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A Demographic and Economic Model of the Canada Pension Plan

Octavio Maupomé-Carvantes

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A Demographic and Economic Model of the Canada Pension Plan

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by

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Act. & M.Sc.

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IMPORTANT NOTICE:

"This research appeared previously as a Master of Science Thesis (University of Ottawa, Ontario, Canada). Some changes were made to the text so as to correct minor errors and to improve the presentation. Those changes, however, do not modify the research content nor its structure and conclusions".

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MESSAGE FROM THE

SECRETARY GENERAL

The Interamerican Conference on Social Security (CISS) is a specialized international agency that was instituted in 1942. At present, the Conference is formed by 59 Social Security institutions of 35 countries of the Americas. Its main objective is that of promoting the collaboration and exchange of experiences amongst its members in order to improve, expand and develop social security services to benefit the different populations in America.

Mr. Genaro Borrego-Estrada, President of the CISS, suggested, according to its Bylaws and Regulations, to develop and Editorial Program, which includes the "Studies Series", with the aim of compiling and disseminating social security's breakthroughs.

This book entitled "A Demographic and Economic Model of the Canada Pension Plan" describes how demographic developments influence the Canadian Social Security System, not only through the evolution of the size and age structure of the Canadian population, but also through the possible economic consequences of a decreasing and ageing population. The second chapter will situate the reader in the historical context of social security systems in the world, it also provides and overview of the Canadian Social Security System. The third chapter analyzes the whole system in terms of the systems approach and the demographic accounting. The fourth chapter describes the models that have been developed and that provide a structure for the connection of all the variables involved. The fifth chapter shows the results derived from the application of the models. Finally, the sixth chapter will delineate the main conclusions reached through the models' results and their analysis, as well as possible alternative uses for the model presented.

The Secretariat General wants to thank Mr. Octavio Maupome-Carvantes for doing this research work, as well as Mr. Carlos J. Soto-Perez, chairman of the American Actuary and Finance Commission, for the publication of this book, and it hopes that this study will be an incentive and a valuable tool for those who are committed to social security.

Maria Elvira Contreras-Saucedo
Secretary General

ONE

INTRODUCTION

> ...the depletion of the trust funds is not inherently very important. However, the depletion of the trust funds is evidence that social security is now more expensive relative to our economic resources than was previously thought, and this point is of substantial importance.
>
> Rudolph G. Penner

Canada is experiencing a significant ageing of her population and this trend is expected to increase the burden of social security programmes. Between the years 2016 and 2036[1], population ageing may have the most adverse impacts on dependency ratios.[2] Also, among the western industrialized countries, Canada currently has one of the youngest populations, as measured by the number of people aged 65 and over to those aged between 20 and 64.

However, by the year 2030, Canada will have one of the oldest populations. This demographic development implies that Canada will have fewer young people to provide economic security for an ever increasing number of old people. The ageing of the Canadian population represents a serious threat to the stability of her social security system.

A common measure of the possible ageing of the society is related to fertility rates.[3] ***Figure 1.1*** shows the pattern that this variable has experienced from 1921 to 1986. However, contrary to public concerns, ageing is not the most important factor in determining the future public-sector cost and revenues, it is rather the design and management of those programmes that represent the greatest area of uncertainty.[4]

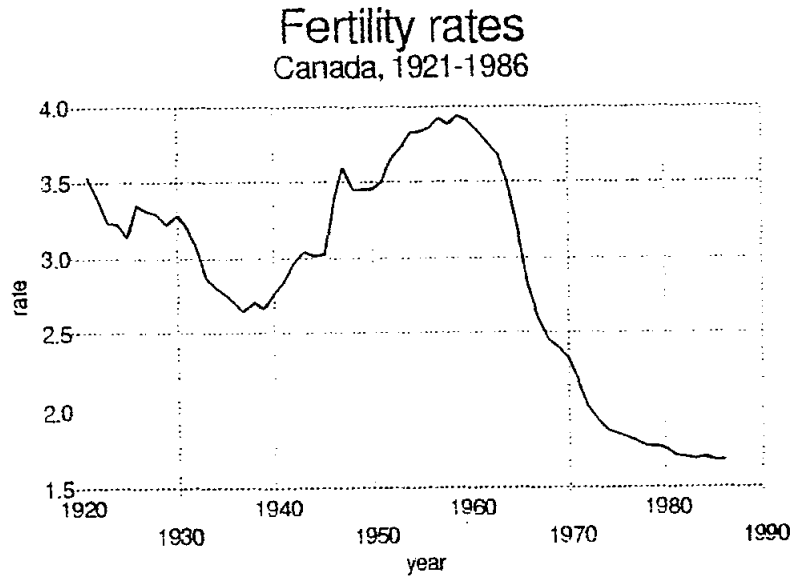

Figure 1.1 Total fertility rate: average number of children that would be born if women were to pass through all child-bearing years conforming to the age-specific fertility rates of a given year.

Some programs' expenditures are affected by population ageing whereas others, such as health care, depend more on organization and management effectiveness. The management of unit costs is as critical as ageing in considering the public sector burden of social programs. Undoubtedly, population ageing will affect public expenditure and its allocation, and raises the question if the economy can bear the costs.

The social security system is financed on a pay-as-you-go basis [where] active workers and their employers pay taxes to finance the benefits of [...] retired and disabled workers and their dependents and survivors. The idea is not to build up a large reserve from which benefits will be paid, but rather to accumulate sufficient funds to provide a buffer against brief, unanticipated economic fluctuations.[5]

A common, underlying concern of most published analyses on the social security system's benefit schemes is the question, or perhaps the anxiety, that the future will represent a serious problem to its structure or, at least, to the fairness or opportunity of the benefits provided. This concern has been focused in two main aspects: (1) the suitability of the funding method of the system, i.e., adopting a different method of financing rather than the current pay-as-you-go; and (2) population ageing and its related phenomena, such as dependency ratios, fertility rates and other of similar nature.

This has led to a "funding debate" and its never ending controversy, which demonstrates that the issue of financing the programs and the appropriate funding method required are not settled yet. This debate has been focused in to the pay-as-you-go (PAYGO) funding method and its consequences to the plan, the economy and the society as a whole. The different viewpoints are summarized in the following table.[6] For simplicity of presentation, they have been divided according to their economic, social policy and actuarial-financial nature.

Table 1.1 Funding Debate

In favour of PAYGO

Economic

· If society wishes to increase saving, considerations of social equity suggest that the basis for deferring consumption should be more selective and progressive than would be appropriate for pension financing. This would depend on the progressivity of the contribution structure.

· Restraining consumption at a time when demand is weak may result in diminishing investment and economic growth during a period when there is already capacity under utilization.

· A large fund may pose investment problems and may result in a concentration of financial power under government control that might squeeze out private investment.

Social policy

· A national retirement income programme should be considered a transfer between generations, rather than a savings plan.

· Intergenerational equity cannot be established simply by funding pension plans, but must be placed within the total legacy passing from one generation to another.

· A fund or reserves are not necessary because government exists in perpetuity and has infinite resources based on its taxing power.

Actuarial / Financial

· Although large funds may be accumulated through pension arrangements, saving on such scale and in such a form may be inappropriate.

Against PAYGO

Economic

· The fund helps to ensure that no decline in the rate of saving per worker, and hence in the accumulation of capital stock per worker, occurs because of pension promises.

· Funding provides a source of capital accumulation which could be used to finance industrial revitalization and an industrial strategy.

Social policy

· Funding ensures that the pension "contract" between the contributor and the government of the day is honoured. There is no guarantee that future governments will honour pension promises made by previous governments unless paid for.

· Funding promotes intergenerational equity inasmuch as each generation is required to forgo consumption equivalent to the estimated value of the pensions it has promised itself. A separate fund exists to pay benefits, so that future generations will not be required to meet any part of the cost of paying pensions to earlier generations.

· PAYGO funding, or a low degree of partial funding, encourages demands for increased benefits since it undervalues the true cost of pension benefits so they are perceived as "free goods".

· An investment fund under public control could serve as a countervailing force to private institutional investors.

Actuarial / Financial

· Funding leads to relatively stable contributions since each generation "pays its own way". PAYGO rates, which vary with changes in the proportion of elderly, are likely to be unfair between generations.

· Funding would eliminate the regressivity associated with current contribution rates under which high-income earners receive a larger wealth transfer from the next generation of workers than do low-income earners.

It is known that some degree of funding is required to strengthen the system, relieving it from possible undesirable crises. This is suggested since *despite traditional welfare state adherence to pay-as-you-go financing [...] it is now increasingly recognized that pension promises "cannot absolutely bind successor governments" [...] thus, a degree of funding may be required to protect state pension entitlement in the future.*[7]

As of today, the CPP is administered by considering the creation of a reserve that should be sufficient, at any year, to pay the equivalent of two years of benefits. This goal is expressed as the ratio of the Account (reserve) to expenditures. The rationale behind this approach is that *if normal actuarial funding were to apply to the CPP, it is feared that the colossal investment funds that are generated would lead either to unwarranted government projects or to indirect government control over the private sector through the investment of social insurance funds.*[8] *[Moreover] the application of the principles of actuarial funding is [...] usually considered inappropriate in the field of social insurance.*[9]

At the same time, demographic trends point to the need for attention in other facets of society. Shifts in gender and ethnicity in the workforce, as well as demographics of migration, call for analysis. Finally, the challenge comes not only from the domestic front but also from the rest of the world. According to United Nations estimations[10], nearly 95% of the world's population growth will be in developing countries, a fact that may strain the immigration to Canada from other countries, and consequently, may pose an additional pressure on her social security system.

[Since the] political economy of pensions [...] represents the conjuncture, or intersection, between old age as a personal experience and the pension system as part of the broader socio-economic structure,[11] an analyst who wishes to explore the subject of social security programs must keep in mind the whole system and the numerous variables that affect its development, i.e., demographic, economic and political considerations should be integrated in a conceptual framework to place the system in the proper context.

As a general objective, this research attempts to determine how demographic developments influence the Canadian Social Security System not only through the evolution of the size and age structure of the Canadian population, but also through the possible economic consequences of a decreasing and ageing population, namely declining real economic growth rates. It also considers the effects of the current immigration policy when analyzing the future stability of the system.

As a particular objective, the research determines a measure that will help to decide if the current funding method of the Canada Pension Plan (CPP) is adequate or not. The appropriateness of such a measure should be expressed in terms not on the amount of the fund, nor in terms of other alternative funding methods, but as a relationship between the country's output and the burden that the benefits of that program represents to the society. This is important since the CPP is a major part of the Income Security System, which is one of the two main components of the whole Social Security System. For the purpose of this text, the CPP includes the Quebec Pension Plan (QPP), since we are analyzing the whole country.

The research adopts a systems approach for the analysis of the social security scheme, since *modern systems analysis is an attempt to recognize the high degree of complexity in socio cultural systems [and] it represents a new method of analyzing the behaviour of these systems capable of replacing traditional causal analysis.*[12]

As a conceptual framework, we will use the so-called *Social Accounting* or *Social Demographics,*[13] as a means of coordination of information on human stocks and flows. This framework, used by Richard Stone, is of great importance because *with the progress of economic and social modelling a need has grown for a coherent framework within which demographic, educational, manpower and other data relating to human stocks and flows can be coordinated and analyzed.*[14]

Among the goals of demographic accounting is to bring together a knowledge of the operating characteristics of the system and the set of aims that the system is expected to serve. Consequently, the models must consider those characteristics, the intrinsic constraints and set an objective function.

Thus, the future behaviour of the sub-system can be assessed more precisely and some answers to the public concerns can be presented. It is obvious that the whole system is too complex to be analyzed by a partial model, but further developments on other sub-systems can be done, and in this way the whole picture can be delineated. In this research we have attempted to focus on one element of the whole system, but it is obvious that much has to be done. However, we feel confident that this part of the system is significant enough to let the reader feel the nature of the problem.

The research will follow a sequential process in developing the topic. The second chapter will situate the reader in the historical context of the social security systems in the world. It also describes the Canadian Social Security System and its structure, providing an overview of this system. The third chapter analyzes the whole system in terms of the

adopted analytical framework. The systems approach is applied in order to define the main elements, their linkages and their respective level of complexity involved. The use of demographic accounting as our analytical framework helps to expose the numerical relations among the various variables in the model, their influence on the system, and provides a means for presenting both the structure of the system and the results, in a clear, easy to understand manner.

The fourth chapter describes the models that have been developed. The main assumptions and variables of the models and the key relationships among the distinct factors will be discussed. The models provide a structure for the connection of all the variables involved, as well as for presenting the results in a clear manner. The fifth chapter shows the results derived from the application of the models. Finally, the sixth chapter will delineate the main conclusions reached through the models' results and their analysis, as well as a sensitivity simulation and possible alternative uses for our model.

The final objective of the research is to contribute to the well being of Canadians, contributors or recipients, and to the soundness of their social welfare system. Envied throughout the world, this outstanding system must face its problems, actual and expected, with the confidence that they can be solved through analytical tools and societal efforts.

Notes.

1. *Murphy, Brian B., and Michael C. Wolfson (1991)*
2. *Ratio of population in age group 0 - 19 and 65+, to population in age group 20 - 64. (ibid).*
3. *Total fertility rate: average number of children that would be born if women were to pass through all child-bearing years conforming to the age-specific fertility rates of a given year [Canada, 1991-A].*
4. *Murphy (loc. cit.).*
5. *Alicia Munnell in Ross, Myron H. (1985).*
6. *Adapted from Deaton, Richard L. (1989).*
7. *Deaton (loc. cit.).*
8. *Canada (1991-E).*
9. *Ibid.*
10. *Belous, Richard (1991).*
11. *Deaton (loc. cit.).*
12. *Smith, lan G. (1973).*
13. *The term social accounting was introduced into economics by J.R. Hicks in 1942. It means "the accounting of the whole community or nation, just as private accounting is the accounting of the individual firm" [Sohn, Ira (1986)].*
14. *Richard Stone in Sohn, Ira (1986).*

TWO

THE CANADIAN SOCIAL SECURITY SYSTEM

> The Great Depression seriously undermined [the] confidence in the historic tradition of self reliance and in the virtue of individual thrift as a means of providing for income in old age.
> Alicia Munnell

In agricultural societies the population lived in relatively small units where social ties were strong. Village communities implied security for their members since social relations could remain unchanged for long periods. Thus, generations kept working on the same lands and families were interacting with each other at the same place year after year.

Under those circumstances, transfer payments to persons in need, mainly elders, formed a quite informal insurance within the group. If a group or extended family can be considered such an insurance against old age or other contingencies, the manner this system functions might be regarded is as a pay-as-you-go (PAYGO) system. The PAYGO quid pro quo is that in succeeding generations the young support the old and are supported in turn themselves when old. Thus, intergenerational transfers to the old became the principle of social security systems.

The industrial revolution, that began in England, changed the living conditions for most people, due to technical innovations in production methods and the new demand for industrial workers. The resulting decline of agricultural activities gave rise to a shift in housing and working conditions of the population.

The new living conditions meant that large numbers of industrial workers in cities began behaving as anonymous individuals connected only to their immediate families. Individual mobility rose substantially because of occupation changes that were caused by rapidly changing industrial markets and production processes, as well as to the fact that workers no longer interacted with the rest of the former groups. The mutual help which was common in agricultural societies ceased to exist.

The industrial revolution left workers unprotected against dangers of life, and the need for a new protection system arose. At the beginning of this epoch, charity, provided mainly by the church, tried to offer the required assistance but it was not until the last part of the nineteenth century that governmental institutions began to grant some sort of assistance. Two factors delayed government assistance. First, the old age problem was not quantitatively important due to low life expectancy; and secondly, the predominant political liberal ideology at the time contended that social assistance should

only be given under strict conditions. This was particularly clear in Germany and the United Kingdom.[1]

Among the main factors for the appearance of public assistance schemes, we may mention that the first labour unions, born in Europe around the 1860s, suggested the quantitative importance of the new social class and their awareness of political influence. Besides, *social insurance programs were a means to increase labour productivity by providing greater security of income to workers.*[2]

There is no single explanatory variable that induced the introduction of social welfare programs. However, among the more commonly accepted theories we might advance the proposition that governments were forced by voters to establish some scheme to solve these new social problems, although democracy is not a necessary condition for this kind of programs to arise. *In one sense, then, the income security programs developed by the modern state can be seen essentially as a response to the social problems of industrial society.*[3]

A brief history of the social welfare system in Canada.

Retirement benefit programs are by no means recent phenomena in the area of employer-employee relations in Canada [...] as far back as the late seventeenth century the Hudson's Bay Company had a policy of rewarding employees of long and faithful service with retirement gratuities. In addition, in the early nineteenth century, another type of retirement arrangement became evident in Canada with the appearance of military pension benefit programs.[4]

The emergence of the Canadian welfare system was insinuated by the establishment of the Indian Act in 1876, which *authorized the Governor in Council to direct moneys arising from the sale of Indian lands [...] and how payments or assistance to Indians [should] be made.*[5] From that beginning Canada's social security system has evolved, during the last one hundred years, with the objective of sharing the cost or redirecting the resources of society to the greatest possible number of individuals. As Deaton (1989) remarks, *[USA, Britain and Canada] share a similar, though by no means identical, social security history which has developed from a common social and intellectual history and philosophy of social welfare. [The] introduction of a state pension system in Canada drew much "inspiration" from the United Kingdom where the non-contributory, means-tested old age pension was first introduced in 1908. Canada followed suit with its means-tested old age pension in 1927.*

Although some authors have asserted that Canada's Social Security System is not well structured[6] or that the benefits are not adequate to help the elders in their moment of need[7], through the years the Canadian social security system has been modified, amended and improved with the general objective of helping its members to cope with the inevitable burdens arising from life's contingencies. Some programs have a broader scope of application than others, but most try, despite their problems, to satisfy the needs of their beneficiaries.

Under the Canadian Constitution, responsibility for social security is shared by the federal and provincial governments, regarding planning, administration, delivery and financing. Consequently, in the course of the last hundred years, several regulations have been created or amended, to fulfil the requirements or needs of the population. The system has evolved gradually in response to a variety of social, economic and political factors. In the early decades of this century, a complex structure began to be developed that consists of universal and income-tested benefits, earnings-related social insurance plans, means-tested social assistance programs and a wide array of health and social services.

Structure of the system.

The Canadian Social Security System can be arranged in two main divisions: the programs that provide financial support to the beneficiary (Income Security System) and those that provide in-kind assistance (Services Security System). This partition is somewhat arbitrary, since some programs can be classified as both financial and in-kind, e.g., the Canada Assistance Plan or the Provincial Workers' Compensation Programs. However, for the purpose of this research, this adopted classification complies with the objectives of the models that will be described in the following chapters.

1 *The income security system.* It includes various programs designed to provide financial benefits to Canadians. As a definition we may say that *an income security program is any federal, provincial or municipal program having as its main objective the provision of direct financial benefits to individuals or families.*[8]

This division includes several programs, which are listed below[9]:

"(A) Senior citizen's financial benefits	Old Age Security (OAS) Guaranteed Income Supplement (GIS) Spouse's Allowance (SPA)"

"(B) Children's Financial Benefits	Family Allowances (FA) Child Tax Credit (CTC)"
"(C) Social Assistance	Canada Assistance Plan (CAP)"
"(D) Taxation Assistance	·Basic Personal Credit ·Age Credit ·Married / Equivalent to Married Credit ·Dependent Child Credit ·Credit for Infirm Dependants (over age 18) ·Disability Credit ·Pension Credit ·Refundable Sales Tax Credit ·Goods and Services Tax Credit ·Child Care Expense Deduction"
"(E) Pension Plans·	Canada Pension Plan (CPP) and Quebec Pension Plan (QPP)"
"(F) Unemployment	Unemployment Insurance (UI)"
"(G) War Veteran's Financial Benefits	Veterans' and Civilians' Disability Pensions War Veterans' and Civilian War Allowances"

These programs have federal coverage, but each province or territory may exercise its constitutional prerogative to establish similar programs as long as they set up a comparable program of their own. Therefore, in provinces there may exist programs equivalent to those mentioned above, but they must possess similar characteristics and aims as the federal programs. For a detailed description of the main programs, see *Appendix A*.

2 *The services security system*. The common feature of these programs is that they provide assistance to persons in need, regardless of the requirements of the Income Security System programs, namely the ability to pay. Among these we may mention the following:

(A) Health Insurance (HI)

(B) Federal Employment Programs (FEP)

(C) Alcohol and Drug Treatment and Rehabilitation Program (ADRP)

(D) Vocational Rehabilitation of Disabled Persons Program (VRDP)

(E) Canada Assistance Program (CAP)

In a similar manner to the previous division, these programs have federal coverage, and again the provinces may exercise their prerogative to organize comparable programs. For a description of these programs, see *Appendix A*.

Overview of the system.

Canada's social security system programs are designed to respond to the socioeconomic needs of Canadians, and due to their nature they are influenced by the changing demographic, economic, fiscal, legal and jurisdictional environment. All of them have undergone changes from the date of their inception to respond to the changing conditions.

Historically, the social security system has been shaped by three main goals[10] that can be summarized as follows: *(1) to guarantee a basic income, (2) to assure fair opportunities to get health and social services, and (3) to avoid serious disorders in the living standard of people due to contingent events.*

Despite their objectives, however, some of these programs do not always provide the expected services and benefits efficiently. We may visualize the impact of each main program in the life of the elderly, as depicted in *Figures 2.1* and *2.2*, where we can observe the relative importance of the different sources of their income.

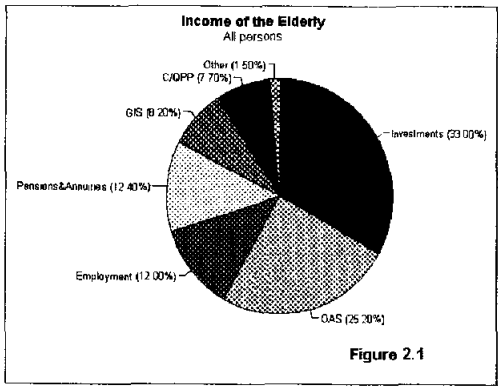

Figure 2.1

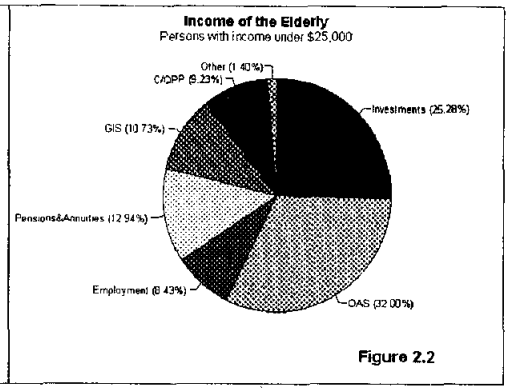

Figure 2.2

Since the elderly are among the most sensitive groups of society, their fate depends heavily in the adequacy of the programs of the system. Therefore, they must be conceived, financed and operated with the important principle of intergenerational equity in mind. This implies that a generation should not place an undue burden on future generations as a consequence of the arrangements it establishes.

Two guiding principles must be kept in mind to diminish the risk of unfairness. First, the current generation (active workforce) must leave resources to the next one to ensure that accrued benefit entitlements will not be excessive in relation to national output. Second, each generation must provide for the elderly of today as they would like to be provided for when they retire.

These social principles are the basis of any social security system, and must always be respected, especially when amendments are made and benefits are granted. In this way, the system may survive through time, and most important of all, it may achieve the expected goals of intergenerational transfers to the old and distributive equity between pre-retirement and post-retirement incomes.

Notes.

1. *Verbon, Harrie (1988).*
2. *Ibid.*
3. *Banting, Keith G. (1987).*
4. *Edwards, A. Charles (1967).*
5. *Canada (n.a.).*
6. *Brown, Joan C. (1975).*
7. *Finlayson, Ann (1988).*
8. *Canada (1991-C).*
9. *Ibid.*
10. *Canada (1982).*

THREE

ANALYSIS OF THE SYSTEM

> "Pension mountain" is the term that has been coined to describe the projected increase in the number of pensioners and thus the cost of pensions resulting from population aging, but it could be applied equally to the mass of studies of pensions produced in Canada and elsewhere in recent years by commissions, task forces, councils, committees, interest groups and sundry others.
>
> Kenneth Bryden

Canada today, as most of the industrialized countries, face a set of demographic changes that affect her social security system. Among those important changes are the ageing of the population, immigration patterns and the role of women in the work force. All these factors have caused a rapid increase in the costs incurred by the social security system.

The ageing of society is a product of some phenomena that affect the financial and operational equilibrium of the system, and that can be described by the changing ratios of dependency, longer life expectancy and low fertility rates. These events have given rise to questions concerning the stability of the system, and more precisely, if it can face the burden that the granted benefits imply. Some individuals and interest groups[1] as well as governmental institutions[2] have focused their efforts to describe and address the origin of the problem and propose some feasible solutions. Some journalists have also called public attention to what they label the "pension crisis", warning Canadians about the possible collapse of the system[3] and its critical consequences for the general public.

[But] the smallness of trust fund reserves should not be a source of concern in a social insurance program as it would in a private insurance plan [since] the social security system is a mandatory and permanent program which can rely on the government's taxing power to meet its obligations. Thus, the system has evolved into a contract between generations, each generation depending on the next one to finance promised benefits.[4]

As a response to this public concern, the government had published several studies, analyses and assessments on the subject, with the main purpose to disperse unfounded fears. As an example, Health and Welfare Canada[5] published a study that assessed the main demographic features of the country, such as immigration, population ageing and growth, environmental impacts of population behaviour, changes in family structure, women's roles and others. Also, the government started in May, 1986 a review of demography[6] to *evaluate, extend and integrate the social science evidence bearing on the relationship between population change and society.*

As a motivation for the analysis presented here, we may say that *two tendencies can be identified with respect to the study of the social welfare state system. In one instance, those who analyze "social welfare" from the perspective of the legitimization and coercion functions of the state [but] exclude the capital accumulation function from their framework. Alternatively, where the capital accumulation function is made central to the analysis, the coercion and ideological functions associated with the pension system are excluded.*[7]

Here we do not examine the ideological functions of the state, since they are beyond the scope of the research, but we will like to adhere to the idea of capital accumulation as a very important function of the system. This lead us to the linkage of the social security system and the economic agents that produce the wealth of the country. Those agents are represented by the productive economic entities that pay wages and taxes, and those entities that distribute the economic output into the appropriate channels, forming in this way the intertwined relationships of the system.

As a consequence of all the above, our demographic model projects the population age groups of Canada, based on projections made by Statistics Canada, so that the transition proportions of each year can be estimated. With the use of our economic model we will be able to assess the burden that those projected population groups represent to the federal pension program. Such a burden can be related to the output of the economic agents, and that relationship can be estimated using those same population groups.

The need for the systems approach.

In order to determine in which ways demographic and economic variables' development influence the social security structure, a systems approach is suggested. In this way we might be able to analyze the performance of the social security system as a complex and dynamic structure. Besides, systems theory helps us to design a model that will measure the performance of the system under the chosen framework.

A system is a conceptual or physical entity consisting of interrelated, interacting and interdependent parts.[8] The existing relationships between the different parts are the "organization" of the system, with its own objectives. Those objectives speak about the overall purpose and may lead us to the identification of the characteristics of the system. Among the spectrum of systems, in one side we have the so-called *steady-state* systems, which maintain a stable equilibrium with the environment. On the other side, are the *aggressive* systems, whose purpose is to sprout out at the expense of the environment. Obviously, there are several types in between these two extremes.

The nature of the social security system may be perceived as a steady-state system. Its organization strives to maintain an equilibrium among the generations of persons, if it is to avoid burdensome financial contribution rates and/or lack of funds to face the prescribed benefits. On the other hand, it may be perceived as an aggressive system since it is designed to increase and adapt the benefit scheme to ever changing conditions, at the expense of the economic and social environment's resources.

The social security system must behave within its boundaries and satisfy a set of minimum requirements to avoid financial crisis or the betrayal of society's promises. At the same it must be able to adapt its organization in order to provide better benefits to recipients. Therefore, the system might be perceived as a mix of these two types of systems. *Figure 3.1* [9] depicts the relational structure of the social security system as exists today.

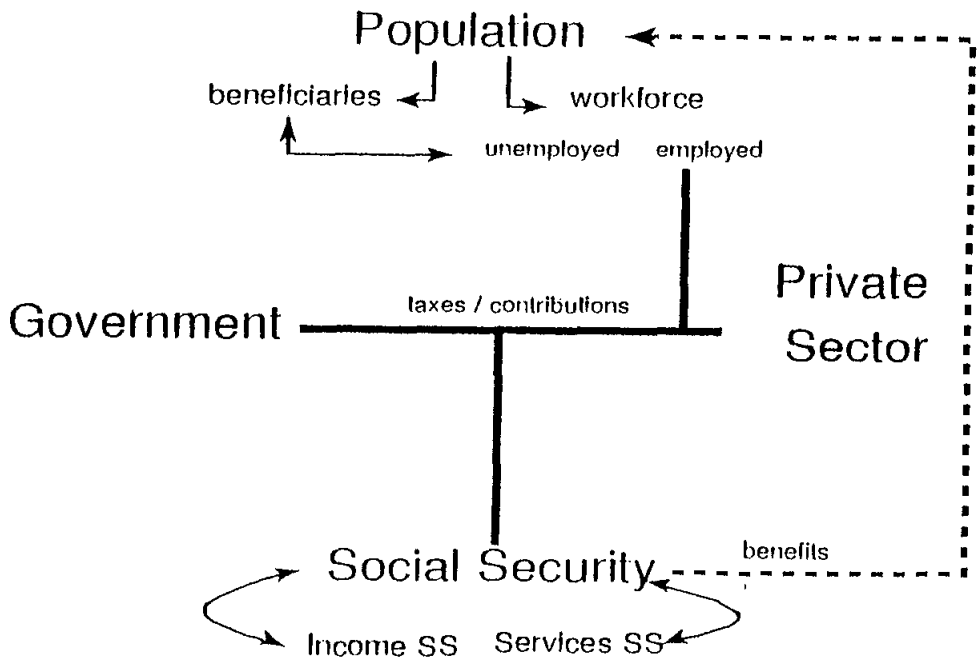

Figure 3.1

The system, as any other, is characterized by three main features. First, the elements or components are related to each other in a definable manner. Second, those components comprise parts of the whole and possess a continuous, dynamic interrelationship subject to the influence of exogenous and endogenous variables, as well as from the other components. Finally, there are levels of complexity among those parts which affect the structure of the system and its performance.

In this case, the systems approach allow us to visualize where the sub-system of Income Security stands within the whole system, and more importantly, the relation it has to other parts of the system. We have chosen to separate this sub-system and one of its main components, i.e., the federal pension program, and evaluate its features and develop the appropriate measure in terms of a model that considers both the exogenous and endogenous variables that play an important role in its performance.

The importance of this sub-system and more specifically, the federal pension program, can be easily perceived. Most people think first about the social welfare in terms of those programs that provide financial help to them when old or in need, and those that have been present in their daily life for years. Besides, CPP's contributors are virtually all employed and self-employed persons who are between ages 18 and 65.[10]

Secondly, other welfare programs play an important role to them as well, but some are perceived as "natural" or contractual benefit schemes that need not be concerned about, or simply they are used constantly (e.g., Health Insurance) and in that way they form part of their day-to-day life. As a third reason, we may say that pensions are a hot political issue, since the future of the system and its soundness are often debated during election time and the elderly have formed a strong political lobby. The bases for our analysis of the sub-system and its relationship with the rest of the social security system are derived from the above ideas.

Analytical framework.

For the present analysis, we have chosen the so-called Demographic Accounting because it is a means of coordinating, within a single framework, a great variety of demographic and social statistics. It makes possible the integration of information on human stocks and flows, and provides a comprehensive basis for social research and planning.[11]

One should understand the demographic and social factors on which the success of policies based on models depends, and how this information can be used analytically and

connected with the national economic accounts. The input-output analysis is an immediate example of this type of model building process. For this purpose we use the *Standard Socio-Demographic Matrix* form as a basis for socio-demographic models in order to make projections. This kind of matrix is similar to open Leontieff models in economics in the sense that they are set by injecting exogenous elements as the inputs of the system.[12]

Variables affecting the system.

Based on the systems analysis approach, we may distinguish two classes of impacts: (1) direct demographic impact (reflected by population size and structure change), and (2) indirect demographic impact (economic consequences of demographic changes). *[Besides] the impact of a decreasing and ageing population on revenues and expenditures of the social security system depends on the relevant part of the system [...] and on particular institutional arrangements characterizing each individual system.*[13]

In accordance with the research objectives, demographic and economic changes on the Income Security System are estimated, in particular those pertaining to the CPP. In assessing the demographic consequences of changes in certain variables, one should not take into consideration the development of total population size alone. Changing composition of the population is of special importance because it is accompanied by changes in the dependency ratios and thus in the financial burden of the system. Moreover, and among other things, public retirement systems face the danger of being misused for electoral purposes. But our proposal considers the economic and demographic dynamics within the pay-as-you-go system, disregarding the political validity of such a financing method.

This PAYGO method implies that we may assume an insurance principle, where an equivalence between receipts and expenses exists, and thus there is a correlation between wages growth and retirement income. This point is reinforced by the fact that *allocations to technical reserves and/or contingency funds are [the] difference between receipts and expenditure. If the figures [...] are relatively high this may indicate the degree to which the [state pension] system contributes to national savings and the capital formation of the country, depending, of course, on how the amounts concerned are utilized, for instance whether they are spent by the State [...] to meet current expenditure or whether they are in fact placed in productive investments in the interest of the national economy.*[14]

Also, it is assumed that the system will be stable in terms of birth and death rates in the long run, and the structure of the population behave in a constant fashion, i.e., each group maintains the same "weight" with respect to the total, making allowance for the evolution of the respective cohorts. These considerations mean that a financial equilibrium in the system is possible as long as certain demographic conditions are met.

Furthermore, public institutions attempt to realize interpersonal distribution goals within the retirement system, so that pre-retirement and post-retirement incomes do not differ drastically. There is a wide concern for the loss of purchasing power of retired individuals.

[However] the hypothesis that the elderly are more vulnerable to inflation [has been] carefully examined [...] and then rejected. The mistake in the above argument is assuming that older persons live on fixed incomes. In the recent past, the major income sources of the elderly have been earnings, social security payments, pensions, other federal transfer programs and returns on accumulated assets.[15] Also *the elderly tend to spend larger proportions of their incomes on food at home, medical care, and utilities than do younger families. [The] reasons for these differences include lower income for older families, more time at home, and a declining health with age. These different spending patterns imply different sensitivities to relative price changes.*[16]

Accordingly, we do not consider the inflation factor in the model. Instead the real increase of the national output is appraised by means of the index of productivity gains. *Productivity measures the efficiency of the production process by relating the outputs (the amount of goods and services produced) to the inputs (the quantity of labour, capital, energy and other intermediate inputs used). Productivity increases when the same amount of input produces larger quantities of goods and services than before, or when the same amount of output is produced with smaller quantities of inputs.*[17] *[This is suggested since among] other important factors needed to quantify the magnitude of future pension-funding crisis is the productivity of the labour force.*[18] Thus we can close the loop in the system of economics and demographics mentioned above with the basic conceptual ideas of the research.

Frequently, the discussion of the ageing of society is focused on the expected decrease in the number of active workers per retired individual. The implications of such a phenomenon are diverse. As for the employees, the impact is in terms of their rates of contribution; the retirees are affected since the benefit payments may cease due to a lack of funding. However, the assumption on which the expected change in the dependency ratios rests is that fertility rates will remain low in the future. There are some theories

that refute this assumption, and provide some insights about causal mechanisms that provide a range of possible values for this variable. Thus we should be cautious in accepting such catastrophic forecasts, because *if we are so hard-pressed to forecast the future fertility of persons [alive], what confidence can we have in predicting the fertility of cohorts still unborn?*[19]

Notes.

1. *e.g., Ann Finlayson, Geoffrey Calvert, Louis Ascah, Daniel Baum and Joan Brown.*
2. *e.g., Canada (1990-B) & Canada (1987-B).*
3. *e.g., Financial Post Daily (1/26/89), Financial Times of Canada (2/27-3/5/1993).*
4. *Alicia Munnell in Ross, Myron H. (1985).*
5. *Canada (1989-A).*
6. *Canada (1987-B).*
7. *Deaton, Richard L. (1989).*
8. *Smith, Ian G. (1973).*
9. *Adapted from Huijser, A.P. (1986).*
10. *Canada (1991-C).*
11. *Stone, Richard (1971).*
12. *Sohn, Ira (1986).*
13. *Berthold, Norbert and Ulrich Roppel (1984).*
14. *International Labour Organization, cited in Deaton (loc. cit.).*
15. *Robert Clark in Ross, Myron H. (1985).*
16. *Ibid.*
17. *Rao, Someshwar and Tony Lempriere (1992).*
18. *Stone, Leroy and Susan Fletcher (1984).*
19. *Ibid.*

FOUR

DESCRIPTION OF THE MODELS

> The ideas of economists and political philosophers, both when they are right and when they are wrong, are more powerful than it is commonly understood.
>
> J.M. Keynes

This chapter describes both the demographic and economic models developed to analyze the Canadian Social Security sub-system under consideration, that is, the income security's federal pension program. The aim of the demographic model is to account for the behaviour of the human flows through time, considering the appropriate demographic variables that are immersed in it. The various factors causing the population change, e.g., births, deaths and migration should be kept in mind, since they may influence the system in different manners and to a different extent, depending on the relevant part of the system under analysis. Hence, the consequences of demographic variables and their future developments are considered. This is necessary because the simple projection of dependency ratios is not appropriate to assess the effects of multiple variables and factors affecting the system.

As for the economic model, it is developed to show the relationship between national income and the system's demographics. This is important since *the contribution rate required to support the national pension systems is determined by the degree of funding, level of benefits and the underlying demographics.*[1]

Those contribution rates depend on the number of active persons and their incomes, and, therefore, the capacity of production of the society. Hence, the linkages between economics and demographics are vital and represent the contribution of this research. Current research[2] has been carried out by projecting population groups without regard for the impact of economics.

The demographic model.

The demographic model uses the so-called Demographic Accounting as a means of coordination of information on human stocks and flows. For this purpose, a set of demographic matrices is developed using the *Standard Socio-Demographic Matrix* model to represent the human flows in a particular period. In that matrix the inputs are shown in the rows and the outputs in the corresponding columns.

Those inputs of the matrix are the human beings that enter the system. Hence, the inflow population of a given year is made up of (1) those living in the country at the

end of the preceding period, and that remain at the beginning of the next period; (2) those births of the period, who flow inside; (3) those immigrants of the period. On the other hand, the outputs, that is, the outflow population, consists of (1) deaths during the period, who flow outside, and (2) the emigrants of the period, flowing to the outside world. When subdividing the population into age groups, the class limits will be determined by the purpose of the model. The population considered in our model has been divided into 15 different groups, each of them containing 5 year-periods, save the last one. Thus, the Canadian population is partitioned by ages 0 to 4, 5 to 9, 10 to 14, and so on until the last group that assembles those individuals aged 70 and over.

To study the ageing of the Canadian population, a system of demographic accounts is set up along the line suggested by Richard Stone (1971). In symbolic form, the standard matrix of socio-demographic stocks and flows for a country can be represented by *Figure 4.1* for any given year *t*.

Figure 4.1 Standard Socio-Demographic Matrix Model

$state_t$ / $state_{t+1}$	outside world	age groups 1 2 3 n	closing stocks
outside world	a	$d_1\ d_2\ d_3 \ldots d_n$	
age group 1	b_1	s_{11}	x'_1
age group 2	b_2	s_{21} s_{22}	x'_2
...	.	s_{32}	..
...	.	....	..
...	.	....	..
		....	
age group n	b_n	s_{nn}	x'_n
opening stocks		$x_1\ x_2\ x_3 \ldots x_n$	

The population divided into n age groups is represented by an n-vector. In the table, the population at the beginning of year t is denoted by the row vector

$$(x_1, x_2, \ldots, x_n)$$

which will be called the opening stocks. For example x_1 denotes the number of children under 4 years of age, x_2 the number of children between the ages 5-9, while x_{15} denote the number of people aged 70 and over. At the end of year t, the population is given by the column vector

$$(x'_1, x'_2, \ldots, x'_n)$$

known as the closing stocks. This vector will then constitute the opening stocks at the beginning of the following year, i.e., year $t+1$. The evolution of the population from one year to another, i.e., the transition

$$(x_1, x_2, \ldots, x_n) \text{ -----> } (x'_1, x'_2, \ldots, x'_n)$$

is explained by births, deaths, immigration and emigration. The entry denoted by a in the table above gives the number of individuals, irrespective of age, who both entered and left the country during year t.

In principle, this total $\boldsymbol{a}$ should contain (1) all the babies born in year t who died during that same period; (2) all the immigrants of year t, who either died or changed their minds and emigrated before the end of that period; (3) all short-term visitors. In practice, statistics for emigrants and temporary visitors are not sufficiently detailed to fill those categories (2) & (3), so essentially, $\boldsymbol{a}$ represents only those in category (1).

Column vector $\boldsymbol{b}$ gives us the number of individuals in each age group who entered the country in year t and were still there in the following year. The number b_1 represent the number of babies born in year t who survived into year $t+1$, whereas

$$(b_2, \ldots, b_n)$$

denote net immigrants to the respective age groups, including transitions from the lower age group and losses to the upper age group.

The row vector

$$(d_1, d_2, \ldots, d_n)$$

denote the number of individuals, subdivided by age, who were in the country at the beginning of year t but left the country during that year, either by death or emigration. At the centre of the table there is a matrix that contains all the individuals who were present in the country in year t and survived into year $t+1$. For example, x_1 is the number of children under 4 years of age at the beginning of year t, that during the year d_1 of them would leave the country either by emigration or through deaths, s_{11} of them remain in this age group and s_{21} of them would move into the next age group. Clearly

$$x_1 = s_{11} + s_{21} + d_1.$$

and as for the closing stocks, it is easy to see that

$$x'_1 = b_1 + s_{11}, x'_2 = b_2 + s_{21} + s_{22}, \ldots$$

A succession of demographic matrices, as presented, describe the demographic flows of a country. Under certain hypotheses concerning births, deaths, and migration, the dynamic motion of the country's population is projected by computing successive matrices. The results of this process are shown in the next chapter.

The economic model.

To analyze the impacts of demographic developments on the Social Security System, the link between demography and national income must be established. In this model, the economy is divided into k industries, and the value added contributed by each industry is estimated. The results are then summed across industries to arrive at a value for national income. For a typical industry, its output, Y, can be written symbolically as

$$Y = f(K, L, R)$$

where K, L and R are inputs of capital, labour, and raw materials or intermediate inputs, respectively. Here K denote a vector of various types of capital goods (e.g., machines), R various types of intermediate inputs, and L various types of labour.

The labour inputs are classified according to age and occupation. Under this classification L is a matrix with the following interpretation: L_{ijk} is the number of workers with age i and skills j employed in industry k. For industry k, its value added, say VA_k, is given by the difference between the value of goods produced and the value of the intermediate inputs. This value added is then used to pay the workers (wages and salaries) and the capital owners (cost of capital), so

$$VA_k = \Sigma_{i,j} \; W_{ijk} \; L_{ijk} + \mathbf{P}_k$$

where W_{ijk} is the wage of a worker with age i and occupation j in industry k, and P_k are the profits of industry k. The national income in a period is then given by the sum for all the VA's,

$$GDP = \Sigma_k \; VA_k$$

Thus, national income depends on the age, skill structure and size of the labour force; it also depends on the technology and technical progress in each industry. Since the structure of the labour force depends on the country's demographic developments, the research will attempt to project the labour force structure using the demographic model described above. Another important dimension is the gain in productivity, which also is considered into the model.

Assumptions.

As in any other model, some assumptions must be made when available data are not appropriate or sufficient. In order to be consistent with other studies on this subject, at least in the source of information, the data used in this research is derived from Statistics Canada's publications and database sources. From it we have developed the tables required by the research.

In the case that the data does not exist, or is insufficient, or additional figures are needed, some assumptions related to the future behaviour of certain variables are made. This is where the necessity of assumptions shows up. Additionally, data for 1992 is the actual data, unless otherwise specified.

Population projections. The population totals for the projection period (i.e., 1993 - 2011) were obtained from Statistics Canada (*see Table 4.1*).

Table 4.1 Population projections by age group

(Figures in '000)

year age group	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
0 - 4	1,982.0	1,813.1	1,777.2	1,730.9	1,684.2	1,638.3	1,593.7	1,551.2	1,511.2	1,473.6
5 - 9	1,884.8	1,856.7	1,863.6	1,870.1	1,866.6	1,850.2	1,824.3	1,788.3	1,741.9	1,695.0
10 - 14	1,867.2	1,849.4	1,856.2	1,855.7	1,856.0	1,863.3	1,859.6	1,876.4	1,882.6	1,879.2
15 - 19	1,840.6	1,823.6	1,836.1	1,844.8	1,855.1	1,861.4	1,873.2	1,880.0	1,879.3	1,879.5
20 - 24	1,979.2	1,959.2	1,934.5	1,912.3	1,883.4	1,880.2	1,879.6	1,892.0	1,900.5	1,910.6
25 - 29	2,296.6	2,174.1	2,104.4	2,056.4	2,045.4	2,030.0	2,017.1	1,992.3	1,969.9	1,941.1
30 - 34	2,460.1	2,416.9	2,419.7	2,402.9	2,349.1	2,282.7	2,203.8	2,134.0	2,086.0	2,074.9
35 - 39	2,319.4	2,315.3	2,345.7	2,370.7	2,401.8	2,410.3	2,420.5	2,423.2	2,406.5	2,352.8
40 - 44	2,073.7	2,065.4	2,107.1	2,159.9	2,204.6	2,259.4	2,303.3	2,333.7	2,356.6	2,389.6
45 - 49	1,736.4	1,809.3	1,885.2	1,958.6	2,019.2	2,025.5	2,050.9	2,092.5	2,145.2	2,190.0
50 - 54	1,356.9	1,412.2	1,472.3	1,530.5	1,594.2	1,706.7	1,791.7	1,866.9	1,939.6	1,999.6
55 - 59	1,209.3	1,211.5	1,233.2	1,257.2	1,289.0	1,332.4	1,393.5	1,452.7	1,510.2	1,572.9
60 - 64	1,174.4	1,182.1	1,182.2	1,178.0	1,178.8	1,178.3	1,182.5	1,204.1	1,228.0	1,259.5
65 - 69	1,059.0	1,071.1	1,076.8	1,088.7	1,099.1	1,109.9	1,117.6	1,118.6	1,115.9	1,117.9
70 +	2,167.1	2,257.2	2,332.5	2,407.1	2,480.6	2,549.9	2,618.8	2,682.4	2,750.5	2,816.6
TOTAL	27,408.9	27,217.1	27,426.8	27,623.8	27,807.3	27,979.5	28,140.1	28,288.3	28,426.2	28,553.2

Source: Statistics Canada (CANSIM CD-ROM Data Base)

Table 4.1 Population projections by age group (concluded)

(Figures in '000)

year age group	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
0 - 4	1,438.7	1,406.9	1,377.6	1,351.5	1,328.3	1,306.8	1,286.7	1,268.1	1,251.0	1,234.1
5 - 9	1,549.0	1,604.3	1,561.8	1,521.8	1,484.0	1,449.2	1,417.2	1,388.0	1,361.7	1,338.4
10 - 14	1,862.3	1,836.3	1,800.2	1,753.6	1,706.8	1,660.6	1,615.9	1,573.2	1,533.2	1,495.3
15 - 19	1,886.7	1,892.9	1,899.5	1,905.8	1,902.2	1,885.3	1,859.3	1,823.1	1,776.6	1,729.8
20 - 24	1,916.9	1,928.7	1,935.4	1,934.7	1,934.9	1,942.0	1,948.2	1,954.8	1,961.0	1,957.5
25 - 29	1,937.7	1,937.0	1,949.2	1,957.5	1,967.7	1,973.7	1,985.4	1,992.0	1,991.3	1,991.3
30 - 34	2,059.3	2,046.2	2,021.3	1,999.0	1,970.0	1,966.6	1,965.7	1,977.8	1,986.1	1,996.2
35 - 39	2,287.6	2,207.8	2,138.4	2,090.5	2,079.2	2,063.8	2,050.6	2,025.9	2,003.6	1,974.6
40 - 44	2,398.3	2,408.7	2,411.5	2,394.9	2,341.5	2,276.7	2,197.5	2,128.3	2,080.8	2,069.7
45 - 49	2,244.7	2,288.6	2,319.0	2,344.1	2,375.3	2,384.2	2,394.7	2,397.8	2,381.6	2,328.9
50 - 54	2,006.7	2,032.3	2,074.0	2,126.5	2,171.2	2,225.6	2,269.3	2,299.8	2,325.1	2,356.3
55 - 59	1,663.6	1,767.3	1,841.5	1,912.9	1,972.3	1,979.6	2,005.4	2,046.9	2,098.8	2,143.1
60 - 64	1,302.0	1,361.4	1,419.2	1,474.9	1,535.9	1,643.4	1,724.8	1,796.7	1,866.0	1,923.5
65 - 69	1,118.6	1,123.7	1,144.9	1,168.1	1,198.6	1,239.3	1,295.9	1,350.9	1,403.9	1,461.9
70 +	2,878.4	2,936.8	2,984.0	3,031.6	3,081.3	3,125.9	3,172.0	3,222.9	3,276.6	3,339.0
TOTAL	28,670.5	28,778.9	28,877.5	28,967.4	29,049.2	29,122.7	29,188.6	29,246.2	29,297.3	29,339.6

Source: Statistics Canada (CANSIM CD-ROM Data Base)

Births. According to Statistics Canada projections, figures corresponding to this variable for the projection period are as follows:

Table 4.2 Projection of Births

(Figures in '000)

year	births
1992	347.60
1993	337.50
1994	327.80
1995	318.70
1996	310.30
1997	302.40
1998	294.70
1999	287.40
2000	280.60
2001	275.10
2002	270.20
2003	265.20
2004	260.80
2005	257.10
2006	253.50
2007	249.80
2008	246.50
2009	243.40
2010	240.10
2011	237.80

Source: Statistics Canada (CANSIM CD-ROM Data Base)

Migration and Deaths. Using the same source as above, for migration and deaths we assumed that they will be distributed in the same proportion as the occurred in 1992 (see *Tables 4.3, 4.4 & 4.5).* Thus we obtained the specific numbers for each age group during the projection years.

Table 4.3 Projection of Immigrants by age group

(Figures in '000)

year age group	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
0 - 4	15.02	9.98	10.08	10.06	10.03	10.00	9.98	9.96	9.94	9.92
5 - 9	17.92	11.91	12.02	11.99	11.96	11.93	11.91	11.88	11.86	11.83
10 - 14	16.52	10.98	11.09	11.06	11.03	11.01	10.98	10.96	10.93	10.91
15 - 19	15.93	10.59	10.69	10.66	10.63	10.61	10.59	10.56	10.54	10.52
20 - 24	26.14	17.37	17.54	17.49	17.45	17.40	17.37	17.33	17.29	17.26
25 - 29	37.96	25.23	25.47	25.41	25.34	25.28	25.23	25.16	25.11	25.07
30 - 34	31.46	20.91	21.11	21.06	21.00	20.95	20.91	20.86	20.81	20.77
35 - 39	21.77	14.47	14.61	14.57	14.54	14.50	14.47	14.43	14.40	14.38
40 - 44	13.95	9.27	9.36	9.34	9.32	9.29	9.27	9.25	9.23	9.21
45 - 49	7.84	5.21	5.26	5.25	5.23	5.22	5.21	5.20	5.19	5.18
50 - 54	6.64	4.41	4.45	4.44	4.43	4.42	4.41	4.40	4.39	4.38
55 - 59	6.39	4.25	4.29	4.28	4.27	4.25	4.25	4.24	4.23	4.22
60 - 64	6.19	4.11	4.15	4.14	4.13	4.12	4.11	4.10	4.09	4.08
65 - 69	4.34	2.88	2.91	2.91	2.90	2.89	2.88	2.88	2.87	2.87
70 +	4.70	3.12	3.15	3.14	3.14	3.13	3.12	3.11	3.11	3.10
Total	232.76	154.70	156.20	165.80	155.40	155.00	154.70	154.30	154.00	153.70

Source: Statistics Canada (CANSIM CD-ROM Data Base)

Table 4.3 Projection of Immigrants by age group (concluded)

(Figures in '000)

year age group	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
0 - 4	9.90	9.89	9.87	9.86	9.84	9.83	9.82	9.81	10.43	9.27
5 - 9	11.81	11.79	11.77	11.76	11.74	11.72	11.71	11.70	12.44	11.06
10 - 14	10.89	10.88	10.86	10.84	10.83	10.81	10.80	10.79	11.47	10.20
15 - 19	10.50	10.48	10.46	10.45	10.43	10.42	10.41	10.40	11.06	9.83
20 - 24	17.23	17.20	17.17	17.15	17.12	17.10	17.08	17.07	18.15	16.14
25 - 29	25.02	24.98	24.93	24.90	24.87	24.84	24.80	24.79	26.35	23.43
30 - 34	20.73	20.71	20.67	20.64	20.61	20.59	20.56	20.54	21.84	19.42
35 - 39	14.35	14.33	14.30	14.28	14.26	14.25	14.23	14.22	15.12	13.44
40 - 44	9.20	9.18	9.17	9.15	9.14	9.13	9.12	9.11	9.69	8.61
45 - 49	5.17	5.16	5.15	5.14	5.14	5.13	5.12	5.12	5.44	4.84
50 - 54	4.37	4.37	4.36	4.35	4.35	4.34	4.34	4.33	4.61	4.10
55 - 59	4.21	4.21	4.20	4.19	4.19	4.18	4.18	4.17	4.44	3.94
60 - 64	4.08	4.07	4.06	4.06	4.05	4.05	4.04	4.04	4.29	3.82
65 - 69	2.86	2.86	2.85	2.85	2.84	2.84	2.84	2.83	3.01	2.68
70 +	3.09	3.09	3.08	3.08	3.08	3.07	3.07	3.07	3.26	2.90
Total	153.40	153.20	152.90	152.70	152.50	152.30	152.10	152.00	161.60	143.70

Source: Statistics Canada (CANSIM CD-ROM Data Base)

Table 4.4 Projection of Emigrants by age group

(Figures in '000)

year age group	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
0 - 4	1.98	4.29	4.40	4.41	4.42	4.43	4.43	4.44	4.44	4.45
5 - 9	2.79	6.05	6.20	6.22	6.23	6.24	6.25	6.26	6.26	6.27
10 - 14	2.81	6.10	6.26	6.27	6.28	6.29	6.30	6.31	6.32	6.32
15 - 19	2.35	5.11	5.24	5.25	5.26	5.27	5.27	5.28	5.29	5.29
20 - 24	3.35	7.28	7.46	7.48	7.49	7.51	7.51	7.52	7.53	7.54
25 - 29	5.93	12.87	13.19	13.22	13.24	13.27	13.29	13.30	13.32	13.33
30 - 34	5.39	11.70	11.99	12.02	12.03	12.06	12.08	12.09	12.10	12.12
35 - 39	4.47	9.71	9.96	9.98	9.99	10.02	10.03	10.04	10.05	10.06
40 - 44	3.88	8.42	8.63	8.65	8.66	8.68	8.69	8.70	8.71	8.72
45 - 49	1.93	4.20	4.30	4.31	4.32	4.33	4.33	4.34	4.34	4.35
50 - 54	1.16	2.53	2.59	2.60	2.60	2.61	2.61	2.61	2.61	2.62
55 - 59	0.75	1.63	1.67	1.67	1.67	1.68	1.68	1.68	1.68	1.58
60 - 64	0.53	1.15	1.18	1.18	1.18	1.18	1.19	1.19	1.19	1.19
65 - 69	0.49	1.07	1.09	1.10	1.10	1.10	1.10	1.10	1.11	1.11
70 +	0.51	1.10	1.13	1.13	1.13	1.13	1.14	1.14	1.14	1.14
Total	38.33	83.20	85.30	85.50	85.60	85.80	85.90	86.00	86.10	86.20

Source: Statistics Canada (CANSIM CD-ROM Data Base)

Table 4.4 Projection of Emigrants by age group (concluded)

(Figures in '000)

year age group	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
0 - 4	4.45	4.46	4.46	4.47	4.47	4.47	4.47	4.48	4.99	4.07
5 - 9	6.28	6.28	6.29	6.30	6.30	6.31	6.31	6.31	7.03	5.74
10 - 14	6.33	6.34	6.35	6.35	6.35	6.36	6.36	6.37	7.09	5.79
15 - 19	5.30	5.30	5.31	5.32	5.32	5.32	5.32	5.33	5.93	4.84
20 - 24	7.55	7.56	7.57	7.58	7.58	7.58	7.58	7.59	8.45	6.90
25 - 29	13.35	13.36	13.38	13.39	13.39	13.41	13.41	13.42	14.94	12.20
30 - 34	12.13	12.15	12.16	12.17	12.17	12.19	12.19	12.20	13.58	11.09
35 - 39	10.07	10.09	10.10	10.11	10.11	10.12	10.12	10.13	11.28	9.21
40 - 44	8.73	8.74	8.75	8.76	8.76	8.77	8.77	8.78	9.78	7.99
45 - 49	4.35	4.36	4.36	4.37	4.37	4.37	4.37	4.38	4.87	3.98
50 - 54	2.62	2.62	2.63	2.63	2.63	2.63	2.63	2.64	2.93	2.40
55 - 59	1.69	1.69	1.69	1.69	1.69	1.69	1.69	1.70	1.89	1.54
60 - 64	1.19	1.19	1.19	1.20	1.20	1.20	1.20	1.20	1.33	1.09
65 - 69	1.11	1.11	1.11	1.11	1.11	1.11	1.11	1.11	1.24	1.01
70 +	1.14	1.14	1.14	1.15	1.15	1.15	1.15	1.15	1.28	1.04
Total	86.30	86.40	86.50	86.60	86.60	86.70	86.70	86.80	96.60	78.90

Source: Statistics Canada (CANSIM CD-ROM Data Base)

Table 4.5 Projection of Deaths by age group

(Figures in '000)

year age group	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
0 - 4	0.98	0.99	1.01	1.02	1.04	1.05	1.07	1.09	1.10	1.12
5 - 9	0.40	0.41	0.41	0.42	0.42	0.43	0.44	0.44	0.45	0.46
10 - 14	0.43	0.43	0.44	0.45	0.45	0.46	0.47	0.47	0.48	0.49
15 - 19	1.52	1.54	1.56	1.58	1.60	1.63	1.66	1.68	1.71	1.73
20 - 24	1.81	1.83	1.86	1.88	1.91	1.94	1.97	2.00	2.03	2.06
25 - 29	2.13	2.15	2.18	2.21	2.25	2.28	2.32	2.36	2.39	2.43
30 - 34	2.57	2.60	2.64	2.67	2.71	2.76	2.80	2.85	2.89	2.93
35 - 39	2.79	2.82	2.86	2.90	2.94	2.99	3.04	3.08	3.13	3.18
40 - 44	3.58	3.62	3.67	3.72	3.78	3.84	3.90	3.96	4.02	4.08
45 - 49	4.54	4.59	4.66	4.72	4.79	4.87	4.95	5.02	5.10	5.18
50 - 54	6.41	6.48	6.57	6.67	6.76	6.87	6.98	7.09	7.20	7.31
55 - 59	10.22	10.33	10.48	10.63	10.77	10.95	11.13	11.30	11.48	11.65
60 - 64	15.62	15.78	16.01	16.24	16.47	16.74	17.01	17.28	17.54	17.81
65 - 69	21.68	21.91	22.23	22.55	22.85	23.24	23.61	23.99	24.35	24.72
70 +	122.56	123.83	125.63	127.43	129.17	131.35	133.46	135.57	137.62	139.74
Total	197.25	199.30	202.20	205.10	207.90	211.40	214.80	218.20	221.50	224.90

Source: Statistics Canada (CANSIM CD-ROM Data Base)

Table 4.5 Projection of Deaths by age group (concluded)

(Figures in '000)

year age group	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
0 - 4	1.14	1.16	1.18	1.20	1.22	1.24	1.26	1.28	1.31	1.33
5 - 9	0.47	0.48	0.48	0.49	0.50	0.51	0.52	0.53	0.53	0.54
10 - 14	0.50	0.51	0.52	0.53	0.53	0.54	0.55	0.56	0.57	0.58
15 - 19	1.77	1.80	1.83	1.86	1.89	1.92	1.96	1.99	2.02	2.06
20 - 24	2.10	2.14	2.18	2.22	2.25	2.29	2.33	2.37	2.41	2.45
25 - 29	2.47	2.52	2.56	2.61	2.65	2.70	2.74	2.79	2.83	2.88
30 - 34	2.99	3.04	3.10	3.15	3.20	3.26	3.31	3.37	3.42	3.48
35 - 39	3.24	3.30	3.36	3.41	3.47	3.53	3.59	3.65	3.71	3.77
40 - 44	4.16	4.24	4.31	4.39	4.46	4.53	4.61	4.69	4.77	4.85
45 - 49	5.27	5.37	5.47	5.56	5.65	5.75	5.85	5.94	6.04	6.14
50 - 54	7.45	7.58	7.72	7.85	7.98	8.12	8.25	8.39	8.53	8.67
55 - 59	11.67	12.09	12.30	12.52	12.72	12.94	13.15	13.37	13.60	13.82
60 - 64	18.14	18.48	18.81	19.13	19.44	19.78	20.11	20.44	20.79	21.13
65 - 69	25.18	25.65	26.11	26.56	26.99	27.45	27.91	28.37	28.86	29.33
70 +	142.35	144.96	147.57	150.11	152.54	155.15	157.76	160.36	163.10	165.77
Total	229.10	233.30	237.50	241.60	245.50	249.70	253.90	258.10	262.50	266.80

Source: Statistics Canada (CANSIM CD-ROM Data Base)

Death probability for newborns. From the Canada Pension Plan Fourteenth Actuarial Report[3] was taken the probability of death for persons aged 0, averaging female and male infants. This number comes to be 7.68 deaths per thousand lives, and was assumed constant for the projection period.

Active population. From the 1992 employment statistics were calculated the proportion of persons in each age group that are active. These proportions were assumed to remain constant during the projection period.

Table 4.6 Active population proportions. Canada, 1992

Age group	Active population proportions
0 - 4	0.00%
5 - 9	0.00%
10 - 14	0.00%
15 - 19	40.80%
20 - 24	62.55%
25 - 29	71.71%
30 - 34	71.70%
35 - 39	76.01%
40 - 44	76.00%
45 - 49	73.29%
50 - 54	73.33%
55 - 59	55.07%
60 - 64	32.10%
65 - 69	11.61%
70 +	3.05%

Source: Statistics Canada (1993). Labour force annual averages 1992. Catalogue 71-220

Employment by industry. According to the 1980 Standard Industrial Classification (SIC-80)[4], industries were considered to belong to 19 different activities. The corresponding 1992 figure of employed persons in each industry, as a rate of the economy's total employment, was assumed to be maintained through the projection period.

Table 4.7 Employment Rate by Industry. Canada, 1992

Industry	Employment rate
Agriculture	3.54%
Fishing & Trapping	0.32%
Logging & Forestry	0.50%
Mining, Quarrying & Oil wells	1.28%
Manufacturing	14.61%
Construction	5.56%
Transportation & Storage	4.76%
Communication	2.75%
Wholesale trade	4.51%
Retail Trade	13.10%
Finance & Insurance	4.02%
Real Estate & Ins. Agents	2.21%
Business services	5.52%
Government services	6.81%
Educational services	7.25%
Health & Social Services	9.99%
Accommodation, food & beverage services	6.23%
Other services	7.03%
Unclassified	0.00%

Source: Statistics Canada (1993). Labour force annual averages 1992. Catalogue 71-220

Employment by Occupation. There are 10 different occupations in each industry, as outlined by the 1980 Standard Occupational Classification (SOC-80).[5] Again, the proportions of employed persons in each occupation during 1992 were assumed to remain constant for the rest of the projection period.

Table 4.8 Employment Rate by Occupation. Canada, 1992

Occupation	Employment rate
Managerial & other professional	31.86%
Clerical	16.21%
Sales	9.90%
Services	13.59%
Primary occupations	4.75%
Processing	11.56%
Construction	5.20%
Transport	3.63%
Material handing	3.29%
Unclassified	0.00%

Source: Statistics Canada (1993). Labour force annual averages 1992. Catalogue 71-220

Average weekly earnings. Data for each industry (see Table 4.9) were obtained from Statistics Canada publications, except for Agriculture and Fishing & Trapping sectors. However, we obtained from the officials of the Agriculture Department in Statistics Canada[6] an hourly approximation for that number. Using the 1992 Average Standard Work Week (see Table 4.10) for that industry we arrived at a figure assumed to be reasonable. Since we did not have the corresponding number for the Fishing & Trapping Industry, it was assumed to be equal to that of the Agriculture Industry due to the similar nature of both activities.

Table 4.9 Average weekly earnings by Industry. Canada, 1992

Industry	Average weekly earnings before taxes, 1992 dollars (includes overtime)
Agriculture	324.90
Fishing & Trapping	324.90
Logging & Forestry	704.67
Mining, Quarrying & Oil wells	935.48
Manufacturing	655.88
Construction	638.59
Transportation & Storage	661.61
Communication	755.33
Wholesale Trade	582.87
Retail Trade	320.89
Finance & Insurance	623.22
Real Estate & Ins. Agents	516.57
Business Services	584.70
Government Services	723.10
Educational Services	683.23
Health & Social Services	486.58
Accommodation, Food & Beverage Services	212.57
Other Services	368.43
Unclassified	405.31

Source: Statistics Canada (CANSIM CD-ROM Data Base)

Table 4.10 Average Standard Work Week by Industry. Canada, 1992

Industry	original data (hours)	adjusted data (hours)
Agriculture	n.a.	38.0
Fishing & Trapping	n.a.	38.0
Logging & Forestry	38.6	38.6
Mining, Quarrying & Oil wells	38.2	38.2
Manufacturing	38.3	38.3
Construction	39.5	39.5
Transportation & Storage	38.2	38.2
Communication	38.4	38.4
Wholesale Trade	38.5	38.5
Retail Trade	39.3	39.3
Finance & Insurance	36.3	36.3
Real Estate & Ins. Agents	36.5	36.5
Business services	36.9	36.9
Government Services	38.0	38.0
Educational Services	n.a.	38.0
Health & Social Services	35.6	35.6
Accommodation, Food & Beverage Services	40.1	40.1
Other Services	37.3	37.3
Unclassified	n.a.	38.0
Average		38.0

(*) assumed equal as local administration

Source: Statistics Canada (1993). Employment, earnings and hours. Catalogue 71-220

Profits by Industry. Although the corresponding figures for each industry were not available from Statistics Canada (only partial disclosures are made quarterly, but they do not cover all industries), the total profits before taxes for all industries have been published.[7] To estimate the participation of each of those industries in the total, we assumed that profits were proportional to the amount that each industry contributed to the 1992 Gross Domestic Product (GDP).

Table 4.11 GDP at factor cost & Profits by Industry. Canada, 1992

Industry	GDP (millions of dollars, constant 1986)	Profits
Agriculture	11,025.1	834.4
Fishing & Trapping	822.1	62.2
Logging & Forestry	2,946.2	223.0
Mining, Quarrying & Oil wells	19,938.1	1,509.0
Manufacturing	8,046.8	6,663.8
Construction	29,034.2	2,197.4
Transportation & Storage	21,915.5	1,658.7
Communication	15,383.5	1,164.3
Wholesale Trade	30,253.9	2,289.7
Retail Trade	29,913.2	2,264.0
Finance & Insurance	39,895.7	3,019.5
Real Estate & Ins. Agents	42,938.2	3,249.7
Business services	241.9	18.3
Government Services	34,041.5	2,576.4
Educational Services	28,304.3	2,142.2
Health & Social Services	32,579.3	2,465.7
Accommodation, Food & Beverage Services	11,186.2	846.6
Other Services	1,253.9	94.9
Unclassified	8,458.2	640.2
Total	448,177.8	33,920

Source: Statistics Canada (1993). Provincial Gross Domestic Product by industry 1984-1992. Catalogue 71-220

Productivity index. From the published data as of 1992 (see *Appendix B, Table B6*) productivity indices for the projection period were calculated using a linear regression model. This regression model was applied to the productivity index for the business sector as well as for the manufacturing sector. The adjusted coefficients of determination are 79.07% and 86.47%, respectively. These projections were assumed to be reasonable due to the lack of projected figures from an official or other source. The figures used in the economic model corresponds to the average of both sectors, and are shown below.

Table 4.12 Estimation of Productivity Index, Canada

Year	author[8]	CPP assumption[9]
1992	96.10	98.00
1993	103.62	98.60
1994	104.59	99.40
1995	105.56	100.20
1996	106.54	101.20
1997	107.51	102.20
1998	108.48	103.20
1999	109.45	104.20
2000	110.43	105.20
2001	111.40	106.20
2002	112.37	107.20
2003	113.34	108.20
2004	114.32	109.20
2005	115.29	110.20
2006	116.26	111.20
2007	117.23	112.20
2008	118.21	113.20
2009	119.18	114.20
2010	120.15	115.20
2011	121.12	116.20

All these assumptions are incorporated into the models, in order to reach a high degree of complexity without interfering with the easiness of presentation or the simplicity of understanding the obtained results.

Notes.

1. Deaton, Richard L. (1989).
2. e.g., Canada (1989-A).
3. Canada (1991-E).
4. Canada (1980).
5. Canada (1993-G).
6. Mr. Mario Menard.
7. Canada (1993-B).
8. Results obtained by a linear regression model.
9. Taken from The Canada Pension Plan Fourteenth Actuarial Report (loc. cit).

FIVE

RESULTS

> The inexactitude of our methods of measurement has no more reason in statistics than it has in physics to dim our conception of what which we measure.
>
> R.A. Fisher

This chapter describes the results obtained from the application of the demographic model by means of the Socio-Demographic Standard Matrix, together with the economic model, both described in the preceding chapter. We have already mentioned the key assumptions made in the application of those models and the purpose of those assumptions. Therefore, in this chapter we exhibit the results needed for further discussion.

Results of the demographic model.

Table 5.1 shows the **Socio-Demographic Standard Matrix Canada, 1993** developed according to the theory explained in the previous chapter.[1] With the matrices corresponding to years 1993 - 2011 we were able to estimate the human flows for each year. All figures are expressed in thousands and some slight errors are attributable to rounding off.

Table 5.1 Standard Socio-Demographic Matrix, Canada 1993

group			1	2	3	4	5	6	7	8	9	10	11	12	13	14	15		
	age group		0-4	5-9	10-14	15-19	20-24	25-29	30-34	35-39	40-44	45-49	50-54	55-59	60-64	65-69	70 +	closing stocks	
			d1	d2	d3	d4	d5	d6	d7	d8	d9	d10	d11	d12	d13	d14	d15		
	deaths	2.6	1.0	0.4	0.4	1.5	1.8	2.2	2.6	2.8	3.6	4.6	6.5	10.3	15.8	21.9	123.8	201.9	
	emig'n	0.0	4.3	6.1	6.1	5.1	7.3	12.9	11.7	9.7	8.4	4.2	2.5	1.6	1.1	1.1	1.1	83.2	
	total	2.6	5.3	6.5	6.5	6.6	9.1	15.0	14.3	12.5	12.0	8.8	9.0	12.0	16.9	23.0	124.9	285.1	
group																			
0	births	337.5																337.5	
1	0-4	10.0	1445.2															1455.2	x'1
2	5-9	11.9	362.6	1478.9														1853.4	x'2
3	10-14	11.0		371.3	1472.9													1855.3	x'3
4	15-19	10.6			369.9	1452.2												1832.7	x'4
5	20-24	17.4				364.7	1558.3											1940.3	x'5
6	25-29	25.2					391.8	1724.3										2141.3	x'6
7	30-34	20.9						434.8	1919.2									2375.0	x'7
8	35-39	14.5							483.4	1839.7								2337.6	x'8
9	40-44	9.3								463.1	1640.3							2112.6	x'9
10	45-49	5.2									413.1	1438.7						1856.9	x'10
11	50-54	4.4										361.9	1120.7					1487.0	x'11
12	55-59	4.2											282.4	957.2				1243.9	x'12
13	60-64	4.1												242.3	928.7			1175.2	x'13
14	65-69	2.9													236.4	833.9		1073.2	x'14
15	70 +	3.1														214.2	2132.3	2349.6	x'15
		494.8																27426.8	
	opening stocks		1813.1	1856.7	1849.4	1823.6	1959.2	2174.1	2416.9	2315.3	2065.4	1809.3	1412.2	1211.5	1182.1	1071.1	2257.2	27217.1	
			x1	x2	x3	x4	x5	x6	x7	x8	x9	x10	x11	x12	x13	x14	x15		

The structure of the matrix is as explained in Section 4.2 of the preceding chapter. Here we would like to emphasize the main features. The upper left most corner figure (2.59 thousand) corresponds to the *a* scalar value, which contains those newborns that died during the year and the emigrants of age less than one. This last figure was considered to be zero since we did not obtain the appropriate data.

The first three rows show the deaths and emigrants for each age group, as well as the totals for the year. For instance, age group 10-14 projects that 0.43 thousand persons will die during the year and 6.10 thousand will emigrate; the sum, 6.54 thousand persons, will either die or emigrate. Figures for totals, for example, are 5.29 thousand for the age group 0-4 and 6.46 thousand for age group 5-9; the age group of those aged 70 and more, accounts for 124.93 thousand deaths and emigrants. The total of deaths and emigration, for all age groups, during the year accounts for 285.09 thousand.

The bottom row of the matrix shows the initial stocks for each age group, i.e., those survivors from the previous year. In the case of year 1993, the survivors from year 1992 are, for example, 1959.20 thousand persons for the age group 20-24, and 1182.10 thousand for those persons aged 60-64. The total of those opening stocks are 27,217.10 thousand, i.e., the total initial population of the year.

The left column depicts the immigrants of the year, divided by age groups, where the first figure corresponds to the births of the year. In this case, births for the year accounts for 337.50 thousand. As for immigrants we have, for example, 14.47 thousand for age group 35-39, whereas 2.88 thousand corresponds to age group 65-69. The total is 494.79 thousand, located in the lower part of the same column.

In the main body of the matrix are shown the survivors of the year that either will remain in the same age group as the previous year or that will move into the next age group. The upper figure in each column corresponds to those that will remain in that same age group for next year, e.g., in age group 30-34 we have 1919.23 thousand persons. The lower number represents the number of persons that will flow into the next age group in the following year. For that same age group, 483.38 thousand will move into the next group in the following year.

For each age group, the number of persons moving into the next age group at the end of the present year was assumed to be one fifth of the total number of persons in this group, since each age group is composed of five different ages. This implies that within each age group, individuals are equally distributed. This assumption makes sense since we are talking about flows during a period, thus after five years all persons of

each age group will have left that group. The exception to this dynamic flow is the last group (those aged 70+), since there is no further group into which they can move. This is the case of the 2132.27 thousand persons aged 70+ shown in our table.

In the right column we have the so-called closing stocks. These figures correspond to the algebraic sum of each row, including the corresponding numbers in the immigrants and births' column. As for age group 40-44, for example, we have 2112.61 thousand persons, i.e., in 1994 there will be 2.1 million people aged 40-44. Thus the closing stocks' figures will become the opening stocks for the next year for all age groups. We must mention that the exception to this rule are births for the year and the first age group since both are added up each year so that they will conform the 0-4 age group of next year, making room for next year's births.

Similar interpretations should be applied to all tables of our Demographic model, so that all age groups will flow from year to year in a similar fashion. Based on the results from the matrices as explained above, we obtained the number of persons in each age group for the whole projection period. In this form, we have estimated the summary for all projected years that is shown in *Table 5.2* ; these results can be compared with Statistics Canada's data (see *Table 4.1* in preceding chapter).

From those tables we observe that, although the totals match as expected, the proportions of persons in each group change. Those changes are more noticeable in the 0-4 group as well as in the 70+ group. Furthermore, they become more acute as we progress in our projection.

We may explain those differences. First, we are assuming that the distribution of persons among the age groups will be, for all the projection period, as they occurred in 1992. Second, we are assuming that population is equally distributed within each age group.

Table 5.2 Population Projections by age group

year / age group	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
0 - 4	1,982.0	1,813.1	1,792.7	1,766.6	1,736.6	1,704.2	1,670.3	1,635.4	1,600.2	1,565.1
5 - 9	1,884.8	1,856.7	1,853.4	1,846.7	1,836.0	1,821.5	1,803.3	1,781.9	1,757.8	1,731.4
10 - 14	1,867.2	1,849.4	1,855.3	1,859.3	1,861.1	1,860.4	1,856.9	1,850.4	1,840.9	1,828.4
15 - 19	1,840.6	1,823.6	1,832.7	1,841.1	1,848.6	1,854.9	1,859.7	1,862.8	1,863.9	1,862.8
20 - 24	1,979.2	1,959.2	1,940.3	1,927.0	1,918.0	1,912.2	1,908.7	1,906.8	1,905.8	1,905.1
25 - 29	2,296.8	2,174.1	2,141.3	2,111.2	2,084.4	2,060.9	2,040.9	2,024.1	2,010.1	1,998.7
30 - 34	2,460.1	2,416.9	2,375.0	2,334.7	2,296.4	2,260.2	2,226.5	2,195.4	2,167.1	2,141.5
35 - 39	2,319.4	2,315.3	2,337.6	2,346.8	2,346.1	2,337.8	2,323.8	2,305.7	2,285.0	2,262.6
40 - 44	2,073.7	2,065.4	2,112.6	2,154.7	2,190.1	2,218.2	2,238.8	2,252.5	2,259.7	2,261.3
45 - 49	1,738.4	1,809.3	1,856.9	1,904.4	1,950.7	1,994.7	2,035.4	2,072.0	2,103.9	2,130.8
50 - 54	1,356.9	1,412.2	1,487.0	1,556.3	1,621.1	1,682.1	1,739.5	1,793.5	1,843.9	1,890.5
55 - 59	1,209.3	1,211.5	1,243.9	1,284.7	1,331.0	1,380.8	1,432.7	1,485.5	1,538.4	1,590.6
60 - 64	1,174.4	1,182.1	1,175.2	1,175.9	1,184.4	1,200.2	1,222.5	1,250.5	1,283.1	1,319.5
65 - 69	1,059.0	1,071.1	1,073.2	1,073.2	1,073.0	1,074.2	1,078.0	1,085.0	1,095.9	1,110.8
70 +	2,167.1	2,257.2	2,349.6	2,440.6	2,529.9	2,617.3	2,702.8	2,786.9	2,870.3	2,953.8
TOTAL	27,408.9	27,217.1	27,426.8	27,623.3	27,807.2	27,979.4	28,139.6	28,288.3	28,425.8	28,552.8

Source: Author

Table 5.2 Population Projections by age group (concluded)

(Figure in '000)

year / age group	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
0 - 4	1,531.5	1,499.7	1,469.3	1,440.4	1,413.6	1,388.6	1,364.8	1,342.4	1,321.4	1,301.3
5 - 9	1,703.2	1,674.0	1,644.2	1,614.2	1,584.4	1,555.2	1,526.8	1,499.2	1,472.7	1,447.3
10 - 14	1,813.1	1,795.2	1,775.0	1,752.8	1,729.0	1,704.0	1,678.2	1,651.8	1,625.1	1,598.5
15 - 19	1,859.4	1,853.6	1,845.3	1,834.5	1,821.5	1,806.2	1,788.9	1,769.9	1,749.4	1,727.6
20 - 24	1,904.3	1,902.9	1,900.5	1,896.9	1,891.8	1,885.0	1,876.5	1,866.1	1,854.0	1,840.4
25 - 29	1,989.3	1,981.5	1,974.9	1,969.0	1,963.5	1,958.0	1,952.1	1,945.6	1,938.3	1,930.0
30 - 34	2,118.7	2,098.4	2,080.5	2,064.8	2,051.0	2,038.7	2,027.7	2,017.6	2,008.2	1,999.1
35 - 39	2,239.5	2,216.4	2,193.7	2,172.0	2,151.3	2,131.9	2,113.9	2,097.1	2,081.7	2,067.1
40 - 44	2,258.0	2,250.6	2,239.9	2,226.8	2,211.8	2,195.6	2,178.7	2,161.5	2,144.2	2,126.9
45 - 49	2,152.6	2,169.2	2,180.9	2,188.0	2,191.0	2,190.3	2,186.3	2,179.7	2,170.9	2,160.1
50 - 54	1,933.0	1,971.2	2,005.0	2,034.2	2,058.8	2,079.0	2,094.8	2,106.6	2,114.5	2,118.9
55 - 59	1,641.4	1,690.4	1,737.0	1,780.8	1,821.5	1,858.7	1,892.3	1,922.1	1,948.1	1,970.4
60 - 64	1,358.8	1,400.1	1,442.5	1,485.5	1,528.3	1,570.3	1,611.1	1,650.1	1,686.9	1,721.3
65 - 69	1,129.5	1,152.0	1,177.7	1,206.3	1,237.3	1,270.2	1,304.5	1,339.7	1,375.1	1,410.4
70 +	3,038.2	3,123.7	3,211.1	3,301.0	3,394.1	3,490.9	3,591.8	3,696.8	3,806.3	3,920.2
TOTAL	28,670.5	28,778.7	28,877.4	28,967.1	29,048.7	29,122.6	29,188.3	29,246.3	29,296.8	29,339.4

Source: Author

These figures imply that the dependency ratios derived from our population estimations are higher than those calculated from the official data, as can be easily observed in *Figure 5.1*

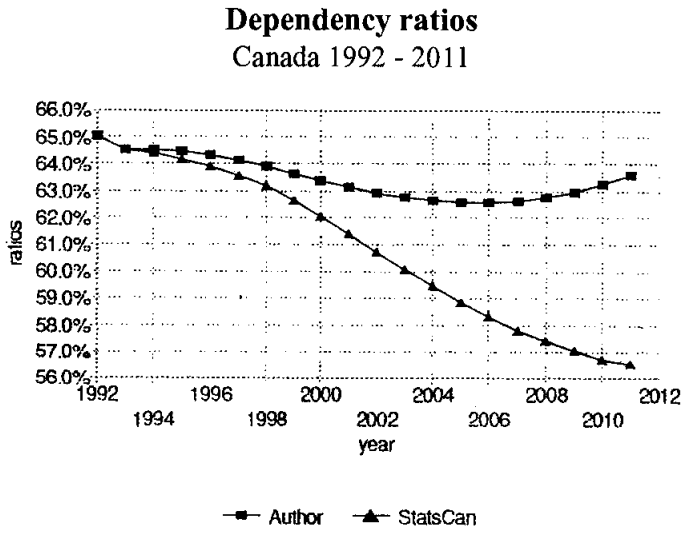

Figure 5.1 Ratio of population in age group 0 - 19 and 65 + to population in age group 20 - 64.

As a tentative explanation for the differences shown in the dependency ratios, we may advance the proposition that our assumptions regarding population distribution in each age group differ from Statistics Canada's assumption. Furthermore, since we are starting our projection with a different age structure, it will be unlikely to arrive to identical figures. On the other hand, the assumption of distribution within age groups may not coincide with the method used by the official sources.

Results of the economic model.

Using the population projections obtained from the demographic model's matrices, we input those numbers into the economic model to obtain the corresponding numbers of active persons for each year. The divisions of the model coincide with 19 industries,

10 occupational activities and 12 age groups, producing a matrix of 1,803 entries for each year. The first three age groups, i.e., persons aged 0 to 14 are not considered active individuals. The industry and occupational classifications are shown in *Tables 4.7* and *4.8* of the preceding chapter, respectively.

In *Table 5.3* we may observe that in 1993, for example, 8.4 thousand people are aged 15-19, are employed in industry 1 (Agriculture and related service industries) and are of occupation 1 (managerial and other professional). Similarly, 21,800 persons aged 20-24, are working in industry 10 (retail trade industries) belonging to occupation 4 (services).

Table 5.3 Economic Model Matrix (persons) Canada, 1993

Age group	industry	occupation 1	2	3	4	5	6	7	8	9	10	Total
1		0,0										0,0
2		0,0										0,0
3		0,0										0,0
4	1	8,4	4,3	2,6	3,6	1,3	3,0	1,4	1,0	0,9	0,0	26,3
	2	0,8	0,4	0,2	0,3	0,1	0,3	0,1	0,1	0,1	0,0	2,4
	3	1,2	0,6	0,4	0,5	0,2	0,4	0,2	0,1	0,1	0,0	3,7
	4	3,0	1,5	0,9	1,3	0,5	1,1	0,5	0,3	0,3	0,0	9,5
	5	34,6	17,6	10,8	14,8	5,2	12,6	5,6	3,9	3,6	0,0	108,7
	6	13,2	6,7	4,1	5,6	2,0	4,8	2,2	1,5	1,4	0,0	41,4
	7	11,3	5,7	3,5	4,8	1,7	4,1	1,8	1,3	1,2	0,0	35,4
	8	6,5	3,3	2,0	2,8	1,0	2,4	1,1	0,7	0,7	0,0	20,5
	9	10,7	5,4	3,3	4,6	1,6	3,9	1,7	1,2	1,1	0,0	33,6
	10	31,0	15,8	9,6	13,2	4,6	11,3	5,1	3,5	3,2	0,0	97,4
	11	9,5	4,8	3,0	4,1	1,4	3,5	1,6	1,1	1,0	0,0	29,9
	12	5,2	2,7	1,6	2,2	0,8	1,9	0,9	0,6	0,5	0,0	16,5
	13	13,1	6,7	4,1	5,6	2,0	4,8	2,1	1,5	1,4	0,0	41,1
	14	16,2	8,2	5,0	6,9	2,4	5,9	2,6	1,8	1,7	0,0	50,7
	15	17,2	8,7	5,3	7,3	2,6	6,2	2,8	2,0	1,8	0,0	53,9
	16	23,7	12,1	7,4	10,1	3,5	8,6	3,9	2,7	2,4	0,0	74,3
	17	14,8	7,5	4,6	6,3	2,2	5,4	2,4	1,7	1,5	0,0	46,3
	18	16,7	8,5	5,2	7,1	2,5	6,1	2,7	1,9	1,7	0,0	52,3
	19	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0
Total		237,1	120,6	73,7	101,2	35,4	86,0	38,7	27,0	24,5	0,0	744,1
5	1	13,8	7,0	4,3	5,9	2,1	5,0	2,3	1,6	1,4	0,0	43,4
	2	1,2	0,6	0,4	0,5	0,2	0,5	0,2	0,1	0,1	0,0	3,9
	3	1,9	1,0	0,6	0,8	0,3	0,7	0,3	0,2	0,2	0,0	6,1
	4	5,0	2,5	1,6	2,1	0,7	1,8	0,8	0,6	0,5	0,0	15,7
	5	57,0	29,0	17,7	24,3	8,5	20,7	9,3	6,5	5,9	0,0	179,0
	6	21,7	11,1	6,8	9,3	3,2	7,9	3,5	2,5	2,2	0,0	68,2
	7	18,6	9,5	5,8	7,9	2,8	6,7	3,0	2,1	1,9	0,0	58,4
	8	10,8	5,5	3,3	4,6	1,6	3,9	1,8	1,2	1,1	0,0	33,7
	9	17,6	9,0	5,5	7,5	2,6	6,4	2,9	2,0	1,8	0,0	55,3
	10	51,1	26,0	15,9	21,8	7,6	18,6	8,3	5,8	5,3	0,0	160,5
	11	15,7	8,0	4,9	6,7	2,3	5,7	2,6	1,8	1,6	0,0	49,3
	12	8,6	4,4	2,7	3,7	1,3	3,1	1,4	1,0	0,9	0,0	27,1
	13	21,6	11,0	6,7	9,2	3,2	7,8	3,5	2,5	2,2	0,0	67,7
	14	26,6	13,5	8,3	11,4	4,0	9,7	4,3	3,0	2,7	0,0	83,5
	15	28,3	14,4	8,8	12,1	4,2	10,3	4,6	3,2	2,9	0,0	88,8
	16	39,0	19,8	12,1	16,6	5,8	14,2	6,4	4,4	4,0	0,0	122,4
	17	24,3	12,4	7,6	10,4	3,6	8,8	4,0	2,8	2,5	0,0	76,3
	18	27,5	14,0	8,5	11,7	4,1	10,0	4,5	3,1	2,8	0,0	86,2
	19	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0
Total		390,5	198,6	121,3	166,6	58,3	141,7	63,7	44,5	40,3	0,0	1.225,5
6	1	17,6	8,9	5,5	7,5	2,6	6,4	2,9	2,0	1,8	0,0	55,2
	2	1,6	0,8	0,5	0,7	0,2	0,6	0,3	0,2	0,2	0,0	5,0
	3	2,5	1,3	0,8	1,1	0,4	0,9	0,4	0,3	0,3	0,0	7,8
	4	6,4	3,2	2,0	2,7	1,0	2,3	1,0	0,7	0,7	0,0	20,0
	5	72,6	36,9	22,6	31,0	10,8	26,3	11,8	8,3	7,5	0,0	227,7
	6	27,6	14,1	8,6	11,8	4,1	10,0	4,5	3,1	2,9	0,0	86,7
	7	23,7	12,0	7,4	10,1	3,5	8,6	3,9	2,7	2,4	0,0	74,3
	8	13,7	7,0	4,3	5,8	2,0	5,0	2,2	1,6	1,4	0,0	42,9
	9	22,4	11,4	7,0	9,6	3,3	8,1	3,7	2,6	2,3	0,0	70,3
	10	65,1	33,1	20,2	27,8	9,7	23,6	10,6	7,4	6,7	0,0	204,2
	11	20,0	10,2	6,2	8,5	3,0	7,2	3,3	2,3	2,1	0,0	62,7
	12	11,0	5,6	3,4	4,7	1,6	4,0	1,8	1,3	1,1	0,0	34,5
	13	27,4	14,0	8,5	11,7	4,1	10,0	4,5	3,1	2,8	0,0	86,1
	14	33,8	17,2	10,5	14,4	5,1	12,3	5,5	3,9	3,5	0,0	106,2
	15	36,0	18,3	11,2	15,4	5,4	13,1	5,9	4,1	3,7	0,0	113,0
	16	49,6	25,2	15,4	21,2	7,4	18,0	8,1	5,7	5,1	0,0	155,8
	17	30,9	15,7	9,6	13,2	4,6	11,2	5,0	3,5	3,2	0,0	97,1
	18	34,9	17,8	10,9	14,9	5,2	12,7	5,7	4,0	3,6	0,0	109,7
	19	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0
Total		496,7	252,7	154,4	211,9	74,1	180,2	81,0	56,6	51,3	0,0	1.559,0

Age group	industry	occupation 1	2	3	4	5	6	7	8	9	10	Total
7	1	19,5	9,9	6,1	8,3	2,9	7,1	3,2	2,2	2,0	0,0	61,3
	2	1,8	0,9	0,5	0,8	0,3	0,6	0,3	0,2	0,2	0,0	5,5
	3	2,8	1,4	0,9	1,2	0,4	1,0	0,4	0,3	0,3	0,0	8,6
	4	7,1	3,6	2,2	3,0	1,1	2,6	1,2	0,8	0,7	0,0	22,2
	5	80,7	41,0	25,1	34,4	12,0	29,3	13,2	9,2	8,3	0,0	253,2
	6	30,7	15,6	9,5	13,1	4,6	11,1	5,0	3,5	3,2	0,0	96,4
	7	26,3	13,4	8,2	11,2	3,9	9,5	4,3	3,0	2,7	0,0	82,5
	8	15,2	7,7	4,7	6,5	2,3	5,5	2,5	1,7	1,6	0,0	47,7
	9	24,9	12,7	7,7	10,6	3,7	9,0	4,1	2,8	2,6	0,0	78,2
	10	72,3	36,8	22,5	30,9	10,8	26,2	11,8	8,2	7,5	0,0	227,0
	11	22,2	11,3	6,9	9,5	3,3	8,1	3,6	2,5	2,3	0,0	69,7
	12	12,2	6,2	3,8	5,2	1,8	4,4	2,0	1,4	1,3	0,0	38,4
	13	30,5	15,5	9,5	13,0	4,6	11,1	5,0	3,5	3,2	0,0	95,7
	14	37,6	19,1	11,7	16,1	5,6	13,7	6,1	4,3	3,9	0,0	118,1
	15	40,0	20,4	12,4	17,1	6,0	14,5	6,5	4,6	4,1	0,0	125,6
	16	55,2	28,1	17,1	23,5	8,2	20,0	9,0	6,3	5,7	0,0	173,2
	17	34,4	17,5	10,7	14,7	5,1	12,5	5,6	3,9	3,6	0,0	107,9
	18	38,8	19,8	12,1	16,6	5,8	14,1	6,3	4,4	4,0	0,0	121,9
	19	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0
Total		552,2	280,9	171,6	235,6	82,4	200,3	90,0	62,9	57,1	0,0	1.733,0
8	1	19,8	10,1	6,2	8,5	3,0	7,2	3,2	2,3	2,0	0,0	62,3
	2	1,8	0,9	0,6	0,8	0,3	0,6	0,3	0,2	0,2	0,0	5,6
	3	2,8	1,4	0,9	1,2	0,4	1,0	0,5	0,3	0,3	0,0	8,8
	4	7,2	3,7	2,2	3,1	1,1	2,6	1,2	0,8	0,7	0,0	22,6
	5	81,9	41,7	25,5	34,9	12,2	29,7	13,4	9,3	8,5	0,0	257,1
	6	31,2	15,9	9,7	13,3	4,7	11,3	5,1	3,6	3,2	0,0	97,9
	7	26,7	13,6	8,3	11,4	4,0	9,7	4,4	3,0	2,8	0,0	83,8
	8	15,4	7,9	4,8	6,6	2,3	5,6	2,5	1,8	1,6	0,0	48,5
	9	25,3	12,9	7,9	10,8	3,8	9,2	4,1	2,9	2,6	0,0	79,4
	10	73,4	37,4	22,8	31,3	11,0	26,6	12,0	8,4	7,6	0,0	230,5
	11	22,5	11,5	7,0	9,6	3,4	8,2	3,7	2,6	2,3	0,0	70,7
	12	12,4	6,3	3,9	5,3	1,9	4,5	2,0	1,4	1,3	0,0	39,0
	13	31,0	15,8	9,6	13,2	4,6	11,2	5,1	3,5	3,2	0,0	97,2
	14	38,2	19,4	11,9	16,3	5,7	13,9	6,2	4,3	3,9	0,0	119,9
	15	40,6	20,7	12,6	17,3	6,1	14,7	6,6	4,6	4,2	0,0	127,5
	16	56,0	28,5	17,4	23,9	8,4	20,3	9,1	6,4	5,8	0,0	175,8
	17	34,9	17,8	10,8	14,9	5,2	12,7	5,7	4,0	3,6	0,0	109,6
	18	39,4	20,1	12,3	16,8	5,9	14,3	6,4	4,5	4,1	0,0	123,8
	19	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0
Total		560,7	285,3	174,3	239,3	83,7	203,5	91,4	63,8	57,9	0,0	1.759,9
9	1	17,7	9,0	5,5	7,5	2,6	6,4	2,9	2,0	1,8	0,0	55,5
	2	1,6	0,8	0,5	0,7	0,2	0,6	0,3	0,2	0,2	0,0	5,0
	3	2,5	1,3	0,8	1,1	0,4	0,9	0,4	0,3	0,3	0,0	7,8
	4	6,4	3,3	2,0	2,7	1,0	2,3	1,0	0,7	0,7	0,0	20,1
	5	73,1	37,2	22,7	31,2	10,9	26,5	11,9	8,3	7,5	0,0	229,3
	6	27,8	14,2	8,6	11,9	4,2	10,1	4,5	3,2	2,9	0,0	87,3
	7	23,8	12,1	7,4	10,2	3,6	8,6	3,9	2,7	2,5	0,0	74,8
	8	13,8	7,0	4,3	5,9	2,1	5,0	2,2	1,6	1,4	0,0	43,2
	9	22,6	11,5	7,0	9,6	3,4	8,2	3,7	2,6	2,3	0,0	70,8
	10	65,5	33,3	20,4	27,9	9,8	23,8	10,7	7,5	6,8	0,0	205,6
	11	20,1	10,2	6,2	8,6	3,0	7,3	3,3	2,3	2,1	0,0	63,1
	12	11,1	5,6	3,4	4,7	1,7	4,0	1,8	1,3	1,1	0,0	34,8
	13	27,6	14,1	8,6	11,8	4,1	10,0	4,5	3,1	2,9	0,0	86,7
	14	34,1	17,3	10,6	14,5	5,1	12,4	5,6	3,9	3,5	0,0	107,0
	15	36,2	18,4	11,3	15,5	5,4	13,2	5,9	4,1	3,7	0,0	113,8
	16	50,0	25,4	15,5	21,3	7,5	18,1	8,1	5,7	5,2	0,0	156,8
	17	31,1	15,8	9,7	13,3	4,6	11,3	5,1	3,5	3,2	0,0	97,7
	18	35,2	17,9	10,9	15,0	5,3	12,8	5,7	4,0	3,6	0,0	110,4
	19	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0
Total		500,1	254,4	155,4	213,4	74,6	181,5	81,6	56,9	51,7	0,0	1.569,7
10	1	14,9	7,6	4,6	6,4	2,2	5,4	2,4	1,7	1,5	0,0	46,9
	2	1,3	0,7	0,4	0,6	0,2	0,5	0,2	0,2	0,1	0,0	4,2
	3	2,1	1,1	0,7	0,9	0,3	0,8	0,3	0,2	0,2	0,0	6,6
	4	5,4	2,8	1,7	2,3	0,8	2,0	0,9	0,6	0,6	0,0	17,0
	5	61,7	31,4	19,2	26,3	9,2	22,4	10,1	7,0	6,4	0,0	193,7
	6	23,5	12,0	7,3	10,0	3,5	8,5	3,8	2,7	2,4	0,0	73,8
	7	20,1	10,2	6,3	8,6	3,0	7,3	3,3	2,3	2,1	0,0	63,2

Age group	industry	occupation 1	2	3	4	5	6	7	8	9	10	Total
10	8	11,6	5,9	3,6	5,0	1,7	4,2	1,9	1,3	1,2	0,0	36,5
	9	19,1	9,7	5,9	8,1	2,8	6,9	3,1	2,2	2,0	0,0	59,8
	10	55,3	28,1	17,2	23,6	8,3	20,1	9,0	6,3	5,7	0,0	173,7
	11	17,0	8,6	5,3	7,2	2,5	6,2	2,8	1,9	1,8	0,0	53,3
	12	9,4	4,8	2,9	4,0	1,4	3,4	1,5	1,1	1,0	0,0	29,4
	13	23,3	11,9	7,3	10,0	3,5	8,5	3,8	2,7	2,4	0,0	73,2
	14	28,8	14,6	8,9	12,3	4,3	10,4	4,7	3,3	3,0	0,0	90,3
	15	30,6	15,6	9,5	13,1	4,6	11,1	5,0	3,5	3,2	0,0	96,1
	16	42,2	21,5	13,1	18,0	6,3	15,3	6,9	4,8	4,4	0,0	132,5
	17	26,3	13,4	8,2	11,2	3,9	9,5	4,3	3,0	2,7	0,0	82,5
	18	29,7	15,1	9,2	12,7	4,4	10,8	4,8	3,4	3,1	0,0	93,3
	19	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0
Total		422,5	214,9	131,3	180,3	63,0	153,3	68,9	48,1	43,7	0,0	1.326,0
11	1	11,7	5,9	3,6	5,0	1,7	4,2	1,9	1,3	1,2	0,0	36,6
	2	1,1	0,5	0,3	0,4	0,2	0,4	0,2	0,1	0,1	0,0	3,3
	3	1,6	0,8	0,5	0,7	0,2	0,6	0,3	0,2	0,2	0,0	5,2
	4	4,2	2,2	1,3	1,8	0,6	1,5	0,7	0,5	0,4	0,0	13,3
	5	48,2	24,5	15,0	20,6	7,2	17,5	7,9	5,5	5,0	0,0	151,3
	6	18,4	9,3	5,7	7,8	2,7	6,7	3,0	2,1	1,9	0,0	57,6
	7	15,7	8,0	4,9	6,7	2,3	5,7	2,6	1,8	1,6	0,0	49,3
	8	9,1	4,6	2,8	3,9	1,4	3,3	1,5	1,0	0,9	0,0	28,5
	9	14,9	7,6	4,6	6,3	2,2	5,4	2,4	1,7	1,5	0,0	46,7
	10	43,2	22,0	13,4	18,4	6,4	15,7	7,0	4,9	4,5	0,0	135,6
	11	13,3	6,7	4,1	5,7	2,0	4,8	2,2	1,5	1,4	0,0	41,6
	12	7,3	3,7	2,3	3,1	1,1	2,7	1,2	0,8	0,8	0,0	22,9
	13	18,2	9,3	5,7	7,8	2,7	6,6	3,0	2,1	1,9	0,0	57,2
	14	22,5	11,4	7,0	9,6	3,4	8,2	3,7	2,6	2,3	0,0	70,6
	15	23,9	12,2	7,4	10,2	3,6	8,7	3,9	2,7	2,5	0,0	75,0
	16	33,0	16,8	10,2	14,1	4,9	12,0	5,4	3,8	3,4	0,0	103,5
	17	20,5	10,4	6,4	8,8	3,1	7,5	3,3	2,3	2,1	0,0	64,5
	18	23,2	11,8	7,2	9,9	3,5	8,4	3,8	2,6	2,4	0,0	72,8
	19	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0
Total		330,0	167,9	102,5	140,8	49,2	119,7	53,8	37,6	34,1	0,0	1.035,6
12	1	7,5	3,8	2,3	3,2	1,1	2,7	1,2	0,9	0,8	0,0	23,6
	2	0,7	0,3	0,2	0,3	0,1	0,2	0,1	0,1	0,1	0,0	2,1
	3	1,1	0,5	0,3	0,5	0,2	0,4	0,2	0,1	0,1	0,0	3,3
	4	2,7	1,4	0,8	1,2	0,4	1,0	0,4	0,3	0,3	0,0	8,6
	5	31,1	15,8	9,7	13,3	4,6	11,3	5,1	3,5	3,2	0,0	97,5
	6	11,8	6,0	3,7	5,0	1,8	4,3	1,9	1,3	1,2	0,0	37,1
	7	10,1	5,2	3,1	4,3	1,5	3,7	1,7	1,2	1,0	0,0	31,8
	8	5,9	3,0	1,8	2,5	0,9	2,1	1,0	0,7	0,6	0,0	18,4
	9	9,6	4,9	3,0	4,1	1,4	3,5	1,6	1,1	1,0	0,0	30,1
	10	27,8	14,2	8,7	11,9	4,2	10,1	4,5	3,2	2,9	0,0	87,4
	11	8,5	4,3	2,7	3,6	1,3	3,1	1,4	1,0	0,9	0,0	26,8
	12	4,7	2,4	1,5	2,0	0,7	1,7	0,8	0,5	0,5	0,0	14,8
	13	11,7	6,0	3,6	5,0	1,8	4,3	1,9	1,3	1,2	0,0	36,8
	14	14,5	7,4	4,5	6,2	2,2	5,3	2,4	1,6	1,5	0,0	45,5
	15	15,4	7,8	4,8	6,6	2,3	5,6	2,5	1,8	1,6	0,0	48,4
	16	21,2	10,8	6,6	9,1	3,2	7,7	3,5	2,4	2,2	0,0	66,7
	17	13,2	6,7	4,1	5,6	2,0	4,8	2,2	1,5	1,4	0,0	41,5
	18	15,0	7,6	4,6	6,4	2,2	5,4	2,4	1,7	1,5	0,0	46,9
	19	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0
Total		212,6	108,1	66,1	90,7	31,7	77,1	34,7	24,2	22,0	0,0	667,2
13	1	4,3	2,2	1,3	1,8	0,6	1,6	0,7	0,5	0,4	0,0	13,4
	2	0,4	0,2	0,1	0,2	0,1	0,1	0,1	0,0	0,0	0,0	1,2
	3	0,6	0,3	0,2	0,3	0,1	0,2	0,1	0,1	0,1	0,0	1,9
	4	1,6	0,8	0,5	0,7	0,2	0,6	0,3	0,2	0,2	0,0	4,9
	5	17,7	9,0	5,5	7,5	2,6	6,4	2,9	2,0	1,8	0,0	55,4
	6	6,7	3,4	2,1	2,9	1,0	2,4	1,1	0,8	0,7	0,0	21,1
	7	5,8	2,9	1,8	2,5	0,9	2,1	0,9	0,7	0,6	0,0	18,1
	8	3,3	1,7	1,0	1,4	0,5	1,2	0,5	0,4	0,3	0,0	10,4
	9	5,5	2,8	1,7	2,3	0,8	2,0	0,9	0,6	0,6	0,0	17,1
	10	15,8	8,1	4,9	6,8	2,4	5,7	2,6	1,8	1,6	0,0	49,7
	11	4,9	2,5	1,5	2,1	0,7	1,8	0,8	0,6	0,5	0,0	15,3
	12	2,7	1,4	0,8	1,1	0,4	1,0	0,4	0,3	0,3	0,0	8,4
	13	6,7	3,4	2,1	2,8	1,0	2,4	1,1	0,8	0,7	0,0	21,0
	14	8,2	4,2	2,6	3,5	1,2	3,0	1,3	0,9	0,9	0,0	25,9

Age group		occupation										
	industry	1	2	3	4	5	6	7	8	9	10	Total
13	15	8,8	4,5	2,7	3,7	1,3	3,2	1,4	1,0	0,9	0,0	27,5
	16	12,1	6,1	3,8	5,2	1,8	4,4	2,0	1,4	1,2	0,0	37,9
	17	7,5	3,8	2,3	3,2	1,1	2,7	1,2	0,9	0,8	0,0	23,6
	18	8,5	4,3	2,6	3,6	1,3	3,1	1,4	1,0	0,9	0,0	26,7
	19	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0
Total		120,9	61,5	37,6	51,6	18,0	43,9	19,7	13,8	12,5	0,0	379,5
14	1	1,4	0,7	0,4	0,6	0,2	0,5	0,2	0,2	0,1	0,0	4,4
	2	0,1	0,1	0,0	0,1	0,0	0,0	0,0	0,0	0,0	0,0	0,4
	3	0,2	0,1	0,1	0,1	0,0	0,1	0,0	0,0	0,0	0,0	0,6
	4	0,5	0,3	0,2	0,2	0,1	0,2	0,1	0,1	0,1	0,0	1,6
	5	5,8	2,9	1,8	2,5	0,9	2,1	0,9	0,7	0,6	0,0	18,2
	6	2,2	1,1	0,7	0,9	0,3	0,8	0,4	0,3	0,2	0,0	6,9
	7	1,9	1,0	0,6	0,8	0,3	0,7	0,3	0,2	0,2	0,0	5,9
	8	1,1	0,6	0,3	0,5	0,2	0,4	0,2	0,1	0,1	0,0	3,4
	9	1,8	0,9	0,6	0,8	0,3	0,6	0,3	0,2	0,2	0,0	5,6
	10	5,2	2,6	1,6	2,2	0,8	1,9	0,8	0,6	0,5	0,0	16,3
	11	1,6	0,8	0,5	0,7	0,2	0,6	0,3	0,2	0,2	0,0	5,0
	12	0,9	0,4	0,3	0,4	0,1	0,3	0,1	0,1	0,1	0,0	2,8
	13	2,2	1,1	0,7	0,9	0,3	0,8	0,4	0,2	0,2	0,0	6,9
	14	2,7	1,4	0,8	1,2	0,4	1,0	0,4	0,3	0,3	0,0	8,5
	15	2,9	1,5	0,9	1,2	0,4	1,0	0,5	0,3	0,3	0,0	9,0
	16	4,0	2,0	1,2	1,7	0,6	1,4	0,6	0,5	0,4	0,0	12,4
	17	2,5	1,3	0,8	1,1	0,4	0,9	0,4	0,3	0,3	0,0	7,7
	18	2,8	1,4	0,9	1,2	0,4	1,0	0,5	0,3	0,3	0,0	8,8
	19	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0
Total		39,6	20,2	12,3	16,9	5,9	14,4	6,5	4,5	4,1	0,0	124,4
15	1	0,8	0,4	0,2	0,3	0,1	0,3	0,1	0,1	0,1	0,0	2,4
	2	0,1	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,2
	3	0,1	0,1	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,3
	4	0,3	0,1	0,1	0,1	0,0	0,1	0,0	0,0	0,0	0,0	0,9
	5	3,2	1,6	1,0	1,4	0,5	1,2	0,5	0,4	0,3	0,0	10,0
	6	1,2	0,6	0,4	0,5	0,2	0,4	0,2	0,1	0,1	0,0	3,8
	7	1,0	0,5	0,3	0,4	0,2	0,4	0,2	0,1	0,1	0,0	3,3
	8	0,6	0,3	0,2	0,3	0,1	0,2	0,1	0,1	0,1	0,0	1,9
	9	1,0	0,5	0,3	0,4	0,1	0,4	0,2	0,1	0,1	0,0	3,1
	10	2,9	1,5	0,9	1,2	0,4	1,0	0,5	0,3	0,3	0,0	9,0
	11	0,9	0,4	0,3	0,4	0,1	0,3	0,1	0,1	0,1	0,0	2,8
	12	0,5	0,2	0,2	0,2	0,1	0,2	0,1	0,1	0,1	0,0	1,5
	13	1,2	0,6	0,4	0,5	0,2	0,4	0,2	0,1	0,1	0,0	3,8
	14	1,5	0,8	0,5	0,6	0,2	0,5	0,2	0,2	0,2	0,0	4,7
	15	1,6	0,8	0,5	0,7	0,2	0,6	0,3	0,2	0,2	0,0	5,0
	16	2,2	1,1	0,7	0,9	0,3	0,8	0,4	0,2	0,2	0,0	6,9
	17	1,4	0,7	0,4	0,6	0,2	0,5	0,2	0,2	0,1	0,0	4,3
	18	1,5	0,8	0,5	0,7	0,2	0,6	0,3	0,2	0,2	0,0	4,8
	19	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0
Total		21,9	11,1	6,8	9,3	3,3	7,9	3,6	2,5	2,3	0,0	6,7
Totals		3.884,9	1.976,3	1.207,3	1.657,5	579,7	1.409,5	633,5	442,3	401,4	0,0	12.192,5

Table 5.3 Economic Model Matrix (wages) Canada, 1993

Age group		occupation										
	industry	1	2	3	4	5	6	7	8	9	10	Total
1		0,0										
2		0,0										
3		0,0										
4	1	146,8	74,7	45,6	62,6	21,9	53,3	23,9	16,7	15,2	0,0	460,8
	2	13,2	6,7	4,1	5,6	2,0	4,8	2,2	1,5	1,4	0,0	41,5
	3	44,9	22,8	13,9	19,1	6,7	16,3	7,3	5,1	4,6	0,0	140,8
	4	153,3	78,0	47,6	65,4	22,9	55,6	25,0	17,5	15,8	0,0	481,1
	5	1.223,9	622,6	380,3	522,2	182,6	444,0	199,6	139,3	126,5	0,0	3.841,1
	6	453,9	230,9	141,0	193,6	67,7	164,7	74,0	51,7	46,9	0,0	1.424,4
	7	402,6	204,8	125,1	171,8	60,1	146,1	65,6	45,8	41,6	0,0	1.263,4
	8	265,7	135,1	82,6	113,3	39,6	96,4	43,3	30,2	27,5	0,0	833,7
	9	335,8	170,8	104,4	143,3	50,1	121,8	54,8	38,2	34,7	0,0	1.053,8
	10	536,8	273,1	166,8	229,0	80,1	194,8	87,5	61,1	55,5	0,0	1.684,8
	11	320,0	162,8	99,4	136,5	47,8	116,1	52,2	36,4	33,1	0,0	1.004,3
	12	146,1	74,3	45,4	62,3	21,8	53,0	23,8	16,6	15,1	0,0	458,5
	13	412,5	209,8	128,2	176,0	61,6	149,7	67,3	47,0	42,6	0,0	1.294,6
	14	629,4	320,2	195,6	268,5	93,9	228,4	102,6	71,7	65,0	0,0	1.975,3
	15	632,5	321,7	196,6	269,9	94,4	229,5	103,1	72,0	65,4	0,0	1.985,0
	16	621,1	315,9	193,0	265,0	92,7	225,3	101,3	70,7	64,2	0,0	1.949,2
	17	169,0	86,0	52,5	72,1	25,2	61,3	27,6	19,2	17,5	0,0	530,5
	18	331,1	168,4	102,9	141,3	49,4	120,1	54,0	37,7	34,2	0,0	1.039,0
	19	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0
Total		6.838,4	3.478,8	2.125,2	2.917,7	1.020,5	2.481,1	1.115,2	778,5	706,6	0,0	21.461,9
5	1	241,8	123,0	75,1	103,2	36,1	87,7	39,4	27,5	25,0	0,0	758,9
	2	21,8	11,1	6,8	9,3	3,3	7,9	3,6	2,5	2,3	0,0	68,4
	3	73,9	37,6	23,0	31,5	11,0	26,8	12,0	8,4	7,6	0,0	231,9
	4	252,5	128,4	78,5	107,7	37,7	91,6	41,2	28,7	26,1	0,0	792,3
	5	2.015,8	1.025,5	626,4	860,1	300,8	731,4	328,7	229,5	208,3	0,0	6.326,4
	6	747,5	380,3	232,3	318,9	111,6	271,2	121,9	85,1	77,2	0,0	2.346,1
	7	663,0	337,3	206,0	282,9	98,9	240,6	108,1	75,5	68,5	0,0	2.080,8
	8	437,5	222,6	136,0	186,7	65,3	158,7	71,4	49,8	45,2	0,0	1.373,2
	9	553,0	281,3	171,9	236,0	82,5	200,7	90,2	63,0	57,1	0,0	1.735,7
	10	884,2	449,8	274,8	377,2	131,9	320,8	144,2	100,7	91,4	0,0	2.775,0
	11	527,1	268,1	163,8	224,9	78,7	191,2	86,0	60,0	54,5	0,0	1.654,1
	12	240,6	122,4	74,8	102,7	35,9	87,3	39,2	27,4	24,9	0,0	755,2
	13	679,4	345,6	211,1	289,9	101,4	246,5	110,8	77,3	70,2	0,0	2.132,3
	14	1.036,6	527,3	322,1	442,3	154,7	376,1	169,0	118,0	107,1	0,0	3.253,3
	15	1.041,7	529,9	323,7	444,5	155,5	377,9	169,9	118,6	107,6	0,0	3.269,3
	16	1.022,9	520,4	317,9	436,4	152,6	371,1	166,8	116,5	105,7	0,0	3.210,3
	17	278,4	141,6	86,5	118,8	41,5	101,0	45,4	31,7	28,8	0,0	873,8
	18	545,3	277,4	169,5	232,6	81,4	197,8	88,9	62,1	56,3	0,0	1.711,3
	19	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0
Total		11.262,9	5.729,7	3.500,2	4.805,5	1.680,8	4.086,4	1.836,7	1.282,2	1.163,8	0,0	35.348,3
6	1	307,6	156,5	95,6	131,3	45,9	111,6	50,2	35,0	31,8	0,0	965,5
	2	27,7	14,1	8,6	11,8	4,1	10,1	4,5	3,2	2,9	0,0	87,0
	3	94,0	47,8	29,2	40,1	14,0	34,1	15,3	10,7	9,7	0,0	295,0
	4	321,2	163,4	99,8	137,0	47,9	116,5	52,4	36,6	33,2	0,0	1.007,9
	5	2.564,4	1.304,5	796,9	1.094,1	382,7	930,4	418,2	291,9	265,0	0,0	8.048,1
	6	951,0	483,8	295,5	405,7	141,9	345,0	155,1	108,3	98,3	0,0	2.984,5
	7	843,5	429,1	262,1	359,9	125,9	306,0	137,5	96,0	87,2	0,0	2.647,1
	8	556,6	283,2	173,0	237,5	83,1	202,0	90,8	63,4	57,5	0,0	1.746,9
	9	703,6	357,9	218,6	300,2	105,0	255,3	114,7	80,1	72,7	0,0	2.208,1
	10	1.124,8	572,2	349,6	479,9	167,9	408,1	183,4	128,1	116,2	0,0	3.530,2
	11	670,5	341,1	208,4	286,1	100,1	243,3	109,3	76,3	69,3	0,0	2.104,3
	12	306,1	155,7	95,1	130,6	45,7	111,1	49,9	34,9	31,6	0,0	960,7
	13	864,3	439,7	268,6	368,8	129,0	313,6	140,9	98,4	89,3	0,0	2.712,6
	14	1.318,7	670,9	409,8	562,7	196,8	478,5	215,1	150,1	136,3	0,0	4.138,7
	15	1.325,2	674,2	411,8	565,4	197,8	480,8	216,1	150,9	136,9	0,0	4.159,1
	16	1.301,3	662,0	404,4	555,2	194,2	472,1	212,2	148,1	134,5	0,0	4.084,0
	17	354,2	180,2	110,1	151,1	52,9	128,5	57,8	40,3	36,6	0,0	1.111,6
	18	693,7	352,9	215,6	296,0	103,5	251,7	113,1	79,0	71,7	0,0	2.177,0
	19	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0
Total		14.328,2	7.289,0	4.452,8	6.113,4	2.138,2	5.198,6	2.336,6	1.631,2	1.480,6	0,0	44.968,5

Age group	industry	occupation 1	2	3	4	5	6	7	8	9	10	Total
7	1	342,0	174,0	106,3	145,9	51,0	124,1	55,8	38,9	35,3	0,0	1.073,2
	2	30,8	15,7	9,6	13,1	4,6	11,2	5,0	3,5	3,2	0,0	96,7
	3	104,5	53,2	32,5	44,6	15,6	37,9	17,0	11,9	10,8	0,0	327,9
	4	357,0	181,6	110,9	152,3	53,3	129,5	58,2	40,6	36,9	0,0	1.120,5
	5	2.850,6	1.450,1	885,9	1.216,2	425,4	1.034,2	464,9	324,5	294,6	0,0	8.946,4
	6	1.057,1	537,8	328,5	451,0	157,8	383,5	172,4	120,3	109,2	0,0	3.317,7
	7	937,6	477,0	291,4	400,0	139,9	340,2	152,9	106,7	96,9	0,0	2.942,6
	8	618,7	314,8	192,3	264,0	92,3	224,5	100,9	70,4	63,9	0,0	1.941,9
	9	782,1	397,9	243,0	333,7	116,7	283,8	127,5	89,0	80,8	0,0	2.454,5
	10	1.250,4	636,1	388,6	533,5	186,6	453,7	203,9	142,3	129,2	0,0	3.924,2
	11	745,3	379,2	231,6	318,0	111,2	270,4	121,5	84,9	77,0	0,0	2.339,2
	12	340,3	173,1	105,7	145,2	50,8	123,5	55,5	38,7	35,2	0,0	1.068,0
	13	960,8	488,8	298,6	409,9	143,4	348,6	156,7	109,4	99,3	0,0	3.015,3
	14	1.465,9	745,7	455,6	625,5	218,8	531,9	239,1	166,9	151,5	0,0	4.600,7
	15	1.473,1	749,4	457,8	628,5	219,8	534,5	240,2	167,7	152,2	0,0	4.623,3
	16	1.446,5	735,9	449,5	617,2	215,9	524,8	235,9	164,7	149,5	0,0	4.539,9
	17	393,7	200,3	122,4	168,0	58,8	142,9	64,2	44,8	40,7	0,0	1.235,7
	18	771,1	392,3	239,6	329,0	115,1	279,8	125,7	87,8	79,7	0,0	2.420,0
	19	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0
Total		15.927,5	8.102,6	4.949,8	6.795,7	2.376,9	5.778,8	2.597,4	1.813,3	1.645,8	0,0	49.987,7
8	1	347,3	176,7	107,9	148,2	51,8	126,0	56,6	39,5	35,9	0,0	1.089,9
	2	31,3	15,9	9,7	13,3	4,7	11,3	5,1	3,6	3,2	0,0	98,2
	3	106,1	54,0	33,0	45,3	15,8	38,5	17,3	12,1	11,0	0,0	333,0
	4	362,5	184,4	112,7	154,7	54,1	131,5	59,1	41,3	37,5	0,0	1.137,8
	5	2.894,8	1.472,6	899,6	1.235,1	432,0	1.050,3	472,1	329,6	299,1	0,0	9.085,1
	6	1.073,5	546,1	333,6	458,0	160,2	389,5	175,1	122,2	110,9	0,0	3.369,1
	7	952,1	484,4	295,9	406,2	142,1	345,5	155,3	108,4	98,4	0,0	2.988,2
	8	628,3	319,6	195,3	268,1	93,8	228,0	102,5	71,5	64,9	0,0	1.972,0
	9	794,2	404,0	246,8	338,9	118,5	288,2	129,5	90,4	82,1	0,0	2.492,6
	10	1.269,7	645,9	394,6	541,8	189,5	460,7	207,1	144,6	131,2	0,0	3.985,0
	11	756,9	385,0	235,2	322,9	113,0	274,6	123,4	86,2	78,2	0,0	2.375,4
	12	345,6	175,8	107,4	147,4	51,6	125,4	56,4	39,3	35,7	0,0	1.084,5
	13	975,7	496,3	303,2	416,3	145,6	354,0	159,1	111,1	100,8	0,0	3.062,1
	14	1.488,6	757,3	462,6	635,1	222,1	540,1	242,8	169,5	153,8	0,0	4.672,0
	15	1.495,9	761,0	464,9	638,3	223,2	542,8	244,0	170,3	154,6	0,0	4.694,9
	16	1.468,9	747,3	456,5	626,8	219,2	533,0	239,6	167,2	151,8	0,0	4.610,2
	17	399,8	203,4	124,3	170,6	59,7	145,1	65,2	45,5	41,3	0,0	1.254,9
	18	783,0	398,3	243,3	334,1	116,9	284,1	127,7	89,1	80,9	0,0	2.457,5
	19	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0
Total		16.174,3	8.228,2	5.026,5	6.901,0	2.413,7	5.868,4	2.637,7	1.841,4	1.671,3	0,0	50.762,5
9	1	309,7	157,6	96,3	132,2	46,2	112,4	50,5	35,3	32,0	0,0	972,1
	2	27,9	14,2	8,7	11,9	4,2	10,1	4,5	3,2	2,9	0,0	87,6
	3	94,6	48,1	29,4	40,4	14,1	34,3	15,4	10,8	9,8	0,0	297,0
	4	323,4	164,6	100,5	138,0	48,3	117,3	52,7	36,8	33,4	0,0	1.014,9
	5	2.581,9	1.313,5	802,4	1.101,6	385,3	936,8	421,1	293,9	266,8	0,0	8.103,3
	6	957,5	487,1	297,6	408,5	142,9	347,4	156,1	109,0	98,9	0,0	3.005,0
	7	849,2	432,0	263,9	362,3	126,7	308,1	138,5	96,7	87,8	0,0	2.665,3
	8	560,4	285,1	174,2	239,1	83,6	203,3	91,4	63,8	57,9	0,0	1.758,9
	9	708,4	360,4	220,1	302,2	105,7	257,0	115,5	80,6	73,2	0,0	2.223,2
	10	1.132,5	576,1	352,0	483,2	169,0	410,9	184,7	128,9	117,0	0,0	3.554,4
	11	675,1	343,4	209,8	288,0	100,7	244,9	110,1	76,9	69,8	0,0	2.118,7
	12	308,2	156,8	95,8	131,5	46,0	111,8	50,3	35,1	31,8	0,0	967,3
	13	870,2	442,7	270,4	371,3	129,9	315,7	141,9	99,1	89,9	0,0	2.731,2
	14	1.327,7	675,4	412,6	566,5	198,1	418,7	216,5	151,2	137,2	0,0	4.167,1
	15	1.334,3	678,8	414,7	569,3	199,1	484,1	217,6	151,9	137,9	0,0	4.187,6
	16	1.310,2	666,5	407,2	559,0	195,5	475,4	213,7	149,2	135,4	0,0	4.112,0
	17	356,6	181,4	110,8	152,2	53,2	129,4	58,2	40,6	36,9	0,0	1.119,3
	18	698,4	355,3	217,0	298,0	104,2	253,4	113,9	79,5	72,2	0,0	2.191,9
	19	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0
Total		14.426,4	7.338,9	4.483,3	6.155,2	2.152,9	5.234,2	2.352,6	1.642,4	1.490,7	0,0	45.276,5
10	1	261,6	133,1	81,3	111,6	39,0	94,9	42,7	29,8	27,0	0,0	821,2
	2	23,6	12,0	7,3	10,1	3,5	8,6	3,8	2,7	2,4	0,0	74,0
	3	79,9	40,7	24,8	34,1	11,9	29,0	13,0	9,1	8,3	0,0	250,9
	4	273,2	139,0	84,9	116,5	40,8	99,1	44,5	31,1	28,2	0,0	857,3
	5	2.181,0	1.109,5	677,8	930,6	325,5	791,3	355,7	248,3	225,4	0,0	6.845,0
	6	808,8	411,5	251,4	345,1	120,7	293,4	131,9	92,1	83,6	0,0	2.538,4
	7	717,4	364,9	222,9	306,1	107,1	260,3	117,0	81,7	74,1	0,0	2.251,4

Age group		occupation										
	industry	1	2	3	4	5	6	7	8	9	10	Total
	8	473,4	240,8	147,1	202,0	70,6	171,8	77,2	53,9	48,9	0,0	1.485,8
	9	598,4	304,4	186,0	255,3	89,3	217,1	97,6	68,1	61,8	0,0	1.878,0
	10	956,7	486,7	297,3	408,2	142,8	347,1	156,0	108,9	98,9	0,0	3.002,5
	11	570,3	290,1	177,2	243,3	85,1	206,9	93,0	64,9	58,9	0,0	1.789,7
	12	260,4	132,4	80,9	111,1	38,9	94,5	42,5	29,6	26,9	0,0	817,1
	13	735,1	374,0	228,4	313,6	109,7	266,7	119,9	83,7	76,0	0,0	2.307,1
	14	1.121,6	570,6	348,6	478,5	167,4	406,9	182,9	127,7	115,9	0,0	3.520,0
	15	1.127,1	573,4	350,3	480,9	168,2	408,9	183,8	128,3	116,5	0,0	3.537,3
	16	1.106,8	563,0	343,9	472,2	165,2	401,6	180,5	126,0	114,4	0,0	3.473,5
	17	301,3	153,3	93,6	128,5	45,0	109,3	49,1	34,3	31,1	0,0	945,5
	18	590,0	300,1	183,3	251,7	88,0	214,1	96,2	67,2	61,0	0,0	1.851,6
	19	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0
Total		12.186,3	6.199,4	3.787,1	5.199,5	1.818,6	4.421,4	1.987,3	1.387,4	1.259,3	0,0	38.246,3
11	1	204,3	104,0	63,5	87,2	30,5	74,1	33,3	23,3	21,1	0,0	641,3
	2	18,4	9,4	5,7	7,9	2,7	6,7	3,0	2,1	1,9	0,0	57,8
	3	62,4	31,8	19,4	26,6	9,3	22,7	10,2	7,1	6,5	0,0	195,9
	4	213,3	108,5	66,3	91,0	31,8	77,4	34,8	24,3	22,0	0,0	669,5
	5	1.703,3	866,5	529,3	726,8	254,2	618,0	277,8	193,9	176,0	0,0	5.345,9
	6	631,7	321,3	196,3	269,5	94,3	229,2	103,0	71,9	65,3	0,0	1.982,4
	7	560,3	285,0	174,1	239,0	83,6	203,3	91,4	63,8	57,9	0,0	1.758,3
	8	369,7	188,1	114,9	157,7	55,2	134,1	60,3	42,1	38,2	0,0	1.160,4
	9	467,3	237,7	145,2	199,4	69,7	169,6	76,2	53,2	48,3	0,0	1.466,7
	10	747,1	380,1	232,2	318,8	111,5	271,1	121,8	85,1	77,2	0,0	2.344,9
	11	445,4	226,6	138,4	190,0	66,5	161,6	72,6	50,7	46,0	0,0	1.397,8
	12	203,3	103,4	63,2	86,8	30,3	73,8	33,2	23,1	21,0	0,0	638,2
	13	574,1	292,1	178,4	244,9	85,7	208,3	93,6	65,4	59,3	0,0	1.801,8
	14	875,9	445,6	272,2	373,7	130,7	317,8	142,8	99,7	90,5	0,0	2.749,1
	15	880,2	447,8	273,6	375,6	131,4	319,4	143,5	100,2	91,0	0,0	2.762,6
	16	864,4	439,7	268,6	368,8	129,0	313,6	141,0	98,4	89,3	0,0	2.712,8
	17	235,3	119,7	73,1	100,4	35,1	85,4	38,4	26,8	24,3	0,0	738,4
	18	460,8	234,4	143,2	196,6	68,8	167,2	75,1	52,5	47,6	0,0	1.446,1
	19	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0
Total		9.517,3	4.841,6	2.957,7	4.060,7	1.420,3	3.453,1	1.552,1	1.083,5	983,5	0,0	29.869,7
12	1	131,7	67,0	40,9	56,2	19,6	47,8	21,5	15,0	13,6	0,0	413,2
	2	11,9	6,0	3,7	5,1	1,8	4,3	1,9	1,4	1,2	0,0	37,2
	3	40,2	20,5	12,5	17,2	6,0	14,6	6,6	4,6	4,2	0,0	126,3
	4	137,4	69,9	42,7	58,6	20,5	49,9	22,4	15,6	14,2	0,0	431,4
	5	1.097,5	558,3	341,1	468,3	163,8	398,2	179,0	124,9	113,4	0,0	3.444,4
	6	407,0	207,0	126,5	173,6	60,7	147,7	66,4	46,3	42,1	0,0	1.277,3
	7	361,0	183,6	112,2	154,0	53,9	131,0	58,9	41,1	37,3	0,0	1.132,9
	8	238,2	121,2	74,0	101,6	35,5	86,4	38,8	27,1	24,6	0,0	747,6
	9	301,1	153,2	93,6	128,5	44,9	109,2	49,1	34,3	31,1	0,0	945,0
	10	481,4	244,9	149,6	205,4	71,8	174,7	78,5	54,8	49,7	0,0	1.510,8
	11	287,0	146,0	89,2	122,4	42,8	104,1	46,8	32,7	29,7	0,0	900,6
	12	131,0	66,6	40,7	55,9	19,6	47,5	21,4	14,9	13,5	0,0	411,2
	13	369,9	188,2	115,0	157,8	55,2	134,2	60,3	42,1	38,2	0,0	1.160,9
	14	564,4	287,1	175,4	240,8	84,2	204,8	92,0	64,3	58,3	0,0	1.771,3
	15	567,1	288,5	176,3	242,0	84,6	205,8	92,5	64,6	58,6	0,0	1.780,0
	16	556,9	283,3	173,1	237,6	83,1	202,1	90,8	63,4	57,5	0,0	1.747,8
	17	151,6	77,1	47,1	64,7	22,6	55,0	24,7	17,3	15,7	0,0	475,7
	18	296,9	151,0	92,3	126,7	44,3	107,7	48,4	33,8	30,7	0,0	931,7
	19	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0
Total		6.132,0	3.119,5	1.905,7	2.616,3	915,1	2.224,8	1.000,0	698,1	633,6	0,0	19.245,2
13	1	74,9	38,1	23,3	31,9	11,2	27,2	12,2	8,5	7,7	0,0	235,0
	2	6,7	3,4	2,1	2,9	1,0	2,4	1,1	0,8	0,7	0,0	21,2
	3	22,9	11,6	7,1	9,8	3,4	8,3	3,7	2,6	2,4	0,0	71,8
	4	78,2	39,8	24,3	33,4	11,7	28,4	12,7	8,9	8,1	0,0	245,3
	5	624,2	317,5	194,0	266,3	93,1	226,5	101,8	71,1	64,5	0,0	1.959,0
	6	231,5	117,8	71,9	98,8	34,5	84,0	37,7	26,4	23,9	0,0	726,5
	7	205,3	104,4	63,8	87,6	30,6	74,5	33,5	23,4	21,2	0,0	644,3
	8	135,5	68,9	42,1	57,8	20,2	49,2	22,1	15,4	14,0	0,0	425,2
	9	171,2	87,1	53,2	73,1	25,6	62,1	27,9	19,5	17,7	0,0	537,5
	10	273,8	139,3	85,1	116,8	40,9	99,3	44,6	31,2	28,3	0,0	859,3
	11	163,2	83,0	50,7	69,6	24,4	59,2	26,6	18,6	16,9	0,0	512,2
	12	74,5	37,9	23,2	31,8	11,1	27,0	12,2	8,5	7,7	0,0	233,8
	13	210,4	107,0	65,4	89,8	31,4	76,3	34,3	24,0	21,7	0,0	660,3
	14	321,0	163,3	99,8	137,0	47,9	116,5	52,3	36,5	33,2	0,0	1.007,4

Age group	industry	occupation 1	2	3	4	5	6	7	8	9	10	Total
	15	322,6	164,1	100,2	137,6	48,1	117,0	52,6	36,7	33,3	0,0	1.012,3
	16	316,7	161,1	98,4	135,1	47,3	114,9	51,7	36,1	32,7	0,0	994,1
	17	86,2	43,9	26,8	36,8	12,9	31,3	14,1	9,8	8,9	0,0	270,6
	18	168,8	85,9	52,5	72,0	25,2	61,3	27,5	19,2	17,4	0,0	529,9
	19	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0
Total		3.487,6	1.774,2	1.083,8	1.488,0	520,5	1.265,4	568,7	397,0	360,4	0,0	10.945,6
14	1	24,5	12,5	7,6	10,5	3,7	8,9	4,0	2,8	2,5	0,0	77,0
	2	2,2	1,1	0,7	0,9	0,3	0,8	0,4	0,3	0,2	0,0	6,9
	3	7,5	3,8	2,3	3,2	1,1	2,7	1,2	0,9	0,8	0,0	23,5
	4	25,6	13,0	8,0	10,9	3,8	9,3	4,2	2,9	2,6	0,0	80,4
	5	204,6	104,1	63,6	87,3	30,5	74,2	33,4	23,3	21,1	0,0	642,2
	6	75,9	38,6	23,6	32,4	11,3	27,5	12,4	8,6	7,8	0,0	238,2
	7	67,3	34,2	20,9	28,7	10,0	24,4	11,0	7,7	7,0	0,0	211,2
	8	44,4	22,6	13,8	19,0	6,6	16,1	7,2	5,1	4,6	0,0	139,4
	9	56,1	28,6	17,4	24,0	8,4	20,4	9,2	6,4	5,8	0,0	176,2
	10	89,8	45,7	27,9	38,3	13,4	32,6	14,6	10,2	9,3	0,0	281,7
	11	53,5	27,2	16,6	22,8	8,0	19,4	8,7	6,1	5,5	0,0	167,9
	12	24,4	12,4	7,6	10,4	3,6	8,9	4,0	2,8	2,5	0,0	76,7
	13	69,0	35,1	21,4	29,4	10,3	25,0	11,2	7,9	7,1	0,0	216,5
	14	105,2	53,5	32,7	44,9	15,7	38,2	17,2	12,0	10,9	0,0	330,3
	15	105,7	53,8	32,9	45,1	15,8	38,4	17,2	12,0	10,9	0,0	331,9
	16	103,8	52,8	32,3	44,3	15,5	37,7	16,9	11,8	10,7	0,0	325,9
	17	28,3	14,4	8,8	12,1	4,2	10,3	4,6	3,2	2,9	0,0	88,7
	18	55,4	28,2	17,2	23,6	8,3	20,1	9,0	6,3	5,7	0,0	173,7
	19	0,0	0,	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0
Total		1.143,4	581,6	355,3	487,8	170,6	414,8	186,5	130,2	118,1	0,0	3.588,4
15	1	13,6	6,9	4,2	5,8	2,0	4,9	2,2	1,5	1,4	0,0	42,6
	2	1,2	0,6	0,4	0,5	0,2	0,4	0,2	0,1	0,1	0,0	3,8
	3	4,1	2,1	1,3	1,8	0,6	1,5	0,7	0,5	0,4	0,0	13,0
	4	14,2	7,2	4,4	6,0	2,1	5,1	2,3	1,6	1,5	0,0	44,4
	5	113,1	57,5	35,1	48,2	16,9	41,0	18,4	12,9	11,7	0,0	354,9
	6	41,9	21,3	13,0	17,9	6,3	15,2	6,8	4,8	4,3	0,0	131,6
	7	37,2	18,9	11,6	15,9	5,6	13,5	6,1	4,2	3,8	0,0	116,7
	8	24,5	12,5	7,6	10,5	3,7	8,9	4,0	2,8	2,5	0,0	77,0
	9	31,0	15,8	9,6	13,2	4,6	11,3	5,1	3,5	3,2	0,0	97,4
	10	49,6	25,2	15,4	21,2	7,4	18,0	8,1	5,6	5,1	0,0	155,7
	11	29,6	15,0	9,2	12,6	4,4	10,7	4,8	3,4	3,1	0,0	92,8
	12	13,5	6,9	4,2	5,8	2,0	4,9	2,2	1,5	1,4	0,0	42,4
	13	38,1	19,4	11,8	16,3	5,7	13,8	6,2	4,3	3,9	0,0	119,6
	14	58,1	29,6	18,1	24,8	8,7	21,1	9,5	6,6	6,0	0,0	182,5
	15	58,4	29,7	18,2	24,9	8,7	21,2	9,5	6,7	6,0	0,0	183,4
	16	57,4	29,2	17,8	24,5	8,6	20,8	9,4	6,5	5,9	0,0	180,1
	17	15,6	7,9	4,9	6,7	2,3	5,7	2,5	1,8	1,6	0,0	49,0
	18	30,6	15,6	9 5	13,1	4,6	11,1	5,0	3,5	3,2	0,0	96,0
	19	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0
Total		631,8	321,4	196,3	269,6	94,3	229,2	103,0	71,9	65,3	0,0	1.982,9
Totals		112.056,0	57.004,9	34.823,6	47.810,6	16.722,2	40.656,2	18.273,8	12.757,1	11.579,1	0,0	351.683,5

This division allows us to estimate the number of persons that are employed in each industry and each specific occupation for every age group. The figures and their totals are also shown. A similar procedure was applied for years 1994-2011, whose results are not presented for the sake of space.

To compute the wages paid to those employed persons, we applied the value for each cell in the matrix to the corresponding annual average wage. Wages are shown in *Table 4.9* in Chapter 4. For each year, the corresponding productivity index was applied to reflect the future performance of the economic agents into the national output.

The procedure that we followed for this was to multiply the average weekly wage, $655.88(industry 5, manufacturing industries), by the productivity index for the year, i.e., 1.0362. This yields to 679.63 that multiplied by 52 (weeks) give us $35,340.39 annually. This amount was multiplied by the number of active persons in each occupation and for all age groups, having as a result the amount of wages paid to that industry during the year.

For productivity index figures, we considered two different scenarios. The first is the result of a projection made based on a linear regression model as explained in the preceding chapter; the second corresponds to the assumption made in the CPP Actuarial Report [2] that apply varying yearly increments in productivity from 1993 to 1995 and a 1% yearly increase onwards. Data for productivity is shown in *Appendix B, Table B6* (historical data) and in *Table 4.12* (projected data). We must state that inflation rate was not considered in our model since we are dealing with real, not nominal, values.

Applying this same procedure to all industries and all years, we arrived at the totals for this variable, i.e., wages paid, needed for our economic model. Those totals for each industry were added to the corresponding productivity-indexed profits of the same industries (*see Table 4.11*), to obtain the Value Added for the year. The amounts of this variable for the different projected years are shown below, for both scenarios previously described.

Table 5.4 Value Added. Canada, 1993 - 2011 (constant 1992 million dollars)

Year	Scenario 1 Regression Model	Scenario 2 CPP Assumption
1993	386,830.7	368,097.5
1994	393,361.6	373,840.6
1995	399,801.9	379,490.7
1996	406,133.9	385,794.3
1997	412,340.7	391,982.5
1998	418,397.5	398,031.6
1999	424,288.6	403,926.1
2000	429,993.9	409,646.4
2001	435,496.8	415,176.4
2002	440,781.7	420,500.6
2003	445,828.0	425,599.0
2004	450,625.7	430,461.4
2005	455,162.3	435,075.3
2006	459,432.2	439,435.1
2007	463,432.0	443,537.0
2008	467,156.0	447,374.8
2009	470,604.7	450,948.7
2010	473,778.1	454,258.2
2011	476,669.0	457,295.9

Projected cost of benefit payments.

As a means of linking the results of our demographic model with the economic model, we must create a measure that will yield an index of all the involved variables. Such an index will help us in our objective, i.e., assessing the overall economic burden of the CPP relative to the output of the Canadian economy. For this purpose, we have to estimate the expected amount of benefits that the CPP will pay to the beneficiaries in the projected years, i.e., 1993-2011. In order to do so, we multiplied the number of persons aged 60 and over by the expected maximum initial monthly retirement pension that they would be entitled to. That pension was $636.11 for the year 1992.[3]

For each year, the totals for this benefit were obtained taking into consideration some additional assumptions. Those beneficiaries aged 60-64 are entitled to an actuarially reduced pension. That reduction is equal to 0.5% for each month between age 65 and the age when the pension begins. For our purposes, we assumed that the population aged between 60 and 64 is distributed in such a way that the actuarial reduction factor

is 0.875. Secondly, we assumed that the ratio of the average monthly pension to the maximum monthly pension was 0.789, according to the data of the CPP Actuarial Report.[4] These two factors, applied to the retirement pension value, yield to $439.15 as our average monthly retirement income. Finally, we considered a distribution of retirement election proportions pursuant to the above mentioned Report. That distribution is shown in *Appendix B, Table B7.*

Since the CPP provisions (see *Appendix A*) imply that, besides the retirement benefit, beneficiaries may receive disability and survivors pension, as well as death and orphan's benefit, we must estimate them also. In order to be consistent with CPP's figures,[5] we assumed that the ancillary benefits will maintain the same proportion to the total amount of benefits as calculated in the CPP Actuarial Report. Therefore, once our retirement benefits had been calculated, we adjusted the corresponding ancillary benefits, obtaining the totals of all benefits for each year, as shown in the following table.

Table 5.5 Estimated CPP benefit payments. Canada 1993 - 2011 (constant 1992 million dollars)

Year	Total Benefits
1993	23,468.4
1994	23,894.5
1995	24,171.0
1996	24,529.3
1997	24,800.4
1998	25,403.5
1999	26,014.5
2000	26,651.7
2001	27,306.2
2002	27,993.3
2003	28,698.3
2004	29,416.8
2005	30,152.3
2006	30,905.0
2007	31,653.7
2008	32,388.4
2009	33,134.3
2010	33,902.6
2011	34,681.5

Measure index.

In order to assess the economic burden that the CPP's expected benefits will represent to the economy, we conceived a modification of the PAYGO rates.[6] Concisely, our index means the ratio of those benefits to the value added at each year. The rationale behind this index, developed in this research, is that the society as a whole must produce enough output to face the financial burden derived from the benefits granted to its population.

As the index diminishes the strength of the social security system improves, since that would imply that each person represents a lesser burden for the nation, in terms of national production. However, this index is expected to behave in an upward fashion, reflecting the fact that each year the burden of the non-active population becomes heavier in relation to the calculated value added.

Furthermore, since the dependency ratios are expected to increase in the future, as explained before, the overall weight of those persons is more significant to the whole economy. The following table shows the pension cost index for both scenarios.

Table 5.6 Pension Cost Index. Canada 1993 - 2011

Year	Scenario 1 Regression Model	Scenario 2 CPP Assumption
1993	6.07%	6.38%
1994	6.07%	6.39%
1995	6.05%	6.37%
1996	6.04%	6.36%
1997	6.01%	6.33%
1998	6.07%	6.38%
1999	6.13%	6.44%
2000	6.20%	6.51%
2001	6.27%	6.58%
2002	6.35%	6.66%
2003	6.44%	6.74%
2004	6.53%	6.83%
2005	6.62%	6.93%
2006	6.73%	7.03%
2007	6.83%	7.14%
2008	6.93%	7.24%
2009	7.04%	7.35%
2010	7.16%	7.46%
2011	7.28%	7.58%

Under Scenario 1, that projects the productivity index according to a regression model, we have for example that in 1994 benefit payments that are expected to be paid by the Canada Pension Plan will represent 6.07% of the nation's Value Added; in year 2000 it will be increased to 6.20%. As for Scenario 2 (CPP's productivity index projections), the corresponding figures would be 6.39% and 6.51%, respectively.

As can be easily observed, productivity gains play an important role in the economic burden that CPP's future benefit payments will represent. Small changes in the productivity index have a direct impact in the expected costs of the plan. Therefore, the cost of the social security system is highly dependent to the performance of the economy.

Notes.

1. *Tables corresponding to years 1994 - 2011 are not included for the sake of space.*
2. *Canada (1991-E).*
3. *Ibid.*
4. *Ibid.*
5. *Ibid.*
6. *PAYGO rate for a given year corresponds to the ratio of the year's total benefit expenditures to the year's total contributory earnings. [(1991-E)].*

SIX

CONCLUSIONS

> A number of reasons account for the traditional lack of concern with respect to a critical economic analysis of the role, function and impact of the state [...] pension systems...[among them is that] they have been incorporated into broader based ideology and social philosophy ... not analytical categories.
>
> Richard Deaton

Conclusions.

According to the results previously shown, and making allowance for deviations in the assumptions, we may reach some important conclusions from this research. For simplicity, we will express them in point form:

1 Population projections, under the methodology of the demographic accounting, and its Socio-Demographic Standard Matrix approach, can be performed in a concise, clear form. Since each component of the matrix is related to the rest, the use of the input-output concept helps us to determine the future structure of the population.

2 The projected age groups for the period under analysis, i.e., 1993-2011, imply higher dependency ratios than those obtained from the age groups estimated by Statistics Canada (*see Figure 5.1*). This means that in the near future, i.e., 20 years from now, the ratio of non-active persons to active persons will be no lower than 62% and its trend suggests higher numbers beyond this period. This is due to the expected low birth rates and longer life expectancy of the Canadian population.

3 The performance of the Canadian economy must be sufficient to pay out the expected burden of the CPP benefits. This implies that the efficiency of the economic agents, measured in terms of the productivity index, must attain certain minimum levels. If that performance is not reached, then national output might not be sufficient to face the burden derived from this, and perhaps other, plans. Therefore, Canada must increase its output and productivity gains in the near future, otherwise the country will be in great pains to face the consequences.

4 Some changes may be necessary in the public benefit systems, if society is to keep them affordable and sound. However, most of the reviewed analyses are focused on the increase in dependency ratios alone. Our suggestion is that we must consider a way to relate the output of the economy and the future population of the country, since the whole population is responsible for its own support. This responsibility

must be met in terms of production of goods and services, and in terms of productivity. Also, the programmes should not be influenced by political decisions.

Extensions.

The results of the simulation carried out in the preceding chapter suggest that the stability of the Canada Pension Plan is not threatened at least in the next two decades. These results depend on the structure of the model, especially the values assumed for the model's parameters. Structurally speaking, the model in this research consists of two submodels: a demographic submodel and an economic submodel.

The demographic submodel describes the evolution of the population structure through time. In this submodel, birth rates as well as death rates for the various age groups that constitute the population are assumed to be exogenous. Demographic developments take place inexorably through time and provide the main driving force for the system's dynamics. The demographic submodel provides annual projections of the occupational structure and earnings of the labour force, from which wages can be projected for each of the coming twenty years. This is the link between the demographic and economic submodels.

In the economic submodel, annual national income (computed as the sum of wages and industry profits according to the value-added approach) is projected for the next two decades. Here the most important parameter used in calculating these projections is the productivity growth rate. It is the ageing of the population predicted by the demographic submodel that may threaten the integrity of the CPP. Without a reasonable productivity growth, the system's health will be in great trouble in the near future. The value assumed for the annual growth in productivity thus plays a critical role behind the predictions of the model.

Productivity growth depends on technical progress, capital accumulation, and the quality of the labour force. The most important factor behind productivity growth is technological progress, i.e., new technologies and new ways of organizing production. However, technological progress is inherently uncertain and quite difficult to measure.

A high capital-labour ratio, achieved through capital accumulation, also yields a high output per worker. The role played by human capital, accomplished through education and training, is also fundamental in increasing productivity. All these factors can be influenced by government policies, such as research and development, and expenditures on health and education.

Besides the assumptions made on productivity growth, the economic submodel also assumes implicitly that the economy will be well-behaved in the next two decades, namely there will be no excessive unemployment, and no major structural changes in the economy. All these assumptions should be kept in mind when trying to interpret the predictions of the model. Particular care should be given to the assumed value of productivity growth and the time horizon considered in the model. For a time beyond the next two decades, the uncertainty concerning the parameters of the model increases tremendously, and the predictions would lose much of their power.

Sensitivity analysis.

In the economic submodel, productivity growth is assumed to be exogenous. The annual rates of productivity used in this research seems to be reasonable at this point of time (see *Table 4.12* in Chapter 4), however the model has also been simulated for three more scenarios:

(A) Productivity: as for the sensitivity analysis regarding productivity growth, the first scenario involves more optimistic values than the figures obtained by the regression model; the second is characterized by a more pessimistic outlook for the future, lower than the CPP's assumptions. For both cases, the change is 3.0%

(B) Active population: the third scenario used for sensitivity analysis considers that more people will participate in the economic activities. For this scenario, the change is 2.0% more persons than those assumed in *Table 4.6*.

The new set of alternatives is Scenario 3, 4 & 5. Results and their relative change to Scenarios 1 & 2, for both Value Added and Pension Cost Index, are as follows:

Table 6.1 Sensitivity Analysis on Value Added.
Scenario 3 : 3 % Increase in Productivity Index

	V. A. Scenario 1	V. A. Scenario 3	Variation	V. A. Scenario 2	V. A. Scenario 3	Variation
1993	386,830.7	398,030.4	2.8952%	368,097.5	379,297.2	3.0426%
1994	393,361.6	404,644.6	2.8683%	373,840.6	385,123.5	3.0181%
1995	399,801.9	411,163.9	2.8419%	379,490.7	390,852.7	2.9940%
1996	406,133.9	417,570.5	2.8160%	385,794.3	397,230.9	2.9644%
1997	412,340.7	423,847.0	2.7905%	391,982.5	403,488.9	2.9354%
1998	418,397.5	429,968.2	2.7655%	398,031.6	409,602.3	2.9070%
1999	424,288.6	435,918.0	2.7409%	403,926.1	415,555.4	2.8791%
2000	429,993.9	441,675.8	2.7168%	409,646.4	421,328.3	2.8517%
2001	435,496.8	447,224.9	2.6930%	415,176.4	426,904.5	2.8249%
2002	440,781.7	452,549.4	2.6697%	420,500.6	432,268.4	2.7985%
2003	445,828.0	457,628.4	2.6468%	425,599.0	437,399.3	2.7726%
2004	450,625.7	462,451.6	2.6243%	430,461.4	442,287.2	2.7472%
2005	455,162.3	467,006.4	2.6022%	435,075.3	446,919.5	2.7223%
2006	459,432.2	471,287.4	2.5804%	439,435.1	451,290.4	2.6979%
2007	463,432.0	475,291.4	2.5590%	443,537.0	455,396.2	2.6738%
2008	467,156.0	479,012.2	2.5380%	447,374.8	459,231.0	2.6502%
2009	470,604.7	482,451.0	2.5172%	450,948.7	462,795.0	2.6270%
2010	473,778.1	485,607.7	2.4969%	454,258.2	466,087.8	2.6042%
2011	476,669.0	488,475.3	2.4768%	457,295.9	469,102.2	2.5818%

Table 6.2 Sensitivity Analysis on Pension Cost Index.
Scenario 3 : 3 % Increase in Productivity Index

Year	P.C.I. Scenario 1	P.C.I. Scenario 3	Variation	P.C.I. Scenario 2	P.C.I. Scenario 3	Variation
1993	6.07	5.90	-2.81%	6.38	6.19	-2.95%
1994	6.07	5.91	-2.79%	6.39	6.20	-2.93%
1995	6.05	5.88	-2.76%	6.37	6.18	-2.91%
1996	6.04	5.87	-2.74%	6.36	6.18	-2.88%
1997	6.01	5.85	-2.71%	6.33	6.15	-2.85%
1998	6.07	5.91	-2.69%	6.38	6.20	-2.82%
1999	6.13	5.97	-2.67%	6.44	6.26	-2.80%
2000	6.20	6.03	-2.64%	6.51	6.33	-2.77%
2001	6.27	3.11	-2.62%	6.58	6.40	-2.75%
2002	6.35	3.19	-2.60%	6.66	6.48	-2.72%
2003	6.44	6.27	-2.58%	6.74	6.56	-2.70%
2004	6.53	6.36	-2.56%	6.83	6.65	-2.67%
2005	6.62	6.46	-2.54%	6.93	6.75	-2.65%
2006	6.73	6.56	-2.52%	7.03	6.85	-2.63%
2007	6.83	6.66	-2.50%	7.14	6.95	-2.60%
2008	6.93	6.76	-2.48%	7.24	7.05	-2.58%
2009	7.04	6.87	-2.46%	7.35	7.16	-2.56%
2010	7.16	6.98	-2.44%	7.46	7.27	-2.54%
2011	7.28	7.10	-2.42%	7.58	7.39	-2.52%

Table 6.3 Sensitivity Analysis on Value Added.
Scenario 4 : 3 % Decrease in Productivity Index

Year	V. A. Scenario 1	V. A. Scenario 4	Variation	V. A. Scenario 2	V. A. Scenario 4	Variation
1993	386,830.7	375,631.0	2.8952%	368,097.5	356,897.8	3.0426%
1994	393,361.6	382,078.7	2.8683%	373,840.6	362,557.7	3.0181%
1995	399,801.9	388,439.9	2.8419%	379,490.7	368,128.7	2.9940%
1996	406,133.9	394,697.3	2.8160%	385,794.3	374,357.7	2.9644%
1997	412,340.7	400,834.3	2.7905%	391,982.5	380,476.2	2.9354%
1998	418,397.5	406,826.8	2.7655%	398,031.6	386,460.9	2.9070%
1999	424,288.6	412,659.3	2.7409%	403,926.1	392,296.7	2.8791%
2000	429,993.9	418,311.9	2.7168%	409,646.4	397,964.5	2.8517%
2001	435,496.8	423,768.6	2.6930%	415,176.4	403,448.2	2.8249%
2002	440,781.7	429,014.0	2.6697%	420,500.6	408,732.9	2.7985%
2003	445,828.0	434,027.7	2.6468%	425,599.0	413,798.6	2.7726%
2004	450,625.7	438,799.9	2.6243%	430,461.4	418,635.5	2.7472%
2005	455,162.3	443,318.1	2.6022%	435,075.3	423,231.2	2.7223%
2006	459,432.2	447,576.9	2.5804%	439,435.1	427,579.8	2.6979%
2007	463,432.0	451,572.8	2.5590%	443,537.0	431,677.7	2.6738%
2008	467,156.0	455,299.8	2.5380%	447,374.8	435,518.5	2.6502%
2009	470,604.7	458,758.4	2.5172%	450,948.7	439,102.4	2.6270%
2010	473,778.1	461,948.4	2.4969%	454,258.2	442,428.5	2.6042%
2011	476,669.0	464,862.8	2.4768%	457,295.9	445,489.7	2.5818%

Table 6.4 Sensitivity Analysis on Pension Cost Index.
Scenario 4 : 3 % Decrease in Productivity Index

Year	P.C.I. Scenario 1	P.C.I. Scenario 4	Variation	P.C.I. Scenario 2	P.C.I. Scenario 4	Variation
1993	6.07	6.25	2.98%	6.38	6.58	3.14%
1994	6.07	6.25	2.95%	6.39	6.59	3.11%
1995	6.05	6.22	2.93%	6.37	6.57	3.09%
1996	6.04.	6.21	2.90%	6.36	6.55	3.05%
1997	6.01	6.19	2.87%	6.33	6.52	3.02%
1998	6.07	6.24	2.84%	6.38	6.57	2.99%
1999	6.13	6.30	2.82%	6.44	6.63	2.96%
2000	6.20	6.37	2.79%	6.51	6.70	2.94%
200I	6.27	6.44	2.77%	6.58	6.77	2.91%
2002	6.35	6.53	2.74%	6.66	6.85	2.88%
2003	6.44	6.61	2.72%	6.74	6.94	2.85%
2004	6.53	6.70	2.70%	6.83	7.03	2.82%
2005	6.62	6.80	2.67%	6.93	7.12	2.80%
2006	6.73	6.90	2.65%	7.03	7.23	2.77%
2007	6.83	7.01	2.63%	7.14	7.33	2.75%
2008	6.93	7.11	2.60%	7.24	7.44	2.72%
2009	7.04	7.22	2.58%	7.35	7.55	2.70%
2010	7.16	7.34	2.56%	7.46	7.66	2.67%
2011	7.28	7.46	2.54%	7.58	7.79	2.65%

Table 6.5 Sensitivity Analysis on Value Added.
Scenario 5 : 2 % Increase in Active Population Proportions

Year	V. A. Scenario 1	V. A. Scenario 5	Variation	V. A. Scenario 2	V. A. Scenario 5	Variation
1993	386,830.7	399,347.9	3.2358%	368,097.5	380,008.5	3.2358%
1994	393,361.6	406,128.8	3.2457%	373,840.6	385,974.1	3.2456%
1995	399,801.9	412,820.1	3.2562%	379,490.7	391,847.6	3.2562%
1996	406,133.9	419,404.2	3.2675%	385,794.3	398,400.0	3.2675%
1997	412,340.7	425,863.7	3.2796%	391,982.5	404,837.9	3.2796%
1998	418,397.5	432,173.2	3.2925%	398,031.6	411,136.8	3.2925%
1999	424,288.6	438,316.7	3.3063%	403,926.1	417,281.0	3.3063%
2000	429,993.9	444,273.5	3.3209%	409,646.4	423,250.3	3.3209%
2001	435,496.8	450,026.7	3.3364%	415,176.4	429,028.3	3.3364%
2002	440,781.7	455,560.3	3.3528%	420,500.6	434,599.3	3.3528%
2003	445,828.0	460,852.7	3.3701%	425,599.0	439,941.9	3.3701%
2004	450,625.7	465,893.3	3.3881%	430,461.4	445,045.8	3.3881%
2005	455,162.3	470,669.3	3.4069%	435,075.3	449,898.0	3.4069%
2006	459,432.2	475,174.8	3.4265%	439,435.1	454,492.6	3.4266%
2007	463,432.0	479,406.4	3.4470%	443,537.0	458,825.5	3.4470%
2008	467,156.0	483,357.5	3.4681%	447,374.8	462,890.2	3.4681%
2009	470,604.7	487,028.6	3.4900%	450,948.7	466,686.6	3.4900%
2010	473,778.1	490,419.4	3.5125%	454,258.2	470,213.8	3.5125%
2011	476,669.0	493,522.3	3.5356%	457,295.9	473,464.3	3.5356%

Table 6.6 Sensitivity Analysis on Pension Cost Index.
Scenario 5 : 2 % Increase in Active Population Proportions

Year	P.C.I. Scenario 1	P.C.I. Scenario 5	Variation	P.C.I. Scenario 2	P.C.I. Scenario 5	Variation
1993	6.07	5.88	-3.13%	6.38	6.18	-3.13%
1994	6.07	5.88	-3.14%	6.39	6.19	-3.14%
1995	6.05	5.86	-3.15%	6.37	6.17	-3.15%
1996	6.04	5.85	-3.16%	6.36	6.16	-3.16%
1997	6.01	5.82	-3.18%	6.33	6.13	-3.18%
1998	6.07	5.88	-3.19%	6.38	6.18	-3.19%
1999	6.13	5.94	-3.20%	6.44	6.23	-3.20%
2000	6.20	6.00	-3.21%	6.51	6.30	-3.21%
2001	6.27	6.07	-3.23%	6.58	6.36	-3.23%
2002	6.35	6.14	-3.24%	6.66	6.44	-3.24%
2003	6.44	6.23	-3.26%	6.74	6.52	-3.26%
2004	6.53	6.31	-3.28%	6.83	6.61	-3.28%
2005	6.62	6.41	-3.29%	6.93	6.70	-3.29%
2006	6.73	6.50	-3.31%	7.03	6.80	-3.31%
2007	6.83	6.60	-3.33%	7.14	6.90	-3.33%
2008	6.93	6.70	-3.35%	7.24	7.00	-3.35%
2009	7.04	6.80	-3.37%	7.35	7.10	-3.37%
2010	7.16	6.91	-3.39%	7.46	7.21	-3.39%
2011	7.28	7.03	-3.41%	7.58	7.33	-3.41%

As we can observe, changes in productivity gains and active population proportions affect the Value Added, and consequently, the Pension Cost Index. However, in the case of productivity, the yearly variation diminishes as we approach the end of our projection period. For example, in the corresponding tables (*6.1*, *6.2*, *6.3* & *6.4*) we notice that each year the increase in the Value Added is smaller than the previous' year increment; a similar feature can be observed in our Pension Cost Index.

On the other hand, when we assume a higher proportion of active population than that of Scenario 1 & 2 (see *Tables 6.5* & *6.6*), the effect is the opposite: as we have more people involved directly in the economic activities, the Value Added grows each year relative to the preceding year. Again, the Pension Cost Index is smaller each year, reflecting the behaviour of the Value Added.

We may suggest that, if all assumptions behave as expected, the increase of the productivity gains is at least as important as an increase in the active population proportions, since both variables affect directly the future output of Canada, and consequently, the cost of the CPP. This may lead us to believe that, in the final analysis, human beings are the most precious capital asset of the country. That asset must be as productive as possible, and the nation must look forward to the best long-run investment in these areas, i.e., amount (number of persons) and quality (skills, education, attitude) of the population.

Alternative applications.

The model built in this research has many applications. Among them we may mention the following:

A It can be used to study the evolution of the Canada Pension Plan, which is the raison d'être of this research. For a given rate of annual contribution, the model can be used to decide whether there will be financial problems in the future. Using the model, one also can compute the annual contribution rate required to support the old generation and to see if the required rate imposes an excessive burden on the young generation.

B The predictions concerning the evolution of the size of the senior citizen group will be helpful in health care planning to ensure the necessary resources required in meeting the needs of this group.

C The model can be used for education planning. This requires a more disaggregated population structure than is found in the text. More specifically, population subgroups should contain persons in the different stages of schooling, such as kindergarten, elementary and secondary school, high school and university students, as well as their completion rates. From the economic submodel, one also should try to determine the resources required for education and training.

D The demographic submodel also can be used to analyze immigration policies. In the demographic submodel, the annual number of immigrants accepted into the country is set at around 150,000, and the composition of this group is also assumed to be exogenous. For Canada, a thinly populated country with abundant natural resources, a more selective immigration policy can be pursued. The question then is to find the optimal number of immigrants to be admitted each year as well their optimal composition in terms of skills and age.

E Fertility decisions can be made endogenous in the model along the line of overlapping-generation models. In this type of models, economic agents make decisions concerning the number of offspring, saving rates, labour supply decisions and consumption over their lifetime.

F The economic submodel can be enlarged to become a multi-sector model that encompasses many industries with their own production functions. These industries use many intermediate inputs and labour of various skills. Such economic models, known as *computable general equilibrium models*, are widely used these days in many countries for planning and forecasting purposes.

G The model can be extended by improving the linkages between the demographic and economic submodels. A demographic submodel, in which fertility decisions are endogenized and depend on economic variables, and a computable general equilibrium model of the Johansen-type well integrated into a unified structure probably is the best model to deal with the questions raised in this research.

As a final word, we would like to say that one part of the planning process consists of ensuring that resources will be available to meet the expected needs of the system. The other part consists of deciding what these needs ought to be. This research deals with the task of suggesting an alternative approach to the long-run wellbeing of the CPP, in particular, and the Social Security System of Canada, in general.

We have followed the principle that more useful than forecasts is the improvement of flexibility and innovative skills among institutions and persons, and in the development of statistical systems and intellectual tools for early warning and analysis.

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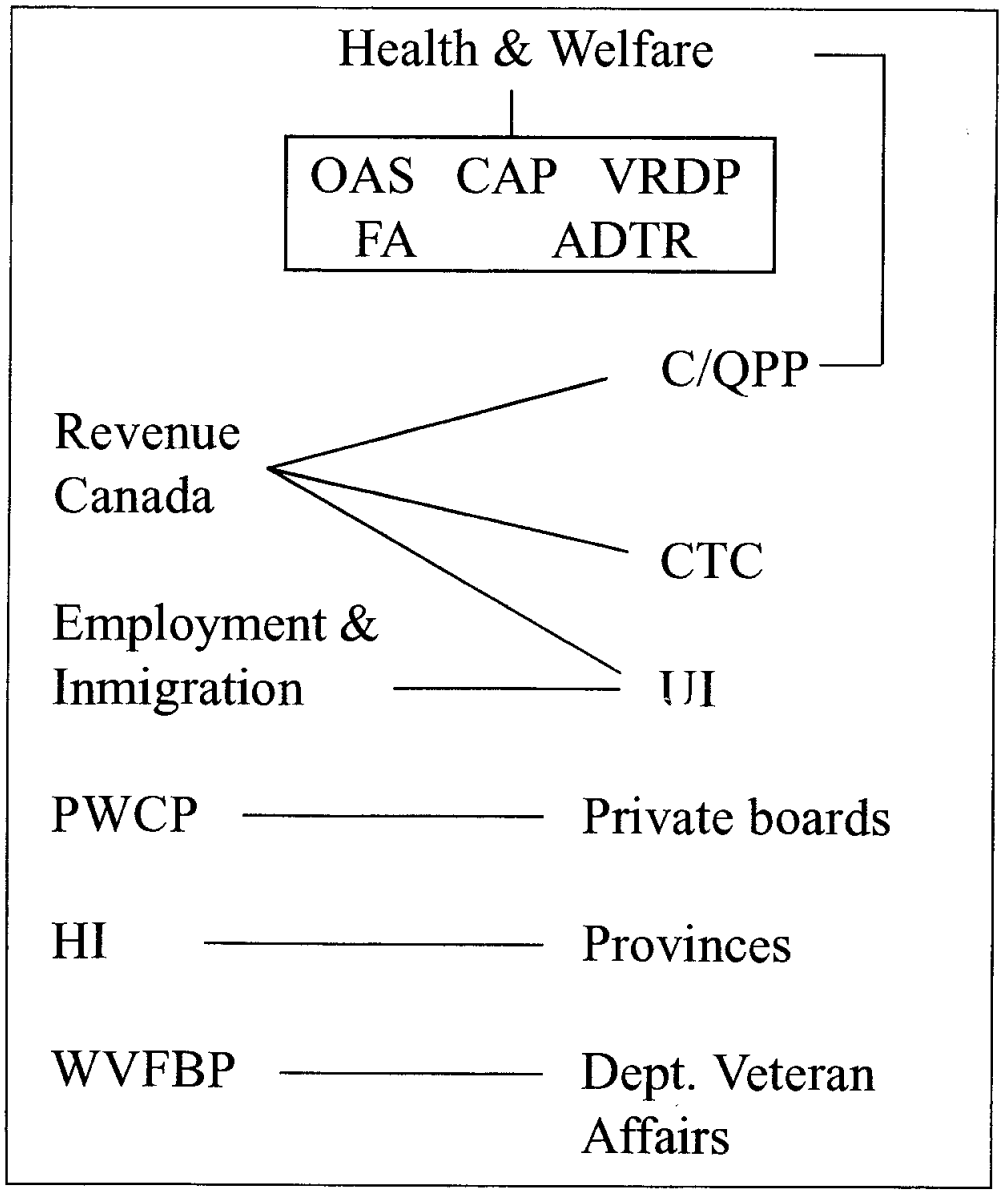
APPENDIX A

CANADIAN SOCIAL SECURITY SYSTEM

A.1 List of Programs

OAS	Old Age Security
GIS	Guaranteed Income Supplement
SPA	Spouse's Allowance
C/QPP	Canada / Quebec Pension Plan
FA	Family Allowance
CTC	Child Tax Credit
CAP	Canada Assistance Plan
UI	Unemployment Insurance
HI	Health Insurance
VRDP/ADTR/PWCP/ WVFBP	Vocational Rehabilitation of Disabled Persons / Alcohol & Drug Treatment and Rehabilitation Program / Provincial Worker's Compensation Program / War's Veterans Financial Benefit Program

A.2 Administrative Agencies



A.3 Description of programs

These pages provide an overview of the main programs of the Canadian Social Security System. It is intended to give a general description of how the programs operate, who is eligible, how the benefits are determined, along with some information about the financing, taxation and indexation of those benefits.

Old Age Security (OAS)

The Old Age Security program may be considered the cornerstone of Canada's retirement income system. Benefits include the Basic Old Age Security pension, the Guaranteed Income Supplement (GIS) and the Spouse's Allowance (SPA). Each is described below.

The Old Age Security Act came into force in 1952, replacing legislation dating from 1927 which authorized the federal government to cost-share provincial means-tested old age benefits. The main amendments made to the respective legislation are:

1965	lowered the retirement age from 70 to 65 years
1966	establishment of the GIS
1972	introduction of full annual cost-of-living indexation
1975	establishment of SPA
1977	modification of benefit formulae, allowing partial pensions based in years of residence in Canada
1985	extension of SPA benefits to low-income widows and widowers aged 60 to 64

The OAS benefits, once approved, are payable outside Canada even if the recipient changes his country of residence.

Eligibility	(1) to be 65 or more years old; and (2) to be a Canadian citizen or legal resident	
	(A) Full monthly pension	
	Option 1	(1) must have been 25 years old on 1/July/1977; and (2) must have been a legal resident on that date **or** have been residing in Canada after attaining age 18; and (3) must have resided in Canada 10 years prior to application
	Option 2	if, on 1/July/1977, the applicant was not 25 years old, or had no prior residence, he must have accumulated 40 years of residence after age 18
	(B) Reduced pension	must have been a resident at least 10 years after age 18
Benefits	life monthly pension, based on the total years of residence in Canada each years credits 1/40 of the total maximum amount is payable both in Canada and abroad	
Indexation	rates are escalated quarterly according to C.P.I.	
Taxation	income subject to taxes	
Financing	payments made from government's Consolidated Revenue Fund.	

Guaranteed Income Supplement

(GIS)

Coming in force in January, 1967 with amendments in 1971, 1972 and 1973, it is intended for OAS pensioners with no income or only a limited amount of income apart from OAS. Upon application, OAS pensioners receive the Guaranteed Income Supplement.

Entitlement is normally based on income of the preceding year, in accordance with the Income Tax Act.

Eligibility	to be recipient of OAS, either full or partial, to be a low-income OAS pensioner
Benefits	the amount depends on marital status and income of pensioner application must be made each year payable abroad for 6 months only
Indexation	rates are escalated quarterly according to C.P.I.
Taxation	income not considered taxable
Financing	payments made from government's Consolidated Revenue Fund.

Spouse's Allowance

(SPA)

In October 1, 1975 an Act to amend the Old Security Act became effective, and instituted the Spouse's Allowance as an income tested benefit.

The spouse of a GIS pensioner may be eligible. The amount is based on the couple's combined yearly income.

Eligibility	to be between 60 and 64 years old; and (1) to be spouse of a GIS pensioner; or (2) to be widow or widower of a deceased GIS pensioner
Benefits	the amount depends on marital status and income of pensioner application must be made each year payable abroad for 6 months only
Indexation	rates are escalated quarterly according to C.P.I.
Taxation	income not considered taxable
Financing	payments made from government's Consolidated Revenue Fund.

Canada Pension Plan

The Canada Pension Plan (CPP) is a contributory, earning-related social insurance program which ensures a measure of protection for a contributor and his/her family against the loss of income due to retirement, disability and death.

The Plan operates throughout Canada (except Quebec). However, both plans (CPP & QPP) are coordinated through a series of agreements, in such a way that pension credits accrued under either plan are recognized by the other.

The CPP was enacted in 1965 and came into force in 1966, as a consequence of former plans such as the Government Annuities Act (1908). Among the most important legislative amendments, we may mention:

(a) the full annual cost-of-living indexation,
(b) equality of male and female benefits,
(c) elimination of retirement proof for receiving pensions at age 65,
(d) exclusion of zero-earnings periods due to child-rearing,
(e) establishment of early retirement at age 60,
(f) increase of disability pensions,
(g) division of marriage benefits due to divorce/breakdown.

The CPP's contributors:

virtually all employed and self-employed persons who are between ages 18 and 65; and who earn more than a prescribed minimum income (known as Year's Basic Exemption).

The benefits provided by the plan are:

(a) Retirement pension
(b) Disability pension
(c) Surviving Spounse's pension
(d) Disabled Contributor's Child benefit
(e) Orphan's benefit
(f) Death benefit

Reciprocal international social security agreements exits for both CPP and QPP, to avoid duplication of coverage and to ensure that eligible persons may contribute to the plan of their country of residence. As of January, 1991 there were agreements with 21 countries.

Eligibility	all individuals that contribute to the plan
Benefits	benefits are calculated according the number of contributions made to the plan
Retirement Benefit	normal: payable to any person 65 or older who made at least one valid contribution; early: between ages 60 and 64, is payable to those who have ceased working or whose income is below the maximum annual retirement pension; Amount: 25% of the average adjusted pensionable career earnings
Disability Benefit	payable to any person who becomes mentally or physically disabled and who meets minimum contributory requirements; Amount: flat-rate portion plus 75% of retirement pension payable to a 65 years old individual
Surviving spouse's pension	payable to the surviving legal spouse of a deceased contributor, provided contributions were made for at least 3 to 10 years, and if (1) the surviving spouse is between 45 and 64, or (2) if the surviving spouse is younger than 45, he/she must be disabled or have dependent children; Amount: flat-rate portion plus 37.5% of the contributor's pension calculated as if he/she would have been 65 years. At age 65, surviving spouse's pension is equal to 60% of the contributor's retirement pension.
Disabled Contributors' Child benefit	Payable on behalf of the dependant of the disabled contributor, provided the child is under 18 or under 25 if attending school; Amount: flat-rate.
Orphan's benefit	Payable on behalf of the dependant of the deceased contributor, provided the child is under 18 or under 25 if attending school; Amount: flat-rate.
Death Benefit	Payable to the estate of a contributor who has made contributions for at least 3 to 10 years; Amount: lump sum equivalent to six times the monthly retirement pension, up to a maximum of 10% of the Year's Maximum Pensionable Earning for the year.

Indexation	maximum benefit amounts are adjusted annually (January 1) according the C.P.I. of the last 24 months ending in October 31 of the preceding year.
Taxation	income is considered taxable, except for the Disabled Contributor's Child Benefit for a child under age 18
Financing	funded from employer and employee contributions, plus interests earned on fund investment less benefit and administrative expenses

We must mention that the above description pertains to the Canada Pension Plan but the Quebec Pension Plan is, essentially, the same. The differences between these two plans are in conditions that the beneficiary must met, not in the benefits' structure.

There is also another plan in Saskatchewan (Saskatchewan Pension Plan), that is a voluntary money purchase scheme which was established in August, 1986 to provide additional retirement security to those persons not adequately covered by a private pension plan.

Family Allowances

(FA)

The objective of the program is to provide financial assistance to parents with dependent children to help meet the costs of raising them.

The program, which became affective in July 1, 1945, also includes payment of a Special Allowance on behalf of children who are maintained by a welfare agency, a government department or a public institution.

Eligibility	to be a parent or guardian who is wholly or substantially maintaining a dependent child under 18, and to be a canadian citizen, or to be a permanent resident, or to be an authorized visitor with income subject to Canadian income tax
Benefits	monthly flat-rate benefit
Indexation	rates are indexed annually to C.P.I. in excess of 3%
Taxation	Family allowances income is considered taxable Special allowances income is not considered taxable
Financing	funded from government's Consolidated Revenue Fund.

Child Tax Credit

(CTC)

The program provides assistance in meeting the cost of raising children for low-income and middle-income families. A supplement to the Child Tax Credit (CTC) is also available to parents of eligible children under 7 years provided no care expenses are claimed for those same children.

Eligibility	a parent or guardian who receives Family Allowances on behalf of a dependent child may claim a CTC on his/her income tax return
Benefits	varies according to family income and the number of eligible children
Indexation	rates are indexed annually to C.P.I. in excess of 3%
Taxation	benefit is considered refundable tax of cash payment, depending on parent's fiscal results
Financing	funded from government's Consolidated Revenue Fund.

Canada Assistance Plan

(CAP)

Effective April 1, 1966, the Canada Assistance Plan authorized agreements with the provinces for federal sharing of costs derived from welfare services granted in accordance to provincial legislations.

Under such agreements with provincial governments, the federal government contributes on a 50/50 basis to eligible costs incurred by provinces and municipalities in providing the prescribed services of the Canada Assistance Plan (CAP).

The main amendments took place in 1970, 1972 and 1976.

Eligibility	persons in need or likely to become in need of welfare services persons with difficulty in finding or retaining jobs
Benefits	provide basic requirements (food, shelter, clothing, utilities, household supplies, etc.) welfare services (e.g. day-care, nursing homes, elderly care) health services not covered under universal health care programs according to the Canada Health Act maintenance of foster child homes
Taxation	benefit is not subject to income tax
Financing	funded from government's Consolidated Revenue Fund.

Unemployment Insurance

(UI)

The federal Unemployment Insurance (UI) program provides protection for workers suffering income interruptions due to sickness, birth or adoption of a child and unemployment. About 95% of Canadian workers are currently protected.

The legislative history of the UI is long. Created under the Employment and Social Insurance Act in 1935, it underwent amendments on several occasions throughout its life.

Eligibility	workers (except self-employed) who: were employed in "insurable employment", and have made premium contributions (20 weeks)
Benefits	60% of claimant's average weekly insurable earnings up to a maximum Regular benefits: are paid during 17 to 50 weeks, depending on the number of weeks worked Special benefits: 15 weeks due to maternity 10 weeks due to parental care
Indexation	benefits are set annually as a moving-average of the last 8 years of national annual average earnings
Taxation	benefit is considered taxable
Financing	financed from employer and employee premiums calculated as:
employee	$2.25 for each $100 of weekly insurable earnings up to a maximum weekly premium of $15.30
employer	$3.15 for each $100 of weekly insurable earnings up to a maximum weekly premium of $21.42

Health Insurance

(HI)

The system is a publicly funded and administered universal insurance system providing full coverage to all residents for medically necessary hospital and physician services.

Access is not limited by ability to pay. Costs are paid by provincial governments, with some assistance from federal funds. In 1989-90 the federal expenditure on this plan was $14,109 millions.

Eligibility	provincial residents provided they have resided in the province for 3 consecutive months landed inmigrants are covered as of date of entry, in most provinces
Benefits	medically necessary hospital care meals and accommodation drugs, supplies, diagnosis tests medically necessary physician and nurse care surgical-dental services
Taxation	premiums paid by employer on behalf of the employee are considered taxable benefits
Financing	provincial funds plus some assistance from federal government

Vocational Rehabilitation of Disabled Persons Program (VRDP)

- Eligible recipients are those physically and/or mentally disabled persons of working age who require vocational rehabilitation services. This includes persons who are disabled because of psychiatric, sensorial, intellectual or learning impairment, and alcohol and drug addicts.
- Unlike CAP, this program does not establish financial need as a requirement.
- The costs are paid by federal and provincial governments on a 50/50 basis.

Alcohol and Drug Treatment and Rehabilitation Program (ADTR)

-The program extends support for drug and alcohol problems, with a special emphasis on youths.
- Eligible persons are all those who might require help on this subject. Benefits include detoxification services, counselling, therapeutic intervention, clinical follow-up, etc.
- The costs are paid by federal and provincial governments. For 1989-90 the federal allocation was $20 million.

Provincial Worker's Compensation Programs (PWCP)

- Provide income protection for members of Canada's labour force who suffer wage loss due to occupational injury or disease, as well as some assistance with medical expenses.
- It is a mutual insurance scheme through which the employers are liable for the costs of work-related injuries. The funding of the system is paid entirely by employers and is administered by boards whose function is the assessment of compensation and eligibility.
- Benefits are cash compensation, medical aid and/or rehabilition services.

War Veteran's Financial Benefit Programs (WVFBP)

- These programs provide three main types of benefits and services to members and former members of the Canadian Armed Forces:

(a) pensions for disability or death
(b) income support for survivors and dependants
(c) treatment and health care benefits

-Benefits are payable throughout the world and are administered by the Department of Veteran Affairs, with funding made from the federal government's Consolidated Revenue Fund.
-Related programs include: War Veterans' and Civilian War Allowances, Veterans Independence Program, Veterans' and Civilians Disability Pensions, Compensation of Former Prisoners of War.

APPENDIX B

AUXILIARY TABLES

Table B1. Total fertility rate[1]
Canada, 1921 - 1986

Year	Rate	Year	Rate
1921	3.536	1954	3.828
1922	3.402	1955	3.831
1923	3.234	1956	3.858
1924	3.221	1957	3.925
1925	3.132	1958	3.880
1926	3.357	1959	3.935
1927	3.319	1960	3.895
1928	3.294	1961	3.840
1929	3.217	1962	3.756
1930	3.282	1963	3.669
1931	3.200	1964	3.502
1932	3.084	1965	3.145
1933	2.864	1966	2.812
1934	2.803	1967	2.597
1935	2.755	1968	2.453
1936	2.696	1969	2.405
1937	2.646	1970	2.331
1938	2.701	1970	2.187
1939	2.654	1972	2.024
1940	2.766	1973	1.931
1941	2.832	1974	1.875
1942	2.964	1975	1.852
1943	3.041	1976	1.825
1944	3.010	1977	1.806
1945	3.018	1978	1.757
1946	3.374	1979	1.764
1947	3.595	1980	1.746
1948	3.441	1981	1.704
1949	3.456	1982	1.694
1950	3.455	1983	1.680
1951	3.503	1984	1.690
1952	3.641	1985	1.670
1953	3.721	1986	1.670

(1) average number of children that would be born if women were to pass through all child-bearing years conforming to the age-specific fertility rates of a given year.

Sources: Statistics Canada (1984). Current demographic analysis. Fertility in Canada: from baby-boom to baby bust. Data from 1921 to 1982.
Statistics Canada (1990). Population Projections for Canada, provinces and territories. Data from 1983 to 1986.

Table B2. Population Projections

Canada

(Figures in '000)

Year	Population (begin of year)	Births	Deaths	Net Migration
1993	27,217.3	337.6	199.3	71.5
1994	27,427.1	327.8	202.2	70.9
1995	27,623.6	318.7	205.1	70.3
1996	27,807.5	310.3	207.9	69.8
1997	27,979.7	302.4	211.4	69.2
1998	28,139.9	294.7	214.8	68.8
1999	28,288.6	287.4	218.2	68.3
2000	28,426.1	280.6	221.5	67.9
2001	28,553.1	275.1	224.9	67.5
2002	28,670.8	270.2	229.1	67.1
2003	28,779.0	265.2	233.3	66.8
2004	28,877.7	260.8	237.5	66.4
2005	28,967.4	257.1	241.6	66.1
2006	29,049.0	253.5	245.5	65.9
2007	29,122.9	249.8	249.7	65.6
2008	29,188.6	246.5	253.9	65.4
2009	29,246.6	243.4	258.1	65.2
2010	29,297.1	240.1	262.5	65.0
2011	29,339.7	237.8	266.8	64.8

Statistics Canada (1990). Population Projections for Canada, provinces and territories. Catalogue 91-520.

Table B3. Inmigration, Emigration and Net Migration.

Canada, 1971-72 to 2010-11

(Figures in '000)

Year		Inmigration assumption		Emigration (1)	Net Migration assumption	
		low	high		low	high
1971	1972	118	118	66	52	52
1972	1973	130	130	62	68	68
1973	1974	214	214	84	130	130
1974	1975	213	213	79	134	134
1975	1976	166	166	65	101	101
1976	1977	133	133	57	76	76
1977	1978	105	105	63	42	42
1978	1979	83	83	64	19	19
1979	1980	138	138	51	87	87
1980	1981	129	129	44	85	85
1981	1982	135	135	45	90	90
1982	1983	105	105	50	55	55
1983	1984	88	88	49	39	39
1984	1985	84	84	46	38	38
1985	1986	88	88	45	43	43
1986	1987	126	126	51	75	75
1987	1988	151	151	41	110	110
1988	1989	160	160	41	119	119
1989	1990	160	170	66	94	104
1990	1991	150	180	66	84	114
1991	1992	140	185	67	73	118
1992	1993	140	190	68	72	122
1993	1994	140	195	69	71	126
1994	1995	140	200	70	70	130
1995	1996	140	200	70	70	130
1996	1997	140	200	70	70	130
1997	1998	140	200	70	70	130
1998	1999	140	200	70	70	130
1999	2000	140	200	70	70	130
2000	2001	140	200	70	70	130
2001	2002	140	200	70	70	130
2002	2003	140	200	70	70	130
2003	2004	140	200	70	70	130
2004	2005	140	200	70	70	130
2005	2006	140	200	70	70	130
2006	2007	140	200	70	70	130
2007	2008	140	200	70	70	130
2008	2009	140	200	70	70	130
2009	2010	140	200	70	70	130
2010	2011	140	100	81	59	119

(1) numbers correspond to projection 4

Source: Statistics Canada (1990). Population projections for Canada, provinces and territories. Catalogue 91-520.

Table B4. 1980 Standard Industrial Classification, Canada

1	Agricultural and related service industries
2	Fishing and trapping industries
3	Logging and forestry industries
4	Mining, quarrying and oil wells industries
5	Manufacturing industries
6	Construction industries
7	Transportation and storage industries
8	Communication and other utilities industries
9	Wholesale trade industries
10	Retail trade industries
11	Finance and insurance industries
12	Real estate operators and insurance agent industries
13	Business service industries
14	Government service industries
15	Educational service industries
16	Health and social service industries
17	Accommodation, food and beverage service industries
18	Other service industries
19	Unclassified

Source: Statistics Canada (1980). Standard Industrial Classification 1980. Catalogue 12-501 E.

Table B5. 1980 Standard Occupational Classification, Canada

1	Managerial and other professional
2	Clerical
3	Sales
4	Services
5	Primary occupations
	farming, horticultural and animal husbandry fishing and trapping forestry and logging mining and quarrying
6	Processing
	machining, fabricating, assembling & repairing
7	Construction
8	Transport
9	Material handling and other crafts
10	Unclassified

Source: Statistics Canada (1993). Labour force annual averages 1992. Catalogue 71-220.

Table B6. Index of Industry value multifactor productivity for selected industries, Canada (1986 = 100)

Year	Business	Manufacturing
1961	75.0	56.0
1962	78.3	61.1
1963	80.7	63.7
1964	83.0	67.1
1965	84.5	69.6
1966	85.5	69.6
1967	83.6	67.8
1968	86.1	71.1
1969	87.9	74.3
1970	87.9	72.1
1971	90.9	75.3
1972	93.4	79.7
1973	96.6	84.9
1974	93.9	84.7
1975	91.9	78.7
1976	95.3	84.0
1977	95.5	88.6
1978	95.7	90.6
1979	95.9	90.5
1980	94.8	87.1
1981	94.9	89.7
1982	90.0	82.2
1983	93.6	89.8
1984	97.9	98.7
1985	99.0	101.8
1986	100.0	100.0
1987	101.4	101.0
1988	101.9	100.8
1989	100.7	97.9
1990	98.6	93.1
1991	969.9	89.6

Source: Statistics Canada (1992). Aggregate productivity measures. Catalogue 15-204 E.

Table B7. Retirement Election Proportions by age group. Canada.

Year	60-64	65-69	70 +
1992	12.90%	38.65%	87.50%
1993	12.90%	43.25%	87.50%
1994	12.90%	42.70%	87.50%
1995	12.90%	40.35%	87.50%
1996	12.90%	38.60%	87.50%
1997	12.90%	35.50%	87.50%
1998	12.90%	35.50%	87.50%
1999	12.90%	35.50%	87.50%
2000	12.90%	35.50%	87.50%
2001	12.90%	35.50%	87.50%
2002	12.90%	35.50%	87.50%
2003	12.90%	35.50%	87.50%
2004	12.90%	35.50%	87.50%
2005	12.90%	35.50%	87.50%
2006	12.90%	35.50%	87.50%
2007	12.90%	35.50%	87.50%
2008	12.90%	35.50%	87.50%
2009	12.90%	35.50%	87.50%
2010	12.90%	35.50%	87.50%
2011	12.90%	35.50%	87.50%

Source: The Canada Pension Plan Fourteenth Actuarial Report (1991).

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