A MODEL OF THE LABOUR SUPPLY DETERMINANTS OF CANADA'S ELDERLY POPULATION

by

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B.A., The University of British Columbia, 1978

A THESIS SUBMITTED IN PARTIAL FULFILMENT OF

THE REQUIREMENTS FOR THE DEGREE OF

MASTER OF ARTS

in

THE FACULTY OF GRADUATE STUDIES

(School of Community and Regional Planning)

We accept this thesis as conforming

to the required standard

THE UNIVERSITY OF BRITISH COLUMBIA

September 1981

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ABSTRACT

This study examines Canada's aging trend, the factors influencing the elderly's withdrawal from the labour force, and the implications of the two trends for planners and policy makers. Canada's population is aging. The absolute and relative number of people 65 and over is projected to increase well into the twenty-first century. Over this same period of time the elderly, defined as those persons 65 and over, are expected to reduce their participation in the labour force. With a greater proportion of elderly in the population and fewer of them working the costs and burdens involved with supporting this segment of the population will increase. It is important, therefore, that planners and policy makers understand why the population is aging, why the elderly are withdrawing from the labour force, and what the possible economic and social implications of these trends are.

Based on explanatory models of the elderly's labour force participation constructed mainly by researchers in the United States, a multiple regression analysis is conducted which attempts to evaluate those variables included in an explanatory equation which accounts for the variance in the elderly's labour force participation rate in Canada. Cross-section analyses are conducted for three years--1961, 1971, and 1976--with data derived principally from Statistics Canada census sources and aggregated at the provincial level.

In contrast to studies originating in the United States, the results obtained in this study found pension benefits were not the most significant factor in explaining the decline in the elderly's

labour force participation in Canada. Both the unemployment rate and the occupation chosen by an elderly labour force participant consistently proved to be more significant factors in accounting for the variance in the elderly's labour force participation rate in Canada.

The economic and social implications of a society which is aging and one in which an increasing number of elderly are choosing not to work are discussed. The two areas in which future planners and policy makers will face the most pressing problems in terms of funding and program delivery are the public pension and health care services. There will be a number of other areas affected by the increased incidence of elderly retired persons in the population. It is important, therefore, that research be conducted today, at all levels, into the various impacts a large proportionate increase in non-working elderly will have on Canadian society in the future.

ACKNOWLEDGEMENT

I would especially like to acknowledge the inspirator and motivator behind this thesis--my mother, the greatest educator in my life.

TABLE OF CONTENTS

	Page
ABSTRACT	ii
ACKNOWLEDGEMENT	iv
TABLE OF CONTENTS	v
LIST OF TABLES	viii
LIST OF FIGURES	ix
CHAPTER	
1. INTRODUCTION	1
A. Problem Statement	1
B. Thesis Objectives	3
C. Methodology	4
2. DEMOGRAPHIC AND ECONOMIC CHARACTERISTICS OF THE ELDERLY	6
A. The Aging of the Population	6
B. Historic Measures of the Elderly's Labour Supply and Projected Dependency Ratios	14
3. A MODEL OF THE LABOUR SUPPLY DETERMINANTS OF THE ELDERLY	21
A. The Elderly and the Labour Supply	21
(i) Labour Supply Theory	21
(ii) The Elderly's Labour Supply Determinants	35
(a) Pension Related Factors	36
(b) Health Related Factors	40
(c) Economic Factors	42
(d) Other Financial Factors	45
(e) Family and Individual Factors	48
B. A Model of the Elderly's Labour Supply	50

(i) The Model 50

(ii) The Dependent Variable 51

(iii) The Independent Variables 51

4. THE EMPIRICAL FINDINGS 56

A. The Data Base 56

B. Discussion of Results 57

C. Principal Data and Model Deficiencies 66

(i) Deficiencies Particular to the Data 66

(a) Lack of a Health Variable 66

(b) Lack of Disaggregated Data 67

(c) Other Data Deficiencies 68

(ii) Deficiencies Particular to the Model 68

(a) Possible Problems Associated With Multicolinearity 69

(b) Possible Bias in the Selection of Variables 73

5. CONCLUSION 75

A. Implications of an Aging Society 75

(i) Economic 75

(a) The Dependency Burden 75

(b) Productivity 82

(c) Mobility 83

(d) Consumption, Saving, and Investment 84

(ii) Social 86

(a) Political Implications 87

(b) Planning and Administrative Implications 87

(iii) Implications of the Regression Analysis 89

B. Directions for Future Research 93

BIBLIOGRAPHY 95

GLOSSARY 102

APPENDICES

A. Raw Data 103

B. Variables in Retirement and Pre Retirement Surveys 105

C. Selected Models Used by Researchers of the Elderly's Labour Supply 108

LIST OF TABLES

Table		Page
I.	Number and Proportion of Elderly in Total Population 1851-1976	7
II.	Rates of Birth, Death, and Natural Increase, Canada, 1851-1976	8
III.	Rates of Immigration, Emigration and Net Migration, Canada, 1851-1976	10
IV.	Projected Proportions of Population 65 and Over, Canada, 1976-2051	12
V.	The Labour Force and Participation Rates for Canada's Elderly, 1921-1976	15
VI.	Young, Old, and Total Dependency Ratios, Canada, 1881-1976	18
VII.	The Burden of the Non-Working Elderly, Canada, 1921-2000	19
VIII.	Results of Regression Analysis	60
IX.	Results of Regressions Corrected for Multicolinearity	71

LIST OF FIGURES

Figure		Page
I.	The Individual Labour Supply Function	23
II.	The Effect of Pension Plans on Individual Labour Supply	27
III.	Work and Leisure Profiles of the Three Activity Life-Cycle Models	32

Chapter 1

INTRODUCTION

A. Problem Statement

The research presented in this thesis most appropriately fits into the field of study known as Labour, or Manpower, Economics. The field of manpower economics has been defined as the subdivision of economics that deals with the forces operating within labour markets (Jakubauskas and Palomba, 1973). One of the most pressing labour market problems includes the increasing trend towards decreased labour force participation of the elderly (earlier retirement), coupled with greater longevity and a growing proportion of elderly population.

As Canada approaches the twenty-first century the elderly, defined in this study as that part of the population 65 and over, are expected to comprise a substantially larger proportion of the total population. By the year 2031 population projections assuming low fertility, low mortality, and medium net migration foresee that over one in four Canadians will be 65 years or older. This compares with approximately one in ten today. In addition, labour force participation rates for Canada's elderly have been decreasing from 33 percent in 1921 to just over 9 percent in 1976 (Denton, Feaver, and Spencer (1980); and Denton and Ostry (1967)). The implications of these dramatic changes in Canada's age profile and labour market activity are numerous and socially pervasive. Many questions stem from these demographic and economic changes. It is the purpose of this thesis to address just one.

As the average Canadian progresses through the life-cycle he, or she, generally engages in some form of employment. This action adds to the amount of economic activity in the nation and provides support through contributions to social security programs for young dependents and old dependents. Support programs for both groups of dependents include a number of government programs which make direct transfer payments to the two groups. Examples of these programs include the Family Allowance for young dependents and the Old Age Security (O.A.S.) and Guaranteed Income Supplement (G.I.S.) for elderly dependents.

Ultimately, the time comes when the contributor to social security programs retires or withdraws from participation in the labour force and himself becomes dependent, to some degree, on those still active in the labour force for support. The reasons for this withdrawal, or for participation past 65, the generally accepted age of retirement, are many and varied. Given that after the turn of the century over one quarter of Canada's population will be of retirement age (assuming that the age of pension and/or retirement eligibility will remain at 65), and that the labour force participation rate of this age group is expected to decline, it is important that the factors which determine the elderly's decision to retire from the labour force, or participate in it, be understood. Policies designed to alleviate the economic and social burdens of this demographic trend can only be formulated through careful analysis of the factors determining population aging and elderly labour supply.

It is the purpose of this thesis to focus attention on the relative importance of the factors which determine the labour force

participation of the elderly or, conversely, their decision to retire. Expressed as a problem, the thesis will attempt to answer the following question: what factors explain the decision of the elderly to participate in the labour force or withdraw from it? Stated another way, the problem might be better understood as: what are the main factors which cause the elderly to retire, or contimue working past the age of 65?

B. Thesis Objectives

To properly address the problem posed and relate it to the professional planning field the thesis will have three objectives.

(1) To analyse the demographic and labour force characteristics of Canada's elderly population (elderly being defined as those persons 65 years of age and older).

Prior to explaining the relative importance of the factors which lay behind the elderly's decision to retire from the labour force it is helpful to understand the demographic and economic factors which will determine the elderly's large proportionate increase in the population, and how the elderly have historically faired as participants in the labour force market.

(2) To propose a model which explains the labour supply determinants of Canada's elderly population.

There is a dearth of Canadian studies which attempt to explain the labour supply determinants of Canada's elderly. American studies in this area are somewhat more numerous. Unfortunately, however, most of these studies limit their analysis to participants less than 65 years old. In conjunction with a review of the empirical and theoretical studies on labour supply determinants this

thesis proposes a cross-sectional analysis of the labour supply determinants of Canada's elderly population.

(3) To address the findings associated with objectives 1 and 2 and comment on the policy implications each will have for the professional planner and decision maker.

It is important to understand the problems planners and decision makers must cope with when faced with an aging society and one in which a smaller proportion of the population contributes to the economic activity of the country. An understanding of the factors which explain the elderly's decision to retire, or to continue participating in the labour force, can assist in the formation of policies and programs designed to lessen the burden of an expanding aged and less economically productive proportion of the population.

C. Methodology

The methodology adopted to analyse what factors explain the decision of Canada's elderly to participate in the labour force or withdraw from it is that of constructing a step-wise inclusion least squares multiple linear regression model. The multiple regression technique was chosen for three main reasons:

(1) The step-wise inclusion least squares multiple linear regression technique provides an evaluative response to the various determinants included in the explanatory equation of the labour supply of the elderly. Additionally, the technique allows tests of reliability and significance to be applied to the derived output.

(2) The technique duplicates that used in other analyses of labour supply determinants, hence, the results can be compared with those of previous studies.

(3) Due to limited existing data sources (principally Statistics Canada Census data), as well as limitations on time and funding necessary to conduct a separate data

collection survey, least squares multiple linear regression was the most thorough, reliable and cost efficient method available.

Data for three years--1961, 1971, and 1976--were collected from various sources for the variables in the model (see Chapter 3 and 4 for a thorough discussion of the variables in the model and the data base from which they were derived), placed on computer file, and regressed with the U.B.C. Statistical Package for the Social Sciences (SPSS) version 8 computer "package" (Kita (1977); Nie et al. (1975)).

In summary, Canada's population is aging and the proportion of elderly will continue to increase well into the next century. Along with this trend, the elderly are withdrawing from active participation in the labour force and relying on existing public support programs for their sustenance. These trends will create a number of economic and social burdens for society in the future. It is essential, then, that research which works to understand the mysteries and consequences of these trends be conducted. Only through present research can we expect to find future solutions to the burdens created.

Chapter 2

DEMOGRAPHIC AND ECONOMIC CHARACTERISTICS OF THE ELDERLY

The proportion of Canada's population 65 and over is increasing year by year and is expected to peak about the year 2031. At the same time, the labour market activity of the elderly has been decreasing. This chapter looks at the trends and patterns of the demographic and labour force profile of Canada's elderly population.

A. The Aging of the Population

Population aging is the outcome of a complex interaction between birth, death, and net migration. The absolute and relative proportion of Canada's elderly has increased steadily since 1851. Table I shows both the numerical and proportionate growth in Canada's elderly population. In 1851 the proportion of elderly in Canada was only 2.7 percent. By 1976 it had increased to 8.7 percent. This section of the thesis examines the birth, death and net migration rates over the period and discusses the influence they have had in increasing the proportion of Canada's elderly.

(i) Factors Accounting for an Aging Population

Table II shows the rates of birth, death and natural increase for decennial periods between 1851 and 1971, and for quinquennial periods between 1951 and 1976. The birth rate, the number of live births per 1,000 population, has decreased from 45.2 in the 1851-1861 decennial period to 20.6 in the 1961-1971 decennial period. The death rate, the number of deaths per 1,000 population, has decreased from 23.5 to 7.5 over the same period of time. An exam-

Table I

Number and Proportion of Elderly in Total Population 1851-1976*

YEAR	TOTAL POPULATION (000's)	TOTAL ELDERLY (000's)	PROPORTION ELDERLY (%)
1851	2,436	65	2.7
1861	3,230	98	3.0
1871	3,689	135	3.7
1881	4,325	178	4.1
1891	4,833	220	4.6
1901	5,371	271	5.0
1911	7,207	336	4.7
1921	8,788	420	4.8
1931	10,377	576	5.6
1941	11,507	768	6.7
1951	14,009	1,086	7.8
1956	16,081	1,244	7.7
1961	18,238	1,391	7.6
1966	20,015	1,540	7.7
1971	21,568	1,744	8.1
1976	22,993	2,002	8.7

*Excludes Newfoundland prior to 1951
Source: 1851-1891 found in Denton et al. (1980) p. 10. 1901-1976 found in Statistics Canada. Catalogue 98-800, 1979.

Table II

Rates of Birth, Death, and Natural Increase, Canada, 1851-1976*

DECENNIAL PERIOD	BIRTHS/1000 POP.	DEATHS/1000 POP.	NATURAL INCREASE
1851-1861	45.2	23.5	21.7
1861-1871	39.6	22.0	17.6
1871-1881	36.9	20.0	16.9
1881-1891	33.6	19.2	14.4
1891-1901	30.3	17.2	13.1
1901-1911	30.7	14.4	16.3
1911-1921	29.2	13.3	15.9
1921-1931	27.3	11.0	16.3
1931-1941	22.0	9.8	12.2
1941-1951	25.8	9.7	16.1
1951-1961	27.7	8.2	19.5
1961-1971	20.6	7.5	13.1
QUINQUENNIAL PERIOD			
1951-1956	28.0	8.4	19.6
1956-1961	27.5	8.0	19.5
1961-1966	23.5	7.6	15.9
1966-1971	17.9	7.4	10.5
1971-1976	15.8	7.4	8.4

*Excludes Newfoundland prior to 1951
Source: Denton et al. (1980) p. 4

ination of both rates is instructive to understanding why the proportion of elderly in Canada is growing.

Birth rates at the turn of the century were relatively high. Since that time they have, over-all, decreased as fertility rates have decreased. This is significant because people born around the turn of the century are now past, at, or approaching 65. The high birth rates at the turn of the century and the aging of this cohort has, today, resulted in an increased proportion of people 65 and over.

Augmenting the consequence of high turn of the century birth rates are decreasing death rates. Declining death rates since the turn of the century reflects medical advances and improvements in the over-all standard of living. The significance of this trend is that people born around the turn of the century are living longer. The average life expectancy has increased between 1931 and 1971 by over ten years from 61 to almost 73. The high birth rates around the turn of the century and the declining rates today, combined with a declining death rate have, together, been key contributors to the growing proportion of elderly in Canada.

A third factor which helps explain the growing proportion of elderly in Canada is the trend in the net migration rate. Table III illustrates this trend. Between 1901 and 1931 close to 3 million people immigrated to Canada. After 1931, the net migration rate fell and between 1931-1941 became negative. The average age of immigrants between 1901 and 1931 ranged from 20 to 35. Most of these immigrants are today 65 and over and have increased the proportion of elderly in the population.

Table III

Rates of Immigration, Emigration and Net Migration, Canada, 1851-1976*

DECENNIAL PERIOD	IMMIGRATION/1000 POPULATION	EMIGRATION/1000 POPULATION	NET MIGRATION
1851-1861	12.4	6.0	6.4
1861-1871	7.5	11.9	-4.4
1871-1881	8.7	9.7	-1.0
1881-1891	14.9	18.1	-3.2
1891-1901	4.9	7.4	-2.5
1901-1911	24.6	11.8	12.8
1911-1921	17.5	13.6	3.9
1921-1931	12.6	12.2	0.4
1931-1941	1.4	3.2	-1.8
1941-1951	4.4	3.5	0.9
1951-1961	9.6	2.9	6.7
1961-1971	7.2	3.6	3.6
QUINQUENNIAL PERIOD			
1951-1956	10.4	2.5	7.9
1956-1961	8.9	3.2	5.7
1961-1966	5.6	2.9	2.7
1966-1971	8.6	4.1	4.5
1971-1976	7.5	3.1	4.4

*Excludes Newfoundland prior to 1951
Source: Denton et al. (1980) p. 8

More recent demographic trends will affect the proportion of elderly in the future. The over-all decrease in the birth rate between 1851 and 1976 was not steady. Post World War II birth rates rose dramatically in what has come to be termed the "Baby Boom". The high birth rates experienced in the 1940s and 1950s is significant in terms of the proportion of elderly in Canada because by approximately 2010 the large number of babies born during the "Baby Boom" will be reaching 65 years of age. The aging of the baby boom population is, after the turn of the twenty-first century, expected to dramatically increase the proportion of Canada's elderly population. Population projections estimating the proportion of elderly are based on alternative assumptions about future rates of birth, death, and net migration. Table IV shows five projections of the proportion of the population 65 and over. A detailed discussion of methodology used and assumptions made in deriving the projections can be obtained from Denton et al. (1980) pages 19-27.

The assumptions underlying each of the five projections in Table IV are as follows. Projection P-01 assumes medium fertility, medium mortality, and medium net migration. It can be viewed as a "baseline" projection. Projection P-08 is the "Rapid Growth" projection and assumes high fertility, low mortality, and high net migration. Projection P-09 is the "Slow Growth" projection which assumes low fertility, high mortality, and low net migration. Projection P-10 can be viewed as an "Old Population" projection including underlying assumptions of low fertility, low mortality, and medium net migration. The final projection in Table IV, P-11, is the "Young Population" projection which assumes high fertility,

Table IV

Projected Proportions of Population 65 and Over, Canada, 1976-2051

YEAR	P-01	P-08	P-09	P-10	P-11
1976	8.7	8.7	8.7	8.7	8.7
1981	9.4	9.3	9.5	9.6	9.2
1986	10.0	9.5	10.3	10.4	9.4
1991	10.7	9.9	11.3	11.6	9.7
1996	11.2	10.2	12.1	12.5	9.8
2001	11.5	10.2	12.6	13.2	9.7
2006	11.7	10.0	13.2	13.8	9.5
2011	12.4	10.2	14.5	15.2	9.6
2016	13.9	10.9	16.8	17.4	10.2
2021	15.4	11.6	19.5	20.0	10.9
2026	17.2	12.4	22.4	22.9	11.6
2031	18.3	12.7	24.8	25.3	11.8
2036	18.2	12.1	25.7	26.3	11.0
2041	17.5	11.2	25.8	26.6	10.0
2046	17.3	11.0	25.8	26.7	9.8
2051	17.6	11.4	25.8	26.7	10.3

Source: Denton et al. (1980) p. 32

high mortality, and medium net migration.

Which projection will prove most accurate is difficult to predict. A lot will depend upon the fertility rates of women in Canada. As can be seen from Table II the most recent birth rates, reflected in the quinquennial period, have been steadily decreasing. Another major determinant of the accuracy of the projections in Table IV will be the future state of the medical field. Should a major medical breakthrough increase the average life expectancy more Canadians will be living longer and increasing the proportion of elderly in the population. The third major factor affecting the accuracy of the projections in Table IV is net migration. Future government immigration policy will largely determine the impact of net migration on the proportion of elderly in Canada's population. Because of this, it is difficult to predict the influence of future net migration on the proportion of elderly.

Given historic birth, death and net migration rates a number of scholars believe the "Old Population" projection is the most accurate including: Sheppard and Rix (1977); Science Council of Canada (1977); Stone (1978); Economic Council of Canada (1979); Weitz (1979); Rosenburg and Grad (1980); Stone and Fletcher (1980); Denton and Spencer (1980); and, of course, Denton et al. (1980). If projections forecasting an "Old Population" for Canada are accurate, the labour supply implications can be significant. It is important to examine the historic measure of the elderly's labour supply in Canada. In so doing an insight into the future labour supply activity of the elderly may be gained.

The following section will look at the historic labour force

participation rates of the elderly, and projections of dependency ratios which may result from the greater proportion of elderly people in the population.

B. Historic Measures of the Elderly's Labour Supply and Projected Dependency Ratios

As defined by Statistics Canada in their census enumerations, the labour force includes all the non-inmate population 15 and over who, in the week prior to the enumeration, were either employed or unemployed. Employed persons included those people who, in the week prior to enumeration, worked for pay or in their own business, farm or professional practice; helped without pay in a family business or farm; or had a job from which they were temporarily absent because of illness, vacation, labour dispute, training course (with a job being held for trainee's return), bad weather, fire, personal reasons et cetera. Unemployed persons included those people who, in the week prior to enumeration, looked for work and were available to start work; were on temporary lay-off, not exceeding 30 days, from a job to which they expected to return (excluding full-time students); or had definite plans to start a new job at a future date. All persons not classified as either employed or unemployed are considered outside the labour force. People outside the labour force include elderly people who are retired. The labour force participation rate is defined by Statistics Canada as the percentage the total labour force (employed plus unemployed) forms of the population 15 years of age and older.

Table V shows the large decrease in both the elderly's labour force and the elderly's labour force participation rate between 1921

Table V

The Labour Force and Participation Rates for Canada's Elderly, 1921-1976*

YEAR	ELDERLY POPULATION	ELDERLY LABOUR FORCE	ELDERLY PARTICIPATION RATE (%)
1921	406,000	137,000	33.7
1931	557,000	178,000	31.9
1941	742,000	202,000	27.2
1951	1,086,000	247,000	22.7
1956	1,244,000	258,000	20.7
1961	1,391,000	258,000	18.5
1966	1,540,000	251,000	16.3
1971	1,744,000	216,000	12.4
1976	2,002,000	178,000	8.9

*Excludes Newfoundland prior to 1951
Source: 1921-1941 Denton and Ostry (1967). 1951-1976 Denton et al. (1980)

and 1976. The elderly's total labour force grew from 137,000 in 1921 to a peak in 1961 of 258,000. Since 1961, however, the number of people 65 and over in the labour force has steadily decreased to 178,000 in 1976 despite there being over 2 million elderly people to draw on. The historic labour force participation rates of the elderly, the total elderly labour force as a percentage of the total elderly population, has steadily decreased from 33.7 percent in 1921 to 8.9 percent in 1976. Clearly, a large majority of elderly persons in Canada do not participate in the labour force.

From the earlier discussion of the increasing proportion of elderly in the population and from the discussion above concerning the declining elderly labour force and labour force participation rate, Canada has seen, and can expect in the future, an increase in the number of elderly who do not work. One measure of the burden placed on an economy by this trend can be derived by examining historic and projected dependency ratios.

Dependency ratios can be defined as the proportion of people 0-14 plus people 65 and over to the 15-64 proportion of the population. The dependency ratio relates the more economically inactive proportion of the population to the more economically active proportion. It is believed that the 15-64 cohort supports the more dependent 0-14 and 65 and over cohorts. Clearly, dependency ratios are an inexact measure of dependency since there are members of the 0-14 and, particularly, the 65 and over cohort who are economically active and self-supporting. In addition, some members of the 15-64 cohort are not economically active and dependent on those who are. Nevertheless, dependency ratios provide rough indicators of the

dependency burden in a population. A more precise measure of the dependency burden created by the increasing proportion of the elderly in the population and their decreasing labour force participation is the ratio of non-working elderly to total labour force.

Tables VI and VII look at the dependency ratios based on population and labour force respectively. Table VI reveals an overall decrease in the ratio of total dependents from a peak in 1881 of 0.749 (approximately 75 people 0-14 and 65 and over per 100 persons in the 15-64 cohort) to a low in 1976 of 0.523. The decrease in the ratio of total dependents results from the large decrease in the ratio of young dependents and disguises the significant increase in the ratio of old dependents. While the ratio of total dependents has decreased, the ratio of old dependents has increased from 0.072 in 1881 to 0.133 in 1976.

Table VII shows historic trends and projections to the year 2000 of the ratio of non-working elderly to the total labour force. The table discloses the increasing burden placed on the labour force by elderly non-participants. The ratio has increased virtually every census period from a low in 1921 of 0.081 to a high in 1976 of 0.177. Projections to the year 2000 predict that there will be over 20 persons 65 and over outside the labour force for every 100 persons in the labour force. What is even more significant is that the leading edge of people born during the baby boom will reach 65 after the year 2000. This fact will probably result in even higher ratios of non-working elderly to the total labour force after the year 2000.

In summary, Canada's population is aging. A greater proportion

Table VI

Young, Old, and Total Dependency Ratios, Canada, 1881-1976*

YEAR	RATIO OF YOUNG DEPENDENTS (0-14)	RATIO OF OLD DEPENDENTS (65+)	RATIO OF TOTAL DEPENDENTS
1881	.677	.072	.749
1891	.615	.077	.692
1901	.568	.083	.651
1911	.529	.075	.603
1921	.566	.079	.644
1931	.503	.088	.592
1941	.424	.102	.526
1951	.490	.125	.615
1961	.581	.131	.712
1966	.555	.130	.684
1971	.475	.130	.604
1976	.391	.133	.523

*Excludes Newfoundland prior to 1951
Source: Kalbach and McVey (1979) p. 171

Table VII

The Burden of the Non-Working Elderly, Canada, 1921-2000*

YEAR	NON-WORKING ELDERLY (000's)	TOTAL LABOUR FORCE (000's)	RATIO
1921	269	3,302	.081
1931	379	4,042	.093
1941	540	4,652	.116
1951	839	5,232	.160
1956	986	5,794	.170
1961	1,133	6,510	.174
1966	1,289	7,450	.173
1971	1,528	8,649	.176
1976	1,824	10,308	.177
1980	---	---	.188
1985	---	---	.192
1990	---	---	.208
2000	---	---	.208

*Excludes Newfoundland prior to 1951
Source: 1921-1941 in Denton and Ostry (1967). 1951-1976 in Denton et al. (1980). 1980-2000 in Weitz (1979).

of the total population is at, or over, 65 years of age than at any other time. It is expected that the proportion of elderly will increase into the next century until after people born during the 1940s and the 1950s baby boom period reach 65 years of age. In addition, the elderly are reducing their amount of labour supply. It is predicted that the ratio of non-working elderly to the total labour force will increase well into the next century. The implications of these trends will be discussed in Chapter 5.

In light of the fact that the proportion of elderly in the population has grown, and is expected to continue to grow into the twenty-first century, and that the elderly's labour force participation has decreased, and is expected to continue to decrease into the next century, it is important to examine the labour supply determinants of the elderly. The following chapter reviews labour supply theory and the literature on the factors which influence the elderly's decision to remain in, or withdraw from, the labour force. Furthermore, Chapter 3 presents a model designed to explain the determinants of the elderly's labour force participation in Canada.

Chapter 3

A MODEL OF THE LABOUR SUPPLY DETERMINANTS OF THE ELDERLY

A. The Elderly and the Labour Supply

This chapter reviews labour supply theory and the literature on the labour supply determinants of the elderly. In addition, the chapter will propose a model to explain the labour supply determinants of the elderly in Canada.

(i) Labour Supply Theory

Labour supply is traditionally regarded as a composite of at least four dimensions (Samuelson and Scott, 1980):

(1) Population
(2) Proportion of the population actually in the labour force, or labour force participation rate
(3) Average number of hours worked per week or year by workers
(4) Quality and quantity of effort and skill that workers provide

Once the population has been analyzed in terms of the total population of working age, or once the available work force has been determined, various individual and household consumption components come into effect which attempt to explain the amount of labour supplied by an individual.

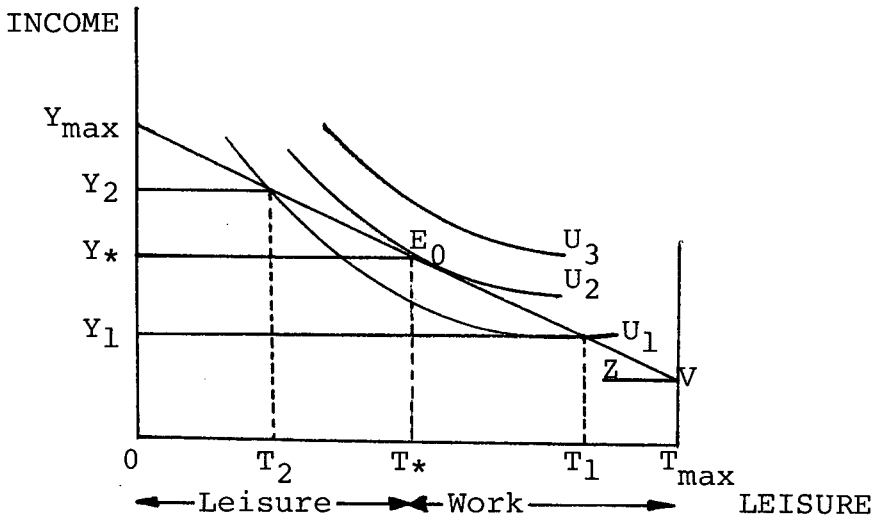
The basic theoretical framework developed in 1930 by economist Lionel Robbins and further developed by John Hicks (1939), which helps explain the individual components of labour supply, is the work-leisure choice model. The work-leisure model depicts an individual as a constrained utility maximizer where, subject to his or her potential income constraint, he or she will optimize the

division of time available between work and leisure. The division of available time is conditioned by the individual's wage rate and his subjective preference for the consumption of leisure, where "leisure" is defined as non-labour market activities which include household activities, investment in human capital, and pure leisure activities. The following figures graphically describe the work-leisure model.

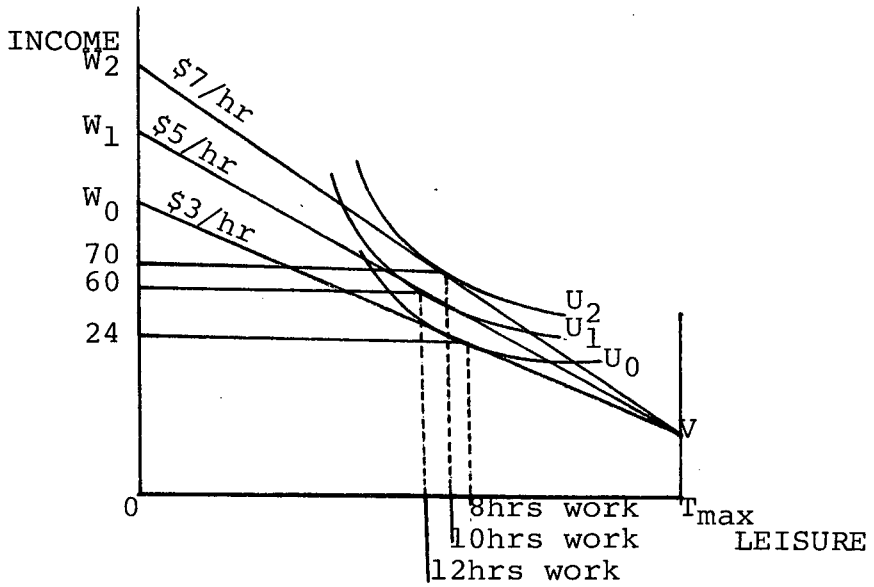
In Figure I (a) the individual's optimal amount of income and leisure is depicted. The vertical axis (OY) represents income, the horizontal axis (OT_{max}) time. The point T_{max} is the maximum amount of time available to the individual. From this stock of time the individual proportions both time spent in leisure (measured from left to right) and work (measured from right to left). The amount of time proportioned between work and leisure is determined by the individual's potential income constraint, represented by the line $Y_{max}V$, and the individual's indifference curves, U_1, U_2, and U_3. The indifference curve represents equal utility, or welfare, between income and leisure. The slopes of the indifference curves exhibit diminishing marginal rates of substitution between income and leisure, in other words, the more income an individual has relative to leisure the lower is the relative substitution value of income. The same would apply to an individual who had more leisure relative to income resulting in a lower relative substitution value for leisure. The 'rational' individual will always attempt to move to the highest indifference curve possible limited by his or her potential income constraint. The 'potential' income constraint is so named because it represents the varying potential amounts of

Figure I

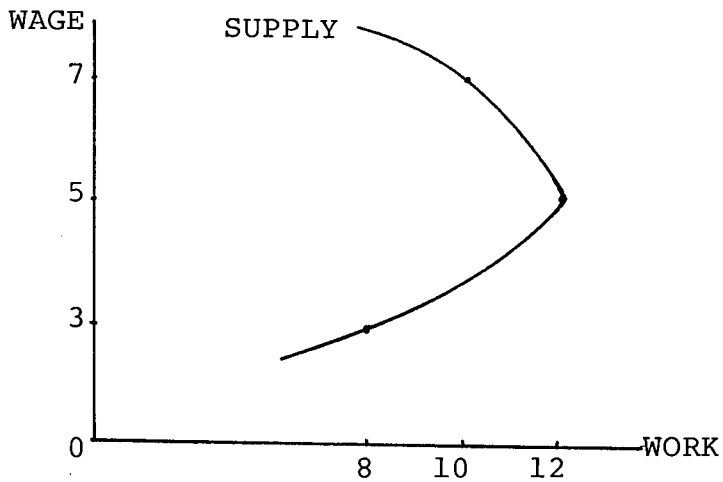
The Individual Labour Supply Function



(a)



(b)



(c)

income the individual can receive by substituting leisure for work at the market wage rate. The market wage rate is depicted by the slope Z, and $T_{max}V$ denotes the amount of non-labour income available to the individual.

The amount of labour supplied by an individual is determined by the point at which the individual maximizes his or her utility subject to the constraints of his or her labour market earnings. This point is depicted in Figure I (a) as the equilibrium point E_0 where utility curve U_2 is tangent to $Y_{max}V$. The amount of labour supplied is $T_{max}T_*$, the individual's income is Y_*, and the amount of leisure consumed is OT_*. The 'rational' individual will not work at the lower indifference curve U_1. This is apparent since by working $T_{max}T_1$ the individual derives an income of Y_1. At this point the wage rate exceeds the marginal rate of substitution, hence, the individual can increase his utility by consuming more hours of work and less of leisure. By working $T_{max}T_2$ the individual derives an income of Y_2 and the marginal rate of substitution exceeds the wage rate. Again, the individual can increase his utility by consuming more hours of leisure and less or work.

As Robbins (1930) has pointed out, the work-leisure choice model can be used to derive an individual's labour supply schedule; that is, the amount of work offered at various wage rates. Figure I (b) shows what happens to the individual's equilibrium when the wage rate rises from \$3 per hour, to \$5 per hour, to \$7 per hour. Income, the vertical axis, is measured in income per day while work and leisure, the horizontal axis, is measured in units of hours per day. Line W_0V depicts a \$3 per hour wage rate and E_0 is the point

of utility maximization given U_0 as the highest attainable indifference curve. At E_0 the individual supplies 8 hours of work and earns \$24. With a wage increase to \$5 per hour, represented by the line W_1V, the utility maximizing equilibrium point E_1 depicts the individual supplying 12 hours of work and earning \$60. In this case the substitution effect of income relative to leisure is greater than the income effect and, therefore, the individual substitutes away from leisure and increases the hours of labour supplied. When the wage rate is increased to \$7 per hour, line W_2V, the new equilibrium E_2, shows the individual increases his wage to \$70 but decreases his supply of labour to 10 hours. This case is illustrative of the income effect. As income rises, individuals will want to consume more normal goods, of which leisure is one. The substitution effect causes individuals to offer more work (less leisure) and the income effect causes individuals to cut back on labour supply (more leisure).

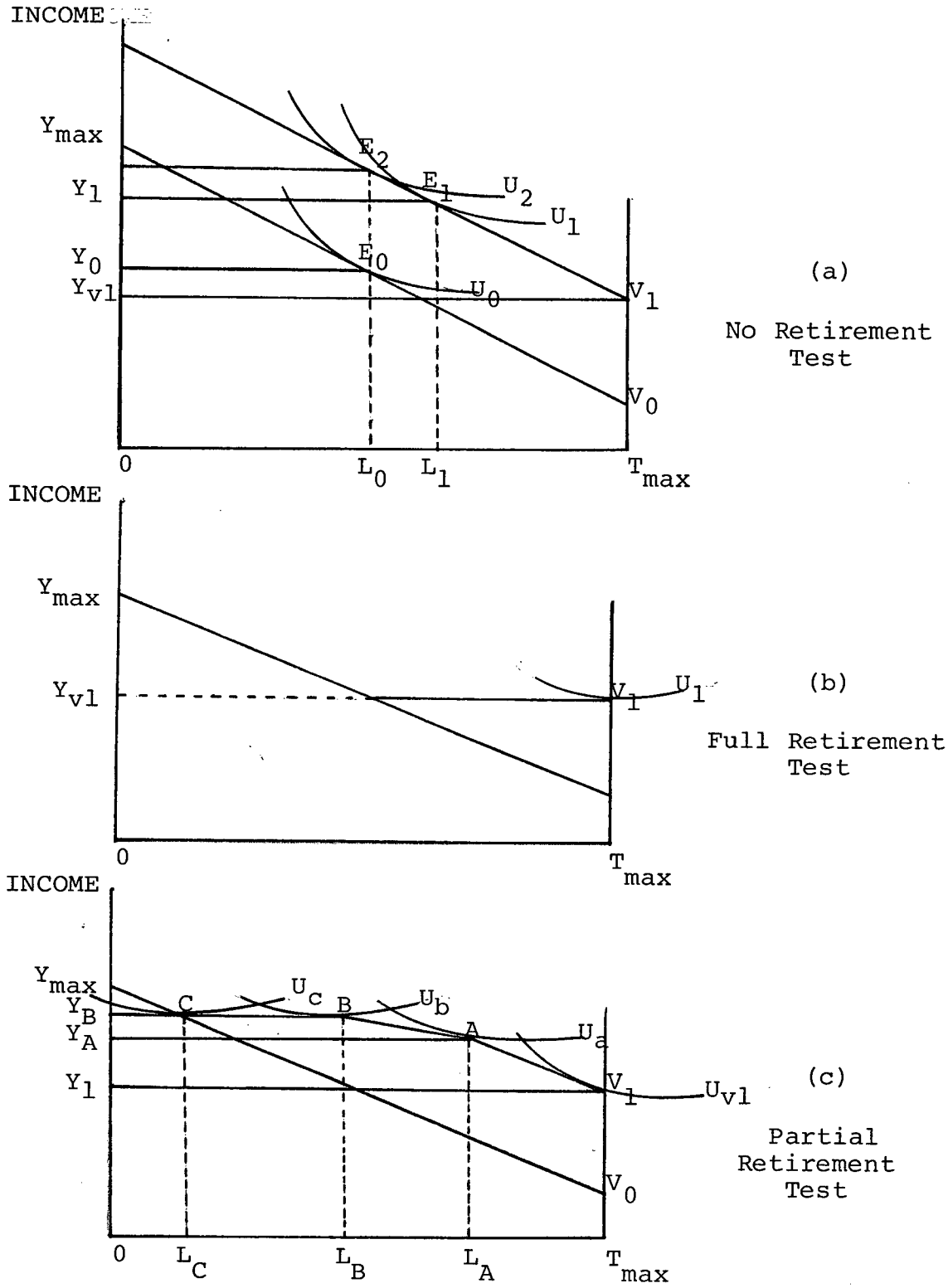
Figure I (c) shows the individual's labour supply schedule derived from Figure I (b). It is important to note that the supply curve becomes backward bending as the wage rate increases. This is indicative of the dominance of the income effect over the substitution effect. Economists generally agree that Figure I (c) is a reasonably close approximation of the theoretical labour supply for most individuals (Fleisher (1970)). At low wage rates individuals have a host of unmet desires. A higher wage rate induces these individuals to work more to be able to meet their desires. At a high wage rate many unmet desires are fulfilled and the additional income is used to purchase more leisure.

The basic work-leisure choice model can be extended to analyse effects of an increase in V, the non-labour income of an individual. Non-labour income increases include bequests, windfall earnings from lotteries or gambling, sale of stocks or bonds and transfer payments such as social insurance benefits. The social insurance program which the literature reveals has had a significant impact on the elderly's decision to participate in the labour force is the pension program. Since the following section in this chapter reviews the literature on pension programs and their effect on the elderly's labour supply, the purpose here is to discuss the theoretical labour supply model as it applies to an increase in non-labour income from a source such as a pension plan. It is important to remember that most of the authors of the pension related literature reviewed derive their theoretical origin from the basic work-leisure choice model.

Figure II (a) shows the effect an increase in non-labour income, derived from a pension plan, can have on an individual's labour supply. The example assumes that the individual qualifies for the pension payment and he is not subject to a retirement test defined as an earnings related reduction in total pension payment. The more one works and earns after qualifying for the pension, the less the pension payment. Canada's Old Age Security program eliminated its retirement test in 1975. Figure II (a) indicates that the pre non-labour income increase equilibrium, E_0, has been shifted outwards to E_1. The individual has achieved a higher indifference level as a result of the pension plan. His income has increased from Y_0 to Y_1 and at E_1 the amount of labour he offers will fall from $T_{max}L_0$ to

Figure II

The Effect of Pension Plans on Individual Labour Supply



$T_{max}L_1$. Depending on the individual's preferences his new utility function could be at V_1 in which case he has completely retired, or at E_2 in which case he offers the same amount of labour as at E_0. The pure income effect of the pension transfer generally tends to encourage recipients to reduce the hours of work they offer, or retire completely.

Figure II (b) graphically displays the case where an individual receives a pension, but it is subject to a full retirement test. In other words, the pension recipient is required to give up $1 of pension for every $1 earned. Such a pension plan encourages the recipient to retire completely, move to point V_1, since up to point V_1 the individual receives the same income whether he works or retires.

Pension plans which have partial retirement tests are depicted in Figure II (c). The portion of the budget constraint line V_0V_1 indicates the pension benefits payable upon complete retirement; income is at Y_1 and leisure is at OT_{max}. Line V_1A shows that the individual can work $T_{max}L_A$ with an income of Y_AY_1 and still earn the maximum pension. At line AB however, the individual will receive only $0.50 pension for every $1 of labour market earnings between Y_BY_A for the additional work L_AL_B. At line BC the pension is subject to the full retirement test. Any additional earnings generated by increased work L_BL_C is subject to a 100 percent tax on pension benefits. At point C the individual receives no pension benefits. Any additional work, represented by L_CO, would yield an additional income along budget constraint line CY_{max}. The work incentive effects of budget constraint line V_1ABCY_{max} act to

encourage retirement in two ways. First, the shift of the budget constraint outwards from the initial, V_0Y_{max}, has an income effect which encourages the purchase of more leisure, or retirement. Second, the slope of V_1ABCY_{max} is, everywhere, equal to or less than the initial constraint meaning the opportunity cost of leisure is reduced. This encourages the substitution of leisure for work. A pension with a partial retirement test similar to the one depicted in Figure II (c) has both an income and substitution effect which work to encourage early retirement.

The simple work-leisure model is fundamentally designed to theorize the individual's welfare maximization between work and his preference for leisure or income (also interpreted as including market goods, which the income earned purchases). In terms of individual labour supply it predicts that the hours of labour offered will increase with a rise in the wage rate (to a point, at which it becomes backward bending), decreases with a rise in non-labour income, and be highly dependent on the individual's preference for leisure over goods.

The work-leisure model is not without its criticisms, however. One of its major weaknesses is that it interprets the decision to participate in the labour force solely as an individual's decision, and his allocation of time between only market work and leisure. In addition, the work-leisure model tends to be static. It does not view the time allocation decisions made within the context of the individual's age or household's stage in the life-cycle.

In reality, an individual's decision to participate in the labour force is influenced by the individual's desires and prefer-

ences as well as the needs and welfare of the family unit of which he is a member. The decision to work is made jointly between the members of the household based on a household utility function which is a composite of each family member's individual utility function. In reality too, the allocation of time is not simply between market work and leisure, but a division of time between market work, pure leisure, and non-market work. The addition of non-market work substantially increases the complexity of the simple model. Activities such as investing in human capital and household production activities create an unlimited number of interdependent time consuming activities and variable preferences for these activities.

The decision to work, or not to work, is influenced by the age, or stage in the life-cycle of the individual in the household. As the individual in the household ages he progresses through different economic, social, and physiological stages which influences and determines his consumption patterns and labour supply activities. When the individual reaches the 'elderly' stage in his life-cycle his economic status, hence his ability to retire from the labour force, is largely the cummulative consequence of a myriad of resource allocation choices made throughout the stages of his life-cycle. Choices which concern education, on-the-job training, work, leisure, health care, consumption, saving and investment.

The evolution of a model which transcends the criticisms of the basic work-leisure framework, and includes a utility maximizing life-cycle household decision making component with a third vector of time allocation, can be traced through the pioneering work of Gary

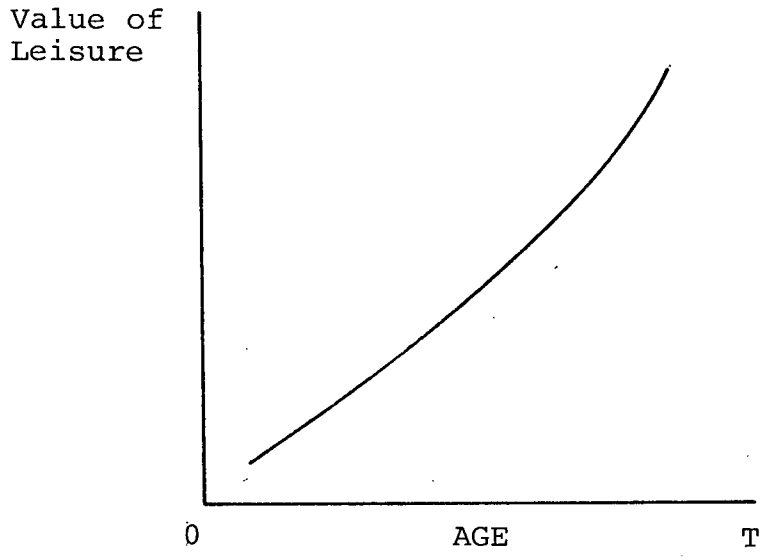
Becker (1965) on time allocation within the household, and P. C. Glick (1947, 1955, 1977) on the life-cycle of the family. However, it is only recently that economists integrated time allocation theory and life-cycle theory to create utility maximizing models of choice between market work, non-market work (which includes investment in human capital and household production activities), and leisure. These models have been proposed by James Heckman (1976), Ali Sadik and Johnson (1976), Alan Blinder and Yoram Weiss (1976), Gilbert Ghez and Becker (1975), and Frank Stafford and Paula Stephan (1972).

The profiles of individual, or household, labour supply and leisure in these three-activity life-cycle models are determined by the individual's, or household's, wealth of assets and human capital, rates of time preference, human capital depreciation rates, and interest rates on investments including rates of return on investment in human capital. Figures III (a) and (b) depict the typical consumer 'Value of Leisure' and 'Measured Hours of Work' profiles respectively as provided by the three-activity life-cycle models (see Heckman, 1976). At relatively early stages in the life-cycle both the value of leisure and the supply of labour rise. This reflects the dominance of the substitution effect of increased earning power. As an individual, or household, reaches the later stages of the life-cycle sequence earning power peaks and the income effect begins to dominate. Leisure becomes more valuable so leisure is substituted for work.

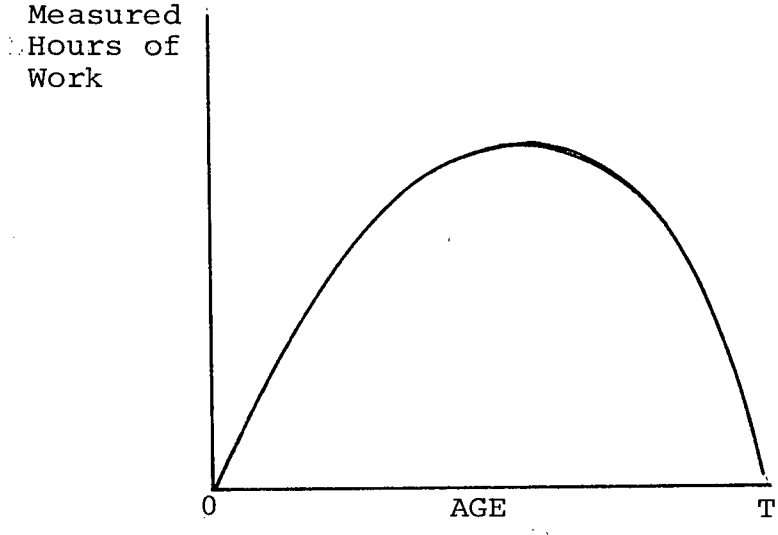
It is important to remember that the profiles depicted in Figure III are only two of a number of consumer choice profiles which are all interdependent and determined by a complex interaction of

Figure III

Work and Leisure Profiles of the Three Activity Life-Cycle Models



(a)



(b)

(Assuming wage growth becomes sufficiently small so that hours peak)

consumer choices made throughout the life-cycle. The value of the three-activity life-cycle model is that it provides a significantly more realistic model of the labour supply decision. However, as Cain and Dooley (1976) discuss below, its disadvantage lies in its overcomplexity to the extent that existing data does not satisfy the model's requirements.

> The obvious benefits of these theoretical developments are greater rigor, the resolution of some ambiguities, and the satisfaction of extending the theory to new problems. One of the costs is that the requirements for estimating these household models cannot, strictly speaking, be met with available data: the empirical models are inevitably under-identified. (p. S180)

The major purpose of this section is to review labour supply theory. Before leaving this section, however, it is important to this study, and to understand an additional limitation of the simple work-leisure model, that two concepts of the effects of changes in labour demand be reviewed. These concepts are the discouraged worker hypothesis, and the added worker hypothesis.

The simple work-leisure model assumes an infinitely elastic demand for labour. This assumption neglects the affects of unemployment on labour supply. In reality, the economy does not expand to absorb every entrant into the labour force. Inevitably, some participants in the labour force are unemployed. The unemployment rate, in part, conditions the size of the labour force. It does so in two ways.

Firstly, the discouraged worker hypothesis holds that the size of the labour force decreases in periods of high unemployment. People looking for work tend to become discouraged in their pursuit

of employment and drop out of the labour force. In the case of the elderly, the presence of high unemployment rates can cause complete retirement from the labour force.

Secondly, the added worker hypothesis holds that the size of the labour force increases in periods of high unemployment. Should the primary breadwinner in the household become unemployed other members of the household enter, reenter, or remain in the labour force to supplement household income. If the added worker hypothesis holds true the labour supply of elderly workers would increase in periods of high unemployment as elderly family members reentered, or rejected retirement and remained in, the labour force.

The discouraged worker and added worker effects operate simultaneously and in opposite directions on the household labour supply. Which effect predominates is still a contentious issue in the literature on over-all labour force participation. Most American empirical studies support the dominance of the discouraged worker effect; however, Mincer's (1962) work supports the dominance of the added worker effect. Canadian studies are considerably less conclusive. Time series studies by Proulx (1969), Officer and Anderson (1969), Davis (1971), Swidinsky (1973), Donner and Lazar (1974), and Swan (1974) find the added worker effect dominates initially with the discouraged worker effect becoming more predominant over time. Cross-section studies are equally as inconclusive. Studies by Ostry (1968), and Spencer and Featherstone (1970) support the added worker effect while Swidinsky (1973), provides evidence supporting the discouraged worker effect. Canadian studies based on more current data tend to support the discouraged worker hypothesis (Spencer

(1973), Skoulas (1974), and Gunderson (1977)). In summary then, American research supports the dominance of the discouraged worker effect, while only Canadian research based on current data agrees with the American findings.

Labour supply theory is an abstraction of reality. Much of the theory is limited by assumptions and conditions. Only through empirical investigation based on the application of extensively collected data can estimates of the magnitude and reliability of the theory be deduced. The following section reviews the literature on the labour supply determinants of the elderly. The studies reviewed merge labour supply theory and theoretical models with available data to derive the determinants of the elderly's labour supply.

(ii) The Elderly's Labour Supply Determinants

The factors which influence the elderly's decision to participate in the labour force, or retire from it, can be broadly categorized into five groups (Clark and Spengler (1980)):

(1) Pension related factors
(2) Health related factors
(3) Economic factors
(4) Other financial factors
(5) Family and individual factors

This section will comment on the literature specific to each of the five groups of factors which determine the elderly's labour supply. Unfortunately, the literature reviewed is based almost exclusively on U.S. data sets, further pointing to the need for Canadian research in this area.

(a) Pension Related Factors

In Canada, the elderly receive their public pension incomes from the Old Age Security (O.A.S.), Guaranteed Income Supplement (G.I.S.), and Canada Pension Plan (C.P.P.) programs. It is beyond the scope of this thesis to analyse and discuss Canada's pension programs. Readers interested in such an analysis should refer to The Retirement Income System in Canada (1979); and the Economic Council of Canada (1979). The private pension system in Canada is discussed in Pesando (1979). The importance of pension incomes as a determinant of the elderly's labour supply is based on the income effect resulting from an increase in non-labour income (Figure II).

Studies of pensions as a determinant of the elderly's labour supply have generally been supplied within the last twenty years. Margaret Gordon (1963a; 1963b), using the ratio of retirement income to total income as as independent variable, derived a significant inverse correlation of (-0.83) in her analysis of the labour force participation of males 65 and over in fourteen industrial nations. A study by Pechman et al. (1968) using 1960 data from nineteen countries, and the ratio of average social security benefits as a percentage of average manufacturing earnings for an independent variable, found that a rise in one percentage point in per capita social security payments would lead to a decrease in the labour force participation rate of men 65 years and over of four-tenths of one percent. Using the 1959 ratio of old age benefits to median earnings of male members of the experienced civilian labour force as his independent variable Lowell Gallaway (1971) obtained a significant inverse relationship with U.S. state labour force participation rates

of (-0.64). In his conclusion Gallaway states that increases in pension benefits change the economic behaviour of the elderly so as to negatively shift the quantity of labour supplied in the labour market at various wage rates (p. 187).

Bowen and Finegan (1969) in their seminal study on labour force participation in the U.S. include pension incomes of the elderly in an "other income" (OI), or non-labour income, variable. Bowen and Finegan acknowledge the inherent bias which arises when using pensions as a determinant of labour force participation since eligibility for many pensions is conditional upon complete, or partial, withdrawal from the labour force. Their results suggest that, between 1948 and 1965, the "other income" variable accounts for a 9.8 percent reduction in the labour force participation rate of males over 64 years of age.

Bowen and Finegan's findings are in contrast to Clarence Long's (1958), who found no significant relationship between pension income and the decline in U.S. labour force participation rates between 1890 and 1950. This discrepancy can, in part, be explained by the fact that Long's data set included years--1890 to 1950--in which pension benefits were relatively small. As Boskin (1977) points out, it was not until 1950 that the Old Age and Survivors Insurance (OASI) program underwent substantial changes and these changes coincide with a marked decrease in the elderly's labour force participation rate. Bowen and Finegan conclude that there is "little doubt that rising levels of other [non-labour] income--and particularly the increase in social security benefits and coverage--have played a major role in reducing the participation of older

males during the postwar years" (p.357).

Michael Boskin (1977), using a sample of 131 from the Panel Study of Income Dynamics (an annual national survey of 5,000 households between 1968 and 1972), applies a one-period, income-leisure model to analyse the difference between an elderly individual who receives pension benefits and one who does not. Boskin's model includes independent variables for health, net earnings, income from assets, spouse's earnings, and social security benefits. He finds social security benefits to be the most important variable with an increase in benefits from $3,000 to $4,000 raising the probability of retirement from 7.5 percent to 16 percent. Boskin concludes that:

> ...recent increases in social security benefits and coverage, combined with the earnings test are a significant contributor of the rapid decline of the labour force participation of the elderly in the United States. The social security system is inducing (or enabling) a substantial fraction of the elderly population to retire earlier than they would have in the absence of the system. (p. 19)

One of the criticisms of Boskin's study was provided by Alicia Munnell (1977) when she pointed out that Boskin did not differentiate between private and public pensions and hence overstated the impact of the public system.

Joseph Quinn (1977a; 1977b) employs data from the Retirement History Survey, a bi-annual survey of 11,153 men and women between 58 and 63, to analyse the determinants of early labour force withdrawal. Quinn uses a one-period model based on cross-section data for 1969. His findings indicate that, in order of their significance, health limitations, eligibility for social security, and other pen-

sion income are the most significant variables in increasing the probability of early retirement.

Analysis of the effects of pensions on Canadian labour supply are limited to two studies by Pesando and Rea (1977) and Burbidge and Robb (1980). The Pesando and Rea study does not include an econometric analysis of labour supply determinants, but, rather, only a discussion of one-period and two-period models of retirement behaviour. To the knowledge of this author, the Burbidge and Robb study provides the only econometric analysis of the factors influencing the labour supply of the elderly in Canada.

Burbidge and Robb designed a model with the purpose of making "a qualitative and quantitative assessment of the effects of pensions on the retirement behaviour of older workers, with particular reference to the Canadian Pension Plan." Operating with a sample size of 257 from the Pre-Retirement Survey, a supplement to the Labour Force Survey in 1975 of individuals 55 and over but not yet retired, Burbidge and Robb regress a dependent variable of expected retirement age by age groups against independent variables consisting of expected pension income, income expected from other sources, 1974 income, spouses' income, inadequate health, compulsory retirement age, and occupation. Their results indicate that "expected pension benefits figure prominently in the retirement plans of individuals" and that "individuals with high, as opposed to low, pension income are 30 to 60 percent more likely to retire early."

The support for pension benefits as the most significant determinant of early retirement is overwhelming. There are, however, many other factors which influence the elderly's labour force partic-

ipation decision. The only other variable which many contributors to the literature feel is as important, if not more so, in the elderly's retirement decision is health related factors.

(b) Health Related Factors

As an individual ages he, or she, physiologically deteriorates. Susceptibility to health problems is an established fact of growing old. Health problems may result in a decrease in worker productivity. This lowers the wage rate offered and decreases the substitution effect. In addition, health problems can be expected to influence the individual's subjective preference for leisure resulting in a decrease in the number of individuals with health problems in the labour force. Because of the reasons discussed above it is likely that health related factors play an important part in the elderly's decision to withdraw from the labour force.

The United States Social Security Administration (S.S.A.) has been conducting surveys of retirees since 1941-1942. Past surveys, based primarily on subjective individual self-evaluation, have concluded that poor health, and not the OASI program, was the main cause of retirement. The S.S.A.'s findings may be somewhat biased because of the interview technique used in the survey. Many people may feel that retirement because of poor health is a more socially acceptable response than a desire for more leisure, therefore, their response may overstate the influence of poor health on the retirement decision. Evidence in the literature which supports this criticism can be found in Brennan et al. (1967), Campbell and Campbell (1976), and Munnell (1977).

More recent surveys conducted by the S.S.A. and studies made by economists outside the S.S.A. suggest that poor health, as well as the eligibility for pension benefits, play an interactive role in the cause of retirement. The 1968-1970 Survey of Newly Entitled Beneficiaries and the ongoing Retirement History Survey begun in 1969 find workers are retiring because of factors other than health. While the 1968 Survey of Newly Entitled Beneficiaries found health to be the primary reason for retirement, 46 percent responded that they retired because they wanted to. Of this 46 percent, two-thirds responded that eligibility for pension benefits influenced their decision to retire (Reno (1971)). The more recent Retirement History Survey findings indicated that 52 percent of male retirees 64 to 65, and 54 percent of male retirees 66 to 67, who retired between 1969 and 1973 did so because of reasons other than poor health or job displacement (Bixby (1976)).

Richard Barfield and James Morgan (1974) utilized a cross-section analysis of a 1966-1967 sample of retirees and found health and financial factors to interactively be the most important factors in the retirement decision. Their conclusion stated that:

> Economic factors provide the basic enabling framework for the retirement decision. If one can afford to retire, then his decision will be affected by his health and his attitudes toward work and retirement. But if one feels economically unable to retire, only rather severe problems with (say) health or work may induce retirement. (p. 70)

Joseph Quinn's works (1977a; 1977b) support the interdependent nature of health and the receipt of pension benefits on the decision to retire. This 1977a study on the microeconomics of

early retirement conclude that

> Both health and retirement benefit eligibility status are important determinants in the early retirement decision and that there is substantial interaction between the two. (p. 344)

Increasingly, the current literature on the elderly's withdrawal from the labour force is acknowledging the interactive effects of the health and pension benefits; the one exception being Boskin (1977) who finds "no support for the conjecture that poor health is the prime mover in retirement decisions." Given this evidence, it would still be incorrect to assume that poor health is one of the primary factors explaining the rapid reduction in the labour force participation of the elderly. While the elderly's labour force participation rates have dramatically decreased since the turn of the century, the elderly's health, as reflected by an increased average life expectancy, in part the result of improved health and medical services programs, has improved. Clearly, other factors in addition to health play an important part in explaining the elderly's decision to retire.

(c) Economic Factors

There are three economic factors which the literature reveals that influence the elderly's labour supply. These are unemployment, urbanization, and labour supply competition.

Unemployment, as discussed in the previous section, influences the labour supply in two opposite ways. The added worker effect works to increase the labour supply while the discouraged worker effect works to decrease the labour supply. One of the first studies

using econometric analysis to determine the effect of unemployment on labour force participation was Bowen and Finegan (1969).

Bowen and Finegan's findings reveal the dominance of the discouraged worker effect for all males and married women. The cohort whose labour supply was most sensitive to a change in the unemployment rate was that of males 65 and over. Bowen and Finegan found this group responded with a -4.36 percent change in their labour force participation rate for every 1 percent change in the unemployment rate. The male 55 to 64 cohort was found to be the second most responsive with a -1.49 percent change in labour force participation for every 1 percent change in the unemployment rate.

Other studies which find a dominant discouraged worker effect include Glen Cain's (1966) analysis of married women in the labour force. Cain finds that the labour supplies of both men and women are negatively correlated with the unemployment rate. Marc Rosenblum's (1975) study finds a dominance of the discouraged worker effect with the most sensitive cohort being workers 55 and over. Quinn's (1977a) finding too supports the dominance of the discouraged worker effect.

Canadian studies analyzing the added and discouraged worker effects were discussed in the previous section of this chapter and need not be reviewed again here. The one comment which can be made is that the Canadian body of literature is less conclusive than the American on which effect dominates, but that both U.S. and Canadian research tend to agree that the labour supply of the elderly male cohort is the most sensitive to changes in the unemployment rates.

The degree of urbanization is viewed as a factor influencing the labour force participation of the elderly. Historically, the elderly have been active participants in the agricultural sector of the economy. The continuous decline in the proportion of the labour force employed in the agricultural sector has restricted the employment opportunities of the elderly. Munnell (1974), believes that the rural to urban migration of the elderly has been a factor in the elderly's long-term labour force participation decline. Gallaway's (1971) empirical analysis provides evidence that the elderly's labour force participation rate is negatively correlated with U.S. state urbanization levels. Bowen and Finegan (1969) cite a change in residential characteristics as the most important demographic variable in the aggregate labour supply of males 64 and over. Their study estimates that between 1948 and 1965 the labour force participation rate of males 64 and over declined by 2.7 percent as a consequence of a change in residential characteristics.

Competition for jobs by younger, more highly skilled participants in the labour market has been proposed as a factor in the reduction of the elderly's labour supply. Long (1958) maintains that the growth in the labour supply of women has decreased the elderly's labour supply. Long feels that the younger, better trained women entering the job market are in greater demand than older workers whose stock in human capital is often viewed as out-of-date. Long also feels that increased participation by female members of the family increases the family's utility function allowing older members of the household to consume more leisure by retiring. Juanita Kreps (1967) extends Long's beliefs in her model of lifetime

allocation of work and leisure. Kreps believes the large influx of baby-boomers into the job market during the 1950s and 1960s significantly reduced the work-life of elderly workers. Brennan et al. (1967, pp. 43-58) in their cross-section analysis of fourteen manufacturing industries in 1959 derived labour demand and supply equations which suggested that employment of women adversely affected the employment of older males.

> ...employment of females does affect adversely the employment of males--with the oldest, the youngest, and the intermediate ages affected in that order. Female labor has been substituted for male labor by industrial firms, but not uniformly across all age groups. (p. 56)

(d) Other Financial Factors

There are four financial factors which the literature identifies that may influence the labour supply of the elderly. These include the individual wage rate, spouse's earnings, asset income, and occupation. Each of these will in turn be discussed.

The discussion of the work-leisure model in the previous section of this chapter described the effect a rise in the wage rate would have on individual labour supply. The substitution effect would work to increase the amount of labour supplied while the income effect would work to reduce the amount of labour supplied. Due to the availability of non-labour income in the form of pensions and the hypothesized preference of the elderly for leisure over work, the literature expects elderly workers to be more sensitive to changes in the wage rate than prime-age workers.

Bowen and Finegan (1969), expecting to find a positive relationship between the labour force participation of males 65 and over

and earnings, found no significant relationship. In their discussion of the decrease in the elderly's labour force participation rate they conclude that "it is best to assume that earnings per se has had a negligible impact." Quinn's (1977a) analysis of the elderly's retirement determinants included a correlation of labour force participation and the wage of an older worker. His results indicated no significant relationship existed and supported Bowen and Finegan's conclusion.

The literature reveals that a dependent variable based on hours of work supplied, as opposed to labour force participation rates, is more sensitive to changes in wage rates or earnings. Although regressions using hours of work supplied as a dependent variable and the wage rate or earnings as an independent variable have given more significant results, their findings are far from conclusive. Quinn (1977a) found evidence of a small income effect. Boskin's (1973) work indicated a small substitution effect, and Parnes et al. (1975) found a significant but irregular relationship. Clearly, the literature on the influence of wage rates and earnings remains conflicting and undecided on which effect--income or substitution--dominates the labour supply of the elderly.

A spouse's earnings are hypothesized to influence the amount of labour offered by her husband. Family life-cycle theory views labour supply decisions as decisions jointly determined by all family members. A spouse entering the work force increases family income and enables the increased consumption of leisure or non-market work by other, possibly elderly, members of the family. The literature reveals little or no influence of spouse's earnings on

male labour supply. Boskin (1977) uncovers only a small negative influence of spouse's earnings on the probability of the husband retiring, while Quinn's (1977a) findings show more sensitivity of elderly female labour supply to spouse's earnings.

The income effect of non-labour income or asset income on labour supply was discussed in the previous section of this chapter. With respect to the elderly, the income effect of asset income is expected to be significant, but of less influence as a labour supply determinant than social security or private pension benefits (Clark and Spengler (1980)). Quinn (1977a) finds a significant negative influence of increased asset income on participation rates of married white males. His findings suggest a rise in asset income from $1,000 to $3,000 would decrease participation rates by 6.5 percent. Boskin (1977) sees a $1,000 annual increase in asset income increasing the probability of retirement by 15 percent. This is in contrast to his 1973 study which revealed no significant influence of asset income on elderly white husbands. Finally, Bowen and Finegan (1969) find a significant relationship; however, asset income was grouped into an "other income" variable which included social security benefits and, because of this, Bowen and Finegan probably overstate the influence of asset income on elderly labour supply.

The occupation a worker chooses is another factor which can influence his retirement decision. It is believed that white-collar workers and self-employed workers receive greater job satisfaction and psychic income from their occupations than blue-collar workers do. In addition, white-collar jobs are, in general, less physically taxing on elderly workers than blue-collar jobs. These factors

support the belief that elderly workers in white-collar or self-employment occupations stay in the labour force longer than elderly workers employed in blue-collar occupations.

A number of studies including Henry Sheldon (1958), Pechman et al. (1968), Bowen and Finegan (1969), Munnell (1974), and Parnes et al. (1975) argue that the decline in the elderly's labour force participation rate has been influenced by the decrease in the number of self-employed elderly individuals. Karen Schwab (1974), reporting on findings of The Retirement History Survey, verifies the importance of occupation as a factor in the labour force participation of the elderly. Schwab finds that a smaller proportion of professionals, farmers and managers are retired than operatives, service workers, and labourers.

(e) Family and Individual Factors

Family and individual factors identified in the literature which are hypothesized to influence the elderly's labour supply include education, marital status and race.

Bowen and Finegan (1969), Sherman (1974), and Boskin (1977) all provide evidence that education and the average age of retirement are positively correlated. The problems with including an education variable and an expected wage variable in a model which already includes an occupation variable is that occupation may be correlated with education and expected wage. Occupation is a function of the level of schooling attained, and also reflects on the expected wage. Including all three variables in a model can lead to severe multicolinearity between the three variables and provide invalid

output in an explanatory model. The most prudent course of action seems to be to include only an occupation variable.

Contributions to the literature commenting on the influence of marital status and race (specifically black males and females) can be found in Bowen and Finegan (1969), Parnes et al. (1975), and Quinn (1977a). In all cases, married men were found to participate more and longer in the labour force than single men. The reverse applied to women. The studies reviewed suggested that race was positively related with early retirement for non-white males; however, the magnitudes of the relationship varied.

In summary then, the review of available literature indicates that eligibility for, or expected, pension income and poor health are the two most significant factors influencing the elderly's retirement decision. No consensus has yet been reached as to which factor is more significant, however, recent contributions argue the interactive influence of both pension income and poor health. Other factors found to be important in the elderly's retirement decision include: economic factors such as unemployment, urbanization, and labour supply competition; other financial factors such as wage rate, spouse's earnings, asset income, and occupation; family and individual factors such as education, marital status, and race.

Based on the review above of the factors influencing the elderly's retirement decision, the following section will propose a model which attempts to explain the labour supply determinants of Canada's elderly. Due to the dearth of Canadian data sources many of the independent variables included in the U.S. studies cannot be included here.

B. A Model of the Elderly's Labour Supply

This section of the chapter proposes a model of the determinants of the elderly's labour supply. The model is presented, and in turn, the dependent and independent variables included in the equation are discussed in detail.

(i) The Model

The following model is designed to explain the relative importance of the variables which are hypothesized to influence the labour force participation rates of the elderly in Canada:

$$LFP_{jk} = a + b_1RBE_{jk} + b_2OCC_{jk} + b_3UNE_{jk} + b_4URB_{jk} + b_5FPR_{jk} + e_{jk}$$

$$(j=1,\ldots,10) \quad (k=1,\ldots,3)$$

Where the dependent variable, LFP_{jk}, is the labour force participation rate of males and females 65 years of age and over in province j in census year k. The independent variables include RBE, the ratio of average retirement benefits to total average earnings; OCC, the ratio of the elderly work force employed in white-collar, as opposed to blue-collar, occupations; URB, the ratio of the population living in urban areas; and FPR, the over-all female labour force participation rate. e_{jk} represents a random statistical error term added to, or subtracted from, the equation.

The assumptions the model is based on include:

(1) The expected value of the error term e_{jk} is zero; e_{jk} is normally distributed; and the standard deviation of e_{jk} is the same regardless the value of the independent variables. Also, the value of e_{jk} is assumed to be statistically independent.

(2) The dependent variable LFP_{jk} is assumed to be linearly related to the independent variables in the equation. Also, it is assumed no linear relationship exists between the independent variables and their influence on the dependent variable is additive.

(ii) The Dependent Variable

The dependent varible LFP_{jk} was chosen as the proxy for labour supply of the elderly for two main reasons:

(1) At the level of aggregation chosen no other variable provided as reliable and easily obtainable a proxy for the elderly's labour supply.

(2) A large number of previous studies use the labour force participation rate as a measure of the elderly's labour supply or retirement decision; thereby allowing a comparison of results.

Data for the dependent variable was derived by taking the labour force participation rates of the elderly, including men and women, for each province in Canada for the years 1961, 1971, and 1976.

(iii) The Independent Variables

RBE, the ratio of average retirement benefits to total average earnings for each province, is similar to the pension variable designed by Gordon (1963a; 1963b), Pechman et al. (1968), and Gallaway (1971). RBE is derived by dividing average public pension benefits (O.A.S. and G.I.S., but not C.P.P. which was still being phased in over the data set period) paid per person by province with average yearly income, based on all returns for year k, for people 65 and over by province. It is hypothesized, given that in labour supply theory pension benefits generate an income effect, that LFP will vary inversely with RBE since the greater the amount of retire-

ment benefits one receives the less the incentive to participate in the labour force. Evidence in the literature which supports this view can be found in Gordon (1963a; 1963b), Pechman et al. (1968), Bowen and Finegan (1969), Gallaway (1971), Boskin (1977), Quinn (1977a; 1977b), and Burbidge and Robb (1980).

OCC, the ratio of the elderly work force employed in white-collar occupations, is derived by dividing the number of persons 65 and over employed in white-collar occupations for province j by those 65 and over employed in blue-collar occupations for province j in 1961, 1971, and 1976. This study defines white-collar occupations as:

1. Management, Administration and related
2. Natural Science, Engineering and Math
3. Social Science and related
4. Religion
5. Teaching and related
6. Medicine and Health
7. Art, Literature, Recreation and related
8. Clerical and related
9. Sales
10. Service

Blue-collar occupations are defined as:

1. Farming, Horticulture and Husbandry
2. Fishing, Hunting, Trapping and related
3. Forestry and Logging
4. Mining and Quarrying
5. Processing
6. Machining and related
7. Product Fabricating and Assembling
8. Construction
9. Transport and Equipment Operating
10. Materials Handling
11. Crafts and Equipment Operating

It is hypothesized that elderly persons employed in white-collar jobs receive greater job satisfaction and personal rewards

than their counterparts in the more physically demanding blue-collar occupations. With greater job satisfaction, physically less taxing duties, and more work schedule flexibility elderly workers in white-collar occupations will have higher labour force participation rates than blue-collar counterparts. Evidence in the literature to support this can be found in Sheldon (1958), Pechman et al. (1968), Bowen and Finegan (1969), Munnell (1974), Schwab (1974), and Parnes at al. (1975).

The variable UNE is the over-all seasonally adjusted unemployment rate by province for 1961, 1971, and 1976. Labour supply theory sees unemployment affecting the LFP of the elderly in two ways. First, if the added worker effect predominates the LFP of the elderly will be positively associated with UNE. In other words, as the independent variable UNE increases the elderly worker will be forced to remain in or reenter the work force or face the prospect of moving to a lower individual or household indifference curve. This will cause the dependent variable LFP to increase as well. Second, if the discouraged worker effect predominates LFP is expected to be negatively associated with UNE. As the independent UNE variable increases the dependent LFP will decrease due to the elderly's low expectation of finding a job when UNE is high. American studies (Cain (1966), Bowen and Finegan (1969), Quinn (1977a; 1977b) and Rosenblum (1975)) support the predominance of the discouraged worker effect. Canadian studies are less conclusive with studies by Ostry (1968), Proulx (1969), Spencer and Featherstone (1970), Davis (1971), Donner and Lazar (1974), and Swan (1974) supporting the predominance of the added worker effect, and studies by Officer and Anderson

(1969), Spencer (1973), Swidinsky (1973), and Gunderson (1977) supporting the predominance of the discouraged worker effect.

URB, the ratio of the population living in urban areas, is derived by dividing the total provincial population by the total living in urban areas as defined by Statistics Canada. It is hypothesized that LFP will vary inversely with URB since employment in rurally based sectors of the economy, particularly farming, horticulture and husbandry, involves greater participation by the elderly. With greater urbanization the rural elderly, with their higher LFP rates, become a smaller proportion of the total labour force. Evidence in the literature which supports this relationship can be found in Bowen and Finegan (1969), Gallaway (1971), and Munnell (1974).

The variable FPR, the over-all female labour force participation rate by province, is used as a proxy to measure the influence of labour supply competition. FPR is expected to be negatively associated with LFP. First, as younger, better trained, women enter the competitive job market older participants will become obsolete and eventually driven out of the labour force. Second, as the daughters and wives of older working men find jobs the financial necessity of remaining in the labour force will be reduced and older males will be more likely to retire. Evidence in the literature to support this hypothesis can be found in Long (1958), Kreps (1967), and Brennan et al. (1967).

In summary, this section of chapter 3 presented a cross-sectional model of the labour supply determinants of the elderly in Canada.

The dependent variable utilized the elderly's labour force participation rate as a proxy for labour supply. Included in the model as independent variables were proxy measures for the influence of pension related factors, economic factors, and other financial factors, with variables specific to economic factors being most numerous. The model is designed to be multiply regressed and an explanatory equation derived. The results of the regression analysis are presented and discussed in the following chapter.

Chapter 4

THE EMPIRICAL FINDINGS

This chapter describes the sources used to collect data for the variables employed in the model. In addition, the chapter discusses the results obtained from the multiple regression analysis, and the principal data and model deficiencies.

A. The Data Base

The bulk of the data for the variables used in the model was derived from Statistics Canada census sources. A number of other data sources were used to collect data for the assorted variables; therefore, the data sources for each variable will be discussed in turn.

Data for the dependent variable LFP, the labour force participation rate for persons 65 and over in the province for 1961, 1971, and 1976 was obtained entirely from Statistics Canada census publications.

The independent variable RBE, the ratio of retirement benefits to total income, was constructed with data from two sources. First, data on average annual public pension benefits was obtained from Statistics Canada's annual publication of Health and Welfare data on Social Security Programs in Canada. In 1971 and 1976 RBE includes benefits from the O.A.S. and G.I.S. program since the G.I.S. program was nonexistent in 1961. Benefits paid through the C.P.P./Q.P.P. program are not included in any year since the C.P.P./Q.P.P. program is available only to those who paid into it, and the program

was phased in beginning 1966. Second, data on average annual total income was obtained from Revenue Canada sources based on taxation returns for all individuals 65 and over by province. RBE is simply the ratio of public pension income, as derived from average provincial O.A.S. and G.I.S. benefits, to total income, as derived from taxation returns for all individuals 65 and over by province, for each of the three years, 1961, 1971, and 1976.

Data for OCC, the ratio of white-collar elderly to blue-collar elderly, was obtained entirely from Statistics Canada census publications for 1961 and 1971. Statistics Canada only asks questions about occupation in their decennial censuses so data on occupation was not available for 1976 and could not be included in the multiple regression analysis.

Data for the independent variable UNE, the provincial unemployment rate was obtained from Statistics Canada census publications for 1971 and 1976, and from data published by the Conference Board of Canada for 1961. Data for the URB variable, the percentage of the provincial population living in urban areas, and the FPR variable, the provincial female labour force participation rate, was obtained entirely from Statistics Canada census sources for 1961, 1971, and 1976.

B. Discussion of Results

Four multiple regressions were run. The first three employed the dependent variables LFP_{61}, LFP_{71}, and LFP_{76}. LFP_{61} is defined as the elderly's labour force participation rate for 1961, and LFP_{71} and LFP_{76} being similar dependent measures for 1971 and 1976 respect-

ively. The fourth regression employed LFP_{61-71} as its dependent variable. This regression utilized the change in the dependent and independent variables between 1961 and 1971, regressed these differences, and derived an explanatory equation which measured those variables which were most significant in the change of the elderly's labour force participation between 1961 and 1971. The first three regressions are cross-sectional analyses, meaning they are analyses based on data for particular points in time (1961, 1971, and 1976). The fourth regression is a time-series analysis, meaning it is an analysis based on data over a number of points in time (1961 and 1971). Time-series analyses are normally based on more than just two points in time; however, data which would allow more years to be included and the fact that data for the OCC variable in 1976 was not available meant a time-series analysis could only be conducted which included 1961 and 1971.

Multiple regression analysis allows the researcher to set levels of confidence or significance at which to test both the over-all predictive equation and the individual coefficients inside the equation. To test the over-all predictive equation a null hypothesis is stated that the value of all of the coefficients in the predictive equation equal zero. If measures of t or F exceed the confidence level assigned, the null hypothesis is rejected. Confidence levels, or levels of significance, are generally set at .01 or .05; however, occasionally the level is set at the less rigorous .10 level. A confidence level set at .01 means there is a 1 percent chance of rejecting a null hypothesis which, in effect, is valid. A level set at .05 means there is a 5 percent chance of rejecting a valid null

hypothesis.

To test the individual coefficients in a regression equation a null hypothesis is stated for each individual regression coefficient which sets the value of the regression coefficient equal to zero. If measures of t or F exceed the confidence level assigned the null hypothesis is again rejected. The value obtained for the regression coefficient is important because it measures the effect of a one unit increase in the independent variable on the expected value of the dependent variable, when all other independent variables in the equation are held constant.

Table VIII summarizes the regression results of the four regressions run. The two predictive equations for 1961 and 1971 are significant at the $p = .05$ level of significance, and the predictive equation for 1976 is significant at the $p = .01$ level of significance. The regression equation explaining the change in the elderly's labour force participation between 1961 and 1971 is significant at the lower $p = .10$ level of significance. The adjusted R^2 values for the first three regressions are moderately high ranging from .80 to .90. The relationship between the dependent variable and independent variables, for each of the three years of analysis, will be discussed in turn.

The stepwise inclusion regression for 1961 reveals the importance of the UNE, OCC, and RBE variables as determinants of the elderly's labour force participation rate. The OCC variable, however, is the only variable in the equation which is statistically significant at the $p = .05$ level of significance. The OCC variable, the

Table VIII

Results of Regression Analysis

DEPENDENT VARIABLE	CONSTANT	UNE	URB	FPR	RBE	OCC	R^2	ADJ R^2	F RATIO
LFP_{61}	54.8	-.532 (3.05)	Insuff. Tol.	.126 (.191)	-1.03 (3.68)	-.284** (15.6)	.94	.89	19.63***
LFP_{71}	61.4	.109 (.093)	-.177 (3.48)	.210 (2.43)	-.720 (4.28)	-.235* (5.59)	.91	.80	8.36**
LFP_{76}	23.6	-.721** (10.3)	-.126*** (19.6)	.178* (2.30)	-.116* (2.65)	N/A	.94	.90	20.85***
LFP_{61-71}	.715	-.173** (7.28)	.120 (.755)	Insuff. Tol.	-.174 (3.11)	-.076 (1.42)	.78	.61	4.59*

*** p = .01 ** p = .05 * p = .10
F Ratios of Coefficients are in Brackets

proportion of the elderly labour force employed in white-collar occupations shows an unexpected negative relationship with LFP_{61}. This finding contrasts with the hypothesized positive relationship expected (Sheldon (1958); Pechman et al. (1968); Bowen and Finegan (1969); Munnell (1974); Schwab (1974); and Parnes et al. (1975)). This result could mean that the hypothesized positive relationship between LFP and OCC may not be valid. Alternatively, the result may, in part, be explained by the importance of the primary sector industries as a source of employment for the elderly. While the over-all number of elderly in the labour force is decreasing, the proportion of elderly employed in white-collar occupations is increasing. This pattern suggests that a larger withdrawal of elderly workers employed in the primary sector, or blue-collar occupations accounts for the over-all decline in the elderly's labour force participation rate.

With LFP_{61} as the dependent variable UNE, the provincial unemployment rate, indicates the predominance of the discouraged worker effect. This supports the findings of Canadian researchers including Officer and Anderson (1969), Spencer (1973), Swidinsky (1973), and Gunderson (1977). In 1961, an increase in the provincial unemployment rate of one percent would have reduced the elderly's labour force participation rate by over one half of one percent. The results obtained for RBE, the ratio of public retirement benefits to total income, support the hypothesized negative relationship found in studies by Gordon (1963a; 1963b), Pechman et al. (1968), Bowen and Finegan (1969), Gallaway (1971), Boskin (1977), Quinn (1977a; 1977b), and Burbidge and Robb (1980). In fact, the results obtained suggest

that in 1961 a one percent increase in RBE would have reduced the elderly's labour force participation rate by 1.03 percent. FPR, the provincial female participation rate, showed an unexpected positive relationship. This contradicts the relationship hypothesized by Long (1958), Kreps (1967), and Brennan et al. (1967). This discrepancy may, in part, be explained by the large simple correlation coefficient between FPR and UNE of -.82 strongly suggesting the presence of multicolinearity in the equation. The problems posed by the multicolinearity will be discussed later in this chapter so they need not be dealt with here. URB, the proportion of the provincial population residing in urban areas, negligibly explained the variance in LFP_{61} so the computer did not include it in the stepwise regression. The default tolerance level set by the SPSS program was T = .001, meaning that an independent variable is entered into the equation if the proportion of its variance not explained by other independent variables exceeds 0.1 percent.

The stepwise inclusion regression for 1971 provides an explanatory equation which points to the importance of OCC, RBE, and FPR as dominant variables in explaining the elderly's labour force participation rate in 1971. OCC, statistically significant at the p = .10 level of significance, shows an unexpected negative relationship again pointing to an invalid hypothesis, or the importance of primary sector industries as a source of employment for the elderly. The results derived suggest that in 1971 a one percent increase in RBE would have decreased the elderly's labour force participation rate by over 0.7 percent. The FPR variable continues to show the unexpected positive relationship, this time with no multicolinearity

apparent from a visual inspection of the simple correlation coefficients. The reasons for this relationship are difficult to speculate on for they suggest that a rise in the female labour force participation rate leads to an increase in the elderly's labour force participation rate. Historically, this has not been the case as rising female participation rates correspond with declining elderly participation rates. The results for URB support the hypothesized negative relationship with LFP_{71} (see: Bowen and Finegan (1969); Gallaway (1971); and Munnell (1974)) suggesting that, other variables held constant, a one percent increase in the proportion of the provincial population living in urban areas reduces the elderly's labour force participation rate by 0.18 percent. In contrast to the 1961 regression, the 1971 regression suggests the predominance of the added worker effect since UNE expresses a positive relationship with LFP_{71}. Evidence in the literature which agrees with this finding for Canadian data sets can be found in Ostry (1968), Proulx (1969), Spencer and Featherstone (1970), Davis (1971), Donner and Lazar (1974), and Swan (1974).

The third regression, looking at the factors influencing the elderly's labour force participation rate in 1976, points to the importance of UNE, URB, and to a lesser degree RBE and FPR. The results obtained show UNE is significant at the $p = .05$ level of significance and is negatively correlated with LFP_{76} indicating the predominance of the discouraged worker effect once again. A one percent increase in the provincial unemployment rate suggests a decrease in the elderly's labour force participation rate of over 0.7 percent. The URB variable is statistically significant at the $p = .01$ level

of significance and again supports the hypothesized negative relationship. The results obtained suggest a one percent increase in the proportion of the provincial population living in urban areas in 1976 would have reduced the elderly's labour force participation rate by almost 0.13 percent. The results obtained for the FPR variable once again support the hypothesized positive relationship; however, as in the 1961 regression, this may be explained by the presence of multicolinearity between FPR and UNE. The simple correlation coefficient between FPR and UNE in the 1976 regression is -.85. The RBE variable, consistent with the results of previous regressions, supported the hypothesized negative relationship with a one percent increase in RBE decreasing LFP_{76} by 0.12 percent.

The final stepwise inclusion regression was designed to highlight those variables in the equation which accounted for the change in the elderly's labour force participation rate between 1961 and 1971. The results suggest OCC, UNE, and RBE were the three most important independent variables in explaining the variance in the elderly's labour force participation rate between 1961 and 1971. As a cautionary note it is important to recognize that the explanatory equation derived in this regression is only statistically significant at the $p = .10$ level of significance.

In summarizing the results of the regression analysis, the four regressions conducted suggest that UNE, the provincial unemployment rate, OCC, the proportion of elderly employed in white-collar occupations, and RBE, the ratio of public retirement benefits to total income, are, generally, the three most important variables in explaining the elderly's labour force participation rate. UNE tends to have

a discouraged worker effect on elderly members of the labour force, although the results for 1971 indicate a small added worker dominance. OCC, although repeatedly exhibiting an unexpected negative relationship, uncovers the importance of blue-collar occupations as significant sources of employment for elderly workers. RBE, consistent with the literature reviewed in its direction of influence but not in its over-all importance (see: Gordon (1963a; 1963b); Pechman et al. (1968); Bowen and Finegan (1969); Gallaway (1971); Boskin (1977); Quinn (1977a; 1977b); and Burgidge and Robb (1980)), works to reduce the number of persons 65 years of age and over in the labour force. Other variables in the regression equations included URB, the proportion of the provincial population residing in urban areas, and FPR, the provincial female labour force participation rate. Both of these variables were found to be very weak contributors to explaining the variance of the labour force participation rate of the elderly in each of the three years analyzed with the exception of URB in 1976. This conflicts with the findings of Bowen and Finegan (1969), Gallaway (1971), and Munnell (1974) for the urbanization variable, and Long (1958), Kreps (1967), and Brennen et al. for the female participation variable.

The regression analysis was conducted, in part, to enable a Canadian comparison with U.S. studies on the elderly's labour supply determinants. As has been discussed earlier, the hypothesized relationship and importance of the independent variables included in this study differed somewhat from comparable variables included in U.S. studies. American studies tend to conclude that receipt of retirement benefits is the most important factor in the elderly's

labour supply decision. In this study, the retirement benefit variable was consistently of less importance than the unemployment rate variable and the occupation variable.

The following section of this thesis discusses the deficiencies of the multiple regression analysis conducted. The deficiencies can broadly be categorized into two areas:

(1) Deficiencies particular to the data sources utilized and how this influenced the construction of the variables in the equations.

(2) Deficiencies particular to the model and the results obtained.

C. Principal Data and Model Deficiencies

(i) Deficiencies Particular to the Data

There are three major deficiencies related to the data and the sources utilized for the regression analysis. These are as follows:

(1) Lack of a Health Variable

(2) Lack of Disaggregated Data

(3) Other Data Deficiencies

Each of these will now be discussed in turn.

(a) Lack of a Health Variable

Lack of a health status variable, or data from which a proxy measure for the elderly's health status could be derived may be the most significant data deficiency. From the literature review of the labour supply determinants of the elderly in Chapter 3, substantial evidence of the importance of a health status variable as a factor influencing the elderly's labour supply was uncovered. A number of

authors argue the significant influence of health on an elderly person's decision to participate in the labour force including Barfield and Morgan (1969), Reno (1971), Bixby (1976), Quinn (1977a; 1977b), and Clark and Spengler (1980). Canadian data sources offering measures of the health status of the elderly are minimal. The only Canadian data sources which provide information on health status are the Pre Retirement Survey and the Retirement Survey conducted by Statisitics Canada for the Department of Health and Welfare as a supplement to the Labour Force Survey in February, 1975.

The measure of health status offered by the Pre Retirement and Retirement surveys was not utilized in this analysis for two reasons. First, including a sample from either of the surveys would conflict with the sample derived from census sources and lead to possible sampling bias. Second, the survey technique used to derive the measure of health status may overstate the importance of health in the decision to retire since poor health is generally viewed as a more socially acceptable response than a desire for more leisure. For a description of the variables available in these surveys see Appendix B.

The significance of a measure of the elderly's health status in many American studies emphasizes the importance of including a similar measure in any Canadian studies of the labour supply determinants, or retirement decision of the elderly. Unfortunately, lack of a health status variable in the data base employed precluded the inclusion of a health status variable in this study.

(b) Lack of Disaggregated Data

A second data deficiency which limited the construction of

variables used in the regression analysis was the lack of disaggregated data by age cohort within the 65 and over category. Data for the dependent variables and the independent variable RBE was only available for those elderly 65 and over. This necessitated consideration of the elderly as a homogeneous group comprised of males and females 65 and over. The "elderly" are not a homogeneous group since various social, economic, and physiological factors will influence those who have just turned 65 or 66 quite differently than those who are 75 or 80 years of age. In order to accurately measure the influence of the variables included in this regression analysis of the "elderly's" labour supply determinants, it is preferable to have data disaggregated into age cohorts represented, at minimum, by elderly in the age 65-69, 70-74, and 75 and over cohorts.

(c) Other Data Deficiencies

Other data deficiencies arose which hampered the efficiency of this study. Firstly, a regression for the year 1966 could not be conducted as data was not available to construct the dependent variable LFP_{66}, or the independent variable FPR, at the provincial level. Second, the independent variable RBE is not a complete measure of pension benefits since benefits received from private or employer pension programs could not be included due to data restrictions. RBE, therefore, only includes average public pension benefits received from the O.A.S. and G.I.S. programs.

(ii) Deficiencies Particular to the Model

There are two major deficiencies related to the model and the statistical results derived. These include:

(1) Possible problems associated with multicolinearity

(2) Possible bias in selection of variables

These two possible sources of deficiencies in the model are discussed in detail below.

(a) Possible Problems Associated With Multicolinearity

Multicolinearity is apparent when two or more of the independent variables in an equation are highly correlated with each other. Multicolinearity between independent variables can lead to inaccurate estimates of regression coefficients for each variable. In addition, multicolinearity can result in very large standard errors of the coefficients providing inaccurate estimates, or apparent insignificance of a coefficient which is significant. The degree of multicolinearity between independent variables in an equation is measured by the simple correlation coefficients between two or more independent variables. A perfect correlation between independent variables would yield a simple correlation coefficient of +1 or -1. Although perfect correlation is rare, high simple correlation coefficients between independent variables is common. In cases in which simple correlation coefficients between independent variables are close to +1 or -1, then it is likely that multicolinearity is a problem.

Of the four regressions run evidence of multicolinearity between independent variables can be seen in three. The 1961 regression yielded a simple correlation coefficient between UNE and FPR of -.82. An examination of the scattergram distribution between these two independent variables confirmed the strong linear relationship.

Eastern provinces, with the exception of Ontario, tended to have lower female participation rates and higher provincial unemployment than western provinces. This possibly reflects regionalized attitudes toward female employment, in addition to differing employment opportunities on the provincial level. This indicates a discouraged worker dominance for females and supports the findings of Cain (1966), Bowen and Finegan (1969), and Swidinsky (1973). The regression conducted for 1971 showed evidence of multicolinearity between RBE and URB with a simple correlation coefficient of -.92. The scattergram distribution between RBE and UNE for 1971 supported the suspicion of multicolinearity. The point distribution showed provinces with the highest proportion of urban population (Ontario, Quebec, B.C., and Alberta) had the lowest ratio of retirement benefits to total income. This is not too suprising since the provinces with the larger urban population generally tend to be considered the wealthier provinces. Elderly people living in these provinces have been able to derive a greater proportion of their total income from sources other than public pensions. An indication of multicolinearity in the regression for 1976 was found between UNE and FPR. The simple correlation coefficient in this case was -.85. Again, as in the 1961 regression, this finding supports the discouraged worker dominance for females.

In the case where two independent variables are found to exhibit multicolinearity one solution to the problems created is to drop one of the two independent variables from the regression equation. Table IX shows the results of regressions which have dropped independent variables which were suspected of showing multicolinearity

Table IX

Results of Regressions Corrected for Multicolinearity

DEPENDENT VARIABLE	CONSTANT	UNE	URB	FPR	RBE	OCC	R^2	ADJ R^2	F RATIO
LFP_{61}	57.9	-.609** (9.12)	.022 (.077)	Dropped	-1.03* (3.44)	-.289** (7.75)	.94	.89	19.17***
LFP_{71}	31.5	.297 (.502)	Dropped	.153 (.915)	-.242 (.706)	-.247 (4.17)	.83	.70	6.40**
LFP_{76}	33.4	-.992*** (44.3)	-.199*** (14.9)	Dropped	-.129* (2.71)	N/A	.91	.88	22.19***

*** p = .01 ** p = .05 * p = .10
F Ratios of Coefficients are in Brackets

with another independent variable in the equation. For 1961 and 1976 FPR has been dropped from the equation, and for 1971 URB has been dropped. The results show a general improvement in the significance of the regression coefficients for 1961 and 1976, but a decrease in the significance of the coefficients for 1971.

The dropping of FPR from the 1961 regression improved the statistical significance of UNE and RBE, as well as increased the variance of LFP_{61} explained by UNE. Excluding FPR from the regression equation for 1976 improved both the statistical significance and the explanatory power of UNE and RBE. By dropping URB from the 1971 regression equation the statistical significance of the variables in the equation was reduced. It was hoped that by dropping a variable which appeared to be colinear with another the statistical significance of the regression coefficients would improve. The reduction in the statistical significance of the coefficients after dropping URB suggests that URB should remain in the regression equation. Evidence of multicolinearity in this case does not appear to be valid.

Summarizing the results of the new series of regressions corrected for multicolinearity, UNE, OCC and RBE tend to be three important independent variables in explaining the variance in the elderly's LFP. The higher coefficient values for the 1961 and 1976 regressions improve the explanatory power of the 1961 and 1976 equations. The values of the coefficients in the corrected regression for 1971 decreases the explanatory power of this equation. The elderly appear most sensitive to the unemployment rate tending to withdraw from the labour force in periods of rising unemployment.

The OCC variable again points to the importance of blue-collar jobs as significant employers of the elderly, and public retirement benefits act to encourage the withdrawal of the elderly workers from the labour force.

(b) Possible Bias in the Selection of Variables

The model may be deficient in one other area. There is a possibility that the independent variables RBE and UNE negatively bias the results. RBE can negatively bias the results since receipt of retirement benefits is often conditional upon retirement from the labour force. This argument appears to have more validity for analyses based on U.S. data where a retirement test is still in effect. In Canada, however, the O.A.S. program is universally applicable to all people 65 and over. Only the G.I.S. program is based on a means test, but people can still work and receive the G.I.S. provided their income falls below a certain level.

A negative bias may also be introduced by using UNE as a variable independent of LFP. It has been argued (Clark and Spengler (1980)) that by using a dependent variable of the labour force participation rate, which was constructed with the size of the labour force in the numerator, and an independent variable of the unemployment rate, which uses the size of the labour force as its denominator, a negative bias is introduced. There is nothing, short of constructing alternative proxy measures for LFP or UNE, which can be done to correct this possible source of bias. It is important, however, to recognize its possible existence and the influence it may exert in the relationship between LFP and UNE.

In the following chapter the thesis concludes with an examination of two points. First, the implications of Canada's aging population and the findings of Chapter 4 are considered and some recommendations stemming from these findings are made. Second, some directions for future research in the area of the elderly's labour supply determinants are discussed.

Chapter 5

CONCLUSION

The absolute and relative number of elderly in Canada's population is growing, and is expected to continue to grow well into the next century. At the same time, the elderly are working less. The growth of the elderly proportion of the population and the decline in their participation in the labour force poses a number of implications for policy makers and planners. This chapter examines some of the economic and social implications of population aging. In addition, the chapter comments on some of the implications associated with the findings of the regression analysis conducted to evaluate the labour supply determinants of Canada's elderly population. Finally, this chapter concludes with a discussion of directions for future research.

A. Implications of an Aging Society

(i) Economic

The economic implications created by population aging can be grouped into four main areas. These are as follows:

(1) The dependency burden
(2) Economic productivity
(3) Mobility
(4) Consumption, saving and investment

(a) The Dependency Burden

People 65 years of age and over who have withdrawn from the labour force are, to a large degree, dependent upon those persons who are still active in the labour force. As the absolute and relative number of elderly persons in the population increases the

number of elderly dependents to people of working age (15-64) also increases. The financial burden placed on the Canadian economy as a result of population aging can be enormous. Costs associated with pension programs and health care facilities to support the elderly could prove unmanageable. Higher taxation of the working age population may be necessary to support the elderly.

An indication of the dimensions of the financial burdens which could be expected as a result of an increased proportion of retired elderly in the population is provided by the Science Council of Canada (1976). Projections of the Canada Pension Plan (C.P.P.) see 1981 as the last year in which contributions to the plan will exceed benefits paid out. Starting in 1982 the C.P.P. fund will begin to shrink. In fact, assuming present contribution rates and continued loans to the provinces from pension contributions, by the year 2025 the C.P.P. is projected to be $854.9 billion in debt. The primary reason for this huge deficit will be the large increase in pension beneficiaries.

In recent years Canada has experienced large increases in its annual rate of inflation. Should the inflation rate continue to rise without adjustments to pension contribution rates the cost of public pension plans in Canada, in real terms, will be increased further. The O.A.S. program is universally applicable to all Canadians 65 and over. What is more important in terms of a possible future financial burden is that the O.A.S., as well as the G.I.S., program is indexed to the cost of living. As inflation goes up, so too will pension payments. If pensions remain indexed and inflation continues to increase, without an increase in the pension

contribution rate or higher taxes to pay for indexed pensions, the pension program could soon go broke.

An increase in the proportion of elderly in the population can be expected to increase health care costs as well. The elderly generally require more medical care than any other segment of the population; therefore, with the elderly comprising an increasing proportion of the total population it is reasonable to assume health care costs will increase. Estimates of the future health care costs to society are not yet well developed. Denton and Spencer (1975), in a computer simulation of the impact of population change on the relative burden of health care costs, conclude that their findings "suggest that population changes can be expected to have a substantial impact on the cost of health care in the longer term".

Many health care programs and services for the elderly administered and funded on the provincial level will likely be financially pressed in the future. In British Columbia, there are five major health care programs developed which serve the elderly. These include the Pharmacare program which subsidizes the cost of prescription drugs and is universally applicable to B.C. residents 65 and older; the Medicare program which provides premium assisted medical coverage for most elderly; elderly Long Term Care programs which provide services at the personal, community, extended, and adult day care levels; hospital acute care services; and a new Dental Care program which provides total coverage of all dental costs for elderly residents of B.C. whose yearly income falls below $2,740, with 50 percent coverage for elderly residents whose yearly income is above $2,740.

The future costs of an aging population, in terms of increased pension and health care expenses, may be eased by the fact that while the proportion of elderly dependents (65 and over) will increase in the future, the proportion of young dependents (0-14) will decrease in the future. Some authors argue that the dependency burden caused by the increased number of elderly in the population will be offset by the decreased number of child and juvenile dependents (Ridler (1979); and Denton and Spencer (1980)). Both Ridler and Denton and Spencer provide projections of the over-all dependency ration as evidence that Canada's financial burdens will not increase significantly. These authors neglect the fact that although the over-all dependency ratio may not change much by 2051 it is composed of a disproportionate amount of elderly dependents. The cost associated with supporting an elderly dependent (pensions and health care) are substantially higher than costs associated with supporting a young dependent (family allowance and education). One estimate places the public cost of supporting an elderly dependent at 2.5 times more expensive than supporting a young dependent (Weiner (1981)). Even though projections of the over-all dependency ratio suggest there will be no added financial burden placed on society, the disproportionate number of elderly included in the over-all dependency ratio will, unquestionably, increase the financial burden.

Ridler (1979) and Denton and Spencer (1980) also neglect the added burdens placed on an economy which has to change the proportion and amount of existing support services which presently serve the dependent young to those which will serve the dependent old. The over-all dependency ratio may not change much, but we can expect

increased financial, administrative, and planning burdens will result as programs and infrastructure presently serving young dependents become obsolete and new programs and infrastructure serving old dependents have to be designed.

With such a bleak outlook, what are some of the policy options planners and decision makers can adopt to ease Canada's future elderly dependency burdens? With regards to the huge financial implications posed by the pension burden, there are four options available:

(1) Raise contribution rates and taxes
(2) Reduce pension benefits
(3) Legislate a higher retirement age and ban mandatory retirement
(4) Create incentives for working longer

By simply raising contribution rates into public pension plans and taxes to cover the amount of pension benefits paid above contributions and taxes received, the federal government could keep pace with the financial pressures of a growing elderly population. West Germany and Sweden, recognizing the need for higher contribution rates, have increased their employer-employee rates to 18 and 11 percent of employment income respectively. A second option would be to reduce the amount of pension benefits paid to the elderly. The review of the literature in Chapter 3, and the results obtained in the thesis' regression analysis discussed in Chapter 4, indicate that pension benefits have an income effect which encourages retirement. Reducing pension benefits could encourage the elderly to work longer before accepting retirement. By working longer, the elderly would also be making contributions to the pension programs. Both of these policy options, particularly the second, are subject to substantial public disfavour and, as such, are not likely to be

politically acceptable.

A third option would see the legislation of a higher retirement age and a ban on mandatory retirement. By legislating a higher retirement age the elderly would remain active in the labour force longer, continue to contribute to the financing of pension programs, and reduce the period in which they would be dependent. An example of where a higher retirement age might be legislated is in the retirement program for Canada's federal civil servants. Should beneficiaries of this program choose they can retire at age 55 with a fully indexed pension. Sheppard and Rix (1977) support legislation for a higher retirement age and argue that we must rethink our retirement age policies and accept the inevitable extension of our active work life.

Banning mandatory retirement at a certain age would increase the productive life of a worker. Many industries have mandatory retirement policies which act to cut short the productivity of workers and increase the dependency burden of the retired elderly. This action not only increases the costs of the public pension program, but of the private pension plans of industries which adopt mandatory retirement policies as well. An example of the burden placed on industry comes from General Motors which, in 1967, had 10 workers on its payroll for every 1 retiree receiving benefits from its pension plan. By 1977 the ratio had dropped to 4 to 1 and projections forecast a 1 to 1 ratio after 1990 (Newsweek (1977)).

The fourth option available to ease the financial pain of the pension burden is to develop policies which provide incentives for the elderly to work longer. By working longer the elderly increase

the size of the labour force and, in doing so, create a larger contribution base from which pension payments can be derived. Of course, any policies which work to increase the size of the labour force will enlarge the contribution base; however, policies which encourage the elderly to work longer attack the pension burden at its source.

Although Canada has not initiated any programs which provide incentives to the elderly to work longer a number of other countries have. Harry Weitz (1980) documents some of these programs. West Germany has introduced both flexible retirement legislation whereby a worker can work past the age of retirement if he so chooses, and increased pension benefits to workers who work beyond age 65. The West German program increases benefits by 0.6 percent for each month worked past the age of 65 up to age 70. France has adopted similar incentives increasing the amount of preretirement earnings covered by their pension program from 45.3 percent to 68.0 percent if retirement is postponed to age 70. The United Kingdom increases pension benefits by 6.5 percent for each year that retirement is delayed before age 70 for men and 65 for women. Figures for 1970 indicate that one-third of the males and one-quarter of the females in the U.K., to which the plan was applicable, delayed their retirement. The United States administration has legislation in place which, beginning in 1982, will increase retirement benefits by 3 percent for each year retirement is postponed past age 65. In addition, the U.S. government is contemplating legislation which effectively will ban mandatory retirement.

(b) Productivity

It is important to recognize the possible implications an aging and less economically productive society can have on individual and national economic productivity. As an individual ages he undergoes physiological transformations which reduce both his physical and mental productivity. Ghez and Becker (1975) in their theoretical model of an individual's allocation of time through the life-cycle viewed old age as a time when an individual's productivity is low. The increased incidence of elderly individuals on a national scale can have serious implications for the productivity of an economy.

A number of age-related degenerative diseases reduce the physical productivity of the elderly (U.N. (1956)). A study by Johns Hopkins University of the elderly, defined as those persons 65 and over, revealed that 80 percent of their sample suffered from one or more "chronic" diseases generally involving major organs (Newsweek (1977)). Newsweek magazine reports that the elderly occupy one third of the hospital beds in the U.S. and account for two out of every five general medical office visits. The United Nations reports (1956) that workers aged 60 to 64 missed almost five times more working days due to illness than workers 17 to 59 years of age.

While the incidence of physical disease increases in the elderly, a number of researchers argue that the elderly's mental productivity remains comparable to that of younger individuals including Friend and Zubek (1958); Riley and Foner (1968); Clemente and Hendricks (1973); and Sheppard and Rix (1977). These findings

contrast sharply with those from other sources which argue that mental abilities dramatically decrease with age (Lehman (1953); Brennan et al. (1967); Newsweek (1977); and Rosenberg and Grad (1980)).

One of the more serious mental diseases which affects the elderly and reduces their mental productivity is an incurable disease known as Senile Dementia. Recent reports indicate that it affects between 5 and 10 percent of the U.S. elderly population (Newsweek (1977)). Its symptoms include disorientation, loss of memory of both recent and past events, and inability to perform such routine tasks as tying shoelaces. More common psychological ailments afflicting the elderly which can reduce their mental productivity include depression, hypochondria, and paranoia.

The increased incidence of elderly individuals on a national scale can have serious implications for the productivity of an economy. The magnitude of this impact will ultimately depend on two factors. First, the proportion of elderly in the population; and second, future medical advances which will keep the elderly physically and mentally productive.

(c) Mobility

A population's mobility, both vertical and horizontal, can be expected to be influenced by population aging. With a population aging, mobility can be expected to decrease both on a vertical level and on a horizontal level.

The vertical mobility, or opportunity for upward movement in a hierarchical structure, can be expected to decrease as the pop-

ulation ages (Sauvy (1948); Keyfitz (1973); Newsweek (1977); and Weitz (1980)). As Clark and Spengler (1980) point out, the decrease in vertical mobility is primarily the result of a slowing down of population growth and not as a result of increased life expectancy. In an interview with Newsweek (1977) eminent demographer Peter Morrison acknowledges the decrease of vertical mobility in the future and attributes it to a maturation of the baby-boom generation. Morrison believes competition for jobs and promotions at all levels in the future will be great, and reduced economic growth, a consequence of declining aggregate demand caused by slowing population growth, will not lead to substantial job creation.

Horizontal mobility, or job-related migration, can be expected to be reduced as the population ages. The elderly are more sedentary and tend to locate themselves in urban areas (Paillat (1976); and Shulman (1980)). The implications of this for an economy based largely on frontier resource development can be significant. The implications of an aging, more sedentary, population can be significant for more sectorally diverse and dynamic economies as well. Clark and Spengler (1980) point out that mobility "is essential to the optimum employment of human and other resources in dynamic modern economies subject to continuous change in composition of output and occupations."

(d) Consumption, Saving, and Investment

Consumption, saving, and investment patterns of the elderly are significantly different from those of younger age cohorts. A large proportionate increase in Canada's elderly population can

have implications on the consumption, saving, and investment patterns of the economy as a whole.

The consumer demands of a younger population are considerably different from those of an aging population. On an individual basis, as a person ages his consumption decreases; primarily the result of reduced earnings caused by decreased productivity (Heckman (1976)). Therefore, as a population ages it is reasonable to expect expenditures made on foodstuffs, consumer goods, services, and housing to decrease. Corporate sectors presently engaged in satisfying the demands of a younger population will encounter reduced profits as the population's tastes shift (Newsweek (1977); and Weiner (1981)).

Saving, or capital formation, is a key ingredient of economic growth. An increase in the proportion and number of people 65 years of age and over in an economy can influence the amount of saving, or capital formation, and, thus, the rate of economic growth in an economy. Generally, the elderly have unfavourable saving patterns (Brady (1955); and Nagatani (1972)); however, as Clark and Spengler (1980) point out, an increase in the over-all average age of the population may increase saving. Clark and Spengler argue that a more mature population contains a greater proportion of people between 45 and 64 years of age. This is important because 45 to 64 tends to be both the peak earning and saving years in the life-cycle. The amount of saving or capital formation in an economy will be conditioned by the number of elderly dependents as well. Should taxes have to be increased to maintain social security programs the amount of saving will be reduced.

Another important ingredient of the economic growth process is investment of accumulated capital. Population aging can be expected to reduce the amount of venture capital, or "risk" capital, available in an economy. The elderly are traditionally much more likely to invest their savings in secure areas such as government bonds, term deposits, blue chip equities, and collectibles as hedges against inflation. A decrease in the amount of venture capital available could lead to sluggishness, and even decline, in the economy. As Sauvy (1948) states:

> In countries suffering from aging, the spirit of enterprise, and hence the willingness to accept risks without which capitalism cannot function, gradually atrophies and is replaced by a new feeling: the desire for security. (p. 118)

(ii) Social

There is virtually an infinite number of social implications stemming from population aging and declining elderly labour supply. An aged population has different sociological and cultural attitudes and values than a younger population. The tensions and conflicts generated by these differences can be expected to ripple through society in the future. Intergenerational hostility may increase as a result of declining elderly labour supply. Younger generations may resent having to support a growing elderly dependent population and accuse the elderly of reducing their standard of living. For planners and decision makers concerned with the social implications of an aging and less economically productive society two of the more important areas effects will be felt are:

(1) In the political area
(2) In the planning and administration of services

(a) Political Implications

As the number and relative proportion of elderly in the population increases a stronger potential political force increases as well. The influence this growing proportion of the electorate will have on future political direction will depend, to a large degree, on the amount of political organization the elderly exhibit. Historically, the elderly have had higher voter turn outs than younger age cohorts however, they generally have not tended to vote as a bloc (Newsweek (1979)).

Evidence of increasing elderly political organization is growing. In the United States there are lobbyist groups comprised of elderly citizens. Organizations such as the American Association of Retired Persons, the "Gray Panthers", and "Senior Power" are demanding more recognition from the U.S. political infrastructure (Newsweek (1977)). As Weitz (1980) points out, any measure designed to deal with the anticipated problems of an increased elderly population will be subject to the political reaction of the elderly. The strength of this reaction will, unquestionably, influence the formation of policies and proposals. Two possible problem areas in the future will be the formulation and implementation of policies and programs concerning social security, and health-care.

(b) Planning and Administrative Implications

As the number and proportion of elderly in Canada's population increase, planning, programing, financing, and delivering programs and services for the elderly will place added burdens on planners, administrators, and decision makers. The problems created by an

aging and less economically productive population will face these professionals at all levels at which the elderly's programs and services are delivered.

Pension programs, designed to provide economic security for the retired elderly, will be one of the most important areas of planning and policy formation in the future. It will certainly not, however, be the only area challenging the skills of planners, administrators, and decision makers. A number of other programs and services directed toward the elderly will grow in importance as the population ages. These include programs and services related to the elderly's physical, mental and dental health; nutrition and food requirements; environmental requirements including special housing and living arrangements; employment opportunities and other opportunities for economic self-support; educational opportunities, particularly job re-training; special transportation and communication requirements; opportunities for civic and community participation; and special leisure and recreational requirements.

As alluded to earlier, the elderly tend to locate themselves in urban areas (Paillat (1976); and Shulman (1980)). Should this trend continue city and metropolitan regional planners and administrators will find the problems of planning and delivering programs and services increased at their level. An example of the problems professionals on this level may face can be taken from transportation planning.

Efficient transportation systems are important to the elderly as a means of linking the elderly with an array of programs and services designed for them. Studies have shown (U.S. Senate (1977))

that existing transportation services in the U.S. are ill-suited to the needs of the elderly. In the future, transportation planners in the U.S. will have to plan for more and better public transportation services in tune with the special needs of the elderly who tend to be physically frail, of low mobility, and poor.

It is important that planners and administrators involved with providing programs and services to the elderly, and those not involved with programs for the elderly, begin making demand projections, and conduct research into the needs of the elderly. Investigation at all levels into what services and programs exist to serve the elderly, their adequacy, and their gaps should be initiated.

Planners in the future will have to adapt programs and services to an aging population. They will face problems involved with formulating policies, determining planning strategies, and allocating scarce resources. The ease with which these problems can be dealt with in the future depends, to a large degree, on both greater understanding of the needs of the elderly population and the factors causing declining elderly labour force participation, as well as the amount of preparation we take to address these potential problems today.

(iii) Implications of the Regression Analysis

In contrast to the findings of a number of researchers in the United States (Gordon (1963a; 1963b); Pechman et al. (1968); Bowen and Finegan (1969); Gallaway (1971); Boskin (1977); and Quinn (1977a; 1977b)) and Burbidge and Robb (1980) in Canada, this study found

the retirement benefit variable to be of less importance in explaining the variance in the elderly's labour force participation in Canada than variables measuring the rate of unemployment, and the elderly's occupation. This result points to the differences governing the retirement decision of elderly Canadians and elderly Americans. In addition, the regression analysis of the elderly's labour supply determinants found very weak evidence to support the importance of urbanization (Bowen and Finegan (1969); Gallaway (1971); and Munnell (1974)) and female labour force participation (Long (1958); Kreps (1967); and Brennan et al. (1967)) as factors influencing the elderly's retirement decision in Canada.

The regression results were somewhat disappointing in terms of the statistical significance of the individual regression coefficients in the equation. The explanatory equations did, however, tend to point to the unemployment rate, the type of occupation chosen, and the receipt of pension benefits as important factors explaining the declining labour force participation rate of the elderly. What, then, are the implications of these findings for planners and policy makers in Canada?

Unemployment generally tended to have a discouraging influence on elderly labour force participation. The elderly quite often retire when unemployed rather than face the task of finding new employment in a labour market that disfavours hiring elderly employees. This finding could possibly assist planners and policy makers hoping to ease the potential economic burdens created by an increasing number of retired elderly. It might be possible to design programs which create employment opportunities, if only on

a part-time basis, for the elderly and, thereby, reduce the elderly's dependency burden. Programs which offer job retraining or second career planning would also help to keep the elderly employed and less dependent on the rest of society. If unemployment is as important a factor in the elderly's withdrawal from the labour force as the regression analysis in this study suggests, then, in order to ease future economic burdens, policies and programs which encourage elderly employment should be formulated.

The type of occupation chosen by an elderly person is important since it affects how long he will stay in the labour force. Elderly persons employed in white-collar occupations tend to stay working longer than elderly persons employed in blue-collar occupations. The implications of this finding are important since, as Canada's industrial structure matures into the next century and more people become employed in secondary and tertiary white-collar industries than in primary blue-collar industries, people may select to work longer by choice. The evolution into an economy with a higher proportion of white-collar workers may offset the financial burdens expected as a result of an increase in the proportion of elderly dependents.

The regression analysis also suggested that receipt of retirement benefits discouraged the elderly from participating in the labour force. This finding has some implications for planners and policy makers. If the elderly are withdrawing from the labour force because of the income effect of pension benefits, then policies and programs which reduce or limit the availability of public pension benefits may be necessary to keep the elderly working and contrib-

uting to pension funds longer, and to avoid future financial disaster. Such policies and programs include increasing the retirement age, or increasing the amount of benefits paid the longer one works past the age of 65.

Variables measuring urbanization and the amount of female labour force participation were found to be weak contributors to explaining the variance in the elderly's labour force participation. This finding suggests to planners and policy makers that, in their efforts to keep the elderly working longer, they will meet with little success should they implement policies which alter the rate of urbanization or female labour force participation.

The results obtained in this study suggest that in order to keep the elderly working longer and less dependent on public programs and services, policies which focus on reducing the over-all unemployment rate, increasing the proportion of elderly employed in white-collar occupations, and reducing the amount of public pension benefits paid as a proportion of total income should be implemented. Policies which reduce the over-all unemployment rate and increase the proportion of elderly employed in white-collar occupations are politically more acceptable than policies which reduce the amount of public pension benefits paid. As such, policies designed to increase the elderly's labour force participation rate by reducing the amount of public pension benefits paid should be implemented as a last resort. Policies which cut back public pension benefits may not be politically or publicly acceptable, however, the consequence of not adopting such policies are equally, if not more, unacceptable.

B. Directions for Future Research

The most important addition in any future explanatory model of the elderly's labour supply determinants in Canada would be a variable measuring the elderly's health status. The data set employed in this study did not allow a variable measuring health status to be derived. There are, however, two data sets available which would allow a health status variable to be constructed. These include the Pre Retirement and Retirement surveys conducted by Statistics Canada for the Department of Health and Welfare in February of 1975 as supplements to the monthly Labour Force Survey. The data for both surveys are on file at the U.B.C. data library. A brief discussion of the variables included in each survey can be found in Appendix B.

A cross-section analysis for 1975 using the Retirement Survey and including a variable measuring health status would, logically, be the next piece of research stemming from this study. Burbidge and Robb (1980) conducted a cross-sectional analysis based on data from the Pre Retirement Survey, however, no one as yet has utilized the data set available from the Retirement Survey to construct an explanatory model of the elderly's labour supply determinants.

When data from the 1981 census becomes available a more current cross-sectional analysis, or a time-series regression based on three years--1961, 1971, and 1981--could be conducted. It would be advantageous to conduct a cross-section analysis with data for 1981 so a comparison with the results obtained in this study could be made.

In addition to research on the factors influencing the elder-

ly's labour supply more quantitative research will be needed investigating the economic and social implications of an aging society. Research into the viability of existing public pension programs and possible alternatives, as well as the costs of future health care programs for the elderly, are just two possible areas of future research. Increased understanding of the needs of the elderly and methods by which to meet these needs is desirable at this time. Only through research and preparation today can we effectively formulate policies and plans which will make living in an aged society more bearable in the future.

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Glossary

Variables In Regression Equation

DEPENDENT VARIABLES

LFP LFP can be defined as the labour force participation rate for Canadian males and females 65 years of age and over by province. LFP_{61} is the elderly's labour force participation rate for the year 1961, while LFP_{71} and LFP_{76} are the elderly's labour force participation rate for 1971 and 1976 respectively. LFP_{61-71} is the difference in the elderly's labour force participation rate between 1961 and 1971.

INDEPENDENT VARIABLES

RBE RBE is the ratio of average yearly individual public pension benefits (comprising benefits received strictly from the Old Age Security Program and the Guaranteed Income Supplement program) over total annual individual income of persons 65 and over as provided by Revenue Canada statistics based on all returns by province and age.

OCC OCC is the ratio of those persons 65 years of age and over who are employed in white-collar occupations (see Chapter 3 for a definition of white-collar occupations) over those persons 65 years of age and over who are employed in blue-collar occupations (see Chapter 3 for a definition of blue-collar occupations) by province.

UNE UNE is the over-all annual seasonally adjusted unemployment rate by province.

URB URB is the ratio of all persons living in urban areas as defined by Statistics Canada over all persons living in all other areas by province.

FPR FPR is the over-all female labour force participation rate by province.

Appendix A

Raw Data

PROVINCE (1961)	LFP	UNE	URB	FPR	RBE*	OCC
NFLD.	9.7	20.1	50.7	18.4	20.1	55.9
P.E.I.	22.4	7.0	32.4	24.7	23.9	29.5
N.S.	16.2	8.1	54.3	24.5	21.6	49.9
N.B.	14.9	10.6	46.5	24.8	21.9	50.9
QUE.	16.8	9.1	74.3	27.9	20.9	59.1
ONT.	18.5	5.5	77.3	32.6	20.7	57.7
MAN.	18.1	5.2	63.9	31.5	23.3	50.1
SASK.	21.2	4.6	43.0	26.4	25.1	31.7
ALTA.	18.6	4.7	63.3	30.8	23.4	42.0
B.C.	12.5	8.3	72.5	28.3	22.5	64.9
PROVINCE (1971)						
NFLD.	8.0	8.4	58.9	26.2	45.2	67.8
P.E.I.	17.7	10.2	38.9	38.7	49.0	47.0
N.S.	13.3	7.0	58.0	29.2	42.3	60.3
N.B.	13.1	6.0	54.5	34.4	43.3	64.3
QUE.	14.5	7.3	79.5	35.0	37.1	67.6
ONT.	16.1	5.6	81.8	44.3	35.7	62.6
MAN.	16.2	5.7	70.1	42.3	43.3	52.2
SASK.	18.5	3.5	52.7	39.2	47.9	34.0
ALTA.	17.0	5.6	73.6	44.4	40.7	44.9
B.C.	12.4	7.2	79.7	40.4	38.7	66.5
PROVINCE (1976)						
NFLD.	6.5	13.4	58.8	31.9	48.3	
P.E.I.	15.8	9.6	37.0	43.9	41.2	
N.S.	10.4	9.5	55.8	33.6	43.2	
N.B.	10.1	11.0	52.3	38.6	44.7	
QUE.	11.7	8.6	79.1	41.2	39.8	N/A
ONT.	12.5	6.2	81.2	47.8	45.3	
MAN.	13.6	4.7	69.9	46.2	53.5	
SASK.	17.6	4.0	55.5	46.4	35.2	
ALTA.	15.7	3.9	75.0	50.0	35.5	
B.C.	9.3	8.6	76.7	44.9	43.1	
PROV. (61-71)						
NFLD.	-1.7	-11.7	8.2	7.8	25.1	11.9
P.E.I.	-4.7	3.2	6.5	14.0	25.1	17.5
N.S.	-2.9	-1.1	3.7	4.7	20.7	10.4
N.B.	-1.8	-4.6	8.0	9.5	21.4	13.4
QUE.	-2.3	-1.8	5.2	7.1	16.2	8.5
ONT.	-2.4	0.1	4.5	11.7	15.0	4.9
MAN.	-1.9	0.5	6.2	10.8	20.0	2.1
SASK.	-2.7	-1.1	9.7	12.8	22.8	2.3
ALTA.	-1.6	0.9	10.3	13.6	17.3	2.9
B.C.	-0.1	-1.1	7.2	12.1	16.2	1.6

Appendix A (continued)

*1961 RBE does not include C.P.P./Q.P.P., or G.I.S. payments as these programs were nonexistant in 1961. The O.A.S. program in 1961 payed benefits to those persons 70 years of age and over. The age of eligibility for O.A.S. benefits declined by one year each year between 1966 and 1970 and remains at 65.

Appendix B

Variables in Retirement and Pre Retirement Surveys

3671 M378 1975

Survey of retirement.
Alternate title: Drop-off survey on retirement and pre-retirement circumstances.
Source of title: codebook
Access: B - all users, disseminated by distributor.
Principal investigator:
Jim Martin, Canada. Health and Welfare Canada.
Producer: Canada. Statistics Canada. Labour Division, Ottawa, Ont.
Distributor: Canada. Public Archives Canada. Machine Readable Archives (G00-00085 & G00-00086), Ottawa, Ont.
Geographic area: Canada
Universe: all persons 55 years of age and over who were either still working (pre-retired) or who had retired at the time of the interview (retired).
Sample frame: if the Labour Force Survey respondent was in the relevant age group and was rotating out of the LFS sample.
Method of collection: self-administered questionnaire
Number of files: 2
Type of data: micro

Summary:
The survey was conducted in conjunction with the February 1975 monthly Labour Force Survey.

Documentation:
Doc title: Martin, Jim/ Survey of retirement. prepared by Winston A. Gomes. 2 vols. #1: Data codebook - Retirement survey dataset. #2: Data codebook - Pre-retirement survey dataset. Ottawa, Ont.:Public Archives of Canada, Machine Readable Archives, 1976. (viii, 50 pp & viii, 49 pp.)
Doc notes: & questionnaires: Retired form (English & French lang, 14 pp.) and Pre-retired form (English & French language, 13 pp.) & Regional office procedures manual (vii pp.)
Doc call no.: AV14 3671 M378 1975

Subtitle: Retirement survey.
Catname: RETIRED.FINAL
Edition: PAC/MRAD ed.
Unit of observation: individual
Number of units: 1590
Number of cards per unit: 1
Logical records: 1590
Number of variables: 207
Format: character
File summary: Variables include: province; sub-provincial area; sex; marital status; labour force status; age group; hours worked during reference week; duration of unemployment; looking for full- or part-time work; reason for absence from work; 1961 occupational classification; 1971 occupational classification; industry code SIC; class of worker; place of birth; year immigrated to Canada; status in Canada (immigrant, landed, etc.); age at which stopped full-time work; how change made; in what season retired; reason for retiring; participation in program to prepare for retirement; how soon after retirement did R go on vacation of one month or more; period of time spent with longest employer; age left longest employer; no. of jobs since leaving longest employer; what happened to old position when R

retired; was retirement age compulsory in last job; member of collective bargaining group; total income the year before retiring; has R moved because of retiring, why; where lived before move; prefer to retire at different age, which; would R have retired 5 years earlier given same standard of living; would R change working patterns; approval of compulsory retirement age, which is best age; what is best way to retire; household composition; main financial support; where R is living now; duration of present residence; tenure; prefer different living arrangements; where would prefer to live; present employement statuts; main reason for working or looking for work; frequency of telephone conversations with others, seeing friends or relatives, going shopping, watching tv, listening to radio, reading, hobbies, visit community or drop-in centre, go for drive, entertainment, play cards or bingo, see someone for medical care, attent religious service, work for pay or profit, do volunteer work, go for walk, dancing, bowl, jog, swim, travel overnight; satisfaction with life now; income from pensions and annuities, investments, work, other government payments, all sources in 1974; R's total income, spouse's total income (1974); receipt of pension from work, Canada/Quebec pension, old age security, private pension; is work pension adjusted automatically to cost of living, ditto Canada/Quebec pension, old age security, private pension; knowledge of Canada/Quebec pension, guaranteed income supplement, Local Initiatives Project, New Horizens Project, old age security pension, Opportunities for Youth, Unemployment Insurance; does R benefit from above sources; how important to R is neighbourhood, keeping in touch with family, friends, former workmates, having special interest or hobby, making new friends, other; how adequate is income, diet, clothing, housing, physical health, emotional health, knowledge of where to get help, other things; opportunity to do things important to R; aspects of life now that are better than expected, worse than expected; comparison with other retired persons; derived measures.

Date collected: Feb. 1975
Date file written: May 16, 1980

Subtitle: Pre-retirement survey.
Catname: PRERET.FINAL
Edition: PAC/MRAD ed.
Unit of observation: individual
Number of units: 828
Number of cards per unit: 1
Logical records: 828
Number of variables: 200
Format: character
File summary: Variables include: province; rural/urban; sex; marital status; labour force status; age group; reference week hours worked, looking for full- part-time work, reason for absence from work; 1961, 1971 occupational classification; industry code; class of worker; place of birth; date of immigration to Canada; legal status in Canada; year obtained landed immigrant status; worked full-time since age of 45; is R working at present; compulsory retirement age; member of collective bargaining group; longest time with one employer; at what age left longest employer; full-time jobs after leaving longest employer; no. full-time jobs; approval of compulsory retirement age; preferred compulsory retirement age; best way for people to retire; how would R change work pattern; present

Appendix B (continued)

residence; total income 1974 from all sources; age at which R expects to retire; reason for retiring; age at which R would prefer to retire, why; participation in program to prepare for retirement, contents of program; expected household composition when retired; will spouse be working full-time or part-time; expected residence tenure post-retirement; expected post-retirement place of residence; main financial support; expected post-retirement contact with others, friends, relatives, going shopping, watching tv listening to radio, reading, time on hobbies, visit community or drop-in centres, go for drive, for entertainment, play bingo or cards, medical care, attend religious service, work for pay or profit, do volunteer work, go for walk, dancing, bowl, jog, swim, travel overnight; expected satisfaction with retirement; reasons for feeling this way; knowledge of Canada/Quebec pension plan, guaranteed income supplement, Local Initiatives Project, New Horizons Project, Old age security pension; Opportunities for Youth, unemployment insurance; expected benefits from these sources; required total monthly income for satisfying retirement; given chance to retire early with adequate pension, what would R do; minimum monthly pension to permit R to retire early; income expected from pensions and annuities in first year of retirement, from investments, from work, from other government payments, total from all sources, own income vs spouse's; pension plan through employment, private; expected pension receipts; pensions adjusted to cost of living; expectation of working after retirement, why; importance of neighbourhood, family, friends, workmates, deeloping hobby, new friends; adequacy of income, diet, clothing, housing, physical health, emotional health, knowledge of where to get help; expectation of opportunities to see friends, etc.; general expectation of retirement; preferred living situation when first retired, why; derived measures.

Date collected: Feb. 1975
Date file written: May 16, 1980

Entry date: June 24, 1980

Appendix C

Selected Models Used by Researchers of the Elderly's Labour Supply

(1) Researcher: Gordon, Margaret. (1963b)

Methodology: Cross Section Analysis

Data Source: Utilized data from the International Labour Office; United Nations; U.S. Department of Health, Education and Welfare; and the United Nations Department of Economics and Social Affaires for the year 1950. Countries in the model included Australia, Austria, Belgium, Canada, Denmark, Finland, France, West Germany, Italy, Luxembourg, Netherlands, New Zealand, Norway, Spain, Sweden, Switzerland, United Kingdom, and the United States

Dependent Variable: Labour force participation rate of persons 65 and over

Independent Variable: Ratio of average Old-Age benefits to average annual earnings

(2) Researcher: Pechman et al. (1968)

Methodology: Cross Section Analysis

Data Source: Utilized data from the International Labour Office; United Nations; U.S. Department of Health, Education and Welfare; and the United Nations Department of Economics and Social Affaires for the year 1960. Countries in the model included Australia, Austria, Belgium, Canada, Denmark, Finland, France, West Germany, Iceland, Japan, Netherlands, New Zealand, Norway, Portugal, Spain, Sweden, Switzerland, United Kingdom, and the United States

Dependent Variables: (1) Labour force participation rate of the total population 65 and over
(2) Labour force participation rate of the male population 65 and over

Independent Variables: (1) Per Capita income

Appendix C (continued)

(2) population over social security retirement age as a percentage of the total population
(3) Average social security benefits as a percentage of average earnings in manufacturing

(3) Researcher: Bowen and Finegan. (1969)

Methodology: Cross Section Analysis

Data Source: The 1/1000th sample of the 1960 United States census

Dependent Variables: Labour force participation rate of
(1) Males 55-64
(2) Males 65-74
(3) Single Women 55-64
(4) Single Women 65-74
(5) Married Women 55-64
(6) Married Women 65-74

Independent Variables:
(1) Age
(2) Marital Status
(3) Color
(4) Family Responsibilities and Housing
(5) Schooling
(6) Health (for older males only)
(7) Other Income (other family income for married women)
(8) Employment Status of Husband (for married women)
(9) Occupation

(4) Researcher: Boskin, Michael. (1977)

Methodology: Time Series Analysis

Data Source: Utilized data from the Panel Study of Income Dynamics, a United States National Sample of 5,000 households. Extracted a sample of 131 households between 1968 and 1972

Dependent Variable: Retired persons as defined in the Panel Study

Independent Variables:
(1) Social Security Benefits
(2) Income for Assets

Appendix C (continued)

(3) Net Earnings
(4) Age
(5) Education
(6) Spouses' Earnings
(7) Hours Ill

(5) Researcher: Quinn, Joseph. (1977a)

Methodology: Cross Section Analysis

Data Source: Utilized data from the 10 year Retirement History Study of 11,000 men and non-married women aged 58-63. Extracted a sample of 4,354 of white married men for 1969

Dependent Variables:
(1) Labour force status

Independent Variables:
(1) Health Limitation
(2) Eligibility for Social Security
(3) Eligibility for other Pension
(4) Eligibility for Both
(5) Dependents
(6) Wage rate
(7) Asset Income
(8) Unemployment Rate
(9) Percent Change in Employment
(10) Job Characteristics

(6) Researcher: Burbidge and Robb. (1980)

Methodology: Cross Section Analysis

Data Source: Pre Retirement Survey of individuals over 55 and not yet retired, conducted in February 1975. Extracted a sample of 257

Dependent Variables:
Expected Retirement Age of
(1) Males 55-64
(2) Males 55-59
(3) Males 60-64

Independent Variables:
(1) Expected Pension Income
(2) Income Expected from other Sources
(3) 1974 Income

Appendix C (continued)

(4) Spouses' Income
(5) Inadequate Health
(6) Compulsorarily Retired
(7) Expected to Live with Others
(8) Not in Labour Force
(9) Occupation
(10) Age