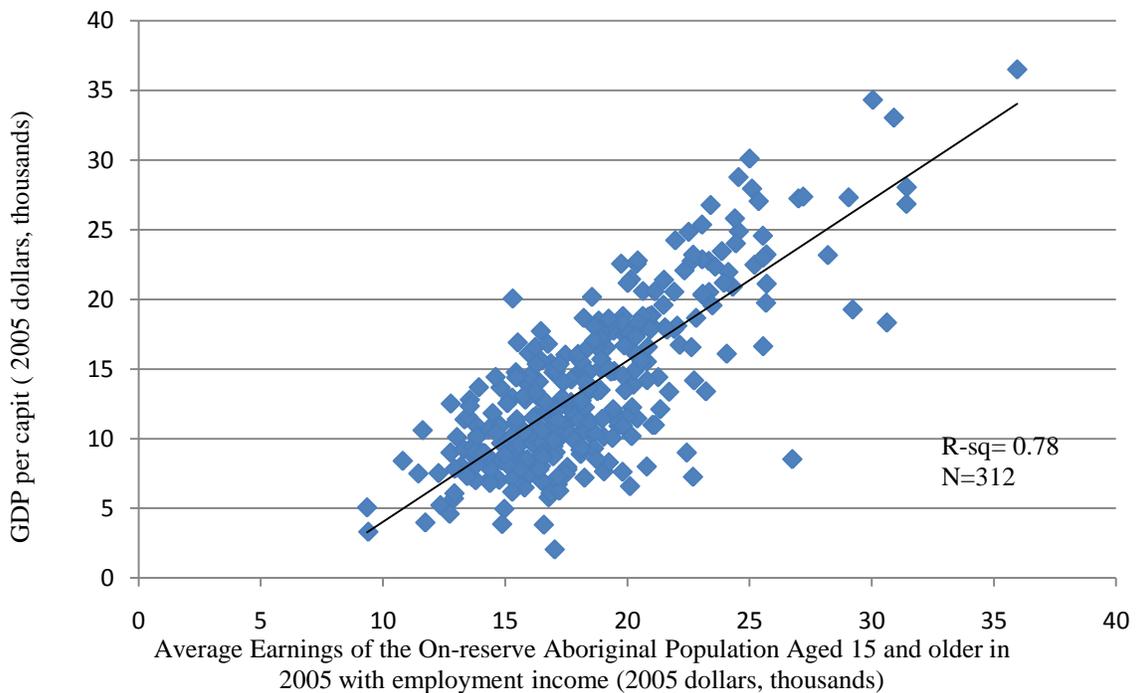


Chart 22: Reserve-specific GDP per capita for 2005, Canada and reserve-specific average annual earnings in 2005, Canada



## Appendix 4: Additional Detailed Regression Results

Table 15: Regression Results for Labour Market Indicators and Governance Index, Including Standard Errors

	Employment Rate		Participation Rate		Unemployment Rate	
	Coefficient	Standard Error	Coefficient	Standard Error	Coefficient	Standard Error
Percentage with a Diploma, Degree or Certificate	0.50***	0.1	0.61***	0.13	-0.17**	0.08
Remoteness Index (2)	0.82	2.1	1.95	2.76	0.22	1.83
Governance	0.54**	0.2	0.49*	0.27	-0.26*	0.16
Manitoba	-4.52	2.8	-6.87*	3.74	-1.55	1.71
Saskatchewan	-10.47***	2.5	-13.15***	3.35	2.73	1.78
Constant	-12.76	15.5	-0.04	18.48	49.23***	10.40
Number of observations	46		46		46	
R-squared	0.39		0.44		0.17	
Adjusted R-squared	0.29		0.37		0.07	
F test	5.15		8.09		1.36	
Akaike Information Criteria	840.69		331.67		298.30	

Note: \*\*\* p<0.01, \*\* p<0.05, \* p<0.1, Robust standard errors. Alberta and Remoteness Index of 1 were omitted.  
Source: Appendix Data (Statistics Canada, 2006 Aboriginal Population Profiles) and FCPP 2009.

Table 16: Regression Results for Economic Outcomes and Governance Index, Including Standard Errors

	GDP per Capita (2005)		Average Earnings per Employed Worker (2005)	
	Coefficient	Standard Error	Coefficient	Standard Error
Percentage with High School Diploma	238.8***	42.6	110.1***	32.5
Remoteness Index (2)	-25.4	843.1	512.7	830.8
Governance	188.5**	78.3	122.5*	65.9
Manitoba	-1,610.2	1,162.6	-1,330.8	980.0
Saskatchewan	-5,201.0***	1,002.8	-1,967.4*	1,020.2
Constant	-6,719.8	5,525.0	6,874.4	4,678.6
Number of observations	46		46	
R-squared	0.56		0.39	
Adjusted R-squared	0.50		0.29	
F test	11.32		5.15	
Akaike Information Criteria	861.14		840.69	

Note: \*\*\* p<0.01, \*\* p<0.05, \* p<0.1, Robust standard errors. Alberta and Remoteness Index of 1 were omitted.  
Source: Appendix Data (Statistics Canada, 2006 Aboriginal Population Profiles) and FCPP 2009.

Table 17: Regression Estimates Using GDP per Capita as Dependent Variable, Including Education Breakdown

	Coefficients	Standard Error
Percentage with High School Diploma as Highest Educational Attainment	346.5***	118.7
Percentage with University Diploma, Certificate or Degree	437.3**	219.8
Governance Index	81.7	87.2
Saskatchewan	-7,030.4***	1,561.3
Manitoba	-3,057.6**	1,417.3
Remoteness Index (2)	-943.4	1,129.9
Constant	4,372.2	5,379.9
Number of observations	46	
R-squared	0.446	
Adjusted R-squared	0.361	
F test	5.308	
Akaike Information Criteria	873.4	

Note: \*\*\* p<0.01, \*\* p<0.05, \* p<0.1, Robust standard errors. Alberta and Remoteness Index of 1 were omitted.

Source: Appendix Data (Statistics Canada, 2006 Aboriginal Population Profiles) and FCPP 2009.

## Appendix 5: Questions on the Governance Survey from the Frontier Centre for Public Policy

### Long Questionnaire

(Taken from FCPP (2009))

#### I. ELECTIONS

1. Are elections held every two years or is the frequency established by custom? Every 2 years  Other
2. Are you satisfied with the quality of the candidates? Yes  No
3. Have favours or payments ever been exchanged for votes? Yes  No
4. Have election results ever been disputed? Yes  No
5. Is the person who resolves such disputes independent from band officials? Yes  No
6. Does your band decide leadership by hereditary custom? Yes  No

#### II. ADMINISTRATION

1. Do the Chief and band council make all decisions? Yes  No
2. Are other band members consulted? Yes  No
3. Do band officials ever benefit personally from their own decisions? Yes  No
4. Does the council tend to hire family? Yes  No
5. Does band employment depend on family or political relations with existing leaders? Yes  No
6. Are open positions of employment with the band posted on bulletin boards? Yes  No
7. Has your band ever had a third-party administrator appointed under the Indian Act? Yes  No
8. Do you think the band is overstaffed? Yes  No
9. Does the band use too many outsiders to do its work? Yes  No
10. Have you ever seen a copy of the band's financial statements? Yes  No
11. Overall, how would you rate your band's administration? Good  Bad

#### III. HUMAN RIGHTS

1. Does the Chief or council use band council resolutions (BCRs) to force residents to leave the reservation? Yes  No
2. Have residents been removed with BCRs within the last five years? Yes  No
3. Do band members removed from the reservation have the right to an appeal? Yes  No

4. Does an independent agency hear such appeals? Yes  No
5. Who appoints that agency? Chief/Council  Other
6. Do band members have security in the possession of their homes and enterprises? Yes  No
7. Have band members ever been evicted from their homes? Yes  No
8. Does the band provide its own police services? Yes  No
9. Is the band policed by an outside force, such as the R.C.M.P.? Yes  No
10. How would you rate the personal security of band residents? Good  Bad
11. How would you describe the percentage of band members incarcerated in jails or prisons over the last five years? High  Low

#### IV. TRANSPARENCY

1. Do you think the band council meets often enough? Yes  No
2. Are band council meetings open to band members on a regular basis? Yes  No
3. Are band council minutes and decisions made available to band members? Yes  No
4. Is there in place a formal process for consulting residents? Yes  No
5. Does the band publish a newsletter, information bulletins or other communications to inform members of band activities? Yes  No
6. Does the band allow access for its members to its business plan and financial statements? Yes  No
7. How would you rate the financial information given band members? Adequate  Inadequate
8. Are band members provided with information on the performance of band enterprises? Yes  No
9. To your knowledge, has the band council ever defaulted on its financial responsibilities? Yes  No
10. Do you think your band carries too much debt? Yes  No
11. Do you think your band's management of records is adequate? Yes  No
12. Is there a formal process in place for handling complaints from band members? Yes  No

#### V. SERVICES

1. Do you think your band's schools are performing well? Yes  No
2. Is your school drop-out rate good or bad? Good  Bad
3. Do you think your band provides enough support for those who want to go on to college or university?  
Yes  No

4. Overall, how would you rate your band's performance with regard to education? Yes  No
5. Do people in your community wait too long for medical attention? Yes  No
6. Overall, how would you rate your band's performance with regard to health services? Yes  No
7. How would you rate the access of your band members to welfare? Adequate  Inadequate
8. Does your band suffer from a shortage of housing? Yes  No
9. Do you think housing is assigned fairly? Yes  No
10. How would you rate the quality of water provided to your community? Good  Bad
11. Overall, are you happy with the services your band's leaders are providing? Yes  No

#### VI. THE ECONOMY

1. Do the members of your band council also run the band's businesses? Yes  No
2. Do you think the hiring of people to work for band businesses is fair? Yes  No
3. Does the band provide equal and fair access to credit or loan capital? Yes  No
4. How would you rate the availability of jobs in your community? Adequate  Inadequate
5. How would you rate the number of band members who have left the reservation? High  Low
6. Is or has the band ever been under third party management? Yes  No
7. Do you think your community's economy is growing? Yes  No
8. Do you think that your children would do better for themselves if they stayed in your community or left? Stay  Leave

### Short Questionnaire

1. In the last Band Council election, were rightful voters able to trust that their votes, and only their votes, would be counted?

- Yes, definitely       Probably not  
 Probably               Definitely not  
 Don't know/not sure

2. If you were a member of the Chief's family, would this

- Guarantee a job               Not help  
 Help get a job               Make it more difficult  
 Be a small help getting a job     Don't know/not sure

3. Are Council minutes and decisions easily available to anyone on the reserve?

- Always       Rarely  
 Mostly       Never  
 Sometimes     Don't know/not sure

4. Does the Council force people off the Reserve whom it doesn't like (with a Band Council Resolution - BCR)?

- Definitely               Never  
 Perhaps sometimes     Don't know/not sure  
 Not really

5. Does the band allow access for its members to its business plan and financial statements?

- Definitely               Never  
 Perhaps sometimes     Don't know/not sure  
 Not really

6. Do members of your band council or their family members run the Reserve's independent service outlets (for example retail outlets or restaurants)?

- Definitely               Never  
 Perhaps sometimes     Don't know/not sure  
 Not really