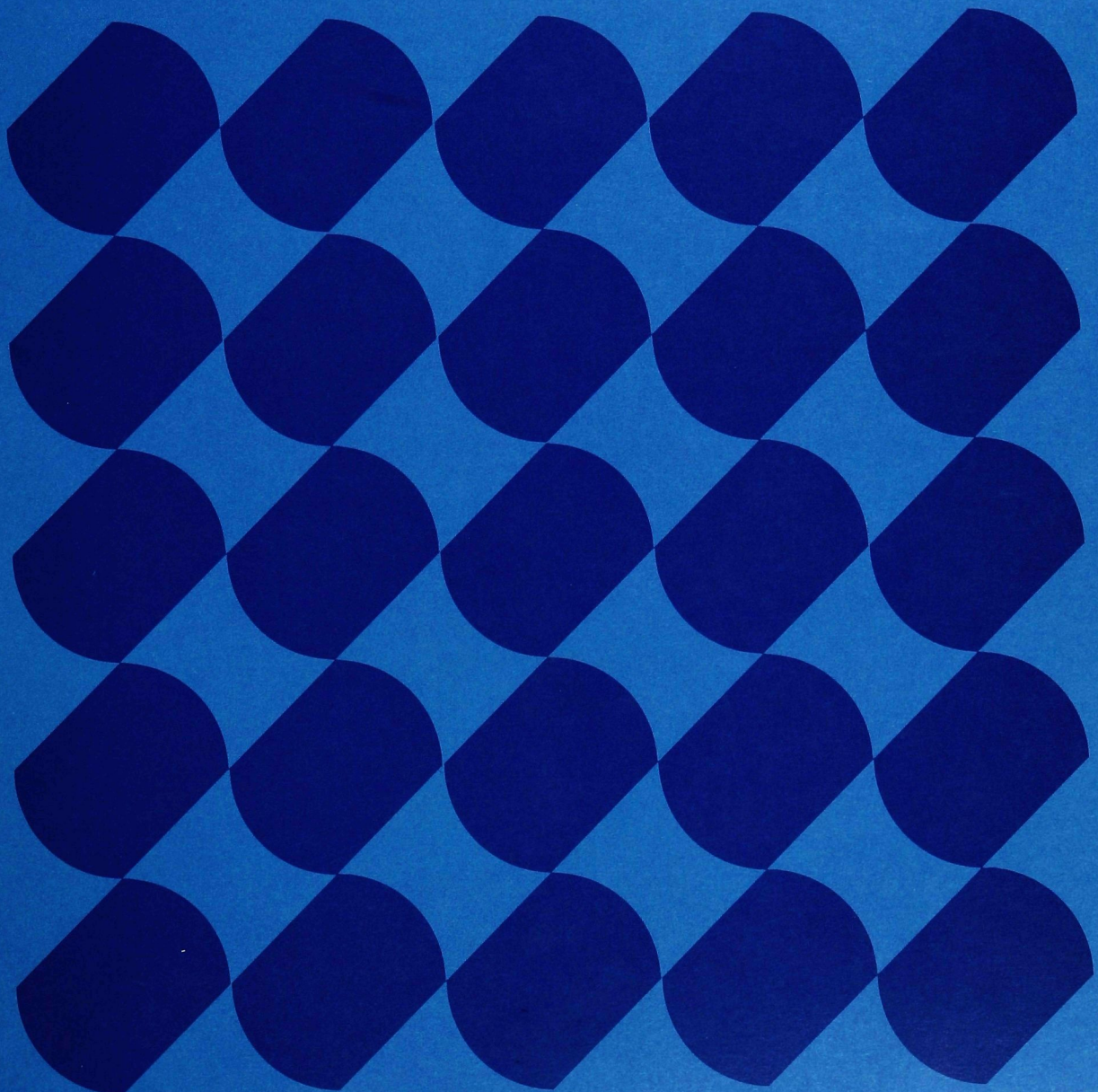
Off Farm Work by Farmers

By Ray D. Bollman



Census Analytical Study

Off Farm Work by Farmers

By Ray D. Bollman

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FOREWORD

The Canadian censuses constitute a rich source of information about the condition of groups and communities of Canadians, extending over many years. It has proved to be worthwhile in Canada, as in some other countries, to supplement census statistical reports with analytical monographs on a number of selected topics. The 1931 Census was the basis of several valuable monographs but, for various reasons, it was impossible to follow this precedent with a similar program until 1961. The 1961 Census monographs received good public reception, and have been cited repeatedly in numerous documents that deal with policy problems in diverse fields such as manpower, urbanization, income, the status of women, and marketing. They were also of vital importance in the evaluation and improvement of the quality and relevance of Statistics Canada social and economic data. This successful experience led to the decision to continue the program of census analytical studies. The present series of analyses is focused largely on the results of the 1971 Census.

The purpose of these studies is to provide a broad analysis of social and economic phenomena in Canada. Although the studies concentrate on the results of the 1971 Census, they are supplemented by data from several other sources. These reports are written in such a way that their main conclusions and supporting discussion can be understood by a general audience of concerned citizens and officials, who often lack the resources needed to interpret and digest the rows of numbers that appear in census statistical bulletins. For these persons, interpretive texts that bring the dry statistics to life are a vital dimension of the dissemination of data from a census. Such texts are often the only means that concerned citizens and officials have to personally perceive benefits from the national investment in the census. This particular report is one of a series planned to be published concerning a variety of aspects of Canadian life, including income, language use, farming, family composition, migration, adjustment of immigrants, human fertility, labour force participation, housing, commuting and population distribution.

I should like to express my appreciation to the universities that have made it possible for members of their staff to contribute to this program, to authors within Statistics Canada who have freely put forth extra effort outside office hours in preparing their studies, and to a number of other members of Statistics Canada staff who have given assistance. The Social Science Federation of Canada has been particularly helpful in the selection of authors for some of the studies, and in arranging for review of several manuscripts. In addition, thanks are extended to the various readers, experts in their fields, whose comments were of considerable assistance to the authors.

Although the monographs have been prepared at the request of and published by Statistics Canada, responsibility for the analyses and conclusions is that of the individual authors.

PETER G. KIRKHAM,

Chief Statistician of Canada.

PREFACE

Historically, off-farm work by farmers has been an integral feature of the agricultural sector. In addition, it represents an important aspect of the interface between the agricultural and non-agricultural sectors. Today, off-farm work is more important to farmers as a group than ever before, and this importance can be expected to grow. The study compliments the census analytic study of Paul Shaw (forthcoming). In an extensive analysis of the socio-economic characteristics of the farm population, Shaw concluded:

> The increasing importance of off-farm employment as a source of income to Canadian census-farm families over the last few decades clearly is one of the most important structural features of Canadian agriculture.

This study is the product of several years of effort. A census analytic study of off-farm work by farmers was first porposed in the spring of 1972. Data from the 1971 Agriculture-Population Linkage were not available until 1975, and most of the intensive work was conducted in 1976 and 1977.

In undertaking this study I was helped by many people. W.L. Porteous, R.B. Proud and E.S. Boyko of Statistics Canada encouraged and supported my two years of educational leave at the University of Toronto, as well as the supplementary time necessary to finish the research.

Catherine Cromey helped make possible the success of the multivariate analysis of the 1971 Agriculture-Population Linkage data. I think it is noteworthy that this is the first study using Agriculture-Population Linkage data to obtain data on spouses of all operators, regardless of whether the operator was the head of the household.

Professors Noah Meltz and David Foot read, reviewed and offered suggestions as each section was completed. Professors Al Steeves, David Stager, Julius Mage and Jim MacMillan, along with Catherine Cromey, Wilson Freeman and Dr. Don McClatchy read the first draft and made useful comments.

The person providing the most support was my wife, Betty Lorimer. Her continued moral support of this study at the expense of a multitude of foregone endeavours will always be remembered, as will the many hours she spent editing and typing.

Ray Bollman,
June 1978.

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CHAPTER 1

INTRODUCTION

1.1. Overview

Off-farm work by farmers has been a significant feature of Canadian agriculture for many years. Louis Hébert, Canada's first farmer of European descent, worked off the farm as an apothecary (Brown, 1942, p. 25). Early settlers often combined farming with trapping, fishing or logging.

The proportion of farmers reporting some days of off-farm work has remained relatively unchanged at about one-third from 1941 to 1976. In recent years off-farm work by farmers has persisted for numerous reasons. Three important ones are:

1. Technological change has allowed farmers to obtain the same return with a smaller labour input.
2. The money and time costs of commuting to urban centres has decreased.
3. Farmers desire to achieve and maintain as high a standard of living as possible under the pressure of the cost-price squeeze on real farm incomes (especially before 1973) and have an increased awareness of urban lifestyles.

1.2. Importance of Study

There are two fundamental policy issues in the agricultural sector:

> The first, and prime concern of this (food) policy... is that consumers are assured, at all times, of high quality food at reasonable prices.
> The second objective is to assure efficient farmers a decent living (Hon. Eugene F. Whelan, Minister of Agriculture, Government of Canada, 1977).

All census-farm operators supply some food[1] but many do not

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See footnote(s) on page 23.

farm full-time. How does the production of food inter-relate with the off-farm work of farmers? All census-farm operators earn some income from the sale of food[1] but many also earn income from off-farm work. How does the income from food production inter-relate with the income from off-farm work?

When commodity programs attempt to stabilise prices or production, the inter-relationships between the production of this commodity and off-farm work by the farmer should be recognised (unless studies can show that farmers' responses to price policies are not affected by the amount of off-farm work). Two issues must be addressed. First, the proportion of each commodity that is produced by operators who report some off-farm work must be ascertained. Second, the interaction between off-farm work and the production activities of farmers must be studied. For example, one question is whether off-farm work by farmers is consistent with the efficient production of food.

When commodity programs attempt to increase the incomes of producers, the inter-relationship between the production of this commodity and off-farm work should again be recognised. The major source of farmers' off-farm income is off-farm work (Bollman, 1973). The impact of government programs on farmers' income is inversely related to the amount of off-farm work.[2]

Public policies for the agricultural sector have traditionally been commodity-based. Whether the purpose of a policy is to influence commodity prices or farmers' incomes, off-farm work by farmers is an important consideration determining the effectiveness of the policy.

Perhaps off-farm work should be promoted as an end in itself. Some government policies have the objective of transferring labour out of agriculture. It is a generally accepted conclusion that there is a surplus of labour resources in primary agriculture (Canada, Federal Task Force on Agriculture, 1969). The encouragement of off-farm work by

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See footnote(s) on page 23.

farmers could aid the transfer of labour out of primary agriculture. In addition, the promotion of off-farm work may be the most effective way to increase the low incomes of some farmers.

1.3. Objectives of Study

The general objective of this study is to investigate the inter-relationship between the farm and off-farm work of farmers. One central issue is the role of off-farm work by farmers in food production including the amount of food produced by part-time farmers and the inter-relationship between off-farm work and food production by farmers. The other central issue is the role of off-farm work in improving farmers' income. Specific points that are examined in this study include:

(a) the number of farmers reporting off-farm work and the distribution of off-farm work between part-time off-farm employment and full-time off-farm employment;
(b) the proportion of each commodity produced by farmers who report some off-farm work;
(c) the distribution of off-farm work with respect to variables such as geographic regions, types of farm, sizes of farm, age of farm operator and educational level of operator;
(d) the extent to which more and better machinery reduces the demand for the farmer's labour on the farm, thus influencing the probability of participating in off-farm work;
(e) the extent to which changes in agricultural prices (and price supports) change the demand for the farmer's labour on the farm, thus influencing the probability of participating in off-farm work;
(f) the factors which determine the probability that a farmer reports some off-farm work; and
(g) the factors which could be influenced by government policy to promote an increase in off-farm work by farmers, if this were desired.

The study is national in scope with a comparative analysis of off-farm work by operators of different types of farms and in different provinces.

1.4. Outline of Study

The most important chapters of this study are Chapter 2, the theoretical analysis; Chapter 4, the historical analysis; and Chapter 6, the multivariate cross-section analysis. The remaining section of Chapter 1 contains definitions of terms and a discussion of the data sources.

A kinked demand curve for farmer's labour is derived in Chapter 2 to explain the presence and amount of off-farm work. The determinants of the curve are discussed. An extensive analysis of the implications of the concept of a kinked demand for labour curve is presented elsewhere (Chapter 3 in Bollman, 1978b) and is available upon request to the author, Agriculture Division, Statistics Canada, Ottawa, K1A OL7. However the implications are summarised in Chapter 2 of this study.

An equation to explain the probability of participating in off-farm work is derived in Chapter 3 and three probability response models are reviewed. Given the nature of the data, a probability response model is estimated. A probability response model has a dichotomous dependent variable where the predicted value is the probability of choosing one of the dichotomous results. In this study, the decision of whether or not to participate in off-farm work is the dichotomous choice variable.

The historical role of part-time farming in the Canadian agricultural sector is considered in Chapter 4. The implications of the theoretical model in the historical context are discussed; the extent, trends and structure of part-time farming in the 1936-76 period are analysed; and the findings of other Canadian studies on part-time farming are incorporated.

In Chapter 5, the available data are reviewed and a feasible estimating equation is developed to explain the probability of a farmer participating in off-farm work.

The results of the multivariate cross-section analysis of off-farm work by farmers in 1971 are presented in Chapter 6 and the implications are discussed in detail.

The results of the study are summarised in Chapter 7 and the implications of the results for public policies are emphasised.

1.5. Definitions and Data Sources

Off-farm work by farmers is defined, theoretically (see Chapter 2) as the participation of farmers in wage activity as distinct from their farming self-employment activity. Operationally, off-farm work is indicated by census-farm operators who reported "Some Days of Off-Farm Work" or some off-farm employment income.[3] Off-farm employment income includes wage and salary income plus net income from non-farm self-employment (see Questions 40a and 40b, Appendix A, Table A.2). Thus, off-farm work refers to all the work done by the farmer off the farm[4] plus non-farm work that may be located on the farm (such as machinery dealerships, motels or cabins).

In the theoretical discussion, a farmer is considered to be any individual who is self-employed in the production of food or fibre. The empirical analysis focuses on the operators of census-farms. A census-farm operator is

> the person who is directly responsible for the agricultural operation of the holding, whether as owner, tenant or hired manager (Introduction to Canada, Statistics Canada, 1971 Census of Agriculture).

A census-farm was defined in the 1971 Census as

> a farm, ranch or other agricultural holding of one acre or more with sales of agricultural products, during the 12-month period prior to the census, of $50 or more (Introduction to Canada, Statistics Canada, 1971 Census of Agriculture).

The definition of a census-farm varied somewhat in other censuses. The

See footnote(s) on page 23.

definitions are summarised in Appendix 2 of Bollman (1978b).

The data sources used in this study are the Censuses of Agriculture from 1936 to 1976 and the 1971 Agriculture-Population Linkage. The first census of agriculture to capture information on off-farm work was the 1936 Census enumerated in the Prairie provinces. A census of agriculture was enumerated across Canada in 1941, 1951, 1956, 1961, 1966, 1971 and 1976. In addition, a census of agriculture was enumerated in the Prairie provinces again in 1946. The censuses of agriculture (in all years except 1956) requested the number of days of off-farm work by the operator of the census-farm. Off-farm work includes both agricultural and non-agricultural work off the operator's holding. For details of the data on off-farm work in each census, see Appendix A.

The long form (Form 2b) of the 1971 Census of Population was enumerated in one-third of the households. Considerable socio-economic information was obtained including the amount of income received in 1970 from the following sources: net farm self-employment income, wage and salary earnings, net income from non-farm self-employment, plus a number of categories of unearned income (see Table A.2). Information from the long Census of Population questionnaire is available for members of farm operator households from the 1971 Agriculture-Population Linkage data base. Details of the Agriculture-Population Linkage are documented by Freeman (1976).

FOOTNOTES

[1] Operators who produce miscellaneous items such as tobacco, nursery products, some greenhouse products, Christmas trees and horses are exceptions.

[2] The reason for this inverse relationship is the larger the amount of off-farm work, the greater the total net income of farmers and the greater the total net income of farmers, the smaller the impact of a given government program.

[3] Not all operators reported both off-farm employment income and "Days of Off-farm Work". This apparent contradiction is investigated in Section 5.2.3.

[4] The term "off-farm work" is generally applicable to the North American setting where the typical farmer lives on the farm holding. However, the analysis of the allocation of the farmer's labour between the wage (or off-farm) activity and the self-employment (or farm) activity can be used to analyse the situation common in some countries where the farmer lives in a village or town and commutes to the farm.

CHAPTER 2

ECONOMIC THEORY OF OFF-FARM WORK

2.1. Introduction

There has been little theoretical analysis of the economic determinants of off-farm work by farmers.[1] Only recently has Huffman (1976a) advanced the earlier work by Lee (1965) and Polzin and MacDonald (1971). The purpose of this chapter is to provide a detailed theoretical analysis of the economic determinants of off-farm work by farmers and to investigate the implications of the theoretical findings for policies that deal with farmers. It is recognised that non-economic factors also influence the participation of farmers in off-farm work (see Appendix D). For the purpose of the economic analysis, these factors are held constant.

The model is developed using off-farm work by farmers as an example. However, the model can be used to analyse the participation in wage activity by an individual who already has some self-employment activity regardless of whether the self-employment activity is the primary or secondary job. Thus, the analysis of the supply of labour by women and men to the paid labour market is an important application of this theoretical framework because home production can be considered a self-employment activity. Only very recently (see Gronau, 1977) has "home production" been considered as an item separate from leisure and market work in the analysis of the allocation of time. Although home production has been recognised to be an important item since the work by Mincer (1962), the impact of home production has almost always entered the analysis as an item determining the utility of leisure or time not spent in market work. The analysis extends that of Becker (1965) by postulating diminishing marginal returns to the self-employment activity; Becker assumed constant marginal productivity in the production of his "commodities" (denoted as "Z").

The analysis begins by postulating a production function for the operator's farm (in general, the self-employment activity) with diminishing

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See footnote(s) on page 40.

marginal returns to the operator's labour. Given the prices of outputs and the prices of all other inputs, a demand schedule for the operator's labour on the farm is obtained. The net off-farm wage available to the operator is viewed as exogenously determined. It is assumed that the operator has no preference for farm over off-farm work and thus he will not engage in farm work with a marginal return less than the net off-farm wage. Given the level of non-earned income, the operator's total supply of labour function is derived. The intersection of the kinked demand curve for operator's labour (derived below) with the operator's supply of labour function determines whether the operator participates in off-farm work and the amount of time worked off the farm.

The next section states the initial assumptions of the analysis and the subsequent sections develop the demand and supply curves faced by the farm operator. A comparative static analysis is provided in Section 2.5. (The theoretical analysis has been pursued extensively in Chapter 3 in Bollman (1978b), copies of which are available upon request to the author.) In the latter document, a formal mathematical derivation is presented; the implications for studies of labour force participation rates, labour supply studies in general, and studies of multiple job-holding are outlined; the implications of a backward-bending supply of labour curve are discussed; a detailed analysis of the implications of removing various simplifying assumptions is presented; the implications of the theoretical framework for the definition of agricultural policy target clientele are outlined; and the implications for studies of rural development are presented. A summary of the analysis and findings are given in Section 2.6 of this study.

2.2. Assumptions

A "perfect markets" situation is assumed where goods can be bought and sold at a fixed price and information is costless. Consequently, capital markets are assumed to be perfect and uncertainty is ruled out. Farm firms are assumed to be in an equilibrium situation; the decision to operate a farm has been made and the location of residence by the operator (i.e., whether farm or non-farm) has been determined.

A static model is postulated. The static model, it is argued, is a useful approximation to the relevant decision-making framework faced by farmers with respect to farm and off-farm work. Thus the analysis abstracts from the dynamic aspects that arise from a consideration of technical change.

For simplicity, it is assumed that the farm unit has only one enterprise (or a fixed enterprise mix). Thus, the production function facing each farm unit is the same;[2] the seasonality of the demand for the operator's labour on the farm is fixed; and there is a homogeneous output among farm firms.

Two types of labour are assumed to exist. Self-employment "entrepreneurial" labour can only be supplied by the individual to the individual's own firm. The other type of labour is "hired" or wage labour. If management skills are bought or sold, that is considered to be hired labour.

2.3. Total Demand for Operator's Labour

The production of the homogeneous farm output, Y, is postulated to be the function of the size of the capital stock, K; the level of total non-labour variable inputs, VIN; the level of hired and unpaid family labour, HL; and the level of operator labour in farm work, OLFW. This can be expressed by a production function in general functional form as:

$$Y = Y\ (K,\ VIN,\ HL,\ OLFW) \qquad (2.1)$$

Substitutions among these four variables are considered significant in determining the level of demand for OLFW. The assumptions of a perfectly competitive model are postulated; specifically, it is assumed that the price of output and the prices of the other inputs are fixed. Maximising farm profits subject to fixed prices, one obtains a function for the demand for operator's labour on the farm, D_{OLFW}, as a function of prices including the price of operator's labour in farm work, P_{OLFW}:

See footnote(s) on page 40.

$$D_{OLFW} = D_{OLFW}\ (P_Y, P_K, P_{VIN}, P_{HL}, P_{OLFW}) \qquad (2.2)$$

where P_i is the price level for the i^{th} input.

Given the usual concavity conditions on the production function, it follows that

$$\frac{\partial D_{OLFW}}{\partial P_{OLFW}} < 0.$$

That is, given all other prices, an increase in the price of operator's labour in farm work will result in a decrease in the quantity of operator's labour demanded; the operator faces a downward-sloping demand for labour in farm work. If capital, hired labour, and other variable inputs are each substitutes (complements) for the operator's labour in farm work, an exogenous increase in any one of P_K, P_{HL}, or P_{VIN} will shift the demand for operator's labour in farm work to the right (left).

In the off-farm labour market, the operator is viewed to be a price-taker in the market for off-farm jobs. It is assumed that the operator is able to work as many hours in an off-farm job as are desired at the available wage rate. The net off-farm wage available to the operator is determined by three basic factors:

1. The (time and money) cost of commuting to the off-farm job. The money wage received minus the time and money cost of commuting equals the net return to off-farm work.
2. The occupational group which the operator is able to enter (which is determined by the job skills of the operator[3]).
3. The wage level in that occupational group or, more correctly, the expected wage level in that occupation. The expected wage could be viewed as the wage weighted by the probability of obtaining a job in that occupation.

See footnote(s) on page 40.

The demand for operator's labour in off-farm work can be written as,

$$D_{OLOFW} = D_{OLOFW} \left[E \left\{ P_{OLOFW} (sk) \right\} - c \right] \qquad (2.3)$$

This is a function of the expected wage, $E(P_{OLOFW})$, which itself is a function of operator skills, sk, minus the cost of commuting, c. The lower the cost of commuting is, the greater the demand for off-farm work facing the operator; the more qualifications, skills, or training possessed by the operator, the more remunerative will be the occupation attained; and the stronger the demand is for that occupation relative to supply, the higher the probability of obtaining a job in that occupation.

The operator is assumed to have no preference between farm and off-farm work if the return for the marginal unit of work is the same. The total demand for labour curve facing the operator is composed of a downward-sloping demand for labour in farm work, VV_1 (Chart 2.1) and a horizontal demand for labour in off-farm work, ZZ_1. The result is that the effective total demand for labour curve facing the operator is the kinked curve, VXZ_1.

2.4. Supply of Operator's Labour

The operator is postulated to maximise a utility function where utility is determined by the level of consumption, C; the amount of operator's leisure, LeO; and the amount of leisure of the operator's spouse, LeS:[4]

$$U = U (C, LeO, LeS) \qquad (2.4)$$

Utility is maximised subject to the budget constraint:

$$\text{full income} = \text{full expenditure.} \qquad (2.5)$$

Full income is:

$$NEI + w_{SL} \bar{L}_{SL} + P_{OL} \bar{L}_{OL} \qquad (2.6)$$

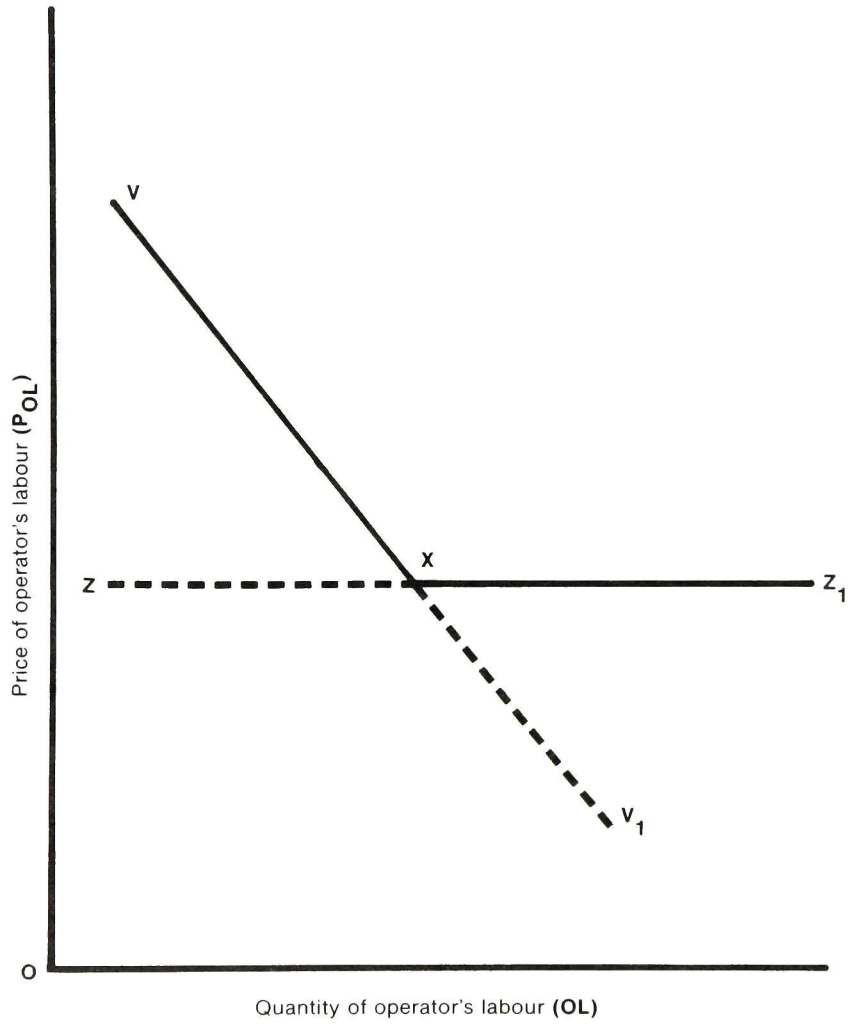
where[5] NEI is non-earned income;[6]

w_{SL} is the (parametric) wage rate faced by the operator's spouse;

See footnote(s) on page 40.

Chart — 2.1

The Kinked Demand for Labour Curve (Solid line)



P_{OL} is the value of the marginal hour of the operator's time;

$\bar{L}_{SL}$ is the total number of hours available for work and leisure in a year for the operator's spouse; and

$\bar{L}_{OL}$ is the total number of hours available for work and leisure in a year for the operator.

Full expenditure is:

$$P_C C + w_{SL} (LeS) + P_{OL} (LeO) \tag{2.7}$$

where P_C is the price of the consumption good.

Substituting Equations 2.6 and 2.7 into 2.5 gives the following budget constraint:

$$NEI + w_{SL} \bar{L}_{SL} + P_{OL} \bar{L}_{OL} = P_C C + w_{SL} (LeS) + P_{OL} (LeO) \tag{2.8}$$

by recognising,

$$OL + LeO = \bar{L}_{OL}$$

$$SL + LeS = \bar{L}_{SL}$$

Equation 2.8 can be simplified to:

$$P_C C = NEI + w_{SL} SL + P_{OL} OL \tag{2.9}$$

Maximising the utility function, Equation 2.4, subject to the budget constraint, Equation 2.9, the operator's total supply of labour function, S_{OL}, is obtained:

$$S_{OL} = S_{OL} (P_C, w_{SL}, P_{OL}, NEI) \tag{2.10}$$

If the substitution effect of a change in P_{OL} is greater than the income effect, then

$$\frac{\partial S_{OL}}{\partial P_{OL}} > 0.$$

That is, given all other prices, an increase in the value of the marginal

unit of operator's time results in an increased supply of labour; the operator has an upward-sloping supply of labour curve.

2.5. Equilibrium Quantity of Hours Worked

The equilibrium quantity of hours worked is indicated by the usual intersection of the demand and supply curves for operator's labour. If the upward-sloping supply of labour curve, S_{OL}, intersects the kinked demand for labour curve facing the operator to the left of the kink, the operator reports no off-farm work (Chart 2.2). The total number of hours worked in the year are OA (all on the farm) and the return to the marginal hour of farm work is Ow_A.

If the supply of labour curve cuts the kinked demand curve to the right of the kink, the operator reports some off-farm work (Chart 2.3). The total number of hours worked in the year are OB where OC hours are worked on the farm and OB - OC are worked off the farm. The return to the marginal hour of farm work equals the off-farm wage which is Ow_B.

Thus, the total number of hours worked, the number of hours worked on the farm, the number of hours worked off the farm, and the labour return per marginal hour of work all depend on the relative position of the demand for the operator's labour on the farm, VV_1, the demand for the operator's labour off the farm, ZZ_1, and the operator's supply of labour curve, S_{OL}. Some comparative static analyses will illustrate the situation.

The greater the demand for the operator's labour on the farm (i.e., the further to the right is VV_1), the greater will be the number of hours worked on the farm. If the operator reports some off-farm work (Chart 2.3), the amount of work on the farm is determined by the intersection of the demand for on-farm work, VV_1, and the demand for off-farm work, ZZ_1. If the operator reports no off-farm work (Chart 2.2), the amount of farm work is determined by the intersection of the demand for on-farm work, VV_1, and the supply of labour curve, S_{OL}.

The greater the demand for off-farm work (i.e., the higher is

Chart — 2.2

Equilibrium Solution with no Off-farm Work

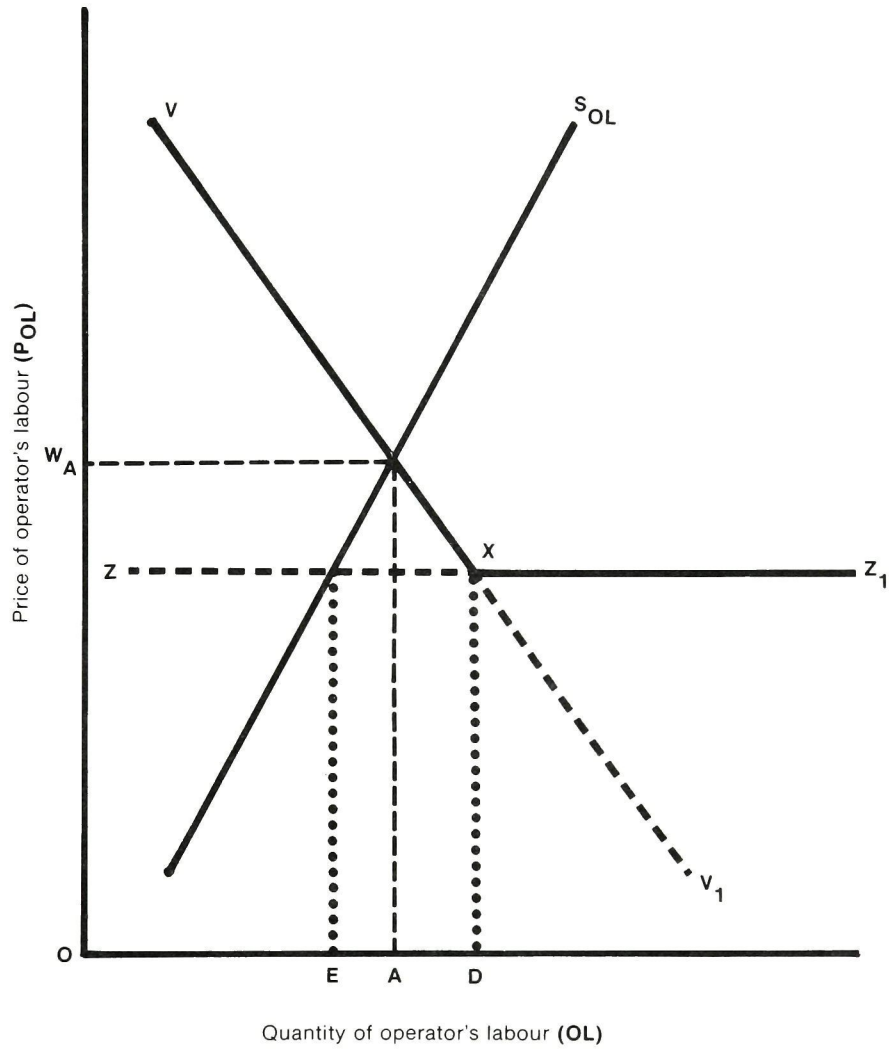
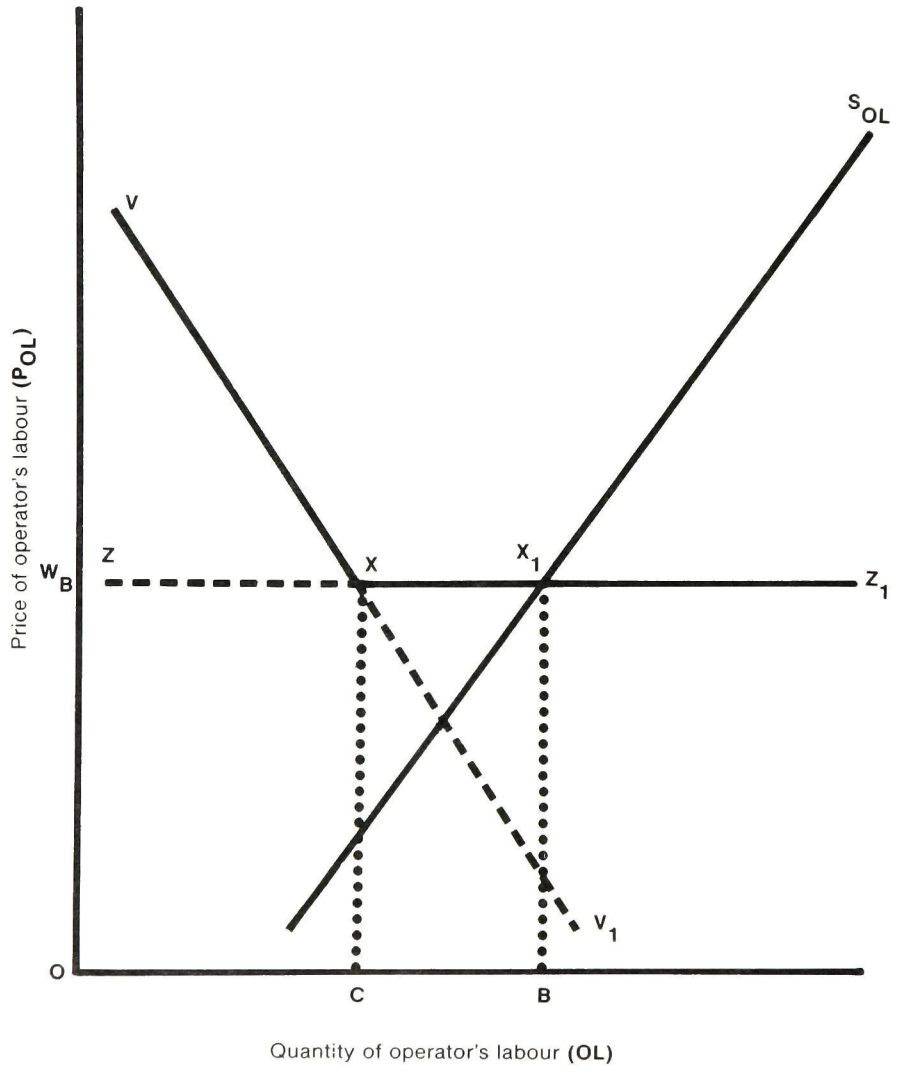


Chart — 2.3

Equilibrium Solution with Some Off-farm Work



ZZ_1), the greater is the total number of hours worked[7] and the smaller is the number of hours worked on the farm. Note that some farm work will be reported unless the demand for off-farm work, ZZ_1, cuts the vertical axis at a higher point than the demand for farm work, VV_1, cuts the vertical axis. Note also that the demand for off-farm work has an influence on the total number of hours worked only if some off-farm work is reported.

The smaller the operator's supply schedule for labour (i.e., the further S_{OL} is to the left), the less is the total number of hours worked. A shift to the left in the supply of labour curve will not reduce the amount of farm work if some off-farm work is reported. Thus, only off-farm work is reduced in this case.

Before proceeding, one important issue must be clarified. It is postulated that two types of labour are input to farm production: self-employment entrepreneurial labour and hired labour. It is assumed that self-employment labour can only be supplied by the individual to the individual's own firm. Any management skills which are purchased are considered to be hired labour. Since only the operator can provide the self-employment labour (and the downward-sloping demand function, VV_1, is a demand for self-employment or entrepreneurial labour), the equilibrium amount of entrepreneurial labour (determined by the intersection of VV_1 with ZZ_1 or with S_{OL}) must be supplied by the operator. Specifically, the operator cannot, by assumption, hire labour to act as entrepreneurial labour and thus the farm cannot be operated with OD hours of hired entrepreneurial labour while the operator works OE hours at an off-farm job (Chart 2.2). The implication of this assumption is that the operator faces a sequential problem: first, the optimal quantity of self-employment work by the operator in farm work is determined; then the optimal quantity of off-farm work is determined.

See footnote(s) on page 40.

2.6. Summary

An economic model has been developed to explain and analyse the participation of self-employed farmers in off-farm work. The farm operator is postulated to face a downward-sloping demand for on-farm labour and a horizontal demand for off-farm labour. Thus, the effective demand for labour curve faced by farm operators is kinked.

If the total supply of labour cuts the kinked demand for labour curve to the left of the kink, the operator participates only in farm work and the intersection determines the marginal value of time and the total quantity of work. Note that the opportunity off-farm wage is irrelevant in this case.

If the total supply of labour cuts the kinked demand for labour curve to the right of the kink, the operator participates in some off-farm work. The intersection of the horizontal demand for off-farm work curve and the total supply of labour curve determines the total quantity of work; the demand for on-farm work curve is irrelevant in this case. The intersection of the downward-sloping demand for on-farm work curve and the horizontal demand for off-farm work curve determines the quantity of farm work; the total supply of labour is irrelevant in this case. The difference between the total quantity of work and the quantity of farm work gives the quantity of off-farm work.

A major conclusion from the analysis is that off-farm work by farmers can exist in a perfect markets equilibrium. Off-farm work does not necessarily exist because of market imperfections.

The labour force participation rates of all individuals in the economy with some (market or non-market) self-employment activity must be analysed differently from individuals with no self-employment activity. Specifically, the variables determining the position of the demand for labour in self-employment activity are an important consideration for the former group but are redundant for the second group. In the case of farmers, the available off-farm wage has no influence on the quantity of farm work if the farmer does no off-farm work. Therefore, research studies and cost of production formulae should only utilise

an off-farm wage to indicate the value of the operator's time if the operator does some off-farm work.

The net supply of labour to wage activity is potentially a kinked function for all individuals in the economy (see Figure 3.4 in Bollman, 1978b). The analysis of the elasticity of the supply of labour to wage activity must recognise that the elasticity of the demand for labour in the self-employment activity influences the net supply of labour to the wage activity below the kink.

The concept of a kinked demand for labour curve suggests that multiple jobholding can exist in a perfect markets equilibrium -- the existence of market imperfections are not necessary to observe multiple jobholding.

The implications of a backward-bending supply of labour curve are discussed in Bollman (1978b). Contrary to the case of a forward-sloping supply of labour function, an increase in the wage rate may decrease the total quantity of work. However, the quantity of work in the wage activity may increase if the quantity of work in the self-employment activity is reduced more than the total quantity of work.

In the case of farmers, the relaxation of the assumptions of the perfectly competitive model may increase or decrease the probability of reporting off-farm work. For example, the existence of a difference in farm and off-farm work, the existence of uncertainty, and the existence of different farm enterprise types may each increase or decrease the probability of reporting off-farm work.

Some off-farm jobs require that the operator work a standard number of hours per week. If the standard workweek is less than desired at the given off-farm wage, then contrary to the earlier results, the total quantity of work is determined by the intersection of the demand for on-farm labour curve and the total supply of labour curve (see Section 3.11.1 in Bollman, 1978b).

Within a given day, an increase in commuting costs does not

influence the quantity of farm work if some off-farm work continues to be reported. The total quantity of work (and quantity of off-farm work) may increase or decrease. However, if the increase in commuting costs is large enough, participation in off-farm work may cease and a large increase in farm work would be expected to take place. An increase in commuting costs does raise the number of days within a given year which the operator works on the farm (see Section 3.11.2 in Bollman, 1978b).

It is expected that the trend to larger, and therefore fewer farms will continue, at least in the Prairies. This implies that commuting distances to off-farm jobs will increase. However a larger farm in terms of a higher level of output does not necessarily imply a greater demand for the operator's labour on the farm (see Section 3.14 in Bollman, 1978b). Thus, the net available off-farm wage will fall if commuting distances increase but the demand for the operator's on-farm labour may increase or decrease as farm size increases. If the latter case prevails (i.e., a decrease in demand for the operator's on-farm labour as farm size increases), it implies that farm operators may choose to live near off-farm jobs because the cost of commuting to the farm may be less than the cost of commuting to the off-farm job.

The implications of recognising different farm enterprises were discussed in Section 3.15 in Bollman, 1978b. In general, the seasonal pattern of labour requirements on the farm differs among different farm enterprises. Thus, operators of different types of farms will face different demand for on-farm labour functions and they will face different demand for off-farm labour functions because there will be only a certain set of occupations that they can consider given the on-farm work requirements. (The choice of type of farm enterprise is essentially endogenous with the choice of off-farm occupation because the available off-farm occupation will also influence the type of farm enterprise chosen.)

The theoretical framework was utilised to develop a definition

of a farmer, a census-farm operator, a part-time farmer, and three variants of an individual with the major source of income being from farming (see Section 3.13 in Bollman, 1978b).

Finally, the situation was illustrated in which rural development programs may increase the productivity of farmers and, at the same time, increase off-farm work among farmers (see Section 3.14 in Bollman, 1978b). The observation that an individual is a part-time farmer does not, in itself, indicate anything about the productivity of that farm unit. Thus, there is no theoretical basis to argue the need for the adjustment of part-time farmers out of farming or towards full-time farming. Forcing part-time farmers either to stop farming or to start full-time farming may cause an inefficient use of resources.

FOOTNOTES

1 A summary of the background literature on labour supply, multiple jobholding, and off-farm work by farmers in Canada and the United States is presented in Bollman (1978b), Chapter 2.

2 The multivariate analysis in Chapter 6 recognises different production functions among different types of farms and estimates separate equations for operators of each type of farm enterprise.

3 Two other factors regarding the occupational group which the operator is able to enter and which are not taken into account by this specification are the extent to which the non-farm labour force is unionised and the certification requirements of the non-farm labour market.

4 This formulation abstracts from the labour/leisure considerations introduced by the presence of offspring. In general, a household utility function can be visualised whereby total consumption and the amount of leisure of the respective household members are the elements in the utility function being maximised. For example, see Becker (1974).

5 Note that the leisure hours of the operator and the operator's spouse are (arbitrarily) valued at their respective opportunity rates.

6 For the purpose of this analysis, non-earned income is assumed to be constant (see Appendix 4 in Bollman, 1978b).

7 This assumes an upward-sloping supply of labour curve. The opposite result is obtained if the supply of labour curve is backward-bending (Bollman, 1978b, Section 3.10).

CHAPTER 3

THEORY OF PROBABILITY RESPONSE MODELS

3.1. Introduction

This chapter has two purposes. The first is to derive an equation to estimate the probability that a census-farm operator reports some off-farm work (Section 3.2). The focus of the empirical analysis of this study is on the participation of farmers in off-farm work (or the probability that a given farmer reports some off-farm work) because of the difficulty of measuring the quantity of labour in farm and off-farm work (see Chapter 5). At the micro or individual level of observation, an operator is either working off the farm or is not working off the farm. Thus, the observation of whether or not the operator reported off-farm work is a binary or dichotomous observation. The reporting of off-farm work is the dependent variable in the estimating equation to determine the characteristics associated with off-farm work and to estimate the impact of a change in any of the characteristics on the probability of reporting off-farm work. Given the set of estimated parameters for the characteristics in the estimating equation, the probability of off-farm work can be calculated for any given set of operator characteristics. The ability to calculate the response in the probability of reporting off-farm work owing to a change in any one of the operator characteristics (i.e., independent variables) gives the title "probability response model". The second purpose of this chapter is therefore to discuss the econometric theory of probability response models. Three models are reviewed; the linear, probit and logit models.

3.2. Model to Explain the Participation of Farmers in Off-farm Work[1]

Labour force participation rates in general have been subjected to considerable analysis (e.g., Bowen and Finegan, 1969; Cain and Watts, 1973). The theoretical discussion in these studies indicates the variables to be

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See footnote(s) on page 49.

included in a study of participation rates. However, the equation to explain the participation rates has never been derived. The purpose of this section is to derive explicitly an equation to explain the participation of farmers in off-farm work. Two alternative methods are presented; both methods result in the same estimating equation.

The probability of reporting off-farm work or the participation rates in off-farm work can be evaluated in terms of either the quantities of labour at a given wage, or wages at a given quantity of labour.

Following the first approach, the probability of off-farm work, Pr(OFW), is equal to the probability that the total quantity of labour supplied, S_{OL}, is greater than the quantity of labour demanded for on-farm work, D_{OLFW}, evaluated at the exogenous wage rate, P_{OLOFW} (which is the horizontal function, D_{OLOFW}):

$$Pr(OFW) = Pr\left[(S_{OL} > D_{OLFW}) \mid D_{OLOFW}\right] . \tag{3.1}$$

Since $S_{OL} - D_{OLFW}$ is the net supply of labour to off-farm work, Equation 3.1 states that Pr(OFW) is positive if the net supply of labour to off-farm work is positive at the off-farm wage rate. That is,

$$Pr(OFW) = Pr\left[(S_{OL} - D_{OLFW} > 0) \mid D_{OLOFW}\right] . \tag{3.2}$$

To simplify, the demand and supply equations (Equations 2.2, 2.3 and 2.10) are written in linear form as follows:

$$D_{OLFW} = \alpha_0 + \alpha_1 P_Y + \alpha_2 P_K + \alpha_3 P_{VIN} + \alpha_4 P_{HL} + \alpha_5 P_{OLFW} + e \tag{3.3}$$

$$D_{OLOFW} = \beta_0 + \beta_1 E(P_{OLOFW}) - \beta_2 c + u \tag{3.4}$$

$$S_{OL} = \gamma_0 + \gamma_1 P_C - \gamma_2 w_{SL} + \gamma_3 P_{OL} - \gamma_4 NEI + v \tag{3.5}$$

where α_i, β_i, and γ_i represent the structural parameter for the i^{th} variable and e, u, and v are stochastic error terms.

By evaluating Equations 3.3 and 3.5 at P_{OLOFW} (i.e., substituting Equation 3.4 for P_{OLFW} in Equation 3.3 and P_{OL} in Equation 3.5) and then substituting into Equation 3.2, one obtains:

$$\begin{aligned}
Pr(OFW) = Pr \Big[& \gamma_0 + \gamma_1 P_C - \gamma_2 w_{SL} + \gamma_3(\beta_0 + \beta_1 E(P_{OLOFW}) - \beta_2 c + u) \\
& - \gamma_4 NEI + v - (\alpha_0 + \alpha_1 P_Y + \alpha_2 P_K + \alpha_3 P_{VIN} + \alpha_4 P_{HL} \\
& + \alpha_5(\beta_0 + \beta_1 E(P_{OLOFW}) - \beta_2 c + u) + e) > 0 \Big]
\end{aligned}$$

$$\begin{aligned}
Pr(OFW) = Pr \Big[& \gamma_0 + \gamma_3\beta_0 - \alpha_0 - \alpha_5\beta_0 + \gamma_1 P_C \\
& - \gamma_2 w_{SL} + \gamma_3\beta_1 E(P_{OLOFW}) - \alpha_5\beta_1 E(P_{OLOFW}) - \gamma_3\beta_2 c \\
& + \alpha_5\beta_2 c - \gamma_4 NEI - \alpha_1 P_Y - \alpha_2 P_K - \alpha_3 P_{VIN} - \alpha_4 P_{HL} > \\
& - \gamma_3 u - v + \alpha_5 u + e \Big]
\end{aligned}$$

$$\begin{aligned}
Pr(OFW) = Pr \Big[& (\gamma_0 - \alpha_0 + (\gamma_3 - \alpha_5)\beta_0) + \gamma_1 P_C - \gamma_2 w_{SL} \\
& + (\gamma_3 - \alpha_5)\beta_1 E(P_{OLOFW}) - (\gamma_3 - \alpha_5)\beta_2 c - \gamma_4 NEI \\
& - \alpha_1 P_Y - \alpha_2 P_K - \alpha_3 P_{VIN} - \alpha_4 P_{HL} > (\alpha_5 - \gamma_3)\, u + e - v \Big] \qquad (3.6)
\end{aligned}$$

This equation allows one to analyse the probability of off-farm work as an explicit function of the variables determining the demand and supply functions facing the farm operator.

The alternative approach to derive the probability of off-farm work equation is to compare wages at a fixed quantity of labour. Specifically, consider the quantity of labour where $S_{OL} = D_{OLFW}$ (i.e., the intersection of the total supply of labour curve and the demand for on-farm labour curve) and evaluate whether the equilibrium wage is greater or less than the exogenous off-farm wage, P_{OLOFW}. The probability of off-farm work is equal to the probability that the wage rate, P_{OL}, at the intersection of the total supply of labour curve and the demand for on-farm labour curve is less than the exogenous off-farm wage, P_{OLOFW}. That is,

$$Pr(OFW) = Pr \Big[P_{OL} \mid S_{OL} = D_{OLFW} < P_{OLOFW} \Big] . \qquad (3.7)$$

The result can be shown to be the same as Equation 3.6. Setting S_{OL} (Equation 3.5) equal to D_{OLFW} (Equation 3.3) gives

$$\gamma_0 + \gamma_1 P_C - \gamma_2 w_{SL} + \gamma_3 P_{OL} - \gamma_4 NEI + v = \alpha_0 + \alpha_1 P_Y + \alpha_2 P_K + \alpha_3 P_{VIN} + \alpha_4 P_{HL} + \alpha_5 P_{OLFW} + e \ . \tag{3.8}$$

Solving for the equilibrium wage, P_{OL} $(=P_{OLFW})$, gives

$$\gamma_3 P_{OL} - \alpha_5 P_{OL} = \left[- \gamma_0 - \gamma_1 P_C + \gamma_2 w_{SL} + \gamma_4 NEI - v + \alpha_0 + \alpha_1 P_Y + \alpha_2 P_K + \alpha_3 P_{VIN} + \alpha_4 P_{HL} + e \right]$$

$$P_{OL} = \frac{1}{(\gamma_3 - \alpha_5)} \left[\ . \ \right] \tag{3.9}$$

Substituting Equations 3.9 and 3.4 into Equation 3.7 gives

$$Pr(OFW) = Pr\left[\frac{1}{(\gamma_3 - \alpha_5)} \left[\ . \ \right] < \beta_0 + \beta_1 E(P_{OLOFW}) - \beta_2 c + u \right]$$

$$= Pr\left[\left[\ . \ \right] < (\gamma_3 - \alpha_5)\beta_0 + (\gamma_3 - \alpha_5)\beta_1 E(P_{OLOFW}) - (\gamma_3 - \alpha_5)\beta_2 c + (\gamma_3 - \alpha_5)\, u \right]$$

$$Pr(OFW) = Pr\left[((\gamma_3 - \alpha_5)\beta_0 - \alpha_0 + \gamma_0) + (\gamma_3 - \alpha_5)\beta_1 E(P_{OLOFW}) - (\gamma_3 - \alpha_5)\beta_2 c + \gamma_1 P_C - \gamma_2 w_{SL} - \gamma_4 NEI - \alpha_1 P_Y - \alpha_2 P_K - \alpha_3 P_{VIN} - \alpha_4 P_{HL} > e - v - (\gamma_3 - \alpha_5)\, u \right] \tag{3.6'}$$

Note that Equation 3.6' is exactly the same as Equation 3.6. The empirical analysis in Chapter 6 estimates this probability of off-farm work equation.

Note that although the parameters attached to each variable bear the same symbol in the estimating equation (Equation 3.6) as in the structural model (Equations 3.3, 3.4 and 3.5), the meaning of the parameters has changed. Specifically, in the structural model, the parameters measure the impact on the quantity of labour demanded or supplied, whereas in the

estimating equation (Equation 3.6), the parameters measure the impact on the probability of reporting some off-farm work. Consequently, since the estimated parameters refer to a different dependent variable, the issue of identification[2] does not arise here because it is not possible to translate estimates of the parameters of the estimating equation into estimates of the structural parameters. Although estimates of the structural parameters will not be obtained, it was necessary to begin with the structural model so that the estimating equation could be derived explicitly from the structural model. In addition, the signs obtained for the estimated parameters are the signs of the structural parameters because the signs of the parameters in both the structural model and the estimating equation indicate the direction of the shift in the demand or supply function.

An equation to explain the probability of participating in off-farm work has been derived in this section. The parameters of the equation give the response in the probability of participating in off-farm work due to a change in an independent variable. The next three sections introduce three econometric techniques that can be used to estimate probabiltiy response models.

3.3. The Linear Probability Model

The characteristics of the linear probability model are outlined in Section 4.4 of Bollman (1978b)[3] where the specific problems associated with the application of ordinary least-squares (OLS) linear regression to an analysis of dichotomous dependent variables are discussed. In general, the problem of predicted values lying outside the (0, 1) range can be solved by employing a non-linear function, such as a probit or logit model (discussed below). The fact that a (0, 1) problem is inherently non-linear suggests that any transformation of an OLS equation is inadequate. The problem of the heteroscedastic error term (see Goldberger, 1964, pp. 249-250) can be solved by utilising a weighted or generalised least squares procedure, but this does not solve the first two problems.

See footnote(s) on page 49.

3.4. The Probit Model

The probit model assumes that the threshold point where some off-farm work is reported is normally distributed. Thus, when considering the proportion of census-farm operators who report some off-farm work (i.e., the proportion with the supply of labour curve to the right of the kink in the kinked demand for labour curve), one obtains the cumulative normal distribution function when the size of a positively (negatively) correlated independent variable is increased (decreased). The cumulative normal distribution function (or normal ogive, or normal sigmoid curve) is a monotonic function which rises from zero to one with a point of inflection at the mean (Chart 3.1).[4]

3.5. The Logit Model

The general shape of the logistic transformation is that of the cumulative normal distribution function, except that it differs noticeably from the cumulative normal for extreme (large and small) values of the independent variable (Chart 3.1).[5]

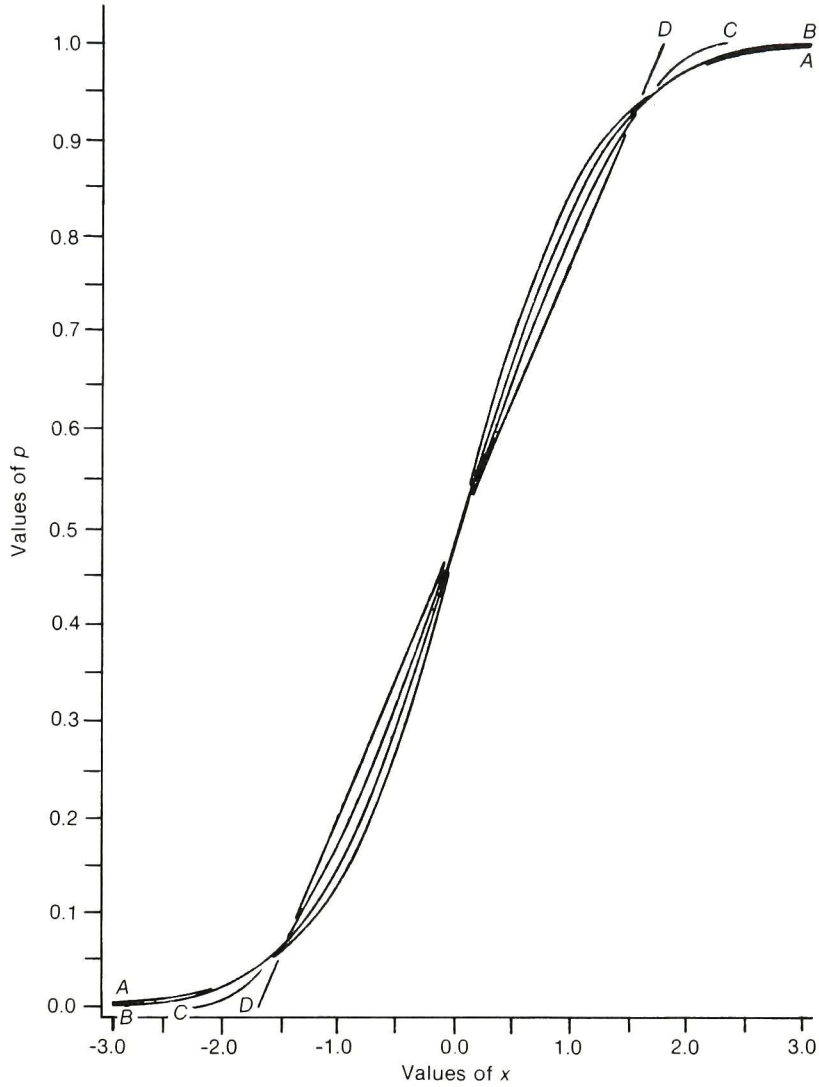
3.6. Comparison of Linear, Probit, and Logit Models

Finney (1964) has compared the linear, probit, and logit models. There is almost no difference between the probit and logit models for probabilities in the range of 0.01 to 0.99 (see Chart 3.1). When probabilities are in the range of 0.05 to 0.95, the linear probability model provides adequate estimates. Some previous studies (see Gunderson, 1972 and 1973) have suggested that any of the three models will give estimated parameters that are surprisingly similar. When the estimated parameters of a linear probability model are compared to the parameters from a theoretically more appealing transformation, the results are almost close enough to provide the same conclusions. As is indicated below, this study is another example of this general conclusion.

See footnote(s) on page 49.

Chart — 3.1

Comparison of Linear, Probit and Logit Models



Relationship between x and P for tolerance distributions with zero mean and unit variance

Curve *A:* Logistic
Curve *B:* Normal
Curve *C:* Angle
Curve *D:* Rectangular

Source: Figure 17.1 in Finney, 1964.

3.7. A Note on Predicting Aggregate Behaviour

The linear, probit and logit models discussed above and estimated in this study in Chapter 6 are designed to explain the behaviour of individuals. This fact should be recognised by analysts who use the results of this study to determine the behaviour of aggregates of individuals. As discussed by Westin (1974), an important question is how to aggregate the predictions for individuals to give predictions of the population. Even if the change in an independent variable is the same for all individuals, the predicted change in the probability will not be constant across all individuals, but will depend on each individual's original probability. The aggregate prediction must incorporate the relative frequency distribution of probabilities for individuals in the population.

3.8. Summary

In this chapter an estimating equation to explain the probability of reporting off-farm work has been derived from the structural model discussed in Chapter 2. Then three econometric techniques to estimate probability response models were introduced. The next chapter presents a detailed investigation of the historical role of part-time farming in the Canadian agricultural sector. The theoretical determinants discussed in Chapter 2 are analysed in a historical context, the trends and structure of off-farm work are reviewed for the 1941-76 period, and the results of other studies of part-time farming in Canada are discussed.

FOOTNOTES

[1] The desirability of implementing Heckman's model (Heckman, 1974) is discussed in Section 4.2. of Bollman (1978b). However, data constraints prevented Heckman's model from being implemented. Photocopies of the section mentioned are available upon request to the author, Agriculture Division, Statistics Canada, Ottawa, K1A OL7.

[2] Identification is the issue of computing the parameters of the structural model from the estimated parameters of the reducted form (see Theil, 1971, pp. 446-449).

[3] In addition, the linear probability model is discussed by Theil (1971, p. 629), Neter and Maynes (1970), Morrison (1972), Goldberger (1973), Buse (1972), Hill (1970), Morgan et al. (1974, p. 377), and Ashenfelten (1966).

[4] The probit model is discussed in Section 4.5 of Bollman (1978b). Also see Hill and Kam (1973) Finney (1964), and Buse (1972).

[5] For a discussion of the logit model, see Section 4.6 of Bollman (1978b), and Buse (1972).

CHAPTER 4

HISTORY OF PART-TIME FARMING IN CANADA: AN OVERVIEW

4.1. Introduction

Part-time farming[1] has always existed in Canada. Louis Hébert, Canada's first farmer of European descent, combined farming with an apothecary practice (Brown, 1942, p. 25). The history of part-time farming in Canada has been discussed extensively in Bollman (1978a). The purpose of this chapter is to summarize the results of the historical analysis.

Section 4.2 contains a review of early references to part-time farming in Canada. It appears that part-time farming was not uncommon in the early years of Canada's development. A summary of trends in part-time farming in Canada in the 1941-76 period is presented in Section 4.3. The incidence of part-time farming has remained relatively constant but there has been a major structural change from part-time off-farm work to full-time off-farm work.

In an attempt to explain the trends in part-time farming, the theoretical determinants of off-farm work summarised in Chapter 2 are analyzed in the historical context in Section 4.4. One theoretical determinant that has changed markedly in the historical context is the cost of commuting.

The participation rate in off-farm work over time is analyzed in Section 4.5 as a function of gross farm sales, type of farm and age of operator. The size of gross farm sales indicates the on-farm demand for labour faced by the operator. The historical analysis of the participation rate in off-farm work by type of farm is important in order to ascertain the stability of the relationship between off-farm work and the production of various food commodities. In addition, if there is a stable relationship, the multivariate analysis in Chapter 6 can base its results by type of farm on the conclusion that differences in participation rates among types of farms are not random but in fact are stable over time. The analysis of the participation rate in off-farm work by age indicates a different conclusion depending upon whether one considers the cross-section or the age cohort

See footnote(s) on page 89.

results.

The distribution of operators by number of days of off-farm work is reviewed in Section 4.6.

The major reason suggested for the high incidence of part-time off-farm work in 1941 is the large participation rate of census-farm operators in agricultural off-farm work, including custom work.[2] The pursuit of this hypothesis is one of the main reasons for investigating in Section 4.7 the off-farm occupation reported by part-time farmers.

The results of the historical analysis are summarised in Section 4.8.

4.2. Early References to Part-time Farming in Canada

Wietfeldt (1976, pp. 207-208) and Steeves (1977b) have noted that although the activities undertaken by farmers have changed over time, farmers have always allocated only part of their time to the production of crops and livestock. In earlier times in Canada, in addition to the cultivation of crops and the care of livestock, farmers allocated considerable time to the processing of food, the manufacture of clothing and the repair and manufacture of tools and equipment. Today, many of these latter activities are pursued by specialists. As a consequence, the time that farmers do not spend on their crops and livestock has now been allocated to off-farm market activities. Although the statistics may show an increase in the allocation of the labour of farmers to off-farm activities, farmers have always allocated only part of their time to the production of crops and livestock.

Early studies by Longley and Chown (1936) and Stewart (1944) noted that many local craftsmen also did some farming and thus were part-time farmers. Local manufacturing persisted until near the end of the 1800's because transportation costs were high and urban manufactured goods were relatively costly. These local craftsmen/part-time farmers disappeared when transportation costs fell and urban goods became less costly.

See footnote(s) on page 89.

Fowke (1946, p.6) and Easterbrook and Aitken (1956, pp. 197-198) discussed the relationship between the timber trade and agriculture. On the St. Lawrence and around the lower lakes, the cutting of timber was incidental to the clearing of land for agricultural production. On the Ottawa River, farming was incidental to the cutting of timber (i.e., farming existed to provide food for the lumber camps). However, since the busiest season for one pursuit was the slack season for the other, individuals often were involved in both the cutting of timber and farming. Benson (1976, p. 117) notes that farming and cutting pulpwood have had a symbiotic relationship in the Rainy River District of northwestern Ontario for two or three generations.

All types of construction activity were potential employment sources (Patton, 1928, p. 123; Buckley, 1955, p. 51; and Fowke, 1961, p. 61). The author's father earned some off-farm income in the late 1930's by helping to dismantle a grain elevator that had been built in a previous period of optimistic growth expectations.

The picture that emerges is that part-time farming has played an important role in the development of both the agricultural and non-agricultural sectors of the economy.

4.3. The Trend in Part-time Farming, 1941-76

In the 1941-76 period, the proportion of census-farm operators[3] reporting "Some Days of Off-farm Work" has remained at about one-third (Chart 4.1). However, a major structural change took place; the proportion of operators reporting a few days of off-farm work decreased and the proportion of operators reporting full-time off-farm work increased.

An examination of the changes between census years reveals that between 1941 and 1951, the number of census-farms declined by 15.0% while the number of operators reporting some days of off-farm work declined by 33.9%. As a result, the per cent reporting off-farm work declined 7.9 percentage points to 27.6% in 1951 (Table 4.1). The pattern was similar in all provinces. Between 1951 and 1961 and between 1961 and 1971, the rate of decline of

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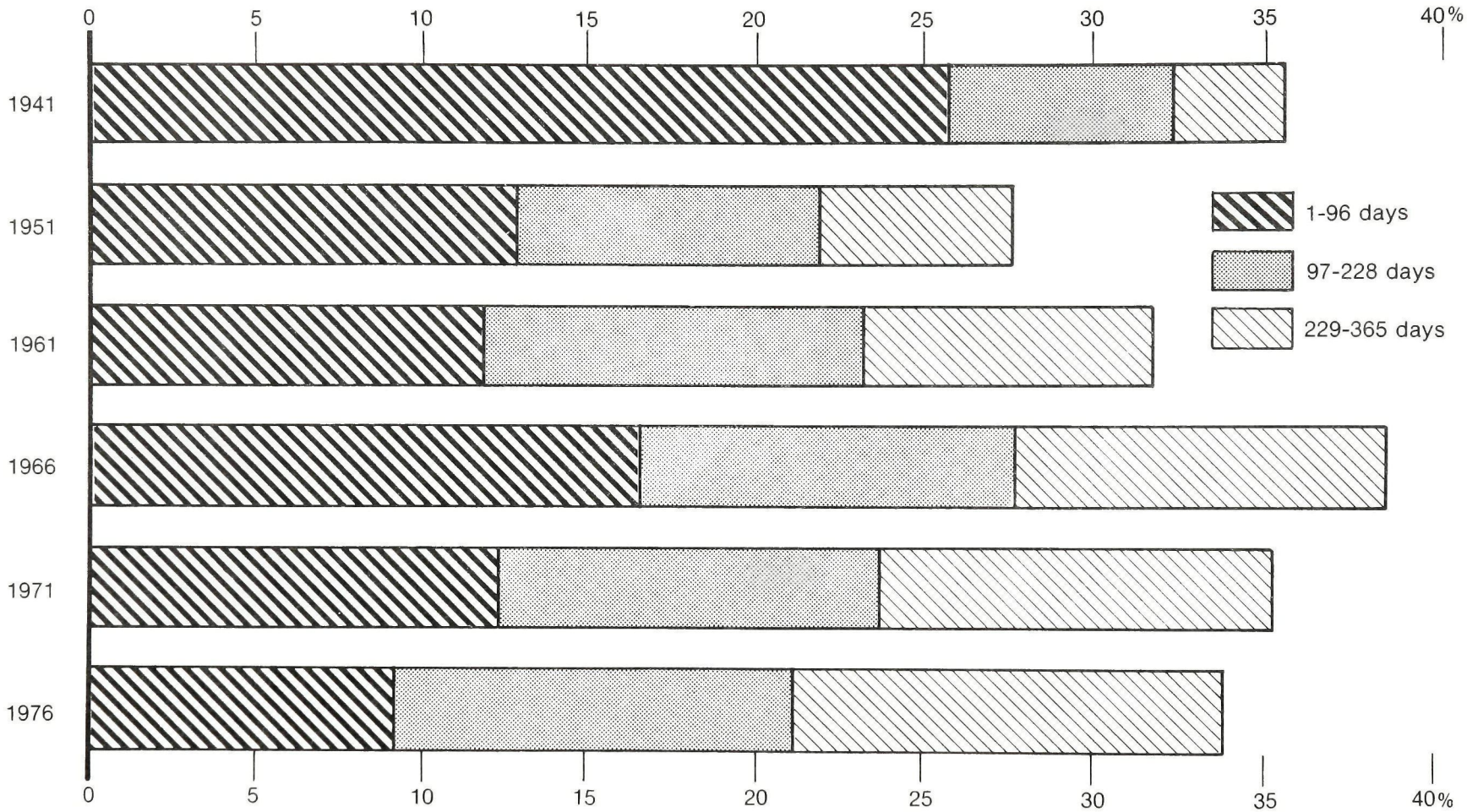
See footnote(s) on page 89.

Chart — 4.1

Per Cent of Census-farm Operators Reporting "Some Days of Off-farm Work" Canada, 1941-76



Source: Statistics Canada, Censuses of Agriculture, 1941-76.

TABLE 4.1. Number and Per cent Change of Census-farm Operators Reporting "Some Days of Off-farm Work", Canada and Provinces, 1941-76

Census year and provinces	Census-farm operators			Census-farm operators reporting "some days of off-farm work"			
	Total	Net change		Total	Net change		Per cent of all census-farm operators
		Number	Per cent (10-year period)		Number	Per cent (10-year period)	
Canada							
1941(1)	732,832	...	...	260,389	...	...	35.5
1951	623,091	-109,741	-15.0	172,092	-88,297	-33.9	27.6
1961	489,903	-142,188	-22.8	153,675	-18,417	-10.7	31.0
1966(2)	430,522	-50,381(2)	...	165,723(2)	12,048(2)	...	38.5
1971	366,128	-114,775	-23.9	129,287	-24,388	-15.9	35.3
1976(2)(3)	338,578	-27,550(2)	...	114,625	-14,662(2)	...	33.9
Newfoundland							
1941(1)	..	..	..	..	..	..	..
1951	3,626	...	...	2,278	...	...	62.8
1961	1,752	-1,874	-51.7	1,004	-1,274	-55.3	57.3
1966(2)	1,709	-43(2)	...	799	-205(2)	...	46.8
1971	1,042	-710	-40.0	378	-626	-62.4	36.3
1976(2)(3)	878	-164(2)	...	332	-46(2)	...	37.8
Prince Edward Island							
1941	12,230	...	...	4,206	...	...	34.4
1951	10,137	-2,093	-17.1	2,988	-1,218	-29.0	29.5
1961	7,355	-2,782	-27.6	2,470	-518	-17.3	33.7
1966(2)	6,357	-998(2)	...	2,729	259(2)	...	42.9
1971	4,543	-2,812	-38.2	1,637	-833	-33.7	36.0
1976(2)(3)	3,677	-866	...	1,346	-291(2)	...	36.6
Nova Scotia							
1941	32,977	...	...	18,454	...	...	56.0
1951	23,515	-9,462	-28.6	12,694	-5,760	-31.2	54.0
1961	12,518	-10,997	-46.7	6,593	-6,101	-48.1	52.7
1966(2)	9,621	-2,897(2)	...	4,942	-1,651(2)	...	51.4
1971	6,008	-6,510	-52.0	2,741	-3,852	-58.4	45.6
1976(2)(3)	5,434	-574(2)	...	2,429	-312(2)	...	44.7
New Brunswick							
1941	31,889	...	...	17,882	...	...	56.1
1951	26,431	-5,458	-17.1	13,555	-4,327	-24.2	51.3
1961	11,786	14,645	-55.4	5,825	-7,730	-57.0	49.4
1966(2)	8,706	-3,080(2)	...	4,246	-1,579(2)	...	48.8
1971	5,485	-6,301	-53.4	2,328	-3,497	-60.0	42.4
1976(2)(3)	4,551	-934(2)	...	1,829	-499(2)	...	40.2
Quebec							
1941	154,669	...	...	62,125	...	...	40.2
1951	134,336	-20,333	-13.1	45,523	-16,602	-26.7	33.9
1961	95,777	-38,559	-28.7	37,158	-8,365	-18.4	38.8
1966(2)	80,294	-15,483(2)	...	40,062	-2,904(2)	...	50.0
1971	61,257	-34,520	-36.0	20,486	-16,672	-44.9	33.4
1976(2)(3)	51,587	-9,670(2)	...	15,757	-4,729(2)	...	30.5

See footnote(s) at end of table.

TABLE 4.1. Number and Per cent Change of Census-farm Operators Reporting "Some Days of Off-farm Work", Canada and Provinces, 1941-76 (concluded)

Census year and provinces	Census-farm operators			Census-farm operators reporting "some days of off-farm work"			
	Total	Net change		Total	Net change		Per cent of all census-farm operators
		Number	Per cent (10-year period)		Number	Per cent (10-year period)	
Ontario							
1941	178,204	..	...	50,804	...	...	28.5
1951	149,920	-28,284	-15.9	39,776	-11,028	-21.7	26.5
1961	121,333	-28,587	-9.1	42,584	2,808	7.1	35.1
1966(2)	109,887	-11,446(2)	...	45,241	2,657(2)	...	41.2
1971	94,722	-26,611	-21.9	40,499	-2,085	-4.8	42.8
1976(2)(3)	88,801	-5,921(2)	...	36,096	-4,403(2)	...	40.6
Manitoba							
1941	58,024	...	...	16,960	...	...	29.2
1946(2)	54,448	-3,576(2)	...	12,942	-4,018(2)	...	23.8
1951	52,383	-5,641	-9.7	9,454	-7,506	-44.3	18.0
1961	43,306	-9,077	-17.3	10,516	1,062	11.2	24.3
1966(2)	39,747	-3,559(2)	...	11,609	1,093(2)	-	29.2
1971	34,981	-8,325	-19.2	10,802	286	2.7	30.9
1976(2)	32,104	-2,877(2)	...	9,288	-1,514(2)	...	28.9
Saskatchewan							
1941	138,713	...	...	44,226	...	...	31.9
1946(2)	125,612	-13,101(2)	...	25,129	-19,097(2)	...	20.0
1951	112,018	-26,695	-19.2	18,655	-25,571	-57.8	16.6
1961	93,924	-18,094	-16.2	18,719	64	0.3	19.9
1966(2)	85,680	-8,238(2)	...	23,444	4,725(2)	...	27.4
1971	76,970	-16,954	-18.0	19,926	1,207	6.4	25.9
1976(2)	70,958	-6,012(2)	...	16,673	-3,253(2)	...	23.5
Alberta							
1941	99,732	...	...	34,098	...	...	34.2
1946(2)	89,541	-10,191(2)	...	19,674	-14,424(2)	...	22.0
1951	84,315	-15,417	-15.4	16,378	-17,720	-52.0	19.4
1961	73,212	-11,103	-13.1	19,125	2,747	16.8	26.1
1966(2)	69,411	-3,801(2)	...	23,100	3,975(2)	...	33.3
1971	62,702	-6,709	-14.3	21,149	2,024	10.6	33.7
1976(2)	61,130	-1,572(2)	...	21,221	72(2)	...	34.7
British Columbia							
1941	26,394	...	...	11,634	...	...	44.1
1951	26,406	12	0.0	10,788	-846	-7.3	40.8
1961	19,934	-6,472	-24.5	9,665	-1,123	-10.4	48.5
1966(2)	19,085	-849(2)	...	9,542	-123(2)	...	50.0
1971	18,400	-1,534	-7.7	9,331	-211	-3.5	50.7
1976(2)	19,432	1,032(2)	...	9,640	309(2)	...	49.6

.. not available.
... not applicable.
(1) Newfoundland joined Canada in 1949.
(2) The net change is calculated for the preceding five-year period.
(3) The 1976 figures represent all agricultural holdings with $50 or more of gross sales.
Source: Canada, Statistics Canada, Censuses of Agriculture, 1941-76.

census-farms was greater than the rate of decline of operators reporting some days of off-farm work. Consequently, the per cent reporting off-farm work increased to 31.0% in 1961 and to 35.3% in 1971. In 1966, the number of operators decreased by 50,381 from 1961 but the number reporting off-farm work actually increased by 12,048 operators. The result was the peak in the proportion of census-farm operators reporting off-farm work -- 38.5%.

The emphasis in the historical and multivariate analysis in this study is on the participation rate of farmers in off-farm work. An alternative measure of the quantity of labour allocated to off-farm work by farmers is to calculate the average days of off-farm work for all operators. From 1941 to 1976, the average days of off-farm work increased from 26.8 days to 58.3 days (Table 4.2). If one assumes 299 working days per year,[4] these figures indicate that the proportion of farm operator labour allocated to off-farm work has doubled from 9.0% in 1941 to 19.5% in 1976. The largest allocation of operator labour to off-farm work in 1976 was British Columbia with 95.9 days (32.1%), on average, of off-farm work. Nova Scotia was the next largest with 82.8 days (27.7%) of off-farm work, on average. The smallest allocation was in Saskatchewan, Manitoba and Quebec with each reporting less than 50 days (less than 16.7%) of off-farm work, on average.

Ontario and each of the four western provinces reported a continuous increase in the allocation of operator labour to off-farm work in the 1941 to 1976 period (since 1935 for the Prairie provinces). The peak in the allocation of operator labour to off-farm work in Quebec and Prince Edward Island occurred in 1966. In Nova Scotia and New Brunswick, the peak occurred in 1961. In Newfoundland, allocation of operator labour to off-farm work has been continuously decreasing since 1950.

The shift from farm to off-farm work by the farm operator workforce can be considered to be one component of the overall shift of human resources from the farm to the non-farm sector of the economy. For example, Szabo (1965) found that the decline in the farm population of a census division in the 1951-61 period was positively correlated with the proportion of operators reporting some days of off-farm work. The shift in

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See footnote(s) on page 89.

TABLE 4.2. Average Number of Days of Off-farm Work Reported by All Census-farm Operators, Canada and Provinces, 1936-76

Province	January 1, 1935 to December 31, 1935 (1)	January 1, 1940 to December 31, 1940	January 1, 1945 to December 31, 1945 (1)	January 1, 1950 to December 31, 1950	June 1, 1960 to May 31, 1961	June 1, 1965 to May 31, 1966	January 1, 1970 to December 31, 1970	June 1, 1975 to May 31, 1976 (2)
Canada	..	26.8	..	35.1	47.2	53.4	54.5	58.3
Newfoundland	..	..	..	99.0	94.7	69.1	61.0	61.5
Prince Edward Island	..	19.6	..	32.6	48.6	61.0	53.9	59.0
Nova Scotia	..	55.6	..	73.6	83.2	78.0	76.3	82.8
New Brunswick ...	..	61.2	..	74.4	83.3	75.1	69.2	69.3
Quebec	..	36.9	..	43.7	50.7	59.3	46.0	48.1
Ontario	..	25.9	..	38.1	58.2	67.6	73.7	77.2
Manitoba	9.8	15.5	15.4	19.4	32.8	37.8	44.0	45.0
Saskatchewan	6.1	9.9	7.9	12.3	25.5	30.3	33.1	34.3
Alberta	10.2	16.2	14.4	20.4	36.5	43.6	50.5	59.0
British Columbia	..	48.7	..	68.3	90.2	92.7	94.3	95.9

.. not available.
(1) The 1936 and 1946 Censuses of Agriculture were enumerated only in the Prairie provinces.
(2) The 1976 figures represent all agricultural holdings with $50 or more of gross sales.
Source: Canada, Statistics Canada, Censuses of Agriculture, 1936-1976.

population from the farm to the non-farm sectors has been large in recent decades. In the period from 1941 to 1976, the proportion of the total population residing on farms[5] declined from 26.2% to 5.3% (Table 4.3).

TABLE 4.3. Rural(1) and Rural Farm(2) Population as a Proportion of Total Population, Canada, 1871-1976

Year	Total population	Per cent rural(1)	Per cent rural farm(2)
	(,000)		
1871	3,689	81.7	..
1881	4,325	76.7	..
1891	4,833	70.2	..
1901	5,371	65.1	..
1911	7,207	58.2	..
1921	8,788	52.6	..
1931	10,377	47.5	32.0
1941	11,507	44.3	26.2
1951	14,009	37.6	19.7
1961	18,238	30.3	11.8
1971	21,568	23.9	6.6
1976	22,993	24.5	5.3

.. not available.

(1) The rural population is:
   (a) for the 1871-1911 period, individuals not living in incorporated cities, towns, and villages of 1,000 or over; and
   (b) for the 1921-76 period, individuals not living in incorporated or unincorporated cities, towns or villages of 1,000 or over plus individuals not living in suburbs with a population density of 1,000 persons or more per square mile.

(2) The rural farm population is all individuals who live on census-farm in rural areas. (The 1976 rural farm population is based on the 1971 definition of a census-farm; see Table A2.1 in Bollman, 1978b.)

Source: Canada, Statistics Canada, Perspective Canada, Catalogue No. 11-507, 1974, Table 1.1, p. 5 and unpublished data from the 1976 Census of Agriculture.

See footnote(s) on page 89.

Data on the ratio of the earnings from off-farm and farm work also indicate that the labour of farmers is shifting from farm to off-farm work. From 1940 to 1958 to 1971, the ratio of average off-farm earnings to average net farm income has increased from 0.18 to 0.36 to 0.74, respectively (Table 4.4). These ratios are only approximate because the data are not strictly comparable, as documented in Table 4.4. However, the trend towards an increased reliance by farmers on off-farm earnings in this period suggests that policy-makers should consider both farm and off-farm income when formulating policies to stabilise or increase the income of farmers.

TABLE 4.4. Ratio of Off-farm to Net Farm Earnings of Census-farm Operator Families, Canada, 1940, 1958 and 1971

Year	Average family off-farm employment income	Average realised net farm income	Ratio of off-farm to net farm earnings
	$	$	
1940.....	97(1)	529(2)	0.18
1958.....	839(3)	2,344(3)	0.36
1971.....	2,980(4)	4,013(2)	0.74

(1) Gross returns from outside work.

(2) Calculated by dividing number of census farm operators into the aggregate realized net farm income (see question 8a in Table A.1.).

(3) Average incomes for single-family farms.

(4) Wages and salaries plus non-farm self-employment income of all members of census-farm operator families.

Source: Canada, Statistics Canada, 1941 Census of Agriculture, Table 47; Farm Net Income, Annual, Catalogue No. 21-202; Fitzpatrick and Parker, 1965; Bollman, 1973.

4.4. Theoretical Considerations

The theoretical variables that explain the existence of part-time farming have been summarised in Chapter 2. The changes in these variables over time and the impact of these changes on part-time farming are discussed in this section.

The first census to obtain data on off-farm work by farmers across Canada was the 1941 Census of Agriculture. The 1941 Census also represents the time period when Canada had its largest number of farm units. By 1976, the number of farms[6] was less than one-half the number in 1941 (Table 4.5). The average acreage per farm in 1976 was double the 1941 level, while gross farm sales per farm were 18 times the 1941 level and investment per farm was 29 times the 1941 level (Table 4.5). The increase in output per farm (measured by gross sales) represents an increased demand for operator's labour on the farm, if technology remains unchanged. However, technological change has allowed farmers to produce an increased output with the same labour input. Thus, because of the inelastic demand for food, technological change has restrained the demand for on-farm labour and has therefore freed operator's time for leisure or off-farm work.

One important indicator of technological change is the mechanisation of Canadian farms. Some tractors and trucks were in use in 1921 while grain combines gained prominence in the following decades. However, the average number of tractors per farm did not reach one until the 1950's, the number of trucks per farm did not reach one until the 1960's and the number of grain combines per farm was less than one in 1976 (Table 4.5). These indicators of mechanisation are important for at least two additional reasons. One minor reason is that power machinery eliminated the necessity of keeping horses through the winter and thus it was not mandatory for the grain farmer to remain on the farm throughout the winter to care for the horses. The second reason is that during the period when farmers were converting from horse-drawn to power machinery, the owners of power machinery experienced considerable demand for custom work services (such as ploughing, planting and

See footnote(s) on page 89.

TABLE 4.5. Trends in the Agriculture Sector, Canada, 1921-76

Item	1921	1931	1941	1951	1961	1971	1976(2)
Index of number of farms(1) (1941=100)	97	99	100	85	66	50	46
Index of number of owner-occupied farms (1941=100)	111	106	100	87	64	46	..
Index of average acreage of farms (1941=100)	83	94	100	118	151	195	211
Index of average improved acreage per farm (1941=100) ..	79	94	100	123	169	236	258
Index of average capital investment per farm (1941=100)	..	124	100	264	473	1,135	2,912
Index of average gross sales per farm (1941=100)	..	52	100	361	501	1,027	1,850(3)
Average number of tractors per farm	0.07	0.14	0.22	0.64	1.14	1.63	1.87
Average number of trucks per farm	0.03(4)	0.07	0.11	0.31	0.63	1.01	1.31
Average number of combines per farm	..	0.01	0.03	0.15	0.32	0.45	0.48

.. not available.
(1) The definition of a farm in each Census is presented in Appendix 2 in Bollman (1978b).
(2) The 1976 figures represent all agricultural holdings with $50 or more of gross sales.
(3) Total gross sales for 1976 were estimated by summing the product of the mid-point of each gross sales class and the number of units in each class. The average gross sales of farms with over $100,000 gross sales was assumed to be $250,000. The average gross sales of institutional farms was assumed to be $4,000.
(4) Estimated by multiplying the ratio of trucks to total automobiles and trucks in 1931 by the total number of automobiles and trucks in 1921.
Source: Canada, Statistics Canada, Censuses of Agriculture, 1921-76.

combining). In the time of horse-drawn machinery, most work for other farmers was on an exchange basis (i.e., no money was exchanged) or was simply paid labour. The appearance of power machinery that was owned by only some farmers meant that a suitable exchange of work was not always possible. Thus, money would be paid for the custom work service (and the custom work service appeared in the statistics of days of off-farm work). Consequently, days of agricultural off-farm work can be expected to be more prominent during the period of adoption of power machinery.

How has the historical change in the variables determining the demand for off-farm work influenced participation in off-farm work? The employment rate, which is 1.0 minus the unemployment rate, suggests the probability that a farmer will obtain off-farm work when the off-farm labour force is entered. One would expect the off-farm work among farmers to be higher when the unemployment rate in the economy is lower. The data do not always support this hypothesis. In 1950, the unemployment rate was 3.8% and the per cent of farmers reporting some days of off-farm work was 27.6% (Table 4.6). In the 12 months preceding the 1961 Census, the unemployment rate was higher at 7.0% but, contrary to the hypothesis, the per cent of farmers reporting some days of off-farm work was also higher at 31.0%. The data for the 1966, 1971 and 1976 Census periods support the the hypothesis. By 1966, the unemployment rate had fallen to 3.6% and the percentage of farmers reporting some days of off-farm work increased to 38.5%. In 1971, the unemployment rate was higher, 5.7%, and the percentage of farmers reporting some days of off-farm work was lower, 35.3%. In 1976, the unemployment rate was again higher, 8.1% , and the percentage of farmers reporting some days of off-farm work was again lower, 33.9%. An analysis of the provincial data indicates more discrepancies with the hypothesis. Nevertheless, the low unemployment rate in 1966 in all provinces should be recognised as an important factor causing the highest participation rates in off-farm work in nearly all provinces in 1966. Also, the trend to higher unemployment rates in all provinces except the Prairies from 1966 to 1976 should be recognised as an important factor causing a decline in the participation rates in off-farm work.

TABLE 4.6 Comparison of Unemployment Rates and Per cent of Census-farm Operators Reporting "Some Days of Off-farm Work," Canada and Provinces, 1941-76

Province	January 1, 1940 to December 31, 1940		January 1, 1945 to December 31, 1945		January 1, 1950 to December 31, 1950		June 1, 1960 to May 31, 1961	
	Unemployment rate(1)	Operators reporting "some days of off-farm work"	Unemployment rate	Operators reporting "some days of off-farm work"	Unemployment rate	Operators reporting "some days of off-farm work"	Unemployment rate	Operators reporting "some days of off-farm work"
		per cent		per cent		per cent		per cent
Canada	..	35.5	..	..	3.8	27.6	7.0	31.0
Atlantic Region	..	..	..	..	8.4	49.5	10.7	47.6
Newfoundland	..	..	..	..	..	62.8	..	57.3
Prince Edward Island	..	34.4	..	..	..	29.5	..	33.7
Nova Scotia	..	56.0	..	..	..	54.0	..	52.7
New Brunswick	..	56.1	..	..	..	51.3	..	49.4
Quebec	..	40.2	..	..	4.6	33.9	9.1	58.8
Ontario	..	28.5	..	..	2.5	26.5	5.4	35.1
Prairie Provinces	..	32.1	2.4(2)	21.4	2.2	17.9	4.2	23.0
Manitoba	..	29.2	..	23.8	..	18.0	..	24.3
Saskatchewan	..	31.9	..	20.0	..	16.6	..	19.9
Alberta	..	34.2	..	21.9	..	19.4	..	26.1
British Columbia	..	44.1	..	..	4.4	40.8	8.5	48.5

Province	June 1, 1965 to May 31, 1966		January 1, 1970 to December 31, 1970		June 1, 1975 to May 31, 1976	
	Unemployment rate	Operators reporting "some days of off-farm work"	Unemployment rate	Operators reporting "some days of off-farm work"	Unemployment rate	Operators reporting "some days of off-farm work"
		per cent		per cent		per cent
Canada	3.6	38.5	5.7	35.3	8.1	33.9
Atlantic Region	6.6	48.2	..	41.5	..	40.8
Newfoundland	..	46.8	7.2	36.3	13.9	37.9
Prince Edward Island	..	42.9	..	36.0	9.0	36.5
Nova Scotia	..	51.4	5.5	45.6	9.0	44.8
New Brunswick	..	48.8	6.3	42.4	11.6	40.1
Quebec	5.0	50.0	7.0	33.4	8.9	30.5
Ontario	2.4	41.2	4.4	42.8	6.8	40.7
Prairie Provinces	2.2	29.8	..	29.7	..	28.7
Manitoba	..	29.2	5.4	30.9	4.7	28.8
Saskatchewan	..	27.4	4.3	25.9	4.0	23.5
Alberta	..	33.3	5.1	33.7	4.1	34.6
British Columbia	4.2	50.0	7.7	50.7	8.9	49.5

.. not available.
(1) Unemployment rate data are not available from the Labour Force Survey until 1946.
(2) Data refer to 1946.

Source: Canada, Statistics Canada, Censuses of Agriculture, 1941-76; Historical Labour Force Statistics - Annual Data, Seasonal Factors, Seasonally Adjusted Data, Catalogue No. 71-201; and Ostry, Sylvia, Unemployment in Canada, 1968, Table 13.

The educational levels of farmers have increased over time. However, it is not clear whether educational levels of farmers have increased at a slower or faster pace than the educational requirements for off-farm jobs. Thus, it is uncertain whether the differential between the educational level among farmers and the educational requirements for off-farm jobs has narrowed or widened. A narrowing of the differential would suggest an increase in demand for off-farm work facing farm operators. However, at a given point in time, the lack of education would place a farmer at a relative disadvantage to the urban worker in the non-farm labour market. When part-time farmers were asked to identify the major barrier when seeking off-farm employment, 47% stated the lack of education and formal training and 42% stated the lack of job skills (Herndier, 1973, p. 90).

The most dramatic change influencing the demand for off-farm work confronting farmers has been the reduction in the time and money cost of commuting. Today, almost every farm family owns an automobile (or truck) and almost every farm family has easy access to roads that are passable the year round. Thus, the time and money cost of commuting, which was probably the major barrier preventing farmers from participating in off-farm jobs, has been lowered tremendously. Locas (1968) concluded that an urban centre within commuting distance positively influenced the allocation of operator labour of off-farm work in 1961 in Ontario and the Prairies. By 1966 in Ontario, the highest incidence of part-time farmers with 200 or more days of off-farm work

> existed in the townships in proximity to all major urban centres in Southern Ontario. At this stage the process of intensification of off-farm work appears to be related directly with the job opportunities generated by the larger urban centres. The farmers in these townships undoubtedly perceive the opportunity to increase total earnings and respond to the "pull" of the city (Centre for Resources Development, 1972, p. 164).

In Manitoba in 1972, Ward (1975) found the incidence of off-farm work to be higher around the urban centres of Winnipeg, Portage la Prairie and Selkirk. Access to urban job markets does appear to influence the amount of off-farm work reported by farmers.

Bunce (1974, 1976) suggested that part-time farmers fall into two distinct spatial activity spheres: those who commute only a short distance and those who commute longer distances to employment in nearby urban centres. Operators participating in the local spatial activity sphere tend to report part-time non-farm self-employment (such as custom farm work, snow ploughing, well drilling, school bus driving, and road maintenance). Such operators have always existed. Operators in the non-local spatial activity sphere are wage and salary employees who tend to report full-time work. A lack of large urban job markets (i.e., a small non-local spatial activity sphere) would explain why part-time farming is lower in some regions.

The reduction in the time and money costs of transportation is important to off-farm work in another respect. The historical decline in transportation costs and food processing costs have reduced the demand for operator's labour on the farm to supply family food needs. Thus, the trade-off between farm and off-farm work has become important and off-farm work would be expected to increase.

Entry to farming has never been easy. However, once farmers obtained their farms, high transportation costs usually prevented part-time participation in off-farm work. The result was that many farmers would allocate their available time to secondary and tertiary enterprises that would produce some income to facilitate the accumulation of additional capital. Examples of such enterprises would be small flocks of chickens to produce eggs for sale, or a small number of cows kept for milking (usually by hand). The cream would be sold (for the manufacture of butter) and the skim milk would be consumed by the family and young farm animals--either pigs or calves, another secondary or tertiary enterprise. The reduction in the time and money costs of commuting over time would be expected to raise the net returns to off-farm work and participation in off-farm work would increase at the expense of such secondary and tertiary enterprises.

4.5. Tabular Analysis of Historical Participation in Off-farm Work

4.5.1. Participation in off-farm work by size of gross farm sales

A larger size of farm in terms of gross farm sales represents a larger demand for on-farm work by the operator and thus the participation rate in off-farm work is expected to be less for larger farms. The per cent reporting off-farm work declines from nearly 60% in the $50-$249 gross sales group to near 15% in the largest sales group in each of the 1961, 1966, 1971 and 1976 Census years (Table 4.7). The pattern is similar among all provinces (Table B.6)[7] and the pattern is consistent among census years; the per cent reporting off-farm work falls smoothly as gross sales increase (Chart 4.2). As will be shown later, the majority of off-farm work by operators of large farms is custom work for other farmers.

One disturbing point is that only 53.6% of the operators with gross sales under $5,000 reported off-farm work in 1976. Operators in this group would receive considerably less than $4,000 net farm income. Thus 46.4% of the operators in this group (or 50,000 operators) reported no off-farm work and net farm income of less than $4,000 in 1976. (The majority of these operators are under 65 years of age and thus also receive no pension income - Table B.35.)

Stock (1976) notes that since the demand for the operator's labour on farms with low gross sales is expected to be small,

> the adjustment of human resources to non-farm employment seems obvious. However, certain characteristics of the small scale farmer limit such possibilities. Small scale farmers tend to be relatively more numerous in the youngest and oldest age categories and in the level of schooling category representing those with less than fifth grade education; factors which limit their demand in the non-farm labour market. Strong ties to the home community, traditional values and low aspiration levels are other limiting characteristics attributed to some small scale farmers (Stock, 1976, p. 69).

See footnote(s) on page 39.

TABLE 4.7. Number and Per cent of Census-farm Operators Reporting "Some Days of Off-farm Work," by Size of Gross Farm Sales, Canada, 1961-76

Size of gross farm sales	June 1, 1960 to May 31, 1961			June 1, 1965 to May 31, 1966		
	Total operators	Operators reporting "some days of off-farm work"		Total operators	Operators reporting "some days of off-farm work"	
		Number	Per cent		Number	Per cent
Total(1).....	480,903	153,675	31.9	430,522	165,732	38.4
Under $2,500.....	221,052	102,849	46.5	152,911	83,381	54.5
$50-249.....	43,850	26,299	59.9	36,693	20,142	54.8
$250-1,199.....	82,946	42,978	51.8	55,271	32,523	58.8
$1,250-2,499.....	94,256	33,572	35.6	60,947	30,716	50.4
$2,500-4,999.....	118,777	28,645	24.1	84,947	33,696	39.6
$2,500-3,749.....	69,023	18,101	26.2	47,024	20,000	42.5
$3,750-4,999.....	49,754	10,544	21.1	37,923	13,696	36.1
$5,000-9,999	90,419	15,245	16.8	96,856	28,226	29.1
$5,000-7,499.....	..	..	...	58,103	18,128	31.2
$7,500-9,999.....	..	..	...	38,753	10,098	26.0
$10,000 and over.....	49,841	6,861	13.7	95,042	20,351	21.4
$10,000-14,999.....	25,923	3,779	14.5	44,217	9,911	22.4
$15,000-24,999.....	14,411	1,963	13.6	31,149	6,526	20.9
$25,000 and over....	9,507	1,119	11.7	19,666	3,914	19.9
$25,000-34,999....	..	..	...	..	..	...
$35,000-49,999....	..	..	...	..	..	...
$50,000-74,999....	..	..	...	..	..	...
$75,000-99,999....	..	..	...	..	..	...
$100,000 and over.	..	..	...	..	..	...

See footnote(s) at end of table.

TABLE 4.7. Number and Per cent of Census-farm Operators Reporting "Some Days of Off-farm Work," by Size of Gross Farm Sales, Canada, 1961-76 - Concluded

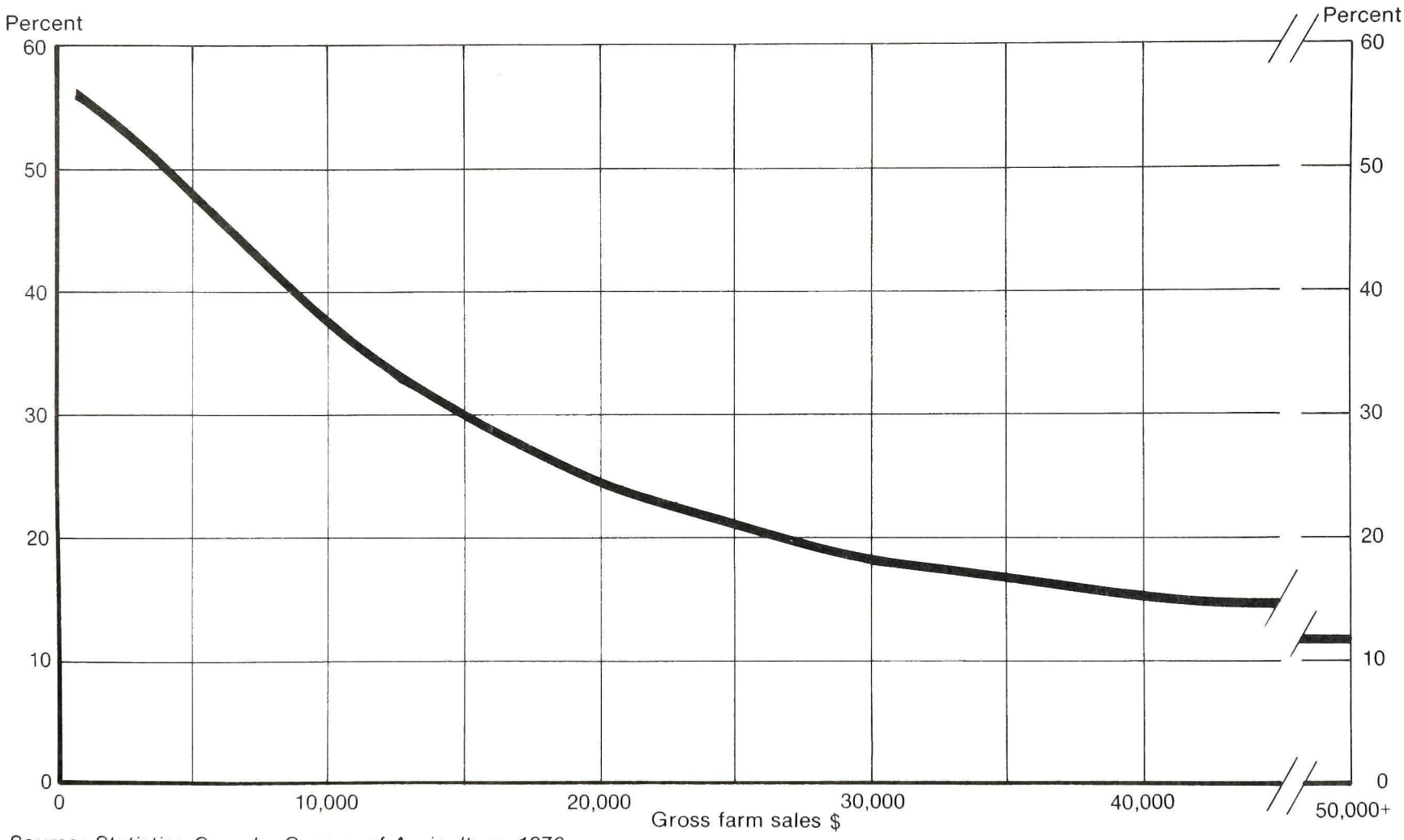
Size of gross farm sales	January 1, 1970 to December 31, 1970			June 1, 1975 to May 31, 1976		
	Total operators	Operators reporting "some days of off-farm work"		Total operators	Operators reporting "some days of off-farm work"	
		Number	Per cent		Number	Per cent
Total(1).....	366,128	129,287	35.3	338,578	114,625	33.9
Under $2,500.....	107,093	56,068	52.3	69,683	38,428	55.1
$50-249.....	26,461	13,702	51.7			
$250-1,199.....	39,799	22,330	56.1	38,460	21,426	55.7
$1,250-2,499.....	40,833	20,036	49.0	31,223	17,002	54.5
$2,500-4,999.....	62,954	25,248	40.1	37,874	19,328	51.0
$2,500-3,749.....	34,008	14,522	42.7	..	..	...
$3,750-4,999.....	28,946	10,726	37.0	..	..	...
$5,000-9,999.....	82,112	24,497	29.8	45,791	19,282	42.1
$5,000-7,499.....	47,660	15,133	31.7	..	..	...
$7,500-9,999.....	34,452	9,364	27.1	..	..	...
$10,000 and over.....	113,193	23,437	20.7	184,459	37,522	20.3
$10,000-14,999.....	42,785	10,088	23.5	35,363	11,459	32.4
$15,000-24,999.....	36,868	7,532	20.4	46,129	11,056	24.0
$25,000 and over....	33,540	5,817	17.3	102,967	15,007	14.6
$25,000-34,999....	14,040	2,639	18.8	32,021	5,765	18.0
$35,000-49,999....	9,012	1,571	17.4	27,288	4,028	14.8
$50,000-74,999....	10,488	1,607	15.3	22,120	2,748	12.4
$75,000-99,999....	..	..	...	9,189	1,070	11.6
$100,000 and over.	..	..	...	12,349	1,396	11.3

.. not available.
... not applicable.
(1) Includes operators of institutional farms.

Source: Canada, Statistics Canada, Censuses of Agriculture, 1961-76.

Chart — 4.2

Per Cent of Census-farm Operators Reporting "Some Days of Off-farm Work" by Size of Gross Farm Sales, Canada, 1976



Source: Statistics Canada, Census of Agriculture, 1976.

4.5.2. Participation in off-farm work by type of farm

As discussed above (Chapter 2 and Section 4.4), operators of different types of farms are expected to face a different seasonality of demand for farm work. In general, operators will face a different demand for on-farm work curve and because of differences in availability of free time, operators of different types of farms will face a different demand for off-farm work curve. Thus, participation in off-farm work can be expected to differ among operators of different types of farms. Considering only farms with gross sales of $2,500 or more, one observes that the participation rate in 1976 in off-farm work ranged from a high of 37.9% for operators of fruit and vegetable farms to a low of 16.6% for operators of dairy farms (Table 4.8). The overall trend was that operators of most types of farms reported an increase in their off-farm work participation rate between 1961[8] and 1966 and a decrease in 1971. Although the participation rate stayed constant between 1971 and 1976 for operators with gross sales of $2,500 or more, operators of miscellaneous specialty farms and mixed farms reported an increased participation rate and operators of the other types of farms reported a decreased participation rate. Operators of wheat, small grain, fruit and vegetable, and miscellaneous specialty farms reported an increasing participation from 1961 to 1966 to 1971.

The structure of the participation rate in off-farm work among operators of different types of farms becomes evident when operators of different types of farms are ranked in decreasing order of the proportion reporting some days of off-farm work. In 1961, 1966 and 1971, operators of forestry farms consistently reported the highest incidence of off-farm work (Table 4.9). Operators of fruit and vegetable farms consistently ranked second and they ranked first in 1976 because forestry farms were not classified separately. Poultry farmers maintained a high ranking by placing third in 1961 and fifth in 1966 and 1971. This was not expected. Forestry

See footnote(s) on page 89.

TABLE 4.8. Number and Per cent of Census-farm Operators Reporting "Some Days of Off-farm Work", by Type of Farm, 1961-76

Type of farm(1)(2)	June 1, 1960 to May 31, 1961(1)			June 1, 1965 to May 31, 1966(2)			January 1 to December 31, 1970(2)			June 1, 1975 to May 31, 1976(2)		
	Total operators	Operators reporting "some days of off-farm work"		Total operators	Operators reporting "some days of off-farm work"		Total operators	Operators reporting "some days of off-farm work"		Total operators	Operators reporting "some days of off-farm work"	
		Number	Per cent		Number	Per cent		Number	Per cent		Number	Per cent
Total(1)(2)	353,293	84,323	23.9	276,835	82,273	29.7	258,259	73,182	28.3	268,124	76,132	28.4
Dairy	79,219	20,555	26.0	56,460	17,803	31.5	55,341	12,692	22.9	47,924	7,932	16.6
Cattle, hogs, sheep(3)	86,532	21,328	24.6	70,936	22,495	31.7	89,610	26,614	29.7	..	..	...
Cattle(4)	..	..	...	..	..	...	..	..	...	57,592	21,074	36.5
Hogs(4)	..	..	...	..	..	...	..	..	...	10,282	3,012	29.3
Poultry	9,961	3,143	31.6	6,299	1,991	31.6	5,615	1,638	29.2	4,332	1,136	26.2
Wheat	77,395	14,715	19.0	71,413	17,476	24.5	33,646	9,052	26.9	61,076	14,685	24.0
Small Grains	32,490	7,859	24.2	29,742	9,214	31.0	36,199	12,304	34.0	50,277	17,158	34.1
Field Crops	10,388	2,160	20.8	9,798	2,820	28.8	8,798	2,334	26.5	5,163	1,155	22.4
Fruits and Vegetables	9,806	3,282	33.5	7,492	2,719	36.3	7,827	2,848	36.4	8,276	3,134	37.9
Forestry(3)	2,310	1,220	52.8	629	345	54.8	949	485	51.1	..	..	...
Miscellaneous Specialty	3,458	917	26.5	3,309	922	27.9	3,405	996	29.2	5,501	1,923	35.0
Total Mixed	41,734	9,144	21.9	20,757	6,488	31.3	16,869	4,219	25.0	17,701	4,923	27.8
Livestock Mixed	28,614	6,218	21.7	13,219	4,044	30.6	8,019	1,728	21.6	11,307	2,736	24.2
Field Crops Mixed ..	5,998	1,293	21.6	3,035	1,065	35.1	4,705	1,319	28.0	1,005	311	30.9
Other Mixed	7,122	1,633	22.9	4,503	1,379	30.6	4,145	1,172	28.3	5,389	1,876	34.8

.. not available.
... not applicable.
(1) Includes farms with gross sales ≥ $1,200 in 1961 Census.
(2) Includes farms with gross sales ≥ $2,500 in 1966 and 1976 Census.
(3) Cattle, hog, and sheep farms and forestry farms did not exist as separate categories in 1976.
(4) Cattle farms and hog farms existed as separate categories in 1976 only.

Source: Canada, Statistics Canada, Censuses of Agriculture, 1961-76.

TABLE 4.9. Per cent of Census-farm Operators Reporting "Some Days of Off-farm Work", Ranked in Decreasing Order of Importance of Type of Farm, Canada, 1961-76

Type of farm	June 1, 1960 to May 31, 1961(1)		June 1, 1965 to May 31, 1966(2)		January 1, 1970 to December 31, 1970(2)		June 1, 1975 to May 31, 1976(2)	
	Operators reporting "some days of off-farm work"	Rank	Operators reporting "some days of off-farm work"	Rank	Operators reporting "some days of off-farm work"	Rank	Operators reporting "some days of off-farm work"	Rank
	per cent		per cent		per cent		per cent	
Average(1)(2)	23.9	8	29.7	11	28.3	8	28.4	8
Dairy	26.0	5	31.5	6	22.9	13	16.6	14
Cattle, hogs, sheep(3)	24.6	6	31.7	4	29.7	4		
Cattle(4)	..	...	..	...	..	...	36.5	2
Hogs(4)	..	...	..	...	..	...	29.3	7
Poultry	31.6	3	31.6	5	29.2	5	26.2	10
Wheat	19.0	14	24.5	14	26.9	10	24.0	12
Small grains	24.2	7	31.0	8	34.0	3	34.1	5
Field crops	20.8	13	28.8	12	26.5	11	22.4	13
Fruits and vegetables	33.5	2	36.3	2	36.4	2	37.9	1
Forestry(3)	52.8	1	54.8	1	51.1	1	..	...
Miscellaneous specialty	26.5	4	27.9	13	29.2	6	35.0	3
Total mixed	21.9	10	31.3	7	25.0	12	27.8	9
Livestock mixed	21.7	11	30.6	10	21.6	14	24.2	11
Field crops mixed	21.6	12	35.1	3	28.0	9	30.9	6
Other mixed	22.9	9	30.6	9	28.3	7	34.8	4

.. not available.
... not applicable.
(1) Includes farms with gross sales ≥ $1,200 in 1961 Census.
(2) Includes farms with gross sales ≥ $2,500 in 1966 and 1976 Census.
(3) Cattle, hog, and sheep farms and forestry farms did not exist as separate categories in 1976.
(4) Cattle farms and hog farms existed as separate categories in 1976 only.

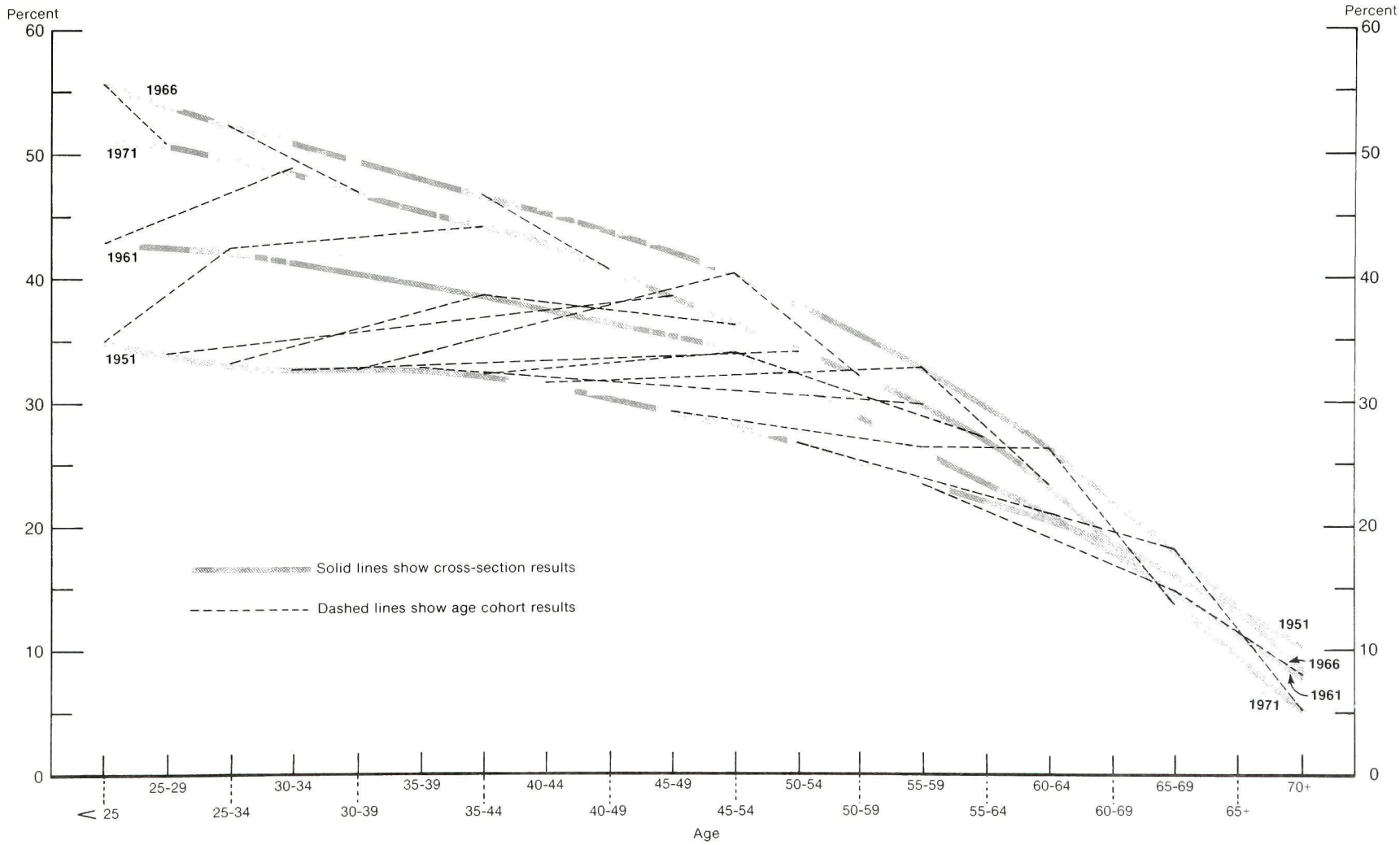
Source: Canada, Statistics Canada, Censuses of Agriculture, 1961-76.

and fruit and vegetable farmers could be expected to participate in off-farm work because the on-farm demand for labour is seasonal and because many operations are small in scale. However, poultry farms are typically year-round operations and they are typically large operations. However, they did rank below average in 1976. The only other operators to report consistently an above-average incidence of off-farm work were operators of cattle, hog and sheep farms and operators of small grain (excluding wheat) farms. Cattle enterprises, especially cow-calf enterprises, can be operated with a minimum of operator labour input; thus, considerable time can be made available for off-farm work. Small grain enterprises require a peak labour input during the planting and harvesting seasons; excess operator labour often exists at other times. In addition, modern machinery has considerably reduced the time required for planting, harvesting and other maintenance functions such as cultivation, spraying and fertilising. The fact that operators of certain types of farms (specifically, forestry, fruit and vegetable, poultry (before 1976), cattle, hog and sheep, and small grain enterprises) consistently reported an above average participation in off-farm work suggests that there is a stable relationship between the production of certain food commodities and off-farm work by farmers.

Operators of dairy farms fell from a ranking of fifth in 1961 to last in 1976. Consistently ranked below average were operators of field crop and wheat farms. The reason for such a low ranking is not apparent--especially in comparison to operators of small grain (excluding wheat) farms because they face similar demands for on-farm labour. Operators of mixed farms ranked below average in 1961, 1971 and 1976 and they ranked low (although above average) in 1966. This supports the hypothesis that operators who do not participate in off-farm work tend to expand their farm operations into secondary and tertiary enterprises. The fact that operators of mixed farms ranked above average in 1966 suggests that these operators participated relatively more in off-farm work when the demand for off-farm work (indicated by a low unemployment rate) was high in 1966.

Chart — 4.3

Per Cent of Census-farm Operators Reporting "Some Days of Off-farm Work" by Age of Operator, 1951-71



Source: Statistics Canada, Censuses of Agriculture, 1951-71.

4.5.3. Participation in off-farm work by age of operator

The age of the operator is an important variable influencing the participation of operators in off-farm work (see Section 5.3.2). Although age captures the influence of many phenomena, it was hypothesised that participation in off-farm work would be larger for younger operators because beginning operators would obtain off-farm jobs to finance their entry into farming. Also, younger operators would have a better education and more job skills which would qualify them for off-farm jobs. In each census from 1951 to 1971, the younger the operator, the greater the proportion reporting some off-farm work (see the solid lines in Chart 4.3). However, when each age cohort is considered, the answer is different. An age cohort is the group of individuals born in a particular time period. When one follows a given cohort through time (see the dashed lines in Chart 4.3), cohorts that were less than 45 years of age in 1951 show the proportion reporting off-farm work to increase from 1951 to 1961 and from 1961 to 1966 and to decrease somewhat in 1971. Cohorts that were 45 years or older in 1951 reported a decline in the proportion reporting off-farm work over time. Thus, contrary to the cross-section result which suggests that participation in off-farm work declines as age increases, a cohort analysis suggests that at least for younger operators, participation in off-farm work increases as age increases.

In a regression analysis using cross-section census division average data from the 1961 Census, Locas (1968) found that the proportion of operators in a census division under 45 years of age were negatively and significantly related to the proportion of total operator days per census division that were allocated to off-farm work in Quebec and Ontario only. In a regression analysis of 100 farmers in Grey County, Ontario in 1970, Perkins (1972) found the probability of off-farm work to be less for older operators.

4.6. Structure of Days of Off-farm Work Reported

4.6.1. Full-time versus part-time off-farm work

From 1941 to 1976, the proportion of census-farm operators reporting full-time off-farm work (i.e., more than 228 days of off-farm

work) steadily increased from 3.2% to 12.9% (Table 4.10). All provinces showed increases except Newfoundland. In 1976, the provinces with the highest proportion of operators reporting full-time off-farm work were British Columbia (22.5%) and Ontario (19.7%).

The proportion of operators reporting part-time off-farm work (1-228 days of off-farm work) has varied little from 1951 to 1976. The proportion was 21.7% in 1951; it reached 27.8% in 1966; and fell to 21.0% in 1976 (Table 4.11). All provinces were higher in 1941 than in any subsequent period because of the predominance of custom work as a part-time farm occupation.

The following analysis of the structure of part-time farming in terms of the number of days reported considers only those operators who reported some days of off-farm work (i.e., it considers only part-time operators).

4.6.2. Structure of days of off-farm work by size of gross farm sales

In 1976, 38.1% of all operators reporting some days of off-farm work (i.e., 38.1% of part-time operators) reported full-time off-farm work (i.e., more than 228 days) (Table 4.12). The smaller are gross farm sales, the larger is the proportion of part-time operators reporting full-time off-farm work. About 56% of the operators with gross sales of $50-1,199 reported full-time off-farm work. The larger are gross farm sales, the greater is the proportion of part-time operators reporting only a small number of days of off-farm work. The pattern is consistent throughout the 1961 to 1976 period and in general, the pattern is similar among all provinces (Tables B.17, B.18, B.19 and B.20).

Also, one can discern a definite trade-off between on-farm work (using gross farm sales as a proxy) and the number of days of off-farm work. The greater is on-farm work (i.e., the larger are gross farm sales), the smaller is the amount of off-farm work. This is indicated by the entries in boxes in Table 4.12. For each group of days of off-farm work reported, the boxed entry is relatively more important for the given gross farm sales

TABLE 4.10. Per cent of Census-farm Operators Reporting Full-time Off-farm Work(1), Canada and Provinces, 1941-76

Province	January 1 to December 31, 1940(2)	January 1 to December 31, 1945(3)	January 1 to December 31, 1950	June 1, 1960 to May 31, 1961	June 1, 1965 to May 31, 1966	January 1 to December 31, 1970	June 1, 1975 to May 31, 1976
Canada(2)	3.2	..	5.9	8.6	10.7	11.5	12.9
Newfoundland	..	..	17.1	16.4	11.9	11.0	10.4
Prince Edward Island	3.1	..	4.8	7.9	11.2	10.3	11.2
Nova Scotia	8.6	..	12.8	15.3	15.6	16.5	18.7
New Brunswick	7.6	..	11.8	12.4	14.9	14.4	14.9
Quebec	3.4	..	5.5	7.0	9.1	8.2	8.9
Ontario	4.0	..	8.2	13.0	16.7	18.2	19.7
Manitoba	1.5	1.9	3.2	5.0	6.7	7.8	8.5
Saskatchewan	0.6	0.6	1.5	4.1	4.8	5.7	6.6
Alberta	1.6	1.7	2.9	6.2	7.9	9.9	12.3
British Columbia ...	7.2	..	14.3	21.0	23.3	22.8	22.5

.. not available.
(1) Full-time off-farm work is defined to be more than 228 days of off-farm work.
(2) Newfoundland joined Canada in 1949.
(3) The 1946 Census of Agriculture was enumerated only in the Prairie provinces.
Source: Canada, Statistics Canada, Censuses of Agriculture, 1941-76.

TABLE 4.11. Per cent of Census-farm Operators Reporting Part-time Off-farm Work(1), Canada and Provinces, 1941-76

Province	January 1 to December 31, 1940(2)	January 1 to December 31, 1945(3)	January 1 to December 31, 1950	June 1, 1960 to May 31, 1961	June 1, 1965 to May 31, 1966	January 1 to December 31, 1970	June 1, 1975 to May 31, 1976
Canada(2)	32.3	..	21.7	23.4	27.8	23.8	21.0
Newfoundland	..	..	45.7	40.9	34.9	25.3	27.5
Prince Edward Island	31.3	..	24.7	25.8	31.7	25.7	25.4
Nova Scotia	47.4	..	41.2	37.4	35.8	29.1	26.0
New Brunswick	48.4	..	39.6	37.0	33.9	38.0	25.3
Quebec	36.8	..	28.4	31.8	40.9	25.2	21.6
Ontario	24.5	..	18.3	22.1	24.5	24.6	20.9
Manitoba	27.7	21.9	14.8	19.3	22.5	23.1	20.4
Saskatchewan	31.3	19.4	15.1	15.8	22.6	20.2	16.9
Alberta	32.6	20.2	16.5	19.9	25.4	23.8	22.4
British Columbia ...	36.9	..	26.5	27.5	26.7	27.9	27.1

.. not available.
(1) Part-time off-farm work is defined to be 1 to 228 days of off-farm work.
(2) Newfoundland joined Canada in 1949.
(3) The 1946 Census of Agriculture was enumerated only in the Prairie provinces.
Source: Canada, Statistics Canada, Censuses of Agriculture, 1941-76.

TABLE 4.12. Per cent Distribution of Census-farm Operator Reporting "Some Days of Off-farm Work", by Size of Gross Farm Sales, by Number of Days of Off-farm Work, Canada, 1976

Size of gross farm sales	Total	Number of days of off-farm work (1)									
		1-6	7-12	13-24	25-48	49-72	73-96	97-126	127-156	157-228	229-365
Total.....	100.0	2.4	2.6	3.9	6.6	6.4	5.3	8.5	5.8	20.5	38.1
$50 - 1,199.....	100.0	0.9	0.6	1.1	2.7	3.2	2.9	5.6	5.0	21.4	56.7
$1,200 - 2,499.....	100.0	0.8	1.0	1.9	3.7	4.6	4.3	7.2	6.0	24.7	45.9
$2,500 - 4,999.....	100.0	1.1	1.4	2.2	4.5	4.7	4.6	8.1	6.4	23.3	43.7
$5,000 - 9,999.....	100.0	1.7	2.0	3.1	6.4	6.7	5.8	9.4	6.4	22.1	36.5
$10,000 - 14,999.....	100.0	2.8	3.1	4.7	8.2	8.7	7.0	10.6	6.1	20.0	28.9
$15,000 - 24,999.....	100.0	4.1	4.4	6.5	11.0	9.8	7.9	11.2	6.0	17.3	21.9
$25,000 - 34,999.....	100.0	6.2	6.0	9.4	12.5	10.7	7.9	10.0	5.5	14.2	17.8
$35,000 - 49,999.....	100.0	8.1	8.0	10.1	13.9	9.8	7.6	10.7	4.5	11.7	15.5
$50,000 - 74,999.....	100.0	9.6	10.0	12.5	14.2	10.5	6.2	8.2	5.2	9.2	14.3
$75,000 - 99,999.....	100.0	9.7	9.6	13.6	16.2	9.4	5.5	8.1	2.9	9.0	15.5
$100,000 and over.....	100.0	9.2	9.2	10.5	14.3	8.6	5.5	7.7	5.4	10.2	19.3

(1) The cells enclosed in boxes indicate the gross sales class that is most prominent in each column.

Source: Canada, Statistics Canada, Census of Agriculture, 1976.

class. The rough diagonal configuration of the boxes gives an indication of a trade-off between farm and off-farm work.

In a study of 34 small farms in the Rosetown-Elrose area of west central Saskatchewan in 1959, Zeman (1961) observed that small farms where more than $2,000 were earned from sources other than sales of grain and livestock did not differ from other small farms in terms of number of acres of crops and distribution of acres among crops. In addition, their capital structure was similar to other small farms. This finding suggests that substantial off-farm work can exist without requiring a reduction in farm acreage or a substitution of capital for labour. Thus, in cases where no off-farm work is reported, under-employment of the operator's labour may exist.

4.6.3. Structure of days of off-farm work by type of farm

An analysis of the structure of days of off-farm work for each type of farm shows a remarkable consistency in the 1961 to 1966 to 1971 to 1976 period. Part-time operators of miscellaneous specialty farms reported the highest incidence of full-time off-farm work, between 40% and 43%, in each census period (Tables B.13, B.14, B.15 and 4.13). Second ranking in each census period were part-time operators of poultry farms; third were operators of fruit and vegetable farms (except in 1976 when they were reversed with poultry operators); fourth were cattle, hog and sheep part-time operators (only hog operators in 1976); and in the 1961 to 1966 to 1971 period, field crop part-time operators were fifth. In each of the 1961, 1966, 1971, and 1976 Census years, the last five places were occupied by part-time operators of dairy farms and mixed farms (and wheat farms in 1976).

The fact that part-time operators of mixed farms tend to work the fewest number of days in off-farm work supports the earlier conclusion that some operators substitute another farming enterprise for additional off-farm work.

TABLE 4.13. Per cent Distribution of Census-farm Operators Reporting "Some Days of Off-farm Work", by Type of Farm (1), ranked in decreasing order of proportion reporting full-time off-farm work (2), by Number of Days of Off-farm Work, Canada, 1976

	Number of days of off-farm work										
Type of farm(1)	Total	1-6	7-12	13-24	25-48	49-72	73-96	97-126	127-156	157-228	229-365
Miscellaneous Specialty	100.0	1.5	2.0	2.9	2.9	6.3	5.0	7.1	5.8	21.6	42.6
Fruit and Vegetable....	100.0	1.5	1.5	2.7	5.6	6.1	5.8	8.7	6.5	19.1	42.3
Poultry.....	100.0	3.3	2.8	4.5	7.0	7.0	4.0	6.5	5.8	18.9	40.3
Hogs.....	100.0	4.0	3.7	4.4	7.8	7.2	4.4	8.4	5.8	17.9	36.6
Other Mixed.....	100.0	2.7	3.1	4.0	7.0	6.1	5.8	7.7	5.2	22.8	35.7
Cattle.....	100.0	2.6	2.9	4.5	7.2	6.4	5.3	8.9	8.9	21.4	34.3
Small Grains.....	100.0	2.6	3.1	4.3	7.9	7.7	6.8	10.1	5.8	19.5	32.2
Average.....	100.0	3.3	3.5	5.1	8.3	7.6	6.2	9.5	6.0	19.4	31.1
Total Mixed (Subtotal)	100.0	3.8	4.2	6.0	8.9	7.6	6.2	8.8	5.7	19.4	29.5
Wheat.....	100.0	3.8	3.8	5.6	9.0	8.3	7.0	10.6	6.0	19.1	27.0
Livestock Mixed.....	100.0	4.6	5.2	7.0	10.0	8.6	6.3	9.2	6.1	17.3	25.8
Other Field Crops.....	100.0	2.9	2.6	9.0	11.3	7.7	7.4	12.5	5.8	17.0	23.8
Field Crop Mixed.....	100.0	2.9	2.6	9.0	11.3	7.7	7.4	12.5	5.8	17.0	23.8
Dairy.....	100.0	5.9	6.2	8.6	12.3	10.5	7.2	10.1	5.5	14.4	19.1

(1) Includes farm with gross sales ≧ $2,500.
(2) Full-time off-farm work is defined to be more than 228 days of off-farm work.

Source: Canada, Statistics Canada, Census of Agriculture, 1976.

4.7. Structure of Off-farm Occupations

4.7.1. Introduction

One of the major off-farm occupations reported by part-time farmers is agricultural work off the operator's farm. In 1941, 54,540 operators reported agricultural off-farm work (Table B.36). This represented 18.8% of part-time operators (Table B.37) and 7.4% of all census-farm operators (Table B.38). These operators were distributed into 23,043 operators who reported agricultural custom work and 31,497 operators who reported paid labour on another farm (exchange labour was excluded). In 1961, 20,492 operators reported agricultural off-farm work; this was 13.3% of all part-time operators. By 1971, the importance of agricultural off-farm work had rebounded; 19.4% of part-time operators (totalling 25,108 operators) reported agricultural off-farm work.

The relative importance of forestry as an off-farm occupation stayed constant from 12.8% in 1941 to 12.6% of part-time operators in 1961. However, by 1971, forestry work represented only 7.0% of the off-farm occupations reported by part-time operators.

Fishing, hunting and trapping have not been major off-farm occupations in the 1941-71 period. The proportion of part-time farmers in these groups declined from 2.3% in 1941 to 1.6% in 1961 to 0.6% in 1971.

In 1961, 15,003 operators (9.7% of the part-time farmers) reported their off-farm occupation to be a truck or bus driver. At least in part because of rural school consolidation, the number increased to 17,862 (13.8% of the part-time farmers) in 1971.

The major type of off-farm occupation reported by part-time farmers is manufacturing and construction. In 1941, 100,148 operators (34.6% of the part-time operators) reported their off-farm occupation to be "manufacturing, construction, and repairs". In 1961, 39,158 operators (25.5%) reported their off-farm occupation to be "construction work" or "factor production work". These figures are not directly comparable because of the large proportion of "not given" and "other" occupations in 1941 (25.0%) and in 1961 (40.9%). In 1971, the proportion of part-time

operators classified as "other" was an acceptable 5.9%. In 1971, 52,429 part-time operators (40.6%) reported an off-farm occupation in manufacturing or construction. These operators were evenly split between construction and manufacturing occupations. Although the provincial off-farm occupational structure varied in relation to the overall occupational structure of each province, the conclusions obtained from the Canada level data apply generally to all provinces.

Again, the off-farm occupation varies depending upon the area within a province. In Ontario in 1971,

> The spatial distribution of small scale off-farm job types ... tends to reflect the patterns of job opportunity. Urban professions, processing occupations, and service jobs tend to be near cities where these respective types of employment are plentiful. Rural-oriented patterns also reflect the availability or lack of availability of the various categories of work. Where farming can be relatively prosperous, especially in Eastern and Western Ontario, full-time farming and off-farm work in agriculture are relatively important. In the North, small scale farmers tend to work at a variety of resource extraction and rural-oriented tertiary occupations. Here, opportunities are relatively limited; there is a tendency for jobs to be insecure and seasonal (Stock, 1976, p. 80).

Steeves (1977a) notes that part-time farmers stating a professional, sales or service occupation are under-represented and individuals stating an industrial or "blue collar" occupation are over-represented compared to the total workforce.

> This substantial employment in the technical secondary occupational areas reinforces the view that the primary off-farm mobility channel for farm operators is via the "blue collar" occupations (Steeves, 1977a, p. 19).

Locas (1968) uses the ratio of non-agricultural to agricultural jobs in a census division as one variable in his regression analysis to explain the proportion of total operator days per census division in 1961 that were allocated to off-farm work. An increase in this ratio increased the allocation of operator's labour to off-farm work in the Maritimes, Ontario and the Prairies. When non-agricultural jobs were segmented into unskilled jobs, primary industry jobs, and all others, unskilled jobs were significant in Quebec, primary jobs were significant in the Maritimes and

Ontario and "other" jobs were a significant, but negative factor in Quebec. Thus, the job mix in the non-farm sector of a particular region influences the amount of off-farm work by farmers.

One item of importance in the 1971 census data is the proportion of census-farm operators who stated a non-farm job as their "major" occupation. Overall, 26.0% of the male census-farm operators stated a non-farm occupation to be their major occupation (Bollman, 1978b, Table 5.17). The proportion ranged from a low of 13.9% in Saskatchewan to a high of 47.1% in British Columbia. Conversely, only 65.5% of the census-farm operators considered themselves to be mainly farmers. Policy analysts should recognise that the number of individuals who call themselves "farmers" is considerably less than the number of census-farm operators (less than 40% in British Columbia and Newfoundland).

4.7.2. Structure of off-farm occupation by number of days of off-farm work

One major conclusion is that in both 1961 and 1971, the proportion of part-time operators reporting agricultural off-farm work is higher if only a few days of off-farm work are reported. In 1961, 54.2% of the operators reporting one to six days of off-farm work reported the work to be agricultural off-farm work (Table B.45). In 1971, 68.6% of the operators reporting one to six days of off-farm work reported their off-farm work to be agricultural (Table B.46). In 1961, operators reporting 73-96 days of off-farm work tended to report "working in the woods" as their off-farm occupation. Truck or bus drivers become significant in the group reporting 157-228 days of off-farm work and factory production work becomes relatively important in the group reporting full-time (i.e., more than 228 days) off-farm work. In 1971, 28.2% of operators reporting full-time off-farm work reported their off-farm occupation to be processing, machining or fabricating occupations. The major off-farm occupation reported with 157-228 days of off-farm work is truck or bus drivers (27.3% in 1971).

4.7.3. Structure of off-farm occupation by size of gross farm sales

The larger the farm in terms of gross farm sales, the greater the proportion of operators who report their off-farm occupation to be

agricultural work (Table B.47 for 1961 and Table B.48 for 1971). These are, in all likelihood, operators with an excess machinery capacity who provide agricultural custom work services for their neighbours for a few days during peak periods in the year. In 1961, truck or bus drivers were relatively prominent among part-time farmers with gross farm sales between $3,750 and $4,999. In 1971, truck or bus drivers were most prominent among part-time farmers with $7,500-$9,999 gross farm sales. In general, all provinces exhibited the pattern where truck or bus driving was higher for part-time farmers with medium gross sales and smaller for part-time farmers with small or large gross farm sales. This suggests that driving a truck or bus is a relatively popular activity of medium-sized farm operators either to attain the total family income of larger-sized farms or to generate sufficient resources to finance a larger-sized farm.

For most other occupations, as gross farm sales declined, the off-farm occupation became relatively more prominent. However, in 1971, off-farm occupations that were managerial and administrative increased in relative importance as the size of gross farm sales increased. Except for the small gross sales categories, the concentration of part-time farmers in sales occupations also increased as gross sales increased.

4.7.4. Structure of off-farm occupation by type of farm

The structure of off-farm occupations by type of farm operated shows that part-time operators of mixed farms have a higher tendency to report agricultural off-farm work than operators of other types of farms (Table B.52 for 1961 and Table B.53 for 1971). Above, it was noted that the incidence of part-time farming was lowest among operators of mixed farms which suggests that some operators participated in a secondary or tertiary farm enterprise instead of participating in off-farm work. The fact that it is now observed that operators of mixed farms who do participate in off-farm work tend to participate in agricultural off-farm work suggests that agricultural off-farm work may be viewed as a secondary or tertiary farm enterprise by some operators. In addition, in 1971, truck or bus driving as an off-farm occupation may be considered to be an extension of the farm enterprise.

4.8. Summary

Part-time farming has always existed. Early references to part-time farming suggest that it played an integral role in the development of both the agricultural and non-agricultural sectors in the economy.

In the 1941-76 period, the proportion of census-farm operators reporting "Some Days of Off-farm Work" has remained at about one-third (Chart 4.1 and Table 4.1). However, a major structural change took place; the proportion of operators reporting a few days of off-farm work decreased and the proportion of operators reporting full-time off-farm work increased (Chart 4.1 and Tables 4.10 and 4.11). One reason for a large amount of part-time off-farm work in 1941 was that only a few farmers had switched to power machinery (Table 4.4) and these farmers performed custom-work services (i.e., off-farm work) for other farmers. Also, a war-induced shortage of farm labour resulted in many farmers participating in paid agricultural labour off their farms (Section 4.7.1).

There has been a marked shift in the structure of earned income received by farmers. The ratio of off-farm earnings to farm earnings has increased from 0.18 in 1940 to 0.74 in 1971 (Table 4.4). Policymakers should recognise the increasing reliance by farm families on off-farm earnings when designing policies to stabilise or increase the incomes of farmers.

The largest participation in off-farm work occurred in 1966 (Chart 4.1). A significant factor was the low unemployment rate (Table 4.6). There was an increase in the number of operators reporting a few days of off-farm work (Chart 4.1) that was distributed among operators of all types of farms (Table 4.8) and among operators in all regions of Canada (Heighton, 1970, Tables 50 to 59). The proportion of census-farm operators reporting off-farm work has declined from 1966 to 1971 and from 1971 to 1976. An important factor has been the trend to higher unemployment rates in all provinces (except the Prairies).

Although not discussed in this chapter, evidence of poverty does appear. For example, 53.6% of operators of farms with less than $5,000

gross sales in 1976 reported no off-farm work. Thus this group, numbering about 50,000 operators, earned no income from off-farm work and obviously considerably less than $4,000 net income from farming.

The type of farm enterprise was identified in Chapter 2 and Section 4.4 as a determinant of both the demand for on-farm labour and off-farm labour functions faced by the operator. A stable relationship between participation in off-farm work and the production of certain food commodities was observed. Specifically, operators of forestry, poultry (before 1976), fruit and vegetable, cattle, hog and sheep, and small grain (excluding wheat) farms consistently reported an above average participation rate in off-farm work in 1961, 1966, 1971 and 1976. These are the types of farm enterprises in which individuals can specialize and still be able to allocate time to off-farm work. In addition, the fact that the relationship between off-farm work participation and type of farm appears stable over time means that the multivariate analysis in Chapter 6 by type of farm can base its conclusions on the fact that the differences in participation rates in off-farm work among types of farms are not random and in fact are stable over time.

As hypothesised in Section 4.4, operators who do not participate in off-farm work tend to expand their farm operations into secondary and tertiary enterprises. Operators with secondary and tertiary entreprises (i.e., operators of mixed farms) tended to report the lowest incidence of off-farm work (Table 4.9). If they did report off-farm work, they reported the fewest days of off-farm work (Table 4.13). In addition, operators of mixed farms who reported off-farm work had a relatively greater tendency to report agricultural off-farm work--an activity that may be viewed as a secondary or tertiary farm enterprise.

Cross-section results indicate that the incidence of off-farm work is lower for older operators. Cohort analysis suggests that as a given group of operators becomes older, the incidence of off-farm work first rises and then falls (Chart 4.3).

Full-time off-farm work among farm operators has increased over time (Chart 4.1 and Table 4.10). Part-time off-farm work has remained

somewhat stable since 1951 (Table 4.11). Operators of miscellaneous specialty farms who reported some off-farm work reported the highest incidence of full-time off-farm work in each of the 1961, 1966, 1971 and 1976 Censuses. Second were poultry operators; third were fruit and vegetable operators (except in 1976 when they were second, ahead of poultry operators); and fourth were cattle, hog and sheep operators (only hog operators in 1976).

FOOTNOTES

[1] The definition of part-time farming has had an equally interesting history. A summary is presented in Appendix 8 of Bollman (1978b).

[2] Custom work is defined and discussed in Section 5.2.3.

[3] For the purpose of this study, a census-farm in 1976 refers to any agricultural holding with gross sales of $50 or more.

[4] The Census of Agriculture allows a maximum of 299 days of off-farm work per year when editing the census questionnaires.

[5] The rural farm population is defined in this study as all individuals residing on agricultural holdings with sales of $50 or more in the preceding 12 months (see Table 4.3).

[6] The definition of a farm in each census period is presented in Appendix 2 of Bollman (1978b). In this chapter, a "farm" in the 1976 Census refers to any agricultural holding with gross sales of $50 or more.

[7] Tables with a prefix "B" are listed in Appendix B and are available from the author upon request.

[8] For 1961, operators of farms with gross sales of $1,200 or more are included in the analysis whereas in 1966, 1971 and 1976, only operators of farms with gross sales of $2,500 or more are included.

CHAPTER 5

DATA AVAILABILITY AND DEVELOPMENT OF AN ESTIMATING EQUATION[1]

5.1. Introduction

A structural model was outlined in Chapter 2. The endogenous variables to be explained by the model were the quantity of operator labour in farm work, the quantity of operator labour in off-farm work, and the price of operator's labour. However, for some observations, data for these variables were missing. The availability of data is discussed in the next section. The section first considers the data on the quantity and price of operator's labour required to estimate a structural model. Next, the data required to implement Heckman's model are reviewed. In both cases, the necessary data were not available. Then, the data available to measure the demand and supply variables are summarised along with a detailed discussion on the meaning and measurement of off-farm work. The third section of this chapter discusses some additional factors that must be considered in the empirical analysis. The chapter concludes with a summary of the variables entering the estimating equation.

5.2. Data Availability

5.2.1. Data on quantity and price of operator's labour

The model outlined in Chapter 2 requires, as variables, quantity of farm work by the operator, quantity of off-farm work by the operator, and marginal wage rate faced by the operator. Unfortunately, good data are not available for any of these variables.

First, consider quantity of work by the operator. The questions on the 1971 Census of Population that obtained information regarding quantity of work were:

(a) hours worked for pay or profit last week (Question 31a, Table 5.1);
(b) hours worked without pay last week in the operation of a family business or farm (Question 31b, Table 5.1);

See footnote(s) on page 132.

TABLE 5.1. Questions on the 1971 Census of Population Questionnaire Relating to Quantity of Work

31.(a) How many hours did you work for pay or profit last week?

Include all jobs and overtime.

○ None ○ 20 or more
○ 1–19

(b) Last week, how many hours did you help without pay in the operation of a family business or farm?
Do not include housework in own home.

○ None ○ 20 or more
○ 1–19

(c) Did you look for work last week?

For example, contact a Canada Manpower Centre, check with employers, place or answer newspaper ads, etc.

○ Yes ○ No

(d) Last week did you have a job from which you were on temporary lay-off?

○ Yes ○ No

(e) Last week did you have a job or business from which you were absent because of illness, vacation, strike, training courses, etc.?

○ Yes ○ No

Questions 33–38 refer to your job or business last week. If none, answer for your job of longest duration since January 1, 1970.

33. How many hours do you usually work each week?

○ 1–19 ○ 35–39 ○ 50 or more
○ 20–29 ○ 40–44
○ 30–34 ○ 45–49

37. In this occupation were you mainly:

○ working for wages, salary, tips or commission?
○ working without pay in a family business or farm?
○ self-employed without paid help?
○ self-employed with paid help?

Was this farm or business incorporated? ○ Yes ○ No

39.(a) In how many weeks did you work during 1970?
Include weeks worked part-time, leave with pay and weeks of self-employment.

○ Did not work during 1970 ○ 14–26 ○ 40–48
○ 1–13 ○ 27–39 ○ 49–52

(b) Was this work mainly full-time or part-time?

○ Full-time ○ Part-time

Source: Canada, Statistics Canada, 1971 Census of Population Questionnaire.

(c) usual hours worked each week (Question 33, Table 5.1); and

(d) weeks worked in 1970 (Question 39, Table 5.1).

The 1971 Census of Agriculture obtained data on the number of days of off-farm work in 1970 (Table A.1, Appendix A).

A simple procedure would have been to take the total quantity of work (ideally, hours per year) from the Census of Population and subtract the quantity of off-farm work from the Census of Agriculture (in the same units) to obtain the quantity of farm work. However, the breakdown was not attempted. First, the units were not the same. (The former obtained "weeks worked last year" and "usual hours worked each week;" the latter referred to "days of off-farm work last year.") Second, the Census of Population questions, implicitly at least, referred to the major or prime source of employment. Thus, total hours worked were not ascertained; only the hours worked at the major occupation were reported. Third, the Census of Agriculture question on "Days of Off-farm Work" was difficult to answer for individuals who worked irregular part days in off-farm jobs.[2]

Let us now consider the price of work by the operator. There is no information available on the wages received by operators, let alone data on the wages on jobs available to operators. The Census of Population obtained data only on total earnings by source (Table A.2). If the data on usual hours worked each week and weeks worked in 1970 referred only to wage and salary employment, then the dollar amount of wages and salaries could be divided by an estimate of hours worked in the year to calculate an average wage. This procedure is not valid if the individual had more than one job. (Note that for farmers with no off-farm work, a similar calculation using net self-employment income from farming would estimate the average hourly earnings from farming but would give no idea of the return to an extra hour of work due to the assumption of diminishing marginal returns to labour.)

Thus, there are no adequate data to measure quantity of farm

See footnote(s) on page 132.

work, quantity of off-farm work, and price of operator's labour. As a consequence, a structural model to explain the level of these variables could not be estimated. The feasibility of estimating the Heckman model is considered next.

5.2.2. The crippling effect of missing observations on the dependent variable: The infeasibility of the Heckman approach

As noted in Section 4.2 of Bollman (1978a), Heckman (1974) models the joint conditional distribution of observed hours and observed wages, given that the person does some market work, as a function of the unconditional distribution of hours and wages, divided by the probability of reporting some market work. (This is simply the relationship that the conditional distribution of A given B is equal to the unconditional distribution of A and B divided by the probability of B.) Heckman derives a likelihood function which can be maximised to provide estimates of the structural parameters.

To implement the Heckman approach, observations for the off-farm wage rate and the off-farm hours of work must be obtained for all operators who did some off-farm work. The operator reports the quantity of work only for the major job. In 1971, 45.7% of the operators with off-farm work reported their major occupation to be "farmer" (Table 5.2) and thus no information on the quantity of off-farm work was reported (on the Census of Population questionnaire). In the group of farmers with some off-farm work, 45.6% reported no days of off-farm work on the Census of Agriculture questionnaire (Table 5.2).

Consequently, the implementation of the Heckman approach was deemed inappropriate. To analyse the inter-relationships between off-farm work and the variables influencing off-farm work, an equation to explain the probability of reporting some off-farm work was estimated.

5.2.3. The measurement of off-farm work (OFW)

The dependent variable in the equation to explain the probability of reporting some off-farm work is whether or not the operator reports

some off-farm work. The purpose of this section is to discuss the concept of off-farm work and to consider the apparent discrepancy in the data mentioned above.

TABLE 5.2. Census-farm Operators (1) Reporting Some Off-farm Work (2), Showing Number with Major Occupation as "Farmer" and the Number of "Farmers" with Off-farm Work who Report Zero Days of Off-farm Work (DOFW=0), Canada and Provinces, 1971

Province	Operators (1) with some off-farm work (2)				
	Total	Operators (1) with major occupation: "farmer"			
		Number	2 as percent of 1	Number reporting DOFW=0	4 as percent of 2
	1	2	3	4	5
Canada	194,075	88,620	45.7	40,420	45.6
Newfoundland	735	180	24.5	130	72.2
Prince Edward Island	2,435	1,055	43.3	510	48.3
Nova Scotia	4,135	1,365	33.0	645	47.2
New Brunswick	3,635	1,230	33.8	620	50.4
Quebec	33,390	14,985	44.9	7,485	49.9
Ontario	57,075	22,225	38.9	9,550	43.0
Manitoba	16,360	8,650	52.9	3,700	42.8
Saskatchewan	31,565	19,225	60.9	8,590	44.7
Alberta	31,460	15,940	50.7	7,330	46.0
British Columbia	13,275	3,755	28.3	1,855	49.4

(1) Operators of institutional farms are excluded.
(2) Off-farm work is recorded for all operators with "some days of off-farm work" or non-zero off-farm employment income.

Source: Canada, Statistics Canada, Census of Agriculture, 1971, Catalogue No. 96-714, Bulletin 4.4-3, Table 1.

5.2.3.1. What is off-farm work?

Off-farm work might be literally interpreted to mean work, by the individual, that is performed off the farm holding. What about work done on the farm holding that is not related to the operation of the farm? Perhaps the term "non-farm work" would be more appropriate because it

could be literally interpreted as all work that is not related to the operation of the farm, whether or not performed on the farm premises. However, "off-farm work" has become the familiar term. (It has appeared on Census of Agriculture questionnaires since 1936; see Appendix A.)

The theoretical model developed in Chapter 2 suggests that all work that is not part of the farm self-employment activity should be classified as off-farm work. The next question is, how does one define work "that is not part of the farm self-employment activity?" Custom work provides a good test case. Using his own machines and providing his own labour, a farmer does farm work for another farmer. Should custom work be considered as off-farm work? The work is definitely performed off the operator's holding. But the work is farm work and it is self-employment work. The preference of the author is to define custom work as off-farm self-employment work because the work does not contribute directly to the productive activities of the farm unit.

In no way does this imply that custom work is an inefficient use of resources. On the contrary, custom work is an efficient use of both surplus labour and surplus machinery that frequently, but temporarily, occur in farming activities. Madden (1962) suggests that the farm be viewed as a goods-and-services firm. He notes,

> The farm operator is usually envisioned as being engaged only in the production of goods, not of outside services, owning or otherwise controlling all the durable factors as fixed resources, and using these resources to provide services only for his own farm. A more realistic concept views the farm firm as
> (a) a producer not only of goods but also of various services, such as custom work and off-farm jobs, and as
> (b) having the possibility of hiring various resource services in the amounts needed, as well as owning and operating durable resources. ...
>
> A farmer who owns (or otherwise controls) a large, high-capacity machine is often able to perform certain operations so rapidly that he and his equipment are idle between sequential operations. This gives rise to excess labor and machine capacity that can be sold to other farmers as a custom service. A part-time

> off-farm job can be viewed in a similar light, as a means of selling unused services of a fixed resource (in this case, the operator's labor) to another firm (Madden, 1962, p. 21).

Thus, Madden views custom work and off-farm work as two of a possible large set of goods and services that could be produced by the farm firm. (See also Ginzel et al., 1971.)

Hanson (1972, p. 6) suggests that the machinery return from custom work be included in net farm income and the labour earnings from custom work be included in off-farm income. Thus, he suggests that custom work be considered off-farm work because the labour component is off-farm income. This is consistent with the usual classification of off-farm work for a farmer working as a paid labourer on another farm.

The author has discussed this issue in a previous paper.

> Net income from custom work should be classified as net off-farm self-employment income. ... However, there appear to be insurmountable difficulties in apportioning the expense of machinery used for custom work between farm and off-farm use (Bollman, 1972, p. 3).

Since similar problems would exist in apportioning the receipts from custom work between machinery rental and operator's labour, it would appear that income from custom work should always be included in net farm income.[3] However, this is not to suggest that questions on "Days of Off-farm Work" should exclude custom work. In fact, custom work has been included in "Days of Off-farm work" since the 1936 Census. As is suggested above, income from custom work is seldom, if ever, included in off-farm employment income. Thus, a discrepancy in the data can be expected whereby some operators will report "Some Days of Off-farm Work" but no off-farm employment income.

The conclusion to be drawn at this point of the analysis is that it is usually necessary to rely on two variables such as "Days of Off-farm Work" and off-farm employment income to capture the

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See footnote(s) on page 132.

phenomenon of off-farm work. The variable "Days of Off-farm Work" will capture custom work whereas off-farm employment income will not. Off-farm employment income will capture non-farm business income from a job that may be physically located on the farm. (As the following discussion will suggest, off-farm employment income captures many other situations as well.) Consequently, this study defines off-farm work to exist when the operator reports some "Days of Off-farm Work" or some off-farm employment income.

What is the magnitude of the differences in these two variables? What reasons exist for such a discrepancy? First the questions that provide these data are discussed and then answers are suggested.

5.2.3.2. Questions that indicate off-farm work

Two questions on the Census of Population collected information on off-farm employment income. One question asked for total wages and salaries received in 1970 (Question 40a, Table A.2) and one question asked for the net non-farm self-employment income in 1970 (Question 40b, Table A.2). The Census of Agriculture ascertained the number of days of off-farm work in 1970 (Table A.1).

Before discussing possible reasons for any discrepancies in response to these two questions, the nature of the enumeration procedures followed by the two censuses should be mentioned. Both questionnaires were distributed by the same enumerator at the same time. That same person called back in a few days to pick up the completed questionnaires and, if necessary, to help with the completion of difficult questions. Ideally, the operator of the census-farm should have completed the Census of Agriculture questionnaire and the head of the household should have completed the Census of Population questionnaire. For innumerable reasons, this was not always possible and thus errors may have arisen because the respondent was not sure or not aware of certain facts pertaining to the operator. If different individuals completed the two questionnaires,

discrepancies would be more prevalent. In addition, it must be remembered that the questionnaires were completed on June 1, 1971 but the questions referred to the 1970 calendar year. Memory bias can be expected to be present.

The second item that should be mentioned is that imputations or assignments made in each census were performed without the benefit of the data on the other census (Lafrenière, 1977, p. 17). This was due to the fact that the linkage of the Agriculture and Population data was done after the imputations were performed. There is no way to determine the number of cases where the response to "Days of Off-farm Work" was assigned in the Census of Agriculture. In addition, the number of imputations or assignments of wages and salaries and net off-farm self-employment income in the Census of Population was not ascertained.

In addition to these reasons, what other circumstances could result in a discrepancy between "Days of Off-farm Work" (DOFW) and off-farm employment income (OFEI)?

5.2.3.3. Reasons for a discrepancy between DOFW and OFEI

Let us first consider the case where an operator reports some days of off-farm work (DOFW > 0) but no off-farm employment income (OFEI = 0). One reason that has already been discussed is the case of custom work. If the operator does some custom work, he will report the number of days as "Days of Off-farm Work" but the income will be attributed to net farm income. There are other cases where "Days of Off-farm Work" would be positive but the income from the off-farm work would be included in net farm income because of the ease (and/or convention) of reporting the income. For example, the income from fishing or wood-cutting activities may be included in net farm income because some of the expenses would be joint expenses and difficult to separate between the farm and the non-farm enterprise.

Another possible explanation for DOFW > 0 and OFEI = 0 is when an operator did some off-farm work in 1970 for which the payment was not received until 1971.

The opposite case, in which an operator reports no days of off-farm work but some off-farm employment income, presents more of a challenge. There are a number of possible explanations but the prime reason suspected is that many operators have off-farm jobs for which the work is difficult to specify in terms of days. Other possible reasons are:

1. The work could literally have been done on the farm site but the income was designated as non-farm self-employment income. Such "on-farm" non-farm enterprises might be a vacation service such as cabins or a motel or another business such as a service station or a farm implement dealership.

2. The operator may be a paid farm manager. Thus, the operator would report no days of off-farm work but would report wage and salary income. All operators of institutional farms should be in this category. Theoretically, all operators of corporate farms (even if the operator is the owner of the corporate farm) should report their farm income as wages and salaries paid by the corporation and as dividends withdrawn from the corporation. Thus, the wage and salary income would appear as off-farm employment income even though the operator reported no days of off-farm work.

3. The operator may have owned a business elsewhere but spent no time working at that business.

4. The operator may have been paid in 1970 for work done in 1969.

5. Some operators may find difficulty in responding to a question requesting days of off-farm work because their work is done in part days (such as driving a

school bus or selling insurance) or because the off-farm work was done on a casual basis and the operator either forgot the work or could not convert the work into days.

6. Lafrenière (1977, p. 16) suggests that some operators who work "regularly and exclusively" off the farm may not have considered their farm to be an agricultural holding and may have thought that the question on "days of work off this holding" was directed only to genuine farm producers. Consequently, they would not have answered the question on days of off-farm work.

7. Finally, some operators may have received small amounts of money that were recorded as wages or salaries, but were not considered by the respondent to be work. Examples might be a job as a polling clerk in an election or some per diem pay to be a member of a committee or board.

5.2.3.4. Magnitude of the discrepancy between DOFW and OFEI

Nearly 50% of the operators who report some off-farm work do not report both days of off-farm work and off-farm employment income (Table 5.3). There were 194,585 operators who reported some off-farm work but 91,710 operators (47.1%) who did not report both days of off-farm work and off-farm employment income. The latter group consists of 24,485 operators reporting DOFW > 0 and OFEI $\neq$ 0, which represents 12.6% of operators reporting some off-farm work. The proportion of such cases ranged from 2.7% in Newfoundland to 17.3% in Saskatchewan (Table 5.4). Another 66,750 operators reported DOFW = 0 and OFEI $\neq$ 0, which represents 34.4% of operators reporting some off-farm work. The proportion of such cases ranged from 30.3% in Ontario and British Columbia to 40.3% in Quebec and to 47.6% in Newfoundland.

TABLE 5.3. Number of Census-farm Operators Reporting Some Off-farm Work, Showing the Number with "Some Days of Off-farm Work" (DOFW>0), and Showing the Number Reporting Non-zero Off-farm Employment Income (OFEI≠0), Canada, 1971

Item	Number	Per cent
Total.....	367,215	100.0
No off-farm work		
DOFW=0 and OFEI=0.....	172,625	47.0
Some off-farm work		
Total.....	194,585	53.0
DOFW>0 and OFEI=0.....	24,485	6.7
DOFW=0 and OFEI≠0.....	67,225	18.3
DOFW>0 and OFEI≠0.....	102,875	28.0

Source: Canada, Statistics Canada, Census of Agriculture, 1971, Catalogue No. 96-714, Bulletin No. 4.4-3, Table 3.

The proportion of consistent responses (i.e., DOFW > 0 and OFEI ≠ 0) ranged from 45.2% in Saskatchewan to 63.2% in British Columbia.

The smaller the number of days of off-farm work, the larger is the incidence of DOFW > 0 and OFEI = 0 (Table 5.5). At the Canada level, 9,845 operators reported one to twelve days of off-farm work and 63.6% of this group reported OFEI = 0. A total of 42,040 operators reported at least 229 days of off-farm work and only 6.8% of this group reported OFEI = 0. The pattern was similar among all provinces. This pattern suggests that operators who report only a few days of off-farm work may forget to record their wages. (Also, farmers performing custom work services tend to report only a few days of off-farm work).

TABLE 5.4. Number and Per cent of Census-farm Operators(1) Reporting Some Off-farm Wor', Showing the Number Reporting Only "Some Days of Off-farm Work" (DOFW>0), an Showing the Number Reporting Only Some Non-zero Off-farm Employment Income (OFEI ≠ 0), Canada and Provinces, 1971

Province	Operators(1) reporting some off-farm work							
	Total		DOFW>0 and OFEI=0		DOFW=0 and OFEI≠0		DOFW>0 and OFEI≠0	
	Number	Per cent	Number	Per cent	Number	Per cent	Number	Per cent
Canada	194,075	100.0	24,480	12.6	66,750	34.4	102,845	53.0
Newfoundland	735	100.0	20	2.7	350	47.6	365	49.6
Prince Edward Island	2,435	100.0	270	11.1	870	35.7	1,295	53.2
Nova Scotia	4,135	100.0	315	7.6	1,425	34.5	2,395	57.9
New Brunswick	3,635	100.0	315	8.7	1,375	37.8	1,945	53.5
Quebec	33,390	100.0	4,060	12.2	13,445	40.3	15,885	47.6
Ontario	57,075	100.0	6,885	12.1	17,285	30.3	32,905	56.2
Manitoba	16,360	100.0	2,245	13.7	5,455	33.3	8,660	52.9
Saskatchewan	31,565	100.0	5,465	17.3	11,835	37.5	14,265	45.2
Alberta	31,460	100.0	4,045	12.8	10,685	34.0	16,730	53.2
British Columbia ...	13,275	100.0	865	6.5	4,020	30.3	8,390	63.2

(1) Excludes operators of institutional farms.

Source: Canada, Statistics Canada, Census of Agriculture, 1971, Catalogue No. 96-714, Bulletin 4.4-3, Table 1.

TABLE 5.5. Number and Per cent of Census-farm Operators (1) Reporting "Some Days of Off-farm Work" (DOFW > 0) and Zero Off-farm Employment Income (OFEI = 0), by Number of Days of Off-farm Work, Canada, 1971

Number of days of off-farm work	Operators with DOFW > 0		
	Total(1)	Operators with DOFW > 0 and OFEI=0	2 as a per cent of 1
	1	2	3
Total	127,315	24,480	19.2
1-12	9,845	6,260	63.6
13-48	17,800	7,140	40.1
49-96	16,850	3,745	22.2
97-156	18,380	2,465	13.4
157-228	22,400	2,000	8.9
229 and over	42,040	2,860	6.8

(1) Excludes operators of institutional farms

Source: Canada, Statistics Canada, Census of Agriculture, 1971, Catalogue No. 96-714, Bulletin 4.4-3, Table 1.

Now consider the incidence of DOFW = 0 and OFEI $\neq$ 0 by size of off-farm employment income. The highest incidence of DOFW = 0 and OFEI $\neq$ 0 was in the group of operators with $15,000 or more of off-farm employment (Table 5.6). This observation supports Lafrenière's hypothesis (above) that persons with full-time off-farm jobs failed to answer the question on days of off-farm work on the Census of Agriculture questionnaire. The next highest incidence was the group reporting the lowest off-farm employment income. The middle groups of off-farm employment reported a lower incidence of DOFW = 0. The pattern was similar in most (although not all) provinces.

TABLE 5.6. Number and Per cent of Census-farm Operators(1) Reporting Zero Days of Off-farm Work (DOFW=0) and Non-zero Off-farm Employment Income (OFEI≠0), by Size of Off-farm Employment Income, Canada, 1971

Size of off-farm employment income	Operators with OFEI ≠ 0		
	Total(1)	Operators with OFEI ≠ 0 and DOFW=0	2 as a per cent of 1
	1	2	3
Total	169,595	66,750	39.4
Less than $2,000(2)	45,290	19,910	44.0
$2,000-4,999	49,880	19,300	38.7
$5,000-9,999	52,415	17,325	33.1
$10,000-14,999	13,460	5,435	40.1
$15,000 and over	8,550	4,785	56.0

(1) Excludes operators of institutional farms.
(2) Includes loss.

Source: Canada, Statistics Canada, Census of Agriculture, 1971, Catalogue No. 96-714, Bulletin 4.4-3, Table 1.

One-half of the operators reporting DOFW > 0 and OFEI = 0 reported their off-farm work to be agricultural or lumbering (Table 5.7). As mentioned above, income from agricultural custom work is not generally included in OFEI. Also, income from agricultural-related work may be easier to include in net farm income rather than off-farm income.

The type of discrepancy in reporting off-farm work is not related to whether or not the operator lived on the farm (Table 5.8). However, marked differences exist depending on the major occupation stated during census week (Table 5.8).

For the group stating a non-farm occupation, 76.6% reported both some "Days of Off-farm Work" (DOFW > 0) and some off-farm employment income (OFEI ≠ 0), compared to only 52.9% overall. Most of the inconsistent responses for this group were zero days (DOFW = 0) and some income (OFEI ≠ 0), which again support Lafrenière's hypothesis.

TABLE 5.7. Number and Per cent of Census-farm Operators Reporting "Some Days of Off-farm Work" (DOFW>0) and Zero Off-farm Employment Income (OFEI=0), by Type of Agriculturally-related Off-farm Work, Canada and Provinces, 1971

Province	Total	Type of agriculturally-related off-farm work					
		Total		"Agricultural work off this holding"		"Logging, lumbering or forestry work"	
	Number	Number	Per cent	Number	Per cent	Number	Per cent
Canada	24,485	12,335	50.4	10,640	43.4	1,695	6.9
Newfoundland	20	10	50.0	5	25.0	5	25.0
Prince Edward Island	270	155	57.4	150	55.6	5	1.8
Nova Scotia	310	170	54.8	115	37.1	55	17.7
New Brunswick	320	165	51.6	100	31.2	65	20.3
Quebec	4,060	1,950	48.0	1,340	33.0	610	15.0
Ontario	5,880	4,060	59.0	3,860	56.1	200	2.9
Manitoba	2,240	905	40.4	815	36.4	90	4.0
Saskatchewan	5,470	2,585	47.2	2,340	42.8	245	4.5
Alberta	4,045	1,860	46.0	1,585	39.2	275	6.8
British Columbia	860	485	56.4	335	39.0	150	17.4

Source: Canada, Statistics Canada, unpublished data drawn from the 1971 Agriculture — Population Linkage.

TABLE 5.8. Number and Per cent of Census-farm Operators who Reported Some Off-farm Work, Showing Occupation Stated During Census Week and Location of Residence, by Type of Discrepancy in Reporting Off-farm Work, Canada, 1971

Occupation and residence	Operators reporting some off-farm work		Type of discrepancy in reporting off-farm work(1)					
			DOFW>0 and OFEI=0		DOFW=0 and OFEI≠0		DOFW>0 and OFEI≠0	
	Number	Per cent	Number	Per cent	Number	Per cent	Number	Per cent
All occupations								
Total operators	194,590	100.0	24,485	12.6	67,225	34.5	102,875	52.9
Lived on farm	167,810	100.0	21.225	12.6	57,560	34.3	89,025	53.1
Did not live on farm	26,775	100.0	3.265	12.2	9.665	36.1	13,850	51.7
From self-employment								
Total operators	88,885	100.0	19,500	21.9	40,665	45.8	28,720	32.3
Lived on farm	78,920	100.0	17,120	21.7	36,445	46.2	25,360	32.1
Did not live on farm	9,965	100.0	2,380	23.9	4,220	42.3	3,365	33.8
Other occupations								
Total operators	91,860	100.0	3,020	3.3	18,490	20.1	70,345	76.6
Lived on farm	76,565	100.0	2.365	3.1	13.795	18.0	60,400	78.9
Did not live on farm	15,295	100.0	655	4.3	4,690	30.7	9,950	65.1
No occupation stated								
Total operators	13,840	100.0	1,965	14.2	8,070	58.3	3.815	27.6
Lived on farm	12,325	100.0	1.740	14.1	7,315	59.4	3,275	26.6
Did not live on farm	1,520	100.0	225	14.8	755	49.7	535	35.2

(1) DOFW = Days of off-farm work.
OFEI = Off-farm employment income.

Source: Canada, Statistics Canada, unpublished data drawn from the 1971 Agriculture — Population Linkage.

For the group stating their occupation to be farming, only 32.3% reported some days and some income. The major discrepancy was zero days and some income (45.8%). The reasons for this discrepancy are not obvious. The remaining 21.9% reported some days but zero income. As argued above, the reason for farmers to report this discrepancy is due to custom work being included in days but not in off-farm employment income. The number of "farmers" reporting this discrepancy (19,500) is 79.6% of all operators reporting this discrepancy (24,485).

An analysis of a sample of farm taxfilers[4] indicates that 19.3% reported some income from custom work in 1971 (Table 5.9). Thus, custom work services appear to be prevalent among farmers and the magnitude is larger than required to reconcile the discrepancy

TABLE 5.9. Number and Per cent of Farm Taxfiler(1) Reporting Income from Custom Work, by Size of Gross Farm Sales, Canada, 1971

Size of gross farm sales	Number of farm taxfilers in sample(1)	Taxfilers reporting custom work	
		number	per cent
Total (1)	260,246	50,248	19.3
Less than $2,500	59,639	4,682	7.9
$ 2,500 - $ 4,999	41,764	5,991	14.3
$ 5,000 - $ 9,999	61,431	11,988	19.5
$10,000 - $19,999	58,249	14,889	25.6
$20,000 and over	39,163	12,698	32.4

(1) A farm taxfiler is a taxfiler who reported some self-employment income from farming. These estimates are based on a partial sample. No attempt has been made to adjust for the approximately 100,000 farm taxfilers not represented in the sample.

Source: Canada, Statistics Canada, unpublished tabulation.

See footnote(s) on page 132.

between DOFW > 0 and OFEI = 0. (Also note that the incidence of custom work increases as gross sales increase, as hypothesised in Chapter 4.)

Perhaps the census questionnaires were too complicated. If this were the case, one would expect that discrepancies would decline as the operator's level of education increased. Although the relationship is slight, the data do support such a hypothesis (Table 5.10). Both types of discrepancies decline as operator's years of schooling increase. Also, fewer discrepancies are reported by operators with some vocational training, compared to the operators with no vocational training.

5.2.4. Data on demand variables[5]

5.2.4.1. The demand for operator's labour on the farm

The variables to explain the demand for on-farm labour are the price of output (P_Y), the price of capital (P_K), the price of hired labour (P_{HL}), and the price of other variable inputs (P_{VIN}). In cross-section analyses, prices are usually assumed to be constant. Variability in the quantity of labour demanded is thus due to differences in the production function being used. Specifically, the scale of production may be different or the input mix (i.e., technology) may be different. The larger the scale (i.e., the greater the output), holding prices constant, the greater the demand for on-farm labour. If it is assumed that capital, hired labour, and other variable inputs are substitutes for operator's labour, then the larger are inputs of capital, hired labour, or other variable inputs, the smaller will be the demand for labour. Are data available for these variables?

Imposing the assumption that prices are constant, the scale of output can be measured by the value of agricultural products sold (Question 188, Table 5.11). For this variable to give an exact measure of output, it is necessary to assume that farm-held inventories of farm products did not increase or decrease.

See footnote(s) on page 132.

TABLE 5.10. Number and Per cent of Census-farm Operators Reporting Some Off-farm Work, Showing the Number Reporting Only "Some Days of Off-farm Work" (DOFW>0), and Showing the Number Reporting Only Non-zero Off-farm Employment Income (OFEI≠0), by Level of Schooling, Canada, 1971

Level of schooling	Operators reporting some off-farm work							
	DOFW>0 and OFEI=0		DOFW=0 and OFEI≠0		DOFW>0 and OFEI≠0		TOTAL	
	Number	Per cent	Number	Per cent	Number	Per cent	Number	Per cent
Total	24,485	12.6	67,225	34.5	102,875	52.9	194,585	100.0
Less than grade 5	1,810	13.4	6,390	47.4	5,295	39.2	13,490	100.0
Grades 5 – 8	11,870	12.9	32,695	35.6	47,315	51.5	91,880	100.0
Grades 9 – 11	7,535	12.8	18,420	31.4	32,685	55.8	58,630	100.0
Some vocational	905	10.1	2,360	26.3	5,715	63.7	8,975	100.0
No vocational	6,630	13.4	16,060	32.3	26,970	54.3	49,655	100.0
Grades 12 and 13	2,425	12.0	6,265	31.0	11,535	57.0	20,225	100.0
Some vocational	425	8.9	1,345	28.1	3,015	63.0	4,785	100.0
No vocational	2,000	12.9	4,920	31.9	3,520	55.2	15,440	100.0
Some university	650	10.6	2,150	35.1	3,315	54.2	6,120	100.0
University degree	190	4.5	1,305	30.8	2,735	64.7	4,230	100.0

Source: Canada, Statistics Canada, Census of Agriculture, 1971, Catalogue No. 96-714, Bulletin 4.4 -3, Table 8.

TABLE 5.11. Selected Questions from the 1971 Census of Agriculture Questionnaire

3. What is the **total area** of all land you **operate**? 004
(This is the total area of land recorded in Question 2.)

156. **Total value of all machinery and equipment** ..... 193 $ /00
(Total of values reported in Questions 145 to 155)

160. **Cash wages paid** to hired agricultural labour
(Do not include amount paid for housework, custom work and construction labour) ..... None ☐ (dollars only) 198 $ /00

163. **Feed purchases** (hay, grain, mixed feeds, concentrates, etc.) ..... None ☐ 202 $ /00

165. **Machine rental, custom work or contract work** ..... None ☐ 204 $ /00

166. **Commercial fertilizers purchased** (Do not include lime) ..... None ☐ 205 $ /00

167. **Agricultural chemicals purchased** (Include insecticides, herbicides, fungicides, pesticides, etc.) None ☐ 206 $ /00

188. **Total value of agricultural products sold** *(Total of entries in Questions 168 to 187)* ..... 227 $ /00

197. How many months did you (the operator) live on this holding during the **past 12 months?** *(Mark an "X" in appropriate box.)*
1 ☐ 9 - 12 months 2 ☐ 5 - 8 months 3 ☐ 1 - 4 months 4 ☐ Did not live on this holding 238

Source: Canada, Statistics Canada, 1971 Census of Agriculture Questionnaire.

The variable "hired labour" (HL), when introduced in Section 2.3, also included upaid family labour. At this point, HL is divided into its two parts:

(a) hired labour-paid (HLP); and
(b) unpaid family labour.

The paid hired labour (HLP) can be measured by the cash wages paid (Question 160, Table 5.11). A measure of unpaid family labour can be developed from the response by the operator's family members to the questions on quantity of labour (see the questions in Table 5.1). Three possible measures of unpaid family labour were identified:

(i) number of family members (excluding the operator) who usually worked without pay (NUFM), which is the number of operator family members responding to Question 37 (Table 5.1);
(ii) number of family members (excluding the operator) who worked without pay in the week prior to the census enumeration (NUFMLW), which is the number of operator family members responding to Question 31b (Table 5.1); and
(iii) number of family members (excluding the operator) who worked without pay in the week prior to the census enumeration but did not usually work without pay (NUFMLWa), which is the number of individuals who are in the second group but not in the first group.

To the extent that the last week of May is a peak period, the potential year-round availability of family labour will be indicated by NUFMLW or NUFM + NUFMLWa.

Good data to measure the quantity of capital as an input are not available. A measure of the quantity of capital is required because constant prices are assumed in cross-section analysis. The only available data are in terms of the value of capital. The value of capital is the present value of the expected stream of future net

earnings.[6] Thus the quantity of capital cannot be measured by the value of capital. Farm capital is usually categorised as land, buildings, machinery and equipment, and livestock. Thus the use of total acres alone to measure the quantity of capital is inadequate because the other categories are missed and because land varies considerably in quality.

The following three variables were adopted to indicate the quantity of capital:

(a) total acres (TA), which does not allow for the variability in the quality of the land and does not include the large investment in specialised buildings for livestock (Question 3, Table 5.11);

(b) value of machinery and equipment (VME) (Question 156, Table 5.11); and

(c) value of livestock (VL), which will be correlated with the value of livestock buildings and thus will proxy the value of livestock plus livestock buildings. The value of livestock was imputed by using average value per head estimates prepared by the Agriculture Division of Statistics Canada.

In Section 2.3, the quantity of capital was hypothesised, in general, to be a substitute for operator's labour (i.e., for a given level of output, the greater the quantity of capital, the smaller the quantity of operator's labour demanded). However, now that capital is not measured in aggregate, the hypothesis must be restated. For a given level of output, the greater the total acres or the greater the value of machinery and equipment, the smaller the demand for operator's labour is hypothesised to be. However, the case is different regarding the livestock component of total capital. For a given level of output, the greater the value of capital in livestock, the greater the demand for operator's labour is hypothesised to be. The

See footnote(s) on page 132.

reason is that for a given output, a larger livestock inventory implies a higher proportion of livestock in total output. Since livestock production is hypothesised to be more labour intensive relative to the production of other commodities, it is hypothesised that the greater the value of livestock (holding output constant), the greater the demand for operator's labour.

The remaining variable which was identified as being important for determining the on-farm demand for operator's labour was the level of other variable inputs (VIN). Many apparently variable inputs are actually an expense that is directly proportional to the level of capital. For example, seed is proportional to land, machinery maintenance and repairs are proportional to the machinery capital stock, rent and taxes are proportional to land, and building and fencing repairs are proportional to the building capital stock. However, some variable inputs are less fixed to the size of the capital base and, for a given level of output, can be substituted for operator's labour. Examples are fertilisers and chemical sprays for crop production and veterinary expenses and feed purchases for livestock production. Given the data available, VIN was defined as the sum of the expenditure for "feed purchases", "machine rental, custom work or contract work", "commercial fertilisers", and "agricultural chemicals" (see Questions 163, 165, 166 and 167 in Table 5.11).

5.2.4.2. The demand for operator's labour off the farm

The variable to explain the demand for off-farm labour is the operator's expected wage rate, $E(P_{OL})$, in off-farm employment minus the cost of commuting (c) to the off-farm job. The wage rate, P_{OL}, available to the operator is determined by the occupation the individual is able to enter which, in turn, is a function of the job skills (sk) possessed by the operator. The greater the job skills, the greater is the demand for off-farm work facing the operator. The expectation of receiving P_{OL} is determined by the probability of obtaining employment in that occupation. This probability could ideally be indicated by a measure of the excess of demand over supply

of labour in that occupation, such as a measure of job vacancies in that occupation. The greater the probability of employment in that occupation, the greater is the demand for off-farm work facing the operator. The operator is influenced by the net wage. The net off-farm wage is equal to the money wage minus the cost of commuting to the off-farm job. The cost of commuting can be indicated by the distance to an urban centre.

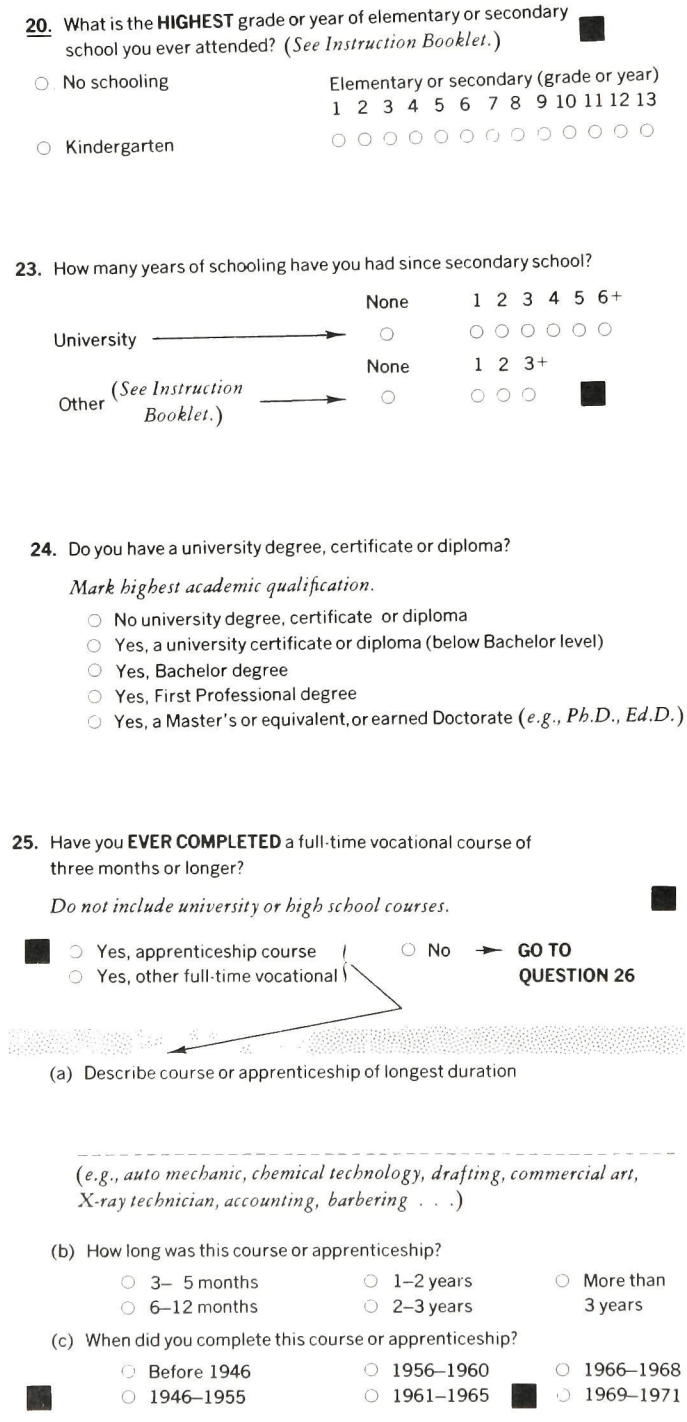
As mentioned above (Section 5.2.1), there were no data on the wages received or available to operators for off-farm work. It is hypothesised that the higher the attainable off-farm wage rate is, the greater are the job skills (sk) of the farm operator. Given the data on the Census of Population, two variables were chosen to indicate job skills:

(a) years of schooling (YOS), which is the sum of Questions 20 and 23 (Table 5.12); and
(b) a dichotomous variable to indicate whether the operator has received any non-agricultural vocational training (VT), where VT = 1 if yes, and VT = 0 if no vocational training has been taken (see Question 25, Table 5.12).

The "other" years of schooling in Question 23 include attendance at a trade or business school, an institute of technology, a community college, a CEGEP, a commercial college, a nursing school or a teachers' college.

A measure of excess demand, even for all occupations, was not available. To measure the general degree of demand for off-farm employment, two alternative measures were identified: the unemployment rate (U) in the census division where the operator resides; or the labour force participation rate (LFPR) in the census division where the operator resides. The unemployment rate can be considered a short-run or cyclical indicator of labour demand whereas the labour force participation rate can be considered a long-run or structural indicator of labour demand in the census division. It is postulated that the

TABLE 5.12. Questions on the 1971 Census of Population Questionnaire Relating to Job Skills



20. What is the **HIGHEST** grade or year of elementary or secondary school you ever attended? (*See Instruction Booklet.*)

○ No schooling

○ Kindergarten

Elementary or secondary (grade or year)
1 2 3 4 5 6 7 8 9 10 11 12 13
○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○

23. How many years of schooling have you had since secondary school?

University →
None 1 2 3 4 5 6+
○ ○ ○ ○ ○ ○ ○

Other (*See Instruction Booklet.*) →
None 1 2 3+
○ ○ ○ ○

24. Do you have a university degree, certificate or diploma?

Mark highest academic qualification.

○ No university degree, certificate or diploma
○ Yes, a university certificate or diploma (below Bachelor level)
○ Yes, Bachelor degree
○ Yes, First Professional degree
○ Yes, a Master's or equivalent, or earned Doctorate (*e.g., Ph.D., Ed.D.*)

25. Have you **EVER COMPLETED** a full-time vocational course of three months or longer?

Do not include university or high school courses.

○ Yes, apprenticeship course
○ Yes, other full-time vocational
○ No → **GO TO QUESTION 26**

(a) Describe course or apprenticeship of longest duration

(*e.g., auto mechanic, chemical technology, drafting, commercial art, X-ray technician, accounting, barbering . . .*)

(b) How long was this course or apprenticeship?

○ 3– 5 months ○ 1–2 years ○ More than 3 years
○ 6–12 months ○ 2–3 years

(c) When did you complete this course or apprenticeship?

○ Before 1946 ○ 1956–1960 ○ 1966–1968
○ 1946–1955 ○ 1961–1965 ○ 1969–1971

Source: Canada, Statistics Canada, 1971 Census of Population Questionnaire.

lower the unemployment rate or the higher the labour force participation rate, the greater is the general demand for off-farm employment and thus the greater is the probability of an operator reporting off-farm work.

The remaining variable in the demand for off-farm labour function is the cost of commuting. The higher the cost of commuting, the lower is the off-farm wage and the demand for off-farm labour, and thus the lower is the probability of off-farm work. Commuting cost is primarily a function of distance, because prices are assumed constant in the cross-section analysis.

Although possible in principle, it is difficult in practice to obtain a measure of the distance an individual or a group of individuals lives away from a job centre or a centre of potential urban jobs. In addition, there is a significant number of non-farm jobs in rural communities. The more people in the community, the greater are the number of nearby off-farm jobs. Thus the proximity of an off-farm job could be indicated by the population density of the census division.[7] The population density (PD) is defined as the total population in the census division divided by the number of acres in the census division.

An alternative proxy of the cost of commuting was specified. The non-farm population as a percent of the total population in the census division (PCNFPOP) was calculated. It was postulated that the greater the proportion of the population that is non-farm, the greater would be the number of nearby jobs.[8]

5.2.5. Data on supply of labour variables

The variables to explain the operator's supply of labour are the price of consumption goods (P_C), the marginal value of the spouse's time (i.e., the wage rate facing the operator's spouse, w_{SL}), the marginal value of the operator's time (i.e., the wage rate facing the operator, P_{OL}) and non-earned income (NEI).

See footnote(s) on page 132.

Prices are assumed constant in the cross-section analysis. There are no data to measure the size of the consumption bundle (i.e., the quantity of consumption) by the operator's family. The larger the quantity of family consumption, the greater the operator's supply of labour is expected to be. The size of the consumption bundle can be indicated by the number of family members. However, those family members that work as unpaid labour on the farm are considered above in the analysis of the demand for the operator's labour on the farm. The greater the quantity of unpaid family labour, the smaller is the demand for the operator's labour on the farm and the greater the probability of off-farm work. Here, the larger the family is, the greater the consumption bundle, the greater the operator's supply of labour, and the greater the probability of off-farm work. Thus a larger family size will increase the probability of off-farm work on both counts. However, the same family member should not be counted in both variables. Thus to avoid such double-counting in the family size variable, family size is defined to be total non-working family members (TNWFM), that is, total family members minus those who report some on- or off-farm employment activity.

The marginal value of the spouse's time should ideally be indicated by data on the wage rate available to the spouse, w_{SL}. However, no observations on wages were available to this study. The level of the spouse's wage was indicated in the same manner as the operator's wage, as discussed above. To indicate the skills possessed by the spouse, SYOS is defined as spouse's years of schooling (see Question 20 and 23, Table 5.12) and SVT = 1, if the spouse received vocational training; SVT = 0, if not (see Question 25, Table 5.12). To measure the probability of obtaining work, the unemployment rate (U) or the labour force participation rate (LFPR) must be relied on. When they were introduced, an increase implied an increase in off-farm demand for labour facing the operator which in turn implied an increase in the probability of reporting off-farm work. Now, an increase implies an increase in the off-farm wage rate faced by the spouse, which implies a reduced supply of labour by the operator, which implies a smaller probability of the

operator's reporting off-farm work. Thus, the sign of U or LFPR in the equation to predict the probability that an operator reports some off-farm work may be positive or negative, depending upon whether the influence is stronger on the total supply curve or on the off-farm demand.

To measure the cost of commuting, the population density (PD) or percent of total population that is non-farm (PCNFPOP) is relied on, as introduced above. Again, the sign on this variable in the estimating equation may be positive or negative, depending upon whether it exhibits a stronger influence through the total supply of labour curve or the demand for off-farm labour curve facing the operator.

The variable NEI (non-earned income) measures the income available to the family exogenous of the decisions made by the operator and the spouse with regard to employment activity. Non-earned income is defined to be all family income except the employment income of the operator and the operator's spouse.

It is recognised that some aspects of this definition of non-earned income are related to the labour supply decision. For example, labour earnings (both farm and non-farm) of other family members are included. Also, income that may accrue in the absence of labour supply (such as unemployment insurance benefits or welfare receipts) is included. Non-earned income needs to be "purged of all income which is in any way related to labor supply" (Sexton, 1975, p. 58). Thus, an alternative measure of non-earned income (NEIa) was constructed. NEIa was defined as the total family income minus the wages and salaries, farm self-employment income, non-farm self-employment income and other government income received by all family members. The labour earnings of other family members are excluded because

> The labor supply of the farm operator to secondary work is determined conjointly with and not independently of the labor supply decisions of other family members. If the wage and salary income of farm family members is to be incorporated in the labor supply equation, it should therefore be entered as an endogenous variable (Sexton, 1975, p. 58).

Note that "other government income" (see Question 40d.3 in Appendix A) consists primarily of unemployment insurance benefits and welfare receipts. A spurious negative correlation may result between non-earned income and off-farm work if these transfers are included in non-earned income. Thus NEIa refers mainly to pension and investment income. Some endogeneity still persists because labour supply decisions in previous years will have an influence on the present size of pensions and the present stock of invested assets.

One other component of non-earned income remained unmeasured-- the flow of services from non-financial assets. The most pervasive example is the value of owner-occupied housing. An ideal procedure would have been to calculate the annuity value of net worth as developed by Weisbrod and Hansen (1968). However, data were not available on non-farm assets or on farm and non-farm liabilities. In this study, it is assumed that the measured non-earned income is correlated with the flow of services from non-financial assets and thus the influence of non-financial assets is captured by the measured non-earned income.

5.3. A Feasible Estimation Procedure

5.3.1. Introduction

Given the data constraints outlined in the above sections, the inter-relationships between off-farm work and the variables influencing off-farm work can be analysed best by estimating an equation to explain the probability of reporting some off-farm work. An equation to explain the probability of reporting some off-farm work is identical to an equation to explain the participation rate in off-farm work. The term "participation rate" is used when referring to a group. Since this study uses observations at the individual level, the former terminology is used. However, the equivalence remains-- the equation specifying the probability for an individual can be interpreted as the participation rate for a group of like individuals.[9]

It is recognised that census-farm operators with some off-farm work represent the intersection of two sets:

See footnote(s) on page 132.

(a) census-farm operators; and

(b) participants in the non-farm labour force.

The decision to predict the probability that a census-farm operator has some off-farm work rather than predict the probability that a member of the non-farm labour force operates a census-farm is arbitrary but reflects the concentration of this study on the population of census-farm operators.

In this section, some additional considerations relating to the empirical analysis are first discussed and the variables that enter the empirical analysis are then summarised.

5.3.2. Additional considerations

5.3.2.1. The assumption of long-run equilibrium: the introduction of operator's age as an independent variable

One general matter requiring discussion is the usual assumption of cross-section analysis that individuals are in a long-run equilibrium. Specifically, this assumption implies that 1970 was an equilibrium year in the market for the operator's labour both on the farm and off the farm. Thus, we assume that the relevant variables have equilibrium values and have had equilibrium values for a reasonable length of time such that the operator's labour market has fully adjusted to the equilibrium values of the relevant parameters. Therefore, no differences in the probability of reporting off-farm work are due to lags in adjustment to the present circumstances. All differences in the probability of reporting off-farm work are due to differences in the assumed equilibrium value of the parameters facing different individuals (assuming constant utility functions among individuals--another typical assumption in cross-section studies of individuals).

Let us investigate the implications of assuming that all individuals are in long-run equilibrium. The long-run decision for any firm is the size of plant to be built. Thus, the assumption of long-run equilibrium implies that all individuals have the optimal size of plant. It assumes that there is no excess demand or supply

of individuals to the farming occupation. All individuals have done a benefit-cost calculation and obtained the optimal scale of plant (or have decided not to be a farmer).

If capital markets are allowed to be imperfect, then it is unrealistic to assume all individuals to be in long-run equilibrium. Imperfections in the capital market mean that individuals cannot borrow and lend at the same rate of interest. Also, there are poor second-hand markets for farm capital investments. The existence of imperfect capital markets implies that adjustments to the optimal capital stock are not instantaneous. Individuals who enter farming will not immediately be able to obtain the desired level of capital stock. Off-farm work can be one method of generating income to enable an operator to build to the desired level of capital stock. In such cases, the probability of reporting off-farm work will be a function of the difference between the desired capital stock and the actual capital stock. There was no feasible way to measure this difference. One proxy for this difference would be the age of the operator. It is hypothesised that the actual capital stock would be less than the desired capital stock for younger operators. It is therefore hypothesised that the younger the operator is, the greater the probability of reporting some off-farm work.

However, the introduction of the "age" variable invites many other interpretations, in addition to being a proxy for the degree of disequilibrium in the capital stock. The age of the operator may introduce other life-cycle considerations (in addition to capital accumulation) such as differences in the utility function of the individuals. Examples of such factors are differing attitudes towards risk among age groups (discussed in Section 3.11.4 in Bollman, 1978b), differing attitudes towards employment in the labour force among age groups, differing attitudes towards admitting failure as a farmer by accepting off-farm work among age groups, differences in commitment to farming as a way of life among age groups, and differences in the state of health, to the extent health is correlated with age. Also,

> the present value of the returns to investing in a search for off-farm jobs will be greater for younger farm operators, since the pay-off period to such search activity is much longer (Sexton, 1975, p. 62).

An additional factor is

> the differing rates of time preference for earlier over later consumption between persons of different age groups. Uncertainty about the length of life remaining will tend to cause individuals in older age groups to be more impatient with respect to the consumption of leisure relative to younger persons, the result being for hours worked to decline as age increases (Sexton, 1975, p. 62).

All factors causing differences in the utility function will shift the supply of labour curve and thus influence the probability of reporting some off-farm work. Thus, to the extent that differences in the utility function of individuals are a function of age, allowing for the age of the operator in the analysis will correct these differences.

Note also that age can proxy the experience of the operator in the farm and/or the off-farm labour market. Thus, age of operator will influence the demand for on-farm labour curve and the demand for off-farm labour curve facing the operator, in addition to the supply of labour curve.

Another issue arises regarding the influence of age when considering the question of occupational choice during analysis of a group of individuals of mixed ages. Over time, an individual gains experience and skills that are useful only in that occupation. Therefore, as experience and skills become occupation specific, the cost of switching occupations becomes larger. Thus as a farmer gets older and specialised in farming as an occupation, the available off-farm wage falls relatively. However, the fact that this off-farm wage declines with age does not explain the cross-section observation that the probability of off-farm work, Pr(OFW), falls as age increases. Rather, one must enquire why the now older farmers did not participate in off-farm work when they were younger to develop the necessary skills.

The question of immediate interest is whether it is the presently available off-farm wage or whether it is the off-farm wage that the operator could have had if he had developed off-farm skills and experience that influences Pr (OFW). This question is equivalent to asking whether off-farm work is a short-run or a long-run phenomenon. That is, is Pr(OFW) primarily influenced by transitory conditions confronting the operator or by the more permanent conditions facing the operator? Viewing occupational choice as a long-run decision, the operator may now have had a high wage job if the occupation had been entered earlier. Thus it is the skilled wage that should influence the Pr(OFW), not the low wage in the unskilled job for which the operator is now qualified. However, as conditions change temporarily, or as the expectation of long-run conditions change, the wage in the occupation which the operator can now enter will be the determining factor.

Consequently, the introduction of the operator's age as an independent variable will capture the influence of a myriad of factors influencing the demand for the operator's labour on the farm, the demand for the operator's labour off the farm, and the operator's total supply of labour function.

5.3.2.2. The introduction of other conditioning variables[5]

The age variable is considered a conditioning variable because it captures a number of effects on both the demand and supply side. Conditioning variables are introduced in order to take into account the variables that are not expected to be randomly distributed among individuals. Thus, a better estimate of the effect solely attributable to a relevant variable is obtained; in other words, the analysis can proceed by stating that all other influences are held constant.

A number of additional variables must be taken into account. In 1971, 3.8% of the (private and partnership) census-farm operators were female (see Appendix C). Since the on-farm demand for labour, the off-farm demand for labour, and the total supply of labour functions

See footnote(s) on page 132.

are expected to be different for female operators, a dummy variable indicating the sex of the operator is included. The variable SEX will be equal to 1 if the operator is female and will be equal to 0 if the operator is male.

Another important conditioning variable is the marital status of the operator. Although marital status captures a number of factors influencing both the demand and supply of labour functions facing the farm operator, the main reason for recognising the marital status of the farm operator is because the influence of the spouse's wage rate (proxied by the spouse's years of schooling (SYOS) and the spouse's vocational training (SVT)) is only operative if the operator is married with a spouse present. Consequently, a dummy variable (DSPOUSE) is included which is equal to 1 if the operator is married with a spouse present and equal to 0 otherwise. Note that the full impact of a spouse on the probability of the operator reporting some off-farm work is the sum of the estimated coefficient for the variable DSPOUSE plus the influence of the spouse's years of schooling (SYOS) and the spouse's vocational training (SVT), given that the operator has a spouse. To obtain this result, a procedure called an interactive dummy variable (Johnston, 1972, p. 181) is utilised. Rather than entering SYOS and SVT as variables, they are interacted with DSPOUSE and the products SYOS x DSPOUSE and SVT x DSPOUSE are entered. Thus, the estimated parameters on the interactive variables give the impact of a year of schooling or a vocational course, given the operator has a spouse. Similarly, the impact of a spouse is

$$\frac{\partial Pr(OFW)}{\partial SPOUSE} = b_{DSPOUSE} + b_{SYOS}\,(SYOS) \quad b_{SVT}\,(SVT)$$

where b_i is the coefficient for variable "i" and where, in this study, SYOS and SVT are evaluated at their means.[10]

All census-farm operators have been included in the empirical

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See footnote(s) on page 132.

analysis undertaken to this point in the study. This was mainly because the published data did not distinguish private and partnership operators from operators of institutional farms, estates and trusts, corporate farms, and other types of farm organisation. In addition, most of the tabular analysis in Section 6.5 relies on published data and thus no distinction is made. However, only private and partnership operators will be considered in the multivariate analysis (Section 6.6) because the dependent variable is defined such that operators of different types of farm organisation will respond differently. Specifically, operators of institutional farms, family corporate farms, non-family corporate farms, and other farms will tend to report their earnings from operating the farm as wages and salaries (i.e., off-farm employment income). Less than 3% of the census farms (9,220 of a total 367,215) are omitted by considering only private and partnership operators (Table 5.13).

One point regarding operators of partnership farms should be noted. Since the Census of Agriculture assigns only one operator per census-farm and since the total number of partners cannot be determined, the total farm rather than the partner's share is attributed to the operator of a partnership farm. The multivariate analysis in Section 6.6 includes a dummy variable (DPART) to capture the effect of a larger farm unit expected for partnership operators. DPART will be equal to 1 if the farm is a partnership and equal to 0 if it is a sole proprietorship.

One remaining conditioning variable is the number of months the operator resides on the farm. Some operators do not reside on the farm. In fact, in Saskatchewan in 1971, 24.2% of the operators did not reside on the farm holding (see Appendix C). The decision of where to reside is essentially endogenous with the decision to participate in off-farm work. For the purpose of this analysis, it is assumed that the decision of where to reside has already been made and the months of residence on farm is entered as a conditioning variable. To capture this effect, three dummy variables were created:

(a) MON 5-8 equals 1 if the operator lived 5-8 months on the farm and equals 0 otherwise;

TABLE 5.13. Number and Per cent of Census-farm Operators Reporting Some Off-farm Work(1), by Type of Farm Organisation, Canada, 1971

Type of farm organisation	Total census-farm operators	Operators reporting some off-farm work(1)			
		DOFW=0 and OFEI≠0	DOFW>0	Total	Per cent
Total	367,215	67,225	127,365	194,590	53.0
Private operators	336,875	59,790	118,730	178,520	53.0
Partnership	21,115	4,080	6,120	10,200	48.3
Institution	785	470	40	510	65.0
Family corporation	7,305	2,340	2,260	4,600	63.0
Other corporation	980	525	215	740	75.5
Other	150	10	15	25	16.7

(1) Off-farm work is recorded for operators with "some days of off-farm work" (DOFW>0) or non-zero off-farm employment income (OFEI≠0).

Source: Canada, Statistics Canada, unpublished data drawn from the 1971 Agriculture — Population Linkage.

(b) MON 1-4 equals 1 if the operator lived 1-4 months on the farm and equals 0 otherwise; and

(c) MON -0 equals 1 if the operator did not live on the farm and equals 0 otherwise.

The omitted class is the operator who lived 9-12 months on the farm (see Question 197, Table 5.11).

5.4. Summary of Variables to Measure Theoretical Constructs

The probability of off-farm work, Pr(OFW), equation was specified in Section 3.2 to be

$$\begin{aligned} Pr(OFW) = Pr \Big[& (\gamma_0 - \alpha_0 + (\gamma_3 - \alpha_5)\beta_0) + \gamma_1 P_C - \gamma_2 W_{SL} \\ & + (\gamma_3 - \alpha_5)\,\beta_1 E(P_{OL}) - (\gamma_3 - \alpha_5)\beta_2 c - \gamma_4 NEI - \alpha_1 P_Y \\ & - \alpha_2 P_K - \alpha_3 P_{VIN} - \alpha_4 P_{HL} > (\alpha_5 - \gamma_3)\, u + e - v \Big] \end{aligned} \tag{3.6}$$

The available data have been enumerated above in Section 5.2. As discussed there, prices are assumed constant in the cross-section analysis so the variability in quantities is used to indicate the availability in the quantity of labour. The specific variables to measure the theoretical constructs are summarised in Table 5.14.

Thus, the equation estimated in Chapter 6, with the hypothesised sign for each variable, is as follows:

$$\begin{aligned} \hat{Pr}(OFW) = {} & a_0 - a_1 VAPS + a_2 TA + a_3 VME - a_4 VL + a_5 VIN + a_6 HLP \\ & + a_7 NUFM + a_8 NUFMLWa + a_9 YOS + a_{10} VT \pm a_{11} U \pm \\ & a_{12} PD + a_{13} TNWFM - a_{14}\,(SYOS)(DSPOUSE) \\ & - a_{15}\,(SVT)(DSPOUSE) - a_{16} NEI \pm a_{17} AGE \pm a_{18} DSPOUSE \\ & \pm a_{19} DPART \pm a_{20} MON\ 5\text{-}8 \pm a_{21} MON\ 1\text{-}4 \pm a_{22} MON\ \text{-}0. \end{aligned} \tag{5.1}$$

The predicted value of the dependent variable, $\hat{Pr}(OFW)$, gives the probability that a given operator will report some off-farm work. The estimated value of each of the coefficients, a_i, gives the impact on $\hat{Pr}(OFW)$ of a unit change in each of the independent variables.

TABLE 5.14. Theoretical Variables and Observed Measures

Theoretical variable(1)	Symbol(2)	Description
Dependent variable		
OFW	OFW	Off-farm work (=1, if days of off-farm work >0 or if off-farm employment income ≠ 0; =0, otherwise)
Demand for operator's labour on the farm (-)		
Y	VAPS(-)	Value of agricultural products sold ($,000)
K	TA(+)	Total acres (,00). Also tested were: IA - Improved Acres (,00) UA - Unimproved Acres (,00).
	VME(+)	Value of machinery and equipment ($,000)
	VL(-)	Value of livestock ($,000)
VIN	VIN(+)	Variable inputs ($,000) (sum of expenditures for feed purchase, machine rental, custom work or contract work, commercial fertilizers, and agricultural chemicals)
HL	HLP(+)	Hired labour paid ($,000)
	UFL(+)	Unpaid family labour. Each of the following was tested: NUFM - Number of unpaid family members who usually worked on the farm; NUFMLW - Number of unpaid family members who reported working on the farm last week; and NUFMLWa - Number of unpaid family members who reported working on the farm last week but who did not usually work on the farm.

See footnote(s) at end of table.

TABLE 5.14. Theoretical Variables and Observed Measures (continued)

Theoretical variable(1)	Symbol(2)	Description
Demand for operator's labour off the farm(+)		
$P_{OL}(sk)$	YOS(+)	Years of schooling
	VT(+)	Non-agricultural vocational training (=1, if yes; =0, otherwise)
$E(\cdot)$	U(M)(-)	Unemployment rate (for males) in census division where operator resides. Also tested was: MLFPR - male labour force participation rate in the census division where the operator resides.
c	PD(+)	Population density in census division where operator resides. Also tested was: PCNFPOP - per cent of total population that was non-farm in the census division where the operator resides.
Supply of operator's labour		
C	TNWFM(+)	Total non-working family members
w_{SL}	SYOS(-)	Spouse's years of schooling
	SVT(-)	Spouse's vocational training (=1, if yes; = 0, otherwise)
	U(M)(+)	Unemployment rate (also, MLFPR)
	PD(-)	Population density (also, PCNFPOP)
P_{OL}	YOS(+)	Years of schooling
	VT(+)	Non-agricultural vocational training (=1, if yes; = 0, otherwise)
	U(M)(-)	Unemployment rate (also, MLFPR)
	PD(+)	Population density (also, PCNFPOP)

See footnote(s) at end of table.

TABLE 5.14. Theoretical Variables and Observed Measures (concluded)

Theoretical variables(1)	Symbol(2)	Description
NEI	NEI(-)	Non-earned income ($,000) (total family income except employment income of operator and operator's spouse). An alternate measure of non-earned income was tested: NEIa - Total family income minus wages and salaries, farm self-employment income, non-farm self-employment income, and other government income received by all family members.
Conditioning variables		
	AGE	Age of operator (years)
	SEX	Sex of operator (=1,if female; = 0, if male)
	DSPOUSE	Operator is married with spouse present (=1, if yes; = 0, otherwise)
	DPART	Partnership farm (=1, if partnership; = 0, if sole proprietorship)
	MON 5-8	Operator resided on farm 5-8 months (=1, if yes; = 0, otherwise)
	MON 1-4	Operator resided on farm 1-4 months (=1, if yes; = 0, otherwise)
	MON -0	Operator did not reside on farm (=1, if yes; = 0, otherwise)

(1) The theoretical variables are defined in Sections 2.3, 2.4, and 5.3.2.
(2) The arithmetic signs in parentheses indicate the expected relationship between that variable and the probability that the farm operator reports some off-farm work, Pr(OFW). Note that a given variable may have a different sign, depending upon which equation it enters.

FOOTNOTES

[1] The variables used in the multivariate analysis are summarised in Table 5.14. Readers not wishing to read the detailed discussion of the selection of the variables may wish to proceed directly to Table 5.14.

[2] See Section 5.2.3 for a discussion of this issue.

[3] At present, net income from custom work is implicitly included in the net farm income series published by Statistics Canada. Also, net income from custom work is included with net farm income in farm taxfiler statistics.

[4] A farm taxfiler is a taxfiler who reported some self-employment income from farming.

[5] The variables are summarised in Table 5.14.

[6] Note that the earnings of the future are not from agricultural production if the land is near an urban centre. The possibility of using the value per acre of land to measure the distance from an urban centre is discussed below.

[7] It was suggested above that the value of land per acre would be a good indicator of the cost of commuting to an urban job centre. In fact, the value of land per acre near urban centres includes the present discounted value of the future benefits foreseen for commuters. In other words, the value of land per acre is a function of the probability of off-farm work, not the other way around.

[8] Information on the "place of work" of the operator was available, but only for the major job. Thus, it was possible (at least in principle) to determine an approximate commuting distance by calculating the distance from the (population) centre of the

municipality of residence to the (population) centre of the municipality of work. However, this variable would have measured the commuting distance only for those operators whose major job was off-farm work. An estimate could have been made of the commuting distance to potential off-farm work by calculating the distance from the (population) centre of the municipality of residence of the operator to the nearest metropolitan area. This was not done because the costs were deemed greater than the expected benefits. However, a dummy variable for proximity of urban area (DURBAN = 1 if an urban area of 25,000 or greater population existed in the given or an adjacent census division = 0, otherwise) was tested but it was found to explain less of the variability in off-farm work than did PD or PCNFPOP.

[9] This statement holds only if the group attributes are averages that depict the representative individual. The introduction of group attributes that cannot be attributed to a representative individual requires an equation specifically designed for group level analysis.

[10] The relevant means are not the means in Tables C.1 or C.2 which are the means for all operators, but the means in Bollman (1978b) which are the means for only the observations with a spouse present.

CHAPTER 6

RESULTS

6.1. Introduction

The purpose of this chapter is to present the results of the analysis of off-farm work by farmers in 1971. To provide a background to the situation faced by farmers in 1971, agregate measures of the agricultural sector are reviewed (in Section 6.2) for the 10-year period leading up to 1971. The following three sections consider the contribution of part-time farmers to agricultural production in 1971, the contribution of off-farm employment income to the total income of farmers in 1971 and a cross-tabular analysis of the impact of a few major variables on the probability that a census-farm operator reported some off-farm work in 1971. The results of the multivariate analysis are presented in Section 6.6 and the results are summarised in Section 6.7.

6.2. Background to the 1971 Situation

As background information and to aid in interpreting the results of the empirical analysis, the question of whether operators were in an equilibrium situation is discussed. It is suggested that if aggregate measures of the agricultural sector in 1970 were close to the trend that had existed for the preceding period (say, 10 years), then most disequilibrium adjustments had been made and, in 1970, operators could be considered to be in an equilibrium situation. The following analysis suggests this to be the situation, with one glaring exception--the wheat market was in a serious disequilibrium. The production of wheat was so great compared to (domestic and export) sales that the stocks of wheat on Prairie farms on July 31, 1970 were 540 million bushels (Table 6.1, Column 11). This was 252.8% greater than the 1961-71 11-year average of 213.6 million bushels. Because of the resulting strain on the Prairie economy, the federal government enacted a wheat acreage reduction program (called Lower Inventory for Tomorrow - LIFT) which applied to the 1970 crop. In 1970, Prairie wheat acreage was 12.0 million acres, compared to 24.4 million acres in 1969, and compared to the 1961-71 11-year average of 25.2 million acres (Table 6.1, Column 9).

TABLE 6.1. Agriculture Sector Indicators, Canada, 1961-71

Year	Number of census-farms(1)	Net farm income		Farm output price index	Farm input price index	Index of pseudo-price margin(3)	Index of physical production	Index of net margin on total production(4)	Wheat in Prairies			Unemployment rate
		Aggregate	Average per farm(2)						Number of acres	Farm price per bushel	Stocks of wheat, July 31	
				1961 index = 100(5)								
		$'000,000	$						'000,000	$	'000,000 bu.	per cent
1961	480,903	1,199	2,493	100.0	100.0	100.0	100.0	100.0	24.6	1.57	168.5	7.1
1962	470,827	1,330	2,825	104.3	105.2	99.1	127.7	126.6	26.2	1.74	56.0	5.9
1963	460,751	1,214	2,635	102.9	108.0	94.9	139.9	132.8	27.0	1.66	63.0	5.5
1964	450,675	1,367	3,033	101.3	108.6	92.7	129.5	120.0	29.1	1.74	118.0	4.7
1965	440,599	1,516	3,441	107.8	112.0	95.8	137.1	131.3	27.8	1.59	107.0	3.9
1966	430,522	1,742	4,046	117.0	118.6	98.4	155.1	152.6	29.2	1.68	98.0	3.6
1967	417,643	1,670	3,999	116.0	121.5	94.5	134.7	127.3	29.6	1.76	197.0	4.1
1968	404,764	1,581	3,906	114.0	124.9	89.1	145.3	129.5	28.9	1.62	240.0	4.8
1969	391,886	1,415	3,619	116.8	129.1	87.7	149.8	131.4	24.4	1.33	370.0	4.7
1970	379,007	1,345	3,549	116.0	131.2	84.8	137.9	116.9	12.0	1.26	540.0	5.9
1971	366,128	1,469	4,012	117.2	135.9	81.3	159.7	129.8	18.9	1.42	392.0	6.4
Average, 1961-71	426,700	1,441	3,414	110.3	117.7	92.6	137.8	127.6	26.2	1.60	213.6	5.1

(1) Number of census-farms between census-years were estimated on the basis of a simple straight-line interpolation.
(2) Average = (Aggregate net farm income/number of census-farms).
(3) Index of pseudo-price margin = 100 + (farm-output price index − farm input price index).
(4) Index of net margin on total production = (Index of pseudo-price margin x index of physical production)/100.
(5) Indexes based on 1961=100 must be interpreted with some caution because 1961 was not a "typical" year, especially with respect to low production due to drought in the Prairies.

Source: Canada, Statistics Canada, Farm Net Income, Cat. No. 21-202, annual; Index of Farm Production, Cat. No. 21-203; Handbook of Agricultural Statistics, Part 1: Field Crops, Cat. No. 21-516; Field Crop Reporting Series, Cat. No. 22-002 ; Index Numbers of Farm Prices of Agricultural Products, Cat. No. 62-003 ; Farm Input Price Indexes, Cat. No. 62-534 ; and The Labour Force, Cat. No. 71-001.

Other aggregate indicators in the agricultural sector exhibited considerable variability in the 1961-71 period but they seemed to show a discernible trend and the 1970 data were not wildly different from the trend. Average net farm income per farm appeared to have a slightly increasing trend (Table 6.1, Column 3). The underlying factors were an increasing level of physical production (Table 6.1, Column 7) that was greater than the decreasing price margin (Table 6.1, Column 6). The price margin was decreasing because farm input prices were increasing (Table 6.1, Column 5) faster than farm output prices (Table 6.1, Column 4). Ideally, a separate analysis of each off-farm labour market is required. However, the above analysis suggests that overall indicators show the agricultural sector to be on trend in 1970. But, the wheat market was severely distorted in 1970 and thus operators in Saskatchewan (and to a lesser extent in Alberta and Manitoba) were not near an equilibrium situation.

6.3. The Contribution of Part-time Farmers to Agricultural Production

Two questions must be answered in assessing the importance of part-time farmers in the supply of food (see Section 1.2). The purpose of this section is to answer the first question--what proportion of each commodity is produced by operators who report some off-farm work? Discussion on the second question--how does off-farm work interact with the production activities of farmers?--is a major theme of the study.

At the Canada level, 52.7% of private and partnership operators reporting total acres participated in some off-farm work and 42.2% of all the agricultural acreage in Canada was operated by an operator with some off-farm work (Table 6.2). Forty-two per cent of the operators producing wheat reported some off-farm work. Thirty-eight per cent of the wheat acreage was operated by farmers with some off-farm work.

Seventy-four per cent of the operators producing small berries (other than strawberries, raspberries and grapes) reported off-farm work and 78% of the acreage of small berries was operated by farmers who reported some off-farm work. Another product largely produced by farmers with off-farm work is nursery products. Seventy-five per cent of the producers of

TABLE 6.2. Proportion of Census-farm Operators(1) Reporting Some Off-time Work(2) by Commodity, and Proportion of Total Commodity Produced by Operators with Some Off-farm Work, Canada, 1971

Commodity	Per cent of operators with commodity who reported some off-farm work	Per cent of total commodity produced by operators with some off-farm work
Total acres	52.7	42.2
Wheat (acres)	42.5	38.1
Oats (acres)	45.2	40.3
Barley (acres)	43.6	40.2
Mixed grain (acres)	47.0	42.4
Rye (acres)	38.6	38.4
Buckwheat (acres)	53.6	45.5
Dry field peas (acres)	42.7	43.7
Dry field beans (acres)	49.6	52.3
Grain corn (acres)	52.9	54.8
Fodder corn (acres)	45.5	46.3
Total hay (acres)	51.0	47.5
Oats for feed (acres)	44.1	38.8
Fodder crops for feed (acres)	45.6	44.2
Flaxseed (acres)	40.6	38.7
Soybeans (acres)	61.8	62.4
Sunflowers (acres)	43.5	40.8
Rapeseed (acres)	43.7	42.1
Mustard seed (acres)	38.8	39.1
Potatoes (acres)	55.4	41.7
Sugar beets (acres)	45.0	42.0
Tobacco (acres)	41.3	36.3
Other field crops (acres)	53.3	45.7
Total fruit (acres)	59.9	53.6
Strawberries (acres)	63.5	57.2
Raspberries (acres)	67.4	65.8
Grapes (acres)	63.1	58.2
Other berries (acres)	74.0	78.5
Total tree fruits (acres)	41.5(3)	30.2(3)
Apples (acres)	40.5(3)	28.9(3)
Pears (acres)	43.4(3)	33.9(3)
Plums and prunes (acres)	43.3(3)	36.9(3)
Sweat cherries (acres)	45.7(3)	36.6(3)
Sour cherries (acres)	43.7(3)	32.6(3)
Peaches (acres)	46.4(3)	29.4(3)
Apricots (acres)	49.8(3)	39.8(3)
Greenhouse ('000 sq. ft.)	66.0	70.4
Mushrooms ('000 sq. ft.)	68.8	70.9
Cut flowers (acres)	65.7	66.0
Nursery products (acres)	75.5	69.2
Total vegetables (acres)	61.4	53.4
Asparagus (acres)	46.3(3)	36.5(3)
Beans (acres)	40.8(3)	36.9(3)
Beets (acres)	35.6(3)	26.2(3)
Sweet corn (acres)	43.0(3)	40.6(3)
Tomatoes (acres)	39.3(3)	38.2(3)
Turnips (acres)	32.6(3)	23.6(3)
Other (acres)	38.0(3)	29.1(3)
Cropland (acres)	51.0	41.7
Woodland (acres)	54.4	57.2
Area fertilized (acres)	49.6	41.8
Area irrigated (acres)	55.6	48.5

See footnote(s) at end of table.

TABLE 6.2. Proportion of Census-farm Operators(1) Reporting Some Off-time Work(2) by Commodity, and Proportion of Total Commodity Produced by Operators with Some Off-farm Work, Canada, 1971 (Concluded)

Commodity	Per cent of operators with commodity who reported some off-farm work	Per cent of total commodity produced by operators with some off-farm work
Total cattle (number)	48.6	41.1
Cows and heifers, 2 years and over for milking (number)	45.5	40.6
Heifers, 1-2 years, raised for milking (number)	44.0	40.9
Cows milked yesterday (number) ..	43.9	39.9
Milk produced yesterday (lb.) ...	43.8	39.1
Total pigs (number)	48.2	42.8
Total sheep and lambs (number)	58.9	56.2
Cattle on feed (number)	45.8	41.1
Total chickens (number)	48.0	55.3
Total turkeys (number)	43.3	56.6
Total geese (number)	53.8	58.9
Total ducks (number)	55.1	52.0
Christmas trees sold (number)	61.5	62.8
Maple trees tapped (number)	51.4	49.9
Dairy products sold ($)	41.8	37.9
Eggs sold ($)	48.0	46.2
Value of milk cows ($)	45.5	40.2
Value of beef cows ($)	47.1	40.3
Value of milk heifers ($)	44.0	40.3
Value of beef heifers ($)	47.7	41.9
Value of steers ($)	46.4	41.2
Value of calves ($)	47.3	39.9
Total capital value ($)	52.7	46.8

(1) Includes private and partnership operators only.
(2) Off-farm work is recorded for all operators with "some days of off-farm work" or non-zero off-farm employment income.
(3) Information on off-farm employment income was not available. These figures are only those operators reporting "some days of off-farm work".
Source: Canada, Statistics Canada, unpublished data drawn from the 1971 Agriculture - Population Linkage.

nursery products reported off-farm work and 69.2% of the nursery product acreage was operated by farmers with some off-farm work.

A significant proportion of all commodities was produced by operators with some off-farm work. Examples of commodities with the smallest proportion produced by part-time farmers are rye and tabacco. Thirty-nine per cent of rye producers reported off-farm work and they operated 38.4% of the total acreage seeded to rye. Forty-one per cent of tabacco producers reported off-farm work and they operated 36.3% of the tabacco acreage.

In summary, food production by farm operators with some off-farm work is a significant proportion of total food production. The per cent of total commodity produced by operators with some off-farm work ranges from 36.3% for tabacco to 78.5% for small berries. For the major items (such as total acres, major crops, total cattle, and total pigs), 40% to 50% of food production comes from farms where the operator participates in some off-farm work.

6.4. The Contribution of Off-farm Employment Income to the Total Income of Farmers

In 1971, census-farm operators received the majority of their total income (51.7%) from off-farm employment (Table 6.3). The contribution of off-farm employment to total operator income ranged from 38.8% in Saskatchewan to 70.1% in British Columbia. The fact that off-farm employment income is a major component of operator total income suggests that policy analysts should recognise off-farm work as an income source when formulating policies to stabilise or increase farmers' incomes.

6.5. Tabular Analysis of Participation in Off-farm Work

A tabular analysis of census-farm operators who reported "Some Days of Off-farm Work" in 1971 is incorporated in the historical review of part-time farming in the 1941-76 period presented in Chapter 4. The purpose of this section is to present a brief tabular analysis of the major variables entering the multivariate analysis in the next section.

TABLE 6.3. Contribution of Off-farm Employment Income(1) to the Total Income of Census-farm Operators, Canada and Provinces, 1971

Province	Average total income	Average off-farm employment income(1)	Off-farm employment income(1) as a per cent of total income
	$	$	
Canada	4,897	2,531	51.7
Newfoundland	4,037	2,617	64.8
Prince Edward Island	3,799	1,750	46.1
Nova Scotia	4,388	2,739	62.4
New Brunswick	4,145	2,512	60.6
Quebec	4,816	2,201	45.7
Ontario	6,000	3,463	57.7
Manitoba	3,756	1,791	47.7
Saskatchewan	3,933	1,528	38.8
Alberta	4,790	2,479	51.8
British Columia	6,769	4,744	70.1

(1) Off-farm employment income includes wage and salary earnings and not off-farm self-employment earnings.
Source: Canada, Statistics Canada, unpublished data drawn from the 1971 Agriculture — Population Linkage.

In 1971, 53.0% of census-farm operators in Canada reported some off-farm work (Table 6.4). Off-farm work is recorded for all operators with "Some Days of Off-farm Work" or non-zero off-farm employment income (see Section 5.2.3). The participation rate ranged from a high of 72.8% in Newfoundland and 72.3% in British Columbia to a low of 41.1% in Saskatchewan. This range suggests substantial differences in the market for operators' labour among provinces. It is expected that most of the differences can be explained in terms of differences in the demand for on-farm work, the demand for off-farm work, and the total supply of labour function for

TABLE 6.4. Number and Per cent of Census-farm Operators(1) Reporting Some Off-farm Work(2), Canada and Provinces, 1971

Province	Census-farm operators(1)		
	Total(1)	Reporting some off-farm work(2)	
		Number	Per cent
Canada	366,430	194,075	53.0
Newfoundland	1,010	735	72.8
Prince Edward Island	4,530	2,435	53.8
Nova Scotia	5,975	4,135	69.2
New Brunswick	5,480	3,635	66.3
Quebec	61,555	33,390	54.2
Ontario	94,825	57,075	60.2
Manitoba	35,060	16,360	46.7
Saskatchewan	76,870	31,565	41.1
Alberta	62,745	31,460	50.1
British Columbia	18,370	13,275	72.3

(1) Excludes operators of institutional farms.
(2) Off-farm work is recorded for all operators with "some days of off-farm work" or non-zero off-farm employment income.
Source: Canada, Statistics Canada, Census of Agriculture, 1971, Catalogue No. 96-714, Bulletin 4.4 -3, Table 1.

operators in the various provinces. For example, operators in the Fraser Valley of British Columbia face a high demand for off-farm work because of the large number of off-farm job opportunities within a reasonable commuting distance. On the other hand, operators in Saskatchewan face a low demand for off-farm work because of the lack of off-farm job opportunities within a reasonable commuting distance. In Newfoundland, the low demand for operators' labour in farm work (primarily because of the lack of good agricultural land) can be expected to be a major determinant of the participation of Newfoundland operators in off-farm work. However, structural differences in the farm operator labour market that are not captured by the demand and supply analysis are expected among the provinces. Consequently, equations to explain the participation of operators in off-farm work are estimated for each province.

The size of gross farm sales, or value of agricultural products sold (VAPS), is a major determinant of the demand for the operator's labour on the farm. It was hypothesised (in Section 2.3) that the larger VAPS is, the smaller is the probability of reporting some off-farm work, Pr(OFW). In the group of operators reporting VAPS < $2,500, 71.9% reported some off-farm work (Table 6.5). In the group of operators with over $10,000 gross sales, 39.3% reported some off-farm work. Thus, the tabular analysis confirms the hypothesis. Graphical analysis indicates that the relation between Pr(OFW) and VAPS is curvilinear (see Chart 4.2). Consequently, the square of VAPS is also entered as an independent variable in the equation to explain Pr(OFW).

The education of the operator is a major determinant of the demand for the operator's labour off the farm. It was hypothesised (in Section 2.3) that the greater the education of the operator, the greater the probability of participating in off-farm work. The data show this to be the case (Table 6.6). Forty-four per cent of the operators with less than five years of schooling reported some off-farm work whereas 80.3% of the operators with a university degree reported some off-farm work.

In addition, operators with some vocational training reported a high participation rate in off-farm work. For the group who have

completed grades nine to 11, 66.1% of those with vocational training reported some off-farm work compared to 54.3% with no vocational training. In the group of operators who have completed Grades 12 or 13, 71.5% of those with vocational training reported some off-farm work compared to 60.3% with no vocational training.

TABLE 6.5. Number and Per cent of Census-farm Operators(1) Reporting Some Off-farm Work(2), by Size of Gross Farm Sales, Canada, 1971

Size of gross farm sales	Census-farm operators(1)		
	Total(1)	Reporting some off-farm work(2)	
		Number	Per cent
Total	366,430	194,075	53.0
Less than $ 2,500	107,095	77,000	71.9
$ 2,500 – 4,999	62,955	34,775	55.2
$ 5,000 – 9,999	82,115	37,830	46.1
$ 10,000 and over	113,190	44,470	39.3

(1) Excludes operators of institutional farms.
(2) Off-farm work is recorded for all operators with "some days of off-farm work" or non-zero off-farm employment income.
Source: Canada, Statistics Canada, Census of Agriculture, 1971, Catalogue No. 96-714, Bulletin 4.4 -3, Table 2.

The level of non-earned income is a major determinant of the supply of operator's labour. It was hypothesised (in Section 2.4) that the greater the level of non-earned income, the smaller the probability of off-farm work. In Section 5.2.5, the alternate definition of non-earned income (NEIa) was defined to be total family income minus the wages and salaries, farm self-employment income, non-farm self-employment income, and other government income received by all family members. The greater NEIa is, the smaller is the probability of reporting some off-farm work, as hypothesised (Table 6.7). Fifty-eight per cent of the operators with NEIa between $1 and $249 reported off-farm work whereas 39.4% of the operators with NEIa between $2,500 and $2,999 reported some off-farm work.

TABLE 6.6. Number and Per cent of Census-farm Operators Reporting Some Off-farm Work(1), by Level of Schooling, Canada, 1971

Level of schooling	Census-farm operators		
	Total	Reporting some off-farm work(1)	
		Number	Per cent
Total	367,215	194,585	53.0
Less than grade 5	30,335	13,490	44.5
Grades 5 – 8	184,245	91,880	49.9
Grades 9 – 11	105,095	58,630	55.8
Some vocational	13,585	8,975	66.1
No vocational	91,510	49,655	54.3
Grades 12 and 13	32,295	20,225	62.6
Some vocational	6,690	4,785	71.5
No vocational	25,605	15,440	60.3
Some university	9,955	6,120	60.8
Diploma graduate	3,870	2,355	61.8
Other	6,090	3,765	80.3
University degree	5,280	4,230	53.0

(1) Off-farm work is recorded for all operators with "some days of off-farm work" or non-zero off-farm employment income.

Source: Canada, Statistics Canada, Census of Agriculture, 1971, Catalogue No. 96-714, Bulletin 4.4-3, Table 8; and unpublished data drawn from the 1971 Agriculture-Population Linkage.

TABLE 6.7. Number and Per cent of Census-farm Operators(1) Reporting Some Off-farm Work(2), by Size of Non-earned Income(3), Canada, 1971

Size of non-earned income(3)	Census-farm operators(1)		
	Total(1)	Reporting some off-farm work(2)	
		Number	Per cent
Total	334,880	178,505	53.5
Less than zero	265	195	73.6
No income	38,850	19,845	51.1
$ 1 - 249	96,665	56,475	58.4
$ 250 - 499	71,680	41,555	58.0
$ 500 - 749	26,280	14,880	56.6
$ 750 - 999	17,360	8,435	48.6
$ 1,000 - 1,249	12,420	5,875	47.3
$ 1,250 - 1,499	14,420	6,715	46.6
$ 1,500 - 1,749	9,040	4,390	48.6
$ 1,750 - 1,999	8,310	3,680	44.3
$ 2,000 - 2,499	10,335	4,495	43.5
$ 2,500 - 2,999	8,815	3,475	39.4
$ 3,000 - 3,499	5,085	2,045	40.2
$ 3,500 - 3,999	3,160	1,350	42.7
$ 4,000 - 4,999	4,015	1,640	40.8
$ 5,000 - 7,499	4,420	1,815	41.1
$ 7,500 - 9,999	1,580	680	43.0
$ 10,000 - 14,999	1,200	490	40.8
$ 15,000 and over	975	455	46.7

(1) Private and partnership operators only.
(2) Off-farm work is recorded for operators reporting "some days of off-farm work" or non-zero off-farm employment income.
(3) The alternate definition of non-earned income, used here, omits "other government income" which includes unemployment insurance benefits, because they are determined by previous income.
Source: Canada, Statistics Canada, unpublished data from the 1971 Agriculture-Population Linkage.

6.6. Multivariate Analysis of the Probability of Reporting Some Off-farm Work

A structural model of the economic determinants of off-farm work by farmers was formulated in Chapter 2. Because of data limitations (which are reviewed in Chapter 5), the empirical analysis in this study is based on the estimation of an equation to explain the probability of participating in off-farm work. Off-farm work is recorded for all operators with "Some Days of Off-farm Work" or non-zero off-farm employment income (see Section 5.2.3). The derivation of the equation to explain the participation of farmers in off-farm work from the structural model is presented in Section 3.2. The three probability response models estimated in this study--the linear, probit, and logit models--are introduced in Sections 3.3 to 3.7. The variables entering the estimating equation are discussed in detail in Sections 5.2.4 and 5.2.5. The estimating equation is specified in Section 5.4 (Equation 5.1) and the definitions of the variables are also summarised in Section 5.4 (Table 5.14).

In this section, the results for the linear probability model (estimated by ordinary least squares) for Canada are discussed first and then they are compared to the probit and logit results. Following is a review of the results for each type of farm, the results for each province and the results for each type of farm by province.

6.6.1. Results for Canada[1]

The results for Canada as a whole (Table 6.8) indicate an $\bar{R}^2$ of 0.14 which means 14% of the variation in the dependent variable can be explained by the independent variables. This is low for many econometric studies but is typical for cross-section studies using a dichotomous dependent variable. As recognised in Section 4.4 of Bollman (1978b) the true probability of reporting off-farm work cannot be expected to be highly correlated with the dichotomous (0, 1) outcomes.

As hypothesised, an increase in farm output will cause an increase in the demand for the operator's labour on the farm and thus

See footnote(s) on page 172.

TABLE 6.8. Regression Coefficients for Ordinary Least Squares Equation to Explain the Probability of Off-farm Work by the Operator (Private and Partnership Operators), Canada, 1971

Variable	Coefficient	Standard error	't' statistic
Estimated population	357,992		
Sample size	126,998		
OFW (mean)	0.527	0.499	–
Constant	0.480*(2)	0.0138	34.68
Demand for on-farm labour			
VAPS ($,000)	– 0.0038*	0.0001	– 30.75
$VAPS^2$	0.000002*	0.00000007	32.50
(VAPS)(1) ($,000)	– 0.0038	–	–
IA (,00)	– 0.0135*	0.0004	– 30.05
UA (,00)	0.0024*	0.0002	9.61
VME ($,000)	– 0.0009*	0.0001	– 6.14
VL ($,000)	– 0.0018*	0.0001	– 14.91
VIN ($,000)	0.0026*	0.0003	9.63
HLP ($,000)	0.0088*	0.0006	14.34
NUFM (no.)	– 0.0371*	0.0020	– 18.96
NUFMLWa (no.)	0.0387*	0.0025	15.52
Demand for off-farm labour			
YOS (years)	0.0090*	0.0005	16.87
VT	0.1023*	0.0053	19.38
MLFPR (percent)	0.0001	0.0001	1.18
PCNFPOP (percent)	0.0041*	0.0001	41.13
Total supply of labour			
TNWFM (no.)	0.0205*	0.0011	18.16
SYOS (years)	0.0002	0.0006	0.30
SVT	0.0036	0.0052	0.69
NEIa ($,000)	– 0.0074*	0.0006	– 12.05
Conditioning variables			
AGE (years)	– 0.0079*	0.0001	– 73.23
SEX	– 0.0493*	0.0071	– 6.94
DSPOUSE	0.0727*	0.0070	10.35
(SPOUSE)(1)	0.0748	–	–
DPART	– 0.0043	0.0056	– 0.77
MON5-8	0.1566*	0.0087	18.07
MON1-3	0.2119*	0.0111	19.08
MON -0	0.1536*	0.0043	35.39
$\bar{R}^2$	0.14		
F	836.7		

(1) This row gives the marginal impact on Pr(OFW) of a one unit change in the independent variable.
In the case of VAPS, $Pr(OFW)/ VAPS = b_{VAPS} + 2(b_{VAPS^2})(VAPS)$

where B is the coefficient for variable ' ' and VAPS is evaluated at its mean.
In the case of SPOUSE, $Pr(OFW)/ SPOUSE = b_{DSPOUSE} + b_{SYOS}(SYOS) + b_{SVT}(SVT)$

where SYOS and SVT are evaluated at their means.

(2)In this and ensuing tables, the symbols on the coefficients indicate the level of the 't' – statistic as follows: '*' for 't' greater than or equal to 1.96; '+' for 't' between 1.64 and 1.96 and '#' for 't' between 1.28 and 1.64. These levels represent a 95 per cent, a 90 per cent, and an 80 per cent level of significance respectively, for a two-tailed 't' – test and a 97.5, 95, and 90 per cent level of significance respectively, for a one-tailed 't'-test. A two-tailed t-test is appropriate for determining if a coefficient is significantly different than zero if the expected sign of the coefficient cannot be specified a priori by the theory. A one-tailed 't'-test is used to determine if a coefficient is significantly different than zero if the expected sign can be specified a priori by the theory. In this study, a one-tailed test is appropriate for VAPS, YOS, VT, TNWFM, and NEIa

a decrease in the probability of reporting some off-farm work. A $1,000 increase in the value of agricultural products sold (VAPS) causes the probability of reporting off-farm work to decrease 0.0038, or 0.38% (Table 6.8). (Since the square of the value of agricultural products sold is also entered as a variable, this result applies only to the operator of an average farm. The rate of reduction is greater for small farmers and less for large farmers. See Table 4.2.)

It was hypothesised that other farm inputs would be substitutes for the operator's labour in farm work, with the exception that livestock capital (VL) was hypothesised to be complementary with operator's labour. Contrary to the hypothesis, improved acres (IA),[2] machinery and equipment (VWE), livestock (VL), and unpaid family members who usually worked on the farm (NUFM) are all complementary inputs with operator's labour. The negative sign on the coefficients for these variables indicates that, for a given level of output (VAPS), an increase in the level of the farm input causes a reduction in the probability of reporting off-farm work which results from an increase in the amount of operator labour on the farm.

The unexpected result is that the number of unpaid family members who usually worked on the farm (NUFM) is a complementary input with operator's labour. It was expected that family members would have a greater familiarity with the farm operation and would be able to substitute for the operator's labour in farm work. A number of rationalisations for this result can be offered. One possibility is that the unpaid family members are children who are interested in farming and the parent tends to work solely at farm work in order to build the farm operation into a viable unit. Another possibility is that the positive correlation between the operator's farm labour and the farm labour of unpaid family members arises from the fact and the unpaid family labour is allocated to farm work because the operator is working full-time on the farm, rather than vice versa.

See footnote(s) on page 172.

Unimproved acres (UA), non-labour variable inputs (VIN), hired labour (HLP), and part-time family labour (NUFMLWa) are substitutes for operator's labour in farm work. A $1,000 increase in variable inputs (VIN) will increase the probability of off-farm work by 0.26%. A $1,000 increase in hired labour will increase the probability of off-farm work by 0.88%.

Thus, the selection of farm inputs that are combined with operator's labour to produce the farm output have a significant influence on the probability that the operator participates in some off-farm work. An increase in improved acres, machinery and equipment, livestock capital and full-time unpaid family workers will reduce the probabilty of off-farm work. An increase in unimproved acres, non-labour variable inputs, hired labour, and part-time family workers will increase the probability of off-farm work.

Variables indicating the demand for off-farm work faced by the operator also significantly influence the probability of off-farm work. As hypothesised, an increase in the education of the operator will increase the probability of participating in off-farm work. An increase of one year in the operator's years of schooling (YOS) will increase the probability of participating in off-farm work by 0.90%. If the operator has some non-agricultural vocational training, the probability of participating in off-farm work is higher by 10.2%. If was hypothesised that the greater the demand for labour in the census division where the operator resides, the greater the probability of off-farm work by the operator. Surprisingly, the demand for off-farm work, proxied by the male labour force participation rate (MLFPR), has an insignificant influence on the probability of off-farm work.[3]

As expected, the variable that proxies commuting costs is an important determinant of off-farm work. The theoretical analysis in Section 3.11.2 of Bollman (1978b) suggested that the cost of commuting causes a discontinuity in the kinked demand for labour curve that can

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See footnote(s) on page 172.

act as a barrier to the participation of farmers in off-farm work. It was argued in Chapter 4 that the historical decline in commuting costs has been a major factor influencing the participation of farmers in off-farm work over time. The ordinary least squares results reported here proxy the cost of commuting by the per cent of the total population that is non-farm (PCNFPOP).[4] Each percentage point increase in PCNFPOP will cause the probability of off-farm work to increase by 0.41%.

It was hypothesised that the higher the off-farm wage available to the spouse, the higher the probability that the spouse would participate in off-farm work and the lower the probability that the operator would participate in off-farm work. However, both the years of schooling of the spouse and the spouse's vocational training have an insignificant impact on the probability of the operator reporting some off-farm work.

Other important variables determining the total supply of operator's labour are the total number of non-working family members (TNWFM) and the level of non-earned income (NEIa). Each additional non-working family member increases the probability of participating in off-farm work by 2.48%. An increase in non-earned income[5] of $1,000 will reduce the probability of off-farm work by 0.42%.

An analysis of the conditioning variables indicates that age, sex, months of residence on the farm, and whether or not the operator was married each has a significant influence on the probability of the operator reporting off-farm work. As hypothesised, the age of operator is negatively related to participation in off-farm work. Each additional year of age of the operator reduces the probability of off-farm work by 0.79%. If the farm operator is female, the probability of participating in off-farm work is lower by 4.2%. If the operator is married with a spouse present, the probability of reporting off-farm work is higher by 7.5%. If the operator lives on the farm for only part of the year, the probability of off-farm work is higher by 15.4% (if the operator resides zero months on the farm) to 21.2% (if the operator resides 1-4 months on the farm).

See footnote(s) on page 172.

6.6.2. Comparison of the ordinary least squares, probit and logit results[6]

The ordinary least squares model estimates a linear relationship between the dependent variable and the independent variables (see Charts 4.1 and 4.3). Consequently, the impact of a marginal change in an independent variable on the dependent variable (i.e., the probability of reporting some off-farm work, Pr(OFW) is constant. The probit and logit models estimate a curvilinear relationship between the Pr(OFW) and the independent variables. Consequently, the impact of a change in an independent variable on the Pr(OFW) depends on the initial Pr(OFW). If Pr(OFW) is near 0.5, the impact of a marginal change in an independent variable is relatively large (i.e., the slope of the curve is steeper) (see Chart 3.1). On the other hand, if Pr(OFW) is near 0 or 1, the impact is relatively smaller because the slope of the curve is flatter. To compare the OLS, probit and logit results, the change in Pr(OFW) of a unit change in an independent variable for the probit and logit models is calculated at various levels of Pr(OFW).[7]

It was indicated in Section 3.6 that when the probabilities are in the range of 0.05 to 0.95, the results of an OLS model are surprisingly similar to the results obtained from a probit or logit model (see Chart 3.1). In general, this finding is confirmed in this study. The OLS regression coefficients fall within the range of the change in Pr(OFW) estimated by the probit and logit models for $0.10 \leq$ Pr(OFW) ≤ 0.90 for all variables except four cases: UA (probit only), VME (and the sign changes between the probit and logit results), MLFPR (logit only), and SYOS (logit only) (Table 6.9). The OLS coefficient for UA is barely out of range of the estimated probit change in probability at Pr(OFW) = 0.10. It is surprising that VME changes signs between the probit and logit models but in both cases, the estimated coefficient for VME is barely significant (t = -2.15 and 2.34, respectively). The MLFPR and SYOS are both insignificant in the OLS model; they are significant with a somewhat larger estimated change in probability in the logit model. In all other cases, the same coefficients are significantly different from

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See footnote(s) on page 172.

TABLE 6.9. Off-farm Work Probability Coefficients – OLS, Probit, and Logit Results (Private and Partnership Operators), Canada, 1971

Variable	Mean	OLS regression coefficient, b_k	Probit coefficient, b_k	Change in probability (1) evaluated around Pr(OFW)= 0.10 I*=-1.282	Pr(OFW)= 0.40 I*=-0.263	Pr(OFW)= 0.527 I*=0.068	Pr(OFW)= 0.80 I*=0.842	Logit coefficient, b_k	Change in probability (2) evaluated around Pr(OFW)= 0.10 K=0.09	Pr(OFW)= 0.30 K=0.21	Pr(OFW)= 0.527 K=0.249	Pr(OFW)= 0.80 K=0.16
Estimated population ...	357,992											
Sample size	126,998											
OFW (mean)	0.527											
Constant	–	0.480*(4)	– 0.191					0.495				
Demand for on-farm labour												
VAPS ($,000)	10.4787	– 0.0038*	– 0.0120*					– 0.0279*				
$VAPS^2$	744.842	0.000002*	0.00001*					0.00003*				
(VAPS) (3) ($,000) ...	–	– 0.0034	– 0.0118	– 0.0021	– 0.0037	– 0.0048	– 0.0033	– 0.0273	– 0.0024	– 0.0057	– 0.0068	– 0.0044
IA (,00)	2.8933	– 0.0135*	– 0.0474*	– 0.0081	– 0.0183	– 0.0189	– 0.0132	– 0.0891*	– 0.0080	– 0.0187	– 0.0222	– 0.0142
UA (,00)	1.4671	0.0024*	0.0074*	0.0027	0.0057	0.0060	0.0041	0.0167*	0.0015	0.0035	0.0042	0.0027
VME ($,000)	10.3794	– 0.0009*	– 0.0010*	– 0.0002	– 0.0004	– 0.0004	– 0.0003	0.0019*	0.0002	0.0004	0.0005	0.0003
VL ($,000)	8.4038	– 0.0018*	– 0.0061*	– 0.0011	– 0.0023	– 0.0024	– 0.0017	– 0.0141*	– 0.0013	– 0.0030	– 0.0035	– 0.0022
VIN ($,000)	1.9673	0.0026*	0.0073*	0.0012	0.0028	0.0028	0.0020	0.0205*	0.0018	0.0043	0.0051	0.0033
HLP ($,000)	0.5518	0.0088*	0.0259*	0.0035	0.0102	0.0204	0.0073	0.0530*	0.0048	0.0111	0.0132	0.0085
NUFM (no.)	0.4565	– 0.0371*	– 0.0995*	– 0.0174	– 0.0384	– 0.0396	– 0.0279	– 0.1504*	– 0.0135	– 0.0316	– 0.0374	– 0.0241
NUFMLWa (no.)	0.2132	0.0387*	0.1114*	0.0186	0.0455	0.0443	0.0312	0.1851*	0.0166	0.0389	0.0461	0.0296
Demand for off-farm labour												
YOS (years)	9,4295	0.0090*	0.0275*	0.0046	0.0108	0.0110	0.0077	0.0480*	0.0043	0.0101	0.0120	0.0077
VT	0.0691	0.1023*	0.3159*	0.0557	0.1216	0.1279	0.0883	0.5038*	0.0453	0.1058	0.1254	0.0806
ALFPR (per cent)	75.6207	0.0001	0.0007*	0.0001	0.0002	0.0002	0.0001	0.0017*	0.0002	0.0004	0.0004	0.0003
PCNFPOP (per cent) ...	77.3515	0.0041*	0.0108*	0.0018	0.0042	0.0044	0.0031	0.0171*	0.0015	0.0036	0.0042	0.0027
Total supply of labour .												
TNWFM (no.)	1.6437	0.0205*	0.0566*	0.0098	0.0218	0.0224	0.0158	0.0947*	0.0085	0.0199	0.0236	0.0152
SYOS (years)	8.8405	0.0002	0.0019					0.0053*	0.0005	0.0011	0.0013	0.0008
SVT	0.0728	0.0036	0.0130					0.0180				
NEIa ($,000)	0.858	– 0.0074*	– 0.0237*	– 0.0041	– 0.0091	– 0.0094	– 0.0067	– 0.0487*	– 0.0044	– 0.0102	– 0.0121	– 0.0078
Conditioning variables												
AGE (years)	48.7562	– 0.0079*	– 0.0223*	– 0.0038	– 0.0087	– 0.0088	– 0.0063	– 0.0374*	– 0.0034	– 0.0078	– 0.0093	– 0.0060
SEX	0.0384	– 0.0494*	– 0.1468*	– 0.0258	– 0.0566	– 0.0584	– 0.0408	– 0.2488*	– 0.0224	– 0.0522	– 0.0620	– 0.0398
DSPOUSE	0.8438	0.0727*	0.1922*					0.3056*				
(SPOUSE) (3)	–	0.0751	0.2132	0.0374	0.0823	0.0847	0.0596	0.3627	0.0326	0.0762	0.0903	0.0580
DPART	0.0590	– 0.0043	0.0009					0.0242				
MON 5-8	0.0235	0.1566*	0.4677*	0.0825	0.1791	0.1835	0.1305	0.7542*	0.0679	0.1584	0.1878	0.1207
MON 1-4	0.0140	0.2119*	0.6841*	0.1214	0.2595	0.2671	0.1903	1.1541*	0.1039	0.2424	0.2874	0.1846
MON -0	0.1087	0.1536*	0.4496*	0.0794	0.1723	0.1775	0.1256	0.7232*	0.0651	0.1519	0.1801	0.1157
R^2	–	0.14	–					–				
pseudo-R^2	–	–	0.21					0.22				

(1) The change in probability is calculated from the cumulative normal distribution, F(x), as the change in F(I) around F(I*):
$F(I^* + 1/2\ b_k) - F(I^* - 1/2\ b_k)$.

(2) The change in probability is calculated as b_k*(Pr(OFW) – (1-Pr(OFW))), where K = Pr(OFW) – (1-Pr(OFW)).

(3) This row gives the marginal impact on Pr(OFW) of a one unit change in the independent variable.
In the case of VAPS, $\partial Pr(OFW)/\partial VAPS = b_{VAPS} + 2\ (b_{VAPS^2})\ (VAPS)$ where b_i is the coefficient for variable "i" and VAPS is evaluated at its mean.
In the case of SPOUSE, $\partial Pr(OFW)/\partial SPOUSE = b_{DSPOUSE} + b_{SYOS}\ (SYOS) + b_{SVT}\ (SVT)$ where SYOS and SVT are evaluated at their mean.

(4) See footnote 2, Table 6.8.

zero; the sign for each OLS coefficient is the same as the probit and logit coefficients; and the OLS coefficient falls within the range of the change in probability estimated from the probit and logit models for $0.10 \leq Pr(OFW) \leq 0.90$. Since the OLS results provide a good approximation to the probit and logit results and since the OLS estimates are computationally easier and less expensive to produce, the following analysis is based on OLS results only.

6.6.3. Results by type of farm[1]

It was hypothesised in Chapter 2 that the type of farm enterprise would influence the demand for farm work facing the farm operator and the demand for off-farm work facing the farm operator. Considerable differences in reporting off-farm work among operators of different types of farms were noted in the historical analysis (Chapter 4). Many of the differences were stable over time suggesting that inherent features of the enterprise mix influence the demand for farm work and the demand for off-farm work facing the farm operator. To recognise the inherent structural differences, separate equations were estimated for operators of each type of farm. The usual census definition of type of farm was used: the sales from the product, or group of products, must constitute 51% or more of total sales. (For the exact definition of each type of farm, see the Introduction to Canada, Statistics Canada, 1971 Census of Agriculture.) One major difference is that all farms are included in this analysis, not just the farms with $2,500 or more of value of agricultural products sold.

The regression coefficients estimated for operators of each type of farm show considerable differences among the types of farms.[8] The value of agricultural products sold (VAPS) is an insignificant variable for the operators of forestry farms. For operators of the other types of farms, the impact of a $1,000 increase in the value of agricultural products sold on the probability of participating in off-farm work ranges from -0.18% for cattle, hog and sheep operators to -2.3% for mixed other operators (Table 6.10).

See footnote(s) on page 172.

The signs on some of the inputs vary among operators of different types of farms which implies that these inputs are complementary with operator's farm labour for some types of farms and substitutes for operator's farm labour for other types of farm enterprises. Improved acres (IA) have an insignificant impact on participation in off-farm work for operators of field crop, fruit and vegetable, forestry and miscellaneous specialty farms. Among the types of farms where improved acres are complementary with operator's farm labour, the impact of an increase of 100 acres on participation in off-farm work ranges from -0.97% for cattle enterprises to -16.0% for poultry enterprises.

On the other hand, unimproved acres (UA) are a substitute for the operator's on-farm labour when considering all farms; they are complementary for operators of fruit and vegetable and forestry farms; and unimproved acres are insignificant for operators of poultry, wheat, miscellaneous specialty and other mixed farms. For farms where unimproved acres are a substitute, the impact of an increase in 100 acres on the participation in off-farm work ranges from +0.06 for cattle operators to +1.2 for field crop operators.

The value of machinery and equipment capital (VWE) is complementary with operator's farm labour when considering all farms but it is a substitute for dairy, hog, wheat, small grains, and all mixed types of farms. As a substitute, the impact of a $1,000 increase in VME will increase the probability of participating in off-farm work in a range of +0.19% for hog enterprises to +0.55% for dairy enterprises. The value of machinery and equipment capital appears as a complement for only three types of farms: cattle, hog and sheep (and cattle alone); poultry; and fruit and vegetable farms. The impact of a $1,000 increase in VME ranges from -0.13% for poultry enterprises to -0.25% for fruit and vegetable enterprises.

The value of livestock capital (VL) is complementary with operator's farm labour for all types of farms except fruit and vegetable, miscellaneous specialty, and mixed livestock farms where the relationship is insignificant and poultry farms where VL is a substitute for operator's

labour to produce a given level of output. In cases where the value of livestock capital is complementary with the operator's farm labour, a $1,000 increase in VL causes a decrease in the probability of participating in off-farm work that ranges from -0.13% for cattle, hog and sheep operators to -0.89% for small grain operators.

Non-labour variable inputs (VIN) are a substitute for operator's farm labour when considering all farms but VIN appears as a substitute only for cattle, wheat, small grain, and all mixed enterprises. Non-labour variable inputs are complementary with the operator's farm labour for cattle, hog and sheep and forestry enterprises. The relationship is insignificant for the other types of farms.

Hired labour (HLP) is a substitute for operator's farm labour for all types of farms except field crops and forestry where the relationship is insignificant. A $1,000 increase in hired labour increases the probability of participating in off-farm work in a range of +0.75% for miscellaneous specialty operators to +5.6% for wheat farmers.

The number of unpaid family members who usually worked on the farm (NUFM)[9] is complementary with operator's farm labour for all types of farms except forestry, mixed livestock, and mixed field crop farms where the relationship is insignificant. A one-person increase in NUFM reduces the probability of off-farm work in a range of -1.1% for dairy operators to -4.0% for field crop operators.

The number of unpaid family members whose major occupation is not unpaid family help but who worked in the week prior to the Census enumeration as unpaid family workers (NUFMLWa)[10] is a substitute for operator's labour in all types of farm enterprises except forestry farms where the relationship is insignificant. A one-person increase in NUFMLWa increases the probability of off-farm work in a range of +2.2% for operators of miscellaneous specialty enterprises to +5.8% for operators of mixed field crop enterprises.

See footnote(s) on page 172.

Years of schooling (YOS) and vocational training (VT) have a positive impact on the probability of reporting off-farm work for operators of all types of farms, except forestry where the relationship is insignificant. The increase in probability because of a one-year increase in YOS ranges from +0.63% for cattle, hog and sheep and wheat operators to +1.7% for operators of mixed field crop farms. If the operator has some vocational training, the increase in the probability of reporting some off-farm work ranges from +3.9% for miscellaneous speciality operators to +13.8% for mixed livestock operators.

The male labour force participation rate (MLFPR) is significant for some types of farms. It registers a positive impact for hog, small grain, fruit and vegetable and miscellaneous specialty operators. The impact is negative for operators of cattle, mixed livestock and mixed field crop farms. The reason for a negative impact is difficult to determine. Theoretically, it is possible for the high MLFPR to indicate a high demand for the spouse's labour in off-farm work which would reduce the probability of the operator participating in off-farm work.

The proximity of non-farm jobs provides a positive influence on the probability of off-farm work for operators of each type of farm. The magnitude of a one percentage point increase in the per cent of total population that is non-farm (PCNFPOP) causes the probability of off-farm work to increase in a range from +0.14% for wheat and fruit and vegetable operators to +0.66% for cattle farmers.

An increase in the number of non-working family members (TNWFM) is expected to shift the total supply of labour curve to the right and thus increase the probability of reporting off-farm work. Such a relationship is obtained for operators of all types of farms except forestry farms, where the relationship is negative. A one-person increase in non-working family members causes an increase in off-farm work participation that ranges from +0.96% for mixed livestock operators to +2.8% for fruit and vegetable operators.

Overall, the education and job skills of the operator's spouse

(indicated by SYOS and SVT) have no impact on Pr(OFW). However, for operators of dairy farms for example, an increase in SYOS and SVT implies a reduction in Pr(OFW). This result suggests that an increase in the spouse's available off-farm wage will increase the probability of the spouse's off-farm work and reduce the probability of the operator's off-farm work. The results are mixed for the spouses of operators of other farm types.

A $1,000 increase in the alternate definition of non-earned income (NEIa) reduces the probability of off-farm work in a range of -0.001% for wheat operators to -0.69% for operators of other mixed farms. However, the relationship is insignificant for hog, forestry and mixed livestock operators.

For the average operator, a one-year increase in age reduces the probability of off-farm work in a range of -.57% for mixed livestock operators to -1.0% for wheat operators. For most types of farms, if the operator is female, the probability of off-farm work is smaller. The relationship is positive for mixed livestock operators and insignificant for hog, poultry, small grain and forestry operators. If the farm operator is married with a spouse present, the probability of the operator reporting off-farm work is higher for all types of farms. The impact of a spouse ranges from +2.5% for other mixed operators to +17.6% for forestry operators If the farm is operated as a partnership, the probability of off-farm work by the person designated as the operator is higher for dairy, hog, wheat, small grain, and mixed field crop operators but it is lower for field crop and other mixed operators. Living on the farm for only part of the year has a positive influence on off-farm work for all types of farm enterprises. The largest impact is +28.2% if a mixed livestock operator resides only 5-8 months on the farm.

6.6.4. Results by province[1]

A significant difference in the participation in off-farm work by census-farm operators in different provinces was noted in Section 6.5 (see

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See footnote(s) on page 172.

Table 6.4). Historically, there have been major differences among provinces in the number of operators reporting "Some Days of Off-farm Work" (see Chapter 4 and Bollman, 1978a). The purpose of this section is to compare the results of the linear probability model estimated for each province.

The relationship between each determining variable and off-farm work in each province is, in general, consistent with the Canada level findings. However, the size of the impact of the variables differs among provinces because of different mixes of types of farms among provinces and differences in off-farm labour markets among provinces.

The signs on some of the inputs vary among the provinces implying that these inputs are complementary with operator's farm labour in some provinces and substitutes for operator's farm labour in other provinces. For example, to produce a given level of output, machinery and equipment (VME) are a substitute for operator's farm labour in Manitoba and Saskatchewan and are complementary with operator's farm labour in Newfoundland, Prince Edward Island, Alberta and British Columbia (Table 6.11). The value of livestock capital (VL) is a substitute in Newfoundland and is complementary with operator's farm labour in all other provinces.

Improved acres (IA) are a substitute for operator's farm labour in all provinces (except British Columbia where the relationship is not significant). The impact of an increase of 100 improved acres on the probability of participating in off-farm work ranges from -0.8% in Alberta to -14.7% in Newfoundland. On the other hand, unimproved acres (UA) are complementary in most provinces. They are a substitute in Newfoundland and insignificant in the Maritime provinces and Manitoba. As a complement, the impact of a 100 acre increase in unimproved acres ranges from +0.14% in Saskatchewan and Alberta to +2.5% in Quebec.

In those provinces where the value of machinery and equipment (VME) is complementary with operator's farm labour, a $1,000 increase implies a reduction in the probability of participating in off-farm work that ranges from -0.19% in Alberta to -.69% in Prince Edward Island.

In those provinces where the value of livestock capital (VL) is

TABLE 6.10. Regression Coefficients for Ordinary Least Squares Equation to Explain the Probability of Off-farm Work by the Operator (Private and Partnership Operators), by Type of Farm, Canada, 1971

Variable	Total	Dairy	Cattle, hog, sheep	Cattle	Hog	Poultry	Wheat	Small grains
Estimated population	357,992	62,163	120,971	82,003	21,175	7,397	46,157	45,563
Sample size	126,998	21,730	42,974	29,268	7,449	2,588	16,144	16,752
OFW (mean)	0.527	0.437	0.527	0.539	0.575	0.610	0.471	0.527
Constant	0.480*(2)	0.552*	0.442*	0.502*	0.665*	0.631*	0.829*	0.481*
Demand for on-farm labour								
VAPS ($,000)	− 0.0038*	− 0.0134*	− 0.0018*	− 0.0019*	− 0.0061*	− 0.0026*	− 0.0188*	− 0.0112*
$VAPS^2$	0.000002*	0.00005*	0.000001*	0.000001*	0.000009*	0.000002*	0.0002*	− 0.000003
(VAPS)(1)($,000)	− 0.0038	− 0.0145	− 0.0018	− 0.0019	− 0.0062	− 0.0027	− 0.0208	− 0.0113
IA (,00)	− 0.0135*	− 0.0160*	− 0.0132*	− 0.0097*	− 0.0453*	− 0.0451*	− 0.0128*	− 0.0172*
UA (,00)	0.0024*	0.0102*	0.0006*	0.0006*	0.0058#	− 0.0076	0.0002	0.0109*
VME ($,000)	− 0.0009*	0.0055*	− 0.0018*	− 0.0020*	0.0019*	− 0.0013+	0.0029*	0.0025*
VL ($,000)	− 0.0018*	− 0.0037*	− 0.0013*	− 0.0018*	− 0.0049*	0.0006#	− 0.0070*	− 0.0089*
VIN ($,000)	0.0026*	0.0003	− 0.0032*	0.0035*	0.0008	0.0006	0.0303*	0.0138*
HLP ($,000)	0.0088*	0.0380*	0.0329*	0.0324*	0.0322*	0.0102*	0.0556*	0.0484*
NUFM (no.)	− 0.0371*	− 0.0113*	− 0.0335*	− 0.0265*	− 0.0257*	− 0.0271*	− 0.0174*	− 0.0219*
NUFMLWa (no.)	0.0387*	0.0452*	0.0347*	0.0395*	0.0378*	0.0361*	0.0442*	0.0285*
Demand for off-farm labour								
YOS (years)	0.0090*	0.0070*	0.0069*	0.0063*	0.0069*	0.0068+	0.0078*	0.0043*
VT	0.1023*	0.0870*	0.1071*	0.1020*	0.0887*	0.1012*	0.0574*	0.0838*
MLFPR (per cent)	0.0001	− 0.0002	− 0.0006*	− 0.0016*	0.0019+	0.0010	− 0.0004	0.0028*
PCNFPOP (per cent)	0.0041*	0.0022*	0.0060*	0.0066*	0.0020*	0.0029*	0.0014*	0.0037*
Total supply of labour								
TNWFM (no.)	0.0205*	0.0227*	0.0257*	0.0270*	0.0205+	0.0179*	0.0190*	0.0221*
SYOS (years)	0.0002	− 0.0025+	− 0.0035*	− 0.0041*	− 0.0052*	0.0045	0.0009	− 0.0011
SVT	0.0036	− 0.0444*	− 0.0011	− 0.0007	0.0025	0.0150	0.0189#	0.0033
NEIa ($,000)	0.0074*	− 0.0059*	− 0.0061*	− 0.0066*	− 0.0028	− 0.0225*	− 0.0110*	− 0.0071*
Conditioning variables								
AGE (years)	− 0.0079*	− 0.0068*	− 0.0088*	− 0.0092*	− 0.0093*	− 0.0082*	− 0.0104*	− 0.0100*
SEX	− 0.0493*	− 0.0272#	− 0.0343*	− 0.0457*	0.0009	− 0.0533	− 0.0414*	0.0063
DSPOUSE	0.0727*	0.0814*	0.1210*	0.1317*	0.1482*	0.0131	0.1137*	0.1170*
(SPOUSE)(1)	0.0748	0.0793	0.0831	0.0872	0.0939	0.0607	0.1250	0.1052
DPART	− 0.0043	0.0426*	− 0.0015	− 0.0042	0.0336#	0.0425	0.0661*	0.0278+
MON 5-8	0.1566*	0.2253*	0.1830*	0.1813*	0.1135*	0.2694*	0.0750*	0.1438*
MON 1-4	0.2119*	0.2373*	0.2080*	0.1745*	0.1642*	0.1232	0.2051*	0.2098*
MON -0	0.1536*	0.1185*	0.1194*	0.1081*	0.0921*	0.1783*	0.1315*	0.1303*
$\bar{R}^2$	0.14	0.07	0.16	0.18	0.18	0.14	0.19	0.21
F	836.7	67.7	388.0	256.7	66.0	18.3	157.0	175.1

See footnote(s) at end of table.

TABLE 6.10. Regression Coefficients for Ordinary least Squares Equation to Explain the Probability of Off-farm Work by the Operator (Private and Partnership Operators), by Type of Farm, Canada, 1971 (concluded)

Variable	Field crops	Fruit and vegetables	Forestry	Miscellaneous specialty	Total mixed	Livestock mixed	Field crops mixed	Other mixed
Estimated population	17,939	13,595	3,489	7,569	31,149	9,465	5,908	17,776
Sample size	6,381	4,585	1,270	2,685	11,889	3,337	2,181	6,371
OFW (mean)	0.617	0.654	0.766	0.751	0.577	0.402	0.465	0.707
Constant	0.763*	0.535*	0.829*	0.779*	0.576*	0.372*	0.655*	0.800*
Demand for on-farm labour								
VAPS ($,000)	− 0.0104*	− 0.0129*	− 0.0021	− 0.0053*	− 0.0135*	− 0.0106*	− 0.0181*	− 0.0215*
$VAPS^2$	0.00003*	0.00003*	0.000007	0.000008*	0.00003*	0.00002*	0.00013*	0.0002*
(VAPS) (1) ($,000)	− 0.0111	− 0.0134	− 0.022	− 0.0054	− 0.0138	− 0.0109	− 0.0207	− 0.0226
IA (,00)	− 0.00002	− 0.0040	− 0.0215	− 0.0067	− 0.0209*	− 0.0279*	− 0.0193*	− 0.0193*
UA (,00)	0.0123*	− 0.0120#	− 0.0070#	0.0002	0.0071*	0.0121*	0.0113*	0.0007
VME ($,000)	0.0008	− 0.0025*	0.0023	0.0008	0.0041*	0.0039*	0.0064*	0.0046*
VL ($,000)	− 0.0058*	0.0015	− 0.0076*	0.0000005	− 0.0056*	− 0.0019	− 0.0064*	− 0.0033*
VIN ($,000)	0.0024	− 0.0042	− 0.0211+	− 0.0028	0.0096*	0.0066+	0.0098#	0.0062*
HLP ($,000)	− 0.0011	0.0134*	− 0.0222	0.0075*	0.0364*	0.0461*	0.0341*	0.0093#
NUFM (no.)	− 0.0397*	− 0.0309*	0.0010	− 0.0199#	− 0.0272*	− 0.0087	− 0.0090	− 0.0196*
NUFMLWa (no.)	0.0262*	0.0464*	− 0.0062	0.0216+	0.0341*	0.0503*	0.0584*	0.0172+
Demand for off-farm labour								
YOS (years)	0.0103*	0.0071*	− 0.0048	0.0103*	0.0091*	0.0093*	0.0171*	0.0069*
VT	0.0576*	0.0828*	0.0210	0.0389+	0.0793*	0.1384*	0.0582#	0.0489*
MLFPR (per cent)	0.0001	0.0047*	0.0004	0.0005#	− 0.0006#	− 0.0009#	− 0.0046#	0.0003
PCNFPOP (per cent)	0.0030*	0.0014#	0.0054*	0.0019*	0.0043*	0.0039*	0.0053*	0.0022*
Total supply of labour								
TNWFM (no.)	0.0166*	0.0275*	− 0.00001	0.0177*	0.0132*	0.0096#	0.0213*	0.0110*
SYOS (years)	− 0.0029	0.0048+	0.0106*	0.0017	0.0035+	0.0049#	0.0085+	0.0002
SVT	0.0300#	0.0064	− 0.0206	0.0228	0.0062	− 0.0684+	0.0272	0.0213
NEIa ($,000)	− 0.0016*	− 0.0016*	0.00032	− 0.0018*	− 0.0007*	0.000001	− 0.0018*	− 0.0069*
Conditioning variables								
AGE (years)	− 0.0089*	− 0.0090*	− 0.0101*	− 0.0072*	− 0.0072*	− 0.0057*	− 0.0074*	− 0.0076*
SEX	− 0.1294*	− 0.0871*	− 0.1002#	− 0.1726*	− 0.1313*	0.0952+	− 0.1124+	− 0.2000*
DSPOUSE	0.0628*	0.0503#	− 0.0767#	0.0254	0.0176	0.0452	− 0.0192	0.0548*
(SPOUSE) (1)	0.0354	0.1005	0.0132	0.0470	0.0540	0.0894	0.1140	0.0254
DPART	− 0.0489*	− 0.0294	0.1158	0.0065	− 0.0085	0.0026	0.0868*	− 0.0467*
MON 5-8	0.1154*	0.0744#	0.1731+	0.0454	0.1879*	0.2819*	0.2531*	0.1080*
MON 1-4	0.1149*	0.1256+	0.1601+	0.1038*	0.1057*	0.0569	0.3325*	0.0258
MON -0	0.0957*	0.1129*	0.1597*	0.0622*	0.1189*	0.0828	0.1356*	0.0482*
$\bar{R}^2$	0.20	0.17	0.11	0.14	0.20	0.09	0.19	0.20
F	63.1	39.2	7.4	18.3	122.5	13.8	21.3	64.3

(1) This row gives the marginal impact on Pr(OFW) of a one unit change in the independent variable.
In the case of VAPS, $\partial Pr(OFW)/\partial VAPS = b_{VAPS} + 2\ (b_{VAPS^2})\ (VAPS)$ where b_i is the coefficient for variable "i" and VAPS is evaluated at its mean.
In the case of SPOUSE, $\partial Pr(OFW)/\partial SPOUSE = b_{DSPOUSE} + b_{SYOS}\ (SYOS) + b_{SVT}\ (SVT)$ where SYOS and SVT are evaluated at their means.

(2) See footnote 2, Table 6.8.

TABLE 6.11. Regression Coefficients for Ordinary Least Squares Equation to Explain the Probability of Off-farm Work by the Operator, (Private and Partnership Operators), Canada and Provinces, 1971

Variable	Canada	Newfound-land	Prince Edward Island	Nova Scotia	New Brunswick	Quebec	Ontario	Manitoba	Saskat-chewan	Alberta	British Columbia
Estimated population	357,992	981	4,419	5,861	5,350	59,870	92,744	34,355	75,479	61,164	17,752
Sample size	126,998	532	1,524	2,053	1,799	20,738	31,508	13,377	26,511	22,158	6,783
OFW (mean)	0.527	0.732	0.535	0.689	0.661	0.541	0.599	0.465	0.408	0.498	0.720
Constant	0.480* (2)	- 3.745	0.453	0.449#	0.266	0.837*	0.865*	0.924*	0.750*	1.204*	0.721*
Demand for on-farm labour											
VAPS ($,000)	- 0.0038*	- 0.0109*	- 0.0157*	- 0.0097*	- 0.0084*	- 0.0078*	- 0.0039*	- 0.0098*	- 0.0057*	- 0.0027*	- 0.0087*
$VAPS^2$	0.000002*	0.00002	0.00008*	0.00004*	0.00002*	0.00001*	0.000003*	0.00003*	0.000006*	0.000001*	0.00002*
(VAPS) (1) ($,000)	- 0.0038	- 0.0111	- 0.0170	- 0.0104	- 0.0088	- 0.0080	- 0.0040	- 0.0104	- 0.0056	- 0.0027	- 0.0090
IA (,00)	- 0.0135*	- 0.1472+	- 0.0664*	- 0.0369*	- 0.0212#	- 0.0513*	- 0.0354*	- 0.0179*	- 0.0126*	- 0.0078*	0.0021
UA (,00)	0.0024*	- 0.0527#	0.0128	0.0034	- 0.0002	0.0254*	0.0082*	0.0008	0.0014*	0.0014*	0.0019*
VME ($,000)	- 0.0009*	- 0.0023#	- 0.0069*	- 0.0010	- 0.0004	- 0.0021*	0.0004	0.0023*	0.0012*	- 0.0019*	- 0.0027*
VL ($,000)	- 0.0018*	0.0212*	- 0.0066*	- 0.0033+	- 0.0064*	- 0.0039*	- 0.0020*	- 0.0050*	- 0.0024*	- 0.0018*	- 0.0010*
VIN ($,000)	0.0026*	- 0.0096	0.0025	0.0027	0.0026	0.0054*	0.0027*	0.0069*	0.0040*	0.0052*	0.0053*
HLP ($,000)	0.0088*	0.0312+	0.0089	0.0061	0.0059	0.0171*	0.0039*	0.0276*	0.0483*	0.0269*	0.0124*
NUFM (no.)	- 0.0371*	0.0207	- 0.0561*	- 0.0600*	- 0.0377*	- 0.0246*	- 0.0547*	- 0.0215*	- 0.0153*	- 0.0328*	- 0.0210*
NUFMLWa (no.)	0.0387*	0.0202	0.0480*	0.0085	0.0617*	0.0360*	0.0217*	0.0192*	0.0325*	0.0405*	0.0171*
Demand for off-farm labour											
YOS (years)	0.0090*	0.0146*	0.0185*	0.0072+	0.0118*	0.0067*	0.0091*	0.0106*	0.0068*	0.0040*	0.0040*
VT	0.1023*	0.1244#	0.1174*	0.0072	0.0450	0.1170*	0.1109*	0.1065*	0.0873*	0.0936*	0.0437*
MLFPR (per cent) .	0.0001	0.0059#	- 0.0008	0.00003	0.00008	- 0.0036*	- 0.0044*	- 0.0052*	- 0.0006	- 0.0064*	0.0028*
PCNFPOP (per cent)	0.0041*	0.0444	0.0061	0.0060+	0.0075*	0.0036*	0.0048*	0.0033*	0.0003#	0.0024*	0.0023*
Total supply of labour											
TNWFM (no.)	0.0205*	- 0.0010	0.0154#	0.0340*	0.0147+	0.0200*	0.0282*	0.0264*	0.0122*	0.0189*	0.0090*
SYOS (years)	0.0002	0.0051	- 0.0120*	- 0.0056	0.0004	0.0008	- 0.0004	- 0.0058*	- 0.0011	0.0003	0.0013
SVT	0.0036	0.0466	0.0066	0.0602#	0.0182	- 0.0359+	- 0.0048	0.0228#	0.0203+	0.0036	- 0.0090
NEIa ($,000)	- 0.0074*	- 0.0005*	- 0.0067	- 0.0003*	- 0.0010	- 0.0009*	- 0.0006*	- 0.0007*	- 0.0007*	- 0.0007*	- 0.0011*
Conditioning variables											
AGE (years)	- 0.0079*	- 0.0074*	- 0.0089*	- 0.0077*	- 0.0081*	- 0.0076*	- 0.0086*	- 0.0082*	- 0.0087*	- 0.0092*	- 0.0093*
SEX	- 0.0493*	- 0.3251*	- 0.1022#	- 0.2100*	- 0.1720*	- 0.0776*	- 0.0542*	0.0267	- 0.0413*	0.0011	- 0.1589*
DSPOUSE	0.0727*	0.0194	0.1793*	0.1573*	0.0920#	0.0435*	0.0737*	0.1753*	0.1021*	0.0603*	0.0547*
(SPOUSE) (1)	0.0745	0.0665	0.0485	0.0999	0.0225	0.0518	0.0204	0.0880	0.0885	0.0643	0.0707
DPART	- 0.0043	- 0.0657	- 0.1350*	0.0040	- 0.0487	- 0.0158	- 0.0342*	0.0413*	0.0329*	0.0088	- 0.0201
MON 5-8	0.1566*	- 0.0800	0.0337	0.0791	0.0762	0.1722*	0.1419*	0.2149*	0.1422*	0.2569*	0.1082*
MON 1-4	0.2119*	0.0459	0.1615	0.1381	0.1660#	0.2392*	0.1046*	0.2794*	0.2773*	0.2815*	- 0.0124
MON -0	0.1536*	0.0170	0.1239*	0.1434*	0.1471*	0.1130*	0.1419*	0.1418*	0.2036*	0.1965*	0.0955*
$\bar{R}^2$	0.14	0.13	0.15	0.16	0.13	0.09	0.14	0.15	0.14	0.17	0.17
F	836.7	4.2	12.0	16.5	11.3	82.7	202.3	92.3	179.6	181.4	57.6

(1) This row gives the marginal impact on Pr (OFW) of a one unit change in the independent variable.
In the case of VAPS, $\partial Pr(OFW)/\partial VAPS = b_{VAPS} + 2\ (b_{VAPS^2})\ (VAPS)$ where b_i is the coefficient for variable "i" and VAPS is evaluated at its mean.

In the case of SPOUSE, $\partial Pr(OFW)/\partial SPOUSE = b_{DSPOUSE} + b_{SYOS}\ (SYOS) + b_{SVT}\ (SVT)$ where SYOS and SVT are evaluated at their means.

(2) See footnote 2, Table 6.8.

complementary with operator's farm labour, a $1,000 increase implies a reduction in the probability of participating in off-farm work that ranges from -0.10% in British Columbia to -0.66% in Prince Edward Island.

Non-labour variable inputs (VIN) are substitutes for operator's farm labour in all provinces except the four Atlantic Provinces where the relationship is insignificant. The impact of a $1,000 increase on the probability of participating in off-farm work ranges from +0.27% in Ontario to +0.69% in Manitoba.

Hired labour (HLP) is a substitute for operator's farm labour in all provinces except the Maritimes where the relationship is insignificant. A $1,000 increase implies an increase in the probability of participating in off-farm work that ranges from +0.39% in Ontario to +4.8% in Saskatchewan.

Full-time unpaid family workers (NUFM) are complementary with operator's farm work in all provinces except Newfoundland where the relationship is insignificant. A one-person increase in full-time unpaid family workers implies a reduction in the probability of off-farm work that ranges from -1.5% in Saskatchewan to -5.6% in Prince Edward Island.

Part-time unpaid family workers (NUFMLWa) are a substitute for operator's labour in all provinces except Newfoundland and Nova Scotia where the relationship is insignificant. An additional part-time family worker increases the probability of off-farm work in a range of +1.7% in British Columbia to +6.2% in New Brunswick.

The positive impact of an additional year of schooling (YOS) by the operator on the probability of participating in off-farm work ranges from +0.40% in Alberta and British Columbia to +1.8% in Prince Edward Island. The positive impact of non-agricultural vocational training (VT) by the operator ranges from +4.4% in British Columbia to +12.4% in Newfoundland. The relationship is insignificant in Nova Scotia, New Brunswick, and Saskatchewan.

The level of demand for labour in the census division (proxied by the male labour force participation rate, MLFPR) has a positive impact on operator off-farm work only in Newfoundland and British Columbia. The

relationship is negative in Quebec, Ontario, Manitoba and Alberta.

The proximity of off-farm jobs (proxied by the per cent of total population that is non-farm, PCNFPOP) increases the probability of off-farm work in all provinces except Newfoundland and Prince Edward Island where the relationship is insignificant. A one percentage point increase in PCNFPOP increases the probability of off-farm work in a range of +0.03% in Saskatchewan to +0.75% in New Brunswick.

The positive impact of an additional non-working family member (TNWFM) ranges from +0.90% in British Columbia to +3.4% in Nova Scotia. The relationship is insignificant in Newfoundland. The education of the spouse (SYOS and SVT) has an insignificant or mixed impact on the prabability of off-farm work in every province.

Non-earned income (NEIa) has a negative impact on the probability of participating in off-farm work in all provinces except Prince Edward Island and New Brunswick where the relationship is insignificant. A $1,000 increase in NEIa causes a reduction that ranges from -0.03% in Nova Scotia to -0.11% in British Columbia.

The impact of an increase in the operator's age by one year has a significant and relatively uniform impact on off-farm work in all provinces. An increase of one year causes a reduction in the probability of off-farm work that ranges from -0.74% in Newfoundland to -0.93% in British Columbia.

The probability of off-farm work is lower in all provinces (except Manitoba and Alberta where the relationship is insignificant) if the operator is female. The impact ranges from -4.1% in Saskatchewan to -32.5% in Newfoundland. The impact of a spouse is positive and significant in all provinces (except Newfoundland). The impact ranges from +2.0% in Ontario to +10.0% in Nova Scotia. The months of residence is an important variable especially in the central and western provinces. The largest impact was a +28.2% increase in the probability of off-farm work if the operator resided 1.4 months on the farm in Alberta.

6.7. Summary

In 1971, over 36% of each food item produced in Canada was produced by a farm operator with some off-farm work (Section 6.3) and over 50% of the total income of farm operators was derived from off-farm work (Section 6.4). To determine the major determinants of off-farm work by farmers, a multivariate analysis of the variables influencing off-farm work was undertaken.

A theoretical model of the demand for farm labour facing the operator, the demand for off-farm labour facing the operator, and the operator's total supply of labour function was specified in Chapter 2. However, because of the data constraints discussed in Chapter 5, a participation rate equation (or an equation explaining the probability of participating in off-farm work) is estimated in this chapter. The estimated parameters indicate the change in the probability of reporting off-farm work because of a unit change in an independent variable. The estimated parameters cannot be related to the structural parameters. However, the signs of the estimated parameters are the signs of the structural parameters (see Section 3.2).

In general, the results confirm the theoretical model. Nearly all the variables are significant in explaining the probability of off-farm work. Nearly all variables have the sign predicted by the theoretical model.

An increase in output increases the demand for the operator's labour on the farm, thereby reducing the probability of off-farm work. Two implications are suggested. The first is that over time the proportion of farmers reporting off-farm work will decrease or increase depending on whether the number of operators with large farms increases or decreases as a proportion of the total number of operators. The proportion of operators with large farms has increased historically (see Chapter 4). If this structural change continues as expected, the proportion of farmers reporting off-farm work will tend to decline over time. The second implication is that if the value of output increases because of an increase in the price of agricultural products, off-farm work among farmers will again tend to decline. In terms of an elasticity evaluated at the mean, a one per cent increase in the price of

agricultural products will cause a 0.068% decrease in the probability of reporting off-farm work. In 1975, the price level of agricultural products peaked at 99.6% higher than the 1970 level (see Canada. Statistics Canada. Index Numbers of Farm Prices of Agricultural Products). This suggests that the probability of operators reporting off-farm work may have been 6.7% lower in 1975.[11] However, the impact of farm output on the off-farm work by operators varies significantly among farmers who produce different products and among farmers in different provinces. Thus, the impact of changes in the structure of farm size and changes in the level of farm product prices will have different impacts on the allocation of farm operator labour to farm and off-farm work, depending on the enterprise mix of the particular farm unit.

The mix of inputs that are combined with the operator's labour to produce a given level of output has a significant bearing on the allocation of the operator's labour to farm and off-farm work. Some farm inputs are complementary with the farm labour of the operator and some inputs are substitutes. The non-labour inputs--acreage, machinery and equipment, livestock capital, and variable inputs--vary between complements and substitutes depending on the type of farm enterprise.

The trend towards increased acreage per farm is expected to continue. Overall, improved acreage (IA) per farm is a complement with the operator's farm labour (Table 6.8). Thus, the trend towards increased farm acreage would be expected to increase the demand for the operator's labour on the farm and thus reduce the probability of off-farm work among farmers over time.

Over time, the capital employed per farm has risen greatly (Table 4.5). The main reason is that technological advances have made the price of capital less than the price of labour and consequently capital has been substituted for labour. However, to produce a given output, the results indicate that, overall, machinery and equipment capital (VME) is not a substitute for, but is a complement to the farm labour of the operator (Table 6.8). Thus, as the trend towards capitalisation continues, an increase in the demand for the operator's labour on the farm is expected which will cause

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See footnote(s) on page 171.

a negative impact on the probability of off-farm work among farmers.

As hypothesised, livestock capital (VL) is complementary with the operator's labour in farm work (Table 6.8). Thus, public policy initiatives to increase the proportion of livestock in the output mix can be expected to have the desired effect of increasing the demand for the operator's labour on the farm and thus keeping more operator labour in rural areas. However, this result depends upon whether livestock is the major enterprise or whether the livestock is a supplementary enterprise. The result also depends on the province being considered. For example, livestock capital is in fact a substitute for operator's farm labour for the following groups of farms and thus the intended public policy objective of increasing the demand for the operator's labour by increasing the proportion of livestock output would not be realised: all poultry farms (Table 6.10); all farms in Newfoundland (Table 6.11); dairy farms in Nova Scotia (Bollman, 1978b, Table A7.1); and field crop farms in Nova Scotia (Bollman, 1978b, Table A7.8).

In general, the three major items of fixed capital--improved acreage, machinery and equipment, and livestock--are complementary with operator's labour. Thus, public policies aiming to increase the capital available to farmers can be expected to increase the demand for the operator's on-farm labour and reduce the probability of off-farm work. However, it was argued in Section 3.14 of Bollman (1978b) that an increase in capital may reduce the demand for the operator's on-farm labour and thus increase the probability of off-farm work. This theoretical result arises because the substitution of capital for labour may reduce the demand for the operator's farm labour by more than the demand for the operator's farm labour is increased because of the increase in output. Thus, even in cases where capital and labour are substitutes, an increase in capital per farm may increase the demand for the operator's labour on the farm if the positive impact of the increase in output is greater than the negative impact of the increase in capital. However, all public policies aiming to increase the farm work opportunities for farm operators by increasing farm capital should take special recognition of cases where capital and operator labour are substitutes. Land is one major capital item. A

consistent result in this study is that unimproved acreage (UA) is a substitute for operator's labour in order to produce a given level of output. In addition, improved acreage is a substitute for operator's labour for dairy enterprises in Ontario (Bollman, 1978b, Table A7.1) and all mixed enterprises in Nova Scotia (Bollman, 1978b, Table A7.12). Machinery and equipment capital is a substitute for the operator's farm labour for the following groups of farmers: all dairy, hog, wheat, small grain (excluding wheat) and all mixed farms (Table 6.10); cattle farms in Prince Edward Island, New Brunswick, Quebec, Ontario, Manitoba and Saskatchewan (Bollman, 1978b, Table A7.3): and field crop farms in Quebec (Bollman, 1978b, Table A7.8). Instances where livestock capital is a substitute for operator's labour are listed in the preceding paragraph.

Overall, non-labour variable inputs (VIN) are a substitute for the operator's labour in farm work (Table 6.8). In the period leading up to 1971, the prices of two major variable inputs--fertiliser and chemicals--were declining. These variable inputs were being substituted for operator's farm labour to produce a given level of output and the probability of off-farm work was increased. The so-called "energy crisis" of the 1970's has changed the picture somewhat because the cost of producing fertilisers and chemicals depends on the price of petroleum.

In general, hired farm labour (HLP) is a substitute for operator's farm labour (Table 6.8). If the price of hired farm labour increases relative to the price of operator's labour, perhaps because of unionisation of the hired farm labour force, operator's labour will be substituted for hired labour in farm work and the probability of off-farm work by operators will decline.

One interesting finding was that full-time unpaid family workers (NUFM) were complementary with the operator's farm work. It was hypothesised they would be substitutes. The reason that greater farm work by family members is correlated with greater farm work by the operator may be because the operator is working to make the farm unit viable so that it may be transferred to a son or daughter, or it may be because many farm family members only work on the farm when the operator is present. The latter may

be the major reason because no age or sex criteria were employed when defining unpaid family workers for the purpose of this study. It may be that any family member that did not have another job was classified by the respondent as an unpaid family worker. This conclusion is supported by the observation that part-time unpaid family workers (NUFMLWa) are a substitute for the operator's farm labour for nearly each type of farm in each province. These are family members who had another job but also worked on the farm during the week prior to the census enumeration. Thus, it appears that the farm labour of the operator and unpaid family members is a substitute if the family members participate in other work but it is a complement if the family members do not participate in other work. This important distinction should be recognised in the future by researchers when collecting and analysing data on unpaid family labour. Specifically, the 1981 Census of Population should keep the 1971 procedure of ascertaining whether the individual participated in any unpaid family work, regardless of the other labour market activity of the individual.

The demand for off-farm work faced by the operator has an important influence on the allocation of the operator's labour between farm and off-farm work. As hypothesised, the greater the job skills in terms of formal education and vocational training that the operator has, the higher will be the demand for off-farm work function and the higher will be the probability of off-farm work. Overall, each additional year of schooling (YOS) will increase the probability of off-farm work by 0.90% and vocational training (VT) will increase the probability of off-farm work by 10.2% (Table 6.8).

In addition, the availability of off-farm jobs within a reasonable commuting distance has a positive and significant impact on the probability of off-farm work by farm operators. At the Canada level, a one percentage point increase in the per cent of total population in the census division that is non-farm (PCNFPOP) causes a 0.41% increase in the probability of off-farm work (Table 6.8). One major objective of rural development policies should be the maintenance of a stable rural population (or at least a slowing down of rural de-population) in order to prevent the per capita cost

of the infrastructure such as roads and schools from becoming prohibitive. One method of maintaining a rural population is to provide off-farm jobs for farmers within a reasonable commuting distance of their farms. The results of this study indicate that off-farm work will be higher the closer the off-farm jobs are located. The conclusion holds for operators of each type of farm (Table 6.10) and operators in all provinces except Newfoundland and Prince Edward Island (Table 6.11). However, given the availability of jobs within a reasonable commuting distance, the level of demand of labour, measured by the male labour force participation rate (MLFPR) in the census division, has no influence on the probability of off-farm work by the operator.

The variables that indicate shifts in the operator's total supply of labour function also have a significant impact on the probability of off-farm work. As expected, more non-working family members (TNWFM) shift the supply of labour curve to the right and increase the probability of off-farm work. An additional family member that does no farm or off-farm work increases the probability of the operator participating in off-farm work by 2.0% (Table 6.8). Also as expected, an increase in non-earned income (NEIa) shifts the supply of labour curve to the left and reduces the probability of off-farm work. The results indicate that each $1,000 increase in pensions, investment income or other non-earned income will decrease the probability of off-farm work by 0.74% (Table 6.8). The available off-farm wage for the operator's spouse (indicated by the spouse's years of schooling, SYOS, and the spouse's vocational training, SVT) has no influence on the probability of off-farm work by the operator at the Canada level. However, for dairy enterprises for example, a negative relationship suggests that the labour of the operator and the spouse are substitutes because the higher available off-farm wage for the spouse reduces the probability of off-farm work for the operator (Table 6.10).

A major influence on the probability of reporting off-farm work is the age of the operator. The discussion in Section 5.3.2.1 concluded that operators of different ages face different demand for farm work functions, different demand for off-farm work functions, and different

supply of labour functions. The older the farm operator, the smaller is the probability of off-farm work. Each additional year of age reduces the probability of off-farm work by -0.79% (Table 6.8). In nearly all instances, the probability of off-farm work is smaller if the operator is female. Also in nearly all instances, the presence of a spouse implies an increase in the probability of off-farm work, +7.5% at the Canada level (Table 6.8). Finally, the probability of off-farm work is higher if the operator lives on the farm for only part of the year.

FOOTNOTES

[1] The variables are defined in Table 5.14.

[2] An initial run indicated that splitting total acres into improved acres (IA) and unimproved acres (UA) was important to explain the impact of acreage on the probability of off-farm work.

[3] The male unemployment rate in the census division was also tested and it was also insignificant.

[4] The population density in the census division was also tested but the PCNFPOP was more important in explaining the probability of off-farm work.

[5] The alternate definition of non-earned income (NEIa) is used throughout the study because it purged more of the income sources that were a function of the labour supplied (see Section 5.2.5). Initial testing indicated that the marginal impact of NEI and NEIa was identical, even though the means were considerably different.

[6] The author wishes to thank John Lewis of Statistics Canada for producing the probit and logit results.

[7] The levels of Pr(OFW) chosen were 1.10, 0.40, 0.527 (i.e., the mean) and 0.80. Since the cumulative normal distribution function (which is the basis of the probit model) and the logistic function are symmetric, the change in probability evaluated at equidistant points from Pr(OFW) = 0.5 is identical. Consequently, the estimated change at the chosen levels of Pr(OFW) also represents the change in Pr(OFW) at the following levels of Pr(OFW): 0.90, 0.60, 0.473 and 0.20 respectively.

[8] The equation estimated at the Canada level (see Table 7.8) was re-estimated with dummy variables for each type of farm to test whether the intersept differs among types of farms. The "t"-statistics on the dummy variables indicated that the intersept for operators of each type of farm were significantly different from the intersept for operators of dairy farms (which was the omitted type). In addition, an F-test on the

sum of squared residuals between the two equations indicated that the equations were structurally different. The calculated F = 203.3 compared to an F = 2.3 under the null hypothesis of no difference between the two equations. (The detailed results can be obtained from the author upon request.) Thus, separate equations for each type of farm were required to capture the structural differences among types of farm.

[9] Hereafter referred to as full-time unpaid family workers.

[10] Hereafter referred to as part-time unpaid family workers.

[11] This statement ignores the problem of aggregation discussed in Section 3.7.

CHAPTER 7

SUMMARY AND CONCLUSIONS

Off-farm work by farmers is an important issue in the formulation of public policy for agriculture and food. One major policy issue is the cost or the efficiency of food production. All census-farm operators produce some food. However, one-half of these operators also participate in some off-farm work. The inter-relationships between food production and the on-farm-off-farm work activities of farmers have important implications for policy formulation. Another major policy issue is the income level of farmers. One-half of the total income of census-farm operators is from off-farm work. The inter-relationships between the level of farmers' total income and the on-farm-off-farm activities of farmers also require attention by policy makers.

This study directly addressed only some aspects of these issues. Because of the lack of research on the allocation of farmers' labour to farm and off-farm work, the prime objective of this study was to analyse the determinants of the on-farm-off-farm work activities of farm operators. The research embodied three major thrusts: a theoretical analysis of the on-farm-off-farm decision faced by farm operators (Chapter 2); a macro historical analysis of the major determinants of off-farm work by farmers and a discussion of the trends and changes in the structure of the participation of farmers in off-farm work over time (Chapter 4); and a multivariate cross-section empirical analysis of off-farm work by farmers in 1971 (Chapter 6).

The concept of a kinked demand for labour curve was developed to analyse the theoretical determinants of off-farm work by farmers.[1] The major conclusion of the theoretical analysis is that part-time farming (i.e., off-farm work by farmers) can exist in a stable equilibrium situation. The allocation of only part of the operator's labour to farm activities and the allocation of the remaining labour to off-farm activities

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See footnote(s) on page 177.

can represent an efficient resource allocation. In other words, the existence of off-farm work by farmers does not necessarily arise from market imperfections. The implication of this result is for policies designed to improve the efficiency of food production. Many public policies that apply to farmers discriminate against the part-time farmer (for examples, refer to Lerner, 1976). If the objective of the policy is the efficient production of food, all food producers, whether they are full-time or part-time farmers, should be eligible. In fact, one might admit that the inter-relationship between food production and the on-farm-off-farm work activities of farmers has received too much attention in the past; it should be ignored.

The major conclusion of the historical analysis is that part-time farming has always existed.[2] However, the structure of off-farm work among farmers has changed in recent decades. In 1941, the shortage of labour caused farmers without power machinery to hire custom work services from other farmers who did own machinery. Custom work services are considered off-farm work. Since 1941, the incidence of agricultural off-farm work (which was typically of only short duration each year) has declined and the incidence of full-time off-farm work has increased. Thus, although the incidence of off-farm work by farmers has not changed dramatically since 1941, part-time farmers are spending more time each year in off-farm work.

In 1971, 53% of census-farm operators reported some off-farm work (Table 6.4). Over 36% of all food items produced in Canada was produced by census-farm operators with some off-farm work and over 50% of the total income of census-farm operators was from off-farm work. Two ways of measuring off-farm work were identified and discussed (Section 5.2.3). Briefly, off-farm work was considered to exist if a farmer reported some days of off-farm work in 1970 or if the farmer reported some off-farm employment income in 1970. After eliminating the influence of major conceptual differences in the two measures of off-farm work, significant discrepancies remained. It appears that many farmers reported some off-farm employment income and no days of off-farm work. One recommendation is that editing and imputation on census questionnaires should utilise the information on both the Census of Agriculture and the Census of Population questionnaires.

See footnote(s) on page 179.

The 1971 linkage of agriculture and population questionnaires was performed after the two questionnaires were independently edited and missing values were imputed.

The major conclusions of the multivariate cross-section analysis of off-farm work in 1970 are:[3]

1. The theoretical model which emphasises the demand for operator's labour in farm work, the demand for operator's labour in off-farm work, and the operator's total supply of labour function appears to capture the essential features of the on-farm-off-farm work decision of farmers. Nearly all the hypothesised variables are significant and nearly all the variables have the hypothesised sign (Table 6.8).
2. The impact on the probability of off-farm work because of shifts in the demand for operator's labour in farm work, shifts in the demand for operator's labour in off-farm work, and shifts in the total supply of labour function are different depending upon the type of farm enterprise operated by the farmer and the province in which the farmer lives (Tables 6.10 and 6.11). Thus, public policies with the objective of increasing the operator's on-farm labour (or, in general, increasing the employment of labour in rural areas) will have a different impact depending upon the province and the type of farm enterprise operated by the farmer.

Some studies (e.g., Gruber, 1971; Herndier, 1973; Moore and Wayt, 1957; and Perkins, 1972) view part-time farming only as a temporary phenomenon whereby farmers are adjusting from full-time farm work to full-time non-farm work (or, sometimes, from non-farm work to full-time farming). This study suggests that part-time farming can be viewed as a permanent situation which may be a solution to the problems of low incomes among farmers and a solution to the problem of rural depopulation. Off-farm work among farmers can be promoted by increasing the opportunities for off-farm work among farm operators. The results of this study indicate two alternative methods will have a positive impact on off-farm work among farmers: either increase the number of jobs

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See footnote(s) on page 179.

within a reasonable commuting distance of the farmer, or train the farmer for job opportunities that already exist.

Nevertheless, the role of off-farm work in facilitating the adjustment of the farm operator's labour resource into or out of agriculture must be recognised. This is a topic that is not addressed in this study. Two longitudinal data bases that can provide answers to many questions on this topic have recently become available. They are the 1966-1971-1976 Census of Agriculture match and the 10-per-cent Longitudinal Taxation Sample. The inter-relationships between off-farm work and the adjustment of the farm operator's labour resource between the farm and non-farm sector is a topic that deserves a major research effort in the near future.

Thus, when considering the efficiency of food production, the fact that food is produced by less than full-time operators is irrelevant. Public policies with the aim of increasing the efficiency of food production should apply to all food producers. In this context, off-farm work by farmers is an important non-issue for public policy. However, when considering the income support of farmers, the farmer's total income must be considered, not merely the income from farming. This is the context in which off-farm work and the off-farm income of farmers is an important issue for public policy. In fact, off-farm work by farmers may be the most feasible solution to the problem of low incomes among farmers.

FOOTNOTES

[1] For a detailed summary of the theoretical analysis, refer to Section 2.6.

[2] For a detailed summary of the historical analysis, refer to Section 4.8.

[3] For a detailed summary of the multivariate cross-section analysis, refer to Section 6.7.

APPENDIX A

CENSUS QUESTIONS PERTAINING TO OFF-FARM WORK, 1936-76

Data on off-farm work by census-farm operators have been collected by each Census of Agriculture since the Census of Agriculture in the Prairie provinces in 1936. The purpose of this appendix is to review the census questions pertaining to off-farm work. In addition, the question on the 1971 Census of Population that ascertained off-farm employment income is reviewed.

The 1936 Census of Agriculture in the Prairie provinces enumerated the days that the operator or any full-time worker on the farm was employed in off-farm work in 1935 (Table A.1). Unfortunately, the only data published were the aggregate weeks of off-farm work, using a factor of six days per week. A search of unpublished data failed to uncover any unpublished tabulations. Consequently, the only table that uses 1936 data is Table 4.2.

The days of off-farm work by the census-farm operator were enumerated in each of the subsequent Censuses of Agriculture except the 1956 Census (Table A.1). Instead of requesting the number of days, the 1956 Census of Agriculture enumerated the number of months of off-farm work. Consequently, the data were of no use for the purpose of this study. In the first place, data on months of off-farm work would be useful for this study if and only if comparable data existed for other reference periods. Secondly, questions on "months" (and to a certain extent, "days") of off-farm work are often difficult to answer, especially for respondents who do not have full-time off-farm jobs. Off-farm jobs in construction trades (e.g., carpenters, plumbers, electricians), sales, and primary industries (e.g., agriculture, logging, fishing, and trapping) can easily be pursued for a part of a month. In fact, these jobs can also be pursued for part of a day and thus some respondents obviously have difficulty answering a question on number of days of off-farm work. Bus drivers might have the greatest difficulty in responding in terms of "days". Alternatively, if a person reports 200 days of off-farm work as a bus driver, does one assume the person worked 200 standard eight-hour days or did the person drive a school bus for three or four hours a day with a substantial part of the day remaining for farm work? Because of

the difficulty that some respondents undoubtedly encountered in responding in terms of "days", it is reasonable to expect that in 1971, the number of farm operators who reported some wage and salary earnings or some net income from non-farm self-employment would be greater than the number of farmers who reported some days of off-farm work.

The 1971 Census of Population requested each individual to state the income received in 1970 by source (Question 40, Table A.2). Responses to the questions of off-farm employment income--specifically wages and salaries (Question 40a) and non-farm self-employment income (Question 40b)--are available for a one-third sample of census-farm operators via the 1971 Agriculture-Population Linkage (see Freeman, 1976). The responses to these questions were also used to indicate the presence of off-farm work. For a detailed discussion of the responses to "Days of Off-farm Work" and "Off-farm Employment Income", see Section 5.2.3.

TABLE A.1. Questions on Off-farm Work from the Census of Agriculture Questionnaires, 1936-76

1936 Census:

7. How many days in 1935 did you, or any person employed the year round on this farm, work for pay at jobs not connected with the farm you operated.....days (omit labour exchanged)

1941 Census:

WORK OFF THIS FARM IN 1940

7. What is the main source of your (farm operator's) total income?.....
(Name the source which usually supplies the greatest proportion of your total income, whether it is from farming such as: dairying, fruit, wheat, etc., or from other sources not connected with this farm such as: road work, fishing, lumbering, carpentering, etc. Where two or more sources bring approximately equal returns, name them.)

8. (a) How many days in 1940 did you (the farm operator) work for pay at work not connected with this farm? (Omit labour exchanged).....days

(b) Occupation followed on days reported under (a).....
(Such as clerk, labourer, carpenter, fisherman, lumberman, road worker, school bus driver, etc.)

(c) Gross returns from outside work $.....
(Include returns from (a) and also returns from any outside work done by members of your family or hired help, with or without horses, tractors, threshing machines, combines, or any other equipment. If a son or daughter living on this farm works permanently off the farm, his or her wages should not be included in the above.)

(d) Gross income from boarders, lodgers, overnight cabins and campers..... $.....
(Do not include board furnished farm labourers.)

(e) Amount received for fire and hail damage, sale of farm machinery, etc .....$.....

1946 Census:

NON-FARM WORK and WORK OFF THIS FARM June 1, 1945, to May 31, 1946

(e.g., non-farm work—carpenter, fisherman, blacksmith, working in woods, grain or live stock buyer, road worker, etc.)
(e.g., farm work—plowing, threshing, general farm labourer, etc.)

7. How many days during this period were you (the farm operator)

engaged for pay at:	(a) non-farm work	No.	days
(Omit labour exchanged)	(b) farm work off your farm	No.	days

8. Occupation followed on days reported in inquiry 7 (a)

9. (a) **Net** receipts for non-farm work $

(b) **Gross** receipts for farm work off this farm $
(Include under (a) **net** wages, commissions, etc., received by the farm operator, for non-farm work reported in 7 (a), and under (b) **gross** receipts for farm work done off the farm by the operator and by members of his family or hired help, with or without horses, tractors, combines, etc.)

10. Gross returns from boarders, lodgers, over-night cabins, etc. $
(Include board paid by members of the family living at home and working off the farm.)

11. Amount received from the sale of coal, sand, and gravel, sold to:

(a) other farmers $

(b) non-farmers $

12. Income from other sources $
(Amount received for hail and fire damage, sale of farm machinery, exhibition prizes, breeding fees, etc.)

1951 Census:

Section X—PART-TIME WORK

98. Was the amount received from the sale of agricultural products of this farm greater than the income you (the operator) received from all other sources in 1950? (exclude income from investments) **8.** ☐ No **9.** ☐ Yes

99. How many days in 1950 did you (the operator) work at non-farm work and at farm work off this farm? _____ (days)
(Do not include exchange work)

TABLE A.1. Questions on Off-farm work from the Census of Agriculture Questionnaires, 1936-76 - Concluded

1956 Census:

PART-TIME WORK IN 1955

74. Months operator worked at NON-FARM work off this farm..... | Months ____

1961 Census:

Section XVI – PART-TIME WORK DURING THE PAST 12 MONTHS [1]

141. Was the income that the operator and his family received from non-agricultural work and agricultural work off this holding greater than the amount received from the sale of agricultural products during the **past 12 months**? (Exclude income from investments.) ☐ No ☐ Yes

[2]

142. Days operator worked at non-agricultural work and at agricultural work off this holding during the **past 12 months** (Do not include exchange work) None ☐ _____ (days)

143. Kind of part-time work: [3]

- ☐ Agricultural work off this holding (including custom work)
- ☐ Working in the woods
- ☐ Fisherman or trapper
- ☐ Construction work
- ☐ Truck or bus driver
- ☐ Factory production work
- ☐ Clerical work
- ☐ Other _____ (name)

1966 Census:

Section X – PART-TIME WORK DURING THE PAST 12 MONTHS

78. What was the income you (the operator) received from non-agricultural and agricultural work off this holding during the **past 12 months**? (Check one.) (Include salaries, wages and commissions, also include the net income from custom work, non-agricultural business, or professional practice. Do not include pensions, family allowances, investment income, rental of farms or unemployment insurance.)
- ☐ under $750
- ☐ $750 or more

79. How many days did you (the operator) work off this holding at agricultural and non-agricultural work during the **past 12 months**? (Do not include exchange work.) None ☐ Days _____

1971 Census:

Section XXI – OFF-FARM WORK DURING 1970

195. How many days did you (the operator) work off this holding at paid agricultural and non-agricultural work during **1970**? (Do not include exchange work) 233 None ☐ _____ days

(If "none" skip to Question 197.)

196. Kind of **paid** off-farm work done during **1970** and number of days worked at each: *(The total of Questions (a) to (e) must equal the number given for Question 195.)*	Number of days worked
(a) Agricultural work off this holding (including custom work)	234
(b) Logging, lumbering or forestry work	235
(c) Truck or bus driver	236
(d) Operator of road maintenance or construction equipment	237
(e) Other kinds of work (Specify) _____	

1976 Census:

Section IX – OFF-FARM WORK DURING THE PAST 12 MONTHS

74. How many days did you (the operator) work off this holding at paid agricultural and non-agricultural work during the **past 12 months**? (Do not include exchange work) 092 None ☐ _____ days

Source: Canada, Statistics Canada, Censuses of Agriculture, 1936-76. (Questionnaires are published in the Volume Series for each Census.)

TABLE A.2. Questions on Income including Off-farm Employment Income[1], 1971 Census of Population

40. INCOME FOR 1970 (State in dollars only)

(a) During 1970 what were your total wages and salaries, commissions, bonuses, tips, etc.? (*before any deductions*)

Amount ..... $_____/00 ○ None

(b) During 1970 what was your net income from self-employment or operating your own non-farm business or professional practice? *State total business income less expenses of operation. If lost money, give amount and write "Loss".*

Amount ..... $_____/00 ○ None

(c) During 1970 what was your net income from operating a farm on your own account or in partnership? *State total farm income less expenses of operation. If lost money, give amount and write "Loss".*

Amount ..... $_____/00 ○ None

(d) During 1970 how much income did you receive from:

1. Family and youth allowances?

Amount ..... $_____/00 ○ None

2. Government old age pensions, Canada pensions, and Quebec pensions?

Amount ..... $_____/00 ○ None

3. Other government income? (*e.g., unemployment insurance, veterans' pensions and allowances, welfare*)

Amount ..... $_____/00 ○ None

4. Retirement pensions from previous employment?

Amount ..... $_____/00 ○ None

5. Bond and deposit interest and dividends?

Amount ..... $_____/00 ○ None

6. Other investment income? (*e.g., net rents*)

Amount ..... $_____/00 ○ None

7. Other income? (*e.g., alimony*)

Amount ..... $_____/00 ○ None

(e) During 1970 what was your total income? ($a+b+c+d$) ■

Amount ..... $_____/00 ○ None

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(1) Off-farm employment income includes wages and salaries (40a) and net income from non-farm self-employment (40b).

Source: Canada, Statistics Canada, 1971 Census of Population Questionnaire.

APPENDIX B

LIST OF HISTORICAL TABLES ON PART-TIME FARMING: 1941-76

Copies of any or all of the tables in the following list are available from the author by writing to the Agriculture Division, Statistics Canada, Ottawa, Ontario, K1A OL7.

The assistance of the following individuals in the preparation of these tables is gratefully recognised: Marie Aldham, Kim Courtney, Sandy Cox, Gloria Deslauriers, Carroll Eyre, Laurent Gratton, Alain Guignard, Ed Hamilton, Cathy Kelly, Luc Landriault, Betty Lorimer, Hank Molenaar, Loretta Nazar, Rose Snaauw, Phyllis Tennant, Jacques Vincent. (Hank Molenaar prepared all the tabulations required to update the tables to include the results of the 1976 Census of Agriculture).

List of Tables Available from the Author

B.1. Trends in the Agriculture Sector, 1921-76, Canada.

B.2. Comparison of Unemployment Rates and Percent of Census-farm Operators Reporting, "Some Days of Off-farm Work", 1941-76, Canada and Provinces.

B.3. Census-farms Classified by Size of Gross Farm Sales, 1951-76, Canada and Provinces.

B.4. Number and Percent Change of Census-farm Operators who reported, "Some Days of Off-farm Work", 1941-76, Canada and Provinces.

B.5. Number and Percent of Census-farm Operators Reporting, "Some Days of Off-farm Work", by Number of Days of Off-farm Work, 1941-76, Canada and Provinces.

B.5a. Number and Percent of Census-farm Operators Reporting Agricultural and Non-Agricultural Off-farm Work, by Number of Days of Off-farm Work Reported, June 1, 1945 to May 31, 1946, Prairie Provinces.

B.6. Number and Percent of Census-farm Operators Reporting, "Some Days of Off-farm Work", by Size of Gross Farm Sales, 1961-76, Canada and Provinces.

B.7. Number and Percent of Census-farm Operators Reporting, "Some Days of Off-farm Work", by Total Acreage of Farm, 1941-1976, Canada and Provinces.

B.8. Number and Percent of Census-farm Operators Reporting, "Some Days of Off-farm Work", by Type of Farm (for farms with gross sales $\geq$ \$1,200 in 1961 and gross sales $\geq$ \$2,500 in 1966, 1971 and 1976), 1961-76, Canada and Provinces.

B.9. Percent of Operators Reporting, "Some Days of Off-farm Work", ranked in decreasing order of importance of Type of Farms (for farms with gross sales $\geq$ \$1,200 in 1961 and gross sales $\geq$ \$2,500 in 1966, 1971 and 1976), 1961-76, Canada and Provinces.

B.10. Percent of Operators Reporting, "Some Days of Off-farm Work", by Size of Gross Farm Sales, by Type of Farm (for farms with gross sales $\geq$ \$1,200), 1961, Canada and Provinces.

B.11. Percent of Operators Reporting, "Some Days of Off-farm Work", by Size of Gross Farm Sales, by Type of Farm (for farms with gross sales $\geq$ \$2,500), 1966, Canada and Provinces.

B.12. Percent of Operators Reporting, "Some Days of Off-farm Work", by Size of Gross Farm Sales, by Type of Farm (for farms with gross sales $\geq$ \$2,500), 1971, Canada and Provinces.

B.13. Percent of Operators Reporting, "Some Days of Off-farm Work", by Size of Gross Farm Sales, by Type of Farm (for farms with gross sales ≧ $2,500), 1976, Canada and Provinces.

B.14. Number and Percent of Census-farm Operators Reporting, "Some Days of Off-farm Work", by Age Cohort, 1951-76, Canada and Provinces.

B.14a. Number of Census-farm Operators by Age Cohort, 1921-76, Canada and Provinces.

B.15. Percent of Census-farm Operators Reporting Full-time Off-farm Work, 1941-76, Canada and Provinces.

B.16. Percent of Census-farm Operators Reporting Part-time Off-farm Work, 1941-76, Canada and Provinces.

B.17. Percent Distribution of Census-farm Operators who reported, "Some Days of Off-farm Work", by Size of Gross Farm Sales, by Number of Days of Off-farm Work, 1961, Canada and Provinces.

B.17a. Same, except for only three size groupings of days of off-farm work, and also shows percent of total operators, 1961, Canada.

B.18. Percent Distribution of Census-farm Operators who reported, "Some Days of Off-farm Work", by Size of Gross Farm Sales, by Number of Days of Off-farm Work, 1966, Canada and Provinces.

B.18a. Same, except for only three size groupings of days of off-farm work, and also shows percent of total operators, 1966, Canada.

B.19 Percent Distribution of Censue-farm Operators who reported, "Some Days of Off-farm Work", by Size of Gross Farm Sales, by Number of Days of Off-farm work, 1971, Canada and Provinces.

B.19a. Same, except for only three size groupings of days off-farm work, and also shows percent of total operators, 1971, Canada.

B.20. Percent Distribution of Census-farm Operators who reported, "Some Days of Off-farm Work", by Size of Gross Farm Sales, by Number of Days of Off-farm Work, 1976, Canada and Provinces.

B.21. Percent Distribution of Census-farm Operators who reported, "Some Days of Off-farm Work", by Total Acreage of Farm, by Number of Days of Off-farm Work, 1940, Canada and Provinces.

B.22. Percent Distribution of Census-farm Operators who reported, "Some Days of Off-farm Work", by Total Acreage of Farm, by Number of Days of Off-farm Work, 1951, Canada and Provinces.

B.23. Percent Distribution of Census-farm Operators who reported, "Some Days of Off-farm Work", by Total Acreage of Farm, by Number of Days of Off-farm Work, 1961, Canada and Provinces.

B.24. Percent Distribution of Census-farm Operators who reported, "Some Days of Off-farm Work", by Total Acreage of Farm, by Number of Days of Off-farm Work, 1966, Canada and Provinces.

B.25. Percent Distribution of Census-farm Operators who reported, "Some Days of Off-farm Work", by Total Acreage of Farm, by Number of Days of Off-farm Work, 1971, Canada and Provinces.

B.26. Percent Distribution of Census-farm Operators who reported, "Some Days of Off-farm Work", by Total Acreage of Farm, by Number of Days of Off-farm Work, 1976, Canada and Provinces.

B.27. Percent Distribution of Census-farm Operators who reported, "Some Days of Off-farm Work", by Type of Farm (for farms with gross sales $\geq$ \$1,200), ranked in decreasing order of proportion reporting Full-time (i.e., > 288 days) Off-farm Work, by Number of Days of Off-farm Work, 1961, Canada and Provinces.

B.27a. Percent Distribution of Census-farm Operators who reported, "Some Days of Off-farm Work", by Number of Days of Off-farm Work, by Type of Farm (for farms with gross sales $\geq$ \$1,200), 1961, Canada.

B.28. Percent Distribution of Census-farm Operators who reported, "Some Days of Off-farm Work", by Type of Farm (for farms with gross sales $\geq$ \$2,500), ranked in decreasing order of proportion reporting Full-time (i.e., > 228 days) Off-farm Work, by Number of Days of Off-farm Work, 1966, Canada and Provinces.

B.28a. Percent Distribution of Census-farm Operators who reported, "Some Days of Off-farm Work", by Number of Days of Off-farm Work, by Type of Farm (for farms with gross sales $\geq$ \$2,500), 1966, Canada.

B.29. Percent Distribution of Census-farm Operators who reported, "Some Days of Off-farm Work", by Type of Farm (for farms with gross sales $\geq$ \$2,500), ranked in decreasing order of proportion reporting Full-time (i.e., > 288 days) Off-farm Work, by Number of Days of Off-farm Work, 1971, Canada and Provinces.

B.29a. Percent Distribution of Census-farm Operators who reported, "Some Days of Off-farm Work", by Number of Days of Off-farm Work, by Type of Farm (for farms with gross sales $\geq$ \$2,500), 1971, Canada.

B.30. Percent Distribution of Census-farm Operators who reported, "Some Days of Off-farm Work", by Type of Farm (for farms with gross sales ≧ $2,500), ranked in decreasing order of proportion reporting Full-time (i.e., > 288 days), Off-farm Work, by Number of Days of Off-farm Work, 1976, Canada and Provinces.

B.31. Percent Distribution of Census-farm Operators who reported, "Some Days of Off-farm Work", by Age of Operator, by Number of Days of Off-farm Work, 1951, Canada and Provinces.

B.32. Percent Distribution of Census-farm Operators who reported, "Some Days of Off-farm Work", by Age of Operator, by Number of Days of Off-farm Work, 1961, Canada and Provinces.

B.33. Percent Distribution of Census-farm Operators who reported, "Some Days of Off-farm Work", by Age of Operator, by Number of Days of Off-farm Work, 1966, Canada and Provinces.

B.34. Percent Distribution of Census-farm Operators who reported, "Some Days of Off-farm Work", by Age of Operator, by Number of Days of Off-farm Work, 1971, Canada and Provinces.

B.34a. Same, except for only three size groupings of days of off-farm work, and also shows percent of total operators, 1971, Canada.

B.35. Percent Distribution of Census-farm Operators who reported, "Some Days of Off-farm Work", by Age of Operators, by Number of Days of Off-farm Work, 1976, Canada.

B.36. Number of Census-farm Operators reporting, "Some Days of Off-farm Work", by Off-farm Occupation, 1941, 1961 and 1971, Canada and Provinces.

B.37. Percent Distribution of Census-farm Operators who reported, "Some Days of Off-farm Work", by Off-farm Occupation, 1941, 1961 and 1971, Canada and Provinces.

B.38. Percent Distribution of Census-farm Operators who reported, "Some Days of Off-farm Work", as a percent of All Operators, by Off-farm Occupation, 1941, 1961 and 1971, Canada and Provinces.

B.39. Occupation of Off-farm Job, listed in decreasing order of importance, for All Operators Reporting, "Some Days of Off-farm Work", 1941, Canada and Provinces.

B.51. Percent Distribution of Census-farm Operators who reported, "Some Days of Off-farm Work", by Age of Operator, by Off-farm Occupation, 1971, Canada and Provinces.

B.52. Percent Distribution of Census-farm Operators who reported, "Some Days of Off-farm Work", by Type of Farm (for farms with gross sales $\geq$ $1,200), by Off-farm Occupation, 1961, Canada and Provinces.

B.53. Percent Distribution of Census-farm Operators who reported, "Some Days of Off-farm Work", by Type of Farm (for farms with gross sales $\geq$ $2,500), by Off-farm Occupation, 1971, Canada and Provinces.

B.54. Average Days of Off-farm Work Reported (by all operators), 1935-76, Canada and Provinces.

B.55. Average Days of Off-farm Work per Operator Reporting, 1940-76, Canada and Provinces.

B.56. Average Days of Off-farm Work per Operator Reporting, by Size of Gross Farm Sales, 1961-76, Canada and Provinces.

B.57. Average Days of Off-farm Work per Operator Reporting, by Total Acreage of Farm, 1951-76, Canada and Provinces (1976 not available, January 1978).

B.58. Average Days of Off-farm Work per Operator Reporting, by Type of Farm (for farms with gross sales $\geq$ $1,200 in 1961 and gross sales $\geq$ $2,500 in 1966, 1971 and 1976), 1961-76, Canada and Provinces.

B.59. Average Days of Off-farm Work per Operator Reporting, by Size of Gross Farm Sales, by Type of Farm (for farms with gross sales $\geq$ $1,200), 1961, Canada and Provinces.

B.60. Average Days of Off-farm Work per Operator Reporting, by Size of Gross Farm Sales, by Type of Farm (for farms with gross sales $\geq$ $2,500), 1966, Canada and Provinces.

B.61. Average Days of Off-farm Work per Operator Reporting, by Size of Gross Farm Sales, by Type of Farm (for farms with gross sales $\geq$ $2,500), 1971, Canada and Provinces.

B.62. Average Days of Off-farm Work per Operator Reporting, by Size of Gross Farm Sales, by Type of Farm (for farms with gross sales $\geq$ $2,500), 1976, Canada and Provinces.

B.63. Average Days of Off-farm Work per Operator Reporting, by Size of Gross Farm Sales, by Off-farm Occupation, 1971, Canada and Provinces.

B.64. Average Days of Off-farm Work per Operator Reporting, by Total Acreage of Farm, by Off-farm Occupation, 1971, Canada and Provinces.

B.65. Average Days of Off-farm Work per Operator Reporting, ranked in decreasing order of importance of Type of Farm (for farms with gross sales $\geq$ \$2,500), by Off-farm Occupation, 1971, Canada and Provinces.

B.66. Average Days of Off-farm Work per Operator Reporting, by Age of Operator, by Off-farm Occupation, 1971, Canada and Provinces.

B.67. Proportion of Operators with, "Some Days of Off-farm Work", who reported more than One Occupation of Off-farm Work, by Size of Gross Farm Sales, 1961, Canada and Provinces.

B.68. Proportion of Operators with, "Some Days of Off-farm Work", who reported more than One Occupation of Off-farm Work, by Size of Gross Farm Sales, 1971, Canada and Provinces.

B.69. Proportion of Operators with, "Some Days of Off-farm Work", who reported more than One Occupation of Off-farm Work, by Total Acreage of Farm, 1961, Canada and Provinces.

B.70. Proportion of Operators with, "Some Days of Off-farm Work", who reported more than One Occupation of Off-farm Work, by Total Acreage of Farm, 1971, Canada and Provinces.

B.71. Proportion of Operators with, "Some Days of Off-farm Work", who reported more than One Occupation of Off-farm Work, by Type of Farm (for farms with gross sales $\geq$ \$1,200), 1961, Canada and Provinces.

B.72. Proportion of Operators with, "Some Days of Off-farm Work", who reported more than One Occupation of Off-farm Work, by Type of Farm (for farms with gross sales $\geq$ \$2,500), 1971, Canada and Provinces.

B.73. Proportion of Operators with, "Some Days of Off-farm Work", who reported more than One Occupation of Off-farm Work, by Age of Operator, 1971, Canada and Provinces.

APPENDIX C

MEANS OF VARIABLES AND SIMPLE CORRELATION COEFFICIENTS BETWEEN VARIABLES IN EMPIRICAL ANALYSIS

The purpose of this appendix is to present the means of the variables entering the multivariate analysis (Section 6.6) and to present the simple correlation coefficients between the variables. The variables are defined in Table 5.14. Only the means by type of farm and by province are presented (Tables C.1 and C.2, respectively). The means by province for each type of farm are available upon request from the author at the Agriculture Division, Statistics Canada, Ottawa, Ontario, K1A OL7.

In order to calculate the marginal impact of a spouse (see the SPOUSE variable in Table 6.8, for example), the mean of the spouse's years of schooling (SYOS) and the mean of the spouse's vocational training (SVT), given that a spouse was present, was required (see Section 5.3.2.2). The means of SYOS and SVT for only the observations with a spouse present are reported in Bollman (1978b), Table A6.3. The simple correlation coefficients are presented in Table C.3.

TABLE C.1. Means of Variables(1) Used in Empirical Analysis (Private and Partnership Operators), by Type of Farm, Canada, 1971 (concluded)

Variable(1)	Field crops	Fruit and vegetables	Forestry	Miscellaneous specialty	Total mixed	Livestock mixed	Field crops mixed	Other mixed
Estimated population	17,939	13,595	3,489	7,569	33,149	9,465	5,908	17,776
Sample size	6,381	4,585	1,270	2,685	11,889	3,337	2,181	6,371
OFW	0.617	0.654	0.766	0.751	0.577	0.402	0.465	0.707
$VAPS_2$($,000).....	12.236	8.565	2.568	9.747	5.522	8.104	9.604	2.790
$VAPS^2$	649.39	379.03	39.82	881.44	128.15	202.68	193.42	66.77
IA (,00)	1.192	0.361	0.661	0.455	2.483	2.828	4.720	1.556
UA (,00)	0.643	0.200	2.024	0.669	1.196	1.254	1.597	1.033
VME ($,000)	9.773	6.746	4.156	5.202	8.245	9.690	13.851	5.613
VL ($,000)	1.472	0.608	2.624	5.288	5.815	8.694	7.760	3.635
VIN ($,000)	1.588	1.141	0.319	1.310	0.922	1.432	1.107	0.590
HLP ($,000)	2.289	2.072	0.128	1.806	0.246	0.227	0.364	0.216
NUFM (no.)	0.36	0.39	0.29	0.35	0.477	0.72	0.50	0.34
NUFMLWa (no.)	0.201	0.272	0.167	0.250	0.227	0.218	0.245	0.225
YOS (years)	9.3	9.8	8.2	10.5	9.4	8.8	9.8	9.6
VT(2)	0.082	0.107	0.073	0.139	0.076	0.045	0.063	0.098
MLFPR (per cent) ...	74.934	75.552	71.961	77.111	75.463	74.836	76.690	75.390
PCNFPOP (per cent) .	84.133	89.939	87.379	87.041	76.357	72.710	71.433	79.935
TNWFM (no.)	1.7	1.7	2.0	1.5	1.7	1.9	1.6	1.6
SYOS (years)	8.6	9.0	7.9	9.5	8.8	8.8	9.2	8.6
SVT(2)	0.072	0.079	0.054	0.108	0.068	0.050	0.085	0.071
NEIa ($,000)	0.986	1.263	0.698	1.957	0.816	0.686	0.698	0.924
AGE (years)	49.4	50.9	49.8	49.3	48.1	49.7	47.3	47.6
SEX(2)	0.050	0.058	0.029	0.073	0.040	0.030	0.022	0.052
DSPOUSE(2)	0.841	0.874	0.830	0.855	0.853	0.903	0.853	0.825
MON 5-8(2).....	0.023	0.018	0.013	0.075	0.028	0.007	0.020	0.043
MON 1-4(2)	0.020	0.010	0.014	0.027	0.030	0.003	0.011	0.050
MON -0(2)	0.098	0.069	0.048	0.024	0.117	0.016	0.080	0.184

(1) For the definition of the variables, refer to Table 5.14
(2) The means of dummy variables are interpreted as the proportion responding "Yes".

TABLE C.1. Means of Variables(1) Used in Empirical Analysis (Private and Partnership Operators), by Type of Farm, Canada, 1971

Variable(1)	Total	Dairy	Cattle, hogs sheep	Cattle	Hogs	Poultry	Wheat	Small grain
Estimated population	357,992	62,163	120,971	82,003	21,175	73,397	46,157	45,563
Sample size	126,998	21,730	42,974	29,268	7,449	2,588	16,144	16,752
OFW	0.527	0.437	0.527	0.539	0.575	0.610	0.471	0.527
VAPS ($,000)	10.479	11.716	12.258	12.446	13.814	35.099	6.302	8.477
$VAPS^2$	744.84	282.86	1352.74	1783.77	672.88	6252.61	80.40	166.80
IA (,00)	2.893	1.494	2.750	2.893	1.895	0.868	5.932	4.734
UA (,00)	1.467	0.778	2.525	3.253	0.657	0.405	1.135	1.095
VME ($,000)	10.379	10.219	10.051	10.244	8.769	7.828	12.323	14.127
VL ($,000)	8.404	11.207	13.265	15.356	7.526	15.801	3.160	3.683
VIN ($,000)	1.967	2.885	2.054	1.498	4.552	1.394	0.333	0.955
HLP ($,000)	0.552	0.524	0.353	0.392	0.325	0.483	0.186	0.260
NUFM (no.)	0.46	0.61	0.47	0.43	0.482	0.48	0.35	0.38
NUFMLWa (no.)	0.213	0.207	0.230	0.226	0.222	0.249	0.151	0.210
YOS (years)	9.4	8.6	9.5	9.5	9.6	9.8	9.7	9.9
VT(2)	0.069	0.042	0.066	0.064	0.086	0.106	0.068	0.076
MLFPR (per cent)	75.621	72.344	76.578	76.500	76.432	74.900	77.106	76.601
PCNFPOP (per cent) ..	75.356	83.165	76.992	77.493	77.771	84.730	68.279	70.287
TNWFM (no.)	1.6	2.1	1.6	1.5	1.6	1.7	1.4	1.5
SYOS (years)	8.8	8.6	9.0	8.9	9.3	9.3	8.5	9.1
SVT(2)	0.073	0.051	0.075	0.074	0.085	0.073	0.077	0.089
NEIa ($,000)	0.858	0.809	0.840	0.924	0.634	0.857	0.841	0.821
AGE (years)	48.8	47.7	48.8	49.8	45.2	48.0	50.3	48.1
SEX(2)	0.038	0.031	0.035	0.038	0.027	0.052	0.046	0.031
DSPOUSE(2)	0.845	0.893	0.843	0.823	0.887	0.903	0.780	0.826
MON 5-8(2)	0.024	0.0062	0.012	0.013	0.013	0.014	0.061	0.039
MON 1-4(2).....	0.014	0.0053	0.0080	0.0084	0.0097	0.0064	0.0226	0.0199
MON -0(2)	0.109	0.0103	0.0586	0.0666	0.0486	0.0385	0.0315	0.1931

See footnote(s) at end of table.

TABLE C.2. Means of Variables(1) Used in Empirical Analysis (Private and Partnership Operators), Canada and Provinces, 1971

Variable(1)	Canada	New found-land	Prince Edward Island	Nova Scotia	New Bruns-wick	Quebec	Ontario	Manitoba	Sask-atchewan	Alberta	British Columbia
Estimated Population ..	357,992	981	4.419	5,861	5,350	59,850	92,744	34,355	75,479	61,164	17,752
Sample Size	126,998	532	1,524	2,053	1,799	20,738	31,508	13,377	26,511	22,158	6,783
OFW	0.527	0.732	0.535	0.689	0.661	0.541	0.599	0.465	0.408	0.498	0.720
VAPS ($,000)	10.479	4.690	8.183	7.697	7.363	8.264	13.453	8.638	8.924	12.147	9.586
$VAPS^2$	744.84	146.67	278.34	420.41	335.9	313.9	1166.9	242.6	288.5	1503.7	666.7
IA (,00)	2.893	0.155	1.046	0.610	0.835	1.039	1.131	3.528	5.960	4.399	0.889
UA (,00)	1.467	0.218	0,595	1.554	1.452	0.696	0.540	1.637	2.040	2.783	1.876
VME (,000)	10.379	3.622	8.176	6.180	6.877	6.816	9.096	11.382	13.257	13.418	7.822
VL ($,000)	8.404	2.466	4.576	5.294	4.328	7.253	8.490	7.170	7.552	12.510	7.237
VIN ($,000)	1.967	1.646	2.051	2.833	2.187	2,749	3.020	1.268	0.593	1.421	2.559
HLP ($,000)	0.552	0.588	0.803	0.766	0.987	0.391	0.940	0.305	0.264	0.404	1.011
NUFM (no.)	0.46	0.20	0.44	0.30	0.32	0.47	0.46	0.46	0.44	0.50	0.41
NUFMLMa (no.)	0.213	0.099	0.242	0.151	0.131	0.131	0.214	0.157	0.142	0.314	0.596
YOS (years)	9.4	7.9	9.4	9.8	8.8	7.7	9.9	9.1	9.6	9.9	10.6
VT(2)	0.069	0.053	0.053	0.064	0.058	0.045	0.075	0.054	0.057	0.089	0.144
MLFPR (per cent)	75.621	64.205	75.288	81.841	70.905	67.958	78.218	74.769	76.295	78.532	76.720
PCNFPOP (per cent)	76.356	98.500	81.147	93.327	92.432	83.548	86.521	63.211	66.989	70.904	90.230
TNWFM (no.)	1.6	2.2	1.8	1.8	2.0	2.2	1.5	1.5	1.4	1.5	1.6
SYOS (years)	8.8	7.8	8.9	9.1	8.7	7.5	9.5	8.4	8.9	9.1	9.6
SVT(2)	0.073	0.022	0.065	0.059	0.060	0.036	0.079	0.0070	0.074	0.092	0.108
NEIa ($,000)	0.858	0.0769	0.901	0.955	0.911	0.911	1.085	0.675	0.714	0.705	1.099
AGE (year)	48.8	50.7	50.1	52.1	51.3	47.7	49.3	48.8	48.9	48.0	49.2
SEX(2)	0.038	0.028	0.034	0.036	0.042	0.035	0.041	0.034	0.043	0.033	0.059
DSPOUSE(2)	0.845	0.867	0.809	0.822	0.850	0.874	0.864	0.827	0.816	0.832	0.863
MON 5-8(2)	0.024	0.0112	0.0088	0.0065	0.016	0.010	0.075	0.019	0.046	0.031	0.027
MON 1-4(2)	0.014	0.002	0.0007	0.0067	0.0073	0.0081	0.115	0.0100	0.0168	0.0226	0.0258
MON -0(2)	0.109	0.094	0.042	0.028	0.045	0.033	0.130	0.130	0.242	0.118	0.0493

(1) For the definitions of the variables, refer to Table 5.14
(2) The means of dummy variables are interpreted as the proportion responding "Yes".

TABLE C.3. Simple Correlation Coefficients Between Variables(1) Used in Empirical Analysis (Private and Partnership Operators), Canada(2), 1971

Variables	OFW	VAPS	$VAPS^2$	IA	UA	VME	VL	VIN	HLP	NUFM	NUFMLWa	YOS
OFW	–											
VAPS	– 0.0831	–										
$VAPS^2$	– 0.0005	0.7337	–									
IA	– 0.1711	0.2157	0.0546	–								
UA	– 0.0389	0.1498	0.1199	0.1923	–							
VME	– 0.1286	0.3673	0.3673	0.5730	0.1387	–						
VL	– 0.1091	0.5527	0.3938	0.3217	0.5109	0.3214	–					
VIN	– 0.0313	0.6209	0.2861	0.0098	0.0258	0.1903	0.3675	–				
HLP	– 0.0150	0.5109	0.2475	0.0971	0.1022	0.2807	0.2389	0.3266	–			
NUFM	– 0.0655	0.0591	0.0011	0.0652	0.0194	0.1038	0.1004	0.0457	0.0139	–		
NUFMLWa	0.0493	0.0173	– 0.0008	– 0.0055	0.0069	0.0338	0.0248	0.0224	0.0216	0.0058	–	
YOS	0.1126	0.0918	0.0187	0.1364	0.0266	0.1396	0.0724	0.0521	0.0799	– 0.0138	0.0461	–
VT	0.0977	– 0.0116	– 0.0026	– 0.0143	– 0.0081	– 0.0095	– 0.0214	– 0.0048	0.0043	– 0.0102	0.0227	0.2106
MLFPR	– 0.0012	0.0327	0.0032	0.0698	0.0202	0.0610	0.0304	0.0004	0.0162	0.0008	0.0229	0.1169
PCNFPOP	0.1490	0.0165	0.0034	– 0.3433	– 0.0899	– 0.1319	– 0.0416	0.0856	0.0811	– 0.0319	0.0256	0.0192
TNWFM	0.0346	0.0148	0.0001	– 0.0224	– 0.0045	0.0156	0.0310	0.0278	0.0088	0.3132	0.0351	– 0.0963
SYOS	0.0842	0.0994	0.0160	0.1174	0.0171	0.1492	0.0879	0.0626	0.0630	0.1146	0.0713	0.3092
SVT	0.0403	0.0244	– 0.0011	0.0440	0.0161	0.0480	0.0256	0.0112	0.0231	– 0.0055	0.0298	0.1645
NEIa	– 0.0520	0.0276	0.0211	– 0.0057	0.0039	0.0159	0.0168	0.0106	0.0630	– 0.0076	0.0091	0.0218
AGE	– 0.2193	– 0.0690	– 0.0031	– 0.0791	– 0.0085	– 0.1020	– 0.0678	– 0.0645	– 0.0223	– 0.0071	– 0.0139	– 0.3153
SEX	– 0.0335	– 0.0260	– 0.0031	– 0.0339	– 0.0079	– 0.0465	– 0.0298	– 0.0163	0.0020	– 0.0736	0.0369	0.0170
DSPOUSE	0.0654	0.0628	0.0073	0.0358	– 0.0028	0.0809	0.0550	0.0533	0.0358	0.1791	0.0474	0.0434
DPART	– 0.0221	0.0902	0.0069	0.0831	0.0485	0.1251	0.0961	0.0553	0.0642	– 0.0248	0.0361	0.0553
MON 4-7	0.0404	– 0.0253	– 0.0030	0.0432	0.0030	– 0.0009	– 0.0463	– 0.0293	– 0.0120	– 0.0405	– 0.0123	0.0307
MON 1-3	0.0651	– 0.0188	– 0.0010	– 0.0078	– 0.0029	– 0.0241	– 0.0291	– 0.0154	– 0.0028	– 0.0311	0.0063	0.0377
MON -0	0.0905	– 0.0377	0.0033	0.0660	– 0.0155	– 0.0564	– 0.0964	– 0.0464	– 0.0077	– 0.1034	– 0.0084	0.0822

See footnote(s) at end of table.

TABLE C.3. Simple Correlation Coefficients Between Variables (1) Used in Empirical Analysis (Private and Partnership Operators), Canada(2), 1971 (concluded)

Variables	VT	MLFPR	PCNFPOP	TNWFM	SYOS	SVT	NEIa	AGE	SEX	DSPOUSE	DPART	MON 4-7	MON 1-3
OFW													
VAPS													
$VAPS^2$													
IA													
UA													
VME													
VL													
VIN													
HLP													
NUFM													
NUFMLWa													
YOS													
VT	–												
MLFPR	0.0255	–											
PCNFPOP	0.0369	0.0374	–										
TNWFM	– 0.0215	– 0.0762	0.0778	–									
SYOS	0.0842	0.0657	0.0302	0.1169	–								
SVT	0.1329	0.0323	0.0052	– 0.0257	0.2486	–							
NEIa	– 0.0048	0.0167	0.0771	0.0744	0.0079	0.0031	–						
AGE	– 0.0881	0.0085	0.0268	0.0360	0.1967	– 0.1051	0.1789	–					
SEX	– 0.0005	0.0009	0.0130	– 0.0761	– 0.2490	– 0.0270	0.0059	0.0772	–				
DSPOUSE	0.0298	– 0.0037	0.0496	0.2397	0.8145	0.1201	0.0004	– 0.0734	– 0.2965	–			
DPART	0.0034	0.0271	0.0122	– 0.0191	– 0.0143	0.0115	0.0277	– 0.0175	0.0127	– 0.0518	–		
MON 4-7	0.0183	0.0094	– 0.0442	– 0.0497	– 0.0251	0.0092	– 0.0087	– 0.0187	0.0040	– 0.0487	– 0.0032	–	
MON 1-3	0.0303	0.0065	– 0.0108	– 0.0215	0.0119	0.0144	– 0.0023	– 0.0551	0.0076	– 0.0035	0.0002	– 0.0185	–
MON -0	0.0246	0.0320	– 0.1371	– 0.0441	– 0.0120	0.0196	0-0324	– 0.0327	0.0348	– 0.0583	0.0091	– 0.0541	– 0.0417

(1) For the definitions of the variables, refer to Table 5.14.
(2) The correlation coefficients for the provincial equations or the type of farm equation are available from the author upon request.

APPENDIX D

WHY FARMERS SAY THEY FARM PART-TIME:

A REVIEW OF THE LITERATURE

The main thrust of this study has been an economic analysis of the objective determinants of off-farm work by farmers. However, some researchers have asked farmers for their subjective views on why they farm on a part-time basis. Subjective verbal responses by individuals in an economic system are difficult to interpret. For a good review of the issues, see Machlup (1946). In general, economic analysis attempts to take into account all non-economic and economic factors that bear on a decision. Economic analysis then concentrates on marginal responses to marginal changes in economic variables. Subjective verbal responses by individuals tend to concentrate on non-marginal changes and often the major factors appear to be the non-economic variables which are held constant in the economic analysis. Nevertheless, verbal responses often provide insight into how a given situation is perceived by individuals. The purpose of this appendix is to review the literature on why farmers say they farm part-time in order to obtain an insight into how part-time farming is perceived by part-time farmers. However, because of space limitations, only a brief summary is presented here. A photocopy of the complete appendix (available in Bollman (1978b)) is available upon request to the author, Agriculture Division, Statistics Canada, Ottawa, K1A 0L7.

The review encompassed the studies by Daugherty (1936), Alleger (1953), Moore and Wayt (1957), Gruber (1971), Purvis and Noble (1973), Hanson (1972), Herndier (1973), and Cortez and Winter (1974). The reasons or advantages of part-time farming that were mentioned included: "opportunity to grow a garden", "better environment to raise children", "low cost of living", "preference for country living", "had always lived in a rural area", "had been born on a farm", "desire for additional income for farm investment or reduction of farm debts", "education expenses for the children", and "home improvement expenses". Overall, two major subjective reasons consistently appear. One is the preference for rural living. The other is

the need to supplement family income. Sometimes the farming activity is viewed as the supplementary income source and sometimes the off-farm job is viewed as the supplementary source.

APPENDIX E

EXCERPT OF CORRESPONDENCE FROM AUTHOR'S FATHER, F.W. BOLLMAN, MOLINE, MANITOBA, JUNE 5, 1976

. . . Way back in the '30's and early '40's . . . the first chance of off-farm income would be immediately after seeding when the councillor of one's ward would be ready to do some road work. Each farmer would have a chance to put a four-horse team on a piece of equipment to build a grade. Usually it would be one of those small scrapers where a man would have to hold the handle just in such a position to make it fill with mud or dry dirt as the case may be. Then the teamster had to walk along behind while holding the handle down until he came to the place where the boss wanted it dumped. If you didn't hold the handle just right it would dump anywhere--always in the wrong place. About four of these loads would make a yard! There were usually six four-horse teams on scrapers, one team on a plow to loosen up the dirt, and one team on the grader to level the piles on the grade. These would make up one outfit in a certain corner of the ward. There was no money paid out in cash; each farmer was given a credit on his taxes. If there was quite a bit of road work to be done, one farmer would be allowed only 10 days with one team or five days with two teams in order to give someone else a chance.

In those days also, after the road was built, gravel was needed. The farmer would hitch his two horses to a wagon (with no box), go to his councillor and receive four 12-inch planks that were 14 feet long to put on his wagon floor and two more 12-inch planks to make the sides. Then he would proceed to the gravel pit and shovel (by hand) a neat pile of gravel on the wagon and he would be off to the road in question. When there, he would tip the planks and unload and he would be away for another load. A load done in this manner was supposed to be one yard. A farmer quite often managed two yards a day! Again this went as a credit toward his taxes.

Then there was the privilege of hitching one's four-horse team to the grader to smooth all the roads in the ward. This was uaually about five days work.

. . . In our own area, the system of road building changed quickly and completely about 1947-48.

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