

LANGUAGE SKILLS AND WAGE DIFFERENCES  
AMONG WAGE EARNING MALES: CANADA - 1980

by

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### ABSTRACT

The officially bilingual nature of Canada lends importance to the economic returns to language skills, as measured by earned income. This thesis analyses the economic relationship between language skills and wages. A theory of language markets is developed which suggests that premiums will accrue to bilinguals, and that those who speak neither English nor French would benefit by learning either or both of the official languages.

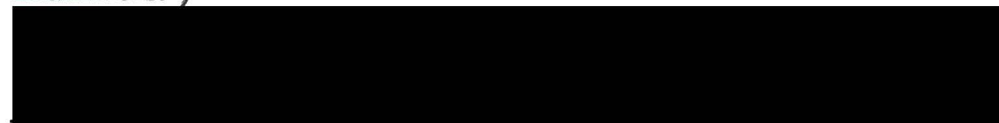
A human capital model is used to estimate the contribution of language and other human capital characteristics to earned wages. The sample data are drawn from Canadian 1981 Census data and include only full-time employed, wage earning males. The model is applied to five geographic areas. Eight language groups are used, with Anglophones as the reference group. The estimates are compared with results from a study by Geoffrey Carliner (1981) using a similar model and data from the 1971 Census. Source of wage difference statistics are calculated and these, too, are compared with the results reported by Carliner (1981).

The comparison model reports that bilingual Anglophones and bilingual Francophones earn a premium over Anglophones. In addition, those who speak neither English nor French earn a premium to learning either or both official languages. The wage discount that Francophones experience with respect to Anglophones has been reduced in the ten year period 1970 to 1980.

The basic comparison model is extended, through the addition of relevant independent variables, to test the robustness of the comparison model. This model is estimated for two areas, English Canada and Quebec. The extended model provides a better goodness-of-fit statistic, indicating that it is a better model with which to analyse the determinants of wages.

Results from the extended model tend to support the findings of the comparison model with respect to the success of Federal language policies. Language premiums and the returns to learning official languages are consistent with the view that Federal language policies have been successful in English Canada. However, in Quebec, the impact of Federal bilingualism policies is harder to find. With respect to Quebec language policies, results from the extended and comparison models may be seen to be pointing to the success of policies promoting the use of the French language in Quebec

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**CHAPTER 1**  
**INTRODUCTION**

**1.1 The Issue**

The question of language and the economic return to language skills, as measured by earned income, is of great interest in a country, such as Canada, in which two languages are recognized in law. Language has been an area of concern, at least since Confederation, especially with respect to power structures and the distribution of wealth and earning potential. The Constitution Act of 1867 recognized the dual linguistic nature of a Federal Canada. French speaking Canadians outside of Quebec, and English speaking Canadians within Quebec have had difficulties with the provision of schooling and government services in their language of choice which may result in inequity of opportunity. The predominant language in Canada and the workplace is English. This fact alone suggests that there may be differences in earnings potential between different language groups in Canada. Economic ownership has also tended to be concentrated in Anglophone hands and this may influence the determination of wages as well.

The issue has received much attention from researchers in Canada. A number of studies have been conducted to determine the extent of earnings disparities among different language groups and various explanations have been put forward. Prominent work in this area has been done by Geoffrey Carliner (1981).

## **1.2 Objectives.**

The purpose of this thesis is to further study the relationship between language skills and wages. The thesis comprises two major elements: first, a comparative analysis, with respect to Carliner's analysis of the 1971 Census data; and second, an extended study which adds several relevant explanatory variables to the model. The results of these studies are based on Public Use Sample Tape (PUST) data derived from the 1981 Canadian Census of Population supplied by Statistics Canada<sup>1</sup>.

### **1.2.1 Comparison Study**

Carliner uses data extracted from the 1971 Public Use Sample Tapes derived from the 1971 Canadian Census of Population to study the market for language skills in Canada. Carliner's sample includes only male, full-time, full-year wage earners to minimize distortions due to variations in labour supply. Five geographical areas are analysed using eight language groups<sup>2</sup>. The geographical areas are Canada, Quebec province, English Canada<sup>3</sup>, the Montreal Census Metropolitan Area (CMA) and the Toronto CMA. The language groups are designed to reflect knowledge of Canada's official languages, French and English, in as broad a manner as is feasible.

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1. The responsibility for the use and interpretation of these data is entirely that of the author.

2. The language groups are: Anglophones, bilingual Anglophones, Francophones, bilingual Francophones, Allophones, bilingual Allophones, English Allophones and French Allophones. Full descriptions of these groups are found in Chapter 1, Section 1.3 and Chapter 2, Section 2.4.1 .

3. English Canada comprises all of Canada outside the province of Quebec.

To study the effects of language on wages Carliner uses a human capital model, with the log of wages per hour as the dependent variable. Independent variables include language, education, experience, population density, nativity of parents, an immigration variable and region of residence. Using multivariate regression techniques Carliner estimates the contribution of each of the explanatory variables to the natural log of wages per hour. This estimation is performed separately for each of the five geographic areas.

Carliner's principle conclusions are that education and language are by far the greatest contributors to differences in wages earned between the various language groups. Additionally, he reports that generally, Anglophones earn a premium over Francophones and that bilingual Anglophones earn a premium over bilingual Francophones.

The comparison study replicates the Carliner study using 1980 data. This allows a comparison of the returns to language skills for the years 1970 and 1980. A model that is as similar to Carliner's as is possible is estimated, with 1980 data, for each of the five geographic areas analysed by Carliner. Sources of wage differences are calculated and all results are compared with those estimated by Carliner using 1970 data.

Analysis of the comparison model contains an additional dimension not found in the original Carliner study. It provides a detailed analysis of the returns to learning a second or third language.

### **1.2.2 The Extended Model**

The literature reveals a number of additional variables shown to have an impact on the determination of wages that are not included in the Carliner model. These variables include ethnicity, family status, occupational and industrial identifiers, as well as sectoral indicators identifying, for example, the distinction between the public and private sectors. Other variables used are extensions of some of the quantitative variables, for example, the interaction between education and experience, and education squared. A full extension of the model, one that introduces all possible additional variables, is beyond the confines of the main focus of the thesis. However, as a partial test of the robustness of the comparison model, the Carliner model is extended to include three of these additional variables: an occupational variable and two enhanced education variables.

This extended model is estimated for two geographical areas, English Canada and Quebec using data from the 1981 PUST. The results are compared with those derived from estimating the basic Carliner comparison model with 1980 data.

### **1.3 Some Notes on Existing Studies**

Premiums to language skills have long been of interest to economists. There have been a number of Canadian studies which analyse the relationship between earnings and language skills. Some of these are discussed below. The discussion is by no means exhaustive but it will cover the most pertinent points.

The discussion is also limited to findings for males. Most of the studies anticipate or corroborate the findings of Carliner's study.

To distinguish the language groups, we define notation that is used throughout the thesis<sup>4</sup>. Anglophones are those workers whose home language<sup>5</sup> is English and who do not speak French. Francophones are those who speak French at home and have no working knowledge of English. Bilingual Francophones are those whose home language is French and who also speak English. Similarly bilingual Anglophones are those who speak English at home and also speak French.

Allophones are those whose home language is neither English nor French and who speak neither official language. English Allophones are Allophones who also speak English. French Allophones are Allophones who also speak French. Bilingual Allophones speak neither English nor French at home but have a working knowledge of both official languages.

Anglophones earn a premium over Francophones in all the studies reviewed. Morley Gunderson (1979b, 1979c) using 1970 data finds this to be the case for Canada, as did Carliner. Studies on Quebec report the same result. Daniel M. Shapiro and Morton Stelcner (1981, 1982a, 1982b) find that in Quebec in 1970 Francophone workers earned less, *ceteris paribus*, than

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4. This specific notation is not necessarily used by the authors reviewed but does describe essentially the same cohorts.

5. Home language refers to the language spoken most often by the respondent in the home. It is assumed that this is the language that the respondent is most conversant in.

Anglophone workers. Francois Vaillancourt (1980) reports similar findings, also from 1970 data for Quebec. Jac-André Boulet (1980) finds that the same holds for Montreal in 1970. Studies using 1980 data from Quebec continue to report a premium to Anglophones over Francophones, as in Shapiro and Stelcner (1987a, 1987b) and Gilles Grenier (1987).

Findings on the returns to bilingualism are generally mixed. In most instances it is found that there is no statistically significant premium to being bilingual over knowing English only. This finding is reported by Carliner and Gunderson (1979b, 1979c). Shapiro and Stelcner (1981, 1982a, 1982b) also find that, in Quebec, there is no premium to Anglophones learning French. The same is reported by Vaillancourt (1980) and, for Montreal, by Boulet (1980). The findings reported using 1980 data show the same results. Shapiro and Stelcner (1987a, 1987b) find that Anglophones earn no statistically significant premium for learning French. The only dissenting view is presented by Gilles Grenier (1987) who finds that in Quebec in 1980 Anglophones earned a significant return to learning French.

The returns to Francophones learning English are nearly always positive and significant. Carliner reports positive significant returns to Francophones learning English in all areas. Shapiro and Stelcner (1981, 1982a, 1982b) and Vaillancourt report similar results for Quebec in 1970, while Boulet reports the same for Montreal in 1970. Gunderson (1979b, 1979c) also reports a positive premium to Francophones learning English in Canada in 1970. Using 1980 data, Shapiro and Stelcner (1987b, 1987c) report that these results still hold for

Quebec, as does Grenier (1987). All the studies cited above report bilingual Anglophones earning a premium over bilingual Francophones.

Those studies which look at Allophones find that they earn a premium for learning either or both official languages as in Shapiro and Stelcner (1981, 1982a, 1982b), Boulet (1980) and Carliner (1981). These studies also showed that Allophones earned a higher return from learning English than from learning French. The same findings are reported by Shapiro and Stelcner (1987a, 1987b) and Grenier (1987) for studies using 1981 data.

#### **1.4 The Theoretical Framework**

The distribution of language in Canada is such that there tend to be pockets of minority official language groups in most regions and very few instances where the distribution of official home language is equally spread between English and French. However, English is dominant in most areas of Canada and is the dominant language of the federal government, commerce and trading partners for all parts of Canada. Drawing on Albert Breton and Peter Miezowski (1977), Vaillancourt (1980) and Carliner (1981), the following is a simple theory of the economics of language markets.

Consider a labour market in an economy with two languages, X and Y. There are three types of jobs, those requiring language X, those requiring language Y and those requiring knowledge of both languages. We assume there are  $Y_n$  number of Y workers and  $X_n$  number of X workers. By Y workers we

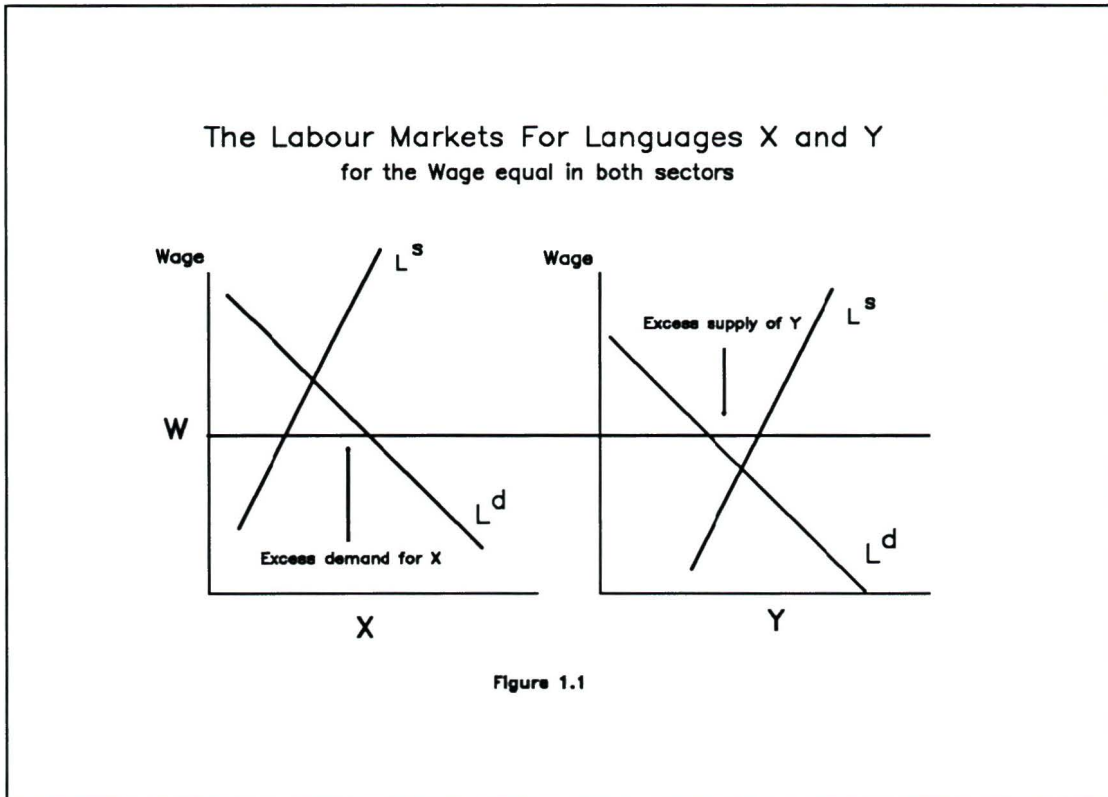
mean those workers whose home language is Y. X workers are those whose home language is X

Workers prefer to work in their own home language. They may however decide to invest in learning the other language for one or both of direct and indirect benefits in consumption and in production. The benefits in consumption are realized through the broader array of goods and services now available in the learned language. The benefit in production is realized through a wage premium as a result of knowledge of the other language. Not everyone has the same ability to learn a second, or third, language and there are costs involved with doing so. For these reasons the supply schedule for bilingual workers will be upward sloping.

We assume, also, that bilingual workers are more proficient in their home language than in the learned language. These workers are indifferent between bilingual jobs and jobs in their learned language.

The demand for workers with any particular set of language skills is dependent on the language of the markets for the final product, the language of the technology of the production process and the language of the owners and the executives of the firm. Suppose the language of government, commerce and tourists from outside the local labour market is generally X, the demand for X workers exceeds  $X_n$  when there is no premium for learning X. When the wage for Y jobs is the same as for X and bilingual jobs the demand for Y workers is less than  $Y_n$  (See Figure 1.1). Wages are determined by the interaction of the

supply and demand for workers with particular language skills within the labour market.



A number of inferences may be made with respect to the workings of the labour market outlined above. Since the demand for X workers exceeds  $X_n$ , the wage for jobs requiring X must carry a premium to induce Y workers to take X jobs. Since workers prefer to work in their home language, bilingual jobs must carry a premium to induce workers to take them to ensure market clearing.

The model may be extended to include  $Z_n$  workers whose home language is neither X nor Y. For these workers there is a clear advantage to learning X and/or Y. We further expect there to be an advantage to learning X over Y.

Since there is a cost associated with learning both languages we can assume that there must be a premium to induce Z workers to learn both X and Y.

#### **1.4.1 The Language Market in Canada**

Canada has two distinct language areas with French being dominant in Quebec and English in Canada excluding Quebec, hereafter referred to as English Canada. In English Canada with the bulk of economic power in the hands of Anglophones and relatively few Francophones there is a comparatively small demand for workers speaking French only. Federal government policy<sup>6</sup> to provide services in both official languages under certain circumstances and trade with Quebec will produce some demand for bilingual workers. Thus in English Canada we would expect the highest wage premium, *ceteris paribus*, to be paid to bilingual workers. It is difficult to establish *a priori* an order between the three bilingual groups except to suggest that since bilingual Allophones speak neither official language at home their proficiency in the official languages might be lower than the other two groups. This indicates that bilingual Allophones might receive a lower premium. The next highest premiums are expected to accrue, in descending order, to Anglophones, English Allophones, Francophones, French Allophones and finally Allophones. The predominance of English in Canada as a whole suggests that the hierarchy of language premiums in Canada will be the same as that for English Canada.

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6. The Official Languages Act of 1969 provides that both the English and French languages enjoy equality of status and are the official languages of the Federal government, its administration and services. In accordance with the act, programs are funded to promote bilingualism in public institutions as well as in the private sector.

In Quebec the relative concentration<sup>7</sup> of economic wealth in Anglophone hands along with significant trade with English Canada and the United States suggest that despite a majority of Francophones in the province the language hierarchy is expected to be much the same as for Canada and English Canada. Quebec language policies<sup>8</sup> have encouraged the use of French only in that province, and this along with the perceived discrimination toward the Quebec English community resulted in a substantial exodus of English workers in the late 1970's. There is, therefore, likely to be a higher premium to knowing English in those areas where English workers are still in demand since the reduced supply of English speaking workers results in an excess demand for workers with a knowledge of English. Market clearing will only result from higher wages. The single exception to the expected pattern of language premiums described for English Canada and Canada as a whole is that French Allophones are expected to earn a higher premium than English Allophones in Quebec. This arises because Allophones speaking English might not be

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7. Even though there has been some erosion in the Anglophone wealth position, 1970 to 1980, the analysis here assumes that this erosion is importantly a consequence of Quebec government language policies and therefore does not pursue analysis of this factor as a separate causal influence.

8. During the 1960's and 1970's, three Bills were passed in the Quebec legislature that promote the use of the French language.

Bill 63 - An Act to Promote the French Language in Quebec - was passed in 1969. It provides for measures to ensure that (i) Anglophone school students gain a working knowledge of French, (ii) immigrants to Quebec and their children gain a working knowledge of French and (iii) the Quebec government administration prepare programs to see to it that French is the working language in the province.

Bill 22 - the Official Language Act - passed in 1974 proclaims French the official language of Quebec and provides guidelines to promote French as the language of commerce, the workplace and government administration. Services in English are available under certain circumstances and school instruction may be carried out in either English or French. All students, however, are required to acquire a working knowledge of French. The passage of Bill 22 repeals Bill 63.

Bill 101 - the Charter of the French Language - passed in 1977 requires that French be made the language of work by all businesses in Quebec. All instruction and services are to be provided in French, whether by the public or private sector. English language instruction remains available to qualified students under certain circumstances.

proficient enough in the language to earn the premium while French Allophones have a better chance of becoming proficient in their adoptive language.

There is no reason, *a priori*, to expect that the language market in the CMA's of Toronto and Montreal are any different from the markets of the regions in which they are located.

The premium to language is thus very dependent on the nature of the market. What is clear is that Anglophones are expected to earn a premium over Francophones. Workers learning a second official language are expected to earn a premium over knowing only their home language, that is, bilingualism is expected to be rewarded for both Anglophones and Francophones. However, no clear statement can be made with respect to the relative premiums for Anglophone and Francophone bilinguals. In addition, it is expected that Allophones be rewarded for learning either or both official languages.

### **1.5 Summary**

The role of language in determining earned wages is of great importance in an officially bilingual country such as Canada. This thesis studies the contribution of language and other human capital variables to the earnings of Canadian male workers. This is done through estimating Carliner's model using 1981 data and then extending the basic Carliner model to better analyse the effect of language on wages.

A review of the existing literature dealing with the question of language skills and earnings in Canada reveals three main findings. The first is that Anglophones, in general, earn more *ceteris paribus* than Francophones. Second, bilingualism carries a premium for Francophones but not for Anglophones<sup>9</sup>. Third, Allophones earn a premium for learning either or both French and English.

### **1.6 Preview**

The rest of the thesis is organized as follows. Chapter 2 introduces the comparison model with a description of the variables and the data. Included is a section on descriptive changes between 1970 and 1980. Chapter 3 describes the methodology used in the estimation of the comparison model using 1980 data and reports the results. The fourth chapter describes the derivation of the source of wage differences statistic and compares the results obtained from the 1980 estimation with those reported by Carliner for 1970. In addition, Chapter 4 presents an analysis of the premiums to acquiring language skills, and a comparison of these premiums between 1970 and 1980.

An extended model, which includes some additional explanatory variables, is introduced in Chapter 5 to test the robustness of the results from the comparison model. In addition, the regression results, sources of wage difference and language premiums estimated from the extended model are reported and analysed in Chapter 5. Chapter 6 reviews the main conclusions.

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9. Grenier (1987) reports the only dissenting results.

**CHAPTER 2**  
**THE BASIC MODEL AND DESCRIPTIVE STATISTICS**

**2.1 Background**

Carliner (1981) uses 1971 Census Public Use Sample Tapes (PUST) to analyse the effects of language skills and other human capital characteristics on wages earned. The effects of language skills are directly obtained from the estimated coefficients of the language dummies used in his equations. The contribution of other characteristics is measured by the sources of wage difference statistic.

The Carliner paper is used as a starting point since it specifically looks at wage differences between language groups within regions and analyses the contribution of other human capital variables to wage differences. The methodology used by Carliner, and simple extensions thereof, allow for a thorough analysis of the determinants of wage differences.

The human capital model used by Carliner does, however, have some comparatively minor shortcomings. For example, no distinction is made between various levels of earnings. Boulet (1980), in a study on language and earnings in Montreal found that language differentials were more pronounced in higher earnings brackets pointing to possible heteroskedasticity. Carliner does not test for the presence of heteroskedasticity in the data.

## **2.2 Comparison Model**

Using the same methodology as Carliner and data from the 1981 Census Public Use Sample Tapes (PUST) this thesis analyses earnings differences between language groups in order to test the hypothesis that language is not a source of earnings difference. This should provide a direct comparison to Carliner's study and thus give an indication of the changes that have occurred in the ten year period 1970 - 1980. A change may be expected since there have been significant demographic changes in the composition of the Canadian population. Also, Federal and some Provincial language policies might be expected to have affected the size of the wage difference between language groups; for example, the provision of Federal services in either official language and Bill 101 in Quebec<sup>10</sup>.

Following Carliner, the sample for the regression analysis includes males between the ages of 18 and 64 inclusive, who worked more than 34 hours per week for more than 26 weeks per year and who were neither self employed nor full time students.

While the two data samples, 1970 and 1980, are similar, there are some unavoidable differences. The exact variable that Carliner used to control for population density (size) is not available, nor is the variable describing the

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10. See footnotes 6 and 8.

nativity of the individuals parents<sup>11</sup>. In addition, the variables that Carliner used to calculate the hourly wage are not available.

The general form of the estimating equation is as follows:

$$\begin{aligned} \ln(\text{WAGES}/\text{HOUR}) = & \alpha_0 + \sum \alpha_i \text{LANGUAGE}_i + \alpha_j \text{EDUC} + \alpha_k \text{EXP} \\ & + \alpha_h \text{EXPSQ} + \sum \alpha_m \text{IMM}_m + \alpha_n \text{SIZE} + \sum \alpha_p \text{REGION}_p \end{aligned} \quad (1)$$

The content of this equation is explained in Sections 2.3 and 2.4 following.

### **2.3 The Dependent Variable**

The dependent variable,  $\ln(\text{WAGES}/\text{HOUR})$ , is calculated by dividing the annual wages and salaries earned in 1980 by the number of weeks worked in 1980<sup>12</sup>. This quotient is then divided by the number of hours worked in the reference week. While not identical, this measure is comparable with Carliner's whose dependent variable is based upon "usual hours worked", a data series that is not available in the 1980 data set. The number of hours worked in the reference week is less general than usual hours worked. Kuch and Haesel (1979) suggest that the usual hours worked response is in fact a measure of the usual hours worked in the current year<sup>13</sup>. In this respect the variable used is comparable with the 1970 data since both measures of activity refer to the year

11. See the table of wage regression results in Carliner (1981), pp 392 - 393.

12. Statistics Canada suggests that many respondents excluded paid vacation and sick leave from the reported number of weeks worked. Consequently those reporting 49 to 52 weeks worked were assigned 52 weeks worked.

13. Although the Census is undertaken in 1981 most of the earnings data refer to the previous year.

following the year in which earnings are measured. However, in other ways the measure used in this study is more accurate than that used by Carliner. The 1971 data has only ranges for the number of weeks worked. The 1981 data reports continuous values for this variable. The wages per hour form of the variable is chosen to control for labour supply variances, and this is further enhanced by limiting the sample to full-time, full-year workers<sup>14</sup>. The natural log (ln) of wages per hour is the usual form of the human capital wage equation<sup>15</sup>. This form also allows for the estimated coefficients to provide a measure of the percentage change in wages as a result of a unit change in independent characteristic.

## **2.4 The independent variables**

The independent variables used in the estimation are: language, education, experience, experience squared, immigration, size and region. They are described in detail in Sections 2.4.1 - 2.4.7 following.

### **2.4.1 Language**

This refers to both the language spoken at home and official language proficiency. Language spoken at home is divided into three categories; French, English and Other. Official language proficiency is divided into four categories; English only, French only, bilingual and no official language. The Census data do not permit the measurement of qualitative differences in official language

14. See the description of the sample above.

15. Vaillancourt (1980, p.62) provides an excellent argument for the use of the log linear form.

proficiency. In the condition column below, the first term (language) describes home language and the second term describes any (other) official language proficiency. A value of 1 is assigned if the condition is satisfied, 0 otherwise. The language categories are the same as in Carliner (1981, p.392).

<u>Condition</u>	<u>Variable Name</u>	<u>Sign</u> <sup>16</sup>	<u>Description</u>
English, none	ENGMONO (the reference group)		Anglophone
English, French	ENGBIL	(+)	Bilingual Anglophone
French, English	FREBIL	(?)	Bilingual French
Other, bilingual	ALLOBIL	(?)	Bilingual Allophone
French, none	FREMONO	(-)	Francophone
Other, French	ALLOFRE	(-)	French Allophone
Other, none	ALLONON	(-)	Allophone
Other, English	ALLOENG	(-)	English Allophone

### **2.4.2 Education**

EDUC measures the total years of formal education attained, whether elementary, secondary or post secondary, including both university and non-university education. The value used is the sum of the separate questions on the 1981 Census long form 2B. Some additional calculations are necessary. Since values reported in the PUST are not all continuous, they have to be recoded to specific values. As a result, years of elementary schooling below 5 are assigned a

16. Sign refers to the expected sign of the estimated coefficient and is based on the theoretical framework presented in Chapter 1, section 1.4. A "?" indicates that no a priori signing is feasible.

value of 2.5 years, the midpoint of the range. The single code for 5 - 8 years of schooling is recoded to 6.5 years, the midpoint of that range. The years of schooling following, from grade nine through grade thirteen are assigned their actual values.

Years of university schooling are assigned the value of 0 for less than 1 year and their actual value elsewhere. The one exception is the last category which is coded in the PUST as 6 years or more. This is given a value of six years if the individual has not reported a highest degree of an earned doctorate, and a value of 9 if an earned doctorate has been reported. For non-university education the values are assigned as coded with two exceptions. For less than 1 year a value of 0 is assigned if the individual has not reported a non-university certificate or diploma. A value of 1 is assigned if a certificate or diploma has been reported. The last category in this field is coded as 4 years or more in the PUST and this is assigned a value of 4 years. It is assumed that more education, *ceteris paribus*, results in a higher earned wage. The sign on this variable is therefore expected to be positive.

### **2.4.3 Experience**

EXP refers to the number of years of potential working experience and is calculated as  $EXP = (AGE - EDUC - 6)$ , where AGE is the respondent's age at the time of the Census and EDUC is as defined above. The variable is limited to non-negative values. We assume that wages increase with increases in experience. Thus, the estimated coefficient is expected to have a positive sign.

#### **2.4.4 Experience Squared**

EXPSQ refers to the square of the experience variable (EXP) and is included to allow for a non-linear relationship between experience and earnings. The expected sign on the estimated coefficient is negative, since we assume that the returns to experience increase at a decreasing rate over time.

#### **2.4.5 Immigration**

The IMM variable refers to the year in which the individual first immigrated to Canada. The IMM categories have been devised to maintain, as closely as possible, the period between year of first immigration and the Census year as used by Carliner<sup>17</sup>. A value of 1 is assigned if the condition is met, 0 otherwise. Assuming country specific human capital characteristics, it can be argued that more recent immigrants will, *ceteris paribus*, tend to earn lower wages. Thus the sign on the estimated coefficient for all the immigration variables is expected to be negative. It is also expected that more recent immigrants will have estimated coefficients larger, in absolute value, than immigrants who have resided in Canada for longer periods of time.

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17. Carliner uses the periods 1970-1971, 1960-1969, 1946-1959 and pre-1946. In the 1981 PUST 1970 is included as part of a cohort including 1967-1970, hence the slight differences.

<u>Condition</u>	<u>Variable Name</u>	<u>Sign</u>
Canadian born	IMM0 (The reference group)	
1980 - 1981	IMM1	( - )
1971 - 1979	IMM2	( - )
1956 - 1970	IMM3	( - )
Pre 1956	IMM4	( - )

#### **2.4.6 Size**

The SIZE variable refers to the population concentration of the area in which the individual usually resides. A value of 1 is assigned if the individual resides in an area with a population of 250,000 or more, 0 otherwise. Carliner used more detailed size descriptions but these are not available in the 1981 PUST. *A priori*, the sign on the variable is expected to be positive.

#### **2.4.7 Region**

The REGION variable identifies the region of residence at the time of the 1981 Census. Historically, there is a well established regional average wage hierarchy with British Columbia (B.C.) leading, wages falling as one moves east across the Prairies<sup>18</sup>, rising in Ontario<sup>19</sup>, and falling again as one continues toward the Maritimes.

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18. We recognize that the Prairies are a mixed case, with higher wages in Alberta and lower wages in Saskatchewan and Manitoba, relative to Ontario. However, the number of employed in Alberta is roughly equal to the number of employed in the other two provinces combined. An analysis of historical wages, weighted for relative employment levels, reveals the Prairies to have a higher wage than Ontario.

19. The Ontario wage is, historically, lower than the wage in B.C.

<u>Condition</u>	<u>Variable Name</u>	<u>Sign</u>
Ontario	ONT (Reference group)	
British Columbia	BC	(+)
Alberta, Saskatchewan, Manitoba	PRAIRIES	(+)
Quebec	QUEBEC	(-)
New Brunswick, Nova Scotia, Newfoundland	MARITIME	(-)

Prince Edward Island (P.E.I.) is not included in the Maritimes as there is no unique identification of the province in the PUST. Responses for P.E.I., the Yukon and the North West Territories are reported together. None of these regions are included in the sample. The SIZE and REGION dummies are used in the regression analysis where appropriate.

## **2.5 The Data**

The data used are from the 1981 Public Use Sample Tapes (PUST) distributed by Statistics Canada. The PUST is a 1/10<sup>20</sup> sample of the individual responses to the 1981 Census Long Form 2B, providing a 2% sample of the Canadian population. The sample used in the study is a subsample of the PUST defined by males aged 18 to 64 inclusive who worked 35 or more hours a week and at least 27 weeks in the year (1980), who were not attending school full time, who earned positive wages and salaries and did not earn positive or negative income from self employment. The analysis employs this data set for each of

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20. The PUST is a 1/10 sample of the 1/5 sample data collected in the 1981 Census.

five geographic areas: Canada, English Canada, Quebec and the CMA's of Toronto and Montreal.

## **2.6 Descriptive Statistics**

Table 2.1 presents the means of variables used in the regression analysis for each language group in each of the five areas. As well, variable means are provided across all language groups for each area. In the discussion that follows, all references are to the data subset described above for 1980 from the PUST.

The highest mean wage per hour for all language groups combined, \$9.94 is found in Toronto, followed by Montreal, English Canada and Canada. The province of Quebec has the lowest mean wage per hour of \$9.38. For education, the highest mean of 12.4 years is found in Toronto, followed by English Canada, Canada, Montreal and Quebec province with a mean of 11.4 years. Mean experience is highest in Montreal, 20.4 years, followed by Quebec, Toronto, Canada and English Canada with a mean of 19.4 years.

Toronto has the highest proportion of immigrants, with only 53% of the Toronto CMA population being Canadian born. English Canada has the next highest immigrant population followed by Canada and the Montreal CMA. Quebec has the lowest immigrant population with 89% being Canadian born.

**TABLE 2.1: VARIABLE MEANS BY LANGUAGE GROUP  
AND BY AREA - 1980**

	<u>ENGMONO</u>	<u>ENGBIL</u>	<u>FREBIL</u>	<u>ALLOBIL</u>	<u>FREMONO</u>	<u>ALLOFRE</u>	<u>ALLNONN</u>	<u>ALLOENG</u>	<u>TOTAL</u> *
CANADA									
Wage	9.73	10.77	10.12	8.39	8.34	7.21	6.97	8.77	9.61
Age	37.40	37.74	37.81	39.47	36.21	42.68	44.47	41.06	37.61
Educ	12.24	13.40	12.36	11.59	10.33	7.92	6.70	10.84	11.93
Exp.	19.16	18.35	19.44	21.81	19.84	28.39	31.24	24.11	19.59
ExpSq.	534.22	487.52	537.33	664.62	577.05	974.27	1128.86	761.35	560.81
Imm0	0.808	0.804	0.948	0.104	0.976	0.039	0.026	0.082	0.791
Imm1	0.002	0.002	0.000	0.006	0.000	0.000	0.045	0.010	0.002
Imm2	0.040	0.033	0.013	0.221	0.008	0.317	0.427	0.300	0.052
Imm3	0.085	0.092	0.027	0.499	0.011	0.523	0.443	0.422	0.096
Imm4	0.065	0.069	0.012	0.170	0.005	0.121	0.059	0.186	0.060
Size0	0.477	0.343	0.367	0.067	0.585	0.085	0.107	0.174	0.443
Size1	0.523	0.657	0.633	0.933	0.415	0.915	0.893	0.826	0.557
B.C.	0.163	0.086	0.005	0.032	0.000	0.005	0.091	0.139	0.117
Prairie	0.235	0.124	0.023	0.039	0.001	0.005	0.100	0.157	0.168
Quebec	0.018	0.293	0.820	0.707	0.981	0.965	0.141	0.060	0.253
Marit.	0.097	0.063	0.047	0.007	0.010	0.000	0.007	0.006	0.072
Ont.	0.487	0.434	0.105	0.215	0.008	0.025	0.661	0.638	0.390
ENGLISH CANADA									
						----- COMB2** -----			
Wage	9.72	10.83	9.16	9.18	7.47		7.11	8.85	9.69
Age	37.31	37.23	36.98	39.96	38.46		44.38	41.04	37.61
Educ	12.24	13.67	11.39	13.15	8.74		6.67	10.87	12.11
Exp	19.08	17.56	19.55	20.77	23.57		31.17	24.05	19.42
ExpSq.	530.51	450.01	556.88	600.73	771.24		1121.00	758.46	545.98
Imm0	0.811	0.816	0.947	0.086	0.922		0.016	0.077	0.758
Imm1	0.002	0.003	0.001	0.010	0.000		0.050	0.011	0.003
Imm2	0.039	0.033	0.016	0.276	0.039		0.444	0.305	0.060
Imm3	0.084	0.087	0.027	0.476	0.033		0.429	0.419	0.109
Imm4	0.064	0.061	0.009	0.152	0.006		0.061	0.188	0.071
Size0	0.484	0.419	0.657	0.181	0.822		0.111	0.189	0.461
Size1	0.516	0.581	0.343	0.819	0.178		0.889	0.811	0.539
B.C.	0.166	0.121	0.029	0.110	0.017		0.106	0.148	0.157
Prairie.	0.239	0.175	0.127	0.133	0.033		0.116	0.167	0.225
Marit.	0.099	0.089	0.262	0.024	0.511		0.008	0.007	0.097
Ont.	0.496	0.615	0.582	0.733	0.439		0.770	0.678	0.522

**TABLE 2.1 (cont.): VARIABLE MEANS BY LANGUAGE GROUP  
AND BY AREA - 1980**

	<u>ENGMONO</u>	<u>ENGBIL</u>	<u>FREBIL</u>	<u>ALLOBIL</u>	<u>FREMONO</u>	<u>ALLOFRE</u>	<u>ALLNONN</u>	<u>ALLOENG</u>	<u>TOTAL</u> *
QUEBEC									
Wage	10.54	10.63	10.33	8.06	8.36	7.16	6.07	7.57	9.38
Age	41.92	38.99	37.99	39.27	36.18	42.65	45.00	41.44	37.61
Educ	12.41	12.75	12.57	10.95	10.36	7.88	6.85	10.33	11.40
Exp.	23.49	20.23	19.42	22.24	19.77	28.40	31.65	25.00	20.09
ExpSq.	734.02	577.97	533.03	691.14	573.46	974.73	1176.77	806.56	576.90
Imm0	0.596	0.777	0.948	0.112	0.976	0.042	0.081	0.130	0.888
Imm1	0.009	0.001	0.000	0.004	0.000	0.000	0.016	0.007	0.001
Imm2	0.109	0.033	0.012	0.198	0.008	0.307	0.323	0.237	0.028
Imm3	0.181	0.102	0.027	0.508	0.011	0.526	0.532	0.470	0.057
Imm4	0.105	0.087	0.013	0.178	0.005	0.125	0.048	0.156	0.027
Size0	0.116	0.158	0.304	0.020	0.580	0.089	0.081	0.052	0.390
Size1	0.884	0.842	0.696	0.980	0.420	0.911	0.919	0.948	0.610
TORONTO									
						----- <u>COMB1</u> *** -----			
Wage	10.12	11.99	11.43	8.92		7.25		8.58	9.94
Age	38.17	37.87	37.46	40.09		45.47		40.99	38.75
Educ	12.83	14.82	13.56	13.31		6.18		10.68	12.44
Exp.	19.34	17.08	17.89	20.77		37.72		24.18	20.22
ExpSq.	542.96	426.08	432.67	587.88		1203.03		760.07	581.82
Imm0	0.642	0.690	0.646	0.070		0.005		0.033	0.532
Imm1	0.004	0.006	0.000	0.000		0.029		0.006	0.005
Imm2	0.092	0.067	0.098	0.313		0.414		0.286	0.129
Imm3	0.165	0.137	0.232	0.465		0.485		0.492	0.224
Imm4	0.097	0.100	0.024	0.152		0.067		0.183	0.110
MONTREAL									
Wage	10.88	10.88	10.39	8.02	8.47	7.01	5.66	7.62	9.74
Age	42.03	38.79	38.14	39.22	35.93	43.00	46.82	41.43	38.27
Educ	12.65	12.96	12.50	10.83	10.26	7.67	6.22	10.50	11.67
Exp.	23.38	19.82	19.65	22.29	19.61	28.93	34.06	24.83	20.44
ExpSq.	729.05	564.60	544.83	694.53	567.19	1001.42	1293.76	792.37	592.62
Imm0	0.551	0.736	0.927	0.113	0.944	0.011	0.000	0.095	0.796
Imm1	0.010	0.001	0.000	0.004	0.000	0.000	0.018	0.008	0.002
Imm2	0.124	0.039	0.020	0.200	0.021	0.309	0.327	0.246	0.052
Imm3	0.204	0.125	0.038	0.509	0.026	0.560	0.600	0.488	0.105
Imm4	0.111	0.099	0.015	0.174	0.009	0.120	0.055	0.163	0.046

Notes:

\* Total refers to all language groups combined.

\*\* COMB2 represents the combined group of Francophones and French Allophones.

\*\*\* COMB1 refers to the combined group of Francophones, French Allophones and Allophones.

Within areas and between language groups, bilingual Anglophones consistently have the highest mean wage per hour, except in Montreal where Anglophones and bilingual Anglophones have the same (highest) wage. The highest mean wage of \$11.99 per hour is earned by bilingual Anglophones in Toronto. The lowest mean wage per hour, \$5.66, is earned by Allophones in the Montreal CMA. Education follows the same pattern, with bilingual Anglophone workers having the highest mean years of education. The highest mean years of completed education is 14.8 years, again in the bilingual Anglophone group in the Toronto CMA. The lowest number of completed years of education, 6.2 years, is shared by the combined group (COMB1 in Table 2.1) of Francophones, Allophones and French Allophones in Toronto, and Allophones in Montreal.

In Canada, bilingual Francophone workers earn the second highest wage per hour, more than any monolingual group. The next highest earners are Anglophones, followed by English Allophones, bilingual Allophones, Francophones, French Allophones and finally Allophones. In English Canada Anglophone workers earn the second highest wage per hour, more than bilingual Francophone and bilingual Allophone workers. Bilingual Francophones earn more than bilingual Allophones, followed by English Allophone workers who earn more than the combined category of Francophone and French Allophone, who earn more than Allophones.

In Quebec Anglophones earn more, on average, than bilingual Francophones. Francophones have the fourth highest wage, followed by bilingual Allophones, English Allophones, French Allophones and Allophones.

In Montreal bilingual Francophones, the third highest wage earners, earn more than Francophones followed by bilingual Allophones, English Allophones, French Allophones, and Allophones. In the Toronto CMA, bilingual Francophones earn more than Anglophones, followed by bilingual Allophones, English Allophones, and the combined group of Francophones, French Allophones and Allophones.

### **2.7 Descriptive changes 1970 to 1980 - Education and Wages**

Evidence of structural change between 1970 and 1980 is presented in Table 2.2. Specifically, education and hourly wage rates are analysed. These are the only two variables that can be compared using information from Carliner (1981).

Table 2.2 shows the percentage<sup>21</sup> difference in wages earned and years of education between Anglophones and the other language groups for the 1970<sup>22</sup> and 1980 data. A negative sign indicates that the specified target language group has a higher level of education or hourly wage than the reference group, Anglophones.

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21. The percentage difference is calculated as:

$$100((\text{Variable mean Anglophone}) - (\text{Variable mean Target group})) / (\text{Variable mean Anglophone}).$$

22. The 1970 data are taken from Carliner (1981, p.391, Table 1).

**TABLE 2.2: COMPARATIVE DESCRIPTIVES FOR FOUR AREAS\***  
**WAGES AND EDUCATION - 1970 and 1980**  
 (Percentage Differences relative to Anglophones)

	<u>ENGBIL</u>	<u>FREBIL</u>	<u>ALLOBIL</u>	<u>FREMONO</u>	<u>ALLOFRE</u>	<u>ALLONON</u>	<u>ALLOENG</u>
<b>CANADA</b>							
Wage '70	-8.6	6.6	-2.8	27.2	20.7	33.3	11.8
'80	-10.7	-4.0	13.8	14.3	25.9	28.4	9.9
Educ '70	-9.4	1.9	-10.4	25.5	46.2	50.0	17.9
'80	-9.5	-1.0	5.3	15.6	35.3	45.3	11.4
<b>ENGLISH CANADA</b>							
				----- <u>COMB2</u> -----			
Wage '70	-6.0	8.8	-54.9	20.2		29.5	12.1
'80	-11.4	5.8	5.6	23.1		26.9	9.0
Educ '70	-9.4	19.8	-17.0	42.5		50.9	17.9
'80	-11.7	7.2	-7.4	28.6		45.5	11.2
<b>QUEBEC</b>							
Wage '70	-10.6	8.4	19.5	29.1	21.9	45.8	12.8
'80	-0.9	2.0	23.5	20.8	32.1	42.4	28.7
Educ '70	-6.4	0.9	-4.6	27.5	40.4	47.7	20.2
'80	-2.7	-1.3	11.8	16.5	36.5	44.8	16.8
<b>MONTREAL</b>							
Wage '70	0.4	17.8	29.5	35.2	38.9	55.6	34.6
'80	0.0	4.5	26.3	22.1	35.6	48.0	30.0
Educ '70	0.0	10.3	20.7	30.2	44.0	51.7	18.1
'80	-2.5	1.2	14.4	18.9	39.4	50.8	17.0

Notes:

\* The variables do not allow for a detailed comparison of the Toronto CMA due to differences between the current sample and the one used by Carliner. The three bilingual groups, bilingual Anglophones, bilingual Francophones and bilingual Allophones, are combined into a single group for Toronto in the Carliner study. The 1980 data allow the use of three separate bilingual groups whereas the 1970 data do not.

\*\* COMB2 represents the combined group of Francophones and French Allophones.

For Canada, the difference in wages relative to Anglophones showed improvement for most groups. Bilingual Anglophones increased their wage advantage, while Francophones, Allophones and English Allophones narrowed their disadvantage. Bilingual Francophones showed a marked increase in relative wages, moving from a 7% disadvantage to a 4% advantage. French

Allophones show a 5 percentage point increase in wage disadvantage, while bilingual Allophones show a marked deterioration of 17 percentage points, from a 3% advantage to a 14% disadvantage.

Differences in education show a similar pattern. Those groups showing a decrease in wage disadvantage, or increase in advantage, show either a narrowing of the education gap or an increase in their education advantage. The single exception is the French Allophone group which shows an increase in wage difference but a decrease in education disadvantage.

The changes in Quebec exhibit a slightly different pattern from that of Canada. The changes, for the most part, show decreased wage disadvantages for French speakers as is reported for Canada. Bilingual Francophones, Francophones and Allophones all show a reduction in their wage disadvantage. Bilingual Allophones and French Allophones show a worsening of their wage disadvantage. However, in contrast to the results for Canada, bilingual Anglophones and English Allophones also show a relative deterioration in their wages, decreasing their advantage by 10 percentage points and increasing their disadvantage by 16 percentage points respectively.

Again, for nearly all groups, changes in education mirror changes in wages. The three groups showing positive wage changes also show a decreasing educational disadvantage with respect to Anglophones. Also, bilingual Anglophones show a decrease in their education advantage, while bilingual Allophones show a marked worsening of their relative position, moving from a

5% advantage in years of education to a 12% disadvantage. Two groups show changes in their relative education position different from the changes in their wage position. French Allophones and English Allophones both show an improved education position despite their worsening wage position.

English Canada shows positive changes for all but two groups: bilingual Allophones show a substantial change from a 55% wage advantage in 1970 to a 6% wage disadvantage in 1980; and the combined group of French Allophones and Francophones (COMB2 in Table 2.2) shows a slight worsening of their wage disadvantage. On the positive side, Allophones, English Allophones and bilingual Francophones show a narrowed disadvantage while bilingual Anglophones exhibit an increased wage advantage from 6% to 11%.

Changes in education show a similar pattern to changes in wages. The single exception is the Francophone group which shows a widening wage disadvantage despite a narrowing education gap. For all the other language groups changes in education mirror the direction of changes in wages.

In the CMA of Montreal, all groups show a reduction in their wage disadvantage with respect to Anglophones. All groups also show an improvement in their relative education positions.

## **2.8 Summary**

The Carliner model is presented as the basic comparison model since it allows an in-depth analysis of the contribution of language and other human

capital characteristics to earned wages. Analysis of the data reveals a fairly wide spread in earned wages per hour between language groups and a lesser spread between areas. Groups reporting high wages usually also show higher levels of education. Allophones are seen to earn the lowest wages per hour in all jurisdictions, while bilingual Anglophones are seen to earn the highest wage per hour.

Looking at changes in wages per hour and education between 1970 and 1980 we see that wage differences, for the most part, have been reduced relative to Anglophones. Differences in completed years of education have also largely been reduced between 1970 and 1980.

### **CHAPTER 3**

#### **THE CARLINER MODEL ESTIMATED WITH 1981 CENSUS DATA**

##### **3.1 Methodology**

By performing regressions on the wage equations for each of five areas the wage determination coefficients can be estimated and the hypothesis that language does not contribute to wages can be tested. The areas are: Canada, English Canada, the province of Quebec and the census metropolitan areas (CMA) of Toronto and Montreal.

##### **3.2 Estimation**

While the regression equation and the data sample are essentially the same as in Carliner's study the estimating procedure here additionally includes a test and correction for heteroskedasticity. Previous studies on the nature of wage differences have indicated that variances are likely to vary with wage levels, specifically, that there is a larger difference in wages at higher levels (Boulet, 1980). Also, there are variables that influence wage determination that are not included in the wage equation because of the lack of data or proxies, for example, the quality and content of education and the quality of experience and language proficiency.

Differing variances of the error term over the range of the independent variable may result from the exclusion of explanatory variables. Consequently,

the Goldfeld-Quandt method is used to test whether the error terms are homoskedastic<sup>23</sup> and this null hypothesis is rejected. The usual method of correcting for heteroskedasticity is to use weighted least squares. The weights are determined using the Park-Glejser technique. After some testing on the entire sample, that is Canada as a whole, it is found that the most appropriate form of the correcting weight is determined by the estimation of  $\ln(\text{RESID}^2) = K + a\text{EDUC} + b\text{EXP}$ . The actual weight used is  $[\text{EDUC}^{(a/2)}][\text{EXP}^{(b/2)}]$ . The weighting procedure, on the whole, works well for all the areas considered with the exception of the Toronto CMA. For Toronto, the regression determining the weights produces results that are not statistically significant. However, given that the weighting procedure provides more reliable results for all other areas, and that this form of the weight is found to be superior to other specifications, the estimates generated for the Toronto area are used to maintain consistency. A table presenting the weight components and information regarding their estimation is found in Appendix A.

### **3.3 Regression Results**

Five regressions are estimated, one for each area, using the general form of equation (1) presented in Chapter 2, Section 2.2, weighted to correct for heteroskedasticity. The results are presented in Table 3.1. The numbers in parenthesis are the standard errors, and the asterisks indicate that the estimated coefficients are not significantly different from zero at the 95% level for a two tailed test.

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23. The techniques used for testing and correcting for heteroskedasticity are found in Pindyck and Rubinfeld (1981, pp. 148 - 152).

**TABLE 3.1: REGRESSION RESULTS - COMPARISON MODEL - 1980**

<u>Variables</u>	<u>Canada</u>	<u>Eng. Canada</u> <sup>a</sup>	<u>Quebec</u>	<u>Toronto</u> <sup>b</sup>	<u>Montreal</u>
ENGBIL	0.030 (0.008)	0.035 (0.009)	0.003* (0.021)	0.069 (0.023)	-0.010* (0.024)
FREBIL	0.036 (0.010)	0.012* (0.015)	0.023* (0.019)	0.036* (0.069)	-0.013* (0.022)
ALLOBIL	-0.123 (0.023)	-0.155 (0.041)	-0.106 (0.030)	-0.104* (0.063)	-0.110 (0.032)
FREMONO	-0.017* (0.011)	-0.041* (0.047)	-0.025* (0.019)		-0.057 (0.023)
ALLOFRE	-0.147 (0.044)		-0.132 (0.044)	-0.065* (0.044)	-0.149 (0.048)
ALLONON	-0.191 (0.030)	-0.179 (0.034)	-0.343 (0.072)		-0.408 (0.079)
ALLOENG	-0.066 (0.010)	-0.061 (0.011)	-0.219 (0.037)	-0.040 (0.018)	-0.214 (0.040)
EDUC	0.061 (0.001)	0.061 (0.001)	0.063 (0.001)	0.050 (0.002)	0.065 (0.002)
EXP	0.046 (0.001)	0.046 (0.001)	0.046 (0.001)	0.047 (0.002)	0.045 (0.002)
EXPSQ (x 1000)	-0.690 (0.012)	-0.685 (0.014)	-0.681 (0.022)	-0.719 (0.036)	-0.672 (0.032)
IMM1	-0.301 (0.041)	-0.312 (0.043)	-0.096* (0.129)	-0.366 (0.082)	-0.125* (0.131)
IMM2	-0.132 (0.009)	-0.123 (0.010)	-0.199 (0.024)	-0.167 (0.019)	-0.220 (0.026)
IMM3	-0.043 (0.007)	-0.041 (0.008)	-0.047 (0.018)	-0.071 (0.016)	-0.075 (0.021)
IMM4	0.016 (0.008)	-0.018 (0.009)	0.007* (0.024)	0.007* (0.020)	-0.020* (0.027)
SIZE	0.049 (0.004)	0.049 (0.005)	0.048 (0.008)		
BC	0.098 (0.006)	0.095 (0.006)			
PRAIRIES	0.024 (0.006)	0.023 (0.006)			
MARITIMES	-0.086 (0.008)	-0.081 (0.008)			
QUEBEC	0.009* (0.008)				
CONST.	1.227	1.318	1.042	1.074	1.082
R <sup>2</sup> ADJUST **	0.153	0.143	0.190	0.141	0.204
F-STAT.	1469.1	1243.2	469.8	185.8	249.0
# OBS.	81777	61074	20703	12247	10179

Notes:

\* Coefficients are not statistically different from zero at the 95% level for a two tailed test.

\*\* The adjusted R<sup>2</sup> refers to the statistic generated by the non-normalized model, as the normalized model will upwardly bias the estimated goodness of fit.

a For English Canada the Francophone and French Allophone groups are combined

b For Toronto, the Francophone, French Allophones and Allophone groups are combined

The estimated coefficients for education, experience and experience squared are remarkably similar for all areas, and mirror the pattern found by Carliner (1981, p.392, Table 2). The magnitude of these coefficients is also similar to and only slightly higher than those estimated by Carliner. The increase in the absolute value of the coefficients suggest that education, experience and experience squared have for the most part only marginally increased their relative effect on earned wages. The signs on the estimated coefficients are as expected, positive for education and experience, and negative for experience squared.

Education is everywhere significant in determining wages per hour. For Canada and English Canada, a one year increase in education will, *ceteris paribus*, raise wages by 6.1%. The increment in wages would be 6.3%, 5.0% and 6.5% in Quebec, Toronto and Montreal respectively.

With the exception of Toronto, the estimated coefficients for the education variable are slightly higher than those estimated by Carliner. Canada and English Canada are both 0.5 percentage points higher than Carliner's estimate, Quebec shows an estimate that is 0.8 percentage points higher, while Montreal shows an increase of 0.6 percentage points. For Toronto, the estimated coefficient is slightly lower, by 0.3 percentage points, than that estimated by Carliner. These results indicate the contribution of education to earned wages has increased modestly in the ten year period 1970 to 1980.

Experience and Experience Squared are also everywhere significant. All areas have similar magnitudes. One extra year of experience, not accounting for non-linear effects, will raise wages by 4.6% in Canada, English Canada and Quebec, 4.7% in Toronto and 4.5% in Montreal. The experience squared coefficient is negative implying that there is a peak beyond which wages no longer rise with increased experience. The peak year of experience is approximately<sup>24</sup> 33 years of experience for all areas.

The estimates of the experience coefficients are again, for the most part, marginally higher than those estimated by Carliner for 1970. Canada and Toronto both show an increase of 0.2 percentage points, while Quebec shows an increase of 0.1 and English Canada shows an increase of 0.3 percentage points. The CMA of Montreal shows the only decrease, 0.2 percentage points.

Estimates of the experience squared coefficient are marginally lower, for all but one area, than those estimated by Carliner with 1970 data. The coefficient itself is very small and any analysis of changes should be considered in this light. Note that the reported estimates for experience squared are scaled up by a factor of 1000. The only change indicating a strengthening of the effect of experience squared is reported for Canada as a whole, with a change in the estimated coefficient from -0.688 in 1970 to -0.690 in 1980. All other regions

24. The peak year of experience can not be calculated with accuracy as the mean of the square of experience is not equal to the square of the mean of experience. Since the peak year is determined by

$$(\partial \ln(\text{WAGES}/\text{HOUR})/\partial \text{EXP})=0$$

the form

$$\alpha_k + 2\alpha_h \text{EXP} = 0$$

is not, strictly speaking, correct since  $\alpha_h$  is estimated for  $\text{EXP}^2$ , and the estimates are evaluated at the means of the variables.

show a reduced effect with smaller absolute estimated coefficients. A substantial change is seen in Montreal where the estimated coefficient for experience squared changed from -0.746 in 1970 to -0.672 in 1980.

Wages are seen to be different in larger size cities, with those living in CMA's of 250,000 or more earning, *ceteris paribus*, 5% more than those living in less populated areas which confirms the *a priori* sign assumption. This could be explained by either or both of higher cost of living in the cities and a concentration of higher paid administrative and professional service occupations in densely populated urban areas.

The signs of the year of immigration coefficients are generally as expected, with a similar pattern to those reported by Carliner. More recent immigrants earn less, on average, than immigrants who have been in Canada for longer periods. Exceptions are in Montreal and Quebec, where the most recent immigrants, all other things equal, do not earn less than native born Canadians<sup>25</sup>. Also of interest, are the coefficients on those who have immigrated to Canada prior to 1956. Canada reports a positive coefficient, Quebec and Toronto report positive but insignificant coefficients, and Montreal has an insignificant negative coefficient. Although one would expect native-born Canadians to earn more than immigrants, it is possible that the length of residence in Canada of this cohort is sufficient to have overcome any country specific differences in human capital characteristics.

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25. The estimated coefficients are negative, but not statistically different from zero.

In English Canada where regional divisions are used, the region coefficients show there to be significant wage differences in all regions when compared with Ontario. British Columbian workers earn roughly 10% more, Prairie workers earn roughly 2% more while workers in the Maritimes earn roughly 8% less than their Ontario counterparts. The magnitude of regional differences is very similar in Canada as a whole. Quebec shows no significant wage difference with respect to Ontario. The signs on the coefficients are generally as expected.

The regression results on the whole support the hypothesis implicit in the theory of language wage premiums presented in Chapter 1, Section 1.4. Bilingualism generally provides a premium over knowing only one official language. Also, Anglophones generally are rewarded more than Francophones, and Allophones are rewarded the least. Allophones are also seen to reap rewards to learning either or both English and French. What follows is a description of the regression estimates of the contribution of language to wages earned. A more in-depth analysis of the changes between the years 1970 and 1980 is presented in Chapter 4, Section 4.2.

In the whole of Canada there is a premium of 3% to Anglophones for learning French<sup>26</sup>. Learning English rewards Francophones, as the coefficient

26. The premium to learning a first or second (official) language is determined by taking the difference between the regression coefficients for language, for the "target" group and the "initial" group. For example, to determine the premium to Anglophones learning French, subtract the ENGMONO ("initial") coefficient from the ENGBIL ("target") coefficient

$$\text{ENGBIL} - \text{ENGMONO} = 0.030 - 0 = 0.030.$$

It is recognized that some of the estimated coefficients may not be statistically different from zero. However we assume that the estimates are unbiased and efficient and therefore use them in calculations such as the one above as well as in the determination of the sources of wage difference statistic.

for bilingual Francophones is greater than the coefficient for Francophones. The premium to bilingual Francophones over Francophones is about 5%. For Allophones, knowledge of English only brings higher reward than knowledge of French only, while knowledge of both official languages brings lower reward than knowledge of only one. This last finding is counterintuitive. It is possible that the fact that there is no qualitative measure of language proficiency accounts for this finding, since those learning both languages may do so inefficiently while those learning only one language may become more proficient in that language.

In English Canada bilingualism is again rewarded, except for Allophones. Bilingual Anglophones earn a premium of 4% above Anglophones. The premium to bilingual Francophones can not be calculated as monolingual Francophones are included in a composite group. Allophones earn a premium for learning French, English or both. Learning English only brings higher reward than learning both English and French.

In Quebec there are no statistically significant differences between the four main language groups. However, a best estimate of the returns to learning English for Francophones is 5%. There is a premium to Allophones learning French over English, and positive rewards to learning either. Contrary to the findings for Canada and English Canada, Allophones in Quebec learning both official languages earn more than those who learn only one.

For the Montreal CMA there is no significant premium to Anglophones being bilingual. The estimated coefficient indicates that there is a disincentive to learn French as the coefficient has a negative sign. Francophones learning English show a premium of 4% over monolingual Francophones. There is however a premium to knowing English over French with Francophones earning 6% less than Anglophones. For Allophones there is a premium to learning French over English, and bilingual Allophones earn a premium over those who speak only English or French.

For the Toronto CMA there is a premium to Anglophones being bilingual of 7%. The premium to French speakers learning English can not be calculated. The combined group of Francophones, Allophones and French Allophones, as well as the bilingual Allophone group are rewarded no differently, statistically, from Anglophone workers. In addition, there is a premium to Allophones learning English.

### **3.4 Summary**

Estimation of the Carliner comparison model with 1980 data yields similar results for the control variables to those reported by Carliner using 1970 data, especially for education, experience and experience squared. Premiums are reported to living in large cities. A noticeable difference between regions is also reported and later immigrants tend to earn less than those who have been in Canada a longer time.

On the whole the regression results support the wage hierarchy presented in the theoretical framework. Anglophones receive a wage premium over all other monolingual<sup>27</sup> groups, bilingualism is rewarded and Allophones are better off learning either or both English and French<sup>28</sup>.

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27. Monolingual, in this context, refers to those groups who speak one of the official languages.

28. A detailed analysis of the contribution of language is found in the following chapter, Section 4.2.

## CHAPTER 4

### AN ANALYSIS OF WAGE DIFFERENCES: 1970 VERSUS 1980

#### 4.1 The sources of wage difference

To measure the sources of wage difference, Carliner uses the statistic:

$$\beta_{jk}(X_{ejk} - X_{ijk}),$$

where:

- " $\beta$ " denotes the partial derivative of  $\ln(\text{WAGES}/\text{HOUR})$  with respect to the explanatory variable chosen,
- "j" denotes the specific regression being analysed and is determined by geographical area,
- "k" denotes the particular explanatory variable,
- "X" denotes the mean value of the explanatory variable as identified by j, k and the language group,
- "e" denotes the Anglophone (reference) language group,
- "i" denotes the target language group(s).

Essentially this statistic estimates the percentage change in wages as a result of equating characteristic "k" between Anglophones, the reference group, and the target language group. That is, the statistic measures the change that would occur in the level of wages of a specified language group if it exhibited the same mean level of characteristic "k" as the Anglophone group. This approach assumes that the differences in wages are attributable only to differences in endowments or characteristics and not to differences in the process or structure of wage determination.

This statistic is derived by noting that the partial derivative of the wage equation with respect to any single independent variable provides a measure of the percentage change in wages per hour for a unit change in the independent variable. The X's are measured at the relevant variable means. This results in the general form of the statistic being:

$$[\partial \ln(\text{WAGES}/\text{HOUR})_j / \partial X_{jk}] (X_{ejk} - X_{ijk}).$$

The  $\alpha_{jk}$ 's below refer to the estimated regression coefficient for variable "k" in regression "j".

#### 4.1.1 Education

The education statistic measures the wage differences due to differences in completed years of formal education. The statistic is calculated by substituting the relevant variables into the general form<sup>29</sup> resulting in:

$$\alpha_{j\text{EDUC}} (\text{EDUC}_{ej} - \text{EDUC}_{ij}).$$

---

29. Carliner's calculation of the effect of education on wages, and similarly in all the studies known to us to date, includes only the direct effect of education and ignores the indirect effect of education operating through the experience and experience squared variables. Thus, the experience variable is calculated as:

$$\text{EXP} = (\text{AGE} - \text{EDUC} - 6).$$

It is clear that the estimated coefficient for the experience variable will capture some of the effect of education on wages. Similarly for experience squared. Since  $\beta_{jk}$  in the general form is in fact:

$$\partial \ln(\text{WAGES}/\text{HOUR})_j / \partial X_{jk},$$

the complete form of the statistic would be:

$$\beta_{j\text{EDUC}}^* = \alpha_{j\text{EDUC}} - \alpha_{j\text{EXP}} - 2\alpha_{j\text{EXPSQ}} (\text{AGE} - \text{EDUC} - 6).$$

However, following Carliner, we use only the direct effect.

### **4.1.2 Experience**

The experience statistic measures the combined effect of experience and the square of experience on wage differences. The statistic is derived from the combined effect of experience and experience squared, resulting in:

$$[\alpha_{jEXP} + 2\alpha_{jEXPSQ}(EXP_{ij})](EXP_{ej} - EXP_{ij}).$$

### **4.1.3 Period of immigration**

Again, a combined statistic is used to measure the contribution of year of immigration to differences in wages. The various individual statistics are summed giving:

$$\sum [\alpha_{jIMMq}(IMM_{ejq} - IMM_{ijq})],$$

where "q" indicates the period of immigration and  $IMM_{ejq}$  and  $IMM_{ijq}$  represent the proportion of Anglophone and other language groups respectively, resident in area "j", who immigrated in period "q".

### **4.1.4 Size of place**

The size of place statistic measures the effect of population concentration on differences in wages. The statistic is:

$$\alpha_{jSIZE}(SIZE_{ej} - SIZE_{ij}).$$

The subscripts are interpreted as above.

#### **4.1.5 Region**

The region statistic measures, for Canada and English Canada, the contribution of region of residence to wage differences. As with migration, the individual statistics are summed, resulting in:

$$\sum_q [\alpha_j \text{REGION}_q (\text{REGION}_{ejq} - \text{REGION}_{ijq})]$$

where "q" identifies the regions.

#### **4.1.6 Residual**

The residual statistic measures the wage difference due to language skill differences. The estimated coefficient on the language variable is multiplied by -1 to generate a source of wage difference statistic for language, since  $(X_{ejk} - X_{ijk})$  for the language variables is always -1.

The sources of wage differences for the five areas are presented in Table 4.1 and calculated as described above. The "Total" rows indicate the change that would occur if all characteristics, including language were equated between the reference group, Anglophones, and the target language group. If all characteristics are equated to the reference group, including language, the largest wage change would accrue to Allophones in Quebec province who would experience a 60% increase in wages per hour. The largest decrease, 13% would be experienced by bilingual Anglophones in Toronto.

**TABLE 4.1: SOURCES OF WAGE DIFFERENCES  
ALL AREAS - 1980**

	<u>ENGBIL</u>	<u>FREBIL</u>	<u>ALLOBIL</u>	<u>FREMONO</u>	<u>ALLOFRE</u>	<u>ALLNONE</u>	<u>ALLOENG</u>
<b>QUEBEC</b>							
EXP	0.059	0.073	0.023	0.067	-0.088	-0.147	-0.027
EDUC	-0.021	-0.010	0.092	0.129	0.285	0.350	0.131
IMM	-0.019	-0.027	0.032	-0.028	0.055	0.060	0.039
SIZE	0.002	0.009	-0.005	0.022	-0.001	-0.002	-0.003
LANG	<u>-0.003</u>	<u>-0.023</u>	<u>0.106</u>	<u>0.025</u>	<u>0.132</u>	<u>0.343</u>	<u>0.219</u>
Total	0.018	0.022	0.248	0.215	0.383	0.604	0.359
<b>ENGLISH CANADA</b>							
				----- <u>COMB2</u> * -----			
EXP	0.029	-0.009	-0.032	-0.085		-0.230	-0.094
EDUC	-0.087	0.052	-0.056	0.214		0.340	0.084
IMM	0.000	-0.006	0.049	-0.004		0.079	0.051
SIZE	-0.003	0.008	-0.015	0.017		-0.018	-0.014
REGION	0.005	0.029	0.002	0.052		0.001	-0.004
LANG	<u>-0.035</u>	<u>-0.012</u>	<u>0.155</u>	<u>0.041</u>		<u>0.179</u>	<u>0.061</u>
Total	-0.091	0.062	0.103	0.235		0.351	0.084
<b>CANADA</b>							
EXP	0.015	-0.005	-0.050	-0.013	-0.175	-0.230	-0.094
EDUC	-0.071	-0.007	0.040	0.167	0.264	0.338	0.085
IMM	-0.001	-0.006	0.039	-0.007	0.054	0.080	0.049
SIZE	-0.007	-0.005	-0.020	0.005	-0.019	-0.018	-0.015
REGION	0.005	0.009	0.004	0.005	0.004	0.001	-0.004
LANG	<u>-0.030</u>	<u>-0.036</u>	<u>0.123</u>	<u>0.017</u>	<u>0.147</u>	<u>0.191</u>	<u>0.066</u>
Total	-0.089	-0.050	0.136	0.174	0.275	0.362	0.087
<b>TORONTO</b>							
					----- <u>COMB1</u> ** -----		
EXP	0.043	0.028	-0.027		-0.349		-0.092
EDUC	-0.100	-0.037	-0.024		0.333		0.108
IMM	-0.005	0.004	0.056		0.086		0.056
LANG	<u>-0.069</u>	<u>-0.036</u>	<u>0.104</u>		<u>0.065</u>		<u>0.040</u>
Total	-0.131	-0.041	0.109		0.135		0.112
<b>MONTREAL</b>							
EXP	0.064	0.067	0.020	0.068	-0.100	-0.192	-0.026
EDUC	-0.020	0.010	0.118	0.155	0.324	0.418	0.140
IMM	-0.026	-0.038	0.040	-0.039	-0.066	-0.074	-0.049
LANG	<u>0.010</u>	<u>0.013</u>	<u>0.110</u>	<u>0.057</u>	<u>0.149</u>	<u>0.408</u>	<u>0.214</u>
Total	0.028	0.052	0.288	0.241	0.307	0.560	0.279

Notes:

\* COMB2 represents the combined group of Francophones and French Allophones.

\*\* COMB1 refers to the combined group of Francophones, French Allophones and Allophones.

Bilingual Francophones and bilingual Anglophones show a mixed set of wage changes. In Quebec both groups would experience a higher wage, 2.2% for bilingual Francophones and 1.8% for bilingual Anglophones. English Canada shows a different pattern, with bilingual Anglophones experiencing a 9% lower wage and bilingual Francophones a 6% higher wage. Both groups show a lower wage in Canada where bilingual Francophones would suffer a 5% drop in wages per hour while bilingual Anglophones would show a drop of 9% if all labour market characteristics were the same as those of Anglophones. Toronto also shows both groups receiving a lower wage, bilingual Francophones by 4% and bilingual Anglophones by 13%. Finally, in Montreal, both groups would receive a higher wage, 3% for bilingual Anglophones and 5% for bilingual Francophones. Specific changes by characteristic and language group are generally very mixed and show no discernable pattern.

Francophones, and all four groupings of Allophones would, overall, experience wage increases in all areas. In all cases, Allophones would experience the greatest wage increase.

The contribution of immigration, region and size are all, generally, limited in explaining wage differences relative to Anglophones. The highest source of wage difference for all three variables is 8%<sup>30</sup>. In contrast, education, experience and the language residual all show reasonably strong contributions. Education accounts for a 42% difference in wages between Allophones and Anglophones in Montreal. Experience accounts for a 23% difference between

30. The contribution of immigration to the difference between Allophone and Anglophone wages in Canada.

the same two groups in Canada. Language contributes to a 16% difference in wages between bilingual Allophones and Anglophones in English Canada.

#### **4.2 Changes: 1970 - 1980**

Having determined the sources of wage difference for 1980 we now turn to analyse the changes that have occurred in the ten year period, 1970 to 1980.

Tables 4.2 - 4.5 show the comparative sources of wage differences for four regression areas, 1970 and 1980. The numbers for 1970 are drawn directly from Carliner (1980, p.397, Table 3). Toronto is again not included because of the lack of comparative data<sup>31</sup>. The sources of wage difference indicate the change in wages that would result if the characteristic in question, for the target group, was made equal to that of the Anglophone group. Note that a negative sign indicates that the characteristic difference is in favour of the target group and thus the wage change due to equating characteristics is negative. Thus if, in 1980 in Canada, bilingual Francophones had the same mean number of years of education as Anglophones, their wages per hour would decrease by 0.7% (Table 4.2). Also, the total column indicates the wage change that would result if all characteristics were equated between the reference and target groups. Thus, in 1970 in Canada, if Francophones were to have had the same human capital characteristics as Anglophones, including language, their wages would have increased by 32% (Table 4.2).

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31. See the notes to Table 2.2.

The regression results<sup>32</sup> show that the contribution of education and experience to wages has increased only marginally between 1970 and 1980. Consequently changes in the source of wage difference, 1970 to 1980, for education and experience may be seen to be largely due to changes in relative characteristics between Anglophones and the target language groups. Language distribution within the regression areas has not changed much in the period 1970 to 1980. Thus, the language premiums may be said to be primarily due to changes in the structure of wage determination for language between 1970 and 1980.

#### **4.2.1 Canada**

Table 4.2 shows the comparative statistics for Canada, 1970 and 1980. Equating experience to that of Anglophones provides a smaller wage gain or larger wage loss for all language groups in 1980 than in 1970. Thus, equating experience either results in a smaller increase in wages in 1980 than in 1970, as in the case of bilingual Anglophones, produces a larger reduction, as for Allophones, English Allophones and French Allophones, or changes an increase in wages in 1970 to a reduction in wages in 1980, for Francophones, bilingual Francophones and bilingual Allophones. The largest change is a 17 percentage point reduction in wages for Allophones. The smallest is a 1 percentage point reduction in wages for bilingual Anglophones.

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32. See the discussion in Chapter 3, Section 3.3.

**TABLE 4.2: COMPARATIVE SOURCES OF WAGE DIFFERENCES  
CANADA - 1970 and 1980**

	ENGBIL	FREBIL	ALLOBIL	FREMONO	ALLOFRE	ALLNONE	ALLOENG
<b>EXP</b>							
'70	0.024	0.010	0.053	0.019	-0.047	-0.064	-0.025
'80	0.015	-0.005	-0.050	-0.013	-0.175	-0.230	-0.094
<b>EDUC</b>							
'70	-0.055	0.012	-0.059	0.152	0.274	0.298	0.110
'80	-0.071	-0.007	0.040	0.117	0.264	0.338	0.085
<b>IMM</b>							
'70	0.002	0.004	0.023	0.005	0.038	0.054	0.020
'80	-0.001	-0.006	0.039	-0.007	0.054	0.080	0.049
<b>SIZE</b>							
'70	-0.014	-0.014	-0.041	-0.016	-0.043	-0.039	-0.018
'80	-0.007	-0.005	-0.020	0.005	-0.019	-0.018	-0.015
<b>REGION</b>							
'70	-0.010	0.006	-0.005	0.005	-0.014	-0.028	-0.020
'80	0.005	0.009	0.004	0.005	0.004	0.001	-0.004
<b>LANG</b>							
'70	-0.019	0.026	0.106	0.123	0.156	0.134	0.090
'80	-0.030	-0.036	0.123	0.017	0.147	0.191	0.066
<b>TOTAL</b>							
'70	-0.072	0.044	0.077	0.320	0.364	0.355	0.157
'80	-0.089	-0.050	0.136	0.174	0.275	0.362	0.087

There is no discernable pattern to the change in the contribution of education between 1970 and 1980. Changes range from -3.5 percentage points for Francophones to 10 percentage points for bilingual Allophones. The estimated increase in wages due to education is smaller in 1980 than in 1970 for Francophones, French Allophones and English Allophones and is larger in 1980 than in 1970 for Allophones. Bilingual Anglophones show a larger estimated

decrease in wages due to education in 1980 than in 1970. The two remaining groups show a reversal of the direction of estimated wage changes. That is, equating the levels of education of bilingual Francophones and bilingual Allophones to that of Anglophones increases the wage of bilingual Francophones and decreases the wage of bilingual Allophones in 1970 and does just the opposite for these two language groups in 1980.

The remaining control variables report varied results. Immigration reports mixed 1970 to 1980 changes, with all the Allophone groups showing larger wage increases, and the remaining groups, bilingual Anglophones, Francophones and bilingual Francophones showing movement from estimated wage increases in 1970 to wage decreases in 1980. The population density variables show smaller wage decreases for all groups with the single exception of Francophones; the latter move from an estimated wage decrease in 1970 to a wage increase in 1980.

The regional variable shows that attributing the regional distribution of Anglophones to the other language groups mainly reduces the wage of the other groups in 1970, but mainly increases the wage of the other language groups in 1980.

The contribution of language itself shows a mixed set of changes between 1970 and 1980. Premiums to bilingual Anglophones have increased one percentage point. Bilingual Francophones have moved from a 2.6% disadvantage to a 3.6% advantage. Premiums to both bilingual groups are

evidenced here and this is a departure from the findings reported by Carliner who reports premiums to bilingual Anglophones only. The strengthening of the premium to both bilingual groups is consistent with the success of Federal government policies in promoting bilingualism. Other groups that show increases between 1970 and 1980 are Francophones (11 percentage points), French Allophones (1 percentage point) and English Allophones (2 percentage points). The substantial decrease in the disadvantage to Francophones over the 1970 - 1980 period is noteworthy and lends credence to arguments that language policies in Quebec and Canada have promoted the use of French. Nevertheless, bilingual Allophones show a deterioration of 2 percentage points while Allophones show a deterioration of 6 percentage points.

#### **4.2.2 English Canada**

In English Canada the changes are also varied. Comparative statistics are presented in Table 4.3. The change in the contribution of experience to wages over the period 1970 to 1980 is seen to be predominantly negative. Wage decreases have become larger, as for Allophones, English Allophones and the combined group of Francophones and French Allophones, wage increases have been reduced for bilingual Anglophones, and bilingual Allophones move from an estimated wage increase of 4% to a wage decrease of 3%. The single exception to this pattern is the bilingual Francophone group which reports a smaller decline in estimated wages in 1980 than in 1970 due to the contribution of experience.

**TABLE 4.3: COMPARATIVE SOURCES OF WAGE DIFFERENCES  
ENGLISH CANADA - 1970 and 1980**

	ENGBIL	FREBIL	ALLOBIL	FREMONO	ALLOFRE	ALLNONE	ALLOENG
EXP				-----	COMB2*	-----	
'70	0.038	-0.014	0.043	-0.009		-0.051	-0.020
'80	0.029	-0.009	-0.032	-0.085		-0.230	-0.094
EDUC							
'70	-0.055	0.119	-0.103	0.223		0.305	0.109
'80	-0.087	0.052	-0.056	0.214		0.340	0.084
IMM							
'70	0.005	0.005	0.011	0.011		0.058	0.013
'80	0.000	-0.006	0.049	-0.004		0.079	0.051
SIZE							
'70	-0.006	0.008	-0.045	-0.002		-0.040	-0.020
'80	-0.003	0.008	-0.015	0.017		-0.018	-0.014
REGION							
'70	-0.017	0.028	-0.025	0.035		-0.038	-0.024
'80	0.005	0.029	0.002	0.052		0.001	-0.004
LANG							
'70	-0.004	0.015	0.059	0.054		0.100	0.083
'80	-0.035	-0.012	0.155	0.041		0.179	0.061
TOTAL							
'70	-0.039	0.161	-0.060	0.312		0.334	0.141
'80	-0.091	0.062	0.103	0.235		0.351	0.084

Notes:

\* COMB2 represents the combined group of Francophones and French Allophones.

Generally there is a lessening of differences in wages due to the contribution of years of formal education between 1970 and 1980. The wage increase is smaller in 1980 for bilingual Francophones, Francophones and English Allophones. Bilingual Allophones report a smaller wage decrease in 1980 than in 1970. Bilingual Anglophones, however, show a larger wage

decrease and Allophones show a larger wage increase due to education in 1980 compared with 1970.

The remaining control variables generally show a mixed pattern of changes. Most groups which reported estimated wage decreases, relative to Anglophones, due to the size variable in 1970 show smaller reductions in 1980. The exception is the combined group of Francophones and French Allophones who move from an estimated wage reduction to a wage increase. Bilingual Francophones remain unchanged. The contribution of the region variable shows increases in estimated wages in 1980 for bilingual Anglophones, bilingual Allophones and Allophones. These groups reported wage decreases due to equating region of residence with that of Anglophones in 1970. The COMB2 group and bilingual Francophones report larger wage increases over the ten year period and English Allophones report smaller wage reduction in 1980 than in 1970. The period of immigration variable shows mixed changes with a similar pattern, but not magnitude, to the results reported for Canada.

The language statistic shows a similar pattern to that for Canada with Francophones and bilingual Francophones improving their wage positions relative to Anglophones. The premium to bilingual Anglophones has increased. Again, bilingual Francophones have moved from a disadvantaged position to one where they earn a premium over Anglophones. These results, as for Canada, are consistent with the success of Federal government policies to promote bilingualism. Bilingual Allophones and Allophones show a worsening of their position relative to Anglophones between 1970 and 1980 while

Francophones and English Allophones show a decrease in relative wage disadvantage due to language.

Total changes in English Canada between 1970 and 1980 reflect the pattern of changes in Canada. Only bilingual Allophones and Allophones experience a decline in their wages relative to that of Anglophones. All other groups show a relative increase in wages per hour, the largest being bilingual Francophones, with an increase of 10 percentage points.

#### 4.2.3 Quebec

Changes during the ten year period 1970 to 1980 are presented in Table 4.4 for the province of Quebec. Only two groups show deterioration in their relative wages, bilingual Anglophones (8 percentage points) and bilingual Allophones (4 percentage points). All other groups show relative improvement with the largest increase (15 percentage points) experienced by Francophones.

The returns to language show improvement in the relative wages of Francophones and bilingual Francophones. Only three groups show decreases in language premiums, with Allophones deteriorating by 15 percentage points, English Allophones decreasing by 2 percentage points and bilingual Anglophones decreasing by 1 percentage point. Of the remaining groups, Francophones show the largest increase, 15 percentage points. Again, French bilinguals move from a disadvantage to a wage premium.

**TABLE 4.4: COMPARATIVE SOURCES OF WAGE DIFFERENCES  
QUEBEC - 1970 and 1980**

	ENGBIL	FREBIL	ALLOBIL	FREMONO	ALLOFRE	ALLNONE	ALLOENG
<b>EXP</b>							
'70	0.013	0.031	0.073	0.005	0.032	0.063	0.045
'80	0.059	0.073	0.023	0.067	-0.088	-0.147	-0.027
<b>EDUC</b>							
'70	-0.039	0.007	-0.027	0.166	0.246	0.292	0.122
'80	-0.021	-0.010	0.092	0.129	0.285	0.350	0.131
<b>IMM</b>							
'70	-0.016	-0.006	0.060	-0.005	0.008	0.068	0.060
'80	-0.019	-0.027	0.032	-0.028	0.055	0.060	0.039
<b>SIZE</b>							
'70	-0.009	-0.002	-0.020	0.029	0.021	-0.021	-0.001
'80	0.002	0.009	-0.005	0.022	-0.001	-0.002	-0.003
<b>LANG</b>							
'70	-0.015	0.072	0.123	0.173	0.165	0.281	0.197
'80	-0.003	-0.023	0.106	0.025	0.132	0.434	0.219
<b>TOTAL</b>							
'70	-0.066	0.102	0.209	0.368	0.472	0.683	0.423
'80	0.018	0.022	0.248	0.215	0.383	0.604	0.359

The evidence in favour of language policies is somewhat mixed. The increases for Francophones and French Allophones suggest that Quebec policies may be effective. However, bilingual Anglophones show a decrease in their wage premium relative to Anglophones, while bilingual Francophones show a marked increase, providing somewhat less definite evidence with respect to the impact of Federal language policies promoting bilingualism. In addition, the smaller percentage of Anglophones in Quebec in 1980 than in 1970, and the

unchanged proportion of bilingual Anglophones<sup>33</sup> may result in bilingual Francophones moving into higher wage jobs requiring English in Quebec. This makes it difficult to interpret the improved language position of bilingual Francophones in terms of Federal language policies.

Changes over the 1970 - 1980 decade in the period of immigration variable are favourable for all groups except French Allophones who show a decrease in relative wages of 5 percentage points. Only two groups show relative improvement due to education, bilingual Francophones (2 percentage points) and Francophones (4 percentage points). All other groups show a relative decline with the largest, 12 percentage points, accruing to bilingual Allophones. The 1970 - 1980 changes in relative wages due to experience are favourable for all Allophone groups. French Allophones experience a 12 percentage point change and Allophones experience a 21 percentage point change, English Allophones a 7 percentage point change and bilingual Allophones experience a 5 percentage point gain in relative wages due to experience between 1970 and 1980. Francophones experience the largest relative wage decrease of 6 percentage points.

#### **4.2.4 Montreal**

Changes over the 1970 - 1980 period in the Montreal CMA do not fully reflect changes in the province of Quebec. Table 4.5 presents the statistics.

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33. Carliner (1981, p391) reports that Anglophones comprise 8% and bilingual Anglophones comprise 9% of the Quebec sample in 1970. The 1980 data show that Anglophones and bilingual Anglophones comprise 5% and 9%, respectively, of the Quebec sample.

Total change over the ten years in question is favourable for all language groups except bilingual Anglophones who experience a 0.5 percentage point worsening of their relative wage rate. Of the other groups, Allophones experience the largest improvement in relative wage of 17 percentage points.

**TABLE 4.5: COMPARATIVE SOURCES OF WAGE DIFFERENCES  
MONTREAL - 1970 and 1980**

	ENGBIL	FREBIL	ALLOBIL	FREMONO	ALLOFRE	ALLNONE	ALLOENG
<b>EXP</b>							
'70	0.004	0.004	0.018	0.000	-0.055	-0.084	-0.022
'80	0.064	0.067	0.020	0.068	-0.100	-0.192	-0.026
<b>EDUC</b>							
'70	0.002	0.071	0.143	0.209	0.304	0.353	0.127
'80	-0.020	0.010	0.118	0.155	0.324	0.418	0.140
<b>IMM</b>							
'70	-0.013	-0.015	0.048	-0.015	0.071	0.099	0.063
'80	-0.026	-0.038	0.040	-0.039	-0.066	-0.074	-0.049
<b>LANG</b>							
'70	0.030	0.075	0.128	0.161	0.142	0.363	0.254
'80	0.010	0.013	0.110	0.057	0.149	0.408	0.214
<b>TOTAL</b>							
'70	0.023	0.135	0.337	0.355	0.462	0.731	0.422
'80	0.028	0.052	0.288	0.241	0.307	0.560	0.279

Changes from 1970 to 1980 in the period of immigration variable have the effect of improving the relative wage of all language groups. The largest change, 17.3 percentage points, is reported for Allophones.

The contribution of education to relative wages has changed for all groups. Allophones, English Allophones and French Allophones all show relative deterioration. The other language groups all experience an improvement in their relative wage position with respect to education.

Changes in relative wages due to experience show an inverse pattern in direction to education, with Allophones, French Allophones and English Allophones all experiencing an improvement in relative wages. All other language groups show a deterioration in relative wage.

Looking at the language variable, the wage disadvantage relative to Anglophones has decreased for Francophones, bilingual Anglophones and bilingual Francophones from 1970 to 1980. This reflects the patterns seen in other parts of Canada. However, both bilingual groups have yet to enjoy wage premiums with respect to Anglophones in Montreal. Nevertheless, these results are consistent with at least the partial success of both the Federal policy promoting bilingualism and the policy of Quebec promoting the use of French. The only two groups to show a deteriorating wage position are French Allophones and Allophones.

#### **4.3 Wage Premiums due to Language**

Carliner (1981) reports that, in 1970, for the minority language markets studied, bilingualism is rewarded everywhere except for Anglophones in the Montreal CMA and English Allophones in Canada and English Canada.

Allophones earn a premium<sup>34</sup> for learning English in all areas. They also earn a premium for learning French in all areas except Canada as a whole.

Table 4.6 shows comparative wage premiums (in percent) for learning official languages in 1970 and 1980 for four regions. The Toronto CMA is again excluded because of the lack of comparative data. For Allophones, wage premiums for learning either English or French have increased in all cases. Francophones have everywhere improved their position with respect to Anglophones. There is still a premium, though much reduced, to Anglophones over Francophones. Bilingualism still carries a premium except for English Allophones learning French in Canada as a whole and English Canada, and Anglophones learning French in Montreal.

In Canada the premium to Anglophones learning French has gone up by 1.1 percentage points while the premium to Francophones learning English has dropped by 4.4 percentage points. The premium to Allophones learning English has increased by 4.7 points while the premium for learning French has improved by 6.7 points, from a disincentive of 2.3% to a 4.4% premium. The premium to French Allophones learning English has decreased from 5.1% to 2.4%. The premium enjoyed by Anglophones over Francophones has been noticeably reduced by 10.6 percentage points.

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34. The premium to learning a first or second (official) language is determined by taking the difference between the regression coefficients for language, for the "target" group and the "initial" group. For example, to determine the premium to Allophones learning English, subtract the ALLONON ("initial") coefficient from the ALLOENG ("target") coefficient.

**TABLE 4.6: COMPARATIVE LANGUAGE PREMIUMS\*\***  
**FOUR AREAS - 1970 AND 1980**

	CANADA		ENGLISH CANADA		QUEBEC		MONTREAL	
	1970	1980	1970	1980	1970	1980	1970	1980
ENGBIL <sup>a</sup>	1.9	3.0	0.4	3.5	1.5	0.3	-3.0	-1.0
FREBIL <sup>b</sup>	9.7	5.3	*	*	10.1	4.8	8.6	4.4
ALLOBIL <sup>c</sup>	2.8	6.8	4.1	2.4	15.8	23.7	23.5	29.8
ALLOBIL <sup>d</sup> (FRE)	-1.6	-5.7	2.4	-9.4	7.4	11.3	12.6	10.4
ALLOBIL <sup>e</sup> (ENG)	5.1	2.4	*	*	4.2	2.6	1.4	3.9
ALLOENG <sup>f</sup>	4.4	9.1	1.7	11.8	8.4	12.4	10.9	19.4
ALLOFRE <sup>g</sup>	-2.3	4.4	*	*	11.3	21.1	22.1	25.9
FREMONO <sup>h</sup>	12.3	1.7	*	*	17.3	2.5	16.1	5.7

Source

The 1970 numbers are calculated from Carliner (1980, Table 2, p 392-393). The numbers for 1980 are calculated from estimates presented in Table 3.1.

Notes

- a. Premium to Anglophones learning French.
  - b. Premium to Francophones learning English.
  - c. Premium to Allophones learning both English and French.
  - d. Premium to English Allophones learning French.
  - e. Premium to French Allophones learning English.
  - f. Premium to Allophones learning English.
  - g. Premium to Allophones learning French.
  - h. Premium enjoyed by Anglophones over Francophones.
- \* indicates unable to compute.  
 \*\* The language premiums are presented in percentages.

Anglophones learning French show an improved premium of 3.1 points in English Canada. Allophones also show an increased premium for learning English of 10.1 percentage points. The premium to Allophones being bilingual has decreased by 1.7 points. There has been a marked change in the incentive for English Allophones to learn French from a 2.4% premium to a 9.4% disincentive.

The province of Quebec exhibits some of the largest changes. The incentive for Anglophones to learn French has been reduced by 1.2 percentage points, while the incentive for Francophones to learn English has been reduced by 5.3 percentage points. Allophones show an increase in the premiums to learning French and English, 9.8 and 4.0 percentage points respectively. The premium to English Allophones learning French has increased from 7.4% to 11.3%. The premium to French Allophones learning English has decreased from 4.2% to 2.6%. Anglophones show a 14.8 percentage point reduction in their advantage over Francophones. This finding is noteworthy and suggests that Quebec language policies have been effective in promoting the use of French in Quebec and thus lowering the wage difference between Anglophones and Francophones in that province.

The Montreal CMA continues to provide Anglophones with a disincentive to learn French, though this has declined from 3.0% to 1.0%. The premium to Francophones learning English has also fallen, from 8.6% to 4.4%. Allophones show an increase in the premium earned from learning both English, French and English and French. Allophones learning English are rewarded with

a 19.4% premium, those learning French are rewarded with a 25.9% premium and those learning both languages enjoy a premium of 29.8% over those Allophones who do not speak any official language. The premium to French Allophones learning English has increased to 3.9% from 1.4%, while the premium to English Allophones learning French has decreased from 12.6% to 10.4%. The premium that Anglophones enjoy over Francophones has been reduced by 10.4 percentage points to 5.7%.

The figures above show that there has been significant change between the years 1970 and 1980 in the way in which language is rewarded in the workplace. Everywhere French is seen to have increased its relative position with respect to English. This indicates that the marketplace is increasing the rewards for knowledge of French faster than the rewards for knowing English. While differences in wages are being reduced, it is clear that Anglophones still earn more, *ceteris paribus*, than their Francophone counterparts.

There has certainly been a shift toward decreasing the disadvantage of knowing French only. The language premiums are consistent with the interpretation that Quebec language policies have been successful in promoting the use of French in the marketplace, both government and private, and have gone some way to narrowing the gap between the returns to French and English. In fact in Quebec province, for Allophones, the return to learning French is substantially higher than the return to learning English. Similarly the return to English Allophones learning French is greater than the return to French

Allophones learning English. Quebec also shows the largest decline in the premium enjoyed by Anglophones over Francophones.

The evidence is somewhat mixed with respect to Federal language policies to promote bilingualism. For Anglophones in Canada and English Canada there is an increase in the premium to learning French between 1970 and 1980 (Table 4.6). Similarly, in 1980 in Canada and English Canada, the relative wage of bilingual Francophones, on account of language, is higher than that of Anglophones, while in 1970 the relative wage of bilingual Francophones, on account of language, is lower than that of Anglophones (see Tables 4.2 and 4.3). In contrast, in Quebec both Anglophones and Francophones show decreased returns to learning the other official language between 1970 and 1980 (Table 4.6). These results seem to be consistent with the view that Federal bilingualism policies have met with some measure of success in English Canada, but that a similar conclusion is more difficult to reach for Quebec.

#### **4.4 Summary**

The sources of wage difference statistics are calculated from estimates of the comparison model. It can be seen that the major contributors to the differences in wages per hour are experience, education and language.

Changes in the total source of wage difference statistic between 1970 and 1980 reflect a general improvement in wages (relative to Anglophones) for Francophones, bilingual Francophones, French Allophones and English Allophones. Bilingual Allophones show a deterioration in relative wages in all

areas except Montreal. Bilingual Anglophones show an improvement in their wages relative to Anglophones in Canada and English Canada, but a deterioration in relative wages in Quebec and Montreal. In contrast, Allophones experience a deterioration in relative wages in Canada and English Canada and an improvement in their wages relative to Anglophones in Quebec and Montreal.

Changes in the source of wage difference statistic for language, 1970-1980, show that Francophones have experienced a decrease in their wage disadvantage relative to Anglophones. The decrease is largest in Quebec. Bilingual Francophones now enjoy a wage premium over Anglophones in all areas but Montreal. This contrasts with the earnings discount for bilingual Francophones relative to Anglophones that Carliner reports for all areas in 1970. Bilingual Anglophones report an increase in their premium in Canada and English Canada but have experienced a reduction in their wage premium relative to Anglophones in Quebec. Montreal still reports a wage discount to bilingual Anglophones, although smaller in 1980 than in 1970.

The premiums to learning either official language have increased for Allophones between 1970 and 1980, and Francophones everywhere show an improvement in their relative wage position. On the whole, bilingualism carries a premium whether it be from learning English or French, though the returns to learning English continue to be higher<sup>35</sup> than the returns to learning French.

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35. The gap between the premium to learning English and the premium to learning French has decreased in the ten year period 1970-1980. See Table 4.6.

Changes in language premiums provide an indication of the success of Federal language policies. In Canada and English Canada, there are increased rewards to Anglophones learning French between 1970 and 1980. In addition, the language premium to bilingual Francophones is greater than that of Anglophones in 1980, while in 1970 the relative wage of bilingual Francophones, on account of language, is lower than that of Anglophones (see Tables 4.2, 4.3 and 4.6). These results seem to be consistent with the success of Federal bilingualism policies in Canada and English Canada. In Quebec, however, both Anglophones and Francophones show decreased returns to learning the other official language between 1970 and 1980. Further, bilingual Anglophones show a decreased wage premium relative to Anglophones between 1970 and 1980, while bilingual Francophones show a marked increase in their wage premiums relative to Anglophones (see Tables 4.4 and 4.6). These results make it much harder to argue in favour of the success of Federal bilingualism policies in Quebec.

With respect to the Quebec policy of promoting the use of French, the evidence is more firm. The province shows the largest decline, of all the regression areas, in the premium that Anglophones enjoy over Francophones between 1970 and 1980. In addition, the returns to learning French are, generally, greater than the returns to learning English. These results are consistent with the view that Quebec language policy has had a positive impact on the use of French in that province.

Finally, we note that some of the results from the comparison model may be coloured by the exclusion of relevant variables in the wage equation. For example, the lack of occupational control may result in some of the wage differences attributable to occupation being captured by the language coefficient. The following chapter introduces an extended model, which includes additional explanatory variables, to test the robustness of the results generated by the comparison model.

**CHAPTER 5**  
**THE EXTENDED MODEL**

**5.1 Rationale of the extended model**

The literature dealing with human capital models of wage determination reveals a number of variables, not included in the comparison model, that are thought to have an impact on wage determination. It is possible that the inclusion of additional relevant variables may alter the estimates of language premiums reported in the comparison model. The comparison model is thus extended to test the robustness of the findings reported for the comparison model.

The comparison model is extended by the addition of several variables: education squared, an interactive education/experience variable and a variable to control for occupation. Thus, the general form of the estimating equation becomes:

$$\begin{aligned} \ln(\text{WAGES}/\text{HOUR}) = & \alpha_0 + \sum \alpha_i \text{LANGUAGE}_i + \alpha_j \text{EDUC} + \alpha_f \text{EDSQ} \\ & + \alpha_k \text{EXP} + \alpha_h \text{EXPSQ} + \alpha_q \text{EXPED} + \sum \alpha_m \text{IMM}_m + \alpha_n \text{SIZE} \\ & + \sum \alpha_p \text{REGION}_p + \sum \alpha_w \text{OCC}_w \end{aligned} \quad (2)$$

This extended model is applied to the two main linguistic areas in our analysis, English Canada and Quebec. The additional variables in this model, education squared, the interactive education/experience variable and occupation are described in the following sub-sections.

### **5.1.1 Education Squared**

As with experience, it is likely that education enters the wage equation in a non-linear form. To incorporate this assumption an education squared variable has been introduced. This variable measures the square of the number of years of completed formal education, that is, the square of the EDUC variable described for the comparison model. It is expected that there is a peak number of years of formal education beyond which any additional education no longer adds positively to wages. Thus the sign of the estimated variable coefficient is expected to be negative. The variable name is EDSQ.

### **5.1.2 Interactive Education-Experience**

It is possible that education and experience have a combined effect on wages. The effect may be introduced in a number of ways. First, education may be more highly rewarded when combined with greater experience and *vice-versa*. Second, on the job training, for example, is counted as experience and not education. Also education is not counted as experience even if the on the job training is a part of the educational programme. Theoretically, each of the above examples should be counted as both education and experience.

To account for these possibilities an interactive education-experience variable is introduced, named EXPED. This variable measures the product of completed years of formal education and potential years of work experience, that is  $EXPED = (EDUC * EXP)$ . *A priori*, the estimated coefficient is

expected to have a positive sign since the interaction is expected to enhance the returns to experience and education.

### **5.1.3 Occupation**

It is well established in the literature that wages are likely to be different in different sectors of the labour market. To capture this an occupation variable is introduced. The occupation groups are generated using the Statistics Canada 1981 Standard Occupational Classification (SOC) as the reference. If an individual's occupation falls within the major occupation group listed under "Condition" the corresponding variable is assigned a value of 1. Otherwise, a value of zero is assigned.

<u>Condition</u> <sup>36</sup>	<u>Description</u>	<u>Variable Name</u>
11	Managerial (Reference Group)	OCC0
21	Natural Sciences	OCC1
23	Social Sciences	OCC2
27	Teaching	OCC3
31	Health	OCC4
41, 51	Clerical	OCC5
61	Service	OCC6
71	Agriculture	OCC7
73, 75, 77	Primary	OCC8
81, 82, 83, 85	Manufacturing	OCC9
87	Construction	OCC10
91	Transport	OCC11
25, 33, 93, 95, 99	Other	OCC12

36. A fuller description of the major occupation group numbers from the SOC is found in Appendix B.

## 5.2 Additional Descriptive Statistics

Tables 5.1 and 5.2 present the means for all variables used in the extended model. Since the bulk of these have been discussed in the chapters dealing with the comparison model, discussion here is limited to the occupation variables.

**TABLE 5.1: VARIABLE MEANS FOR ENGLISH CANADA - 1980  
EXTENDED MODEL**

	ENGMONO	ENGBIL	FREBIL	ALLOBIL	COMB2	ALLNON	ALLOENG	TOTAL
WAGE	9.72	10.83	9.16	9.18	7.47	7.11	8.85	9.69
AGE	37.31	37.23	36.98	39.96	38.46	44.38	41.04	37.61
EDUC	12.24	13.67	11.39	13.15	8.74	6.67	10.87	12.11
EDSQ	159.33	201.27	142.07	191.79	86.08	56.97	135.96	159.43
EXP	19.08	17.56	19.55	20.77	23.57	31.17	24.05	19.42
EXPSQ	535.10	454.11	567.24	610.45	796.81	1172.81	777.04	552.04
IMM0	0.811	0.816	0.947	0.086	0.922	0.016	0.078	0.758
IMM1	0.002	0.003	0.001	0.010	0.000	0.050	0.011	0.003
IMM2	0.039	0.033	0.016	0.276	0.039	0.444	0.305	0.060
IMM3	0.084	0.087	0.027	0.476	0.033	0.429	0.419	0.109
IMM4	0.064	0.061	0.009	0.152	0.006	0.061	0.188	0.071
SIZE1	0.516	0.581	0.343	0.819	0.178	0.889	0.811	0.539
SIZE0	0.484	0.419	0.657	0.181	0.822	0.111	0.189	0.461
ONTARIO	0.496	0.615	0.582	0.733	0.439	0.770	0.678	0.522
B.C.	0.166	0.121	0.029	0.110	0.017	0.106	0.148	0.157
PRAIRIES	0.239	0.175	0.127	0.133	0.033	0.116	0.167	0.225
MARITIMES	0.099	0.089	0.262	0.024	0.511	0.008	0.007	0.097
OCC0	0.147	0.210	0.122	0.119	0.028	0.013	0.065	0.144
OCC1	0.063	0.077	0.039	0.114	0.000	0.005	0.071	0.064
OCC2	0.011	0.028	0.011	0.019	0.000	0.003	0.003	0.012
OCC3	0.029	0.067	0.042	0.029	0.022	0.000	0.009	0.031
OCC4	0.011	0.017	0.009	0.010	0.017	0.000	0.012	0.012
OCC5	0.169	0.156	0.132	0.148	0.078	0.026	0.099	0.161
OCC6	0.070	0.082	0.098	0.138	0.139	0.262	0.120	0.077
OCC7	0.015	0.010	0.010	0.014	0.017	0.026	0.015	0.015
OCC8	0.021	0.024	0.056	0.005	0.128	0.005	0.012	0.022
OCC9	0.214	0.145	0.232	0.176	0.311	0.286	0.346	0.220
OCC10	0.102	0.066	0.117	0.114	0.117	0.267	0.136	0.104
OCC11	0.066	0.048	0.059	0.033	0.089	0.005	0.028	0.061
OCC12	0.080	0.071	0.072	0.081	0.056	0.101	0.082	0.079

**TABLE 5.2: VARIABLE MEANS FOR QUEBEC - 1980**  
**EXTENDED MODEL**

	ENGMONO	ENGBIL	FREBIL	ALLOBIL	FREMONO	ALLOFRE	ALLNONN	ALLOENG	TOTAL
WAGE	10.54	10.63	10.33	8.06	8.36	7.16	6.07	7.57	9.38
AGE	41.92	38.99	37.99	39.27	36.18	42.65	45.00	41.44	37.61
EDUC	12.41	12.75	12.57	10.95	10.36	7.88	6.85	10.33	11.40
EDSQ	167.51	174.84	169.95	139.24	116.61	76.39	60.52	123.03	144.56
EXP	23.49	20.23	19.42	22.24	19.77	28.40	31.65	25.00	20.09
EXPSQ	734.02	577.97	533.03	691.14	573.46	974.73	1176.77	806.56	576.90
IMM0	0.596	0.776	0.948	0.113	0.977	0.042	0.081	0.130	0.888
IMM1	0.009	0.001	0.000	0.004	0.000	0.000	0.016	0.007	0.001
IMM2	0.109	0.033	0.012	0.198	0.008	0.307	0.323	0.237	0.028
IMM3	0.181	0.102	0.027	0.508	0.011	0.526	0.532	0.470	0.057
IMM4	0.105	0.087	0.013	0.178	0.005	0.125	0.048	0.156	0.027
SIZE1	0.884	0.842	0.696	0.980	0.420	0.911	0.919	0.948	0.610
SIZE0	0.116	0.158	0.304	0.020	0.580	0.089	0.081	0.052	0.390
OCC0	0.197	0.241	0.207	0.101	0.073	0.036	0.000	0.078	0.145
OCC1	0.100	0.075	0.062	0.079	0.026	0.016	0.000	0.056	0.049
OCC2	0.008	0.012	0.014	0.004	0.004	0.005	0.016	0.000	0.009
OCC3	0.044	0.035	0.037	0.012	0.021	0.016	0.000	0.015	0.029
OCC4	0.014	0.013	0.017	0.022	0.018	0.010	0.016	0.011	0.017
OCC5	0.184	0.246	0.206	0.172	0.146	0.089	0.048	0.100	0.179
OCC6	0.084	0.062	0.090	0.138	0.094	0.146	0.242	0.237	0.093
OCC7	0.008	0.007	0.005	0.014	0.018	0.026	0.048	0.007	0.011
OCC8	0.006	0.006	0.008	0.000	0.022	0.010	0.016	0.007	0.013
OCC9	0.208	0.154	0.174	0.271	0.322	0.385	0.468	0.333	0.245
OCC10	0.041	0.045	0.056	0.085	0.110	0.182	0.113	0.067	0.080
OCC11	0.041	0.050	0.062	0.057	0.081	0.010	0.000	0.022	0.067
OCC12	0.065	0.054	0.064	0.045	0.067	0.068	0.032	0.067	0.064

The distribution of occupations is much the same in both areas being studied. Occupations, however, are not evenly distributed within each area, nor are they expected to be. The highest concentration is in the manufacturing occupations in both English Canada and Quebec, 22% and 25%, respectively. The smallest concentrations (1%) are found in the social sciences, agriculture and primary occupations in Quebec and in the social sciences and health occupations in English Canada.

Occupation is also not distributed evenly among language groups. The highest single occupational concentration in English Canada is of English Allophones in manufacturing , 35%. In Quebec the highest single concentration is of Allophones, also in manufacturing, 47%. There are a number of occupation-language intersections that are empty.

### **5.3 Estimation**

As with the comparison model, the error term in the model is suspected of being heteroskedastic. Consequently a test is conducted using the same methods as for the comparison model, and it is found that the assumption of homoskedasticity cannot be accepted. Further testing indicates that the most appropriate form of the heteroskedasticity is again the same as for the comparison model, that is,  $\ln(\text{RESID}^2) = K + a\text{EDUC} + b\text{EXP}$ . A discussion of the weights and their estimation is found in Appendix A.

### **5.4 Regression Results**

Two regressions are estimated, one for English Canada and one for Quebec using the general form of equation (2) presented in Section 5.1, weighted for heteroskedasticity. The results are presented in Table 5.3. The asterisks indicate that the estimated coefficients are not statistically different from zero at the 95% level for a two tailed test.

**TABLE 5.3: REGRESSION RESULTS - EXTENDED MODEL - 1980**

VAR	<u>English Canada</u>		VAR	<u>Quebec</u>	
	COEFF	STD ERROR		COEFF	STD ERROR
ENGBIL	0.037	0.0095	ENGBIL	-0.009*	0.021
FREBIL	0.008*	0.014	FREBIL	0.014*	0.018
ALLOBIL	-0.134	0.040	ALLOBIL	-0.109	0.029
COMB2**	-0.033*	0.044	FREMONO	-0.027*	0.019
			ALLOFRE	-0.167	0.043
ALLNONE	-0.116	0.030	ALLNONE	-0.364	0.070
ALLOENG	-0.055	0.011	ALLOENG	-0.210	0.036
EDUC	0.122	0.0039	EDUC	0.090	0.0065
EDSQ	-0.002	0.0001	EDSQ	-0.000*	0.0002
EXP	0.044	0.0006	EXP	0.064	0.0020
EXPSQ	-0.001	0.0000	EXPSQ	-0.001	0.0000
EXPED	-0.003	0.0001	EXPED	-0.002	0.0001
IMM1	-0.380	0.049	IMM1	-0.139*	0.127
IMM2	-0.138	0.011	IMM2	-0.201	0.024
IMM3	-0.040	0.0084	IMM3	-0.050	0.019
IMM4	0.026	0.0092	IMM4	0.027*	0.024
SIZE	0.062	0.0052	SIZE	0.061	0.0080
BC	0.110	0.0069			
PRAIRIES	0.017	0.0061			
MARITIMES	-0.090	0.0086			
OCC1	0.047	0.011	OCC1	0.020*	0.018
OCC2	-0.074	0.021	OCC2	0.041*	0.038
OCC3	-0.030	0.014	OCC3	-0.047	0.023
OCC4	-0.176	0.021	OCC4	-0.117	0.029
OCC5	-0.209	0.0080	OCC5	-0.243	0.013
OCC6	-0.304	0.0099	OCC6	-0.311	0.016
OCC7	-0.595	0.020	OCC7	-0.575	0.036
OCC8	0.021*	0.016	OCC8	0.050*	0.033
OCC9	-0.115	0.0078	OCC9	-0.170	0.013
OCC10	-0.089	0.0092	OCC10	-0.033	0.016
OCC11	-0.181	0.0114	OCC11	-0.230	0.018
OCC12	-0.207	0.0097	OCC12	-0.222	0.017
Const	0.683	0.04534	Const	0.787	0.067
R <sup>2</sup> Adjust.***	0.182		R <sup>2</sup> Adjust.***	0.238	
F-Stat	1137.807		F-Stat.	272.574	
# Obs.	61074		# Obs.	20703	

Notes:

\* Not significant at the 95% level, two tailed test.

\*\* COMB2 is the combined group of Francophones and French Allophones.

\*\*\* The adjusted R<sup>2</sup> refers to the statistic generated by the non-normalized model, as the normalized model will upwardly bias the estimated goodness of fit.

### **5.4.1 English Canada**

The results for the regression on the data for English Canada will be discussed first. The coefficients on the language groups are very similar to those found using the comparison model (Table 3.1). Both bilingual Francophones and the combined group of French Allophones and Francophones remain statistically insignificant. All the significant negatively signed language variables show a decrease in their wage disadvantage with respect to Anglophones. Bilingual Anglophones, positively signed, show an increase in their relative wage advantage over Anglophones.

The coefficient on education is noticeably larger while the coefficient for experience is smaller relative to the results estimated from the comparison model. Experience squared remains negatively signed. Education squared is seen to be negative, indicating a flattening out of the effect of education on wages.

The estimated coefficient for EXPED is also negative. This result is different from the expected sign. This switch in the expected sign of the EXPED coefficient may be the result of collinearity among the regressors. Specifically, we might expect the EDUC, EDSQ, EXP and EXPSQ variables to be highly correlated with the EXPED variable. Analysis of correlation coefficients between the independent variables suggests that the data may indeed be strongly correlated. Two observations moderate this concern. First, the estimates

remain unbiased and can be used for statistical inference<sup>37</sup>. Second, the size of the sample is large enough<sup>38</sup> to help compensate for any problems associated with possible multicollinearity.

A second possible explanation for the negative sign lies in the time dependent nature of the returns to education and experience<sup>39</sup>. For any given level of education, more experience is likely to decrease the returns to that education. Experience is a time related variable and with the passage of time education becomes dated unless it is periodically updated. Experience is a fairly good proxy for the time lapsed since the completion of formal education. For any given level of experience, additional education may decrease the returns to experience since the new knowledge may over-ride the effect of previous experience on wages earned. A number of other studies using a similar variable, for example, Gunderson (1979a, 1979b) and Shapiro and Stelcner (1982b, 1987b) report estimated coefficients that are significant and less than zero.

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37. A discussion of multicollinearity is found in Kennedy (1985 pp.146 - 156). The cost of including irrelevant multicollinear variables is that the true variance of the estimated coefficients may be higher. However, the estimates are still unbiased and may be used for statistical inference. On the other hand, not including relevant explanatory variables which are correlated with already included regressors results in biased estimates that are not useful for statistical inference.

38. The larger the sample size, the smaller the effect of multicollinearity on the variance of the estimated coefficient. This can be seen from the following formula:

$$\text{Var}(\hat{\beta}_j) = [\sigma^2/(N-1)] \cdot (1/[S^2(x_j) \cdot [1-R^2(j)]])$$

where

$\text{Var}(\hat{\beta}_j)$  is the true variance of the estimated coefficient,

$\sigma^2$  is the variance of the error term in the regression,

$S^2(x_j)$  is the sample variance of the regressor  $X_j$ ,

$R^2(j)$  is the  $R^2$  of the regression of  $X_j$  on all other  $X$ 's,

and  $N$  is the sample size.

Thus, when multicollinearity is present  $R^2(j)$  is close to 1 and  $1-R^2(j)$  is small, resulting in a large true variance. However, when  $N$  is large,  $1/(N-1)$  is small and the true variance is small.

39. Jacob Mincer (1974) has published work that suggests the returns to experience and education are time dependent.

The estimated coefficients on the immigration variables show mixed results. An increase in absolute terms, of the effect of immigration on wages, is reported for IMM1 and IMM2 in the extended model relative to the comparison model. IMM3 is a little smaller, while IMM4 has changed sign from negative to positive.

The effect of region on wages is also seen to be different from the estimates reported for the comparison model. British Columbia shows a stronger positive effect while the Maritimes show a stronger negative effect. The effect of residing in the Prairies is seen to be diminished. The coefficient on the size of place variable has increased relative to the comparison model estimates.

The coefficients on the occupation variables are all significant except for the primary occupations. The negative sign on health occupations is probably explained by the fact that doctors are mostly classified as self-employed and therefore do not fall within the study sample. As expected, the managerial occupations (the reference occupations) have a higher wage than most other occupations. The positive but insignificant coefficient on the Primary occupations is puzzling, but may in part be explained by the high degree of union membership among the primary occupations. The positive coefficient on the Natural Sciences and Engineering category may be attributable to the category containing a high proportion of highly qualified personnel. Also, there tends to be some overlap between engineering and administrative positions that is not captured by the census.

### **5.4.2 Quebec**

As with the results for English Canada there are some noticeable differences in the estimated coefficients from the extended model compared with the comparison model. The coefficients for bilingual Anglophones, bilingual Francophones, Francophones, IMM1 and IMM4 remain statistically insignificant, though the sign for bilingual Anglophones has changed from positive to negative. The estimated coefficients for bilingual Allophones, French Allophones and Allophones show a worsening of relative wage positions while English Allophones show a slight improvement relative to estimates using the comparison model.

Education and Experience both show increases in their coefficients. Education squared is not statistically different from zero and EXPED is again seen to be negative.

The effects of both IMM2 and IMM3 on relative wages are seen to be stronger than in the comparison model, as is the effect of the SIZE variable.

The estimated coefficients for three occupation variables are not statistically different from zero; the natural sciences, the social sciences and primary occupations. Explanations for the positive signs on primary and natural science occupations are the same as described above for English Canada. All the other occupation groups show a relative wage disadvantage with respect to managerial and related occupations.

In sum, the extended model does point to an underspecified comparison model. The adjusted  $R^2$  on the non-normalized data show an improvement in goodness-of-fit over the comparison model for both regression areas<sup>40</sup>. Also, the added variables show statistically significant coefficients.

### 5.5 Sources of wage difference

The estimates of the contributions of education and experience are calculated differently from those in the comparison model because of the added variables EDSQ and EXPED.

Formally the source of wage difference due to education remains:

$$\partial \ln(\text{WAGES}/\text{HOUR})/\partial \text{EDUC},$$

which results in:

$$\beta_{j\text{EDUC}} = (\alpha_{j\text{EDUC}} + 2\alpha_{j\text{EDSQ}}\text{EDUC} + \alpha_{j\text{EXPED}}\text{EXP}).$$

Applying this to mean differences in education between language groups, the statistic becomes  $\beta_{j\text{EDUC}}(\text{EDUC}_{ij} - \text{EDUC}_{ej})$ .

Similarly, the experience statistic is expanded and takes the form:

$$(\alpha_{j\text{EXP}} + 2\alpha_{j\text{EXPSQ}}\text{EXP} + \alpha_{j\text{EXPED}}\text{EDUC})(\text{EXP}_{ij} - \text{EXP}_{ej}).$$

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40. To test whether the additional variables add to the explanatory value of the model an F-Test is used to determine whether the estimated coefficients for the new variables are jointly equal to zero. The methodology used is described in Pindyck and Rubinfeld (1981, pp.117-120). The results of the F-Test reject the null hypothesis for both English Canada and Quebec. The F-Statistics are 3502.0 and 214.33 for English Canada and Quebec respectively, and the F-critical value, at the 1% level, is 3.78.

The statistics for the source of wage difference for immigration, size of place, region and the language residuals are calculated in the same way as in the comparison model, as are the "Total" wage difference statistics. The statistic for Occupation is calculated in the same manner as for immigration and region. The statistics for each of the twelve categories are summed to a total occupation statistic.

### **5.5.1 Results**

The source of wage difference statistics for the extended model are presented in Table 5.4. Changes to the total wage difference due to the inclusion of the extra variables are varied in size and magnitude. However, the estimated total wage difference statistics retain the same sign pattern as those reported for the comparison model (Table 4.1). In English Canada bilingual Anglophones retain their relative wage advantage while all other groups are relatively disadvantaged with respect to Anglophones. In Quebec all groups remain relatively disadvantaged with respect to Anglophones.

The magnitude of the statistics are, however, quite different from those estimated using the comparison model. In English Canada the advantage to bilingual Anglophones has risen to 14.6% from 9.1%. Relative wage disadvantages have been increased for all other groups relative to Anglophones.

The patterns seen for Quebec are not as uniform. Allophones, French Allophones and English Allophones all show an improvement in their wage position relative to Anglophones as a result of the inclusion of the occupation

and enhanced education variables. The remaining groups, bilingual Anglophones, bilingual Francophones, bilingual Allophones and Francophones all show increases in the estimated total wage disadvantage relative to Anglophones.

**TABLE 5.4: SOURCES OF WAGE DIFFERENCES  
FOR THE EXTENDED MODEL - 1980  
ENGLISH CANADA and QUEBEC**

<u>English Canada</u>							
	ENGBIL	FREBIL	ALLOBIL	-----COMB2*-----	ALLNON	ALLOENG	
LANG	-0.037	-0.008	0.134	0.033	0.116	0.055	
EDUC	-0.080	0.046	-0.044	0.170	0.183	0.060	
EXP	-0.014	0.003	0.019	0.015	0.076	0.045	
IMM	0.000	-0.004	0.049	-0.001	0.088	0.050	
SIZE	-0.004	0.011	-0.019	0.021	-0.023	-0.018	
REGION	0.005	0.032	0.001	0.057	0.001	-0.005	
OCC	-0.016	-0.001	0.005	0.016	0.051	0.011	
<u>TOTAL</u>	<u>-0.146</u>	<u>0.079</u>	<u>0.145</u>	<u>0.311</u>	<u>0.492</u>	<u>0.198</u>	
<u>Quebec</u>							
	ENGBIL	FREBIL	ALLOBIL	FREMONO	ALLOFRE	ALLNON	ALLOENG
LANG	0.009	-0.014	0.109	0.027	0.167	0.364	0.210
EDUC	-0.016	-0.008	0.062	0.097	0.139	0.136	0.077
EXP	0.067	0.088	0.028	0.096	-0.115	-0.185	-0.032
IMM	-0.020	-0.026	0.032	-0.027	0.055	0.063	0.038
SIZE	0.003	0.011	-0.006	0.028	-0.002	-0.002	-0.004
OCC	-0.002	0.005	0.029	0.031	0.035	0.068	0.044
<u>TOTAL</u>	<u>0.041</u>	<u>0.056</u>	<u>0.254</u>	<u>0.252</u>	<u>0.279</u>	<u>0.444</u>	<u>0.333</u>

Notes:

\* COMB2 is the combined group of Francophones and French Allophones.

Overall, the smallest change is a 0.6 percentage point increase, in the extended model relative to the comparison model, in wage disadvantage for bilingual Allophones in Quebec. The largest change, also in Quebec, is a 16 percentage point decrease in relative wage disadvantage for Allophones.

## **5.6 Language Premiums**

Table 5.5 presents the language premiums<sup>41</sup> for English Canada and Quebec estimated using the extended model as well as language premiums calculated from the comparison model and from Carliner's study. The premiums to learning a second or third language remain of much the same magnitude and sign as those reported for the comparison model with three notable exceptions. The only sign changes are for Anglophones learning French in Quebec who move from a 0.3% premium to a -0.9% disadvantage, and Allophones learning both official languages in English Canada who move from a 2.4% premium to a -1.8% discount. The only noticeable change in magnitude is from an 11.8% premium to a 6.1% premium for Allophones learning English in English Canada.

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41. For a description of how these premiums are calculated see footnote 25.

**TABLE 5.5: LANGUAGE PREMIUMS FOR ENGLISH CANADA & QUEBEC  
1970 AND 1980 (COMPARISON AND EXTENDED MODELS)**

**ENGLISH CANADA**

	Extended Model (1980)	Comparison Model (1980)	Carliner's Model (1970)
	%	%	%
ENGBIL <sup>a</sup>	3.7	3.5	0.4
FREBIL <sup>b</sup>	*	*	*
ALLOBIL <sup>c</sup>	-1.8	2.4	4.1
ALLOBIL (F) <sup>d</sup>	-7.9	-9.4	2.4
ALLOBIL (E) <sup>e</sup>	*	*	*
FREMONO <sup>f</sup>	*	*	*
ALLOFRE <sup>g</sup>	*	*	*
ALLOENG <sup>h</sup>	6.1	11.8	1.7

**QUEBEC**

	Extended Model (1980)	Comparison Model (1980)	Carliner Model (1970)
	%	%	%
ENGBIL <sup>a</sup>	-0.9	0.3	1.5
FREBIL <sup>b</sup>	4.1	4.8	10.1
ALLOBIL <sup>c</sup>	25.5	23.7	15.8
ALLOBIL (F) <sup>d</sup>	10.1	11.3	7.4
ALLOBIL (E) <sup>e</sup>	5.7	2.6	4.2
FREMONO <sup>f</sup>	2.7	2.5	17.3
ALLOFRE <sup>g</sup>	19.8	21.1	11.3
ALLOENG <sup>h</sup>	15.4	12.4	8.4

**Notes**

- a. Premium to Anglophones learning French.
- b. Premium to Francophones learning English.
- c. Premium to Allophones learning both English and French.
- d. Premium to English Allophones learning French.
- e. Premium to French Allophones learning English.
- f. Premium enjoyed by Anglophones over Francophones.
- g. Premium to Allophones learning French.
- h. Premium to Allophones learning English.

\* Indicates unable to compute.

\*\* COMB2 represents the combined group of Francophones and French Allophones.

The numbers for the Comparison model are from Table 4.6.

The numbers for the Carliner model are computed from Carliner (1981, Table 2, pp.392-393)

Evidence pointing to the success of Federal language policies in English Canada is found in a comparison of the language premium estimates presented in Table 5.5. In general, the results from the extended model tend to confirm the results from the comparison model. That is, Federal language policies may be seen to be responsible, in part, for shifting the language market by increasing the rewards to bilinguals. The premiums to Anglophones learning French are higher in 1980 (from the extended model) than in 1970. In addition, estimates of the premiums to bilingual Francophones over Anglophones are greater in 1980 than in 1970. Although inconclusive, indications from the estimated regression coefficients for the combined group of Francophones and French Allophones suggest there is a premium to Francophones learning English.

Two language policies are relevant to Quebec: the Federal policy promoting bilingualism and the Quebec policy promoting the use of the French language. Table 5.5 shows that, in Quebec, there is a reduction in the returns to both Anglophones learning French, and Francophones learning English between 1970 and 1980 (the extended model). These results tend to confirm the findings reported for the comparison model that suggest the impact of Federal language policies are difficult to detect in Quebec. The evidence with respect to Quebec language policy (drawn from Table 5.5) is stronger. The returns to Allophones learning French are greater than the returns to learning English in the extended model (1980) versus 1970. In addition the change in these latter premiums, 1970 to 1980, is greater for learning French. Finally, the much reduced premium (1970 to 1980) that Anglophones enjoy over Francophones, reported in the comparison model is repeated in the extended model. These results tend to

confirm the findings of the comparison model with respect to Quebec language policies, that is, the Quebec policy appears to have had some impact on the language market.

### **5.5 Summary**

A number of variables are added to the comparison model in an attempt to determine the robustness of the estimates reported for this model. The additional variables include occupation and enhanced education variables. Two regions are studied, English Canada and Quebec. Occupations are not evenly distributed within each regression area. However, the distribution of occupations is similar in both English Canada and Quebec. The highest concentration of workers is found in the manufacturing occupations and the lowest in the natural sciences for both regions.

The added variables yield somewhat different estimated results from those of the comparison model. Education has a greater impact in both areas as does the size of place variable. Some change is also seen in the language residuals. In Quebec, the estimated language residuals are increased with respect to Anglophones for nearly all language groups. The estimated language residuals with respect to Anglophones are reduced for nearly all groups in English Canada. The extended model provides a better goodness-of-fit statistic than the comparison model and the included variables are shown to be

significant<sup>42</sup>. Therefore, we conclude that the extended model is a better model with which to examine the determinants of wages.

The sources of wage difference statistics calculated from the extended model tend to maintain the pattern of total change seen in the comparison model. The magnitudes, however, are somewhat different. Nevertheless, the premiums to learning a second or third (official) language remain much the same as those reported for the comparison model.

Evidence regarding the success of Federal government language policies reported from the comparison model is, generally, upheld by the extended model. Federal policies to promote bilingualism appear to have had some impact in English Canada as evidenced by the increased premiums to Anglophones learning French between 1970 and 1980, and the increase in the premium to bilingual Francophones over Anglophones in the same period. In Quebec, on the other hand, the impact of Federal bilingualism policies are difficult to detect. As regards Quebec policy to promote the French language, the results from both the extended and comparison models tend to point to some success with respect to the effectiveness of Quebec language policy.

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42. See footnote 40.

## CHAPTER 6

### CONCLUSIONS

#### 6.1 Overview

The official bilingual nature of Canada lends importance to questions concerning the economic returns to language skills. In addition, government legislation<sup>43</sup> and policies to promote bilingualism in Canada and French in Quebec may have played a role in changing the nature of the language market in Canada. Demographic changes may also have had some effect on the language market in Canada. The purpose of this study is twofold; to determine a measure of changes in the labour market with respect to language in the years between 1970 and 1980, and to ascertain whether an extension of this basic comparison model alters the results in any significant way.

The theoretical framework for the study indicates that there are premiums to bilingualism, that Anglophones enjoy a wage premium over Francophones, and that Allophones receive a premium to learning either or both English and French.

A review of the literature dealing with the returns to language in Canada reveals three main findings which tend to corroborate the theoretical wage hierarchy. First, Anglophones enjoy a wage premium over Francophones. Second, Francophones receive a premium for learning English but Anglophones,

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43. Legislation includes the Official Languages Act of 1969 (Canada) and Bills 63, 22, and 101 (Quebec). See also footnotes 6 and 8.

generally, do not earn a premium for learning French. Third, Allophones receive a premium for learning either or both official languages.

Analysis of the sample data reveals changes in characteristics of all language groups during the ten year period 1970 to 1980. Relative wages tend to be higher, with respect to Anglophones, in 1980 than in 1970. Relative differences in years of formal education tend to be less in 1980 than in 1970.

This study shows that there remain differences in the returns to language in Canada. However, some significant changes have occurred in the ten year period 1970 to 1980. The wage gap between Anglophones and Francophones, *ceteris paribus*, has been narrowed by about 10 percentage points. An important change is the premium to bilingual Francophones over Anglophones. In 1970 Anglophones enjoy a premium over bilingual Francophones. By 1980, bilingual Francophones, generally, report an estimated language premium over Anglophones (see Tables 4.2 - 4.5). In addition, the difference in returns to learning English relative to learning French is smaller in 1980 than in 1970 (see Table 4.6).

## **6.2 The Comparison Model**

The comparison model replicates the study by Carliner (1981). Five regressions are estimated using 1980 data, one for each of Canada, Quebec, English Canada, the CMA of Toronto and the CMA of Montreal. The estimated coefficients, on the whole, reflect similar sign and significance as those reported by Carliner (1981).

In general, the regression results support the wage hierarchy presented in the theoretical framework. Calculation of source of wages difference statistics, and the returns to learning official languages are performed using the regression results. For the bulk of language groups considered, in all areas, the premiums to learning either or both official languages have increased in the period 1970 to 1980. The premium that Anglophones enjoy over Francophones has noticeably decreased in the ten year period. In Canada as a whole, the premium has been reduced by over 85%, from 12.3% in 1970 to 1.7% in 1980. The estimates show further that bilingualism is rewarded for both Francophones and Anglophones in all regions except Montreal. That is, both bilingual Francophones and bilingual Anglophones earn a premium over Anglophones. This last finding is a departure from the Carliner (1981) study which reports only bilingual Anglophones earning a premium over Anglophones.

### **6.3 The Extended Model**

To further analyse the structure of wages among language groups the basic comparison model is enlarged to include an occupational variable and enhanced education variables. This extended model is then estimated using 1980 data for two areas: English Canada and Quebec. The extended model is used to test the robustness of the results of the comparison model.

The estimated coefficients reveal education to have a greater effect on wages in both areas, and experience to have a stronger effect in English Canada

than is reported for the comparison model. Language premiums remain much the same as those reported for the comparison model.

Estimated sources of wage differences show that the total source of wage difference retains the pattern reported for the comparison model. However, in English Canada the absolute value of the total is larger in all instances for the extended model.

Results from the extended model tend to corroborate the findings reported in the comparison model.

#### **6.4 Policy Considerations**

Prior to 1970, and between 1970 and 1980, there have been a number of government initiatives to promote bilingualism and the French language. These have been described in Chapter 1, Section 1.4.1<sup>44</sup>. This study provides estimates of some indicators of the success of Federal government policies to promote bilingualism. There are two interrelated indicators which are estimated in the study: first, the premiums to bilinguals over Anglophones, and second, the returns to learning a second official language. The evidence, based on changes over the ten year period 1970 to 1980, is somewhat mixed with respect to the success of Federal government language policies.

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44. See footnotes 6 and 8.

In English Canada, the premiums to bilingual Anglophones and bilingual Francophones over Anglophones has increased in the ten year period, 1970 to 1980. Results from the extended model tend to corroborate the results from the comparison model. Bilingual Francophones report a premium over Anglophones that is not reported for 1970. The premium to Anglophones learning French has increased over the ten year period 1970 to 1980 (see Table 5.5). The data do not allow calculation of the premiums to Francophones learning English. Thus the bulk of the evidence is consistent with the success of Federal language policies in English Canada.

Evidence for Quebec, regarding Federal language policies, is more difficult to interpret. Again, results from the extended model tend to confirm findings reported in the comparison model (see Table 5.5). On the one hand, bilingual Francophones earn a higher premium over Anglophones in 1980 than in 1970 suggesting some impact by the Federal policy. On the other hand, Bilingual Anglophones earn a lower premium over Anglophones in 1980 than in 1970 and the premiums to learning the other official language are lower in 1980 for both Anglophones and Francophones. These latter findings might be seen to be consistent with the view that Federal language policies have had no impact in Quebec

With respect to Quebec language policies the evidence more clearly supports the view that these policies have been at least partially successful in promoting the French language. Francophones report a substantially lower wage discount with respect to Anglophones in 1980, for both the comparison and

extended models, than in 1970. In addition the returns to learning French are, on the whole, greater than the returns to learning English in Quebec (see Table 5.5). Thus, it may be argued that these results are consistent with the success of Quebec policy to promote the French language.

At this point a not uncommon caveat must be noted. Specifically, the results reported must be interpreted with some caution. First, the extended model, while yielding a better goodness-of-fit statistic than the comparison model, still reports relatively low adjusted  $R^2$ s. Thus, there may still be relevant explanatory variables missing from the model, for example, an indicator of the distinction between the public and private sectors, which results in the estimates being biased and inefficient. Second, some of the language premiums reported are calculated using estimated coefficients that are not significantly different from zero.

Although it is felt that such an undertaking is beyond the scope of this thesis, an extension of this study would be to construct confidence intervals for the calculated source of wage difference statistics, and the premiums to learning official languages.

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## APPENDIX A

### Heteroskedasticity Tests

The Goldfeld-Quandt method is used to test for heteroskedasticity. Each regression area, or data grouping is sorted by the dependent variable, WAGES/HOUR. Then each data grouping is subdivided into 3 groups, a lower, middle and upper sample. The size of the lower and upper samples are identical. Both lower and upper samples are then regressed separately, for each region. The null hypothesis, that the residual sum of squares is equal for both upper and lower data samples is then tested. To do this, the ratio of the residual sums of squares, an F-statistic, is compared with a critical F-value. If the F-statistic is different from the F-value, we fail to accept the null hypothesis of homoskedasticity.

#### A.1 Results

<b>Comparison Model</b>	<b>F= S1/S2</b>	<b>F critical</b>	<b>Sample Size</b>	<b>D.F.</b>
Canada	7.308	1.00	30,000	29,980
English Canada	8.237	1.00	22,000	21,982
Quebec	5.742	1.00	7,600	7,584
Montreal	5.841	1.00	3,700	3,685
Toronto	7.262	1.00	4,500	4,487

<b>Extended Model</b>	<b>F = S1/S2</b>	<b>F critical</b>	<b>Sample Size</b>	<b>D.F.</b>
English Canada	8.323	1.00	22,000	21,968
Quebec	6.001	1.00	7,600	7,570

### A.2 Specification of correcting weight.

A number of alternative specifications are tested to determine a best estimate of the form of the heteroskedasticity in the data. Six specifications are tested for the data used in the comparison model.

- 1.)  $\ln(\text{RESID}^2) = K + a[\ln(\text{EDUC})]$
- 2.)  $\ln(\text{RESID}^2) = K + a[\ln(\text{EXP})]$
- 3.)  $\ln(\text{RESID}^2) = K + a[\ln(\text{EDUC})] + b[\ln(\text{EXP})]$
- 4.)  $|\text{RESID}| = K + a\text{EDUC}$
- 5.)  $|\text{RESID}| = K + a\text{EXP}$
- 6.)  $|\text{RESID}| = K + a\text{EDUC} + b\text{EXP}$

On the basis of regression estimates of  $K$ ,  $a$ , and  $b$ , the best form is #3. Consequently this is the form used to determine the correcting weights in the comparison model. The coefficients used in the weighting are reported below.

<u>Region</u>	<u>Coefficient</u>	<u>Standard Error</u>
<b>Canada</b>		
<i>a</i>	-0.241266	0.024246
<i>b</i>	-0.093651	0.009789
<b>English Canada</b>		
<i>a</i>	-0.285373	0.029103
<i>b</i>	-0.107256	0.011240
<b>Quebec</b>		
<i>a</i>	-0.146299	0.020203
<i>b</i>	-0.043408	0.045290
<b>Toronto</b>		
<i>a</i>	-0.014839	0.057556
<i>b</i>	-0.020298	0.025339
<b>Montreal</b>		
<i>a</i>	-0.134043	0.062683
<i>b</i>	-0.010691	0.028341

The absolute residual forms, #4 - #6, do not exhibit any consistent significance. Consequently they are omitted and three forms are tested for the extended model.

- 1.)  $\ln(\text{RESID}^2) = K + a\ln(\text{EDUC})$
- 2.)  $\ln(\text{RESID}^2) = K + a\ln(\text{EXP})$
- 3.)  $\ln(\text{RESID}^2) = K + a\ln(\text{EDUC}) + b\ln(\text{EXP})$

Again, form #3 is chosen to determine the weights. The coefficients used in the weighting are reported below.

<u>Region</u>	<u>Coefficient</u>	<u>Standard Error</u>
<b>English Canada</b>		
<i>a</i>	-0.28857	0.02955
<i>b</i>	-0.12462	0.01139
<b>Quebec</b>		
<i>a</i>	-0.11906	0.04639
<i>b</i>	-0.00907	0.02063

## APPENDIX B

### OCCUPATIONAL CLASSIFICATIONS

The following description of occupation major groups is taken from the 1981 Standard Occupation Classification published by Statistic Canada (catalogue number 12-566E).

<u>Major Group</u>	<u>Description</u>
11	Managerial, Administration and related occupations.
21	Occupations in the Natural Sciences, Engineering and Mathematics.
23	Occupations in the Social Sciences and related fields.
25	Occupations in Religion.
27	Teaching and Related occupations.
31	Occupations in Medicine and Health.
33	Artistic, Literary, Recreational and related occupations.
41	Clerical and related occupations.
51	Sales occupations.
61	Service occupations.
71	Farming, Horticultural and Animal Husbandry occupations.
73	Fishing, Trapping and related occupations.
75	Forestry and Logging occupations.
77	Mining and Quarrying including Oil and Gas Field occupations.

81/82	Processing Occupations.
83	Machining and related occupations.
85	Product Fabricating, Assembling and Repairing occupations.
87	Construction Trades occupations.
91	Transport Equipment Operating occupations.
93	Material Handling and related occupations, not elsewhere classified.
95	Other Crafts and Equipment Operating occupations.
99	Occupations not elsewhere classified.

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EARNING MALES: CANADA - 1980

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Leslie Lax

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