VARIATION IN TEACHER COMPENSATION AMONG CANADIAN PROVINCES AND ITS PROBABLE REASONS

by

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Abstract

The purpose of this study was to: 1) determine the extent of variation in average teacher compensation among ten provinces; 2) explain inter-provincial variation in teacher compensation in terms of related independent variables; 3) determine and explain variation in teacher compensation within Ontario; 4) establish statistical models to estimate teacher compensation at the inter-provincial level and the census division level in Ontario.

After reviewing related literature, it was hypothesized that the dependent variable, average teacher salary, would be affected by eight independent variables: population density, family income, farm land price, population growth, union influence, teacher supply and demand, unemployment rate, and weather. Data were collected about these variables for ten provinces and for Ontario census divisions. Eight hypotheses were formed and tested with data. Bivariate correlation, scatterplot, partial correlation and multiple linear regression procedures were used.

There was considerable variation among provinces in average teacher salaries in 1995 reflected in the standard deviation of $3,248. Average family income and average farm land

price, as hypothesized, had a positive association with teacher salaries. Contrary to the hypotheses, teacher surplus and unemployment rate had a positive relationship with teacher salaries. No reliable association was observed between teacher salaries and population density, population growth and weather. There is inadequate information about unions' influence on teacher salaries.

Among Ontario census divisions there was some variation in average teacher salaries in 1995-1996 school year indicated by a standard deviation of $1,680. Family income and farm land price in a census division, as hypothesized, had a positive association with teacher salaries. Also as hypothesized, weather had a negative impact on teacher salaries. Contrary to the hypotheses, population growth had a negative relationship with average teacher salaries, and unemployment rate had a positive association with teacher salaries. No relationship was detected between teacher salaries and population density.

This study helps to gain a better understanding of the variation in teacher compensation both among provinces and among census divisions within Ontario. What is revealed in the study contributes to the knowledge in educational administration and may also serve as a basis for further exploration.

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CHAPTER 1

INTRODUCTION

As we approach the next millennium, the pace of change in society is quickening and the complexity of change is increasing. But no matter how fast society changes and how complex it becomes, some issues remain. Teacher compensation is one of these issues (Jacobson, 1996) because it represents the extent to which society values education, how much people are willing to pay for the education of their children, and how people evaluate the work that teachers are doing. This research intends to explore, analyse, discuss and explain variation in teacher compensation among Canadian provinces and territories, as well as variation among different regions in Ontario, using data collected by Statistics Canada, provincial governments and other agencies.

Background of Study

Education is crucial to a society because "we depend [on education] for our livelihood and the quality of our life" and through education "we acquire our moral dimension" (Hodgkinson, 1991, p. 27). For many people, the institution of public schools is the unique, most highly desirable and effective vehicle for the well-being and progress of society (Alexander & Salmon, 1995).

Research in education can be classified by the phenomena investigated. Some of the

major topics in education investigated are: the learning process, teacher education, curriculum, and educational administration (Borg & Gall, 1989). These educational phenomena can be further divided into more detailed subjects. Research in educational administration includes the study of educational leadership, ethics in administration, organizational theory, school finance, human resources management and related topics.

Human resources management in any organization is focused on the people side of management and helps to ensure that the objectives of the organization are met (Riches & Morgan, 1989). Research on human resources in education contributes to the quality of education because quality depends on "getting the right persons in the right positions with the competencies required to perform effectively and efficiently" (Harris & Monk, 1992). "The goals of the personnel function are basically the same in all school systems--to hire, retain, develop, and motivate personnel in order to achieve the objectives" of the systems, to "assist individual members of the staff to reach the highest levels of achievement, and to maximize the career development of personnel" (Rebore, 1987, p. 13). In Rebore's opinion, these goals must be implemented in the following eight dimensions of the personnel function:

1) Human resource planning,

2) Recruitment of personnel,

3) Selection of personnel,

4) Placement and induction of personnel,

5) Staff development,

6) Appraisal of personnel,

7) Compensation of personnel, and

8) Collective negotiations.

Of all the people working in an education system, teachers play the most important role, since it is they who instruct students everyday and have a direct impact on students' cognitive and affective development. It is not an exaggeration to say that a school's success ultimately depends on its teachers. A study by the Canadian Teachers' Federation (King & Peart, 1992) revealed that the majority of Canadian teachers felt proud to be teachers, would choose teaching as a career again if they had a second chance, and considered teaching a very worthwhile job. The same study also revealed that over half of the teachers felt that the financial rewards in teaching were satisfactory.

Like all the other people working in schools, teachers need to be recruited, inducted and compensated. Because the success of a school depends on its teachers, the recruitment of teachers is crucial. In addition, as governments in Canada have been under the pressure of economic constraint (Statistics Canada, 1998) which affects the funding of public schools (King & Peart, 1992), and as the general public's demand for public school's accountability persists (Bégin, Caplan, Bharti, Glaze & Murphy, 1994; Canadian Education Association (CEA), 1992; Gunderson & Hyatt, 1996; Lockhart, 1991; Working Group on Education Finance Reform (WGEFR), 1996), the recruitment and selection of teachers has received more attention (Trinh, 1997).

Combined with financial constraints and the demand for accountability (Bégin et al., 1994; King & Peart, 1992; WGEFR, 1996), the surplus of available teachers (Pickard, 1995; Press, 1998; Tremblay, 1997) has resulted in a competition among people who want to

become teachers. In the spring of 1997, the Toronto Board of Education Secondary Staffing Department received approximately 5,000 applications for about 300 teaching positions that were open (E. McLean, telephone conversation, September 16, 1997). Meanwhile, financial restraint and calls for greater accountability have made persons who recruit and select teachers more careful in making their decisions (CMEC, 1996).

While the study of teacher recruitment, motivation and improvement involves all eight personnel dimensions discussed by Rebore (1987), understanding how teachers are compensated is an important dimension that interacts with the other seven. In comprehending how to attract, recruit, motivate and improve teachers in an elementary and secondary education system, it is necessary to understand how teachers are compensated in the system.

The level of teachers' salaries directly influences the quality of people that will be attracted to teaching (Alexander & Salmon, 1995; Jacobson, 1996; Smith et al., 1993). After they have entered teaching, individuals continue to be influenced by the way in which they are compensated (Jacobson, 1996; Lunenburg & Ornstein, 1991). According to Herzberg's motivation-hygiene theory, factors that arouse either positive or negative attitudes toward work can be put into two classifications: motivation, or intrinsic, factors and hygiene, or extrinsic, factors. Motivation factors include achievement, recognition, the work itself, responsibility, advancement, and growth. Hygiene factors are company policies, supervision, interpersonal relations, working conditions, and salary (Lunenburg & Ornstein, 1991).

While motivation job factors have received considerable attention (CEA, 1992; King & Peart, 1992), hygiene factors such as job security, working conditions and salary also play

significant roles (Jacobson, 1996; Smith et al., 1993). As educational reform remains on the public agenda and increases in complexity, policy makers need to look more closely at the overall picture, of which teacher compensation is a significant piece (Kelley, 1997).

In Canada, teacher compensation has been the subject of a relatively small number of recent studies (e.g., King & Peart, 1992; Lawton, 1987; Lockhart, 1991; Pagliarello, 1995). In the efforts to clarify this issue and defend their positions, scholars and organizations have done research that have produced different and sometimes contradictory findings ("Ontario: Teachers," 1997). Public interest in the use of monetary incentives for teachers may ebb and flow, but the question of how to most appropriately compensate teachers is one that persists (Jacobson, 1996).

Research Problem

In order to develop a clearer picture of what has occurred and what is occurring to Canadian teachers' incomes, and to offer a comprehensive perspective on this issue, the researcher examined teachers' incomes across Canada, including a detailed analysis of Ontario. Specifically, the investigation attempts to:

1) determine the extent of variation in teacher compensation among the ten provinces and two territories;

2) explain inter-provincial variation in teacher compensation;

3) determine and explain variation in teacher compensation within Ontario;

4) establish statistical models to estimate teacher compensation at the inter-provincial

level as well as at the census division level in Ontario.

Ontario has been selected for a more detailed examination for three reasons. First, Ontario is the most populous province in Canada; therefore, an event in Ontario often has a national influence. Second, with local collective bargaining, Ontario teacher compensation varies among school boards, which may not be the case in provinces with centralized collective bargaining, such as New Brunswick, Prince Edward Island, Newfoundland, Quebec and British Columbia (Bezeau, 1989; Lawton, 1997; Mackie, 1997). Finally, in studying Canadian education systems I have learned more about the Ontario system than systems in the rest of Canada.

To evaluate the meaning of something, one relies on interpretation which requires the understanding of the context. According to English (1992), context is the "background or framework of a problem, dilemma, experiment, or human event" (p. 45). In better contextualizing an issue, comparison helps. By comparing teacher compensation in Canadian provinces and in Ontario census divisions and by considering related factors that are expected to affect teacher compensation, insights may be gained as to what influences how teachers are paid.

Significance of the Study

The issue of teacher incomes has been in the news and has been a lively topic for conversations, with different sides providing different arguments ("Ontario: Teachers," 1997; Toronto Star, November 16, 1996). I became interested in this issue after I heard and read

various, sometimes contradictory, viewpoints. The comments and articles that attracted my attention drew very different conclusions and left me wondering whether any kind of objectivity and consensus can be reached, even after a careful examination of the subject. In order to understand why Canadian teachers are paid the way they are, it is important to have a clearer picture of what has happened and what is happening to their incomes. When there is a controversy, conducting an investigation to clarify the facts is one of the important functions of research. In Bouma and Atkinson's (1995) words, when authorities in the same field disagree or when there is no authority to turn to, "we conduct research" (p. 6). The objective of this study is to better understand the factors that are thought related to teacher compensation in Canada and Ontario.

In addition, the "responsibility for education in Canada rests with provincial and territorial governments" (Statistics Canada, 1992, p. ii), and elementary and secondary education is financed almost entirely by provincial and local governments (Bezeau, 1989; King, & Peart, 1992; Lawton, 1996). In 1994, the total expenditure on all types of education in Canada was estimated at 7.7 percent of Gross Domestic Product (Bedard & Ryall, 1996). In Ontario alone, the elementary and secondary educational expenditure for the 1996-97 school year was $13.8 billion. It is worthwhile knowing how this money is spent. In fact, a major part of the funds are used on elementary and secondary education instruction, where the main expense is teacher salaries (Alexander & Salmon, 1995; Working Group on Education Finance Reform (WGEFR), 1996). According to Ontario government's figure, in 1995-1996 school year, 76 percent of the total educational expenditures on elementary and secondary education were spent on teacher salaries, benefits and contributions to teacher

pension fund (http://www.edu.gov.on.ca/eng/document/brochure/quickfac/facts97e.html).

In Odden and Kelley's (1997) words, "because teacher compensation comprises the largest portion of an education budget, questions about teachers' compensation are paramount" (p. 1). That is, better understanding teacher compensation will help better understand educational expenditures. Because teacher compensation is a complicated issue decided by many factors, of which some are quite elusive, only an in-depth and comprehensive study will shed light on the debated elements.

This research is meaningful for policy makers, negotiators and others who make decisions regarding teacher incomes and related matters. A better understanding of variation in compensation of teachers among provinces and territories may suggest actions concerning relevant legislative regulations. With a more consistent system across the country, it could be easier for teachers to move from one province to another, helping to balance the teacher supply and demand situation for the whole nation. Comprehending better the variation within Ontario could contribute to the establishment of a more equitable and efficient educational structure in the province.

Teacher compensation is not a discrete, isolated entity, but rather is an integral aspect of the school personnel function (Rebore, 1987). As an integral aspect, it interacts in significant ways with other aspects of the personnel function in school systems. It is important for us to know more in this area in order to help ensure that changes in educational policies are made with adequate knowledge and bring about positive results.

This research is timely and has current relevance because many people involved in the discussion about teacher compensation are unclear about the various factors related to the

issue and are not sure who, if anyone, is right, when different and contradictory arguments are given (The Toronto Star, Nov. 16, 1996). Many research studies involve the description of natural or man-made phenomena and many important scientific discoveries have resulted from making such descriptions (Borg & Gall, 1989). This research reveals some interesting relationships not previously identified in Canada, provides some reliable insight into the discussion of the issue and establishes a basis for further exploration. It is hoped that policy makers, professional organizations, educational human resources professionals, and the general public may have a better understanding of the issue as a result of the study. It is anticipated that this research will add to the knowledge base of educational administration in the area of teacher compensation in Canada.

Definition of Terms

Compensation: Compensation is a salary or wages. In this study, compensation refers to annual employment income, "total income received by persons 15 years of age and over during calendar year 1995 as wages and salaries" (Statistics Canada, February 1997, p. 30) in the provinces and territories. In Ontario at the census division level, compensation refers to average teacher salaries for the school year of 1995-1996. Compensation in this study does not include pension, supplementary health care, etc. Compensation is interchangeable with salary and employment income.

Teachers: Teachers who teach academic, technical, vocational or specialized subjects at public and private secondary schools, including heads of departments and

librarians; teachers who teach basic subjects such as reading, writing and arithmetic or specialized subjects such as English or French as a second language at public and private elementary schools and kindergarten, including librarians; and school and guidance counsellors, employed by school boards and working in elementary and secondary schools, who advise students on educational issues, career planning and personal development and co-ordinate the provision of counselling services to students, parents and teachers (Employment and Immigration Canada, 1993). In Ontario at the census division level, teachers refer to on grid and off grid teaching staff in public funded schools (Ontario Education Relations Commission, 1997), whose average salaries are analysed in the study.

Population density: In this study, "population density refers to the number of persons per square kilometre" (Statistics Canada, February-b 1997, p. 218).

Farm land price: Cost of living at the inter-provincial as well as at the census division level in this study is indicated by two variables, average farm land price per acre and population growth. Average farm land price is the most basic cost of living in a place, and in this study, it refers to the value of average farm land only per acre in each province. In Ontario for the census divisions, farm land price refers to value of land and buildings per acre of farm land, because land only value is not available. It is assumed that the variation of values of buildings on farm land among census divisions is not significant. Chambers and Fowler (1995) use the base price of land as reflected by the average value of farm land and buildings per acre to indicate cost

of living.

Population growth: Another indication of cost of living of a locality, population growth, influences demand in an economy and increased demand, when supply is not perfectly elastic, influences the cost of any commodity or service. Population growth here refers to the population change in the decade from Statistics Canada 1986 census to 1996 census in each province, territory and each census division in Ontario.

Family income: In this study, "family income is defined to consist of incomes received by all individuals 15 years of age and over who at the time of the survey formed one census family" (Statistics Canada, 1997, February-a, p. 19).

Teacher supply: Teacher supply refers to the number of individuals holding valid teaching certificates who are eligible and willing to seek employment as teachers (Press, 1998).

Teacher demand: Teacher demand in this study refers to the number of school-based teaching and administrative jobs that are required to be filled (Press, 1998).

Unemployment rate: In this study, unemployment rate is "the unemployed labour force expressed as an annual percentage of the total labour force, for persons 15 years of age and over, excluding institutional residents, during calendar year 1995" (Statistics Canada, January 1996, p A-8).

Weather: Weather refers to the annual daily mean temperature at the census division level in Ontario. At the inter-provincial level, annual daily mean

temperature is not available, and annual average high temperature from the largest city in each province and territory is used to indicate the weather condition in that area. In weather forecast, usually a high temperature and a low temperature are reported. Annual average high temperature from the biggest city in each province and territory is available from Statistics Canada's website (http:www.statcan.ca: 80/english/Pgdb/ Land/Geography/phys08a.htm). Average high temperature is used because of its availability.

Delimitation

This research does not address how Canadian elementary and secondary school teachers ought to be compensated; it only attempts to illuminate what compensation Canadian teachers in different provinces and territories receive and the degree to which various observable factors appear to influence or account for variation in teacher compensation. This study also reports the compensation Ontario teachers receive in different census divisions and what noticeable elements appear to have an impact on average teacher salaries. In addition, this study tries to establish statistical models for estimating teacher employment incomes.

The research is a quantitative study in that numerical data were collected from various publications and documents from Statistics Canada (Statistics Canada, 1987, 1989, 1992, 1993, 1996, 1997, 1998), Ontario Education Relations Commission (1997), institutions in other provinces, and a variety of organizations and people. This study tests hypotheses

and is also an exploratory study to detect and explain relationships not predicted or explained before in Canada and Ontario. The time and area frame of this study is 1995 for average teacher compensation in provinces and territories in Canada and 1995-1996 school year for average teacher salaries in different census divisions in Ontario.

Several key assumptions are made. It is assumed that the relationships observed during the year studied may hold true for other time periods. Also, it is assumed that the salary data fairly reflect total compensation of teachers, including personnel benefits, even though these supplementary benefits, which in some cases may be valued at up to 30% of salaries, have not been measured.

Overview

The purpose of the present study is to attempt to 1) determine the extent of variation in teacher compensation among the ten provinces and two territories in Canada; 2) explain inter-provincial variation in teacher compensation; 3) determine and explain variation in teacher compensation within Ontario among census divisions; and 4) establish statistical models for estimating average teacher compensation.

In addressing the purpose of the research, the dissertation is organized in five chapters. Chapter one introduces the background of the study, presents the research problem, gives definitions, and describes delimitations. Chapter two reports the relevant literature and synthesizes the literature into an estimate model with stated factors, which were expected to affect how teachers are paid. In chapter three, the methodology of the study is presented and

the sources of data are given in details. Chapter four describes data analysis and the findings of analysis. In chapter five, the results are discussed, limitations are described, recommendations for further research are made and conclusions are drawn .

CHAPTER 2

REVIEW AND SYNTHESIS OF THE LITERATURE

Teacher Compensation

Selection of Teachers

Who prefers teaching to other professions and why they do so is a fundamental issue in school personnel planning. In the early 1990s, most new Canadian teachers were recruited from the 20 to 24-year-old age group (CEA, 1992). By late 1990s, teaching position applicants were older than they used to be. According to Canadian Teachers' Federation (http://www.ctf-fce.ca/E/WHAT/OTHER/ed-grad.htm), over 57% of Canadian Bachelor of Education graduates in 1997 were between the ages of 24 and 44. In Li's study (1996), the average age of the education student participants (N = 88) was about 25 years old. Young people decide to become teachers for various reasons. According to King and Peart's survey of Canadian teachers (1992), the main motivations appear to be that they like people, particularly children (55%), they feel they have the ability to teach (36%), they want to contribute to the future of society (36%), and they want to help children to develop (55%). For some beginning teachers, the material benefits (11%) and holidays (21%) in teaching also play a role in their decision. Other researchers have reached similar conclusions (Jacobson, 1996; Pickard, 1995; Smith, Herry, Levesque & Marshall, 1993; Yee, 1990). Generally speaking, "teachers want to teach" and "they want to make a difference with

students" (Yee, 1990, p. 108). Furthermore, beginning teachers' initial attitudes towards teaching will also play a significant role in their later career choice to decide whether to stay or leave teaching (Yee, 1990).

All Canadian jurisdictions place restrictions on who can teach (Bezeau, 1989; King & Peart, 1992). To teach, one must hold a certificate, sometimes called licence or credential, which is earned through tertiary education taken at a university. Although universities educate aspiring teachers, it is the provincial ministries or departments of education that issue the certificates (Bezeau, 1989; Lockhart, 1991), except in British Columbia and Ontario where Colleges of Teachers issue teaching certificates (Bowman et al., 1994; "Teacher certificates", 1997).

There is no standard licensing common for all teachers across Canada, but there is enough commonality that a teacher with a certificate in one province can obtain a license in another without much difficulty (Bezeau, 1989; Bowman et al., 1994; CEA, 1992). Teachers' professionalism has been promoted and protected by teacher organizations as well as by provincial authorities that restrict entry to the profession through certificate requirements (Bezeau, 1989; King & Peart, 1992). In addition to promoting professionalism, teacher unions are also expected "to assume defensive roles with respect to issues of job protection, instructional resources, and personal economic benefits, and to provide a vehicle for teachers' representative participation in educational decision making" (Bascia, 1994, p. 69). Some teachers leave teaching when they see top-level reform efforts produce unintended and counterproductive effects (Yee, 1990). Presently, a struggle is going on in Ontario where the provincial government, with the passage of the Education Quality

Improvement Act (1997, http://www.geocities.com/Athens/Parthenon/5725/), Bill 160, has asserted more control in making educational decisions, and the teachers want to keep their decision-making participation, job security, as well as their instructional resources (Mackie, Lewington & Claridge, 1997). A two week teachers' strike in 1997 and labour unrest continuing into 1999 indicate that the fight carries on (Galt, Nov. 1997; Krivel, 1997).

Most Canadian school boards recruit novice teachers every year (CEA, 1992; Press, 1998; Tremblay, 1997) and must consider the competencies that characterize an effective new teacher. The expectations for beginning teachers before they enter the first year of teaching are summarized by Reynolds (1992) in a major review of literature:

1) knowledge of the subject matter they will teach;
2) the disposition to find out about their students and school, and the ethnographic and analytic skills to do so;
3) knowledge of strategies, techniques, and tools for creating and sustaining a learning community, and the skills and abilities to employ these strategies, techniques, and tools;
4) knowledge of pedagogy appropriate for the content area they will teach; and
5) the disposition to reflect on their own actions and students' responses in order to improve their teaching, and the strategies and tools for doing so. (p. 26)

In addition to knowledge and skills, "teachers need certain personality characteristics to execute teaching tasks in a competent manner. Personality characteristics are those interests, temperaments, personality traits, and moral/ethical standards that suggest what the

teacher is likely to do rather than how well he or she can do at peak performance" (Reynolds, p. 5). The character traits Reynolds synthesizes include supportiveness of students, warmth, sensitivity, interest in people, flexibility, self-confidence, honesty, intellectual freedom, equity, tolerance, due process, respect, trust, and care. From the perspective of the philosophy of education, Hare (1993) contends that any teacher would be better for possessing the qualities of humility, courage, impartiality, open-mindedness, empathy, enthusiasm, judgment and imagination.

Although indications are that many aspiring teachers are not able to meet the expectations mentioned above (Reynolds, 1992), people hiring teachers look for the abilities and characteristics to meet these expectations or the potential for developing the abilities and the characteristics (CEA, 1992). The public expect that teachers are most interested in children and the subjects they teach, instead of being mainly interested in the material benefits (Jacobson, 1996). Teachers are "expected to be dedicated to their students, and place their own benefits second" (Jacobson, p. 99). While monetary incentives may not affect the way teachers teach, "they do have an important effect on other teacher labour market behaviours, specifically recruitment, retention, and attendance", and "beginning teachers are responsive to monetary incentives" (Jacobson, 1996, p. 94; King & Peart, 1992; Smith et al., 1993).

The importance of teacher recruitment at school boards is also strongly linked to teacher demand and supply, which in turn is decided by many variables such as demographic change, legislation, pupil-teacher ratios, and teacher retirement age (CEA, 1992; Council of Ministers of Education, Canada (CMEC), 1996; Lockhart, 1991; Press, 1997; Tremblay,

1997). In Canada there used to be a time when anyone who had a university education and who wanted to consider teaching as a career could obtain a teaching position in an elementary or secondary school without much difficulty. This was especially obvious during the period of the 1950s, 1960s and early 1970s when Canadian elementary and secondary education expanded quickly and there was a widespread shortage of teachers (CEA, 1992; King & Peart, 1992; Reynolds, 1990). However, by the mid-1970s many jurisdictions found themselves with surpluses of teachers and some school boards turned to innovative programs to reduce the number of redundant teachers (CEA, 1992; Marcotte, 1984). In the late 1990s, all over Canada there has been a surplus of available teachers (Campbell & Hood, 1997), as every year faculties of education continue to produce new graduates in the thousands while school enrollments basically remain stable (Press, 1998), and fewer senior teachers retire than education students graduate (Pickard, 1995; Press, 1998; Tremblay, 1997).

Compensation of Teachers

In the literature on human resources in education, studies addressing teacher compensation are relatively limited when compared to research dealing with other important issues such as the training of new teachers and the further inservice education of teachers. Nevertheless, teacher compensation is both important and complex (Castetter & Heisler, 1992). It is important, according to Castetter and Heisler, because it is the major part of public education's expenditure. It affects the satisfaction of an education system's needs and goals, impacts on perception of pay equity, and plays an important role in attracting,

retaining, motivating and satisfying personnel. It represents what the system intends to pay for, how it pays and what it expects in return for the compensation. It is complex because it is determined by various, often interactive, factors, which include human resources strategy, compensation strategy, policy administration and evaluation, position and pay structure.

In addition to the factors discussed by Castetter and Heisler, elements such as teachers' status in society, how a society views its education needs, what it expects from teachers, the role teacher unions play, the supply of and demand for teachers, as well as the economic circumstances add to the complexity of the issue (CEA, 1992; Jacobson, 1996; King & Peart, 1992; Lockhart, 1991).

A review of the literature on teacher compensation includes studies by Castetter and Heisler (1992), Pagliarello (1995), Ingersoll (1995), Lawton (1987, 1996), Tremblay (1997), and Chambers and Fowler (1995), to mention a few. Pagliarello (1995) undertook a study of teacher income and the income of other selected occupations in Canada in the two decades between 1970 and 1990. Occupations chosen for his study span the income scale from high paid occupations, such as physicians and surgeons, to low paid ones, such as janitors and cleaners. All data used were based on the 1991 Statistics Canada Census with regard to the Canadian population 15 years of age and over with employment income. Pagliarello concluded that teacher salaries across Canada rose about 30% during this period and that in 1990 school teachers were earning roughly 30% more than the average worker, as school teachers' "average income rose more quickly than most other occupations" (p. 19).

Lockhart (1991) corroborated Pagliarello's conclusion that teacher salaries rose faster

than the industrial composite in recent years. Because incomes are highly correlated with education level and age, these increases were due to teachers acquiring more education and experience and entering the higher earning categories of their pay grids (Pagliarello, 1995).

Looking at teacher salaries from an international perspective, Lawton (1987) suggested that Canadian teachers were better paid than their American counterparts (p. 86). King and Peart (1992) agreed that most Canadian teachers were better paid than most American teachers and they also pointed out that the social status of Canadian teachers was higher than that of their American colleagues. In Financing Education in Canada, Lawton (1996) maintained that it is a widespread view that Canadian teachers are overpaid. He gave one possible reason for such a perception: Local school boards must pay competitive salaries to obtain qualified staff. In "many communities, particularly in rural areas, there may be little or no market outside the school system for university trained personnel, and the average wages and incomes in the communities may reflect those for individuals with less education. As a result, teachers will be very well paid relative to the community norm" (p. 144).

Teachers are sensitive to such a perception. On one of its Internet webpages, quoting the analysis by an economic research firm Informetrica, the Ontario Secondary School Teachers' Federation points out that Ontario teachers' salaries are by no means excessive. "They are competitive and reflect the cost of living and comparative salary levels" in Ontario (http://www.osstf.on.ca/www/issues/edifi/salries.html). In another place, Ontario Public School Teachers' Federation states that teachers receive compensation in correspondence with their work (Andrews, Balfour, & Stitch, 1995). While acknowledging Canadian teachers' salary level is higher than that of the Americans, King and Peart maintained (1992)

that Canadian teachers "tend to do far more than is required and some try to do more than they can physically and emotionally manage" (p. 182).

The goals of the human resources function of all school systems involve the eight personnel dimensions discussed by Rebore (1987). Understanding how teachers are compensated, however, is an important dimension that interacts with the other seven. In comprehending how to attract, recruit, motivate and improve teachers in an education system, it is necessary to understand how teachers are compensated in the system.

How well teachers are paid directly influences the quality of people that will be attracted to teaching (Alexander & Salmon, 1995; Jacobson, 1996; Smith et al., 1993). The most important economic factor identified as affecting the supply of teachers has been teacher salaries relative to alternative occupations (Lewis & Norris, 1992). After they have entered teaching, teachers continue to be influenced by the way in which they are compensated (Jacobson, 1996; Lunenburg & Ornstein, 1991), though other factors also play significant roles in their job satisfaction. These factors include efficacy, autonomy, working conditions, professional development, relations with administration, student characteristics, collegial support, and participation of educational decision making (Bascia, 1994; Smith et al., 1993; Yee, 1990).

Although there is not a totally free market in which people move to where jobs exist due to family and community ties and roles (Gunderson & Riddell, 1993; Smith et al., 1993), teachers and people interested in teaching, like everyone else, tend to go where the psychic or financial reward is the highest. "In many ways teachers are no different than workers in other professions" (Jacobson, 1996, p. 99). While motivation job factors have been receiving

increasing attention (CEA, 1992; King & Peart, 1992; Pickard, 1995; Smith et al., 1993; Yee, 1990), hygiene factors such as job security, working conditions and salary also play significant roles (Chambers & Fowler; Griffiths, Goldman, & Mcfarland, 1965; Jacobson, 1996; Lewis & Norris, 1992; Smith et al., 1993; Yee, 1990).

In addition, teacher compensation can not be viewed exclusively as extrinsic reward, because "the value of salary and other personal benefits not only seemed a function of teachers' personal economic conditions but also reflected teachers' shared understandings of how well they were valued and supported by administrators, school board, and community" (Bascia, 1994, p. 63). Or, in Yee's (1990) words, "money accounts for only a portion of what compensation means to teachers" (p. 108). Moreover, extrinsic factors and intrinsic factors interact with each other. The extrinsic factors may strengthen or weaken the effects of intrinsic factors (Yee, 1990). After all, the compensation of teachers is a complex price that serves a variety of functions (Gunderson & Riddell, 1993). As educational reform remains on the public agenda, stakeholders of public education need to take a closer look at teacher compensation.

Canadian teachers have made substantial progress over their predecessors with regard to salaries. In the 19th century, teachers typically had a small and precarious income and they often had to take part of their salary in payment in kind (King & Peart, 1992). As late as in the 1930s, a beginning teacher could be paid $55 a month when room and board was $21 a month and when sick leave, medical, dental and group insurance were unheard of (Procter, 1997). In 1990 school teachers were earning roughly 30% more than the average worker (Pagliarello, 1995), and most collective agreements contain provisions concerning

sick leave, parental leave, educational leave and leaves of absence with or without pay (Marcotte, 1984).

Chambers and Fowler's Model

The conceptual framework of this research is based on several models applied by previous researchers in this area. One model that has been used in studying teacher incomes is Chambers and Fowler's (1995) "hedonic" wage model, which considers factors that attract workers to an area.

Chambers and Fowler (1995) reported research where they used a hedonic model to develop a geographical teacher cost index (TCI) across the United States. Chambers (1981) describes a hedonic model as follows:

> The intuitive notion underlying this theoretical structure is that individuals care both about the quality of their work environment as well as the monetary rewards associated with particular employment alternatives, and that they will seek to attain the greatest possible personal satisfaction by selecting a job with the appropriate combination of monetary and non-monetary rewards. Similarly, employers are not indifferent as to the characteristics of the individual to whom they offer particular jobs. The result of these simultaneous choices is the matching of individual employees with employers. It is the result of this matching process itself that reveals implicitly the differential rates of pay associated with the attributes of individual employees and the working conditions offered by employers. More formally, it is the supply of, and demand for, individuals with certain personal attributes to any particular kind of job assignment that determines the equilibrium wages of labour as well as the implicit market prices attached to the personal and job characteristics.
>
> The implicit relationship observed between wages and the personal and job characteristics of individuals is referred to as a hedonic wage index. ... The hedonic wage index permits one to decompose the observed variation in the wages paid to

labour into the dollar values attached to each unit of the personal and workplace characteristics (p. 51).

Chambers and Fowler (1995) seemed to assume that all teacher training program graduates were determined to become teachers because they did not mention other work choices for these graduates. When they discussed job market for teachers they only discussed the teaching job market. A Canadian study showed that not all education graduates had become teachers, although most of them had (Smith, Herry, Levesque, & Marshall, 1993). The same study also indicated that most of those education graduates who had not entered teaching listed reasons related to lack of available teaching positions.

One may raise the question: Are all teachers responsive to monetary incentives? As well, the attractiveness of the teaching profession depends on other occupations' contribution to society, autonomy and rewards, these occupations' supply and demand (Gunderson & Riddell, 1993; Lockhart, 1991), and the whole labour market (Lewis, & Norris, 1992). Griffiths, Goldman and Mcfarland (1965) classified teachers into three categories according to what teachers valued most in their work: 1) pupil-oriented teachers, those committed to their students' well-being; 2) subjected-oriented teachers, those concerned with the subjects they taught; and 3) benefits-oriented teachers, those mainly interested in their package of compensatory benefits, including the generous vacation schedule. It is worth noticing that these three types are not mutually exclusive. It is reasonable to assume that even the pupil-oriented teachers and subject-oriented teachers care about their benefits (Jacobson, 1996). In this respect the Chambers and Fowler study is very helpful.

Chambers and Fowler's (1995) research attempted to include not only the variables

that reflect the geographic cost-of-living, but also the labour markets where the public school districts are located. Their sample of 40,484 public school teachers was obtained from the U. S. Schools and Staffing Survey (SASS) data base for the 1990-1991 school year. They used data from the non-fiscal surveys of the Common Core of Data conducted by the U. S. National Centre for Education Statistics (NCES) to fill in a small number of missing values for school enrollment. They also gathered data for regional and jurisdictional characteristics from the U. S. Census Bureau, the Geological Survey, and the National Climatic Data Centre.

Chambers and Fowler's study examined three areas: (1) the effects of teacher and job characteristics on patterns of variation in teacher salaries; (2) the regional and school-district characteristics beyond local control; and (3) teacher cost differences by the type of school district. The result was a teacher-salary cost index (TCI) that included important factors beyond the mere costs of living in considering the recruitment of comparable teachers.

After providing a brief description of the characteristics and limitations of McMahon and Chang's (1991) cost-of-living model and Barro's (1992) cost index model, Chambers and Fowler (1995) claimed that their hedonic model isolated the "impact of regional amenities and costs of living on teacher salaries while controlling for various teacher and job characteristics" (p. 4). With the dependent variable being teacher salaries, Chambers and Fowler divided their independent variables into two subsets: the discretionary factors and the cost factors. "The discretionary factors are those within the control of local school district decision makers in the long run" (p. 7). The cost factors, which are usually not controlled by school districts, are those used directly in the calculation of the teacher cost index. The

discretionary factors are gender, racial-ethnic background, teacher level and school type, teacher qualifications and effort, and job environment impact. The cost factors include regional and district characteristics such as competition in the market for teachers, distance from central cities, costs of living and the characteristics of urban life, climatic conditions, racial-ethnic mix of students and district size and growth.

Chambers and Fowler (1995) compared the teacher cost index (TCI) with the cost-of-living model by McMahon and Chang (1991) and with the cost index model by Barro (1992). Chambers and Fowler calculated teacher cost differences by state and by type of district. In developing the TCI, Chambers and Fowler attempted to "account for all of the factors that affect the ability of local school systems to recruit and employ teachers" (p. 67). "Research involves gathering specific information to answer carefully designed questions" (Gray & Guppy, 1994, p. 10). Chambers and Fowler's (1995) study is relevant to the present research in that they investigated the factors related to variation among states, regions and districts. The Chambers and Fowler study addressed the question: How much more or less does it cost in different jurisdictions to recruit and employ classroom teachers with similar characteristics into similar jobs and job assignments? The present research looks into variation in teacher compensation among Canadian provinces and territories, variation within Ontario, and these variations' probable reasons.

In addition to the similarity among the purposes of the Chambers and Fowler's study and the present research, part of the methodology Chambers and Fowler used in forming their variables may be applied in the present study. Chambers and Fowler's hedonic model may also be used in explaining why people choose teaching as a career, since teachers and people

interested in teaching, like everyone else, tend to go where the psychic or financial reward is the highest (Jacobson, 1996). In considering compensation, factors like amenities, weather and working conditions must be included (McMahon & Chang, 1991). "Both differences in the cost of living and regional amenities affect the cost of employing comparable teachers across local jurisdictions" (Chambers & Fowler, 1995, p. 57). Chambers and Fowler claimed that their research attempted to account for all of the factors that affect the ability of local school systems to recruit and employ teachers. In other words, their study was as comprehensive as they could make it, and comprehensiveness is one of the objectives of the present research.

Variation in Teacher Compensation

Generally speaking, teachers in different Canadian provinces and territories have similar responsibilities (Bezeau, 1989). However, their salaries are not similar (CMEC, 1996). It is worthwhile to find out how much teacher salaries vary and why teacher salaries vary. Specifically, it is worthwhile to find out what factors influence teacher compensation at the inter-provincial level in Canada and at the census division level in Ontario.

One of the strengths of the hedonic wage model is that it includes both pecuniary and nonpecuniary rewards (Chambers & Fowler, 1995). Chambers and Fowler used as independent variables population growth, population density, land price, unemployment rate, number of banks, number of physicians, and number of crimes to reflect cost of living and urban life characteristics. The independent variables from the Chambers and Fowler study

that can be applied in this research are: population density, land price, population growth, teacher supply and demand, and unemployment rate.

Two other models with regard to variation in teacher compensation in the literature are McMahon and Chang's (1991) cost-of-living model and Barro's (1992) cost index model. Among the three models mentioned above, the hedonic model is the most comprehensive in that it takes more variables into consideration than the other two models in measuring and comparing school teachers' incomes. It might be reasonable to assume that when one investigates a phenomenon the more characteristics one knows about it the better one is likely to understand it. Although being the most comprehensive model encountered in a literature review, the Chambers and Fowler's (1995) model still needs some adjustment when applied to the specific situations of Canada and Ontario.

According to Barro (1988), in the United States teacher salaries vary due to three major reasons: 1) experience and training, 2) geographical region, and 3) whether they concern high schools or elementary schools. More experienced teachers with higher degrees are better paid. Teacher salaries are the highest in the Northeast and the lowest in the South. Average salaries for high school teachers are significantly higher than average salaries for elementary school teachers.

McMahon and Chang (1991) pointed out that geographically different costs of living affect the real purchasing power of salaries, which are paid in nominal dollars. They further maintained that to make salaries comparable a geographic cost of living index such as the one developed by them must be taken into consideration. McMahon and Chang noted that in addition to geographical monetary differences, employees and employers also consider

non-monetary advantages or disadvantages related to different locations.

While acknowledging all the factors discussed by Barro (1988) and by McMahon and Chang (1991), Chambers and Fowler (1995) added such factors as amenities of a location, the local labour market, teacher racial-ethnic background, gender, after school hours, assigned homework, class size, student racial-ethnic background, climatic conditions, and even local crime rate. They examined three areas: (1) the teacher and job characteristics' effects on variation in teacher salaries; (2) the regional and school-district characteristics beyond local control; and (3) teacher cost differences by the type of school district. In her study on how teachers' unions affect education production, Hoxby (1996) found that as the effect of teachers' unionization there was a 5 percent increase in teacher salaries.

In Canada, as in the United States (Barro, 1988; Chambers & Fowler, 1995; Jacobson, 1996; Odden & Kelley, 1997), as well as in China, the two variables that figure most prominently in deciding teacher salaries are post-secondary education level or certificate level and general teaching experience (Bezeau, 1989; Lockhart, 1991; Marcotte, 1984; Pagliarello, 1995). In 1995, Quebec teachers on average were a little older than teachers in other nine provinces, where teachers were of quite similar ages (Tremblay, 1997). In Canada, "generally speaking, teachers in all provinces and territories have similar functions and responsibilities" (Bezeau, 1989, p. 147; CMEC, 1996; Lockhart, 1991), yet differences in salaries from province to province have persisted (CMEC, 1996; King & Peart, 1992; Lockhart, 1991).

Factors Affecting Teacher Compensation

Since the issue of teacher compensation is a complex subject, many factors have to be taken into consideration to understand it appropriately. These factors have to be reflected upon and developed into variables, and the variables have to be designed in a way so that they can be measured (Bouma & Atkinson, 1995). In this study, the dependent variable is teacher compensation in every province and territory in Canada and every census division in Ontario. The independent variables expected to influence the dependent variable include: population density, average family income, average farm land price, population growth, union influence and collective bargaining, teacher supply and demand, employment market, and weather. The relationships between these eight independent variables and the dependent variable are explored, analysed and discussed.

Population Density

Population density usually figures significantly in a local economy. "Economic theory suggests that changes in the effective demand for goods and for housing, especially when supplies are not perfectly elastic, can play a large part in the determination of geographical differences in living costs" (McMahon & Chang, 1991, p. 4). Since the supply of land is not elastic at all, the denser the population in a place is, the more expensive the price of land there tends to be. The more expensive the land price in a locality is, the higher the prices of goods and services there tend to be, because land price is the most basic cost of living in a place (Chambers & Fowler, 1995). When the prices of goods and services in a

place are high, teacher salaries there tend to be high to compensate for the high cost of living (McMahon & Chang, 1991).

Fielding, as quoted in Champion (1989), uses population density in testing for the balance of urbanization and counter urbanization in his study. McMahon and Chang (1991) point out that "There is a 74 percent difference in the cost of living as between the higher cost cities and the lowest nonmetropolitan areas in the U. S." (p. 16). The main difference between cities and nonmetropolitan areas is, or course, population density. "In general, more densely populated areas and the large urban areas exhibit significantly higher teacher salaries. One standard deviation above the mean in metropolitan area population is associated with a 6.5 percent salary differential" (Chambers & Fowler, 1995). Furthermore, population density itself may bring about social changes that affect people's lives (Cohen, 1995).

Family Income

In 1990-91, estimated average salaries for public school teachers across the United States ranged from a high of $43,808 in Connecticut to a low of $22,363 in South Dakota, a difference of almost 100 percent. Within New York State, average district salaries for classroom teachers in 1992-93 ranged from $62,406 to $28,187 (Jacobson, 1996). Jacobson maintains that these wage disparities reflect regional differences in the cost of living, alternative employment opportunities for teachers, teacher union strength, the average level of teacher experience and education, as well as the willingness of the local community to support public education. The socioeconomic status of an area will decide the financial

ability of the local authority and influence its willingness to spend on public education, which in turn will affect how teachers are paid.

In studying educational models, family income level is often a factor to be considered (Alexander & Salmon, 1995). Moreover, family incomes are related to parents' education level, and they also influence children's learning habits and achievements (Chambers & Fowler, 1995). Higher income families tend to be willing to pay more for their children's education. Is the difference in average family incomes among the provinces reflected in average teacher salaries?

In educational finance, since family income level is often a factor to be considered, one may raise the question: Are teachers in wealthy areas better paid than their colleagues in less wealthy areas? In Canada, although the gap in family incomes between the lowest and the highest provincial averages has consistently declined over the period from 1970 to 1990, "there is a large variation in family incomes among the various regions of the country," with Ontario having the highest average family income and Newfoundland having the lowest average family income in 1990 (Rashid, 1994, p. 57).

Farm Land Price

Increasingly, cost of living is a factor in collective bargaining agreements. In considering cost of living, school systems and employee organizations even relate to consumer price index (Alexander & Salmon, 1995; The University of Toronto Faculty Association, 1998). Alexander and Salmon list three arguments in favour of using a cost of

living index to adjust amounts in a salary schedule: "1) Many discussions and controversies regarding salary adjustment could be avoided. 2) The use of index would provide an automatic plan for adjustments and would eliminate subjective factors. 3) Salaries would automatically increase or decrease as the cost of living increased or decreased" (p. 327).

In the United States there was a 42 percent variation in the cost of living in 1990 among states in the continent and a 57 percent variation if Hawaii and Alaska were included (McMahon & Chang, 1991). In Canada, the difference in cost of living also exists among cities (http://www.homefair.com/homefair/cmr/salcalc.html?NETSCAPE_LIVEWIRE.src=; Statistics Canada, 1997 June; Wright, 1997). According to Homefair, a company that compares cost of living among North American cities, if one makes $100,000 in St. John's of Newfoundland, one would need to make $169,830 in Vancouver of British Columbia, if one wants to keep the same standard of living.

Barro (1988) suggests that school district wealth, income and per pupil expenditure need to be investigated and that multivariate methods be used to quantify relationships among locational, financial, and other relevant attributes of districts and the levels of teacher salaries. Regional cost of living differences are reflected in the costs for hiring teachers, as they are in everything else. "Regional cost differences reflect the costs to teachers and administrators of living in each area" (McMahon & Chang, 1991, p. 22), and "employers as well as employees interested in maintaining a parity between services that are purchased or provided in different areas ... must make some kind of adjustment implicitly for differences in the cost of living" (p. 23). In Canada, it is assumed that cost of living differences among provinces and territories exist. Are these cost of living differences among provinces reflected

in average provincial teacher salaries?

Cost of living in a locality is reflected in various indications. Chambers and Fowler (1995) applied two variables in their study to indicate the variations in the costs of living: the base price of land as reflected by the average value of farm land and buildings per acre and the percentage change in the population of a county over the decade of 1980 to 1990. Chambers and Fowler use the value of farm land and buildings per acre because it is the base price of land, the cheapest land price, in a county or metropolitan area. Obviously, Chambers and Fowler assume that the variation in the contribution of buildings to the value per acre is insignificant. "The basic land values affect the local costs of producing goods and services and hence the cost-of-living differences across regions" (p. 39). Their study shows that "a one standard deviation increase in the base price of land ... is associated with 4.1 percent higher teacher salaries, all else equal" (p. 39).

Population Growth

Another factor that influences cost of living is population change. Population change in an area influences the local economy, because "changes in the population affect local demand for goods and services and reflect upward pressures on local prices and hence costs of living" (Chambers & Fowler, 1995, p. 39) if the population grows. As population grows, the resources become relatively scarce per capita and the cost of everything rises. Chambers and Fowler's results suggest that "a one standard deviation increase in the percent growth rate in population over the preceding decade ... is associated with approximately a 1.6 percent

teacher salary differential, all else equal" (p. 39).

According to Statistics Canada data, population change differs by province and territory (Statistics Canada, September 1987, April 1997). While most provinces and territories had population growth from 1986 to 1996, Saskatchewan and Newfoundland witnessed population loss in the same period. In Ontario, meantime, four census divisions' population decreased from 1986 to 1996, while all the other census divisions' population increased. Is the variation in population growth reflected in teacher compensation in a province and in a census division in Ontario?

Union Influence

At one time in Canada, "the teacher in a one-room rural school was employed on a pure master-servant basis by a small, elected board with no administrative staff" (Bezeau, 1989, p. 391). He or she was hired and dismissed at the will of the local board. Today, the majority of elementary and secondary school teachers' employment comes under provincial jurisdiction (Lockhart, 1991). "Teachers are covered by the general labour relations act in some jurisdictions, but more often by separate legislation" (Gunderson & Hyatt, 1996, p. 249). They find themselves hired under negotiated collective agreements with boards or provinces, and provincial laws provide them with due process related to employment status (Gunderson & Hyatt, 1996). A school board has to provide a legitimate reason before it can dismiss or even suspend a teacher (Lockhart, 1991), and legitimate reasons are not always accepted without being legally challenged.

From their very inception, Canadian teacher unions have been concerned with economic issues, and their struggles have helped achieve higher salaries for members (King & Peart, 1992). Most Canadian teachers are working under agreements negotiated through collective bargaining between teacher unions and school boards or provinces (Bezeau, 1989). The union is the same organization as the professional association in all provinces but British Columbia, New Brunswick and Ontario (Bezeau, 1989; Bowman, Ellis, Smart, & Weens, 1994; http://www.oct.on.ca/english/new.htm).

In British Columbia the distinction between union and the professional institute is clear (Bezeau, 1989; Bowman et al., 1994). The British Columbia College of Teachers is an independent, professional body empowered by statute to issue teaching certificates and to help design, evaluate and approve teacher education programs at public funded universities in the province. It can discipline members and withdraw certificates (Bowman et al., 1994). In New Brunswick, the difference is largely superficial, devised to allow professionalism in two official languages while maintaining one salary scale. Two professional associations are actively involved in collective bargaining through a single union (Bezeau, 1989). In Ontario, the responsibilities of the newly established College of Teachers have been worked out (Galt, September 15, 1997; "Teacher certificates", 1997; "Teachers define misconduct", 1997). On December 10, 1998, Ontario College of Teachers released "Standards of Practice for the Teaching Profession" (http://www.oct.on.ca/english/ new.htm).

All provinces have laws that organize and regulate the teaching profession. Most provinces require that all teachers working for publicly funded school boards be members of a teachers' association and give teachers the right to collective negotiation (Lawton, 1996;

Smaller, 1995). However, the provisions for collective bargaining and the levels at which the bargaining takes place vary from province to province (Mackie, 1997). In Ontario, The Teaching Profession Act was passed in 1944 (Reynolds, 1990), and in 1975 the School Boards and Teachers Collective Negotiations Act was enacted (http://www.edu.gov.on.ca/eng/general/abcs/drectory.html#erc). In September 1997, Bill 160, the Education Quality Improvement Act, was passed, extending instruction time, putting the provincial government in charge of setting education property tax rates, and replacing the 1975 act, under which negotiations took place (Girard, Ruimy & Small, 1997).

All Canadian provinces and territories have teacher unions doing collective bargaining with teachers' employers, but the levels at which the collective bargaining takes place are different in different provinces. Newfoundland, Prince Edward Island, New Brunswick, and Yukon have bargaining at the provincial or territorial level. Nova Scotia, Quebec, Saskatchewan, British Columbia and Northwest Territories hold bargaining at both the provincial or territorial and the local levels. In Ontario, Manitoba and Alberta, collective bargaining are held at the local level (Canadian Teachers' Federation (CTF), 1997b).

The strike option of dispute resolution is available in all Canadian provinces and territories but two, Prince Edward Island and Manitoba (CTF, 1997b). In these two provinces, "compulsory binding arbitration is the final stage of the collective bargaining process in the event of a deadlock" (CTF, 1997b, p. 33). In Nova Scotia, Quebec and British Columbia, strikes are legal at the provincial level but not at the local level. In Saskatchewan, strikes are permitted at all levels of collective bargaining. In Newfoundland, New Brunswick, Ontario, Alberta, and the two territories, teacher strikes are legal (Mackie, 1997).

In places where strikes are legal, normally certain prerequisites apply (CTF, 1997b).

In some provinces there is only one teachers' union whereas in others there are several federations. In New Brunswick, the umbrella New Brunswick Teachers' Federation hold collective bargaining with the province, although there are two other teacher unions: New Brunswick Teachers' Association for Anglophone teachers and Association des enseignantes et des enseignants francophones du Nouveau-Brunswick for Francophone teachers.

In Quebec there are three associations based on language and religion: Quebec Provincial Association of Teachers for Anglophone Protestants, Provincial Association of Catholic Teachers (Quebec) for Anglophone Catholics and the Centrale de l'enseignement du Québec for Francophone Catholics (Canadian Education Association, 1999).

Ontario used to have six teacher associations: the umbrella Ontario Teachers' Federation and five affiliates. The five affiliated organizations' identities were determined by gender, religious denomination, level of teaching, and language. The Women Teachers' Association of Ontario was for female teachers in public (as opposed to Roman Catholic separate) elementary schools enrolling Anglophone pupils. Ontario Public School Teachers' Federation was for male teachers in public elementary schools enrolling Anglophone pupils. On July 1, 1998, these two unions merged to form the Elementary Teachers' Federation of Ontario (http://www.fwtao.on.ca/who12.html). In Anglophone public secondary schools there is the Ontario Secondary School Teachers' Federation. Elementary and secondary teachers working for separate school boards belong to the Ontario English Catholic Teachers's Association. Teachers who teach in French to Francophone students are members

of L'Association des enseignantes et des enseignants franco-ontariens (Bezeau, 1989).

In the rest of Canada, there is only one teacher union in each province or territory.

Teacher Supply and Demand

Teacher supply and demand is related to teacher compensation (Chambers and Fowler, 1995), and a study by Ingersoll and others (1995) dealing with the supply of and demand for school teachers in the United States is helpful by virtue of its methodology. Like Chambers and Fowler, they used the 1990-1991 Schools and Staffing Survey of the National Centre for Education Statistics of the United States. Their study was partly prompted by the concern that the United States might experience shortages of teachers in the coming years as student enrollment rises and demand for teachers increases. Two of the conclusions they made in the analysis were that between 1990-91 and 1991-92 there was an overall teacher turnover rate of 13% and that fifty-five percent of those who left, left teaching altogether. If experience is important in a profession, it might be reasonable to assume that the higher the rate of turnover, the more unfavourable the impact will be on the work. Teaching is a profession where experience is valued and positively correlated with compensation (Barro, 1988; Bezeau, 1989; Jacobson, 1996).

The present consensus is that there has been a surplus of available teachers in Canada since the early 1990s (Press, 1998), as was the case in Australia several years ago (Lewis & Norris, 1992). The Australian surplus has turned into a shortage, while the Canadian surplus has persisted. In the Atlantic region, school enrollments have been dropping steadily

together with the population (Press, 1998; Statistics Canada, 1997). Furthermore, the trend towards lower pupil-teacher ratios has largely stopped (British Columbia Teacher Supply and Demand Committee, 1994; CMEC, 1996; Gendron, 1997; Lewington & Abbate, 1997; Lockhart, 1991). As the enrolments have relatively remained stable, so have the number of teaching positions, which increased "only 0.03 percent in five years" from 1990 to 1995 (Press, 1997, p. 5). In Canada in 1995 and a few years before that, there had been an overall teacher surplus across the country, but the degree of surplus in every province and territory was different (Pickard, 1995; Press, 1998; Tremblay, 1997).

Since 1989, over a dozen studies about teacher supply and demand in Canada have been undertaken at the national and the provincial levels. Two important studies on the issue were published in 1989, Projections of elementary and secondary enrolment and the teaching force in Canada, 1987-88 to 2006-07 (CTF, 1989) and Perspectives on teacher supply and demand in Ontario, 1988-2008 (Smith, 1989).

At the national level, the Canadian Teachers' Federation (1989) projected that there would be a shortage of teachers in the 1990s and that a net shortage of teachers began as early as 1987 in British Columbia and would begin as late as 1996 in the Atlantic Region. This claim has not been substantiated. Teaching continues to be viewed as an attractive occupation among those who enter Canadian teacher education programs for various reasons. Enrolment in these teacher education programs has been maintained despite the fact that the demand for qualified elementary and secondary school teachers drastically declined in Canada (Allison, 1982, 1984; CMEC, 1996; King & Peart, 1992) and the "employment prospects for graduates" of faculties of education "remain bleak if not dismal" (Pickard,

1995, p. 9). Moreover, Canadian teachers are less likely to leave the profession than their American counterparts (CEA, 1992; Ingersoll and others, 1995).

In 1992, Canadian Teachers' Federation published another teacher demand study, which acknowledged that the previous report (CTF, 1989) substantially overestimated teacher demand in Newfoundland and Saskatchewan. It projected that Newfoundland and Quebec would have -7.69 and -1.6 percent decrease respectively in full-time elementary school teachers from 1991-92 to 1996-97 (CTF, 1992). Ontario (11.69%), British Columbia (10.92%) and the Northwest Territories (14.93%) would have increased above the national average (6.71%) for the same period. The other six provinces and Yukon would have increases from 6.5% in Alberta to 1.07% in Saskatchewan. The Canadian Teachers' Federation (1992) expected the numbers of full-time secondary teachers to decline in Newfoundland (-4.71%), New Brunswick (-1.85) and Quebec (-0.46%) in the same period. Meanwhile, Yukon (21.37%), British Columbia (17.71%), Alberta (13.7%) and Ontario (11.76%) would have above national average (7.94%) increases in secondary teachers. In Prince Edward Island (7.75%), Saskatchewan (7.13%), the Northwest Territories (5.11%) and Manitoba (4.58%) the increases of teaching jobs would be below the national average. This projection overestimated teacher demand in Saskatchewan again (MacPherson, 1995a).

Tremblay (1997) did an analysis attempting to determine how the future retirement of elementary and secondary school teachers in Canada will affect the hiring of new teachers, given the aging of the teaching force along with the whole population. He concluded that "an increase in the demand for teachers at the beginning of the next century can be expected" (p. 67). However, Tremblay (1997) maintained that "there is currently a teacher surplus in

Canada and that this situation will persist if Canadian universities continue to train teachers at the current rate" (p. 70). But he also pointed out that only in Ontario it is likely that teacher supply and demand will be in balance (p. 70).

Press (1997) claimed that in Canada "most school districts will have the benefit of a general teacher surplus -- at least until the end of this century" (p. 14). Later Press (1998) reiterated that the majority of school districts he had surveyed did not have a teacher shortage and they did not expect to have a teacher shortage in the next five years. "Most districts reported large numbers of candidates and few available positions" (Press, 1998, p. 126).

In Newfoundland, the teaching force has been contracting since the early 1980's, but in 1995 and the few years before that time the annual supply of new education graduates was projected to remain constant at the level of about 700 (Press, 1990). With a contracting teaching force, no new policies that would increase demand for teachers, fewer teachers leaving the profession than in any other period of the province's history, and a stable yearly supply of education graduates (Press, 1990), the growing surplus of qualified teachers exceeded that in the rest of Canada with regard to the ratio between the hiring and the supply pool. Furthermore, in 1994-1995 school year, the Provincial Government requested that school boards proceed with plans to lay off 197 teachers in addition to the 138 permitted under the "2 percent savings clause" contained within the collective agreement (Newfoundland Teachers' Association, 1994, p 30).

New Brunswick had a general teacher surplus of about 352 percent in the year of 1995-96, calculated from the data provided in a study of teacher supply and demand for the Maritime provinces by Samson, Sullivan and Uhl (1991). A surplus of 352 percent means

that if 100 teaching positions needed to be filled, there were 452 qualified individuals available. The calculation of New Brunswick's teacher surplus percentage and the percentages of teacher surplus in other provinces are discussed in more detail in Chapter 3, when the methodology is elaborated. This calculated surplus in New Brunswick did not "take into account those teachers available to the school system from the pool of ... reentrant teachers, and previous (education) graduates with no teaching experience" (p. 73). The study suggested that previous graduates might be an important source of potential teachers. The study claimed that "there may be an oversupply of Anglophone and Francophone teachers in the Maritime Provinces to the year 2000" (p. 74) and "if the pool of substitute teachers remains at the 1988-89 level in the maritime Provinces, until the year 2003-2004, teacher shortages can be avoided" (p. 77).

According to a calculation based on the data in the same Samson, Sullivan and Uhl's (1991) study, Nova Scotia would have a general teacher surplus of about 469 percent in 1995-1996 school year.

In Prince Edward Island, there would be a general teachers surplus of about 342 percent for 1995-1996 school year, calculated from the same data source mentioned above. For both Nova Scotia and Prince Edward Island, the calculations did not take into consideration reentrant teachers and previous education graduates who had no teaching experience (Samson, Sullivan & Uhl, 1991).

In 1995-1996 school year Quebec had a teacher surplus of about 350 percent. This surplus was calculated from data provided by Quebec Ministry of Education (Bousquet, 1997). The information table produced by Bousquet lists historical and projected numbers

of annual teacher recruitment, numbers of persons who have a teaching certificate and who are prepared to take a teaching job, and numbers of persons who obtain a teaching certificate for the first time, from 1989-1990 to 2006-2007.

Smith (1989) estimated that in the early 1990's about 7,000 new teachers were needed every year in Ontario, which would rise to 7,500 by the year 1995. To meet the demand for new teachers, Ontario faculties of education would have to produce about 6,500 graduates in the early 1900's and 7000 graduates by the middle of the decade (p. 43). Not long after I came to Canada in 1993, an elementary school principal in Thunder Bay, Ontario, told me that in a couple of years there would be more openings for beginning teachers because many senior teachers would retire around the middle of the 1990s. Things did not turn out as Smith and that principal in Thunder Bay had predicted. In June, 1993, the New Democratic government of Ontario enacted Social Contract legislation to reduce the amount paid to the public sector by two billion dollars for each of the fiscal years 1993-94, 1994-95 and 1995-96. The Social Contract seemed to be restricting the job market for teacher preparation program graduates (Shulha, 1994). In 1995-1996 school year, there was still a substantial surplus of qualified teachers in Ontario (Press, 1998).

In 1996, Smith and McIntyre projected two scenarios in a forecast study about teacher supply and demand in Ontario. In the high demand scenario there would be a near balance of teacher supply and demand in Ontario by the year of 1998. In the low demand scenario there would be a small surplus, in the order of 11% to 14%, of supply over demand. They considered the low demand scenario would be a satisfactory situation. Smith and McIntyre (1996) also pointed out that applicants to Ontario teacher education programs plummeted

from 25,000 in 1991 to an estimated 6,000 in 1997.

In Manitoba, the Ministry of Education and Training established a Teacher Supply and Demand Task Force in 1990 to investigate the magnitude of a possible teacher shortage in the province. In carrying out its mandate, the Task Force concluded that slightly in excess of 1,000 teacher acquisitions would be required for each year from 1991-1992 to 1999-2000, based upon a projected slow decline in student enrolment, a constant pupil-teacher ratio of 15.19 and an annual teacher withdrawal of 8% (Manitoba Teacher Supply and Demand Task Force, 1991). The Task Force did not specify the details on the supply side as Smith (1996) and Samson, Sullivan and Uhl (1991) did, although it dealt with the number of teacher education graduates in Manitoba. A survey of the Faculty of Education 1995 graduates from the University of Manitoba indicated that of those graduates remaining in the province, 49.2% were working as full-time teachers, 8% were teaching part-time, 21.9% were substitute teaching, 18.5% had non-teaching jobs or had returned to university, and 1.7% were unemployed (Manitoba Association of School Trustees, 1996). It is reasonable to assume that there was a surplus in 1995-96, but because no data about the comprehensive supply pool are available, how big the surplus was is not known and cannot be calculated.

Saskatchewan trimmed a further four percent from its 1994-95 operating budget for school boards, after two percent cuts in each of the previous two years ("Education cuts", 1994). By 1995-96, financial restrictions, combined with declining enrolments, an increased pupil teacher ratio and a low rate of teacher turnover, had caused a downward pattern in the number of teaching jobs for seven years in a row, while the supply of university education graduates remained stable (Horsman, 1992; MacPherson, 1995a). Many education graduates

found their way to full-time teaching jobs by first working as substitute or part-time teachers (MacPherson, 1995b). In the first half of the decade there would be teacher surpluses, and in 1995-96, there would be about 100 surplus teachers (Horsman, 1992, p. 2).

Alberta Education (1991) did a survey of superintendents to find teacher supply and demand in Alberta in the fall of 1990. The results show that 3100 new teachers were hired for 1990-91, down from 3200 for 1989-90. Although enrolments increased, teacher turnover seemed to have decreased. Over half (54.6%) of the superintendents were of the opinion that teacher shortages were developing in their jurisdictions. However, Decore (1992) found that education students might have a different perception. Of the random sample of 618 B.Ed. graduates in Spring 1990 from three Alberta universities, 95 percent applied for an Alberta teaching certificate, only 47 percent were teaching full-time in Alberta schools, 16 percent were teaching part-time and 37 percent were not teaching in Alberta schools. The primary reason for not teaching was "not offered a teaching position (57.8%)" (p. 35) and the primary response from those not teaching when asked to describe their employment situation was "looking for a full-time teaching position" (p. 38).

Boberg, Bosetti and O'Reilly's (1993) survey of education graduates of Alberta universities confirmed what Decore found. Only about 56 percent of their cohort were teaching full-time and about over 40 percent were available to meet future increases in demand. While noting there was a teacher surplus in Alberta, this study suggested that demand for teachers in Alberta would increase in mid-1990s as a result of increased retirement. As is the case of Manitoba, no further detailed teacher supply and demand information in Alberta is available or can be calculated from available data.

British Columbia had a Teacher Supply and Demand Committee, whose 1994 report indicated that in 1993-1994 the net number of increase in teaching positions was only 171 across the province, although there had been greater degree of increase in the provincial enrolment. For 1995-96, a calculation based on the projection shows that there would be 2,774 teachers hired while there would be a supply pool of approximately 7,900 qualified teachers. The calculation also shows that there was a surplus of teacher supply about 185 percent for 1995-1996 in British Columbia.

In March, 1996, there were 446 elementary and secondary teachers (FTE) in Yukon (Yukon Education, 1996). Yukon does not have a shortage of available, qualified teachers and no significant change in staffing needs is forecast for next few years (W. Seipp, Assistant Deputy Minister of Education, personal communication, May 20, 1998). No further detailed teacher supply and demand information about Yukon is available.

Employment Market

The general labour market influences young people's decision of whether to enrol in a teacher preparation program after obtaining a bachelor's degree. This in turn affects how many applicants there are for teacher preparation programs. In addition, the general employment market influences school teachers' incomes (Jacobson, 1996).

The employment situation also has an impact on education graduates' choice of whether to enter teaching (Yee, 1990). In King and Peart's study (1992), while 55 percent of respondents indicate working with young people as an important factor in their decision

to enter teaching, 11 percent list available teaching jobs as an important factor, and 9 percent indicate few alternatives as a factor influencing decision to enter teaching. Lewis and Norris (1992) identify the unemployment rate as one of the two most important factors affecting the supply of teachers. "There is some evidence that increased losses to teaching corresponded to lower levels of unemployment" (p. 275). The other factor is teacher salaries relative to alternative occupations. Furthermore, general labour market affects teachers' decision of whether to remain in teaching. In British Columbia, "when the economy is improving and more job opportunities are present, more teachers are likely to choose to resign. In contrast, rising unemployment rates and the lack of job openings tend to inhibit teachers from leaving the profession" (British Columbia Teacher Supply and Demand Committee, 1994, p. 5).

"In essence, public sector wage settlements are not immune to market forces such as unemployment" (Gunderson & Hyatt, 1996, p. 267). Chambers and Fowler's (1995) study shows that "counties with highly competitive labour markets for teachers exhibit salaries as much as 8 percent higher. In addition, counties with tighter overall labour markets as reflected in lower unemployment rates also exhibit higher teacher salaries" (p. 35). Is the general labour market influencing how teachers are paid in each province in Canada and in every census division in Ontario?

Weather

Weather sometimes plays a role when people decide where to work. People prefer to live in warm and sunny places, and it is reasonable to assume that teachers act in the same

way. "The notion is that individuals would trade off salaries to live and work in regions with more favourable climates" (Chamber & Fowler, 1995, p. 42). Chambers and Fowler finds that teacher salaries are negatively associated with mean temperature, i.e., teachers would give up salary to live in warmer areas. "Moving from a region with a mean temperature of 57 ... to a region with a mean temperature of 65 is associated with a 2.8 percent lower level of teacher salaries, all else equal" (p. 42). Chambers and Fowler further point out that the climatic indications do not often show up in single-state studies where the variations in mean temperatures are often not large enough to reveal statistically significant results. In their nation wide analysis, "where variations across local jurisdictions are substantial, the hypothesis about the effects of climatic conditions is borne out" (p. 42).

In addition to people's preference for favourable weather (sunshine, seaside, and moderate temperature), "climatic differences also may have effects on differences in living costs" (McMahon & Chang, 1991, p. 5). People in colder places spend more to keep themselves warm.

Summary

While monetary incentives may not be the most important factor in their decision to enter teaching (King & Peart, 1992), "they do have an important effect on other teacher labour market behaviours, specifically recruitment, retention, and attendance" (Jacobson, 1996, p. 94), and "beginning teachers are responsive to monetary incentives" (Smith et al., 1993). Canadian teachers are in a much better financial position than their predecessors 50

years ago, but sometimes there is a controversy about how they are compensated ("Ontario: Teachers", 1997). A review of literature on factors that affect how teachers are paid among different regions suggest that eight factors may play a role in influencing how teachers in different areas are compensated. These eight factors are population density, average family income, average farm land price, population growth, union influence, teacher supply and demand, general labour market, and weather. Chapter 3 deals with the methodology of the study, where these eight factors are operationalised into variables so that the relationships between them and teacher employment incomes can be explored and analysed.

CHAPTER 3

METHODOLOGY

The present research attempts to answer these questions: What variation, if any, is there in teacher compensation among Canadian provinces and territories? Why is the variation? What variation, if any, is there in teacher compensation among different census divisions in Ontario? Why is the variation?

With regard to the issue of the variation in teacher compensation, a review of relevant literature suggests that eight factors be considered. These eight factors affecting teacher employment incomes examined in this research include population density, average family income, average farm land price, population growth, teachers' unions and collective bargaining, teacher supply and demand, unemployment rate, and weather (Barro, 1988; Chambers & Fowler, 1995; Hoxby, 1996; McMahon & Chang, 1991; King & Peart, 1992).

Design of the Study

Research in social science may be categorized into two types: descriptive studies and explanatory studies. Descriptive studies only describe what happened, whereas explanatory studies attempt to tell why and how it happened (Bailey, 1987). The present study goes beyond whether there is variation in teacher compensation. It attempts to explain why and how teacher compensation varies among provinces and among census divisions in Ontario.

This is an explanatory study.

This study is non-experimental, i.e. the researcher does not arrange the occurrences of behaviour. Since the conditions already exist, in this study, the researcher "merely selects the relevant variables for an analysis of their relationships" (Best & Kahn, 1993, p. 120). The present research seeks answers to questions through the analysis of variable relationships. A typical research question in this kind of study would be: What factors seem to be related with certain occurrences? Subsequently, another common question would be: How do relevant factors affect the events under consideration?

Comparison plays a significant role in this study. Teacher salaries among different provinces and territories in Canada and teacher salaries among different census divisions in Ontario were compared to determine if there is variation in teacher compensation. Once it was determined that there is variation, attempts were made to ascertain the extent of the variation.

In analysing data, this study follows a practical order: 1) first, choosing a treatment to apply to the given set of data; 2) then, identifying the reasons for choosing this treatment; 3) next, describing the types of models that have proved useful in carrying out this choice (Mosteller & Tukey, 1977).

Statistical procedures were conducted to test what factors have a relationship with the variation in teacher compensation, whether the relationship is a positive association or a negative one, and how strong the relationship is. Consequently, efforts were made to establish a mathematical model to estimate average teacher salaries.

The dependent variables in this study are the average annual employment incomes

of teachers in provinces and census divisions in Ontario. The eight factors expected to affect how teachers are compensated according to the review of literature were to be the independent variables. These eight independent variables are: population density, average family income, average farm land price, population growth, union influence and collective bargaining , teacher supply and demand, general employment market, and weather. Since the main source of the data is the 1996 Statistics Canada Census, it is assumed that the data were collected at the same time or nearly the same time. When it was necessary to use other data, great efforts were made to ensure that the data were collected at the same time or as nearly the same time as possible (Bouma & Atkinson, 1995).

Inter-Provincial Comparison

Education in Canada is a provincial or territorial responsibility, and any national research must take into account the characteristics of twelve jurisdictions (Bezeau, 1989; King & Peart, 1992). "The provinces and territories are responsible for education at every level" (Bedard & Ryall, 1996, p. 7) and it was expected that there are significant variations with regard to various educational phenomena at the inter-provincial level. Canada is one of the few countries in the world that does not have a national department or ministry of education. The Council of Ministers of Education, Canada was established only in 1967 to offer ministries and departments of education the opportunity to work together (Bedard & Ryall, 1996, p. 7).

Statistics Canada provides occupational employment income data for each province

and territory, making a study with teacher employment income as the dependent variable only feasible at the provincial level (Statistics Canada, 1989, 1993, October 1997). As well, the economic differences among provinces have been recognized factors in the study of labour markets (Gunderson & Riddell, 1993). The unit of analysis in this part of the study is province or territory. It was expected that eight factors have a relationship with how teachers are compensated in a province or territory.

Intra-Provincial Comparison

In addition to analysis made at the inter-provincial level, analysis was also undertaken at the census division level in Ontario with regard to the relationships between average teacher salaries and variables considered to affect teacher salaries. Census division was used as the unit of analysis in Ontario for two reasons. First, data are available at the census division level from Statistics Canada concerning five of the six independent variables: population density, average family income, average farm land price, population growth, and unemployment rate. Second, the average teacher salary figures from most school boards in Ontario are available from Ontario Education Relations Commission and these figures can be calculated to produce average teacher salary data at the census division level. It was expected that six factors have a relationship with how teachers are compensated in a census division in Ontario because data on union influence and teacher supply and demand are not available for census divisions in Ontario.

Hypotheses and Variables

Hypothesis formulation and testing is an important characteristic of an explanatory study. "A hypothesis is a proposition that is stated in testable form and predicts a particular relationship between two ... variables" (Bailey, 1987, p. 41). In this study, it was hypothesised that relationships exist between eight factors and provincial average teacher compensation. It was further hypothesised that relationships exist between six factors and how teachers are compensated in census divisions in Ontario.

"Explanatory statements vary greatly in scope and complexity, but all explanatory statements contain ... variables" (Bailey, 1987, p. 40). The dependent variables in this study are the average teacher salary in each province and territory and the average teacher salary in each census division in Ontario. The independent variables for each province and territory are population density, average family income, average farm land price, population growth, union influence, teacher supply and demand, unemployment rate, and weather. The independent variables for each census division in Ontario are population density, average family income, average farm land price, population growth, unemployment rate, and weather.

Teacher Employment Income

This study addresses the issue of variation in teacher compensation; therefore, how teachers are paid in each province and territory and in each census division in Ontario are the dependent variables. In each province or territory, the dependent variable is the combined average annual employment income of elementary and secondary school teachers for 1995

(Statistics Canada, October 1997). In each census division in Ontario, the dependent variable is the combined average elementary and secondary teacher salaries for the school year of 1995-1996 (Ontario Education Relations Commission, 1997).

Population Density

It was expected that population density plays a role in the determination of Canadian teacher salaries; and population density, indicated by the number of persons per square kilometre (Statistics Canada, April 1997), was the first independent variable to be investigated in the research at both the inter-provincial level in Canada and the census division level in Ontario.

Average Family Income

Average family income, the second independent variable, reflects the socioeconomic status of a province or a census division in Ontario. Family income is defined to consist of incomes received by all individuals 15 years of age and over who formed one family at the time of the 1996 census survey (Statistics Canada, 1997 February-a).

Average Farm Land Price

In studying the teacher compensation variation among Canadian provinces and territories as well as among census divisions in Ontario, the different costs of living in these

jurisdictions or areas was a factor to be considered. In this research, cost of living is measured by two indicators.

The first indicator is the average farm land price per acre in each province as well as in each census division in Ontario (Partridge from Statistics Canada Agriculture Division, Farm Income and Prices Section, personal communication, July 30, 1998; Houle from Statistics Canada, Agriculture Division, Census of Agriculture, personal communication, June 5, 1998). Average farm land price per acre was used as an independent variable to reflect an area's cost of living for the reason that farm land price is the most basic cost in a local economy (Chambers & Fowler, 1995).

Population Growth

The second indicator for cost of living is the population growth at both the inter-provincial level and the census division level in Ontario during the decade from 1986 to 1996 (Statistics Canada, 1987, 1997 April 15). The reason that population growth was used as an independent variable to indicate cost of living in a province and in an Ontario census division is that as population grows, so does the demand, and the local resources become relatively scarce, driving up the cost of everything (Chambers & Fowler, 1995).

Union Influence

Because union strength in collective bargaining influences teachers' incomes (Gunderson & Hyatt, 1996; Hoxby, 1996; Jacobson, 1996; King & Peart, 1992), teachers'

union and collective bargaining was an independent variable to be considered. Relevant considerations include phenomena such as strike rights, bargaining levels and whether there is a united union or there are several different unions in a province (Canadian Teachers' Federation, 1997b; Galt, Sept. 20, 1997; Gunderson & Hyatt, 1996; Mackie, 1997). It is assumed that having the right to strike and being united in one association give unions more strength in dealing with governments and school boards. Whether collective bargaining is undertaken provincially or locally may affect the process and results. Union influence was only analysed at the inter-provincial level because no data are available at the census division level in Ontario.

Teacher Supply and Demand

Teacher supply and demand factors have exhibited effects on teacher salaries (Chambers & Fowler, 1995; Hoxby, 1996; Jacobson, 1996; King & Peart, 1992). It was worthwhile to analyse the relationship between teacher supply and demand and teacher employment income. In comparing teacher compensation in different provinces in the year of 1995, I looked at the teacher supply and demand situation in the school year of 1995-1996 as an independent variable to determine what impact this factor has on the dependent variable. The degree of teacher surplus in each province was measured to see what relationship, if any, there is between teacher surplus and teacher employment income (Bousquet, 1997; British Columbia Teacher Supply and Demand Committee, 1994; Newfoundland Teachers' Association, 1994; Samson, Sullivan & Uhl, 1991). Like the

information about union influence, the information about teacher supply and demand situation is only analysed at the inter-provincial level because of data availability.

Unemployment Rate

Since the general labour market affects how teachers are paid (Chambers & Fowler, 1995; Jacobson, 1996), unemployment rate in a province and in an Ontario census division was an independent variable to be investigated in explaining teacher salaries' variation. The percentage of unemployment was examined to find a relationship, if there is one, between unemployment situation and teacher employment income in 1995 (Statistics Canada, January 1996, October 1997).

Weather

Weather was the last independent variable to be looked into in this research. Is there a relationship between teacher salaries in a province and the weather there? Furthermore, is there an association between temperature and teacher salaries in every census division in Ontario?

In this study, weather refers to the annual daily mean temperature at the census division level in Ontario. At the inter-provincial level, annual daily mean temperature is not available. In a weather forecast, usually a high temperature and a low temperature are reported. Annual average high temperature from the largest city in each province and

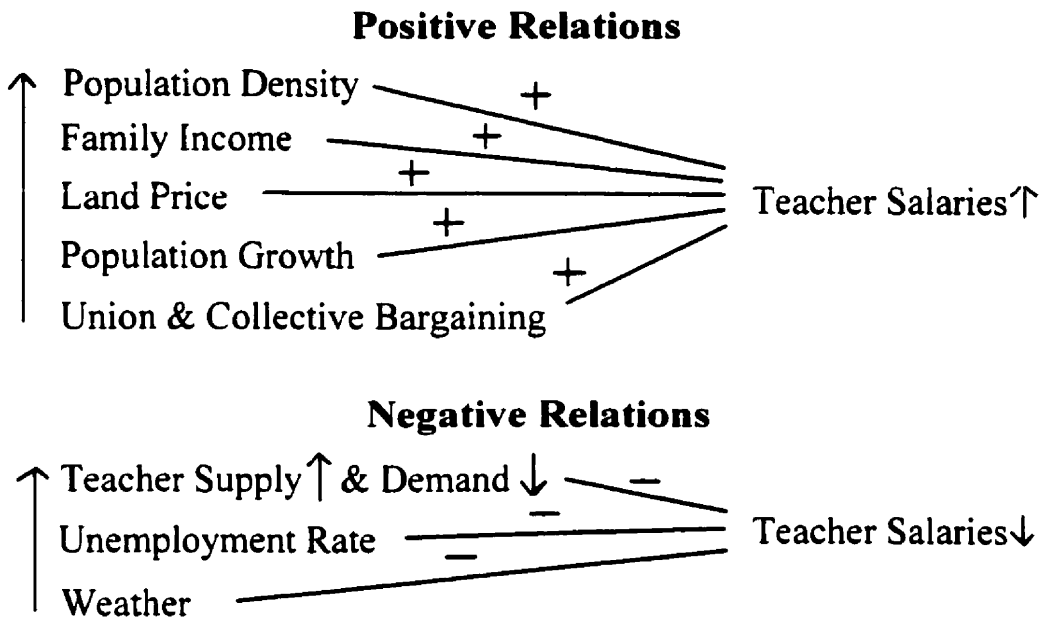
territory is used to indicate the weather condition in a province or territory because of its availability (Statistics Canada, http:www.statcan.ca:80/english/Pgdb/Land/Geography/phys08a.htm). As well, about 80 percent of the Canadian population live in urban areas (Statistics Canada, http://www.statcan.ca/english/census96/table15.htm), and most city dwellers live in or around large cities.

Eight Hypotheses

It was expected that relationships exist between average teacher salaries and the eight independent variables in each province and, in Ontario, it was expected that relationships exist between average teacher salaries and six independent variables in each census division. "When we say that the variables X and Y are related, we mean simply that they vary together, so that a change in X is accompanied by a change in Y and vice versa" (Bailey, 1987, p. 41). Such co-variation is often referred to as correlation. The diagram in figure 3.1 illustrates the expected correlations being tested in this research.

Figure 3.1

Independent Variables Explaining Teachers' Salaries



Eight hypotheses are tested in this research:

1) the greater the population density, the higher the teacher salaries tend to be, other things being equal;

2) the higher the average family incomes are, the higher the teacher salaries tend to be, other things being equal;

3) the higher the average farm land price is, the higher the teacher salaries tend to be, other things being equal;

4) the higher the population growth is, the higher the teacher salaries tend to be, other things being equal;

5) the stronger the union's influence in collective bargaining is, the higher the teacher salaries tend to be, other things being equal;

6) the higher the supply of and the lower the demand for teachers are, the lower the teacher salaries tend to be, other things being equal;

7) the higher unemployment rate is, the lower the teacher salaries tend to be, other things being equal;

8) the warmer the weather is, the lower the teacher salaries tend to be, other things being equal.

While the purpose of this research was to find and analyse the relationships between the eight independent variables and the dependent variable and to test the eight hypotheses that were expected to explain the variation in teacher employment income, it was also assumed that relationships may exist among the independent variables themselves. For instance, population density may be related to average family income and average farm land price. Selected relationships among some of the eight independent variables were also analysed.

Description of Data Sources

This study concentrates on the recent state of teachers' employment incomes in each

province and in each Ontario census division. In Canada, there is no counterpart of the United Sates Schools and Staffing Survey (SASS), for which questionnaires are sent to a large sample of schools, districts and teachers once every three years. To understand and sort out the factors that were expected to underlie the variation patterns in teacher compensation in Canada and Ontario, I first had to approach various data sources for information and then integrate the materials once they were obtained. Data collection was therefore a time-consuming process. One example is the experience of obtaining the average farm land price per acre for every province and for every Ontario census division. I had approached about ten organizations before I obtained the required data from Statistics Canada Agriculture Division, Farm Income and Prices Section.

I relied primarily on Statistics Canada 1996 Census data, which provide combined 1995 provincial average elementary and secondary school teacher employment incomes (Statistics Canada, October 1997), provincial population density, average family incomes (1997, February-a), and the basis of population growth information.

At least since 1986, Statistics Canada has listed average occupational employment incomes for the whole nation and for every province and territory calculated on a 20% sample size (Statistics Canada, 1989, 1993, October 1997). I investigated the combined average salaries of kindergarten, elementary, and secondary school teachers for the provinces and territories in 1995 listed in the 1996 Census results. Kindergarten, elementary and secondary school teachers are categorized according to Employment and Immigration Canada occupational classification system (Employment and Immigration Canada, 1993). The average school teacher salary data by province and territory are available in 1996 Census

file from the computer system of Statistics Canada regional office in Toronto (Statistics Canada, October 1997). The occupational employment income data are only available at the provincial and territorial level, limiting the extent of this study to inter-provincial analysis (Statistics Canada, 1989, 1993, October 1997).

Population density figures for each province and territory were taken from Statistics Canada (1997, April) 1996 Census data contained in the publication A National Overview: Population and Dwelling Counts, Catalogue number 93-357. Average family income in 1995 by province and territory data were taken from the Statistics Canada (1997, February-a) publication, Family Incomes: Census Families, 1995, Catalogue number 13-208-XPB. Data on provincial average farm land only price per acre in 1995 were purchased from Statistics Canada Agriculture Division, Farm Income and Prices Section (Partridge, personal communication, July 30, 1998). Population growth data at the inter-provincial level were calculated with the use of Statistics Canada 1986 and 1996 Census data (Statistics Canada, September 1987, April 1997).

Information on union influence and collective bargaining in the teaching profession has been gathered from several sources (Canadian Education Association, 1999; Canadian Teachers' Federation, 1997b; Galt, Sept. 20, 1997; Gunderson & Hyatt, 1996; Mackie, 1997). Teacher supply and demand in 1995-1996 school year data were collected and calculated from various research reports, of which some were commissioned by provincial ministries of education (Boberg, Bosetti & O'Reilly, 1993; Bousquet, 1997; British Columbia Teacher Supply and Demand Committee, 1994; Canadian Teachers' Federation, 1989, 1992; Decore, 1992; Horsman, 1992; Manitoba Teacher Supply and Demand Task

Force, 1991; MacPherson, 1995a, 1995b; Newfoundland Teachers' Association, 1994; Pickard, 1995; Press, 1990; Press, 1997, 1998; Samson, Sullivan & Uhl, 1991; Smith, 1989; Smith & McIntyre, 1996; Tremblay, 1997).

Table 3.1 shows the conclusions of and the figures calculated from the conclusions of major studies since 1989 about teacher supply and demand situation for Canada and for the provinces in the school year of 1995-1996.

Table 3.1

Major Studies about Teacher Supply and Demand since 1989 and Their Relevant Conclusions or Derived Calculations

Level	Author	Year	Conclusion or Derived Calculation
National	CTF	1989	A teacher shortage was expected in the 1990s.
National	CTF	1992	Number of teachers would be 312,309 by 2001-02.
National	Tremblay	1997	Increased demand at the beginning of the next century, but surplus would persist.
National	Press	1998	For most school districts there is no shortage and no shortage is expected in the next five years.
Nfld	Press	1990	A growing surplus of qualified teachers in 1990's.
PEI	Samson et al.	1991	Surplus of about 342% in 95-96 calculated from conclusion, except reentrant teachers & previous education graduates with no teaching experience.
NS	Samson et al.	1991	Surplus of about 469% in 95-96 calculated from conclusion, with the same exceptions of PEI.

NB	Samson et al.	1991	Surplus of about 352% in 95-96 calculated from conclusion, with the same exceptions of PEI.
QC	Bousquet	1992	Surplus of about 351 % in 95-96 calculated from conclusion.
Ont	Smith	1989	1995 would need 7,500 new teachers.
Ont	Smith & McIntyre	1996	There would be a decreasing, small surplus by 98.
Ont	McIntyre	1998	Teacher shortage looms.
Man	MTS&DTF[1]	1991	Over 1,000 teacher acquisitions would be required from 1991-1992 to 1999-2000.
Sask	Horsman	1992	Estimated 1,231 surplus teachers in 1995-96.
Alta	Boberg, Bosetti & O'Reilly	1993	Only 56% of B.Ed. Graduates were teaching.
B.C.	TS&DC[2]	1994	Surplus of about 123% in 95-96 calculated from conclusion.
Yukon			--
NWT			--

*Note. 1) Manitoba Teacher Supply and Demand Task Force.
2) Teacher Supply and Demand Committee.

Samson, Sullivan and Uhl's (1991) report lists projected teacher surplus or shortage data for the two instructional languages, different subjects and school levels from 1991-1992 to 2003-2004. These separate surplus or shortage data for the 1995-1996 school year were integrated to produce an overall picture of the whole province, which was a surplus of about 342 percent; i.e. for every 100 openings there were 442 qualified individuals willing and ready to take those positions. The surplus percentages for New Brunswick and Nova Scotia

were calculated in a similar way.

Quebec's teacher surplus percentage was calculated by dividing the teacher supply pool by the number of recruitments for the school year of 1995-1996 and then minus 100. The teacher supply pool included individuals holding teaching certificates who were not teaching but were ready to teach and individuals who obtained teaching certificates that year (Bousquet, 1992).

British Columbia's teacher surplus was obtained by dividing teacher supply pool by the number of openings created for the school year of 1995-1996 because of deaths, leaves, retirements, resignations, expired contracts, layoffs and increase in enrolment, and then minus 100 (British Columbia Teacher Supply and Demand Committee, 1994).

In reviewing Canadian teacher supply and demand literature, I find British Columbia Teacher Supply and Demand Committee's 1994 report to be the most useful with regard to the supply and demand scenario in a province. When compared with reports produced in other provinces, The Teacher Supply and Demand Committee's report in British Columbia quantified the supply and demand situation with the most relevant details. While British Columbia Teacher Supply and Demand Committee produced the most helpful study with respect to a province's overall scenario, Samson et al. provided the most detailed study of teacher supply and demand as far as instruction languages, subjects and school levels are concerned.

If all the other provinces and territories had done similar work as was done in British Columbia, it would have been much easier for this study. Unfortunately, this is not the case. It is not possible to paint an accurate picture of teacher supply and demand for every province

and territory in Canada for the school year of 1995-1996. All I can do from available data is to give an approximate description of what the teacher supply and demand situation was in that year and put the provinces, where relevant data are available or relevant data can be calculated from available information, in an estimated order with regard to teacher supply and demand.

With a contracting teaching force, no new policies leading to increased allocations of teachers, fewer teachers leaving the profession than in any other period of the province's history, and a stable yearly supply of education graduates (Press, 1990), the growing surplus of qualified teachers in Newfoundland exceeded that in the rest of Canada with regard to the ratio between the hiring and the teacher supply pool in a province. Furthermore, in the 1994-1995 school year, the provincial government requested that school boards proceed with plans to lay off 197 teachers in addition to the 138 permitted under the "2 percent savings clause" contained within the collective agreement (Newfoundland Teachers' Association, 1994, p 30).

Although the calculation results in table 3.1 show that Prince Edward Island had a smaller teacher surplus than Quebec with regard to percentage of teacher surplus, we should bear in mind that the calculation on Prince Edward Island teacher supply pool did not include reentrant teachers and previous education students with no teaching experiences. It is assumed that when reentrant teachers and previous education students with no teaching experiences were considered, Prince Edward Island had a greater teacher surplus than that of Quebec.

While the 1995 ratio, calculated from data (Tremblay, 1997), between the numbers

of working teachers in Quebec and Ontario is about 0.61, the 1995 ratio between the numbers of available teachers in Quebec and Ontario is 0.73 and the ratio between the approximate numbers of teaching certificates issued per year in Quebec and Ontario is 0.67. As well, according to data (Bousquet, 1997; Smith, 1989), the 1995 ratio between Quebec and Ontario of the numbers of new teachers hired is 0.57. With a lower ratio (0.61) of working teachers and a lower ratio (0.57) of hiring between Quebec and Ontario, but a higher ratio (0.73) of available teachers and a higher ratio (0.67) of the numbers of teaching certificates issued every year between Quebec and Ontario, indications are that in 1995 Quebec had a larger teacher surplus than Ontario as far as percentage of hiring against supply pool is concerned.

Information from persons in the educational circles of Ontario and British Columbia indicates that in 1995-1996 Ontario's teacher surplus was greater than that of British Columbia. Some Ontario teacher preparation program graduates went to British Columbia to seek teaching positions.

With the aforementioned information, I was able to put seven provinces, where teacher surplus information allows me to make inter-provincial comparisons, in an estimated order according to their degree of surplus, starting from the province with the smallest degree of surplus. Table 3.2 puts seven provinces with teacher surplus in the order from the smallest degree of surplus to the greatest degree of surplus.

Table 3.2

The Ordinal Extent of Teacher Surplus from Low to High, Seven Provinces 95-96

B.C.	1
Ont.	2
Que.	3
P.E.I.	4
N.B.	5
N.S.	6
Nfld.	7

Sources: Bousquet, 1997; British Columbia Teacher Supply and Demand Committee, 1994; Newfoundland Teachers' Association, 1994; Press, 1990; Press, 1997, 1998; Samson, Sullivan & Uhl, 1991; Smith, 1989; Smith & McIntyre, 1996; Tremblay, 1997.

Putting the seven provinces in a certain order was not enough. It was preferable to quantify the teacher surplus in each of the seven provinces in a way so that comparisons can be made with regard to teacher surplus and teacher salaries. An average difference in teacher surplus figures can be calculated among the provinces of New Brunswick, Nova Scotia and Prince Edward Island, where teacher supply and demand data are provided in a consistent method (Samson, Sullivan & Uhl, 1991). The average difference is 64 percent among the three provinces calculated from the data about their teacher supply and demand situation.

With the assumption that the difference in teacher supply and demand situation among the seven provinces is 64 percent, with Quebec as the base for estimating other provinces due to Quebec's central location in Canada, another table can be produced that lists

the actual teacher surplus in Quebec and British Columbia, and the estimated teacher surplus in Ontario, Prince Edward Island, New Brunswick, Nova Scotia, and Newfoundland. Table 3.3 presents the seven provinces' actual and estimated teacher surplus in the school year of 1995-1996. As some of the figures are estimates, the calculations concerning teacher supply and demand thereafter are all estimates. Nevertheless, these estimated figures and the resulting calculations do serve as an indication as what might happen when similar conditions exist.

Table 3.3

The Numerical Extent of Teacher Surplus from Low to High, Seven Provinces 95-96

	%
B.C.	123
Ont.	287
Que.	351
P.E.I.	415
N.B.	479
N.S.	543
Nfld.	607

Similar detailed data about teacher supply and demand are not available and can not be calculated from information from Manitoba, Saskatchewan, Alberta, Northwest Territories and Yukon.

Unemployment rates for each province in 1995 were taken from the Statistics Canada (January 1996) publication, The Labour Force: December 1995, Catalogue number 71-001 Monthly. Average annual high temperature from the largest city in each province and territory is used to indicate weather in a province or territory because of its availability. These temperature data are available from Statistics Canada's website (http://www.statcan.ca:80/english/Pgdb/Land/Geography/phys08a.htm).

Data about Ontario average elementary and secondary teacher salaries in 1995-1996 school year from different school boards were obtained from the Ontario Education Relations Commission (1997). Formed to administer The School Boards and Teachers Negotiations Act, the Education Relations Commission monitored "all negotiations, collecting and providing data to all parties in collective negotiations, assisting the parties in their collective negotiations, training third-party neutrals, adjudicating good-faith bargaining charges, supervising last offer, strike and ratification votes and advising the Lieutenant Governor in Council concerning jeopardy to students' course of study in the event of a strike and/or lockout" (http://www.edu.gov.on.ca/eng/general/abcs/drectory.html#erc).

I calculated the weighted average school teacher salaries at the census division level using the number of full-time equivalent teachers from each school board as a weighting factor. These weighted average teacher salaries for each census division in Ontario were used in the data analysis. With the number of teachers factored in, weighted average is more accurate than unweighted average. In conducting quantitative analyses, weighted average should be used whenever it is possible.

For Ontario, data at the census division level on population density at 1996 Census

were taken from the Statistics Canada (April 1997) publication, A National Overview: Population and Dwelling Counts, Catalogue number 93-357. Average family income data in 1995 for each census division were taken from "Census of Canada, 1996: Profile files", which are available at the website of http:www.chass.utoronto.ca/datalib/cc96/profil96.htm.

The 1995 market value of land and buildings per acre of farm land data for each census division were obtained from Statistics Canada, Agriculture Division, Census of Agriculture (Houle, personal communication, June 5, 1998). It is assumed that the variation in the contribution of the buildings' values to the market value of land and buildings per acre of farm land is insignificant among census divisions. Population growth at the census division level was calculated from Statistics Canada 1986 and 1996 Census data (Statistics Canada, September 1987, April 1997).

Unemployment rates in 1995 for each census division were taken from the Statistics Canada Census of Canada 1996 data file at http://prod.library.utoronto.ca/datalib/datar/cc96/bsts/csd/b27csd.ivt, which is available at Robarts Library's data library in the University of Toronto. The access to this data file is restricted to University of Toronto, York University and Ryerson Polytechnic University faculty, students and staff.

Environment Canada's local climate data from weather stations were approximately matched at the census division level (http://www.emc.ec.gc.ca/climate/normals/E_ON_WMO.HTM). There are 44 census divisions for which average teacher salaries were calculated, but there are only 38 weather stations in Ontario according to Environment Canada. Even these 38 weather stations do not spread evenly across Ontario. For some census divisions, there are more than one weather station, such as the census divisions of

Toronto and Ottawa, while for other census divisions, several census divisions have to use the annual daily mean temperature from one weather station.

For census divisions that have more than one weather station, the data considered the most representative were chosen. For census divisions that do not have their own weather stations, data from the nearest weather station located in another census division were used. If there are two nearby weather stations of similar distance, the one that has the same latitude with the census division under consideration was selected because latitude normally has a greater impact on a locality's weather than longitude.

Selection of Data

In collecting data for doing other research projects, I found that sometimes different government departments give different information with regard to the same subject. For example, the elementary enrolment figure of Atikokan Board of Education for the 1994-1995 school year provided by Ontario Ministry of Education and Training is 380 (Ontario Ministry of Education and Training, 1996), whereas the figure provided by Ontario Education Relations Commission is 345 (Ontario Education Relations Commission, 1996). The reasons for such phenomena vary, causing confusion on the part of the researcher and making research more difficult and time consuming. In the case of Atikokan Board of Education elementary enrolment figure, the difference may be caused by slight difference in definition or by the different times data were collected. In order to minimize this problem, I considered all relevant factors when faced with a situation similar to the one mentioned above, and

weighed the pros and cons before making a decision as to which data set to use.

From Ontario Education Relations Commission, three sets of teacher compensation data from most of the school boards are available. These three sets of data include minimum salary, average salary, and maximum salary (Ontario Education Relations Commission, 1997). It was decided that the average salary data set would be used in this research for the following two reasons: 1) the average salaries most represent teacher employment incomes; 2) the average salaries correspond to Statistics Canada data on average provincial teacher employment incomes.

After data were collected from both Statistics Canada (October 1997) and Ontario Education Relations Commission (1997), I found that the average teacher salaries provided by these two institutions are different. The 1995-1996 school year provincial average teacher salary figures in Ontario provided by Education Relations Commission (ERC) are $53,731 for elementary teachers and $57,045 for secondary teachers, while Statistics Canada data indicate that Ontario average annual employment income is $40,677 for elementary teachers and $46,094 for secondary teachers. The figures from Statistics Canada are much lower than those from ERC. This discrepancy may be caused by two factors. First, Statistics Canada Census' categorization of teachers includes teachers' assistants, part-time teachers and anyone who self-reported on the Statistics Canada questionnaire to be a teacher. For example, a substitute teacher who waits for a phone call Monday through Friday to get some work may have a very low annual income, while ERC's average teachers' salaries only list those of Full Time Equivalent (FTE) on grid and off grid teaching staff (ERC, 1997). Second, Statistics Canada's figures are calculated from numbers that may have sampling

errors, while ERC's figures are the weighted average salaries calculated with the actual teacher distribution and corresponding salary grid.

This discrepancy between the figures provided by Statistics Canada and Ontario Education Relations Commission is not a major problem for the study because each comparison is made using only one set of data from the above mentioned two sets of data. Therefore, the data are consistent across the nation or across the province of Ontario. Also, the analysis hinges on the relationships among variables; so long as both the Statistics Canada and Ontario Education Relations Commission data are reliable indices of teacher salary levels, the particular measurement method is not critical.

Annual average high temperature from the largest city in each province or territory was used to indicate the weather condition in that province or territory because the annual daily mean temperature for each province and territory, which would be ideal, is not available from Environment Canada, or any other sources that I have searched. In addition, according to 1996 Census, about 80 percent of the Canadian population live in urban areas (Statistics Canada, http://www.statcan.ca/english/census96/table15.htm), and most city dwellers live in or around large cities.

Summary

Like Chambers and Fowler (1995), I had to merge data from different sources into needed data files to facilitate the calculation and comparison, and to improve the quality of the overall analysis of the variation in teacher employment incomes. In an explanatory study,

usually "the values ... of a variable are designated quantitatively" (Bailey, 1987, p. 40). The most part of the data in this research is in the form of numerical figures and dollar amounts. These figures and amounts are analysed with the application of the Statistic Package for the Social Studies (SPSS) version 6.1 (Norusis, 1995).

It was hypothesised that eight independent variables affect how teachers are paid in a province. It was further hypothesised that six independent variables affect how teachers are paid in a census division in Ontario. Chapter 4 describes the concrete data and their analysis, and presents the testing of the hypotheses that relationships exist between average teacher salaries and the eight independent variables. Furthermore, attempts were made to establish statistical models to estimate average teacher employment incomes for each province and each census division in Ontario. After the statistical models were established, they were tested with the actual data and analytical procedures to see if they fit well.

CHAPTER 4

DATA ANALYSIS AND HYPOTHESES TESTING

The first purpose of the study is to determine whether there is variation in average teacher salaries among Canadian provinces and territories as well as among census divisions in Ontario. Subsequently, if there is variation in average teacher salaries, attempts are made to determine the extent of variation in teacher annual employment income and to determine the relationships between this dependent variable and eight independent variables by testing the hypotheses. In addition, efforts are made to establish statistical models to estimate average teacher salaries.

After obtaining the data, I assessed not only the relationships between the individual independent variables and the dependent variable, but also the relationships among selected independent variables. The bivariate correlation procedure in SPSS was used to test for a relationship between the dependent variable and each independent variable. As well, scatterplots were used to illustrate whether there is a linear association between the dependent variable and those independent variables. The partial correlation procedure was applied to test each hypothesis with corresponding independent variable while other independent variables were kept constant. I also used the multiple linear regression procedure to test the independent variables' separate and combined predicting and explanatory abilities on the dependent variable to find the most parsimonious model for

estimating average school teacher salaries.

Data Presentation and Bivariate Analysis

Before undertaking any analysis, it is helpful to consider the overall picture. Table 4.1 provides, by province and territory: 1995 average school teacher salaries; population density of persons per square kilometre in May 1996; 1995 average farm land price per acre; percentage of total population growth from 1986 to 1996; 1995 average family income; 1995-1996 school year percentage of teacher surplus; 1995 unemployment rate, and annual average high temperature from the largest city in each province and territory.

Table 4.1

Teacher Salary, Population Density, Land Price, Population Growth, Family Income, Teacher Surplus, Unemployment Rate, & Weather by Province & Territory

	Teacher Salary	Popu. Density	Land Price	Popu. Growth	Family Income	Teacher Surplus	Unem. Rate	Weather
		person/km²		%		%	%	C°
Alta.	$36,390	4.2	$341	14	$53,361	--*	7.8	10.3
B.C.	$38,737	4.2	$949	29	$56,925	123	9.0	13.5
Man.	$36,296	2.0	$311	5	$51,467	--*	7.5	8.1
N.B.	$31,771	10.3	$428	4	$44,545	479	11.5	11.0
Nfld.	$35,253	1.5	$777	-3	$42,328	607	18.3	8.6
N.S.	$35,530	17.2	$388	4	$44,826	543	12.1	10.7
Ont.	$42,758	11.7	$1,242	18	$59,356	287	8.7	12.6
P.E.I.	$32,227	23.8	$903	6	$45,450	415	14.7	9.5
Que.	$35,094	5.3	$603	9	$49,498	351	11.3	10.9
Sask.	$33,059	1.7	$231	-2	$50,065	--*	6.9	8.9
N.T.	$42,368	--*	--*	23	--*	--*	--*	-.8
Yukon	$42,080	.1	--*	31	--*	--*	--*	4.1

*Note. Data not available.

Sources: Please see pages 64 to 73.

While table 4.1 shows the data at the inter-provincial level in Canada, table 4.2

presents data by census division in Ontario, including 1995-1996 school year average teacher salaries, population density of persons per square kilometre in May 1996, 1995 average farm land price per acre, percentage of total population growth from 1986 to 1996, 1995 average family income, 1995 unemployment rate, and annual daily mean temperature.

Table 4.2

Teacher Salary, Population Density, Land Price, Population Growth, Family Income, Unemployment Rate, and Weather by Census Division in Ontario

	Teacher Salary	Popu. Density	Land Price	Popu. Growth	Family Income	Unem. Rate	Weather
		person/km²		%		%	C°
Algoma	$55,826	2.4	$975	-5	$51,050	13.3	4.2
Brant	--*	105.0	$3,158	8	$53,893	8.3	7.6
Bruce	--*	16.2	$1,353	12	$52,943	8.7	5.9
Cochrane	--*	.6	$630	-1	$55,302	11.6	1.2
Dufferin	$53,063	30.6	$2,364	40	$59,878	5.2	8.9
Durham	$51,302	184.2	$3,994	41	$64,940	8.1	5.9
Elgin	$52,718	42.0	$2,479	13	$53,313	9.2	7.2
Essex	$55,957	188.2	$3,577	11	$61,590	7.7	9.1
Frontenac	$54,962	35.7	$1,204	18	$56,450	9.7	6.7
Grey	$53,796	19.5	$1,559	17	$49,442	8.6	5.9
Haldimand-Norf.	$53,350	35.2	$2,471	14	$53,766	9.3	7.6
Haliburton	$56,314	3.7	$1,488	28	$42,255	14.9	4.8
Halton	$52,846	354.5	$6,425	25	$79,930	5.5	7.6
Hamilton-Went.	$57,188	420.3	$4,898	10	$56,223	9.1	7.6
Hastings	$54,074	19.9	$1,099	9	$48,351	11.2	8.9
Huron	$55,983	17.7	$2,248	8	$50,428	6.5	8.9
Kenora	$54,625	.2	$855	20	$53,121	12.9	2.4
Kent	$55,024	44.0	$2,941	3	$54,999	8.4	9.1
Lambton	$55,403	43.0	$2,312	4	$58,859	9.5	8.0
Lanark	$54,456	19.5	$1,187	21	$54,120	8.4	4.8

Leeds & Gren.	$53,288	28.4	$1,274	14	$52,031	8.4	6.7
Lennox & Add.	$55,721	13.8	$1,122	14	$48,984	9.7	6.7
Manitoulin	$53,822	3.1	$507	16	$42,786	13.1	5.1
Middlesex	$54,616	116.1	$2,956	17	$58,737	8.9	7.2
Muskoka	$53,885	12.5	$1,713	25	$47,834	10.8	4.8
Niagara	$53,373	218.0	$5,427	9	$54,418	9.6	7.6
Nipissing	$56,687	4.7	$806	7	$50,151	12.0	3.6
Northumberland	$50,694	38.8	$2,001	21	$53,144	9.2	8.9
Ottawa-Carlton	$54,631	261.6	$2,416	19	$67,871	8.7	6.0
Oxford	$52,545	47.8	$3,299	14	$55,320	7.8	7.6
Parry Sound	--*	4.0	$952	18	$42,702	12.9	4.2
Peel	$54,364	695.9	$8,451	44	$64,729	8.1	8.9
Perth	$53,349	32.9	$2,944	8	$56,369	5.3	7.6
Peterborough	$54,215	31.2	$1,696	18	$51,020	10.4	5.9
Prescott & Rus.	$52,703	36.9	$1,750	28	$53,446	8.1	6.0
Prince Edward	$51,379	23.9	$1,527	12	$50,446	8.8	6.8
Rainy River	$55,490	1.4	$459	1	$55,036	10.9	1.5
Renfrew	$53,173	12.6	$855	8	$48,916	9.7	4.2
Simcoe	$53,901	68.1	$2,720	38	$54,304	8.9	7.6
Storm/Dun/Glen.	$53,016	33.7	$1,627	9	$49,792	10.5	6.0
Sudbury D	$56,083	.6	$628	-1	$48,960	14.8	3.5
Sudbury RM	$57,554	62.9	$1,535	8	$56,986	12.1	3.5
Thunder Bay	$58,515	1.4	$1,496	1	$59,375	11.1	2.4
Timiskaming	--*	3.0	$701	-6	$48,898	12.9	2.0
Toronto MM	$56,337	3875.8	$8,555	9	$58,939	10.7	8.9
Victoria	$53,256	22.1	$1,463	29	$48,224	11.0	5.9
Waterloo RM	$56,088	298.2	$3,850	23	$59,916	7.9	6.6
Wellington	$54,923	64.4	$2,907	23	$60,805	6.1	6.6
York RM	$54,414	337.5	$8,555	69	$74,272	6.8	8.9

N = 49

*Note. Salary data for these census divisions are incomplete because data for some school boards in these census divisions are not available.

Sources: Please see pages 73 and 75.

A glance at the data provided in tables 4.1 and 4.2 reveals little. More detailed and more illustrative presentation of the data are needed to see patterns, if any, between the independent variables and the dependent variable. As well, since hypotheses testing is an important part of this study, the relationship between each of the eight independent variables and the dependent variable needs to be systematically assessed.

Population Density and Teacher Salary

In this study, a number of hypotheses are tested. The first hypothesis suggests that the greater the population density, the higher the teacher salaries tend to be, all else being equal. Table 4.3 displays the combined average employment incomes elementary and secondary school teachers received in 1995 in each province and territory according to Statistics Canada 1996 census data (Statistics Canada, October 1997). In addition, table 4.3 provides the independent variable of provincial and territorial population density based on the 1996 Census. Data on these two variables are arranged from the highest to the lowest to display any kind of association between the two variables.

Table 4.3

Population Density and Teacher Salaries from High to Low, Canada

Population Density Persons per km² 5/96		Teacher Salaries 1995	
P.E.I.	23.8	Ont.	$ 42,758
N.S.	17.2	N.T.	$ 42,368
Ont.	11.7	Yukon	$ 42,080
N.B.	10.3	B.C.	$ 38,737
Que.	5.3	Alta.	$ 36,390
B.C.	4.2	Man.	$ 36,296
Alta.	4.2	N.S.	$ 35,530
Man.	2.0	Nfld.	$ 35,253
Sask.	1.7	Que.	$ 35,094
Nfld.	1.5	Sask.	$ 33,059
Yukon	.1	P.E.I.	$ 32,227
N.T*	--	N.B.	$ 31,771
M = 7.5 persons/km²		M = $36,797	
SD = 7.5 persons/km²		SD = $3,881	

*Note. Data not available.

Sources: Statistics Canada, April 1997, October 1997.

From table 4.3 it can be seen that in 1995 the average teacher salaries ranged from the highest of $42,758 in Ontario to the lowest of $31,771 in New Brunswick, with a difference of $10,987 between the two. In 1995, the average difference of teacher

employment income among Canadian provinces and territories was $999. This average difference was obtained by summing up the consecutive 11 differences among the ten provinces and two territories on the teacher salary list and dividing the sum by 11. The means for both average teacher salaries and population density and all the means in the following tables are unweighted means.

As to the independent variable of population density, there was a difference of 23.7 persons per square kilometre between the highest population density of Prince Edward Island and the lowest population density of Yukon at the time of 1996 Census. The average difference of population density among provinces and territories was about 2.4 persons/km^2. This average difference in persons per square kilometre was calculated in the similar way with that of the average teacher salaries.

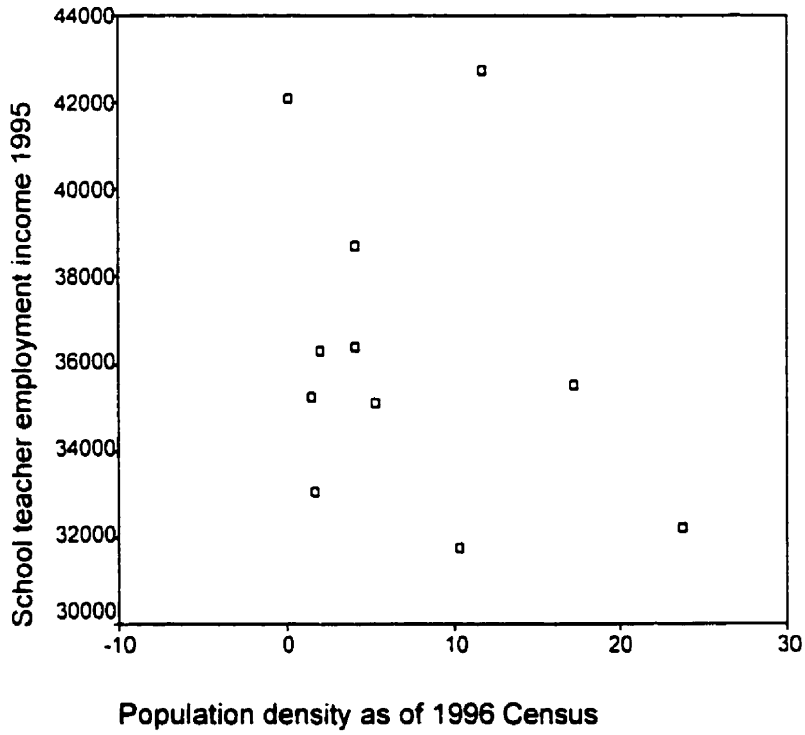
With the bivariate correlation procedure in SPSS, an unexpected negative correlation coefficient ($r = -.30$) between population density and average teacher employment income is noted. The correlation coefficient shows the strength of the linear association between an independent variable and the dependent variable. If the correlation coefficient is 1, these two variables vary together perfectly in the same direction. The correlation coefficient is -1 when the two variables vary simultaneously and perfectly in the opposite direction. The absolute value of the correlation coefficient indicates how strong the linear relationship between an independent variable and the dependent variable is when they vary. I considered each absolute value of the independent variables' correlation coefficients to determine which independent variables have a strong relationship with the dependent variable and which independent variables may actually not have an association with the dependent

variable.

While the bivariate correlation procedure produces a negative correlation coefficient, a scatterplot in figure 4.1 illustrates that a linear relationship between population density and average teacher salaries is difficult to observe. Due to disproportionately influential points, sometimes a misleading correlation coefficient can be obtained with the bivariate correlation procedure (Norusis, 1995). The finding that no linear relationship can be observed between population density and average teacher salaries will be discussed, along with others, later.

Figure 4.1

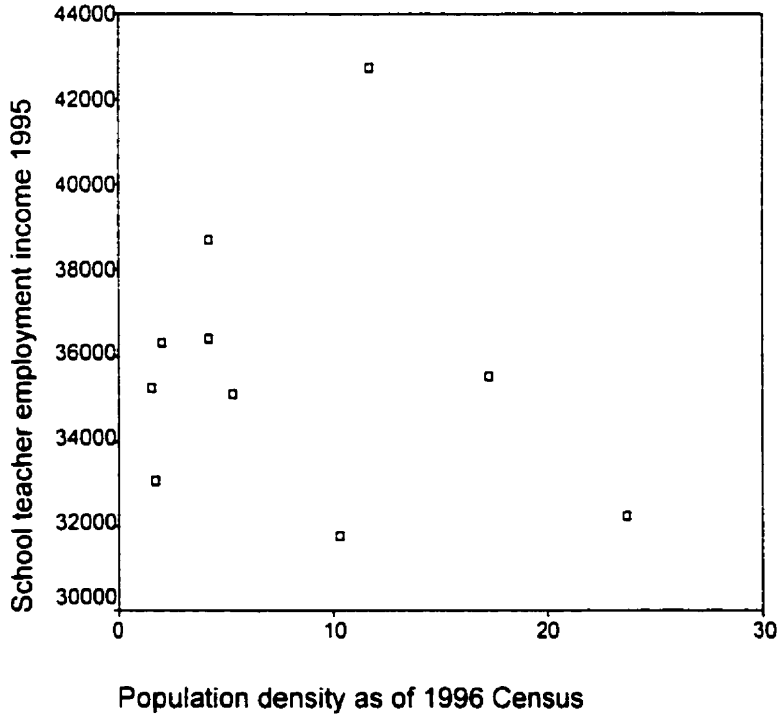
Teacher salaries and population density of 10 provinces and 1 territory



Data with regard to average family income, average farm land price, teacher supply and demand and unemployment rate are not available for the two territories. Hence, for the purpose of comparison, it is necessary to calculate data concerning population density and average teacher salaries for the ten provinces only. For the ten provinces, the unweighted mean of population density is 8.2 persons/km^2 and the standard deviation is 7.5 persons/km^2. The unweighted mean of average teacher salaries for the ten provinces is $35,712 and the standard deviation is $3,248. Excluding the two territories, according to the bivariate correlation procedure there is a low, negative correlation coefficient ($r = -.16$). But, again, a scatterplot in figure 4.2 shows no obvious linear association between population density and average teacher salaries in the ten provinces.

Figure 4.2

Teacher salaries and population density of 10 provinces



Turning to intra-provincial variation, for the province of Ontario, table 4.4 shows population density according to the 1996 Census and average teacher salaries for the school year of 1995-1996 at the census division level. Both population density and teacher salaries are arranged in the order from the highest to the lowest. Because the list is too long, it is difficult to notice any pattern if there is one. However, with all the figures presented, it is easier to analyse and discuss the data.

Table 4.4

Population Density and Teacher Salaries from High to Low, Ontario

Population Density Persons per km² 5/96		Teacher Salaries 95-96	
Toronto MM	3875.8	Thunder Bay D	$ 58,515
Peel RM	695.9	Sudbury RM	$ 57,554
Hamilton-Wentworth RM	420.3	Hamilton-Wentworth RM	$ 57,188
Halton RM	354.5	Nipissing D	$ 56,687
York RM	337.5	Toronto MM	$ 56,337
Waterloo RM	298.2	Haliburton	$ 56,314
Ottawa-Carlton RM	261.6	Waterloo RM	$ 56,088
Niagara RM	218.0	Sudbury D	$ 56,083
Essex	188.2	Huron	$ 55,983
Durham RM	184.2	Essex	$ 55,957
Middlesex	116.1	Algoma D	$ 55,826
Brant	105.0	Lennox & Addington Co	$ 55,721
Simco	68.1	Rainy River D	$ 55,490
Wellington	64.4	Lambton	$ 55,403
Sudbury RM	62.9	Kent	$ 55,024
Oxford	47.8	Frontenac	$ 54,962
Kent	44.0	Wellington	$ 54,923
Lambton	43.0	Ottawa-Carlton RM	$ 54,631
Elgin	42.0	Kenora D	$ 54,625

Northumberland	38.8	Middlesex	$ 54,616
Prescott & Russell UC	36.9	Lanark	$ 54,456
Frontenac	35.7	York RM	$ 54,414
Haldimand-Norfolk RM	35.2	Peel RM	$ 54,364
Stormont, Dundas & Gleng.	33.7	Peterborough	$ 54,215
Perth	32.9	Hastings	$ 54,074
Peterborough	31.2	Simcoe	$ 53,901
Dufferin	30.6	Muskoka DM	$ 53,885
Leeds & Grenville UC	28.4	Manitoulin D	$ 53,822
Prince Edward	23.9	Grey	$ 53,796
Victoria	22.1	Niagara RM	$ 53,373
Hastings	19.9	Haldimand-Norfolk RM	$ 53,350
Grey	19.5	Perth	$ 53,349
Lanark	19.5	Leeds & Grenville UC	$ 53,288
Huron	17.7	Victoria	$ 53,256
Bruce	16.2	Renfrew	$ 53,173
Lennox & Addington Co	13.8	Dufferin	$ 53,063
Renfrew	12.6	Stormont Dundas & Glengar	$ 53,016
Muskoka DM	12.5	Halton RM	$ 52,846
Nipissing D	4.7	Elgin	$ 52,718
Parry Sound D	4.0	Prescott & Russell UC	$ 52,703
Haliburton	3.7	Oxford	$ 52,545
Manitoulin D	3.1	Prince Edward	$ 51,379
Timiskaming D	3.0	Durham RM	$ 51,302
Algoma D	2.4	Northumberland	$ 50,694
Rainy River D	1.4	Brant*	--
Thunder Bay D	1.4	Bruce*	--
Cochrane D	.6	Cochrane D*	--
Sudbury D	.6	Parry Sound D*	--
Kenora D	.2	Timiskaming D*	--

M = 161.9 persons/km²	N = 44	M = $54,430
SD = 558.5 persons/km²		SD = $1,680

*Note. Data are incomplete for these census divisions.

Sources: Statistics Canada, April 1997; Ontario Education Relations Commission, 1997.

For Ontario, the teacher salary figures are the combined average annual elementary and secondary school teacher salaries for most census divisions during the 1995-1996 school year. These figures, as displayed in table 4.4, are weighted average salaries, with the number of full time equivalent school teachers as the weighting factor, calculated from Education Relations Commission data (ERC, 1997).

In 1995-1996 school year, at the census division level, there was a difference of $7,821 between the highest paid average teacher salaries, $58,515, in Thunder Bay District and the lowest paid average teacher salaries, $50,694, in Northumberland County, compared with a difference of $10,987 between the highest average teacher salaries of $42,758 in Ontario to the lowest average teacher salaries of $31,771 in New Brunswick at the inter-provincial level in 1995. While we have to keep in mind that the calculation methods of average teacher salaries in Ontario Education Relations Commission and Statistics Canada were different, the fact is obvious that there was more variation at the inter-provincial level in Canada than there was at the census division level in Ontario. As well, there are only 10 provinces, whereas there are 44 census divisions in Ontario with average salary data.

The average difference of school teacher salaries among these census divisions in Ontario was about $184. This average difference was calculated in a similar way with that of the average teacher salaries at the inter-provincial level in Canada. The unweighted statistical mean of the average teacher salaries at the census division level in Ontario is $54,430 and the standard deviation is $1,680, compared with the unweighted mean for average teacher salaries of about $35,712 and the standard deviation of $3,248 at the inter-

provincial level.

On average, in 1995-1996 school year, the differences in average teacher salaries among census divisions in Ontario were not as large as the differences in average teacher salaries among provinces in 1995. The standard deviation of teacher salaries at the census division level in Ontario, $1,680, was about half of the standard deviation of teacher salaries at the inter-provincial level, which was $3,248.

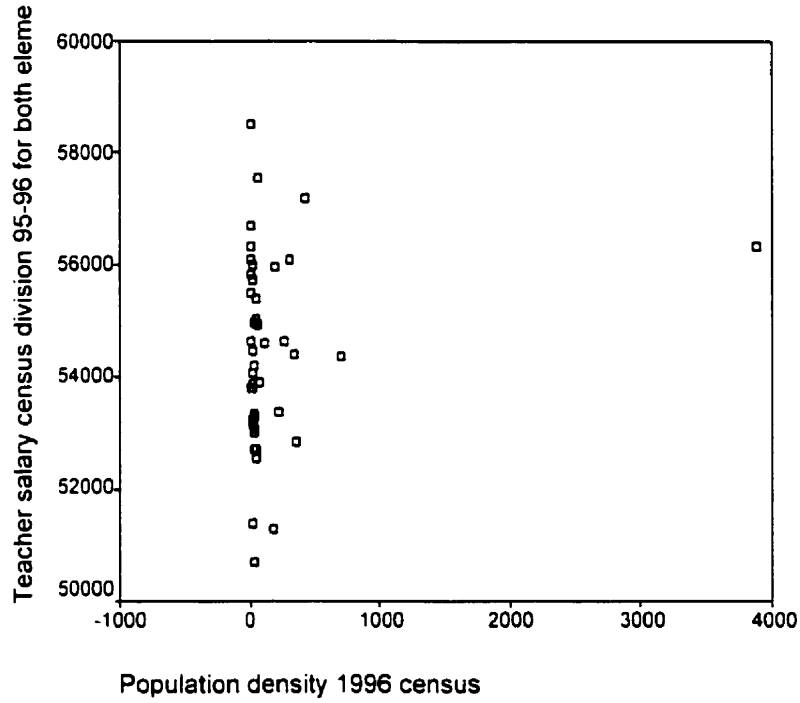
The difference between the highest population density, 3,875.8 persons per square kilometre, in Toronto Metropolitan Municipality and the lowest population density, .2 person per square kilometre, in Kenora District, an area in Northwestern Ontario, is 3,875.6 persons per square kilometre. The average difference of population density among census divisions is 80.7 persons/km^2. Statistically, the unweighted mean is 161.9 persons/km^2 and the standard deviation is 558.5 persons/km^2, compared with the unweighted mean of 7.5 persons/km^2 and the standard deviation of 7.5 persons/km^2 at the provincial and territorial level.

According to the bivariate correlation procedure, there is a low, positive correlation ($r = .18$) between population density and average teacher salaries at the census division level in Ontario. However, the correlation coefficient between population density and teacher salaries at the census division level is greatly skewed by the population density of Toronto Metropolitan Municipality, which is an outlier as shown in the scatterplot in figure 4.3. Figure 4.3 also demonstrates that, with the present scale, no linear association can be observed between population density and teacher compensation, either positive or negative, although a bivariate correlation procedure produces a quite low, positive value. If Toronto

Metropolitan Municipality, the skewing outlier, is taken out, a similar bivariate correlation procedure produces no correlation (r = .04) between population density and teacher compensation.

Figure 4.3

Teacher salaries and population density of census divisions



Average Family Income and Teacher Salary

The second hypothesis was that the higher the average family income, the higher the

teacher salaries tend to be, other things being equal. Table 4.5 lists average family income and average teacher salaries in 1995 for each province in Canada in the order from the highest to the lowest.

Table 4.5

Average Family Incomes and Average Teacher Salaries High to Low, Canada, 1995

Family Incomes		Teacher Salaries	
Ont.	$ 59,356	Ont.	$ 42,758
B.C.	$ 56,925	B.C.	$ 38,737
Alta.	$ 53,361	Alta.	$ 36,390
Man.	$ 51,467	Man.	$ 36,296
Sask.	$ 50,056	N.S.	$ 35,530
Que.	$ 49,498	Nfld.	$ 35,253
P.E.I.	$ 45,450	Que.	$ 35,094
N.S.	$ 44,826	Sask.	$ 33,059
N.B.	$ 44,545	P.E.I.	$ 32,227
Nfld.	$ 42,328	N.B.	$ 31,771
M = $49,782		M = $35,712	
SD = $5,625		SD = $3,248	

Sources: Statistics Canada, February-a 1997, October 1997.

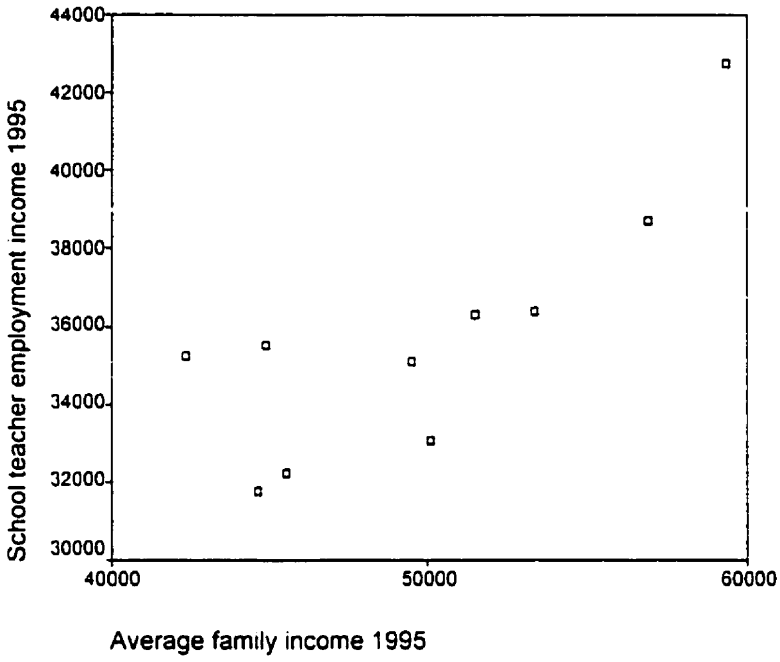
There is a difference of $17,028 between the highest provincial average family income

in Ontario and the lowest provincial average family income in Newfoundland. Average family income ranges from the highest of $59,356 to the lowest of $42,328, while average teacher salaries ranges from the highest of $42,758 to the lowest of $31,771. The average difference in family income among the ten provinces is $1,892. This is nearly twice the average difference in teacher salaries among the ten provinces, which is $1,221. For the average family income in the ten provinces, the unweighted mean is $49,782 and the standard deviation is $5,625, while for the average teacher salaries the unweighted mean is $35,712 and the standard deviation is $3,248. In 1995, according to the bivariate correlation procedure, there was a high, positive correlation (r = .80) between the average family income in a province and that province's average teacher employment income.

A scatterplot confirms what the bivariate correlation procedure reveals. Figure 4.4 is a scatterplot showing clearly that there was a positive linear association between average family income and average teacher salaries at the inter-provincial level in 1995. As average family income rose, so did average teacher salaries.

Figure 4.4

Teacher salaries and family income of 10 provinces



For Ontario, table 4.6 compares 1995 average family incomes in census divisions with those census divisions' average teacher employment incomes in the school year of 1995-1996. Both variables are arranged from the highest to the lowest.

Table 4.6

Average Family Incomes & Average Teacher Salaries from High to Low, Ontario

Family Incomes 1995		Teacher Salaries 1995-1996	
Halton RM	$ 79,930	Thunder Bay D	$ 58,515
York RM	$ 74,272	Sudbury RM	$ 57,554
Ottawa-Carlton RM	$ 67,871	Hamilton-Wentworth RM	$ 57,188
Durham RM	$ 64,940	Nipissing D	$ 56,687
Peel RM	$ 64,729	Toronto MM	$ 56,337
Essex	$ 61,590	Haliburton	$ 56,314
Wellington	$ 60,805	Waterloo RM	$ 56,088
Waterloo RM	$ 59,916	Sudbury D	$ 56,083
Dufferin	$ 59,878	Huron	$ 55,983
Thunder Bay D	$ 59,375	Essex	$ 55,957
Toronto MM	$ 58,939	Algoma D	$ 55,826
Lambton	$ 58,859	Lennox & Addington Co	$ 55,721
Middlesex	$ 58,737	Rainy River D	$ 55,490
Sudbury RM	$ 56,986	Lambton	$ 55,403
Frontenac	$ 56,450	Kent	$ 55,024
Perth	$ 56,369	Frontenac	$ 54,962
Hamilton-Wentworth RM	$ 56,223	Wellington	$ 54,923
Oxford	$ 55,320	Ottawa-Carlton RM	$ 54,631
Cochrane D	$ 55,302	Kenora D	$ 54,625
Rainy River D	$ 55,036	Middlesex	$ 54,616
Kent	$ 54,999	Lanark	$ 54,456
Niagara RM	$ 54,418	York RM	$ 54,414
Simcoe	$ 54,304	Peel RM	$ 54,364
Lanark	$ 54,120	Peterborough	$ 54,215
Brant	$ 53,893	Hastings	$ 54,074
Haldimand-Norfolk RM	$ 53,766	Simcoe	$ 53,901
Prescott & Russell UC	$ 53,446	Muskoka DM	$ 53,885
Elgin	$ 53,313	Manitoulin D	$ 53,822
Northumberland	$ 53,144	Grey	$ 53,796

Kenora D	$ 53,121	Niagara RM	$ 53,373
Bruce	$ 52,943	Haldimand-Norfolk RM	$ 53,350
Leeds & Grenville UC	$ 52,031	Perth	$ 53,349
Algoma D	$ 51,050	Leeds & Grenville UC	$ 53,288
Peterborough	$ 51,020	Victoria	$ 53,256
Prince Edward	$ 50,446	Renfrew	$ 53,173
Huron	$ 50,428	Dufferin	$ 53,063
Nipissing D	$ 50,151	Stormont Dundas & Glengar	$ 53,016
Stormont Dundas & Gleng.	$ 49,792	Halton RM	$ 52,846
Grey	$ 49,442	Elgin	$ 52,718
Lennox & Addington Co	$ 48,984	Prescott & Russell UC	$ 52,703
Sudbury D	$ 48,960	Oxford	$ 52,545
Renfrew	$ 48,916	Prince Edward	$ 51,379
Timiskaming D	$ 48,898	Durham RM	$ 51,302
Hastings	$ 48,351	Northumberland	$ 50,694
Victoria	$ 48,224	Brant*	--
Muskoka DM	$ 47,834	Bruce*	--
Manitoulin D	$ 42,786	Cochrane D*	--
Parry Sound D	$ 42,702	Parry Sound D*	--
Haliburton	$ 42,255	Timiskaming D*	--
M = $54,801 SD = $7,193	N = 44	M = $54,430 SD = $1,680	

*Note. Data for these census divisions are incomplete.

Sources: Census of Canada, 1996: Profile files, http:www.chass.utoronto.ca/datalib/cc96/profil96.htm; Ontario Education Relations Commission, 1997.

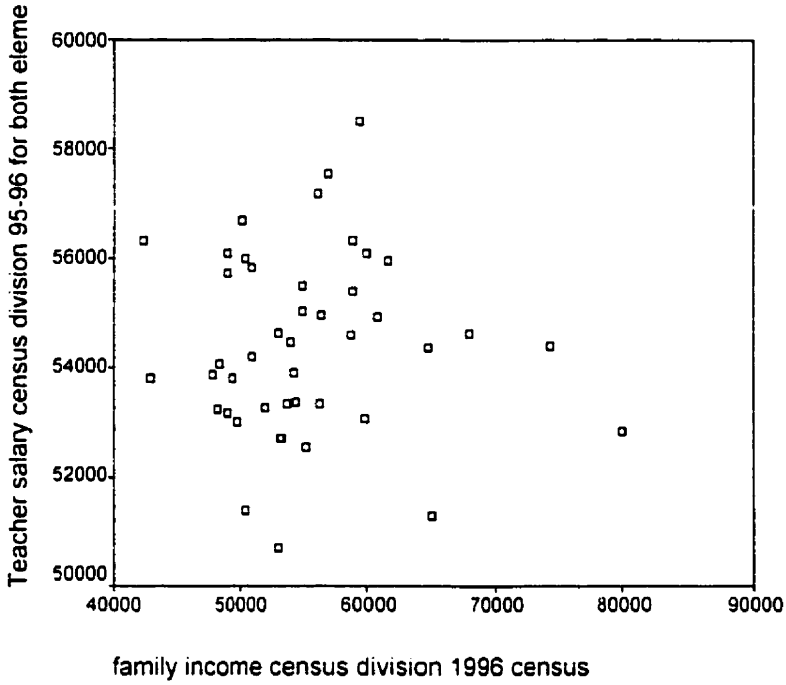
There is a difference of $37,675 between the highest average family income in Halton Regional Municipality and the lowest average family income in Haliburton County at the census division level. Average family income ranges from the highest of $79,930 to the lowest of $42,255, while average teacher salaries ranges from the highest of $58,515 to the

lowest of $50,694. The average difference in average family income among census divisions is $785, which is about 4 times $184, the average difference in teacher salaries among census divisions in Ontario. The unweighted mean for average family income is $54,801 and the standard deviation is $7,193, while the unweighted mean for average teacher salaries is $54,430 and the standard deviation is $1,680. Obviously, there was more variation in average family incomes than in average teacher salaries at the census division level.

According to the bivariate correlation procedure, there is no correlation ($r = -.02$) between average family income and average teacher salaries in Ontario at the census division level. The scatterplot in figure 4.5 confirms what the bivariate correlation procedure indicates: There is no linear relationship between average family income and average teacher salaries at the census division level in Ontario.

Figure 4.5

Teacher salaries and family income of census divisions



Average Farm Land Price and Teacher Salary

In this study, cost of living is indicated by 1995 average farm land price per acre and the total population growth from 1986 census to 1996 census. It was hypothesized that the higher the average farm land price is, the higher the teacher salaries tend to be, other things being equal. Table 4.7 shows 1995 average farm land price per acre and average teacher salaries for the ten provinces. Both the independent variable and the dependent variable are

in the order from the highest to the lowest, so that if there is a pattern, it will be noticed.

Table 4.7

Farm Land Prices per Acre and Teacher Salaries from High to Low, Canada

Land Prices 1995		Teacher Salaries 1995	
Ont.	$ 1,242	Ont.	$ 42,758
B.C.	$ 949	B.C.	$ 38,737
P.E.I.	$ 903	Alta.	$ 36,390
Nfld.	$ 777	Man.	$ 36,296
Que.	$ 603	N.S.	$ 35,530
N.B.	$ 428	Nfld.	$ 35,253
N.S.	$ 388	Que.	$ 35,094
Alta.	$ 341	Sask.	$ 33,059
Man.	$ 311	P.E.I.	$ 32,227
Sask.	$ 231	N.B.	$ 31,771
M = $617		M = $35,712	
SD = $336		SD = $3,248	

Source: Steve Partridge from Statistics Canada, Farm Income & Prices Section, Agriculture Division (personal communication, July 30, 1998); Statistics Canada, October, 1997.

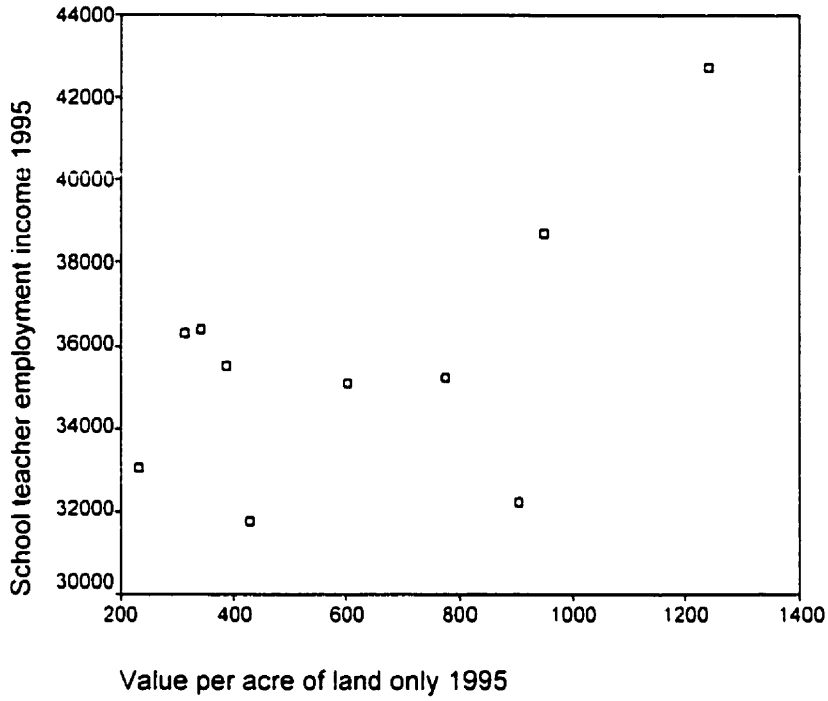
The difference between the highest average farm land price and the lowest average farm land price is $1,011, between the land prices of Ontario and Saskatchewan. The

average difference in farm land price among the ten provinces is about $112. The differences in average farm land prices are quite significant. Among the ten provinces, the differences in average farm land prices are greater than the differences in average teacher salaries, as far as the percentage is concerned. The average difference in farm land price among the ten provinces, $112, is about 18 percent of $617, the average farm land price of the ten provinces. The average difference in teacher salaries, $999, is about 3 percent of $35,712, the average teacher salaries among the ten provinces. The unweighted mean for the average farm land price is $617 and the standard deviation is $336, while the unweighted mean for the average teacher salaries for the ten provinces is $35,712 and the standard deviation is $3,248.

With the bivariate correlation procedure, there is a relatively high, positive correlation ($r = .59$) between average farm land price per acre in a province and that province's average teacher annual salaries. This finding is confirmed by a scatterplot in figure 4.6. The scatterplot for average farm land price and average teacher salaries in ten provinces shows that there was a clear linear association between a province's farm land price and its teacher employment income in 1995. The higher the average farm land price was, the higher the teacher income tended to be.

Figure 4.6

Teacher salaries and land price of 10 provinces



For Ontario, table 4.8 demonstrates average farm land prices per acre in 1995 and average teacher salaries in 1995-1996 school year for most census divisions. Both the independent variable and the dependent variable are in the order from the highest to the lowest.

Table 4.8

Farm Land Prices and Teacher Salaries for Census Divisions, High to Low, Ontario

Land Price per Acre 1995		Teacher Salaries 95-96	
Toronto MM	$ 8,555	Thunder Bay D	$ 58,515
York RM	$ 8,555	Sudbury RM	$ 57,554
Peel RM	$ 8,451	Hamilton-Wentworth RM	$ 57,188
Halton RM	$ 6,425	Nipissing D	$ 56,687
Niagara RM	$ 5,427	Toronto MM	$ 56,337
Hamilton-Wentworth RM	$ 4,898	Haliburton	$ 56,314
Durham RM	$ 3,994	Waterloo RM	$ 56,088
Waterloo RM	$ 3,850	Sudbury D	$ 56,083
Essex	$ 3,577	Huron	$ 55,983
Oxford	$ 3,299	Essex	$ 55,957
Brant	$ 3,158	Algoma D	$ 55,826
Middlesex	$ 2,956	Lennox & Addington Co	$ 55,721
Perth	$ 2,944	Rainy River D	$ 55,490
Kent	$ 2,941	Lambton	$ 55,403
Wellington	$ 2,907	Kent	$ 55,024
Simcoe	$ 2,720	Frontenac	$ 54,962
Elgin	$ 2,479	Wellington	$ 54,923
Haldimand-Norfolk RM	$ 2,471	Ottawa-Carlton RM	$ 54,631
Ottawa-Carlton RM	$ 2,416	Kenora D	$ 54,625
Dufferin	$ 2,364	Middlesex	$ 54,616
Lambton	$ 2,312	Lanark	$ 54,456
Huron	$ 2,248	York RM	$ 54,414
Nothumberland	$ 2,001	Peel RM	$ 54,364
Prescott& Russell UC	$ 1,750	Peterborough	$ 54,215
Muskoka DM	$ 1,713	Hastings	$ 54,074
Peterborough	$ 1,696	Simcoe	$ 53,901
Stormont Dundas & Glen.	$ 1,627	Muskoka DM	$ 53,885
Grey	$ 1,559	Manitoulin D	$ 53,822
Sudbury DM	$ 1,535	Grey	$ 53,796
Prince Edward	$ 1,527	Niagara RM	$ 53,373

Thunder Bay D	$ 1,496	Haldimand-Norfolk RM	$ 53,350
Haliburton	$ 1,488	Perth	$ 53,349
Victoria	$ 1,463	Leeds & Grenville UC	$ 53,288
Bruce	$ 1,353	Victoria	$ 53,256
Leeds & Grenville UC	$ 1,274	Renfrew	$ 53,173
Frontenac	$ 1,204	Dufferin	$ 53,063
Lanark	$ 1,187	Stormont Dundas & Glengar	$ 53,016
Lennox & Addington Co	$ 1,122	Halton RM	$ 52,846
Hastings	$ 1,099	Elgin	$ 52,718
Algoma D	$ 975	Prescott & Russell UC	$ 52,703
Parry Sound D	$ 952	Oxford	$ 52,545
Kenora D	$ 855	Prince Edward	$ 51,379
Renfrew	$ 855	Durham RM	$ 51,302
Nipissing D	$ 806	Northumberland	$ 50,694
Timiskaming D	$ 701	Brant*	--
Cochrane D	$ 630	Bruce*	--
Sudbury D	$ 628	Cochrane D*	--
Manitoulin D	$ 507	Parry Sound D*	--
Rainy River D	$ 459	Timiskaming D*	--
M = $2,478	N = 44	M = $54,430	
SD = $2,020		SD = $1,680	

*Note. Data for these census divisions are incomplete.

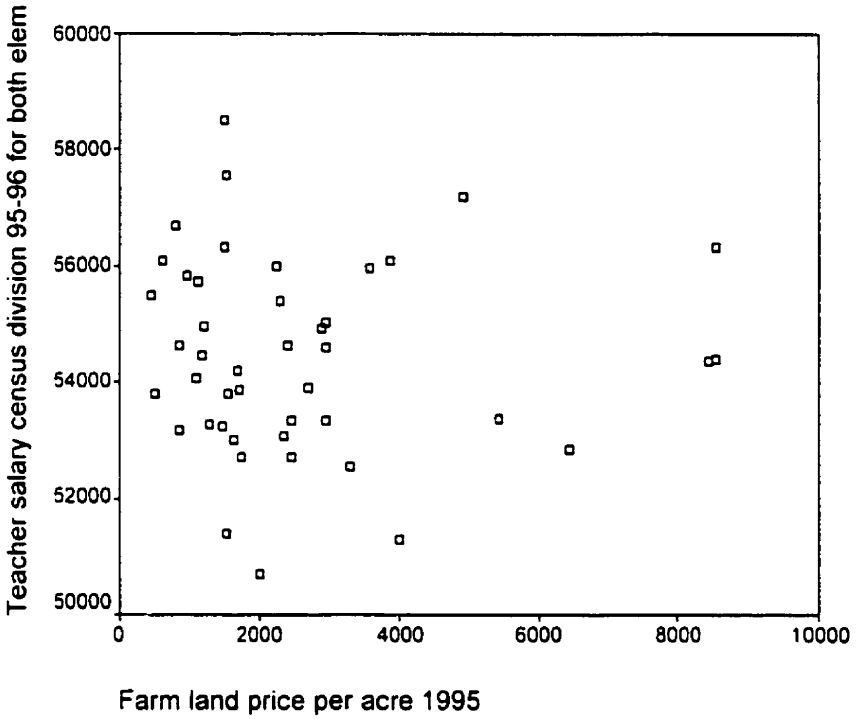
Sources: Bernard Houle from Statistics Canada, Agriculture Division, Census of Agriculture (personal communication, June 5, 1998); Education Relations Commission, 1997.

There is a difference of $8,096 between the highest average farm land price in Toronto Metropolitan Municipality and York Regional Municipality and the lowest average farm land price in Rainy River District, a census division in Northwestern Ontario. The average difference in farm land prices among census divisions is about $169. Statistically, the unweighted mean for the farm land prices of census divisions is $2,478 and the standard

deviation is $2,020, when the unweighted mean for average teacher salaries is $54,430 and the standard deviation is $1,680. In 1995, there was no correlation (r = -.02) between average farm land price per acre and average teacher salaries in Ontario at the census division level. This is confirmed by the scatterplot in figure 4.7.

Figure 4.7

Teacher salaries and land price of census divisions



Population Growth and Teacher Salary

It was hypothesized that the higher the population growth is, the higher the teacher salaries tend to be, other things being equal. Table 4.9 displays total population growth from 1986 to 1996 and average teacher salaries in 1995 by province and territory in the order from the highest to the lowest.

Table 4.9

Population Growth and Teacher Salaries from High to Low, Canada

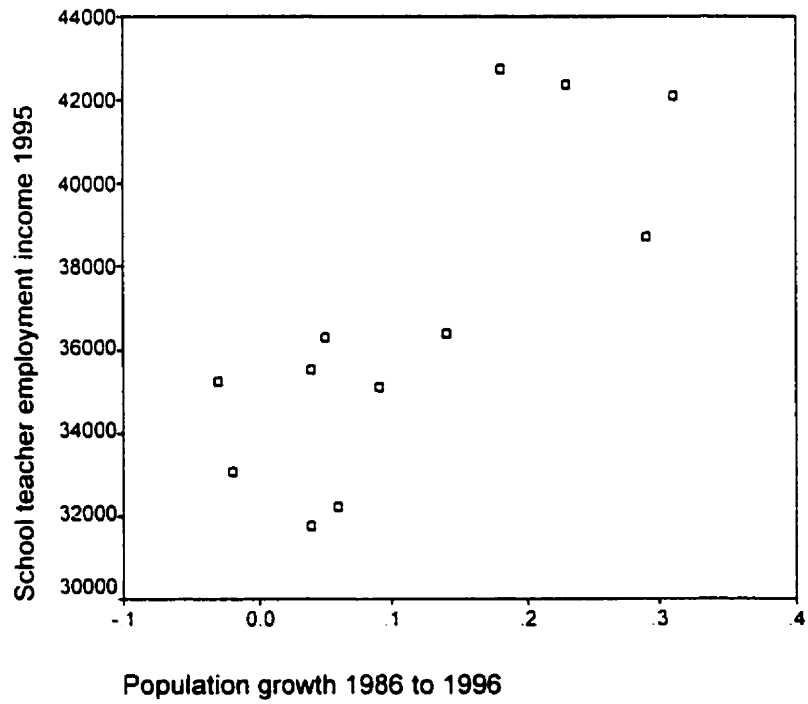
Population Growth (%) 86-96		Teacher Salaries 1995	
Yukon	31	Ont.	$ 42,758
B.C.	29	N.T.	$ 42,368
N.T.	23	Yukon	$ 42,080
Ont.	18	B.C.	$ 38,737
Alta.	14	Alta.	$ 36,390
Que.	9	Man.	$ 36,296
P.E.I.	6	N.S.	$ 35,530
Man.	5	Nfld.	$ 35,253
N.S.	4	Que.	$ 35,094
N.B.	4	Sask.	$ 33,059
Sask.	-2	P.E.I.	$ 32,227
Nfld.	-3	N.B.	$ 31,771
M = 12%		M = $36,797	
SD = 12%		SD = $3,881	

Sources: Statistics Canada, September 1987, April 1997, October 1997.

In the decade from 1986 to 1996, there was a difference of 34% between the highest population growth of Yukon and the greatest population decrease of Newfoundland. The average difference in population growth among provinces and territories was 3%. According to the bivariate correlation procedure, there was a very high, positive correlation (r = .80) between the total population growth in the decade of 1986 to 1996 in a province or territory and that province's or territory's teacher annual salaries in 1995. This finding is further confirmed by the scatterplot in figure 4.8. Figure 4.8 demonstrates that there was an obvious linear relationship between population growth and teacher compensation at the provincial and territorial level.

Figure 4.8

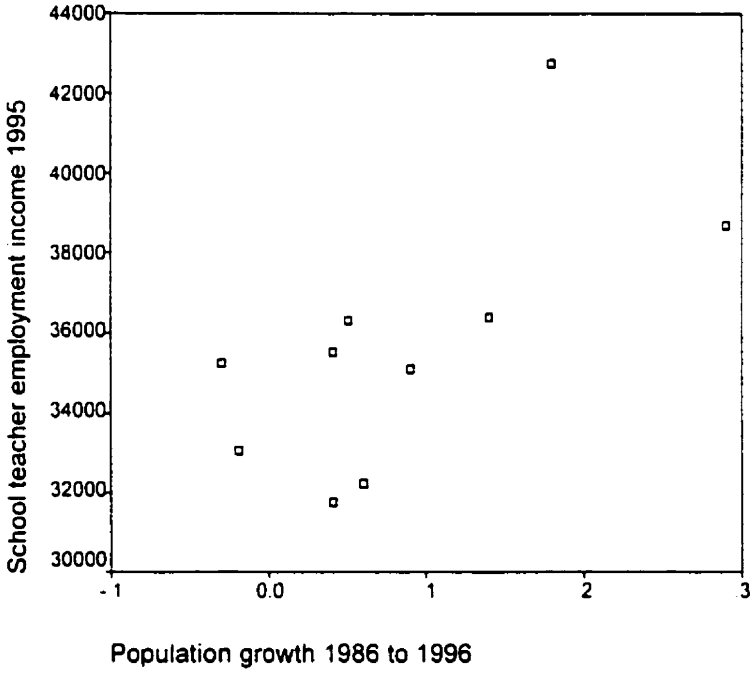
Teacher salaries and population growth of 10 provinces and 2 territories



Again, for the purpose of comparison at the inter-provincial level, data with regard to population growth for the ten provinces only need to be calculated. The unweighted mean of population growth for the ten provinces is 8% and the standard deviation is 10%. There still was a high correlation coefficient (r = .67) between population growth and average teacher salaries in the ten provinces in 1995. This coefficient is confirmed by the scatterplot 4.9.

Figure 4.9

Teacher salaries and population growth of 10 provinces



In the province of Ontario, table 4.10 displays the total population growth during the period of 1986 to 1996 and average teacher salaries for the 1995-1996 school year for census divisions in the order from the highest to the lowest.

Table 4.10

Population Growth & Teacher Salaries for Census Divisions, High to Low, Ontario

Population Growth (%) 86-96		Teacher Salaries 95-96	
York RM	69	Thunder Bay D	$ 58,515
Peel RM	44	Sudbury RM	$ 57,554
Durham RM	41	Hamilton-Wentworth RM	$ 57,188
Dufferin	40	Nipissing D	$ 56,687
Simcoe	38	Toronto MM	$ 56,337
Victoria	29	Haliburton	$ 56,314
Prescott & Russell UC	28	Waterloo RM	$ 56,088
Haliburton	28	Sudbury D	$ 56,083
Muskoka DM	25	Huron	$ 55,983
Halton RM	25	Essex	$ 55,957
Waterloo RM	23	Algoma D	$ 55,826
Wellington	23	Lennox & Addington Co	$ 55,721
Northumberland	21	Rainy River D	$ 55,490
Lanark	21	Lambton	$ 55,403
Kenora D	20	Kent	$ 55,024
Ottawa-Carlton RM	19	Frontenac	$ 54,962
Frontenac	18	Wellington	$ 54,923
Parry Sound D	18	Ottawa-Carlton RM	$ 54,631
Peterborough	18	Kenora D	$ 54,625
Grey	17	Middlesex	$ 54,616
Middlesex	17	Lanark	$ 54,456

Manitoulin D	16	York RM	$ 54,414
Lennox & Addington Co	14	Peel RM	$ 54,364
Leeds & Grenville UC	14	Peterborough	$ 54,215
Haldimand-Norfolk RM	14	Hastings	$ 54,074
Oxford	14	Simcoe	$ 53,901
Elgin	13	Muskoka DM	$ 53,885
Prince Edward	12	Manitoulin D	$ 53,822
Bruce	12	Grey	$ 53,796
Essex	11	Niagara RM	$ 53,373
Hamilton-Wentworth RM	10	Haldimand-Norfolk RM	$ 53,350
Niagara RM	9	Perth	$ 53,349
Stormont Dundas & Glen.	9	Leeds & Grenville UC	$ 53,288
Toronto MM	9	Victoria	$ 53,256
Hastings	9	Renfrew	$ 53,173
Perth	8	Dufferin	$ 53,063
Renfrew	8	Stormont Dundas & Glengar	$ 53,016
Brant	8	Halton RM	$ 52,846
Sudbury RM	8	Elgin	$ 52,718
Huron	8	Prescott & Russell UC	$ 52,703
Nipissing D	7	Oxford	$ 52,545
Lambton	4	Prince Edward	$ 51,379
Kent	3	Durham RM	$ 51,302
Rainy River D	1	Northumberland	$ 50,694
Thunder Bay D	1	Brant*	--
Cochrane D	-1	Bruce*	--
Sudbury D	-1	Cochrane D*	--
Algoma D	-5	Parry Sound D*	--
Timiskaming D	-6	Timiskaming D*	--

M = 16%	N = 44	M = $54,430
SD = 14%		SD = $1,680

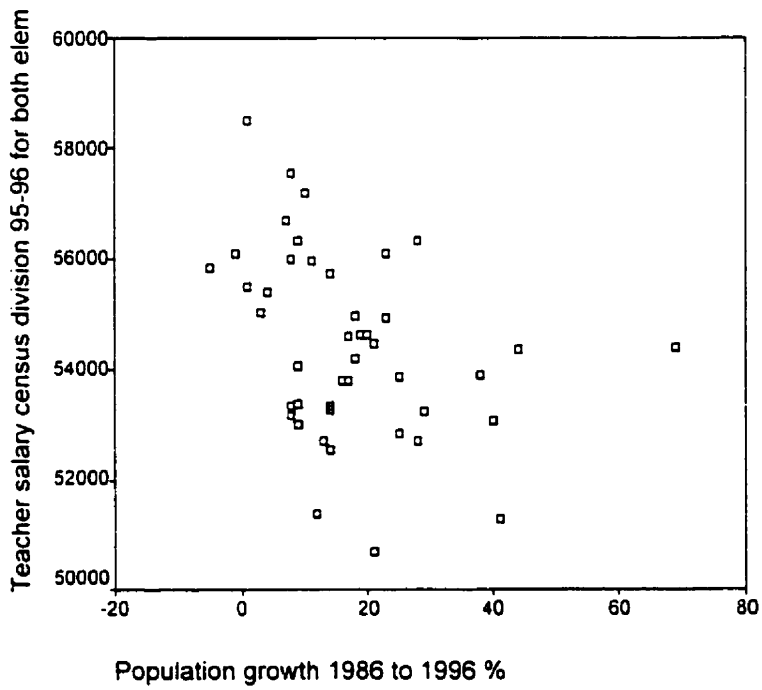
*Note. Data are incomplete for these census divisions.

Sources: Statistics Canada, September 1987, April 1997; Ontario Education Relations Commission, 1997.

There was a difference of 75% between the highest population growth of York Regional Municipality and the greatest population decrease of Timiskaming District in Ontario during the decade of 1986 to 1996. The average difference in population growth among census divisions is 2%. Strangely, there was a moderate, negative correlation (r = -.35) between total population growth during 1986 to 1996 and average teacher salaries for 1995-1996 school year at the census division level in Ontario. The scatterplot in figure 4.10 for population growth and teacher salaries confirms that there is a negative linear association between the independent variable of population growth and the dependent variable.

Figure 4.10

Teacher salaries and population growth of census divisions



Union Influence and Collective Bargaining

The fifth hypothesis stated that the stronger the union's influence in collective bargaining is, the higher the teacher salaries tend to be, other things being equal. Table 4.11, by province and territory, presents teachers' strike rights, the number of unions, and whether the collective bargaining is provincial or local.

Table 4.11

Union Strike Rights, Numbers and Bargaining Level

	Strike Rights	Number of Unions	Bargaining Level
Nfld.	Yes	1	Provincial
P.E.I.	No	1	Provincial
N.S.	Yes provincial; No local	1	Provincial & Local
N.B.	Yes	1	Provincial
Que.	Yes provincial; No local	3	Provincial & Local
Ont.	Yes	5	Local
Man.	No	1	Local
Sask.	Yes	1	Provincial & Local
Alta.	Yes	1	Local
B.C.	Yes provincial; No local	1	Provincial & Local
Yukon	Yes	1	Provincial
N.T.	Yes	1	Provincial & Local

Sources: CTF (1997b); Gunderson & Hyatt, (1996); Mackie (1997).

Table 4.11 shows some interesting factors of union influence in each province and

territory. While these tables are still meaningful, it is too difficult to quantify them for further analysis. For instance, how does one quantify strike right at the provincial level but not the local level? Which is more beneficial to unions, bargaining provincially or locally? The researcher is not able to define these data operationally so that they can be quantified in a way to be measured for testing the hypothesis that the stronger the union influence, the higher the teacher salaries tend to be, other things being equal. In other words, the researcher is not able to carry out an empirical investigation to prove whether the hypothesis is right or wrong. Additional studies are required before any inductions can be made in the respect of union influence and teacher compensation.

Teacher Supply and Demand

In this study, the sixth hypothesis was that the higher the supply of and the lower the demand for teachers are, the lower the teacher salaries tend to be, other things being equal. Table 4.12 presents the independent variable of teacher surplus situation in 1995-1996 school year and average teacher salaries in 1995 for seven provinces. The teacher surplus data are in the order from the lowest to the highest while the teacher salary data are in the order from the highest to the lowest.

Table 4.12

Teacher Surplus Low to High, & Teacher Salaries High to Low, 7 Provinces

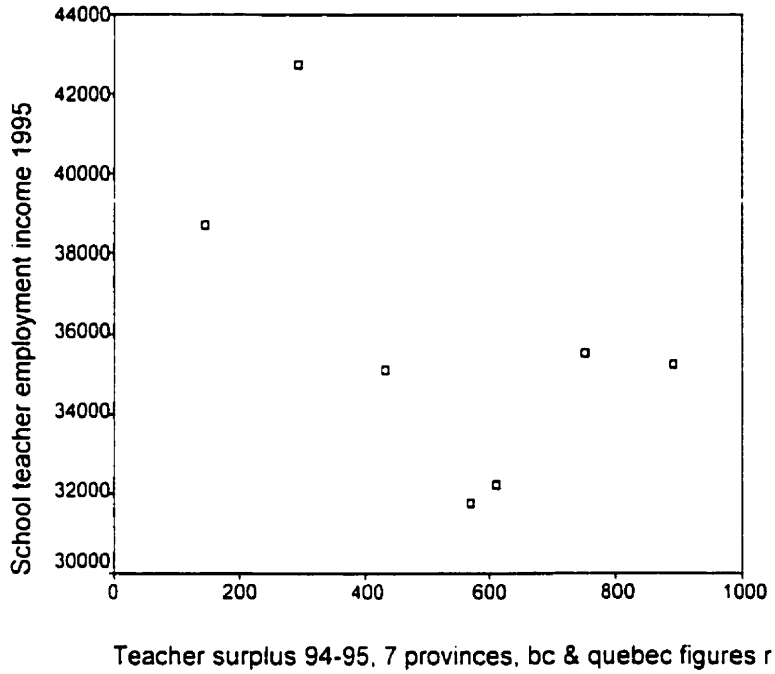
Teacher Surplus 95-96 %		Teacher Salaries 1995	
B.C.	123	Ont.	$ 42,758
Ont.	287	B.C.	$ 38,737
Que.	351	N.S.	$ 35,530
P.E.I.	415	Nfld.	$ 35,253
N.B.	479	Que.	$ 35,094
N.S.	543	P.E.I.	$ 32,227
Nfld.	607	N.B.	$ 31,771

Source of teacher salaries: Statistics Canada, October 1997.

With the assumption that the difference in teacher surplus between two provinces listed together on the teacher surplus column in table 4.12 is about 64%, which is the average difference calculated from the data about New Brunswick, Nova Scotia and Prince Edward Island, a correlation coefficient of -0.65 is obtained. This coefficient is confirmed by figure 4.11, which displays an apparent negative linear association between teacher surplus and teacher compensation.

Figure 4.11

Teacher salaries and teacher surplus of 7 provinces



Employment Market

The year of 1995 saw a high rate of unemployment across Canada, but the dismal employment market was uneven in the country as well as in the province of Ontario. Table 4.13 shows both the annual unemployment rates and the average teacher employment incomes for the ten provinces in 1995. It was hypothesized that the higher the unemployment rate is, the lower the teacher salaries tend to be, other things being equal. Accordingly, the unemployment rates are arranged from the lowest to the highest while the

average teacher salaries are arranged from the highest to the lowest.

Table 4.13

Unemployment Rates Low to High & Teacher Salaries High to Low, Canada, 1995

Unemployment Rates (%)		Teacher Salaries	
Sask.	6.9	Ont.	$ 42,758
Man.	7.5	B.C.	$ 38,737
Alta.	7.8	Alta.	$ 36,390
Ont.	8.7	Man.	$ 36,296
B.C.	9.0	N.S.	$ 35,530
Que.	11.3	Nfld.	$ 35,253
N.B.	11.5	Que.	$ 35,094
N.S.	12.1	Sask.	$ 33,059
P.E.I.	14.7	P.E.I.	$ 32,227
Nfld.	18.3	N.B.	$ 31,771
M = 10.8%		M = $35,712	
SD = 3.6%		SD = $3,248	

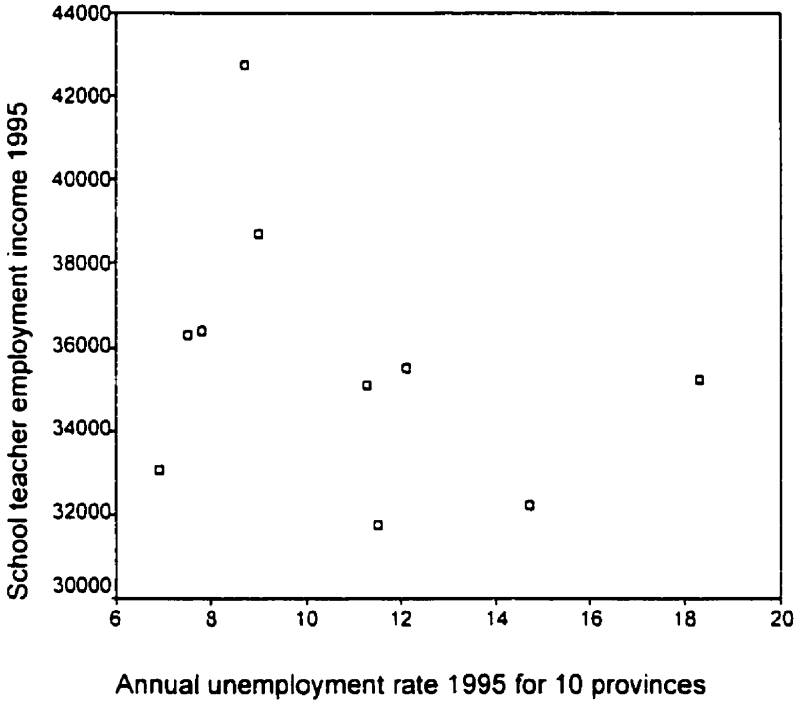
Sources: Statistics Canada, January 1996, October 1997.

In 1995, there was a difference of 11.4% between the highest provincial unemployment rate in Newfoundland and the lowest provincial unemployment rate in Saskatchewan. The average difference in unemployment rate among the ten provinces is

1.3%. The bivariate correlation procedure produces a moderate, negative correlation coefficient (r = -.32) between annual unemployment rate and average teacher salaries at the inter-provincial level in 1995. The scatterplot in figure 4.12 for unemployment rate and average teacher salaries demonstrates a negative association between these two variables, although the relationship is not clearly linear.

Figure 4.12

Teacher salaries and unemployment rate of 10 provinces



For Ontario, table 4.14 displays the annual unemployment rates in 1995 and the average teacher salaries in the 1995-1996 school year by census divisions. Again, the unemployment rates are arranged from the lowest to the highest while the teacher salaries are arranged from the highest to the lowest.

Table 4.14

Unemployment Rates from Low to High & Salaries from High to Low, Ontario

Unemployment Rates (%) 1995		Teacher Salaries 1995-1996	
Dufferin	5.2	Thunder Bay D	$ 58,515
Perth	5.3	Sudbury RM	$ 57,554
Halton RM	5.5	Hamilton-Wentworth RM	$ 57,188
Wellington	6.1	Nipissing D	$ 56,687
Huron	6.5	Toronto MM	$ 56,337
York RM	6.8	Haliburton	$ 56,314
Essex	7.7	Waterloo RM	$ 56,088
Oxford	7.8	Sudbury D	$ 56,083
Waterloo RM	7.9	Huron	$ 55,983
Durham RM	8.1	Essex	$ 55,957
Peel RM	8.1	Algoma D	$ 55,826
Prescott & Russell UC	8.1	Lennox & Addington Co	$ 55,721
Brant	8.3	Rainy River D	$ 55,490
Kent	8.4	Lambton	$ 55,403
Lanark	8.4	Kent	$ 55,024
Leeds & Grenville UC	8.4	Frontenac	$ 54,962
Grey	8.6	Wellington	$ 54,923
Bruce	8.7	Ottawa-Carlton RM	$ 54,631
Ottawa-Carlton RM	8.7	Kenora D	$ 54,625
Prince Edward	8.8	Middlesex	$ 54,616
Middlesex	8.9	Lanark	$ 54,456
Simcoe	8.9	York RM	$ 54,414

Hamilton-Wentworth RM	9.1	Peel RM	$ 54,364
Elgin	9.2	Peterborough	$ 54,215
Northumberland	9.2	Hastings	$ 54,074
Haldimand-Norfolk RM	9.3	Simcoe	$ 53,901
Lambton	9.5	Muskoka DM	$ 53,885
Niagara RM	9.6	Manitoulin D	$ 53,822
Frontenac	9.7	Grey	$ 53,796
Lennox & Addington Co	9.7	Niagara RM	$ 53,373
Renfrew	9.7	Haldimand-Norfolk RM	$ 53,350
Peterborough	10.4	Perth	$ 53,349
Stormont Dundas & Glen.	10.5	Leeds & Grenville UC	$ 53,288
Toronto MM	10.7	Victoria	$ 53,256
Muskoka DM	10.8	Renfrew	$ 53,173
Rainy River D	10.9	Dufferin	$ 53,063
Victoria	11.0	Stormont Dundas & Glengar	$ 53,016
Thunder Bay D	11.1	Halton RM	$ 52,846
Hastings	11.2	Elgin	$ 52,718
Cochrane D	11.6	Prescott & Russell UC	$ 52,703
Nipissing D	12.0	Oxford	$ 52,545
Sudbury RM	12.1	Prince Edward	$ 51,379
Kenora D	12.9	Durham RM	$ 51,302
Parry Sound D	12.9	Northumberland	$ 50,694
Timiskaming D	12.9	Brant*	--
Manitoulin D	13.1	Bruce*	--
Algoma D	13.3	Cochrane D*	--
Sudbury D	14.8	Parry Sound D*	--
Haliburton	14.9	Timiskaming D*	--
M = 9.6%	N = 44	M = $54,430	
SD = 2.3%		SD = $1,680	

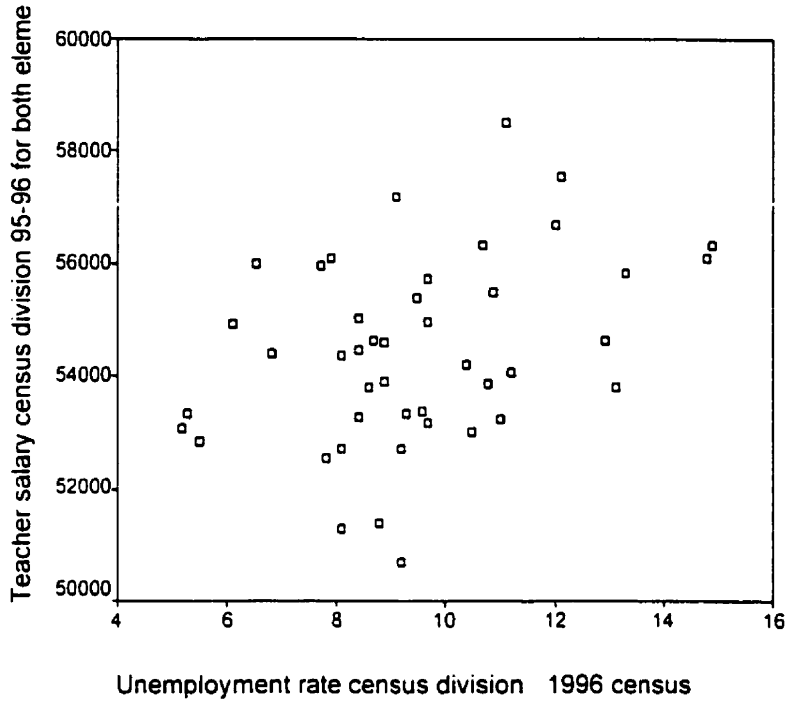
*Note. Data for these census divisions are incomplete.

Sources: Statistics Canada, October 1997; Education Relations Commission, 1997.

There was a difference of 9.7% between the highest unemployment rate in Haliburton County and the lowest unemployment rate in Dufferin County in 1995. The average difference in unemployment rate among census divisions in Ontario was .2%. This is smaller than the average difference, 1.3%, in unemployment rate at the inter-provincial level. At the census division level in Ontario the unweighted mean is 9.6% and the standard deviation is 2.3%, compared with the unweighted mean of 10.8% and the standard deviation of 3.6% at the inter-provincial level. Unlike what is observed at the inter-provincial level, where a negative association between unemployment rates and average teacher salaries is noted, there was a moderate, positive correlation ($r = .37$) between unemployment rates and average teacher salaries at the census division level in Ontario in 1995, which is quite unexpected. This positive correlation is confirmed by a scatterplot in figure 4.13, which displays that there is a positive linear association between unemployment rate and teacher average salaries at the census division level in Ontario.

Figure 4.13

Teacher salaries and unemployment rate of census divisions



Weather

The last hypothesis was that the warmer the weather is, the lower the teacher salaries tend to be, other things being equal. Annual daily mean temperature for each province and territory is not available, so annual average high temperature for the largest city in each province and territory was used as an indicator of its weather. In a weather forecast, usually the high temperature and the low temperature are given. Annual average high temperature was used here because of its availability. Table 4.15 demonstrates the annual average high

temperatures for the largest city in each province and territory in the order from the lowest to the highest and average teacher salaries for the provinces and territories in 1995 in the order from the highest to the lowest.

Table 4.15

Average High Temperature Low to High & Teacher Salaries High to Low, Canada

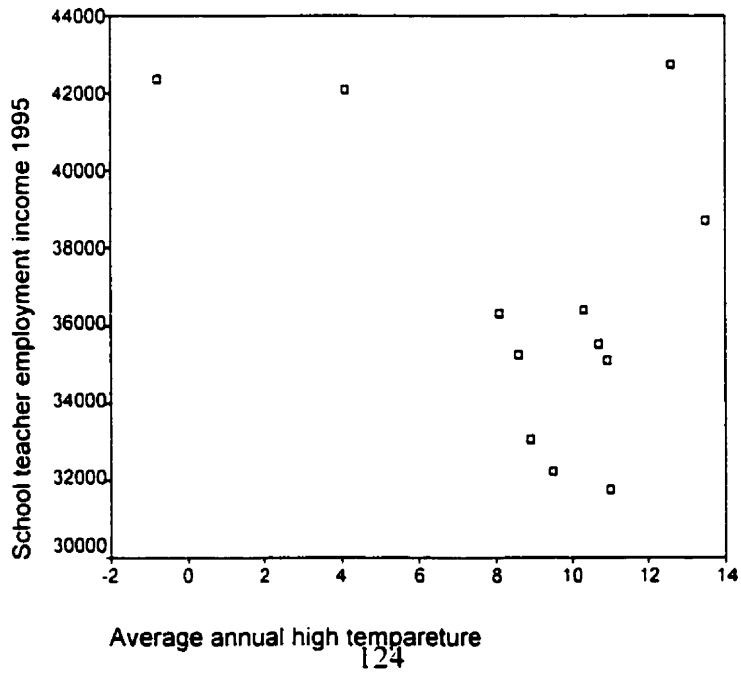
Annual Average High Temperature Celsius			Teacher Salaries 1995	
N.T.	Yellowknife	-0.8°	Ont.	$ 42,758
Yukon	Whitehorse	4.1°	N.T.	$ 42,368
Man.	Winnipeg	8.1°	Yukon	$ 42,080
Nfld.	St. John's	8.6°	B.C.	$ 38,737
Sask.	Regina	8.9°	Alta.	$ 36,390
P.E.I.	Charlottetown	9.5°	Man.	$ 36,296
Alta.	Calgary	10.3°	N.S.	$ 35,530
N.S.	Halifax	10.7°	Nfld.	$ 35,253
Que.	Montreal	10.9°	Que.	$ 35,094
N.B.	Fredericton	11.0°	Sask.	$ 33,059
Ont.	Toronto	12.6°	P.E.I.	$ 32,227
B.C.	Vancouver	13.5°	N.B.	$ 31,771
M = 9.0°C			M = $35,712	
SD = 4.0°C			SD = $3,248	

Sources: http:www.statcan.ca:80/english/Pgdb/Land/Geography/phys08a.htm; Statistics Canada, October 1997.

There is a difference of 14.3°C between the highest annual average high temperature in Vancouver of British Columbia and the lowest annual average high temperature in Yellowknife of Northwest Territories. The average difference in annual average high temperature among the largest cities in provinces and territories is 1.3°C. Overall, the differences in annual average high temperature among the largest cities in each province and territory are not significant. With the bivariate correlation procedure, a moderate, negative correlation (r = -.40) between annual average high temperatures and average teacher salaries by province and territory is noted. However, this correlation coefficient is proved to be misleading by the scatterplot in figure 4.14. Figure 4.14 shows a curvilinear--neither a positive nor negative--relationship between annual average high temperature and provincial and territorial average teacher salaries.

Figure 4.14

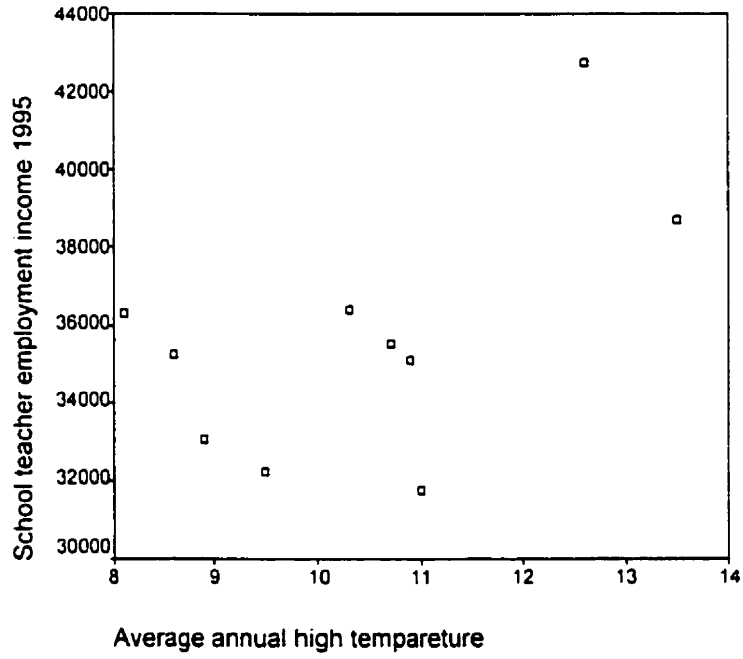
Teacher salaries and temperature of 10 provinces and 2 territories



To make comparisons among provinces possible, it is necessary to calculate data with regard to weather for the ten provinces only. For the ten provinces, the mean in annual average high temperature is 10.4°C and the standard deviation is 1.7°C. Now, there is a high, positive correlation (r = .57) between annual average high temperature and average teacher salaries in the ten provinces. This correlation is confirmed by the scatterplot in figure 4.15.

Figure 4.15

Teacher salaries and temperature of 10 provinces



In Ontario, annual daily mean temperature is used to indicate weather in each census

division. The annual daily mean temperatures are provided by weather stations located in most of the census divisions. Table 4.16 displays annual daily mean temperature arranged from the lowest to the highest and average teacher salaries arranged from the highest to the lowest by census division.

Table 4.16

Annual Daily Mean Temperature Low to High & Salaries High to Low, Ontario

Annual Daily Mean Temperature C°		Teacher Salaries 1995-1996	
Cochrane D	1.2°	Thunder Bay D	$ 58,515
Rainy River D	1.5°	Sudbury RM	$ 57,554
Timiskaming D	2.0°	Hamilton-Wentworth RM	$ 57,188
Thunder Bay D	2.4°	Nipissing D	$ 56,687
Kenora D	2.4°	Toronto MM	$ 56,337
Sudbury RM	3.5°	Haliburton	$ 56,314
Sudbury D	3.5°	Waterloo RM	$ 56,088
Nipissing D	3.6°	Sudbury D	$ 56,083
Renfrew	4.2°	Huron	$ 55,983
Parry Sound D	4.2°	Essex	$ 55,957
Algoma D	4.2°	Algoma D	$ 55,826
Lanark	4.8°	Lennox & Addington Co	$ 55,721
Muskoka DM	4.8°	Rainy River D	$ 55,490
Haliburton	4.8°	Lambton	$ 55,403
Manitoulin D	5.1°	Kent	$ 55,024
Durham RM	5.9°	Frontenac	$ 54,962
Grey	5.9°	Wellington	$ 54,923
Bruce	5.9°	Ottawa-Carlton RM	$ 54,631
Peterborough	5.9°	Kenora D	$ 54,625
Victoria	5.9°	Middlesex	$ 54,616
Prescott & Russell UC	6.0°	Lanark	$ 54,456
Ottawa-Carlton RM	6.0°	York RM	$ 54,414
Stormont Dundas & Glen.	6.0°	Peel RM	$ 54,364

Wellington	6.6°	Peterborough	$ 54,215
Waterloo RM	6.6°	Hastings	$ 54,074
Leeds & Grenville UC	6.7°	Simcoe	$ 53,901
Frontenac	6.7°	Muskoka DM	$ 53,885
Lennox & Addington Co	6.7°	Manitoulin D	$ 53,822
Prince Edward	6.8°	Grey	$ 53,796
Middlesex	7.2°	Niagara RM	$ 53,373
Elgin	7.2°	Haldimand-Norfolk RM	$ 53,350
Perth	7.6°	Perth	$ 53,349
Halton RM	7.6°	Leeds & Grenville UC	$ 53,288
Oxford	7.6°	Victoria	$ 53,256
Brant	7.6°	Renfrew	$ 53,173
Simcoe	7.6°	Dufferin	$ 53,063
Hamilton-Wentworth RM	7.6°	Stormont Dundas & Glengar	$ 53,016
Haldimand-Norfolk RM	7.6°	Halton RM	$ 52,846
Niagara RM	7.6°	Elgin	$ 52,718
Lambton	8.0°	Prescott & Russell UC	$ 52,703
Dufferin	8.9°	Oxford	$ 52,545
Huron	8.9°	Prince Edward	$ 51,379
York RM	8.9°	Durham RM	$ 51,302
Peel RM	8.9°	Northumberland	$ 50,694
Northumberland	8.9°	Brant*	--
Toronto MM	8.9°	Bruce*	--
Hastings	8.9°	Cochrane D*	--
Essex	9.1°	Parry Sound D*	--
Kent	9.1°	Timiskaming D*	--
M = 6.2°C	N = 44	M = $54,430	
SD = 2.2°C		SD = $1,680	

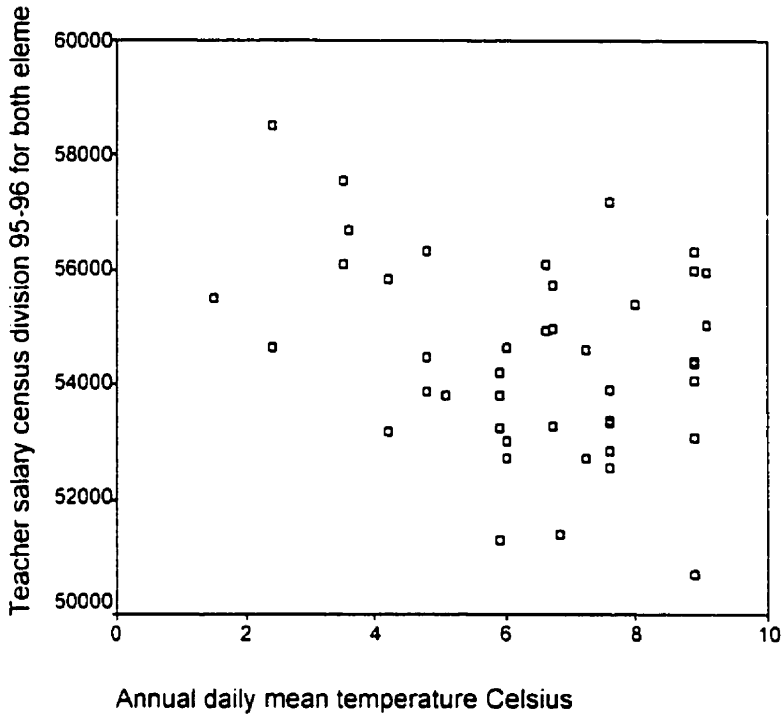
*Note. Data for these census divisions are incomplete.

Sources: Environment Canada, http://www.cmc.ec.gc.ca/climate/normals/E_ON_WMO.HTM; Ontario Education Relations Commission, 1997.

There is a difference of 7.9°C between the lowest annual daily mean temperature in Cochrane District and the highest annual daily mean temperature in Kent County. The average difference in annual daily mean temperature among census divisions in Ontario is about .2°C. This is a third of the average difference in annual average high temperature among the largest cities from the ten provinces, which is .6°C. The unweighted mean for annual daily mean temperature among census divisions in Ontario is about 6.2°C and the standard deviation is about 2.2°C, compared with the unweighted mean of 10.4°C and the standard deviation of 1.7°C for annual average high temperature at the inter-provincial level. With the bivariate correlation procedure, a moderate, negative correlation ($r = -.31$) is observed between annual daily mean temperature and average teacher salaries at the census division level in Ontario. This negative coefficient is confirmed by figure 4.16, where the scatterplot shows that there is a negative linear association between annual daily mean temperature and average teacher salaries. This is different from what is observed at the inter-provincial level, where a positive linear relationship is noted between temperature and average teacher salaries.

Figure 4.16

Teacher salaries and temperature of census divisions



Testing Hypotheses and Establishing a Statistical Model

Canada

Testing Hypotheses

It is obvious that there is significant variation in average teacher salaries among Canadian provinces and among census divisions in Ontario. For the inter-provincial level of analysis, eight independent variables were hypothesized to be related to teacher compensation. There is inadequate information available about one independent variable, union influence, to draw any conclusion. The other seven variables were found to be related to teacher employment income by the bivariate, zero-order correlation procedure, although not necessarily in the direction expected.

These seven independent variables are, in the order of their bivariate correlation coefficients' absolute value from the highest to the lowest: average family income ($r = .80$); population growth ($r = .69$); teacher supply and demand ($r = -.65$); average farm land price ($r = .59$); weather ($r = .57$); unemployment rate ($r = -.33$); and population density ($r = -.16$).

These correlations are not adequate tests of the hypotheses since when the relationship between the dependent variable and one independent variable was tested the other independent variables were not controlled; i.e. other things are not equal as assumed in the hypotheses. In reality, complicated interrelationships exist among the independent variables themselves, as indicated by table 4.17.

Table 4.17

Bivariate Correlation Coefficients for the Dependent Variable and Seven Independent Variables

	Salary	Density	Landpric	Popugro	Familyin	Surplus	Unemplo	Weather
Salary	1.00	-.16	.59	.67	.80	-.56	-.33	.57
	(10)	(10)	(10)	(10)	(10)	(7)	(10)	(10)
	p= .	p= .65	p= .07	p= .03	p= .01	p= .19	p= .36	p= .09
Density	-.16	1.00	.32	.01	-.25	.15	.33	.17
	(10)	(10)	(10)	(10)	(10)	(7)	(10)	(10)
	p= .65	p= .	p= .36	p= .98	p= .49	p= .75	p= .35	p= .63
Landpric	.59	.32	1.00	.54	.38	-.57	.30	.57
	(10)	(10)	(10)	(10)	(10)	(7)	(10)	(10)
	p= .07	p= .36	p= .	p= .11	p= .28	p= .18	p= .39	p= .08
Popugro	.67	.01	.54	1.00	.80	-.97	-.40	.85
	(10)	(10)	(10)	(10)	(10)	(7)	(10)	(10)
	p= .03	p= .98	p= .11	p= .	p= .01	p= .00	p= .25	p= .00
Familyin	.80	-.25	.38	.80	1.00	-.88	-.73	.59
	(10)	(10)	(10)	(10)	(10)	(7)	(10)	(10)
	p= .01	p= .49	p= .28	p= .01	p= .	p= .01	p= .02	p= .08
Surplus	-.56	.15	-.57	-.97	-.88	1.00	.78	-.87
	(7)	(7)	(7)	(7)	(7)	(7)	(7)	(7)
	p= .19	p= .75	p= .18	p= .00	p= .01	p= .	p= .04	p= .01
Unemplo	-.33	.33	.30	-.40	-.73	.78	1.00	-.22
	(10)	(10)	(10)	(10)	(10)	(7)	(10)	(10)
	p= .36	p= .35	p= .39	p= .25	p= .02	p= .04	p= .	p= .54
Weather	.57	.17	.57	.85	.59	-.87	-.22	1.00
	(10)	(10)	(10)	(10)	(10)	(7)	(10)	(10)
	p= .09	p= .63	p= .08	p= .00	p= .08	p= .01	p= .54	p= .

To test the hypotheses, one needs to control other independent variables while attempting to find out whether there is an association between the dependent variable and one independent variable; i.e. one needs to make other things, to the extent possible, equal. Although it is impossible to make other things perfectly equal in reality, the partial correlation procedure in SPSS does test whether there is a linear association between the dependent variable and one independent variable, while controlling one or more independent variable(s) by keeping them constant. I tested each of the seven independent variables using the partial correlation procedure.

Due to the small number of cases (N = 10), it is neither practical nor necessary to control all other six independent variables when testing the relationship between the dependent variable and one independent variable. Instead, only two independent variables, family income and land price, were used as control variables.

Average family income was chosen as the first control variable because its bivariate correlation with the dependent variable has the greatest absolute value. Average farm land price was chosen as the second control variable because of its strong relationship with the dependent variable (r = .59) and its relative independence (r = .38) from average family income. Other independent variables either had strong bivariate correlations with family income (r = .80 for population growth and r = -.88 for teacher surplus, see table 4.17 on page 131) or lower bivariate correlations with the dependent variable (r = .57 for weather, r = -.33 for unemployment rate, and r = -.16 for population density). In the case of testing the relationship between the dependent variable and family income, however, I used land price and population density as the control variables since population density is the

independent variable that is the most independent from all the other independent variables (see table 4.17 on page 131). In testing the association between the dependent variable and land price I controlled for family income and population density. Table 4.18 presents the partial correlation coefficients with regard to the seven independent variables and the original seven hypotheses.

Table 4.18

Partial Correlation Coefficients for Seven Independent Variables

	Density	Familyin	Landpric	Popugrow	Surplus	Unemploy	Weather
Salary	-.24	.72	.55	-.16	.83	.51	-.05
p-value	.57	.04	.15	.71	.08	.20	.91
Controlling:	Familyin Landpric	Landpric Density	Familyin Density	Familyin Landpric	Familyin Landpric	Familyin Landpric	Familyin Landpric
Hypothesized Correlation with Salary:	+	+	+	+	-	-	-

Table 4.18 shows that the partial correlation coefficients between teacher salaries and both land price and family income confirm the respective hypotheses. However, the partial correlation coefficients for population density, population growth, teacher surplus, unemployment rate and weather differ from what was hypothesized. The following is the findings reported in more detail.

Hypothesis 1: The greater the population density, the higher teacher salaries tend to be, other things being equal.

Results: The partial correlation coefficient between average teacher salaries and average population density was -.24 controlling average family income and average farm land price. This finding does not confirm the hypothesis that higher teacher salaries are related to higher population density when other factors are under control. In Canada for the ten provinces, 1996 population density was negatively correlated with 1995 average teacher salaries, with 1995 average family income and average farm land price being kept constant. However, the p-value ($p = .57$) is too high, indicating that the negative partial correlation coefficient is probably obtained by chance when actually there is no relationship between population density and average teacher salaries. Why is the economic pattern of the positive correlation between population density and average teacher salaries observed in other places, but not in Canada at the inter-provincial level? The possible reasons for this and other results will be discussed in chapter five when outcomes are examined in more detail.

Hypothesis 2: The higher the average family incomes are, the higher teacher salaries tend to be, other things being equal.

Results: The partial correlation coefficient between average teacher salaries and average family income is .72 controlling average farm land price per acre and population density persons per square kilometre. This finding confirms the hypothesis that higher family income is related with higher teacher salaries when other factors are under control. In Canada for the ten provinces, 1995 average family income was positively correlated with

1995 average teacher salaries, with 1995 average farm land price and population density being kept constant.

Hypothesis 3: The higher the average farm land price is, the higher teacher salaries tend to be, other things being equal.

Result: The partial correlation coefficient between average teacher salaries and average farm land price per acre is .55 controlling average family income and population density. Again, this finding confirms the hypothesis that higher farm land price is related to higher teacher salaries when other factors are under control. In Canada at the inter-provincial level, 1995 average farm land price per acre was positively correlated with 1995 average teacher salaries, with 1995 average family income and population density being kept constant.

Hypothesis 4: The higher the population growth is, the higher teacher salaries tend to be, other things being equal.

Result: The partial correlation coefficient between average teacher salaries and population growth is -.16 controlling average family income and average farm land price. This finding does not confirm the hypothesis that higher population growth is related to higher teacher salaries when other factors are under control. In Canada at the inter-provincial level, total population growth from 1986 to 1996 was negatively correlated with average teacher salaries in 1995, with 1995 average family income and 1995 average farm land price per acre being kept constant. However, the high p-value ($p = .71$) casts a serious doubt on this partial coefficient. The negative correlation may be produced by chance when

actually there is no relationship between population growth and average teacher salaries.

Hypothesis 5: The stronger the union's influence in collective bargaining is, the higher teacher salaries tend to be, other things being equal. There is inadequate information at the moment for the researcher to draw any conclusion in this respect. Further research is needed.

Hypothesis 6: The higher the supply of and the lower the demand for teachers are, the lower teacher salaries tend to be, other things being equal.

Result: The partial correlation coefficient between average teacher salaries and teacher surplus is .83 controlling average family income and average farm land price per acre. This finding does not confirm the hypothesis that the supply of teachers is negatively related with teacher salaries when other factors are under control. In Canada for the seven provinces with available data, 1995-1996 school teacher surplus was positively correlated with 1995 average teacher salaries, with 1995 average family income and average farm land price per acre being kept constant. Why average teacher salaries might be higher where there is a larger surplus of available teachers is a question explored later.

Hypothesis 7: The higher unemployment rate is, the lower teacher salaries tend to be, other things being equal.

Result: The partial correlation coefficient between average teacher salaries and unemployment rate is .51 controlling average family income and average farm land price per acre. This finding does not confirm the hypothesis that higher unemployment rate is

negatively related to lower teacher salaries. In Canada for the ten provinces, 1995 higher unemployment rate was positively correlated with higher 1995 average teacher salaries, with 1995 average family income and average farm land price per acre being kept constant. Why are teacher employment incomes not affected by the general labour market at the inter-provincial level in Canada as they do in other countries?

Hypothesis 8: The warmer the weather is, the lower teacher salaries tend to be, other things being equal.

Result: The partial correlation coefficient between average teacher salaries and average annual high temperature is -.05 controlling average family income and average farm land price per acre. This finding does not confirm the hypothesis that warmer weather is negatively related with lower teacher salaries. In Canada for the ten provinces, no relationship can be observed between 1995 average teacher salaries and average annual high temperature, with 1995 average family income and average farm land price per acre being kept constant. Why is there no association between average teacher salaries and average annual high temperature in Canada at the inter-provincial level?

One may wonder why some partial correlation coefficients differ from bivariate correlation coefficients. While both the bivariate and scatterplot procedures indicate that there is a positive correlation between average teacher salaries and population growth ($r = .69$), the partial coefficient for population growth shows that there is actually a negative relationship between population growth and average teacher salaries (Beta = -.16) when the influence from family income and land price are under control. The positive association

between population growth and average teacher salaries indicated by the bivariate and scatterplot procedures is spurious and is obtained because of the influence of family income, which has a high correlation with population growth (see table 4.17 on page 131). Once the influence of family income is removed, or once family income is kept constant, the negative relationship between population growth and average teacher salaries is revealed.

Although both bivariate and scatterplot indicate that teacher surplus is negatively correlated with average teacher salaries, the partial correlation procedure displays that when average family income and average land price are kept constant teacher surplus is actually positively related with average teacher salaries. Looking back at table 4. 17 on page 131, one will notice that the bivariate coefficients between teacher surplus and family income is highly negatively correlated ($r = -.88$). In other words, average family income affects the relationship between average teacher salaries and teacher surplus in the bivariate procedure, which does not keep other independent variables constant when measuring the relationship between average teacher salaries and teacher surplus.

Specifically, average family income is a suppressor which distorts the relationship between teacher surplus and average teacher salaries by being negatively related to teacher surplus but positively related to average teacher salaries. Due to the influence of average family income, not only the actual positive correlation between teacher surplus and average teacher salaries is cancelled but also a spurious negative correlation between these two variables is displayed in the bivariate procedure. The real positive relationship between teacher surplus and average teacher salaries is only revealed by the partial correlation procedure when the suppressor, average family income, is controlled for (Bailey, 1987).

In addition, if one examines all the other independent variables' bivariate coefficients with teacher surplus in table 4.17 on page 131, one will find that other independent variables combined have a suppressing effect on the correlation between average teacher salaries and teacher surplus in the bivariate procedure. The same thing can be said about unemployment rate, but to a less degree.

While both the bivariate and scatterplot procedure show that there is a positive association between temperature and average teacher salaries, the partial correlation procedure indicates that actually there is no relationship between temperature and average teacher salaries once the effects of average family income and average farm land price are removed. In other words, Ontario and British Columbia teachers have the highest average salaries not because of higher annual temperature but mainly because of higher average family income and average farm land price.

Establishing a Statistical Model

With the factors affecting teacher employment incomes unravelled, one may want to go a step further. After one learns what affects average teacher salaries, one may want to know whether a statistical model to estimate average teacher salaries can be established in order to provide a concise statement of the findings. The best model in estimating the dependent variable is the model that predicts well but includes as few independent variables as possible. If one can estimate average teacher salaries satisfactorily with only two independent variables instead of six, the simpler model is better. The goal is to establish

a simple model that predicts well (Norusis, 1995).

In addition, although six independent variables are observed to be either positively or negatively correlated to teacher compensation according to the partial correlation procedure, the question of how well these independent variables predict the dependent variable remains. It is neither warranted nor feasible to include all six independent variables related to the dependent variable in a model to estimate teacher compensation at the inter-provincial level. Some of these six independent variables' contribution to a statistical model may be insignificant. In establishing a parsimonious model that estimates average teacher salaries well, variable selection is necessary.

The partial correlation procedure indicates that six independent variables are either positively or negatively correlated with the dependent variable at the inter-provincial level. However, it is not appropriate to include the independent variable of teacher supply and demand in a multiple variable model because information about this independent variable is incomplete; only seven provinces provided enough information that can be used in this study. In making comparisons one needs to use consistent numbers. Therefore, the independent variable of teacher supply and demand is not considered in a multiple variable model.

Furthermore, although there seems to be an association between the dependent variable and the independent variable of population density, this independent variable's explanatory is too low to be seriously considered. The independent variable of population density is therefore omitted. This leaves four independent variables to be contemplated on in a multiple regression model: average family income, population growth, average farm

land price, and unemployment rate.

Some of the four independent variables may predict the dependent variable quite well, while others may only have a weak capacity in predicting the dependent variable, as illustrated by the scatterplots. In determining how well each of the four independent variables predicts the dependent variable, linear regression analysis can be used to display the ability of an independent variable to predict and explain the variation of the dependent variable.

The linear regression procedure is used to test each of the four independent variable's explanatory power on the dependent variable. As well, I applied the multiple linear regression procedure to test the explanatory ability of the independent variables when they were put together in different combinations. There are three factors that can be considered when one selects independent variables for a multiple regression model: 1) the R-square, i.e., the percentage of the variation of the dependent variable explained by the variation of an independent variable; 2) an independent variable's independence from other independent variables, which determines how much it contributes to a multiple regression model; and 3) the p-value, which indicates the probability of obtaining an outcome when actually no relationship exists.

R-square is used to describe the percentage of the variation in the dependent variable explained by the independent variable. An R-square of 1 means a perfect, 100%, explanation of the variation in the dependent variable by the variation in the independent variable. An R-square of 0 means that no variation in the dependent variable is explained by the variation in the independent variable. I looked at the R-square of each of the four

independent variables to determine the variation of which independent variable explains most of the variation in the dependent variable and which independent variable's variation does not explain the variation in the dependent variable at all.

In deciding to use which independent variables in a multiple regression model, one should consider correlations among independent variables themselves. One wants to minimize collinearity by selecting variables that are as independent of each other as possible. Also, choosing independent variables that have low correlations with other independent variables ensures the independent variables selected contribute most to the multiple regression model. I considered the four independents' average correlations among themselves to determine which independent variables should be used in a multiple regression model.

The p-value indicates the probability of obtaining a certain number in a statistical analysis when there is, in fact, no relationship. The usual acceptable frame of reference to make a generalization from a sample to a population is to allow 5% chance for error, i.e. to require p-values less than or equal to .05 to consider a relationship by statistical significance. While the data as observed in this study either are or can be considered as population data and do not need significance level to generalize the resulting analysis to a larger population, the p-value still tells us how likely the observed values simply occur by chance, with the assumption that no relationship actually exists. I looked at each p-value of the four independent variables' correlations to determine which independent variable's correlation has the smallest probability of occurring by chance alone.

Table 4.19 presents the R-squares, the absolute values of the average correlations

with other independent variables and the p-values of each of the four independent variables, which are average family income, population growth, average land price, and unemployment rate. The R-square figures are in the order from the highest to the lowest, but the average correlations' absolute values and the p-values are in the order from the smallest to the greatest.

Table 4.19

Rank of Independent Variables for R-squares, Average Correlations & P-values

R-squares		Average Correlations with other 3 Variables		P-values	
.64	family income	.15	family income	.01	family income
.46	population growth	.28	unemployment rate	.03	population growth
.35	land price	.31	population growth	.07	land price
.11	unemployment rate	.40	land price	.36	unemployment rate

The strongest explanatory independent variable, average family income, is associated with the smallest average correlation's absolute value and the smallest p-value. While unemployment rate's average correlation is lower than those of land price and population growth, on balance, it is not likely that unemployment rate will contribute as much to a multiple regression model as do land price and population growth. The weakest explanatory independent variable, unemployment rate, is related to the greatest p-value. The statistics

reported in table 4.19 suggest that the independent variable of unemployment rate not be included in a multiple regression model because its explaining ability is too low and its p-value is too great.

Combining family income, population growth and land price in a multiple regression model to predict teacher compensation produces an R-square of 75% and a p-value of .03. This means that a model with these three independent variables explains about 75 percent of the variation in average teacher salaries and it is quite unlikely that the result is obtained by chance.

As stated earlier, the goal is to find a model that predicts well with as few independent variables as possible. Is it possible to have a model with only two independent variables that predicts as well? Family income should be one of the two independent variables in such a model because of its high explanatory ability (R-square = .64). Of population growth and land price, one needs to decide which to use in a new multiple regression model by looking at the results of a family income and population growth multiple regression, as well as the results of a family income and land price multiple regression. One has to determine which model works as well as the model with three independent variables. Table 4.20 reports the results from these two multiple linear regressions.

Table 4.20

Regression Results of Family Income & Population Growth Compared with Those of Family Income & Land Price

	Family Income & Population Growth		Family Income & Land Price
R-square	.65		.74
p-value	.03		.01
Partial regression coefficients:			
Family income	.42		.39
Population growth	3193.67	Land price	3.23
Beta:			
Family income	.73		.68
Population growth	.10	Land price	.33
Constant	14557.45		14286.69

A multiple regression model with average family income and population growth produces an R-square of .65 and a p-value of .03. With average family income and average farm land price in the model, the R-square is .74 and the p-value is .01. A comparison of the above two multiple regression results suggests that a model of average family income and average farm land price per acre is more appropriate for estimating teacher compensation in 1995 at the inter-provincial level in Canada because the model with family income and land price has a higher R-square, .74 and a smaller p-value, .01, than does the model with family income and population growth, which has an R-square of .65 and an p-

value of .03. In its explanatory power (R-square = .74), the model with family income and land price is almost as good as the model with family income, land price and population growth (R-square = .75). By removing land price, the model with family income and population growth significantly reduces the explanatory ability (R-square = .65).

The estimated regression equation in predicting teacher compensation in Canada at the inter-provincial level in 1995 with the two independent variables of average family income and average farm land price per acre can be written as

$$Y = 14286.69 + .39 \text{ x family income} + 3.23 \text{ x land price} \qquad (1)$$

where Y is the predicted teacher compensation in a province in 1995. The number of 14286.69 is the constant, which is the predicted value for Y when all the independent variables are 0. The number of .39 is the partial regression coefficient for average family income controlling for average farm land price, and 3.23 is the partial regression coefficient for average farm land price per acre controlling for average family income.

In a multiple regression equation, the partial regression coefficient for an independent variable indicates how much the estimated value of the dependent variable changes when the value of that independent variable increases by 1 and the values of the other independent variable(s) do not change. A positive partial coefficient means that when the value of the independent variable increases the predicted value of the dependent variable also increases. A negative partial coefficient means that when the value of the independent variable increases the predicted value of the dependent variable decreases.

The partial coefficient for the average family income variable in equation (1) indicates that when average family income increases $1, the predicted teacher employment income increases 39 ¢. The partial coefficient for the average farm land price variable in the same equation indicates that when land price per acre increases $1, the estimated teacher employment income increases $3.23.

These two figures of 39 ¢ and $3.23 may be a bit misleading. They may give the impression that land price has about eight times the impact on teacher salaries as does family income. The reality is not necessarily so. The mean, $35,712, and standard deviation, $3,248, of family income (see table 4.7 on page 101) are much greater than the mean, $617, and standard deviation, $336, of land price (see table 4.7). The influence on teacher salaries from family income and land price is measured on different scales, which are not comparable. One method to make partial regression coefficients somewhat more comparable is to calculate their Beta values, which are the partial coefficients "when all independent variables are expressed in standardized (Z-score) form" (Norusis, 1995, p. 486). The Beta value for family income is .68 and the Beta value for land price is .33 (see table 4.20 on page 145), implying that family income has about twice the impact on teacher salaries than does land price. The Beta values of .68 and .33 are considered to reflect relative influence while the partial regression coefficients of .39 and 3.23 are considered to reflect absolute influence.

We now have a model for estimating a province's average teacher employment income if we know that province's average family income and average farm land price. We can verify the model by checking the actual data. In 1995, the average family income in

Ontario, the most populous province in Canada, was $59,356 and its land price was $1,242 per acre; therefore, according to the model in equation (1), Ontario's average teacher compensation is estimated to be

$$Y = \$14,286.69 + .39 \times \$59,356 + 3.23 \times \$1,242 = \$41,447. \qquad (2)$$

The actual average Ontario teacher annual income in 1995 was $42,758, which is $1,311 more than the estimated value.

Quebec, the second most populous province in Canada, can be used as another example to test the above model. In 1995, Quebec's average family income was $49,498 and its average farm land price was $603 per acre, therefore, according to the same model, its average teacher compensation is estimated to be

$$Y = \$14,286.69 + .39 \times \$49,498 + 3.23 \times \$603 = \$35,539. \qquad (3)$$

The actual average Quebec teacher 1995 employment income was $35,094, which is $445 less than the estimated amount.

The model was tested with the actual average teacher employment income data from other eight provinces. Table 4.21 presents the actual average teacher salaries, the estimated average teacher salaries, and the differences between the two from the ten provinces in 1995.

Table 4.21

Actual Salaries, Estimated Salaries and Their Differences, 1995

	Actual Salaries	Estimated Salaries	Differences
Alta.	$36,390	$36,199	+$191
B.C.	$38,737	$39,552	-$816
Man.	$36,296	$35,363	+$933
N.B.	$31,771	$33,042	-$1,271
Nfld.	$35,253	$33,304	+$1,949
N.S.	$35,530	$33,022	+$2,508
Ont.	$42,758	$41,447	+$1,311
P.E.I.	$32,227	$34,929	-$2,702
Que.	$35,094	$35,539	-$445
Sask.	$33,059	$34,555	-$1,496

In 1995, according to the model in equation (1) on page 146, on average the difference between the estimated teacher employment income and the actual teacher employment income in the ten provinces is $1,362. This average difference was obtained by summing up the absolute values of the ten differences and dividing the sum by ten. The average teacher employment income in 1995 for the ten Canadian provinces was $35,712, and $1,362 is about 4 percent of the average teacher employment income from these ten provinces. The model with average family income and average farm land price works quite well at the inter-provincial level. Besides, we need to bear in mind that this model is able

to explain only about 74 percent of the variation in average provincial teacher employment income.

The fact that the estimated regression equation uses average farm land price instead of population growth does not mean that average farm land price alone has a stronger ability than does population growth in predicting and explaining teacher compensation. It only means that in a multiple regression model with average family income as another independent variable, the independent variable of average farm land price contributes more explanatory power than does the independent variable of population growth in explaining teacher compensation. This occurs because of the complicated interrelationships among the independent variables themselves.

In establishing a statistical model, it is preferable to include an independent variable that is strongly correlated with the dependent variable but weakly correlated with other independent variables. Although population growth alone has a higher bivariate correlation coefficient ($r = .69$) with teacher compensation than does farm land price alone ($r = .59$), with family income as another independent variable population growth does not contribute as much to a multiple regression model in predicting teacher compensation as does farm land price. A bivariate correlation procedure reveals that population growth has a closer relationship with average family income ($r = .80$) than does average farm land price ($r = .38$). In other words, in a multiple independent variable regression procedure, population growth's prediction and explanation abilities are offset by those of the average family income. Average farm land price's relationship with average family income is not as close as that between population growth and average family income, so when the independent

variable of average farm land price is added to a multiple regression, the multiple regression's prediction and explanation abilities are significantly increased.

Ontario

Testing Hypotheses

It is obvious that at the census division level in Ontario, there is significant variation in average teacher salaries, although the variation is not as large as that at the inter-provincial level. There are fewer independent variables to be considered in explaining this variation at the census division level because union influence and teacher supply and demand information is not available. Six independent variables were hypothesized to have a relationship with the dependent variable, average teacher salaries, in Ontario at the census division level. These six independent variables are: population density, average family income, population growth, average farm land price, unemployment rate and weather. The bivariate correlation procedure indicates that there is a relationship, although not always in the direction hypothesized, between the dependent variable and four independent variables, whereas there is no association between the dependent variable and two independent variables. Table 4.22 presents the bivariate correlation procedure results with regard to the dependent variable and the six independent variables.

Table 4.22

Bivariate Correlation Coefficients for Dependent Variable and Six Independent Variables

	Salary	Density	Landpric	Popugrow	Familyin	Unemploy	Weather
Salary	1.00	.18	-.02	-.35	-.02	.37	-.31
	(44)	(44)	(44)	(44)	(44)	(44)	(44)
	p= .	p= .24	p= .92	p= .02	p= .91	p= .01	p= .04
Density	.18	1.00	.62	.02	.24	-.01	.28
	(44)	(44)	(44)	(44)	(44)	(44)	(44)
	p= .24	p= .	p= .00	p= .90	p= .13	p= .96	p= .07
Landpric	-.02	.62	1.00	.48	.69	-.45	.59
	(44)	(44)	(44)	(44)	(44)	(44)	(44)
	p= .92	p= .00	p= .	p= .00	p= .00	p= .00	p= .00
Popugrow	-.35	.02	.48	1.00	.43	-.38	.31
	(44)	(44)	(44)	(44)	(44)	(44)	(44)
	p= .02	p= .90	p= .00	p= .	p= .00	p= .01	p= .04
Familyin	-.02	.24	.69	.43	1.00	-.60	.32
	(44)	(44)	(44)	(44)	(44)	(44)	(44)
	p= .91	p= .13	p= .00	p= .00	p= .	p= .00	p= .03
Unemploy	.37	-.01	-.45	-.38	-.60	1.00	-.63
	(44)	(44)	(44)	(44)	(44)	(44)	(44)
	p= .01	p= .96	p= .00	p= .01	p= .00	p= .	p= .00
Weather	-.31	.28	.58	.31	.32	-.63	1.00
	(44)	(44)	(44)	(44)	(44)	(44)	(44)
	p= .04	p= .07	p= .00	p= .04	p= .03	p= .00	p= .

Again, these bivariate correlations do not provide adequate tests of the hypotheses since the other independent variables were not controlled when the relationship between the dependent variable and one independent variable was tested. To test the hypotheses, it

is necessary to apply the partial correlation procedure, which controls other independent variables when the relationship between one independent variable and the dependent variable is tested. Since the number of cases is fairly large (N = 44), it is feasible to control five independent variables when testing the relationship between the dependent variable and one independent variable. Table 4.23 presents the partial correlation coefficients, their p-values, controlled variables, and original hypotheses with regard to the six independent variables. Subsequently, specific hypotheses are stated along with a written interpretation of the results.

Table 4.23

Partial Correlation Coefficients for Six Independent Variables

	Density	Familyin	Landpric	Popugrow	Unemploy	Weather
Salary	.02	.16	.13	-.35	.25	-.16
p-value	.89	.34	.41	.03	.12	.34
Controlling:	Familyin Popugrow Landpric Unemploy Weather	Density Popugrow Landpric Unemploy Weather	Density Familyin Popugrow Unemploy Weather	Density Familyin Landpric Unemploy Weather	Density Familyin Popugrow Landpric Weather	Density Familyin Popugrow Landpric Unemploy
Hypothesized Correlation with Salary:	+	+	+	+	-	-

Hypothesis 1: The greater the population density, the higher teacher salaries tend to be, other things being equal.

Results: The partial correlation coefficient between average teacher salaries and average population density was .02 controlling family income, farm land price, population growth, unemployment rate and weather. This finding does not confirm the hypothesis that higher teacher salaries are related to higher population density when other factors are under control. Why this economic pattern has been observed in other places, but not in Ontario at the census division level, is discussed in chapter five.

Hypothesis 2: The higher the average family incomes are, the higher teacher salaries tend to be, other things being equal.

Results: The partial correlation coefficient between average teacher salaries and average family income is .16 controlling population density, farm land price, population growth, unemployment rate and weather. This finding confirms the hypothesis that higher family income is related to higher teacher salaries when other factors are under control, although the strength of the relationship is quite weak and the p-value is high.

Hypothesis 3: The higher the average farm land price is, the higher teacher salaries tend to be, other things being equal.

Result: The partial correlation coefficient between average teacher salaries and average farm land price per acre is .13 controlling population density, family income, population growth, unemployment rate and weather. Again, this finding confirms the hypothesis that higher farm land price is related to higher teacher salaries when other factors

are under control, although again the strength of the relationship is quite weak and the p-value is high.

Hypothesis 4: The higher the population growth is, the higher teacher salaries tend to be, other things being equal.

Result: The partial correlation coefficient between average teacher salaries and population growth is -.35 controlling population density, family income, farm land price, unemployment rate and weather. This finding does not confirm the hypothesis that higher population growth is related to higher teacher salaries when other factors are under control. Why do average teacher salaries, the major part of the price for educational service, decrease when the demand increases? This question is explored later in chapter five.

Hypothesis 7: The higher unemployment rate is, the lower teacher salaries tend to be, other things being equal.

Result: The partial correlation coefficient between average teacher salaries and unemployment rate is .25 controlling population density, family income, farm land price, population growth and weather. This finding differs from the hypothesis that higher unemployment rate is negatively related to lower teacher salaries. Why are teacher incomes not affected by the general labour market at the census division level in Ontario as they do in other places?

Hypothesis 8: The warmer the weather is, the lower teacher salaries tend to be, other things being equal.

Result: The partial correlation coefficient between average teacher salaries and annual daily mean temperature is -.16 controlling population density, family income, farm land price, population growth and unemployment rate. This finding does confirm the hypothesis that average temperature is negatively related to lower teacher salaries, implying that salaries are lower in warmer areas and higher in colder areas.

Establishing a Statistical Model

With the factors affecting teacher employment incomes untangled, one wants to know whether a statistical model to estimate average teacher salaries at the census division level in Ontario can be established. According to the partial correlation procedure, it is observed that five independent variables are related to average teacher salaries: average family income, average farm land price, population growth, unemployment rate and weather. Because of a fairly large number of cases (N = 44), all five independent variables can be utilized in the calculation to see how well a statistical model is able to estimate average teacher salaries. With these five independent variables in the multiple linear regression model, an R of .57, an R-square of .33 and a p-value of .01 are obtained, indicating that 33% of the variation in average teacher salaries can be accounted for by the variation of the five independent variables. Table 4.24 provides the results of this multiple linear regression.

Table 4.24

Regression Results of Family Income, Land Price, Population Growth, Unemployment Rate, Weather and Average Teacher Salaries

	Familyin	Landpric	Popugrow	Unemploy	Weather
Partial regression coefficients:	.0530	.2390	-47.19	265.1	-177.4
Beta:	.23	.29	-.39	.36	-.21

R: .57 R-square: .33 p-value: .01 Constant: $50,322

Ideally, it would be better to reduce the number of independent variables to simplify a regression model, as has been done at the inter-provincial level. Due to the weak explanatory power of this model (R-square = .33), it is more appropriate to keep all the five independent variables at the census division level in Ontario in order not to lessen its already low explanatory power. In addition, there is more difference among the independent variables' Beta values at the inter-provincial level than at the census division level in Ontario, indicating that there is more difference among the independent variables' relevant influence at the inter-provincial level than at the census division level (see table 4.20 on page 145). With less difference among the independent variables' relevant influence at the census division level than at the inter-provincial level, reducing the number of independent variables would weaken a regression model's explanatory power more at the census division level than at the inter-provincial level.

The estimated regression equation in predicting average teacher salaries in Ontario for census divisions in 1995 with five independent variables can be written as

$$Y = \$50{,}322 + .0530 \times \text{family income} + .2390 \times \text{land price} - 47.19 \times \text{population growth} + 265.1 \times \text{unemployment rate} - 177.4 \times \text{daily mean temperature} \quad (4)$$

where Y is the predicted average teacher salary in a census division in 1995-1996 school year. The number of $50,322 is the constant, which is the predicted value for Y when all the five independent variables are 0. The number .0530 is the partial regression coefficient for family income controlling for other four independent variables, and .2390 is the partial regression coefficient for land price controlling for other four independent variables, etc.

The partial coefficient for family income in equation (4) indicates that when family income increases $1, the predicted teacher employment income increases approximately 5 ¢. The partial coefficient for land price in the same equation indicates that when land price increases $1, the estimated teacher employment income increases about 24 ¢. The partial coefficient for population growth, -47.19, indicates that when population grows 1 percent, average teacher salaries are $47.19 less. The partial coefficient for unemployment rate shows that when unemployment rate is 1 percent higher, average teacher salaries are $265.10 greater. The partial coefficient for daily mean temperature means that when the temperature is 1 degree Celsius higher, average teacher salary is $177.40 less.

While there is much variation in the five independent variables' absolute influence, the difference in their relevant influence is not as large at the census division level in

Ontario as at the inter-provincial level (see table 4.24 on page 157 and table 4.20 on page 145). The difference between the highest Beta value and the lowest Beta value is .18 at the census division level, whereas at the inter-provincial level the difference between the highest Beta value and the lowest Beta value is .62. This finding suggests that intra-provincially there is little differentiation in the explanatory powers of the five independent variables in comparison to what is observed at the inter-provincial level, where three independent variables explain a great deal of the variation in average teacher salaries.

We now have a model for estimating a census division's average teacher employment income if we know that census division's family income, land price, population growth, unemployment rate and weather. We can verify the model by checking the actual data. In 1995, the average family income in Toronto Metropolitan Municipality, the most populous census division in Ontario, was $58,939, its 1995 land price was $8,555 per acre, its population growth for the past decade was 9 percent, its 1995 unemployment rate was 10.7 percent and its temperature is 8.9 degree Celsius; therefore, according to the model in equation (4), Toronto's average teacher salary for 1995 is estimated as

$$Y = \$50,322 + .0530 \times \$58,939 + .2390 \times \$8,555 - 47.19 \times 9 + 265.1 \times 10.7 - 177.4 \times 8.9°C = \$56,322 \qquad (5)$$

The actual average Toronto teacher salary in 1995 was $56,337, $15 more than the estimated value.

The model was tested with the actual average teacher employment income data from

other 43 census divisions. Table 4.25 presents the actual average teacher salaries, the estimated average teacher salaries, and the differences between the two from the 44 census divisions in 1995.

Table 4.25

Actual Salaries, Estimated Salaries and Their Differences, 1995

	Actual Salaries	Estimated Salaries	Differences
Algoma D	$55,826	$56,277	-451
Brant	--*		
Bruce	--*		
Cochrane D	--*		
Dufferin	$53,063	$51,971	1,092
Durham RM	$51,302	$53,883	-2,581
Elgin	$52,718	$54,287	-1,569
Essex	$55,957	$54,348	1,609
Frontenac	$54,962	$54,134	828
Grey	$53,796	$53,745	51
Haldimand-Norfolk RM	$53,350	$54,218	-868
Haliburton	$56,314	$54,694	1,620
Halton RM	$52,846	$55,022	-2,176
Hamilton-Wentworth RM	$57,188	$55,064	2,124
Hastings	$54,074	$54,112	-38
Huron	$55,983	$53,298	2,685
Kenora D	$54,625	$55,391	-766
Kent	$55,024	$54,410	614
Lambton	$55,403	$54,903	500
Lanark	$54,456	$53,857	599
Leeds & Grenville UC	$53,288	$53,761	-473
Lennox & Addington Co	$55,721	$53,908	1,813
Manitoulin D	$53,822	$54,523	-701

Middlesex	$54,616	$54,420	196
Muskoka DM	$53,885	$54,098	-213
Niagara RM	$53,373	$55,274	-1,901
Nipissing D	$56,687	$55,384	1,303
Northumberland	$50,694	$53,485	-2,791
Ottawa-Carlton RM	$54,631	$54,841	-210
Oxford	$52,545	$54,100	-1,555
Parry Sound D	--*		
Peel RM	$54,364	$54,263	101
Perth	$53,349	$53,691	-342
Peterborough	$54,215	$54,291	-76
Prescott & Russell UC	$52,703	$53,333	-630
Prince Edward	$51,379	$53,920	-2,541
Rainy River D	$55,490	$55,924	-434
Renfrew	$53,173	$54,567	-1,394
Simcoe	$53,901	$53,067	834
Stormont Dun. & Glen. UC	$53,016	$54,643	-1,627
Sudbury D	$56,083	$56,416	-333
Sudbury RM	$57,554	$55,917	1,637
Thunder Bay D	$58,515	$56,295	2,220
Timiskaming D	--*		
Toronto MM	$56,337	$56,322	15
Victoria	$53,256	$53,728	-472
Waterloo RM	$56,088	$54,255	1,834
Wellington	$54,923	$53,599	1,324
York RM	$54,414	$53,269	1,145
N = 44	M = $54,430	M = $54,430	M = $0
	SD = $1,680	SD = $961	SD = $1,378

*Note. Data not available.

Actual salary sources: Education Relations Commission, 1997.

In 1995, according to the model in equation (4), on average the difference between the estimated teacher employment income and the actual teacher employment income in the 44 census divisions is $1,097. This average difference was obtained by summing up the absolute values of the 44 differences and dividing the sum by 44. The average teacher employment income in 1995 for the 44 census divisions was $54,430, and $1,097 is about 2 percent of the average teacher employment income. The model with family income, land price, population growth, unemployment rate and weather works reasonably well at the census division level in Ontario.

Although including five independent variables, the statistical model for estimating average teacher salaries at the census division level in Ontario is able to explain only about 33 percent of the variation in average teacher salaries. The weak explanatory power of this model prompts one to wonder if the above statistical model fits the data well. One important way of checking whether a statistical model fits a specific set of data well is to analyse the residuals produced with the model. Such analysis can reveal curvilinear and other non-linear relationships that violate the assumptions of linearity underlying the regression model.

Residuals are the differences between observed data and predicted values, which are presented in the third column of table 4.25 in this case. If a statistical model fits well, its residuals' distribution is approximately normal. To check whether the residuals are normally distributed, one needs to standardize them so that it is easier to determine their relative magnitude. Table 4.26 provides actual average teacher salaries, estimated salaries, residuals and standardized residuals.

Table 4.26

Actual Salaries, Estimated Salaries, Residuals and Standardized Residuals

	Actual Salaries	Estimated Salaries	Residuals	Standardized Residuals
Algoma D	$55,826	$56,277	-450.57	-.31
Brant	--*			
Bruce	--*			
Cochrane D	--*			
Dufferin	$53,063	$51,971	1,091.72	.74
Durham RM	$51,302	$53,883	-2,581.03	-1.76
Elgin	$52,718	$54,287	-1,569.21	-1.07
Essex	$55,957	$54,348	1,609.30	1.10
Frontenac	$54,962	$54,134	828.00	.56
Grey	$53,796	$53,745	50.92	.03
Haldimand-Norfolk RM	$53,350	$54,218	-867.65	-.59
Haliburton	$56,314	$54,694	1,620.24	1.11
Halton RM	$52,846	$55,022	-2,176.24	-1.48
Hamilton-Wentworth RM	$57,188	$55,064	2,124.38	1.45
Hastings	$54,074	$54,112	-37.87	-.03
Huron	$55,983	$53,298	2,685.38	1.83
Kenora D	$54,625	$55,391	-766.22	-.52
Kent	$55,024	$54,410	614.39	.42
Lambton	$55,403	$54,903	499.60	.34
Lanark	$54,456	$53,857	598.61	.41
Leeds & Grenville UC	$53,288	$53,761	-472.71	-.32
Lennox & Addington Co	$55,721	$53,908	1,813.38	1.24
Manitoulin D	$53,822	$54,523	-701.23	-.48
Middlesex	$54,616	$54,420	195.72	.13
Muskoka DM	$53,885	$54,098	-212.65	-.15
Niagara RM	$53,373	$55,274	-1,901.19	-1.30
Nipissing D	$56,687	$55,384	1,302.92	.89
Northumberland	$50,694	$53,485	-2,790.86	-1.90

Ottawa-Carlton RM	$54,631	$54,841	-209.62	-.14
Oxford	$52,545	$54,100	-1,555.19	-1.06
Parry Sound D	--*			
Peel RM	$54,364	$54,263	100.74	.07
Perth	$53,349	$53,691	-342.22	-.23
Peterborough	$54,215	$54,291	-76.46	-.05
Prescott & Russell UC	$52,703	$53,333	-630.47	-.43
Prince Edward	$51,379	$53,920	-2,540.90	-1.73
Rainy River D	$55,490	$55,924	-434.04	-.30
Renfrew	$53,173	$54,567	-1,393.92	-.95
Simcoe	$53,901	$53,067	833.91	.57
Stormont Dun. & Glen. UC	$53,016	$54,643	-1,627.38	-1.11
Sudbury D	$56,083	$56,416	-333.05	-.23
Sudbury RM	$57,554	$55,917	1,636.51	1.12
Thunder Bay D	$58,515	$56,295	2,219.90	1.51
Timiskaming D	--*			
Toronto MM	$56,337	$56,322	14.69	.01
Victoria	$53,256	$53,728	-471.65	-.32
Waterloo RM	$56,088	$54,255	1,833.39	1.25
Wellington	$54,923	$53,599	1,323.91	.90
York RM	$54,414	$53,269	1,144.71	.78
N = 44	M = $54,430 SD = $1,680	M = $54,430 SD = $961	M = $0 SD = $1,378	M = 0 SD = .94

*Note. Data not available.

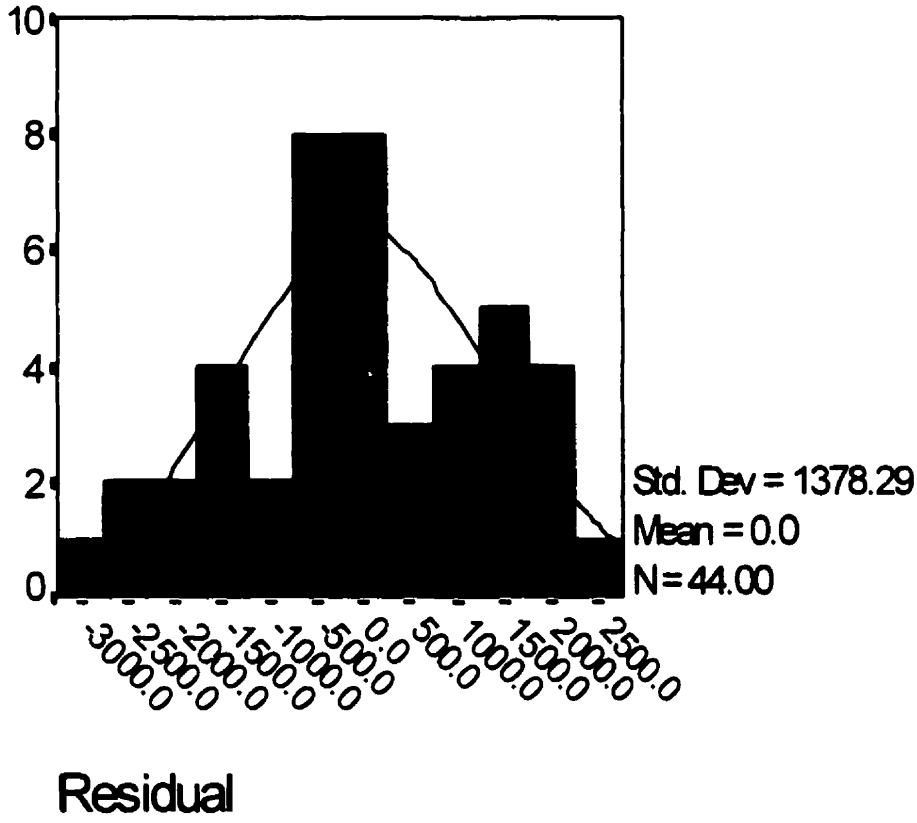
Actual salary sources: Education Relations Commission, 1997.

If the distribution of residuals is approximately normal, about 95% of the standardized residuals should be between -2 and +2 (Norusis, 1995). The lowest standardized residual, -1.90 from Northumberland, is less than -2 and the highest standardized residual, 1.83 from Huron, is less than +2; that is, all of the standardized

residuals are between -2 and +2. The distribution of residuals is approximately normal and the statistical model fits well. A histogram in figure 4.17 about the distribution of residuals also illustrates that the residuals are approximately normally distributed.

Figure 4.17

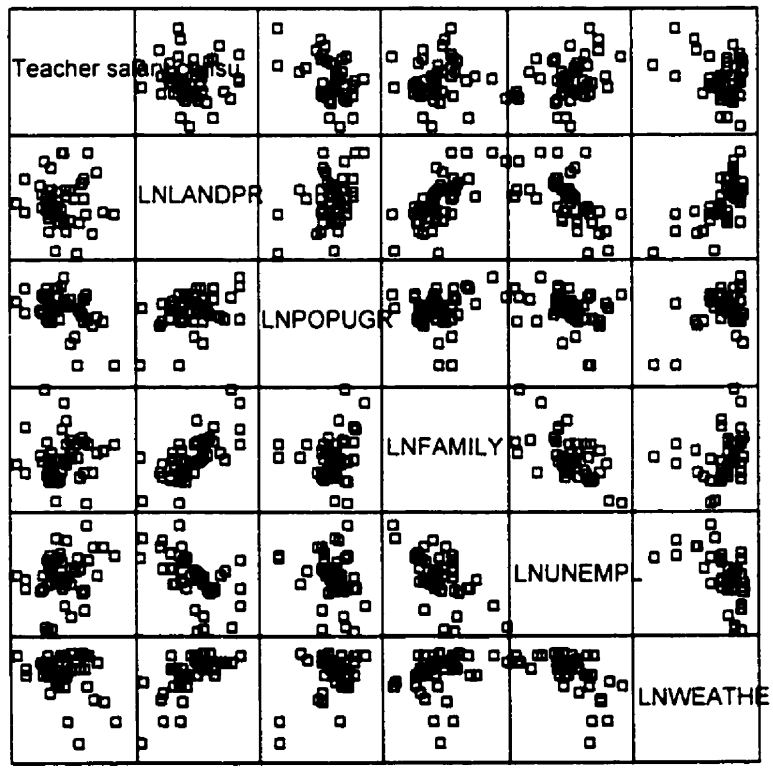
Distribution of Residuals



Further efforts in transforming data to increase the explanatory power of the independent variables did not produce any improvement. With the natural logs of the five independent variables in a multiple regression model, the explanatory power (R-square = .33) of the model is the same as the one written in equation (4). The scatterplot matrix in figure 4.18 displays no curvilinear or other patterns.

Figure 4.18

Scatterplot matrix for natural logs of five independent variables and the dependent variable



LANDPR = Land Price; POPUGR = Population Growth; FAMILY = Family Income; UNEMPL = Unemployment Rate; WEATHE = Weather; Teacher sa = Average Teacher Salaries

Summary

For the ten Canadian provinces, the findings of this study confirm two hypotheses concerning the relationships between average teacher salaries and family income and farm land price, but do not confirm four others with regard to the relationships between average teacher salaries and population density, population growth, teacher surplus and unemployment rate. This study did not detect any relationship between average teacher salaries and weather differences among provinces.

In addition to testing the seven hypotheses at the inter-provincial level, this study establishes a statistical model to estimate the ten provinces' average teacher salaries with the independent variables of average family income and average farm land price per acre. This model accounts for approximately 74 percent of the variation in average teacher salaries for the ten provinces.

In Ontario for the census divisions, the findings of this study confirm three hypotheses with regard to the relationships between average teacher salaries and family income, farm land price and weather, but the findings differ for two hypotheses concerning the relationships between average teacher salaries and population growth and unemployment rate. No relationship is observed between average teacher salaries and population density.

A statistical model in estimating average teacher salaries at the census division level was also established, which explains about 33 percent of the variation in average teacher salaries.

In chapter five, implications of the findings are discussed, limitations are mentioned, recommendations on further research are suggested and conclusions are drawn.

CHAPTER V

SUMMARY, DISCUSSION, LIMITATIONS, RECOMMENDATIONS AND CONCLUSION

Introduction

Chapter five summarizes the study and discusses in detail the implications of the findings concerning the relationships between the dependent variable and each independent variable. Comparisons are made in regards to the differences between the findings for provinces and the findings for census divisions in Ontario and with previous literature. The limitations of this study are mentioned, followed by recommendations on future research. Finally, conclusions are presented.

Summary of the Study

The purpose of this study was to examine the variation in teacher compensation across Canada and across the province of Ontario. Specifically, the investigation attempted to: 1) determine the extent of variation in average teacher compensation among the ten provinces and two territories; 2) explain inter-provincial variation in teacher compensation in terms of related independent variables; 3) determine and explain variation in teacher compensation within Ontario; 4) establish statistical models to estimate teacher compensation at the inter-provincial level as well as at the census division level in Ontario.

A better understanding of teacher compensation will help to account for varying levels of educational expenditures, which is critical for the success of policy makers, negotiators in collective bargaining and others who make decisions regarding teacher incomes and related matters. A better understanding of variation in compensation of teachers among provinces may suggest actions to be taken to produce a more consistent, efficient, and effective educational system across the country. With a more consistent system, it would be easier for teachers to move from one province to another. A more efficient and effective educational system would contribute to the social and economic well-being of all Canadians.

Comprehending better the roots of the variation in teacher compensation within Ontario could contribute to the establishment of a more equitable and efficient educational structure in the province. As an integral aspect of the school personnel function (Rebore, 1987), teacher compensation interacts in significant ways with other aspects of the personnel function in school systems. It is important for us to know more in this area in order to help ensure that changes in educational policies are made with adequate knowledge and bring about positive results.

This research reveals some interesting relationships not previously identified in Canada, provides some insight into the related discussion about educational expenditures, and establishes a basis for further exploration. It is hoped that this research will add to the knowledge base of educational administration in the area of teacher compensation in Canada and Ontario. As well, it contributes to the international literature on this topic.

The majority of people who decide to become teachers are motivated by a liking for

people, particularly children (King & Peart, 1992). While teachers want to teach and make a difference with their students (Yee, 1990), they also care about the compensation they receive (Jacobson, 1996). Teacher compensation is important and complex, decided by a variety of factors (Castetter & Heisler, 1992). How teachers are compensated directly influences the quality of people interested in teaching (Alexander & Salmon; Jacobson, 1996; Lewis & Norris, 1992). Although there is not truly a free market in which people move where jobs exist due to limitations imposed by family and community ties (Smith et al., 1993), teachers and people attracted to teaching are no different from workers in other professions (Jacobson, 1996), preferring positions where the psychic and financial rewards are the highest. With regard to rewards, both working conditions and salary play significant roles (Lewis & Norris, 1992). In addition, salary and other personal benefits reflect teachers' shared understandings of how well they are valued (Bascia, 1994). Extrinsic factors may strengthen or weaken the effects of intrinsic factors (Yee, 1990).

Canadian teachers have made substantial progress from their predecessors with respect to salaries. As late as the 1930s, a new teacher could be paid $55 a month when room and board was $21 a month (Procter, 1997). By 1990 school teachers received salaries about 30 percent above that of the average worker (Pagliarello, 1995) and over half of the teachers felt that the financial rewards were satisfactory (King & Peart, 1992). However, how teachers are paid has been a recent topic of discussion (Andrews, Balfour, & Stitch, 1995; http://www.osstf.on.ca/www/issues/edifi/salries.html; Lawton, 1996; Ontario Teachers, 1997).

Chambers and Fowler (1995) stress that individuals care about the quality of their

work environment as well as the monetary rewards associated with particular employment alternatives and that they will seek to attain the greatest possible personal satisfaction by selecting a job with the appropriate combination of monetary and non-monetary rewards. With McMahon and Chang's (1991) cost-of-living model and Barro's (1992) cost index model in mind, Chambers and Fowler (1995) attempted to "account for all of the factors that affect the ability of local school systems to recruit and employ teachers" (p. 67).

In Canada, as elsewhere, including the United States (Odden & Kelley, 1997) and China, the two variables that figure most prominently in deciding teacher salaries are post-secondary education level and general teaching experience (Lockhart, 1991). In 1995, Quebec teachers were a little older than teachers in other nine provinces, where teachers were of similar ages (Tremblay, 1997). Canadian teachers have similar responsibilities (Bezeau, 1989), but salary levels among provinces differ (CMEC, 1996).

After reviewing related literature, it was determined that eight independent variables, for which data were probably available, would affect the dependent variable, average teacher salary. These eight independent variables were population density, family income, farm land price, population growth, union influence, teacher supply and demand, unemployment rate, and weather.

This investigation is a non-experimental, explanatory study in which comparison plays an important role. To address the purpose of the study, from Statistics Canada and other organizations, data were collected about eight independent variables for the ten provinces and data about six independent variables were collected for census divisions in Ontario. In relation to the eight independent variables, eight hypotheses were formed.

Hypothesis 1: The greater the population density, the higher teacher salaries tend to be, other things being equal.

Hypothesis 2: The higher the average family incomes are, the higher teacher salaries tend to be, other things being equal.

Hypothesis 3: The higher the average farm land price is, the higher teacher salaries tend to be, other things being equal.

Hypothesis 4: The higher the population growth is, the higher teacher salaries tend to be, other things being equal.

Hypothesis 5: The stronger the union's influence in collective bargaining is, the higher teacher salaries tend to be, other things being equal.

Hypothesis 6: The higher the supply of and the lower the demand for teachers are, the lower teacher salaries tend to be, other things being equal.

Hypothesis 7: The higher unemployment rate is, the lower teacher salaries tend to be, other things being equal.

Hypothesis 8: The warmer the weather is, the lower teacher salaries tend to be, other things being equal.

These eight hypotheses were tested with the data. In analysing the data, bivariate correlation, scatterplot, partial correlation and multiple linear regression procedures were used. In addition, two statistical models for estimating average teacher salaries were established, one for provinces and the other for census divisions in Ontario.

With respect to the first issue, according to Statistics Canada 1996 census data, there was considerable variation among provinces and territories in the combined average annual

elementary and secondary school teacher employment incomes in the year of 1995 (Statistics Canada, October 1997). Between the highest paid salaries and the lowest paid salaries, there was a difference of $10,987. In 1995, the standard deviation of average teacher salaries among Canadian provinces and territories was $3,881. Excluding the two territories, the standard deviation of average teacher salaries among the ten provinces was $3,248.

The second issue, explanation of the variation in teacher compensation among ten provinces, was addressed by investigating eight independent variables posited to be related to teacher compensation. Average family income and average farm land price per acre in a province, as originally expected, were observed to have a positive association with average teacher salaries in that province. If average family income and average farm land price per acre in a province were high, so was the average teacher salary in that province, with other things being equal. Of these two independent variables, average family income was found to play a greater role in influencing the average teacher salary in a province.

Contrary to the hypotheses, teacher surplus and unemployment rate were noted to have a positive relationship with average teacher salaries. No reliable association was observed in this study between average teacher salaries and population density, population growth and weather for the ten provinces. There is inadequate information about unions' influence on average teacher salaries.

With regard to the third issue, according to data calculated from information provided by Ontario Education Relations Commission, among census divisions there was significant variation in the combined average annual elementary and secondary school teacher salaries

in 1995-1996 school year. Between the highest paid average salaries, those of Thunder Bay District teachers, and the lowest paid salaries, those of Northumberland County teachers, there was a difference of $7,821. In 1995-1996 school year, the standard deviation of average teacher salaries among census divisions in Ontario was $1,680, about half of $3,248, the standard deviation of the average teacher salaries for ten provinces in 1995. There was more variation in average teacher salaries among provinces than among census divisions in Ontario.

Average family income and average farm land price per acre in a census division, as were originally expected, were observed to have a positive association with average teacher salaries. If average family income and average farm land price were high in a census division, so was the average teacher salary, other things being equal. However, these two independent variables' impact on average teacher salaries for census divisions was not as significant as for provinces. Also as expected, annual daily mean temperature has a negative impact on average teacher salaries. It seems that colder census divisions needed to pay higher salaries to attract and keep teachers.

Contrary to the hypotheses, population growth was observed to have a negative association with average teacher salaries, and unemployment rate was noted to have a positive relationship with average teacher salaries. No association was detected between population density and average teacher salaries.

In dealing with the fourth issue, two statistical models, equations (1) and (4), were established to estimate average teacher salaries for the ten provinces and for census divisions in Ontario.

$$Y = \$14{,}286.69 + .39 \times \text{family income} + 3.23 \times \text{land price} \qquad (1)$$

where Y is the estimated average teacher salary in a province. The number of $14,286.69 is the constant. The partial coefficient for family income variable indicates that when family income increases $1, the estimated average teacher salary increases ¢39. The partial coefficient for farm land price tells you that when land price increases $1, the estimated average teacher salary increases $3.23.

$$Y = \$50{,}322 + .0530 \times \text{family income} + .2390 \times \text{land price} - 47.19 \times \text{population growth} + 265.1 \times \text{unemployment rate} - 177.4 \times \text{daily mean temperature} \qquad (4)$$

where Y is the predicted average teacher salary in a census division of Ontario in 1995-1996 school year. The number of $50,322 is the constant. The number .0530 is the partial regression coefficient for family income, and .2390 is the partial regression coefficient for land price, etc.

With an ability to account for about 74 percent of the variation in average teacher salaries, the model for provinces is more successful in estimating average teacher salaries than the one for census divisions in Ontario, which is able to explain about 33 percent of the average teacher salary variation.

Discussion

Canada

Originally, it was hypothesized that eight independent variables would affect the dependent variable, average teacher salaries, at the inter-provincial level. The variation in average teacher salaries among provinces and the relationships as observed between the dependent variable and each of these eight independent variables are discussed in detail in the following sections.

Variation in Teacher Compensation among Provinces

There was considerable variation in teacher compensation among the ten Canadian provinces in 1995 according to Statistics Canada 1996 census data (Statistics Canada, October 1997). Between the highest paid average salary at $42,758, of Ontario teachers, and the lowest paid average salary at $31,771, of New Brunswick teachers, there was a difference of $10,987. In 1995, the standard deviation of average teacher salaries among ten provinces was $3,248.

Population Density and Teacher Salary

Population density normally figures significantly in a local economy. It was hypothesized that the greater the population density, the higher teacher salaries tend to be, other things being equal. According to the partial correlation procedure, with average

family income and average farm land price per acre kept constant, this study found that there was a negative partial correlation coefficient of -.24 between population density and average teacher salaries at the inter-provincial level, which is not compatible with conventional economic theory. However, while the partial correlation procedure produces a value of -.24, its p-value of .57 casts a doubt on the negative partial correlation. It is not clear whether the correlation actually exists or is obtained due to chance. With average family income and average farm land price being equal, this study is not able to establish an association beyond doubt between population density and average teacher salaries for the ten provinces.

The lack of a relationship between population density and average teacher salaries at the inter-provincial level may reflect the presence in every Canadian province, except for Prince Edward Island, of large unpopulated areas, which greatly dilute any relationship between population density and average teacher salaries. As a whole, Canada has a population density of only 3.1 persons per square kilometre (Statistics Canada, April 1997). For the ten provinces, the unweighted mean of population density is 8.2 persons per square kilometre, still much lower than most countries in the world. As a result, population density, which has an impact on people's income and related factors in most places, does not have a meaningful impact on average teacher salaries in Canada, at least for the ten provinces in this study.

Family Income and Teacher Salary

In studying educational expenditures, family income is often a factor to be considered (Alexander & Salmon, 1995). It was hypothesized that the higher the average family incomes are, the higher teacher salaries tend to be, other things being equal. It was observed that average family income, as expected, had a very high positive partial correlation coefficient of .72 with teacher employment income at the inter-provincial level, with average farm land price and population density kept constant. The bivariate correlation and scatterplot analyses produced similar results. Average family income is the independent variable that has the highest bivariate correlation coefficient with average teacher salaries (r = .80). Table 4.5 on page 94 shows that Ontario, British Columbia, Alberta and Manitoba are at the top of the average family income column, and these four provinces are also at the top of the average teacher salaries column, even in the same order. New Brunswick is next to the bottom on the average family income column, and it is at the bottom of the average teacher salaries column. The match between average family income and average teacher salaries in table 4.5 is almost perfect, indicating a high, positive association between the average family income in a province and that province's average teacher salary.

In estimating how teachers are to be compensated in a province, the variation in inter-provincial average family income alone is able to predict about 80 percent of the variation in average teacher salaries (r = .80). In addition, the variation in average family income alone is able to explain about 64 percent of the variation in average teacher salaries (R-square = .64). This study confirms that in a Canadian province the higher the average

family income is, the higher the average teacher employment income tends to be, with average farm land price and population density held constant.

This finding confirms the relationship expected. In Canada, education is a provincial responsibility, and how much a province spends on education is to a great extent dependent on how wealthy that province is. Average family income reflects the average income of a province's residents; therefore, it indicates indirectly very well how much that province is able to spend on education. The higher the income of the residents in a province are, the more they contribute in their taxes, and the more revenues the provincial government collects. The more revenues a provincial government collects, the more it can spend on elementary and secondary education. Finally, in a province, nearly 70 percent of educational expenditure is spent on teacher salaries (http://www.edu.gov.on.ca/eng/document/brochure/quickfac/facts97e.html, Manitoba Education and Training, 1996). If a provincial government spends more on elementary and secondary education, it is quite likely that teachers get higher salaries. Due to the relationship between the income of residents and educational expenditure in a province, average family income is able to play the most important role in estimating average teacher salary in a province.

Farm Land Price and Teacher Salary

Similar to average family income, cost of living was also hypothesized to have a positive association with teacher employment income in a province. In this study, cost of living is indicated with two independent variables: average farm land price per acre and

population growth.

In a regional economy, farm land price is the most basic element in calculating cost (Chambers & Fowler, 1995). It was hypothesized that higher farm land price would be positively related to higher average teacher salaries, of which the determination usually takes into account the cost of living in a locality.

Average farm land price per acre is found to have a positive partial correlation coefficient of .33 with average teacher salaries at the inter-provincial level, with average family income and population density kept constant. The bivariate correlation and scatterplot analyses produced similar results. The variation in average farm land price per acre in a province alone is able to explain about 35 percent (R-square = .35) of the variation in average teacher salaries in that province. That is, the higher the average farm land price in a province is, the higher the average teacher salary tends to be, with average family income and population density being equal.

The finding is as expected. The most basic cost of living in a place is the cost of land, and farm land is the original land without any added values, of which the supply is inelastic and which affects all other costs in a local economy. In a certain locality, the higher the farm land price is, the higher the price for everything else tends to be. The price for hiring teachers is no exception. In hiring teachers, school boards have to take cost of living into consideration, which is posited to be related to average farm land price. Consequently, average farm land price per acre in a province is able to contribute significantly to the estimating of average teacher salary in that province.

Population Growth and Teacher Salary

Another cost of living variable, population growth, was also hypothesized to have a positive relationship with average teacher salaries for the reason that as population grows, so does the demand for goods and services, and if the supply remains the same, the prices for goods and services tend to rise. Teaching is a public service, of which the price should be affected by the decrease or increase of the demand in a market. In turn, the demand in a market is influenced by the decrease or increase of the local population. If the population in a locality increases, so does the demand for teachers. If the supply remains the same, there will be a pressure on the price of hiring teachers to increase.

Surprisingly, with average family income and average farm land price kept constant, this study observed a negative partial correlation coefficient of -.16 between population growth and average teacher salaries, contrary to the original hypothesis and contrary to conventional economic theory. However, the high p-value of the partial correlation coefficient, .71, casts a serious doubt on the noted negative relationship between population growth and teacher salaries. The negative partial correlation may be produced by chance when actually there is no relationship between population growth and average teacher salaries. This study is not able to establish an association beyond serious doubt between population growth and average teacher salaries at the inter-provincial level, with family income and farm land price being equal.

Two factors may contribute to there being no significant relationship between population growth and average teacher salaries for the ten provinces. The first factor is that

as population grows, enrollment increases and more new teachers are hired. These new staff are paid entry level salaries, bringing down the average salaries. If there is a tendency for average teacher salaries to rise, this tendency may be more than offset by the impact of many new teachers entering schools. Secondly, when the demand increases due to population growth, the prices for goods and services rise only when the supply remains the same. In reality, the supply of teachers never remains the same and there was a teacher surplus across the nation in 1995. If there was a pressure to drive up the price for the public service of teaching due to the increased enrollment in some provinces, this pressure might have been offset by the teacher surplus situation at that time.

Union Influence and Teacher Salary

Due to inadequate information, no relationship was observed between union influence and average teacher salaries in the ten provinces.

Teacher Supply and Demand and Teacher Salary

The teacher supply and demand situation in a region affects how much teachers are paid (Jacobson, 1996). "Basic economic theory predicts that wages will be rising in those markets characterized by ... excess demand and falling in markets with ... excess supply" (Gunderson & Riddell, 1993, p. 687). It was hypothesized that the higher the supply of and the lower the demand for teachers are, the lower teacher salaries tend to be, other things being equal.

Surprisingly, there was a positive partial correlation coefficient of .83 between provincial teacher surplus and 1995 average teacher salaries, with average family income and average farm land price kept constant. This conclusion is based on seven provinces where relevant data were available or could be approximately calculated from available information. In these seven provinces, the degree of teacher surplus was noted to be positively correlated with average teacher salaries.

Why did the surplus of persons with teaching certificates not produce a downward effect on teacher salaries as conventional economic theory predicts? One probable reason is that rigidity of salary structure in the public sector, especially when employees are unionized, prevents average teacher salaries at the inter-provincial level from responding to market forces in a timely way. It takes time for average teacher salaries to be affected by the ups and downs of supply and demand of the educational labour market. The effect of teacher surplus was probably not felt immediately.

Another explanation could be that few new teachers were hired during 1995 and previous years. While faculties of education kept producing new graduates, enrolments were stable. Stable enrolment meant few new teachers being hired. As the vast majority of working teachers got older, they entered senior salary grids, raising the average salaries. With more new graduates from faculties of education not teaching and more working teachers in senior salary grids, there was a situation of teacher surplus positively correlated with average teacher salaries.

In addition, due to imperfect information and constraints, at any point of time and in any place, there may be a surplus of teachers and relatively high teacher salaries that do not

match labour market expectations. It was not clear whether the teacher surplus situation was known to the boards and teacher unions and had a downward pressure on salaries in their negotiations. Even if boards and teacher unions knew of the surplus, how well they knew and how they reacted to the surplus are questions that need answers. How much influence the forces of marketplace have and how much influence they should have remain highly debatable (Alexander & Salmon, 1995).

Furthermore, the accuracy of teacher supply and demand situation information collected and calculated from the seven provinces is less than ideal. More consistent, more accurate, more detailed and more comprehensive information is needed and further research is warranted in this respect.

Unemployment Rate and Teacher Salary

The general employment market influences school teachers' incomes (Jacobson, 1996). For this reason, it was hypothesized that the higher unemployment rate is, the lower teacher salaries tend to be, other things being equal. However, average provincial unemployment rate was noted to have a positive partial correlation coefficient of .51 with provincial average teacher salaries. If the unemployment rate in a province is high, the average teacher salary in that province also tends to be high, with average family income and average farm land price being kept constant. This appears to be puzzling. Teacher salaries are expected to be affected by the general labour market (Chambers & Fowler, 1995). When the unemployment rate is low, there is a pressure on school boards to provide

relatively high salaries to attract people and to keep personnel. Whereas when the unemployment rate is high, there is a pressure on people seeking a teaching job to accept offers without considering too much about how much they will be paid. Conventional economic theory predicts that salaries will be rising in markets characterized by excess demand and falling in markets with excess supply (Gunderson & Riddell, 1993). "In essence, public sector wage settlements are not immune to market forces such as unemployment" (Gunderson & Hyatt, 1996, p. 267).

Education is part of public sector. As employees in education, theoretically, teachers would be affected by the general labour market. How could average teacher salaries avoid being influenced by the general labour market forces as predicted by economic laws? Or is it because that the impact of the general labour market is not felt immediately and there is a lag? This may be the case. Given the fact that most teacher employment contracts are for two or more years, it may not be possible to observe the relationship, if there is any, between unemployment rate and average teacher salaries on a yearly basis.

In addition, there are other factors that may make the relationship between unemployment rate and average teacher salaries difficult to note and calculate. One factor is that unemployment is only one of the variables that affect how employees are paid. Other variables include productivity growth and expected inflation. The impact of unemployment's downward pressure may be offset by other variables or may be too insignificant to be reflected in average teacher salaries. Another factor is that unemployment rate may affect entry level teacher salaries in a negative way but may not affect average teacher salaries noticeably, since average salaries are influenced by seniority

and added qualifications. Furthermore, since there are few other jobs available teachers stay in place and increase their seniority.

In the education labour market the process of matching salaries and supply situation takes time. Average teacher salaries that do not reflect market forces may exist at any point of time. One explanation is that there is a downward salary rigidity; that is, salaries fall less rapidly in response to excess supply than they rise in response to excess demand (Gunderson & Riddell, 1993). The other probable explanation is that education labour market, to a certain extent, is insulated from competitive pressures.

All these factors contribute to the difficulty of measuring the relationship between unemployment rate and average teacher salaries. To understand the relationship between general labour market and teacher employment incomes and to see whether the education labour market is responsive to economic fluctuations in the short term, more information is required and further research is warranted.

Weather and Teacher Salary

Weather sometimes plays a role when people make decisions as to where to work. It was hypothesized that the warmer the weather is, the lower teacher salaries tend to be, other things being equal. This study was not able to observe any association between the weather of a province with that province's average teacher salaries, with average family income and average farm land price kept constant. The fact that the standard deviation of average annual high temperature is just 1.7°C among the ten Canadian provinces helps to

explain the lack of relationship between weather and average teacher salaries. It is unlikely that people moving among provinces would consider the difference in average temperature at the inter-provincial level.

Ontario

In the province of Ontario, the scenario is different. In Ontario for census divisions there were six independent variables expected to influence how much teachers are to be compensated. These six independent variables were population density, average family income, average farm land price, population growth, unemployment rate, and weather. The following sections discuss the variation in average teacher salaries and the relationship between the dependent variable and each of the six independent variables. As well, the differences between the relationships for the ten provinces and the relationships for the census divisions in Ontario are discussed.

Variation in Teacher Compensation among Census Divisions

There is significant variation in teacher compensation among census divisions in the province of Ontario. In 1995-1996 school year, at the census division level, between the highest paid average teacher salary, $58,515 in Thunder Bay District, and the lowest paid average teacher salary, $50,694 in Northumberland County, there was a difference of $7,821. This was somewhat less than the difference of $10,987 between the highest average

teacher salary of $42,758 and the lowest average teacher salary of $31,771 at the inter-provincial level in 1995, although the sources of data for average salaries differed. Education Relations Commission data were used for Ontario, while Statistics Canada data were used for the ten provinces. The standard deviation of average teacher salaries among census divisions in Ontario was $1,680, compared with $3,248, the standard deviation of average teacher salaries among provinces. There was more variation in average teacher salaries among provinces than among census divisions in Ontario, implying that salaries in Ontario were more homogeneous than were salaries among provinces.

Population Density and Teacher Salary

With the partial correlation procedure, this study was not able to find any association between population density and average teacher salaries ($r = .02$) at the census division level in Ontario, while controlling for family income, land price, population growth, unemployment rate and weather. This is similar to what was observed at the inter-provincial level, where no relationship was noted between population density and average teacher salaries.

Two factors may explain why no relationship was noted between population density and average teacher salaries at the census division level in Ontario. The first factor is that at 3,876 persons per square kilometre, almost 24 times 162 persons/km^2, the mean population density, the population density of Toronto greatly skewed the distribution (see table 4.4 on page 89 and figure 4.3 on page 93). Since Toronto teachers did not receive

exceptionally high salaries, no significant partial correlation could be detected among census divisions in Ontario. The second factor is if there is any impact of population density on average teacher salaries, this impact is probably offset by the provincial government's equalizing funding formula. The Ontario Ministry of Education and Training provides grants to school boards according to their full-time equivalent student enrolment, regardless their local situations. This powerful equalizing effect tends to minimize any local influence on average salaries teachers in a census division receive. It is not clear which factor plays a more important role.

Family Income and Teacher Salary

As at the inter-provincial level, average family income had a positive correlation with average teacher salaries ($r = .16$) at the census division level in Ontario, with the other five independent variables kept constant. The reason for this phenomenon is also similar that average family income is an important factor in estimating how local teachers are paid.

However, the partial correlation between family income and teacher salaries is far weaker at the census division level in Ontario ($r = .16$) than at the inter-provincial level ($r = .72$). Besides, the p-value is higher at the census division level in Ontario ($p = .34$) than at the inter-provincial level ($p = .04$).

For the ten provinces, the variation in family income and farm land price is able to account for 74 percent of the variation in average teacher salaries (R-square = .72), whereas at the census division level in Ontario a multiple linear regression model with only family

income and farm land price is not able to explain the variation in average teacher salaries at all (R-square = .00). At the census division level in Ontario, only when other independent variables are controlled, the positive association between teacher salaries and family income is observed. It is also worth noting that the relevant impact of family income on average teacher salaries is much smaller at the census division level in Ontario (Beta = .23) than for the ten provinces (Beta = .68).

Why does average family income, a very important economic factor in any region according to economic theory, have so little influence on teacher salaries at the census division level in Ontario? Several probable reasons are suggested to account for the discrepancy between provinces in Canada and census divisions in Ontario with respect to family income's impact on average teacher salaries.

First of all, a census division in Ontario may be too small an area to form its own relatively independent economic climate. Some people may earn their living in Toronto Metropolitan Municipality but live in satellite towns around Toronto, which are in different census divisions. For example, an individual may work in Toronto but may live in the census division of Peterborough and have his or her income as part of family income reported in Peterborough. "The labour market, more so than most other markets, is subject to market imperfections and other constraints" (Gunderson & Riddell, 1993, p. 8). There are imperfections and constraints that prevent average teacher salaries from responding to market forces as described by conventional economic theory at the census division level in the province of Ontario. A census division in Ontario being too small an area to form its relatively independent local economic climate is one important constraint.

In addition, a census division is an area designated by Statistics Canada for the purpose of data collection and statistical analysis. Although a census division is often an administrative region all by itself, in the form of a municipality, county or district, the administration in a census division rarely makes and implements policies that can influence the local economy in a significant way. Nor does a census division's administration have its own independent revenue system to form a local environment of collecting revenues and redistributing wealth, as does a provincial government.

Education in Canada is a provincial responsibility, and provincial governments make and implement policies, which have comprehensive effects influencing various aspects of publicly funded education in a province. Since elementary and secondary education is financed "primarily through partnerships between provincial ... and local governments (Bedard & Ryall, 1996, p. 22), the federal government's influence upon education in each province is quite limited. A census division does not have a policy making power similar to that of a province to produce an overwhelming effect on education.

The Ontario government, in providing grants to different school boards, intends to equalize the funding situation for every board in this province. The Ontario Ministry of Education and Training gives funds to school boards according to their full-time equivalent student enrolment, regardless their local economic situations. This powerful equalizing effect tends to minimize any local socio-economic influence on the compensation teachers in a census division receive. Even when school boards in wealthy census divisions collect taxes that are above the provincial average, the extra money may not necessarily go to teacher compensation as defined in salaries. The extra revenues may go to other school

benefits or some educational programs that less wealthy boards can not afford to provide. As a result, much of the socio-economic differences among census divisions in Ontario are not reflected in average teacher salaries.

Furthermore, with Ontario's five provincial teacher federations involved in collective bargainings with school boards, local economic variation tends to be overwhelmed by decisions made by teacher unions at the provincial level (Lawton, Bedard, MacLellan & Li, 1999; Ontario Education Relations Commission, 1997).

Sometimes, idiosyncratic political and legal decisions may also somewhat distort the whole picture. Teachers in York Region Board of Education once received one of the highest compensation in the province because an arbitrator decided that York Region teachers' salaries could not be frozen by the Social Contract implemented by a New Democratic Party government throughout the province of Ontario. Teacher employment incomes grew in York Region due to the decision of that arbitrator while they were fixed elsewhere in the province.

The standard deviation of average family income among census divisions in Ontario is $7,193, which is about four times $1,680, the standard deviation in average teacher salaries among census divisions. Average family income and average teacher salaries at the census division level in Ontario have different levels of variation. For the ten provinces the standard deviation of family income, $5,625, is less than twice as large as the standard deviation of teacher salaries, $3,248. Different levels in variation between family income and teacher salaries at the census division level in Ontario is another reason why only a low partial correlation between average family income and average teacher salaries was

observed for census divisions in Ontario.

Several reasons have been provided to explain why average family income may have had a very weak impact on average teacher salaries at the census division level in Ontario. However, the most significant reason was probably the provincial government's funding formula, which had a powerful equalizing effect on how teachers were paid in Ontario census divisions. The provincial government's funding formula minimized the impact of family income on average teacher salaries, but it did not make the impact disappear.

Farm Land Price and Teacher Salary

As was originally hypothesized, average farm land price per acre is found to have a positive association with average teacher salaries ($r = .13$) at the census division level, with other five independent variables kept constant, the same as observed at the inter-provincial level and for the same explanation.

However, the partial correlation between land price and teacher salaries is far weaker at the census division level in Ontario ($r = .13$) than at the inter-provincial level ($r = .55$). Besides, the p-value is higher at the census division level in Ontario ($p = .41$) than at the inter-provincial level ($p = .15$).

Why does average farm land price, an important economic factor in any region according to economic theory, have so little influence on teacher salaries at the census division level in Ontario? Most of the reasons suggested to account for the discrepancy between provinces and census divisions in Ontario with respect to family income's impact

on teacher salaries can also be applied to explain farm land price's weak impact on teacher salaries at the census division level in Ontario. These explanations include a census division being too small an area to form its independent economic climate, its administration having no revenue system to collect and redistribute wealth, provincial teacher unions' influence, idiosyncratic decisions, and the provincial government's equalizing funding formula.

Population Growth and Teacher Salary

Within Ontario, population growth was observed to have a negative association with average teacher salaries ($r = -.35$) according to the partial correlation procedure, similar to what was noted at the inter-provincial level. However, unlike at the inter-provincial level, population growth at the census division level had the highest partial correlation coefficient, making it the dominant independent variable affecting average teacher salaries. The partial correlation coefficient between population growth and teacher salaries at the inter-provincial level was -.16, whereas it was -.35 at the census division level in Ontario. The p-value for the partial coefficient at the inter-provincial level was .71, whereas it was .03 at the census division level. Population growth has a much stronger impact on average teacher salaries at the census division level in Ontario than at the inter-provincial level.

It was surmised that for Ontario census divisions the negative relationship between population growth and average teacher salaries was due to the hiring of more junior teachers to meet the demand of increasing enrolment. New teachers are paid the entry level salaries,

bringing down the overall average teacher salaries.

Secondly, when the market demand increases due to population growth, the prices for goods and services rise only when the supply remains the same. In reality, there was a teacher surplus across the province of Ontario in 1995. If there was a pressure to drive up the price for the public service of teaching due to the increased enrollment in some census divisions, this pressure might have been offset by the teacher surplus situation in the province at that time.

As well, it is easier for people to move within a province from one census division to another. Therefore if there is a high demand for teachers in one census division, people with teaching certificates in other census divisions can meet the demand by applying for teaching jobs in the high demand census division and prevent the price of hiring teachers there from rising. A move from one province to another is not so easily accomplished.

Unemployment Rate and Teacher Salary

For Ontario census divisions, the unemployment rate was observed to have a positive correlation with average teacher salaries ($r = .25$), as was noted at the inter-provincial level. The reasons why this is so are also the same as at the inter-provincial level. In addition, it is easier for people to move from one census division to another than from one province to another. With a greater mobility of people, regional economic differences play a smaller role, further preventing average teacher salaries from responding to the general labour market at the census division level in Ontario.

Weather and Teacher Salary

As was expected, all three procedures, bivariate correlation, scatterplot and partial correlation analyses, demonstrated that weather has a negative correlation with average teacher salaries ($r = -.16$) at the census division level in Ontario. Annual daily mean temperature is observed to have a negative association with average teacher salaries in Ontario census divisions, unlike what was noted for the ten provinces where average annual high temperature is observed to have no relationship with average teacher salaries. The reason for this negative correlation between weather and average teacher salaries in census divisions may be that northern Ontario school boards have to pay higher salaries to attract people to teach in colder locations. Canada is a northern country and it is reasonable to assume that the vast majority of Ontarians prefer to live in the southern part of the province, with its warmer climate.

In addition to low temperatures, Northern Ontario communities are usually small, isolated communities, and distant from a broad range of urban activities, which makes it difficult to recruit teachers from outside the local communities. Actually, the provincial government did consider factors such as remote location, low population density, small school boards and small schools when it gave supplementary grants to school boards (Lawton, 1996).

The standard deviation of daily mean temperature for census divisions in Ontario is 2°C, compared with 1.7°C, the standard deviation of annual average high temperature for provinces. There are 44 census divisions of which the temperature data were calculated and

there are only ten provinces. There is greater variation in temperature among census divisions in Ontario than among provinces.

Illustrated Summary and Comparison of the Findings

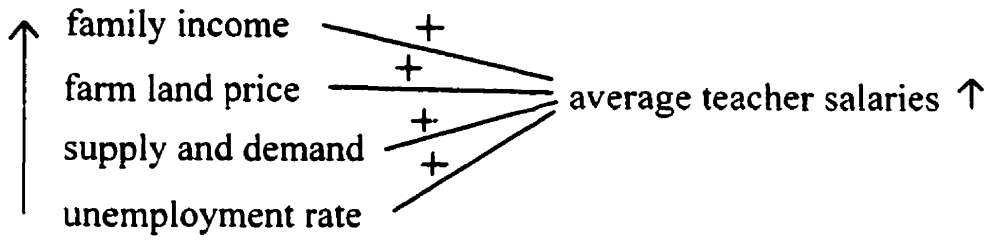
It seems that teacher compensation is very much a provincial matter -- not a national or local matter. Three provinces bargain provincially (Newfoundland, Prince Edward Island, and New Brunswick), four provinces bargain in a two-tiered system (Nova Scotia, Quebec, Saskatchewan and British Columbia) and three provinces bargain locally (Ontario, Manitoba and Alberta, see table 4.11 on page 113). Even in locally bargained provinces, such as Ontario, provincial equalization payments apparently have an overwhelming effect. There are strong forces of standardization within provinces but not among. What this means is that a single model does not fit all levels of analysis.

It was hypothesized that eight independent variables affect the dependent variable inter-provincially. Inter-provincially, the findings of the study confirm two hypotheses, but differ from two others. Still, no relationship can be detected between the dependent variable and four independent variables. The diagram in figure 5.1 depicts the inter-provincial findings.

Figure 5.1

Inter-Provincial Independent Variables Related to Dependent Variable

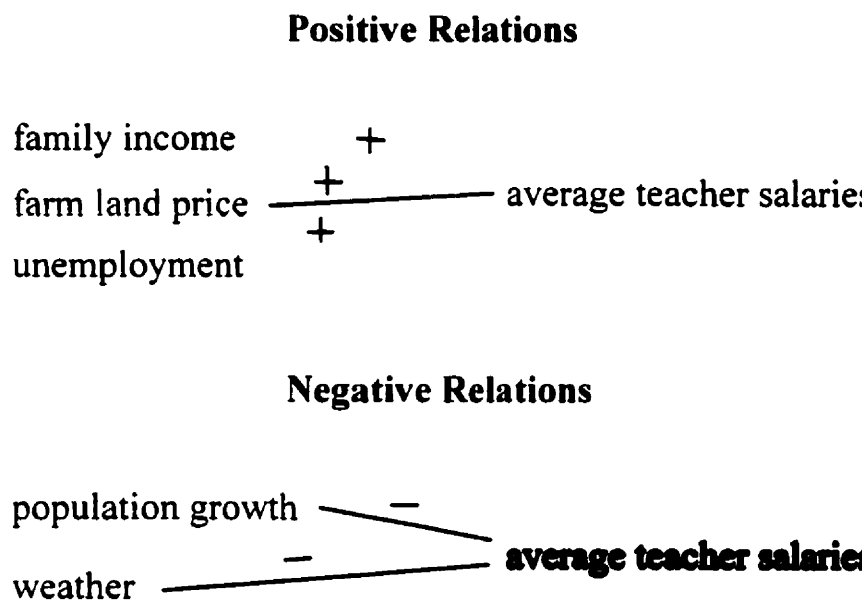
Positive Relations



It was further hypothesized that six independent variables affect the dependent variable intra-provincially. Intra-provincially, the findings confirm three hypotheses, but differ from two others. No relationship can be noted between the dependent variable and one independent variable. While figure 5.1 draws a picture of the observed relationships at the inter-provincial level, figure 5.2 depicts the intra-provincial relationships noted.

Figure 5.2

Intra-Provincial Independent Variables Related to Dependent Variable



While quite different from Chambers and Fowler's (1995) research which was of a much larger scale and with far better financial resources, this study does offer some findings that can be compared with their findings. Table 5.1 compares correlations found in this study with those in Chambers and Fowler's study.

Table 5.1

Findings: Inter-Provincial, Intra-Provincial, Chambers & Fowler

	Inter-Provincial	Intra-Provincial	Chambers & Fowler
Population density	no	no	positive
Family income	positive	positive	positive
Farm land price	positive	positive	positive
Population growth	no	negative	positive
Union Influence	--	--	--
Supply & demand	positive	--	negative
Unemployment rate	positive	positive	negative
Weather	no	negative	negative

While some of the findings in this study are similar to Chambers and Fowler's findings, others differ. One difference is that population density has no relationship with average teacher salaries in the present study. The reason for the difference is that Chambers and Fowler used counties as the unit of analysis, while the present study uses province and census division as the units of analysis. Chambers and Fowler's analysis unit is smaller and more accurate and reflects the impact of population density on average teacher salaries. No data at the similar unit in Canada exists.

Another difference concerns the independent variable of population growth. While

Chambers and Fowler's finding indicates that population growth has a positive correlation with average teacher salaries, this study finds no relationship between the two variables at the inter-provincial level and a surprising negative association at the intra-provincial level. Again, different data may have produced different results. Chambers and Fowler integrated teacher qualifications and experiences data in their analysis, but such data are not available in Canada at the provincial level and census division level in Ontario.

One more difference is that Chambers and Fowler found that unemployment rate was negatively related to average teacher salaries, while this study found, at both the inter-provincial level and intra-provincial level, unemployment rate was positively related to average teacher salaries. Several explanations are provided in the discussion section for why this is so, but with the present data it is difficult to say which factors are more significant than others.

Limitations

As with all research, this study has its limitations. The first limitation is the limitation imposed by the availability of relevant data. It would be ideal to have a set of data for such a study from one source collected at the same time with the same unit of measurement. However, reality is never ideal. I had to gather data from a variety of sources which collected relevant data at different times with different units of measurement. Great efforts were made to minimize the difficulties caused by the integration of data from different sources.

Analysing data at the inter-provincial level has its drawbacks. It is not possible for an analysis at the inter-provincial level to reflect the influence of urban amenities on average teacher salaries, which is an important independent variable in the study by Chambers and Fowler (1995), whose unit of analysis is county. However, with different units of analysis, different sets of independent variables need to be investigated. There is no model that fits all situations.

Also, focussing on teachers' compensation but not their working conditions is a limitation. Working conditions are related to compensation. One important working condition is how many students a teacher teaches in a class or the overall pupil-teacher-ratio. Pupil-teacher-ratio is always considered a key element in negotiations in regards to teacher compensation in that teachers may trade off higher salaries (an extrinsic reward) for a lighter workload and better classroom satisfaction (an intrinsic reward).

As well, this study tested hypotheses with a "snapshot" taken in 1995. A retest might produce different results. It is not clear how stable the variables and their inferred impacts are from year to year. Future research replicating for other years may yield interesting information in this respect.

Another limitation of the study is that average teacher salaries were used. It is not clear which variable reflects the impact of independent variables more accurately, average salaries or entry level salaries. The latter were not readily available for provinces from sources accessible by the author.

A further limitation of the study is that the impact of government policies is extremely difficult to assess. For example, how does one measure the impact of the budget

cuts made by provincial and federal governments and relate these to average teacher salaries in a meaningful way? Due to these limitations, caution should be exercised in interpreting some of the findings in the study.

Implications

While confirming a number of hypotheses, this study still leaves some questions unanswered due to less than ideal data, delimited scope of research, time and fiscal constraints. It is hoped that persons or organizations with better financial resources will do more exhaustive studies to further explore the relationships indicated in this study. Still, the findings in the study has implications for both practitioners and researchers. The following sections present the major implications the study suggests.

Implications for Practice

Less than ideal data is one constraint this study encountered. Specifically, the data on teacher supply and demand information from provinces are not consistent. In some provinces such data do not even exist. Consistent and up to date teacher supply and demand information across the nation has practical implications. To improve on this situation, several groups could consider appropriate actions.

Provincial ministries of education could take up the responsibility of gathering, analysing and providing teacher supply and demand information. More accurate and updated teacher supply and demand information would help faculties of education, which

receive funds from provincial governments, plan their programs, at least in part, according to educational demand. With accurate and updated information concerning teacher supply and demand, provincial governments can help people interested in teaching plan their careers with job opportunities factored in. Better information related to educational labour market is necessary for provincial governments to deal with challenges they face in elementary and secondary education.

The Council of Ministers of Education could take on the task of collecting, analysing and distributing data with regard to the overall situation of teacher supply and demand in every province and territory. The Council has collected some information in this area. However, a data system able to present consistent and up to date teacher supply and demand situation across Canada is needed. With a consistent and up to date information system concerning teacher supply and demand, school boards will have a better picture of the supply pool when they hire new teachers and people interested in teaching will encounter less ups and downs in looking for teaching jobs. Press (1998) has mentioned the further benefits of providing information about aggregate demand for teachers in this country. It will be ideal if general information about teacher supply is also provided.

Canadian Teachers' Federation could produce its teacher supply and demand projection more frequently and with more details. With affiliates in all the provinces and territories, Canadian Teachers' Federation is in a unique position to work on the teacher supply and demand situation in every province and territory, which affects its current and future members, since all teachers in public funded schools are required by law to be members of a teachers' union. The Federation could conduct a study of teacher supply and

demand on a regular basis, in some ways similar to what Press (1998) did but at a much larger scale. In collecting and analysing data related to teacher supply and demand situation, the Federation may also learn from the Teacher Demand and Shortage Survey conducted every three years by the United States National Centre for Education Statistics.

Today, it is still difficult for many young people graduating from a faculty of education to find a teaching job immediately in Canada. One of the important reasons of this difficulty is that there has been a surplus of qualified people available for teaching in Canada. With more information concerning teacher supply and demand in every province, faculties of education could adjust their programs to meet the overall educational demand without having to tell their graduates that they have to be patient and wait for times to change before the most of them can obtain a full-time teaching job. People interested in teaching "need accurate and timely information about labour markets to make informed choices, not only about whether to enter teacher education but also about what choices to make while enrolled, and what paths to take once completed" (Press, 1998, p. 184). Press' findings show that teacher preparation program students are eager to receive labour market information related to their decisions.

A study by McIntyre (1998) for Ontario College of Teachers predicts that shortage could emerge as the fast-growing wave of teacher retirements engulfs boards across Ontario over the next decade. However, his study does not provide the information about how large the present teacher supply pool is. Nor does it give any information concerning how many teaching certificates are issued in Ontario each year. It appears that more detailed teacher supply and demand information could be used by school boards and prospective teachers.

The present study reveals that both inter-provincially and intra-provincially, family income and farm land price are positively reflected in average teacher salaries. In Ontario, family income and farm land price's impact on average teacher salaries is far weaker than it is inter-provincially, but it still exists. In giving equalizing grants, provincial governments intend to provide adequate education to children in different communities regardless their socio-economic status. What is revealed here has practical implications for school finance. Specifically, it relates to the aim of providing equitable funds to schools while taking their relevant community conditions into consideration.

Implications for Research

The findings of this study could serve as a basis for researchers to further explore the issue of teacher compensation. To ensure that the educational system is equitable, efficient and effective, teachers ought to be adequately compensated. In seeking the optimal way of compensating teachers, questions that are not answered by this study could be investigated.

The surprising but also interesting discovery in this study is that there is a positive correlation between unemployment rate and average teacher salaries at both the inter-provincial level and census division level in Ontario. This is contrary to conventional economic theory and contrary to what Chambers and Fowler (1995) found in their study, where counties with lower unemployment rates exhibited higher teacher salaries because with a high demand for labour it was more difficult to hire teachers. Apparently, there was a upward pressure for school boards to raise teacher salaries. Gunderson and Hyatt (1996)

maintain that "public sector wage settlements are not immune to market forces such as unemployment" (p. 267). Why does this not apply to Canadian provinces and to census divisions in Ontario? Some suggested explanations have been presented here, but further research could be conducted to find out if these explanations are supported by empirical evidence. As well, more variables, such as labour market variation, occupational mobility, status of substitute teachers, economic policies, collective agreements and school board hiring practices, may need to be investigated.

Since a model for estimating a province's teacher annual employment income is established and tested, it may be further tested whether the model works well or not by checking the actual data in years after 1995. If a province's annual average family income and average farm land price per acre are known, the model may be used to estimate how much the average teacher salaries will be in that province. Furthermore, the model may be tested to see whether it is of any practical application. For example, according to equation (1), Nova Scotia teachers appear to be overpaid and Prince Edward Island teachers appear to be underpaid (see table 4.21 on page 149). How valid is this interpretation? Is it possible to establish a kind of norm for the provinces?

Similarly, the model for estimating a census division's average teacher salary may also be tested with data in later school years in Ontario and in other provinces. In Ontario the number of school boards was reduced to 72 (http://www.edu.gov.on.ca/eng/general/list /bordlist.html). With fewer and larger school boards, it may be worthwhile to find out if the statistical model is of any practical application. A more exhaustive study could be conducted to find out how truthful the model is in reflecting the independent variables. As

well, research could be undertaken to see whether there are ways to improve the explanatory power of the model.

Future research could utilize entry level teacher salaries instead of average teacher salaries to see if entry level salaries reflect the impact of the independent variables more obviously. Also, future research could use Human Resources Development Canada's 11 economic areas in Ontario as units of analysis in this province to see if different patterns would emerge when adequate data were aggregated to these 11 economic areas (http://www.ont.hrdc-drhc.gc.ca/english/lmi/eaid/ore/lfs/lfsgeo_e.html). Furthermore, are there better ways to treat and operationalize each variable? Variables that are not studied here but may relate to teacher compensation could be added. With adequate data, how predictive a model can be? Especially intra-provincially, where provincial governments' equalizing funding formulas have an overwhelming effect? This study did not take benefits into consideration. Is there a way to factor in benefits when teacher compensation is studied?

Teacher salaries are partly a reflection of economic conditions and partly an indication of the importance attached by citizens to education and teaching (Alexander & Salmon, 1995). It is possible to measure economic conditions, although not always easy, but how do we measure the importance citizens attach to teaching?

Conclusions

This research was devoted to developing a better understanding in factors related to

teacher compensation. It is hoped that researchers and practitioners in educational administration, policy makers in governments, institutions that have a stake in public education, school boards, teachers and their unions, as well as the general public will gain insight from the relationships revealed in this study.

Changing demographics, financial constraints and increasing demand for accountability are challenges that governments, school boards and teachers have to deal with. In meeting these challenges and in ensuring that every child receive adequate education, while taking relevant circumstances into consideration, we need to understand better the factors related to the variation in teacher compensation. With the application of conventional economic theory to the phenomenon of variation in teacher compensation, certain relationships are revealed, particularly the effect of average family income. This study helps to gain a better understanding of the variation in teacher compensation both among provinces and among census divisions within Ontario.

While one always hopes to paint a more holistic picture, understanding the individual independent variables and their relationships with the dependent variable is the first important step. With these related factors, future studies may reveal more relevant factors and further explore the relationships between independent variables and the dependent variable as well as the relationships among independent variables themselves. While with much more work, a more comprehensive depiction is possible, what is revealed in the study contributes to the knowledge in the field of educational administration and serves as a basis for further exploration.

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