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Determinants of the participation rate of married women in the canadian labour force: An econometric analysis

by N. Skoulas

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DETERMINANTS OF THE PARTICIPATION RATE OF MARRIED WOMEN IN THE CANADIAN LABOUR FORCE:

AN ECONOMETRIC ANALYSIS

by
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Published by Authority of
The Minister of Industry, Trade and Commerce

February 1974
3-1500-501

Price: $1.00

Information Canada
Ottawa

FOREWORD

Statistics Canada supports, carries out, and publishes studies which contribute to the public knowledge and understanding of socio-economic issues.

This study is a labour supply study investigating how, and to what extent, several factors might affect the housewife's decision in allocating her working time between market work and non-market activities. The qualification and quantification of the relationships between those factors and the labour force participation of married women was the focus of the study.

Although the present study has been supported and published by Statistics Canada, responsibility for the analyses and conclusions is that of the author.

SYLVIA OSTRY,

Chief Statistician of Canada.

PREFACE

This study is concerned with the investigation and assessment of the magnitude and direction of several factors which might affect the decision of married women in allocating their working time between market work and non-market activities.

A model, based on the consumer choice theoretical framework, is developed to examine the influence of certain factors on the quantity of labour supplied to the market by married women, in a family context. Hypotheses concerning the relationships of these factors and the labour force behavior of married women are postulated and then tested by using regression techniques against two bodies of cross-sectional data; disaggregative data from the 1968 Survey of Consumer Finances (SCF68), and aggregative data from the 1961 Census of Canada.

I wish to acknowledge my debt to Statistics Canada whose support has made this study possible.

Concerning this study itself there were many influences on the development of my thinking which makes it difficult to assign intellectual indebtedness. However, I wish to acknowledge my considerable debt to Professors D.R. Maki and R.A. Holmes of the Department of Economics, Simon Fraser University, and Professor F.T. Denton of the Department of Economics, McMaster University, for their valuable suggestions and constructive comments. I wish to express my sincere thanks to Dr. S. Ostry, Chief Statistician of Canada, who initiated this study when she was Director of Special Manpower Studies and Consultation Division, Dominion Bureau of Statistics. Thanks are extended also to Mr. J.S. Wells, Director of the former Econometric Research Division, and to all the members of the staff for their moral support, encouragement and useful discussions. In particular, I wish to thank Mr. P. Conway and Miss R. Simonton for their valuable assistance in computer programming, and Mr. J.S. Lewis, of the Regional and Urban Research Staff, for his immeasurable help in tailoring his programme "Multiple Regression Analysis" for the needs of this study.

It is not necessary to state that the contribution of those mentioned above was strictly positive, and therefore, for any errors and deficiencies in the research, I am entirely responsible.

NICHOLAS SKOULAS.

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CHAPTER I

INTRODUCTION

In the last five decades, profound changes have taken place in the economic and social life of most countries. These changes have affected the patterns of work and employment as well as the sex composition of the labour force. As a consequence, a changing sex composition of the labour force has been observed at an international level.[1] The female component of the labour force has increased remarkably in the last few decades, not only in absolute terms but also as a percentage of the total labour force, and the component "married women", which was a small proportion of the total female labour force a few decades ago has become the most significant component, and is continually increasing in importance.[2] Moreover in most countries the component "married women" remains one of the largest potential sources of increased labour supply in the future.

Canadian married women, in keeping with the international trend, have shown a striking increase in the female labour force as is indicated in Tables I.1 and I.2.

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[1] C.D. Long, *The Labour Force Under Changing Income and Employment*, Princeton University Press for National Bureau of Economic Research, New York, 1958.

[2] There are some historical statistics showing a small decline of the participation rate of females in some countries: e.g., see *The Determinants and Consequences of Population Trends*, United Nations, New York, 1953, pp. 194-209. ". . . In 1906, the percentage of French women 20 years old and over engaged in non-agricultural occupations, was 29.9; in 1936 it was 25.2. The corresponding percentages among all married women were 20.2 in 1906 and 18.7 in 1936." ". . . In Switzerland the proportion of women aged 15 years and over who were economically active declined from 42% to 33% during the period 1900-1940".

In any event, for such small changes these historical social statistics cannot be accepted with great confidence, because by the passage of time, changes take place in census techniques, in population and employment patterns, etc. See: R. Smuts, "The Meaning of Historical Statistics of the Female Labour Force," *Journal of the American Statistical Association*, March 1960.

TABLE I. 1. Female Labour Force Participation Rates: Canada 1921 - 61

Year	Marital status			Total	Married women as % of the female labour force
	Married	Single	Other		
1921	2.16	45.09	21.65	17.59	7.25
1931	3.45	46.58	21.03	19.65	10.07
1941	3.74	50.00	20.11	20.66	10.30
1951	11.20	58.12	19.34	24.06	30.02
1961	21.95	54.16	22.96	29.47	49.77

Note: These rates are based on decennial census data for the age group 15 years and over. The Yukon and Northwest Territories are excluded throughout except for the 1961 Census, and Newfoundland is included from 1951 on. No adjustment is made to account for changes of census concepts and coverage of certain groups, i.e., members of Armed Services, Indians living on reserves, etc.

Sources: DBS, 1931 Census, Vol. VII, Table 26. 1941 Census, Vol. III Table 7, Vol. VII Table 5. 1951 Census, Vol. II, Tables 1 and 2, Vol. IV Table 19. 1961 Census, Vol. III – Part 2, Table 9, Vol. I – Part 3, Table 78.

In 1941 only 10% of the Canadian female labour force consisted of married women, whereas in 1970 the proportion of married women was over 56%.

TABLE I. 2. Female Labour Force Participation Rates: Canada 1962 - 70

Year	Marital status			Total	Married women as % of the female labour force
	Married	Single	Other		
1962	21.6	50.3	26.8	29.0	48.41
1963	22.6	49.0	27.7	29.6	49.57
1964	24.1	48.3	27.9	30.5	51.06
1965	25.2	48.7	27.6	31.3	51.68
1966	26.8	49.7	28.0	32.8	52.08
1967	28.3	49.6	28.9	33.8	53.27
1968	29.6	48.7	28.4	34.4	54.68
1969	31.2	48.6	27.4	35.2	55.76
1970	32.0	47.5	27.8	35.5	56.69

Note: These statistics are annual averages for the age groups 14 years and over. They exclude inmates of institutions, members of armed services, Indians living on reserves and residents of the Yukon and Northwest Territories.

Source: DBS, Labour Force Survey Section publication, Special Table.

Tables I.1 and I.2 are not strictly comparable: (a) they differ in coverage and (b) Table I.1 gives the participation rates at a point of time during the Census year, whereas Table I.2 presents twelve-month averages. However, they clearly show the trend of married women in the labour force.

The labour force status of married women has important social and economic implications. It affects their entire way of life and their role in society. Furthermore, it affects the family and the marital relationship.[3]

The economic implications of an increased participation rate of married women may be significant. The rate of economic growth of the country at large is affected by the proportion of married women in the labour force; shifts in the job structure of the economy create increasing demands and opportunities for women, and consequently raise their economic well-being.[4]

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[3] E.E. Maccoby, "Effects Upon Children of their Mother's Outside Employment", L. Bartemeir, M.D., "The Children of Working Mothers: A Psychiatrist's View" in National Manpower Council, *Work in the Lives of Married Women*, Columbia University Press, New York, 1958. F. Elkin, *The Family in Canada*, Canadian Conference on the Family, 55 Parkdale Avenue, Ottawa, April, 1964.

[4] If the home production is counted in the GNP (it is not included in Canadian figures), the rate of economic growth will increase as a result of including more wives in the labour force only if their productivity is higher in the market than at home, and the increase of GNP is equal to the difference in productivity between the two sectors.

Knowledge of the factors affecting participation rates, in conjunction with other knowledge, is useful for national planning of full employment, for predicting future labour supplies, for attracting or discouraging entrance into the labour force by wives, and for designing income redistribution policies.

The aim of this thesis is to investigate and assess the magnitude and direction of the several factors which might affect the decision of Canadian wives to seek employment in the market, taking into account the Canadian socio-economic environment and the limitations of existing data. By doing this it is hoped that some light will be shed on the factors affecting Canadian wives' decisions in choosing their employment status, and that some results will be derived which will be useful for policy purposes.

Chapter II presents a review of some theories of labour supply and relevant North American empirical studies, with emphasis on empirical studies related to the labour supply of married women, in an attempt to give an overall picture of the problem.

In Chapter III a theoretical framework for analysing the participation rate of married women, based on an expanded consumer choice model is presented. It is then used for developing a testable statistical model, which is simple enough to permit its estimation with the available data. The same chapter discusses the data used for the empirical work and the hypotheses to be tested.

Chapters IV and V present and discuss the empirical findings and compare them with those of previous studies in Canada and the United States. Finally, Chapter VI presents a brief summary, states the conclusions of the study with respect to the factors affecting the decision of married women to seek market employment, and the implications of the study for policy purposes.

CHAPTER II

A REVIEW OF THE RELEVANT LITERATURE

In this chapter a brief discussion of some theories of labour supply[1] and relevant North American empirical studies is undertaken both for their own sake and for their suggestive value.

Supply of labour in the market is a multidimensional phenomenon. An individual may vary it in at least three ways: by changing the number of hours he is willing to work, the intensity of work and the nature of the skills he provides. The aggregate supply of labour has two more dimensions: the size of the population and the proportion of the population actually participating in the labour force. Any study which is trying to investigate one or more of the preceding dimensions of market oriented work, for example labour force participation, is a labour supply study.

In the traditional theory, total time available to the worker is dichotomized into working and non-working time, and the latter is usually termed "leisure". This dichotomy of time may be sufficient when the labour supply of adult males is considered, because homework, which is a principal type of non-market work, will be a negligible part of their activities over the span of their working life.[2]

Theoreticians have been intrigued by the specific question of what would be the effect of a change in wages on the labour supply.[3] Several factors made the answer furnished by theorists uncertain. These include the multidimensional character of labour supply, the strict work-leisure dichotomy, the time factor, the restriction of the determinants of labour supply to economic factors while over-looking the socio-cultural factors and spiritual and personal characteristics, and the lack of enough quantitative information to test alternative theories.

Concerning the individual supply curve of labour, Marshall[4] noted that it would be negatively sloped for ". . . the more ignorant and phlegmatic of races" and positively sloped for those ". . . whose mental horizon is wider, and who have

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[1] Labour supply, as defined by economists, refers to the quantity of labour willingly offered to the market by the workers in return for monetary gain, regardless of whether or not the latter provides the sole incentive. But, the definition of labour supply involves many theoretical questions such as, what is the labour unit, etc. For some theoretical problems involved in the labour unit, see P.H. Douglas, *The Theory of Wages*, Kelley and Millman, Inc., New York, 1957, (1st. ed. 1934), pp. 14-16.

[2] Adult males spend a negligible part of their time at homework because: (a) of biological and cultural reasons, (b) their productivity in the market is higher than at home, (c) in the present social and cultural structure they enjoy higher wages than their wives in the market. In any event, homework for adult males would not be a barrier to their market work.

[3] By changes in wages we mean permanent changes in rate schedules, and not higher wage-rates which apply only to any additional work performed above some standard number of hours (overtime rates).

[4] A. Marshall, *Principles of Economics*, 8th ed., MacMillan and Co., Ltd., London, 1964, (1st ed. 1890), pp. 438-439.

more firmness and elasticity of character, and work the harder and the longer the higher the rate of pay which is given to them". Knight[5] believed an increase in wages would result in a decrease of the quantity of labour supplied, while a decrease in wages would presumably have the opposite result.[6] Lionel Robbins'[7] classic article in 1930 has been a breakthrough in the understanding of the nature of the labour supply problem. In this article one can find the core of the income and substitution effects. He pointed out that the labour supply-curve may be backward-bending, positively inclined over a range, then becoming negatively inclined. It all depends, as he puts it, on the elasticity of demand for income in terms of effort.[8]

The theory of the backward-bending supply-curve has been established and is the prevalent notion today.[9] It combines the Marshallian ideas and Robbins' suggestions and accepts a labour supply increasing and then decreasing with rising wages, with a turning point depending on the level of development, tastes, etc.[10]

Concerning the aggregate supply of labour, a distinction is desirable between the short-run supply of labour, the supply of labour for a given population of given capacities, and the long-run supply of labour, which is not subject to such restrictions. Classical economists tended to regard the supply of labour as synonymous with the total population and clearly their theory was mostly a population theory. Changes in wages would affect the size of population in the same direction, through birth rates and death rates, with a tendency for the wage

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[5] F.H. Knight, *Risk, Uncertainty and Profit*, Houghton Mifflin Co., New York, 1921, pp. 117-118.

[6] Many other economists, of the seventeenth and eighteenth centuries, believed that the labour supply-curve was negatively inclined. For references see P.H. Douglas, *op. cit.*, pp. 270-271.

[7] L. Robbins, "On the Elasticity of Demand for Income in Terms of Effort", *Economica*, 1930, pp. 123-129.

[8] In terms of income and substitution effects, the supply curve is positively sloped in the range where the substitution effect is stronger (assuming that leisure is a normal good), and negatively sloped when the income effect dominates.

[9] There is still some controversy on this notion. For example see: (a) R. Perlman, *Labor Theory*, John Wiley and Sons, Inc., New York, 1969, pp. 9-13. He suggests that the labour supply-curve may have more than one turning point, it is winding in and out upward. (b) H.G. Vatter, "On the Folklore of the Backward-Sloping Supply Curve", *Industrial and Labor Relations Review*, 1961, pp. 578-586. He attempts to show that the regressive segment of the backward-bending supply-curve lies well outside the range of realistic wages in an advanced economy. Furthermore, he argues that even if such a backward-bending supply-curve exists, it is irreversible, consequently it is not a real supply-curve in the customary meaning. His arguments have been subject to criticism by T.A. Finegan, Communication; "The Backward-Sloping Supply-Curve", *Ibid.*, 1962, pp. 230-234.

[10] See for example: (a) K.W. Rothschild, *The Theory of Wages*, Oxford, Basil Blackwall, 1965, pp. 42-45. (b) M. Friedman, *Price Theory*, Aldine, Chicago, 1962, p. 204. (c) K.E. Boulding, *Economic Analysis*, (3rd, ed.), Harper and Row, Publishers, New York, 1955, pp. 797-801.

rate to be kept at the "subsistence level".[11] This line of thinking leads to a perfectly elastic long-run supply curve of labour and a constant (inelastic) short-run labour supply. This theory ignores the fact that labour supply is a multidimensional phenomenon and might vary with the wage rate and economic conditions in the short-run as well.

Economists outside this classical tradition recognized that there was a functional relation of the short-run labour supply to the wage rate, and they believed that the supply curve was negatively inclined.[12] This conclusion was based on the notion that individuals work less as they become more affluent, but it ignored, as was pointed out by Robbins,[13] the fact that the response of the individuals' labour supply to wage changes depends on the elasticity of income in terms of effort (income and substitution effects), and since all the individuals do not react in the same way, an increase in wages could be perfectly compatible with an increase or decrease in the aggregate labour supply.

A number of economists today view the aggregate short-run labour supply curve as having the same shape as the individual labour supply curve, i.e., backward-bending.[14]

Several points can be raised regarding the acceptance of the backward-bending aggregate labour supply curve. First of all, an increase in wages may increase the participation rate in the labour force by attracting people who did not work at the lower wage range because their reservation price was higher.[15] Secondly, when wage rates are widely spaced, a change in wage rates will not provoke the same reaction of all individuals. Some of them will respond with an increase of labour supply and some others with a decrease of it, depending on the segment of their labour supply-curve on which they operate. In other words, it depends on whether the income or substitution effect dominates. Therefore the change in aggregate labour supply will depend on the number of workers who operate above or below the turning point of their labour supply-curve, and the slopes of the two segments of such curves as well. Third, institutional, traditional and legal factors do not always permit the workers to change their labour supply in response to wage changes. Fourth, the family, not the individual, is the

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[11] Although the theory is attributed to the French physiocratic school, Malthus is considered the founder of this line of thinking. This theory has been contradicted by experience in western countries, and economists are taking population for granted, leaving the explanation of population changes to demographers, sociologists, etc.

[12] For references see: P.H. Douglas, *op. cit.*, pp. 270-271, and C.D. Long, *op. cit.*, pp. 34-35.

[13] L. Robbins, *op. cit.*

[14] See: (a) Friedman, *op. cit.*, p. 203, (b) K.W. Rothschild, *op. cit.*, pp. 46-47, (c) H.G. Lewis, "Hours of Work and Hours of Leisure", *Proceedings of the Industrial Relations Research Association*, 1957, pp. 196-206.

[15] The reservation price depends on many factors, such as the person's wealth and health, unemployment and welfare benefits, social standards, expectations regarding future opportunities, etc.

appropriate economic unit to be considered regarding labour supply; the response of the family to wage changes would be different than the individual's response. Higher wage rates may permit the family to keep children at school longer, the wife at home, etc. Also, the reaction of the family to wage changes depends on the social group to which it belongs; therefore the distribution of income would affect the response to wage changes.

In addition, an ambiguity arises regarding the effect of wage changes on the total labour supply when rising or falling wages are highly correlated with labour market conditions, and the non-wage characteristics of the labour market are affected. Under the additional worker hypothesis,[16] high unemployment of men (loose market conditions) would force many secondary workers to enter the labour force. The discouraged worker hypothesis[17] claims that the opposite would happen. Loose labour market conditions would discourage secondary workers from seeking a job and the labour force participation rate would decline. Now, it is believed that both the additional worker and the discouraged worker effects co-exist, with no clear consensus regarding which effect dominates or how the two effects interrelate.

For the preceding reasons, we tread on very uncertain ground when dealing with aggregate labour supply, and our factual knowledge about the response of aggregate labour supply to wage changes takes a speculative character. The answer to the question of what is the effect of wage changes on aggregate labour supply requires further empirical study and cannot be determined by *a priori* analysis.

In several empirical studies, economists have attempted to measure the aggregate supply curve by using time series and cross-sectional data. Douglas[18] has been a pioneer in this field of economics. He attempted to measure indirectly the short-run labour supply curve by investigating: (a) the relationship between working hours and hourly earnings, and (b) the relationship between average yearly earnings and the proportions of population in the labour force. The first relationship was investigated by using annual time series for 1890 to 1926 for fifteen industries, and interindustry cross-sectional data for 1890, 1914, 1926.[19] He found a strong negative correlation between working hours and hourly earnings. For the second relationship, cross-sectional data for various age and sex groups as well as for the population as a whole were used for forty-one large

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[16] W.S. Woytinsky, "Additional Workers and the Volume of Unemployment in the Depression", *Social Science Research Council*, Pamphlet Series 1, Washington, 1940.

[17] D.D. Humphrey, "Alleged 'Additional workers' in the Measurement of Unemployment", *Journal of Political Economy*, October 1940.

[18] Douglas, *op. cit.*

[19] *Ibid.*, pp. 302-307.

American cities in 1919, and a negative correlation between average yearly earnings and the proportions of the population in the labour force was found.[20]

Douglas' findings have subsequently been both widely cited and supported by later studies. Long,[21] using largely population censuses data of the United States and several other countries for 1890 to 1950, investigated the relationships between labour force participation rates and earnings. His findings, to a great extent, amplified Douglas' results. Finegan, using interindustry and interoccupation cross-sectional United States census data for 1940 and 1950 for adult males, found a negative relation between hours worked and hourly earnings. He draws the conclusion that "... the supply curve of adult male labour in the United States is negatively inclined."[22,23] Kosters[24] in a more recent study with cross-sectional United States census data for 1960 for the male age group 50-64 concluded that "the statistical results show a net negative relationship between hours of work and the wage rate. They are thus consistent with a body of existing evidence and support the notion of a backward-bending supply curve with the income effect outweighing the substitution effect."[25]

Concerning the controversial issue of additional and discouraged worker hypotheses, the two basic hypotheses of responsiveness of labour supply to changes in the economic conditions, recent[26] empirical studies in the United States and Britain, using various bodies of cross-sectional and time series data with modern analytical techniques, supported the notion that both adjustments

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[20] The same relationship was investigated by Schoenberg and Douglas by using cross-sectional data for 1929-1930 and the findings supported, to a large extent, the Douglas results. See E.H. Schoenberg and P.H. Douglas, "Studies in the Supply Curve of Labor: The Relation in 1929 Between Average Earnings in American Cities and the Proportions Seeking Employment," *Journal of Political Economy*, February 1937, pp. 45-79.

[21] For a summary of Long's findings, see Long, *op. cit.*, pp. 3-33.

[22] T.A. Finegan, "Hours of Work in the United States: A Cross-Sectional Analysis," *Journal of Political Economy*, October 1962, pp. 452-470.

[23] Although the main focus of the current study is on married women, the results for males are discussed briefly for the purpose of contrast and comparison.

[24] M. Kosters, "Income and Substitution Parameters in a Family Labor Supply Model," Unpublished Ph.D. dissertation, Department of Economics, University of Chicago, 1966.

[25] For a concise summary and general conclusions of a number of labour supply studies, see G.F. Break, "Income Taxes, Wage Rates, and the Incentive to Supply Services," *National Tax Journal*, December, 1953, pp. 333-352.

[26] Until recently empirical evidence, emerging largely from the works of C.D. Long, suggested that the labour force seems largely independent of cyclically high effective demand or cyclically high unemployment. See C.D. Long, "The Labour Force and Economic Changes," in *Insights Into Labor Issues*, R.A. Lester and J. Shisters, eds., MacMillan Co., New York, 1948, pp. 329-355, and C.D. Long, *op. cit.*

co-exist in life, as they do in theory, and that the discouraged worker effect dominates in the overall labour force and in most of the age-sex groups.[27]

In Canada, unlike the United States, empirical studies provide conflicting results. Proulx[28] tested the additional vs. discouraged worker hypotheses, by using annual time series data from 1948-67. His findings suggest that the additional worker hypothesis prevails in the overall male labour force, males aged 20-24, females 45-64, and females 65 years and over, while the discouraged worker effect is dominant only for males 14-19 and females 20-24. Results are not presented for other age-sex groups. In contrast, Officer and Andersen[29] take the theoretical position that the discouraged worker hypothesis is applicable to males and the additional worker hypothesis to the labour force behaviour of females. They tested these hypotheses, by using quarterly data from 1950 to 1967 and their findings support their position. They report that the additional worker effect is consistently dominant in all female age groups, with the exception of those 14-19 years, and the discouraged worker effect dominates in the male age groups. Swidinsky[30] used cross-sectional data from the 1961 census of Canada, in order to test the existence and prevalence of the two hypotheses. Surprisingly, his findings are in conflict with the results of both previous studies. His findings support only the discouraged worker hypothesis for both male and female labour force behaviour, and there is no evidence of additional workers either among males or females. Kunin,[30] using cross-sectional census tracts data for the major Canadian metropolitan areas for 1951 and 1961, examined both the discouraged

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[27] L.C. Hunter, "Cyclical Variation in the Labour Supply: British Experience, 1951-60," *Oxford Economic Papers*, (New Series), July, 1963, pp. 140-153.

W.G. Bowen and T.A. Finegan, "Labor Force Participation and Unemployment," in A.M. Ross (ed.), *Employment Policy and the Labor Market*, University of California Press, Berkeley, 1965, pp. 115-161.

G.G. Cain, *Married Women in the Labor Force*, University of Chicago Press, Chicago, 1966.

A. Tella, "Labor Force Sensitivity to Employment by Age, Sex," *Industrial Relations*, February, 1965, pp. 69-83.

K. Strand and T. Dernburg, "Cyclical Variation in Civilian Labor Force Participation," *Review of Economics and Statistics*, November, 1964, pp. 378-391.

T. Dernburg and K. Strand, "Hidden Unemployment 1953-62: A Quantative Analysis by Age and Sex," *American Economic Review*, March, 1966, pp. 71-95.

W.G. Bowen and T.A. Finegan, *The Economics of Labor Force Participation*, Princeton University Press, Princeton, 1969.

[28] Pierre-Paul Proulx, *"La variabilité cyclique des taux de participation à la main-d'oeuvre au Canada," Canadian Journal of Economics*, May, 1969, pp. 268-277.

[29] L.H. Officer and P.R. Andersen, "Labour Force Participation in Canada," *Canadian Journal of Economics*, May, 1969, pp. 278-289.

[30] R. Swidinsky, "A Note on Labour-Force Participation and Unemployment," *Canadian Journal of Economics*, February, 1970, pp. 146-151.

R. Kunin, "Labour Force Participation Rates and Poverty in Canadian Metropolitan Areas," Unpublished Ph.D. dissertation, Department of Economics, University of British Columbia, April, 1970.

and additional worker hypotheses. Her findings support the over-all prevalence of the discouraged worker effect. However, some evidence for the additional worker effect was found for women among the higher income groups.

From the preceding discussion in this chapter, it has been seen that theory suggests, and empirical studies support, the backward-bending supply curve of labour. Turning to examine the labour force behaviour of married women, which is the focus of this study, we deal with a special group for which personal, family, and household characteristics affect its labour supply in the market to a great extent. The strict work-leisure dichotomy of time is no longer acceptable in investigating the labour supply of this group. Homework is a major type of work for married women over most of their married life, for biological and cultural reasons.

Consequently, wives have a three-way choice in allocating their time: work in the market, homework and leisure. The family context must be taken into consideration in investigating the labour supply of wives. The amount of work supplied by a family member to the market is the outcome of a family decision concerning the allocation of time of its members. Tastes for work of family members, their wage rates in the market, total family income, consumption aspirations, individual's productivity in homework, prices of market substitutes for household goods and services, and composition and size of family are important factors affecting the decision of allocating the time of family members. The effect of rising real income, in the case of adult men, has been to decrease the hours of work in the market, this being the major sector of their work activity. Cross-sectional empirical studies support the inverse relation between increased real income and the market work (labour force participation rates) supplied by married women, which means that evidence can be rationalized in terms of a backward-bending supply curve. But, on the other hand, the labour force participation of married women over time, despite the fact of increasing real income, not only has failed to decline but has been rising rapidly (see introduction).

What has been the cause of this apparent contradiction between cross-sectional and time series evidence? Various studies[31] attributed it to the difference between static factors at a moment of time and dynamic factors over time. But they did not set up a rigorous analytical model explaining this contradiction, so that it was not fully or precisely reconciled. Mincer[32] has taken

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[31] For example see C.D. Long, *op. cit.*, pp. 97-140. He discusses dynamic factors over time such as: (1) declining burden of housework due to fewer children, better appliances, etc., (2) declining hours of work in office and factory jobs which facilitates the performance by women of the dual functions of wage earner and wife or mother, (3) more job opportunities for women, (4) rising wages and improved education of females, relative to males.

[32] J. Mincer, "Labor Force Participation of Married Women," in *Aspects of Labour Economics*, A Conference of the Universities-National Bureau Committee for Economic Research, Princeton University Press, 1962, pp. 63-105.

a major step in the resolution of the contradiction by setting up a rigorous analytical model and testing it with cross-sectional data.[33]

The theoretical foundation of his model is based on the traditional ideas of income and substitution effects to which he added two features: (i) that married women have a three-way choice in allocating their time, between paid work, leisure, and unpaid homework, and this allocation of time is a matter of family decision; and (ii) that people adjust their consumption to their permanent incomes (Friedman's permanent income hypothesis). In the family context, increased income over time has had the effect of decreasing hours of work in the market for adult men, and there is no reason to believe that this has been different for women. But while the total amount of work (market work and homework) of women declined, there was a shift from homework to market work. These shifts can be explained by historical changes in other variables. Market wage rates for women have increased and relative prices of market substitutes for home goods and services, such as food preparation and labour-saving appliances, have declined. This means that larger quantities of home goods and services can be obtained by an hour's work in the market now than previously. These historical changes have resulted in weakening the negative income effect of wage changes on hours supplied in the market, and in making the negative effect on the hours of homework stronger.

At a moment of time, this generalization which refers to work choices over a lifetime may not hold, because the degree of substitutability may differ depending on the life cycle (for example, presence of young children reduces substitutability between market and home goods and services). Also, there are "transitory" variations in variables (such as, income, wage rates, economic conditions, etc.) which influence the particular timing of labour force participation.

On this theoretical ground, Mincer's hypotheses are that market wage changes may have a relatively large substitution effect on work supplied in the market by wives; labour force participation of the wife may be greater the smaller the permanent income of the husband and the greater the negative "transitory" component of his income.

Mincer suggests the following specification of a market labour supply function for married women:

$$m = \beta_p y + \gamma w + u$$

Where m is the quantity of labour supplied to the market, y is a potential permanent level of family income, w is the wife's full-time market wage, and u

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[33] In the next pages some major empirical studies in the United States and Canada are reviewed. This discussion does not purport to give a complete analysis of these studies. Some additional points from these and other empirical studies are discussed in the chapters presenting the empirical findings of this study.

reflects other factors or tastes.[34] During the course of empirical testing of this model, he added three more variables to control for schooling, economic conditions, and presence of young children in the family.

Mincer tested his model against various kinds of cross-sectional, aggregative and disaggregated data pertaining mainly to white married women. The data sources were the 1950 Survey of Consumer Expenditures of the Bureau of Labour Statistics, the 1950 Census of Population, and the 1955 and 1957 current population reports of the Census Bureau.

His principal empirical findings from these cross-sectional studies are the following:

(a) The husband's income is negatively related to the wife's labour force participation rates. The wife's market wage rate exerts a positive effect on her own market labour supply, and this positive effect is nearly twice the size of the negative income effect in elasticity terms. This gives support to the theoretical rationalization of a large substitution effect. Coefficients of additional variables representing the presence of young children in the family, education of the wife and unemployment, carried the expected signs, but they were statistically insignificant.

(b) The wife's labour force response to transitory income is stronger than to permanent income. Wives are more apt to work if the husband's current income is below his permanent income.

(c) The presence of young children weakens the wage effect and strengthens the husband's negative income effect, which is due to lack of good substitutes for the mother's care of young children, as Mincer suggested.

Furthermore, Mincer computed changes in full-time earnings (not current earnings) of males, females, and family earnings from one census year to the next census year, because over long periods the problem of transitory income is not supposed to be relevant. He used these earnings changes and his estimated supply function from the cross-sectional studies to estimate the changes in labour force participation rates of wives from one decade to the next. His model predicts, on

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[34] Mincer rewrites his equation by expressing $y = x_p + w$, where x_p is the permanent level of family's income excluding the wife's earnings, and is for empirical purposes identified with husband's income. Substituting into his model it becomes:

$$m = \beta_p x_p + \alpha w + u$$

where $\alpha = \beta_p + \gamma$. This equation was modified by Mincer by adding one more variable (x_t, transitory income) in an attempt to determine the effect of the transitory component of income. Parameter β_p was interpreted by Mincer as "the effect of 'permanent' family income on the wife's market labor input, keeping her market earning power constant," and α "represents the effect of the wife's market earning power, keeping family income constant." The expected signs are $\beta_p < o$ and $\alpha > o$. Parameter α in the second equation is interpreted as "a relative price effect not compensated by a change in income."

the average, about 75% of the actual increase in labour force participation of married women over time.

Long[35] commented on Mincer's article and accepted it as a "careful and imaginative piece of work", but pointed out two shortcomings: (a) that several features of the study suggest that more than two variables – earnings of husbands and of wives – are needed to explain the labour force behaviour of married women, since Mincer's model does not predict the over-all changes fully, and (b) his model does not appear to fit the data for Negro females whose labour force participation rate has declined since 1900, and especially since 1920.[36] This latter puzzle provided the initial incentive for a large study undertaken by Cain.[37]

Cain's model is built on the work of Mincer[38] and Kosters.[39] He slightly modified their models to make them applicable to a wider range of data in different forms. He used cross-sectional aggregative data for metropolitan areas from the 1940, 1950, and 1960 population censuses, and disaggregated data, for individual married women, from the 1955 Scripps Population Foundation's Growth of American Families Survey, and from the 1-in-1000 sample of the 1960 census.

His major objective was to investigate the determinants of market work by married women, and to explain why white married women have lower, but more rapidly increasing labour force participation rates over time than their non-white counterparts, and why the participation rates of both groups have increased over time. In this extensive study Cain tested his model with two types of statistical data for the total, white, and non-white groups by introducing empirical measures for several variables and estimating their effect on the participation rate by using multiple regression techniques. Basically, three measures of labour supply were used as dependent variables: (a) labour force participation rate (in per cent), (b) dummy variables for current labour force status, and (c) weeks worked by the wife in 1959, a more continuous variable ranging from 0 to 52. A number of interesting points and conclusions emerge from his study.

The economic variables behaved as theoretically expected; significant coefficients were obtained which indicated a negative income effect and a positive wage effect. He devoted a large part of the study, with the help of a number of different tests, to computing elasticities of the participation rate with respect to wives' earnings, and family income excluding wives' earnings, with both sets of data. His findings support Mincer's result of a positive wage effect exceeding the negative income effect, only with the 1950 census data. This is true in the 1940 and 1960 samples only when the variables for children and education were

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35 C.D. Long, "Comment," in *Aspects of Labour Economics*, A Conference of the Universities – National Bureau Committee for Economic Research, Princeton University Press, Princeton, 1962, pp. 98-105.

36 C.D. Long, "Comment", *op. cit.*, p. 104.

37 G.G. Cain, *op. cit.*

38 J. Mincer, *op. cit.*

39 M. Kosters, *op. cit.*

omitted from the regressions.[40] These findings "weakened . . . but not overturned" Mincer's earlier results, as Cain puts it. The estimates of wage elasticity with disaggregated data were larger than the estimates of the income elasticities, but he does not put great confidence on these results, because the procedures for the estimation of the wage effect were quite rough.[41] The wage-elasticity estimates, relative to income-elasticity estimates, for non-white wives were lower than for their white counterparts. This is consistent with the faster rate of growth of the white wives' participation rate, but he has no explanation for the white-non-white income-elasticity differential itself.

Cain's results are in conflict with Mincer's findings on some other points. Coefficients of the variables for children, education, and unemployment were found significant in Cain's study, using the same data as did Mincer, who found insignificant coefficients.

Cain used the difference between actual income and a computed "predicted income", as a measure of the transitory component of income.[42] He found that the coefficient of the transitory component of income was negative and significant but smaller in absolute magnitude than the coefficient of the "permanent" or "predicted" income. This contradicts Mincer's results which claim the opposite, but Cain is not very dogmatic about his results and he suggests that "there is a good chance that the relative strengths of the two income concepts may hinge on the particular definitions and measures adopted."

Another interesting finding was that unemployment consistently had a negative effect (although not significantly so for non-whites) on the overall participation rate of wives. This supports the notion that the discouraged worker hypothesis is the dominant one.

The most original portion of Cain's work lies in the analysis of the labour force participation of non-white wives. His study sheds considerable light on the observed persistent differential of higher labour force participation rates for non-white wives, and the lesser importance of children as a deterrent to market work for non-white wives. Cain suggests four reasons to which these differentials are largely attributable, and provides some empirical evidence to support each of them: (i) he emphasizes the greater prevalence of part-time work of non-white wives, which means that the labour force participation rates overstate the labour

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40 He suggests that the wage effect is diminishing in these regressions because the two variables act in part as proxy for the wage effect. Education may act as a proxy for non-pecuniary returns for market work, and in cross-sectional studies for tastes for market work. The children variable may serve partly as a proxy for a wage effect as long as the wage variable is not the appropriate one, because empirical studies have shown an inverse relation between the number of children and the wife's potential earnings. Cain's income and earnings variables for 1940 are different and less satisfactory than those for 1950 and 1960. See Cain, *op. cit.*, p. 57, and pp. 84-85.

41 Cain, *op. cit.*, p. 117.

42 *Ibid.*, p. 92.

supplied to the market by them, (ii) less homework is required from non-whites because of the greater incidence of "poorer housing conditions, smaller dwelling units, and more doubling up,"[43] (iii) higher family instability, relative to white families, which encourages non-white wives to maintain closer relations to the labour market because they may have to support their families out of their own wages, and (iv) non-white wives may face less discrimination in the labour market than their husbands, which leads "to some substitution in market work between them."[43]

The more rapid increase in participation rates of white wives over time is partially attributed by Cain to the concentration of non-white wives in domestic service – a declining occupation. Concerning the growing overall participation rates of married women over time, he feels that it remains only "partially explained", and more research must be done for a thorough explanation.

The largest study concerning the labour force participation rates of several population groups has been conducted by Bowen and Finegan.[44] They have devoted three chapters of their book to the labour force participation of married women.[45] Their main objective was to investigate the factors affecting market work by married women, and to explain the upward trend in their participation rates.

Their conceptual framework is built on the general theory of choice and is strongly influenced by the work of Mincer[46] and Becker.[47] They use a single equation linear model and apply multiple regression techniques to estimate the effect of several factors on the participation rate of married women. The data used were derived from the censuses of 1940, 1950, 1960, and from the monthly surveys of households over the period 1947-1967. The data from the 1960 census were used in aggregative form, as well as individual observations drawn from the 1-in-1000 sample.

Empirical measures of several variables were carefully constructed, and three measures of labour supplied in the market were used as dependent variables: (i) participation rates (in per cent), (ii) a dichotomous (0,1) variable to indicate the labour force status of wives at a moment of time, and (iii) hours worked by those married women who were "at work" during the census week. Presenting their empirical findings, they classify the factors affecting the labour force participation rates into two groups: (a) individual and household characteristics, and (b) labour market conditions.

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43 Cain, *op. cit.*, p. 119.

44 W.G. Bowen, and T.A. Finegan, *The Economics of Labour Force Participation*, Princeton University Press, Princeton, New Jersey, 1969.

45 This brief review refers to those three chapters concerning the participation rate of married women.

46 Mincer, *op. cit.*

47 G.S. Becker, "A Theory of the Allocation of Time", *The Economic Journal*, September, 1965.

Their empirical findings can briefly be summarized as follows:

1. The economic variables behaved as theoretically expected. The income of husband, or family income excluding the wife's earnings, exerts a negative effect on the labour supplied in the market by wives, whereas the female earnings have a positive effect.
2. The coefficients of variables representing the presence of children in the family carry the expected negative sign, and they are statistically significant, but the age of children has a great deal to do with determining the amount of labour supplied by their mothers in the market.
3. A pronounced positive relation exists between years of schooling completed by married women and their labour force participation rate, when "adjusted" participation rates are considered.[48] This relation is not clear with the "unadjusted" participation rates.[49]
4. A powerful explanatory variable for the labour force status of married women was the occupation in which the wife had the most recent work experience. Occupational characteristics which would affect the decision of a wife to participate in the labour force are: (i) earnings, (ii) psychic income, (iii) future earnings, (iv) opportunity for part-time work, and (v) ease of entry.
5. In a test with employment status of husband as an explanatory variable, they found that wives with unemployed husbands are considerably more likely to participate in the labour force, which indicated the existence of an "additional worker" effect. But the net effect of overall unemployment in metropolitan areas had been to reduce the overall participation rate of wives, which supports the notion that the discouraged worker effect is the dominant one. Their findings support Mincer's results that transitory decreases in family income lead to higher participation rates of wives than permanent decreases. But, they admit that their test is not very sophisticated and that both Mincer and Cain "have devised more unique and interesting ways of working on this problem."[50]
6. With respect to the differences in labour force participation between white and Negro wives, their findings are essentially the same as those of Cain[51] and suggest the same explanations.[52] They investigate separately the group of

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[48] The authors interpret their results by considering both "unadjusted" and "adjusted" participation rates. The latter are constructed from the estimated regressions by using the coefficients for the other variables (except the reference characteristic which is represented by a set of dummy variables) to estimate what the participation rate would be for the group with the particular characteristic, if they would have been "average" in terms of the other characteristics represented by the rest of the variables in the regression. See Bowen, and Finegan, *op. cit.*, pp. 642-644.

[49] The pronounced positive relationship for Negro wives exists only for those who have 16 or more years of schooling.

[50] Bowen, and Finegan, *op. cit.*, p. 148.

[51] Cain did not investigate Negroes separately from other non-white wives.

[52] Bowen, and Finegan, *op. cit.*, p. 93.

non-whites other than Negroes and their findings show a much higher labour force participation rate of this group than for either white or Negro wives. Their basic explanation is "the culturally-inspired-differences-in-tastes."[53]

7. Other variables representing: labour supply of females, opportunity cost borne by the wife who takes a market job, and labour demand for females, were significant with the expected negative signs for the first two and positive sign for the last one.

8. The authors attempted to explain the upward trend in participation rate of married women over the period of 1948 to 1965. Their conclusion, based on their empirical findings, was that it cannot be explained in terms of a negative income effect having been outweighed by a more powerful substitution effect. Their cross-sectional model predicted an increase in the participation rate of married women of 6.8 percentage points, whereas the actual increase, corrected for changes in demographic factors, was 14.6 percentage points. They resorted to changes in other factors such as, (i) hours worked, (ii) prices and methods of production of home goods and (iii) income aspirations, to explain the remaining part of the increase in the participation rate of married women. They made some crude calculations and "guesses" of the quantitative impact of these factors on the participation rate, and concluded that the increase in the participation rate of married women over the period of 1948 to 1965 seems explainable in large part, without falling back on such explanations as "changes in the attitudes of the society toward the working wife."[54]

Empirical studies have also been undertaken in Canada with respect to the labour force status of married women.[55] The Canadian empirical studies are limited in number and less extensive than the similar studies undertaken in the United States because of lack of appropriate data. This limitation has forced researchers to concentrate on investigation of one dimension of labour supplied by married women to the market (participation rate) and to examine the effect of limited numbers of factors on the labour force behaviour of married women.

The first three of the studies we are reviewing in the following pages used published and unpublished data from the 1961 Census of Canada, and only the fourth used unpublished individual observations on households from the 1964 Survey of Consumer Finances.

The first study by Allingham[56] is concerned with the labour force participation rate of females. The author views the participation rate as a function

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[53] *Ibid.*, pp. 96-97.

[54] Bowen and Finegan, *op. cit.*, p. 240.

[55] Most of the relevant Canadian studies have been prepared, or initiated, under the direction of S. Ostry when she was Director, Special Manpower Studies and Consultation Division, at the Dominion Bureau of Statistics.

[56] Dominion Bureau of Statistics, Special Labour Force Studies, No. 5, *Women who work: Part 1, The Relative Importance of Age, Education and Marital status for Participation in the Labour Force*, by J.D. Allingham, Queen's Printer, Ottawa, 1967.

of interrelated demographic, economic, and other social factors. In this framework he examines the effects of age and educational attainment of married women on their labour force status. Cross tabulations of participation of women, by marital status and age (controlled for their educational attainment) were used to determine the relative importance of marital status, education, and age on the labour force participation. Concerning married women, the author concludes that education has an independent positive effect on the participation rate and is a more important factor than age. He argues that age, per se (within the age range of 15 to 54), is not a very important factor, but the observed relationship between age and participation rate is a result of other events related to age, more crucial to participation decisions (e.g., child-bearing).

In a second study Allingham and Spencer[57] investigated not only the effect of education and age of married women on their labour force participation, but also the effect and importance of their child status, the size of the community they live in and their husband's educational attainment, which is used as a proxy for his current and potential earnings. Regression analysis, instead of cross-tabulations, was employed to examine the magnitude and direction of the effect of these factors on the labour force status of wives.

Their findings support Allingham's previous results about the insignificant role of age, per se, in affecting the wife's decision of allocating her working time between market work and home work, and the substantial importance (with a positive effect on the participation rate) of the wife's education which is the most significant variable for women over 45 years of age. For younger wives the most significant variable affecting (negatively) the participation rate is the one representing the presence of young children. Education of wives comes next in its effect upon their joining the labour force. The husband's education, a proxy for his income, has a negative effect on the wife's labour force participation, especially for older women. The weakest effect on the wife's decision whether to participate in the labour force is demonstrated by the residence variable (metropolitan area, other urban, rural non-farm, rural farm). However, it indicates that the larger the centre the wife is living in, the more likely she is to be in the labour force.

The third study, which used aggregative data from the 1961 census, was conducted by S. Ostry.[58] The scope of the study was broader than the labour force participation rate of married women, but the author devotes a large part of

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[57] Dominion Bureau of Statistics, Special Labour Force Studies, Series B, No. 2, *Women Who Work: Part 2, Married Women in the Labour Force: The Influence of Age, Education, Child-Bearing Status, and Residence*, by J.D. Allingham and B.G. Spencer, Queen's Printer, Ottawa, 1968.

[58] S. Ostry, *The Female Worker in Canada*, 1961 Census Monograph, Queen's Printer, Ottawa, 1968.

it to an investigation of several factors which might affect the labour market activities of wives. Cross-tabulations and participation profiles by grouping women according to selected characteristics, analysis of variance, and multiple regression techniques were used in exploring the effect of several factors on the wives' decision concerning their labour force status. The cross-tabulations and the cohort and cross-section participation profiles reveal many facets of the labour force activities of married women. For example, from the cross-section participation profile the "two-phase" working life cycle was revealed in Canada in 1961, as in the United States in 1950.

The major findings of Ostry's study can be summarized as follows: The presence of young children is a very strong deterrent for market work, especially for young mothers. This negative influence of child status declines with age. Education is a more important factor than age, and it positively affects the labour force participation rate of married women. When education is taken into account, the negative effect of presence of young children, while still strong, is weakened. The effect of husband's income on the wife's labour market activity, is weakly positive at levels below a "threshold" of $5,000 to $7,000, becoming strongly negative at higher levels of income. Residence (urban, rural) has a very weak effect on the participation rate, but the regional influence is much stronger, indicating a clear pattern of lower labour force participation of married women in the Atlantic region and in Quebec than in the rest of Canada.

Disaggregated data were used by Spencer and Featherstone[59] in conducting a study concerning the influence of several factors on the labour force participation rate of married women. The study was based on 4,476 observations on families with husband and wife present from the 1964 Survey of Consumer Finances. A single equation model was employed, with a dichotomous (1,0) dependent variable indicating the labour force status of the wife at a moment of time, and multiple regression techniques were used for estimating the parameters.

The findings of the study support previous results concerning the influence of husband's income, child status, and the region of residence on the labour force behaviour of married women, and provide new information from the addition of variables on the financial position of the family, presence of "extra" adults, and residence in a metropolitan centre. Increased stocks of assets in the possession of a family reduce the probability that the wife will be in the labour force, whereas increased value of debts incurred by the family has the opposite effect. Both factors have a weak effect on the labour force behaviour of wives, and the findings are inconsistent with the authors' hypothesis that the wife enters the labour force for the purpose of accumulating assets or to permit the family to incur debts. The presence of an adult in the family, other than the husband and the wife, could have a positive effect on the participation rate by providing a convenient

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[59] Dominion Bureau of Statistics, Special Labour Force Studies, Series B, No. 4, *Married Female Labour Force Participation: A Micro Study*, by B.G. Spencer and D.C. Featherstone, Ottawa, 1970.

baby-sitting service, or a negative effect by placing greater demand for housework. The conclusion of the authors, based on their findings, is that "on balance, the presence of such a person encourages the labour force participation of the wife."[60] Finally, the results support the hypothesis that the larger the centre the wife lives in the more likely she is to be in the labour force.

In the light of the previous brief discussion of some theories of labour supply and empirical studies concerning the labour force behaviour of married women, some points can be raised in summary.

1. During the past decade a considerable amount of econometric work has been devoted to the explanation of labour supply by married women to the market. These studies have focussed their attention on the determinants of the labour force status of wives, exploring the effect not only of economic factors but also the effect of demographic, social and cultural factors in an attempt to explain variations of the labour force behavior of married women at a moment of time, and the rapidly rising amount of labour supplied by this group to the market.

2. Limitations on the availability of appropriate data have forced current econometric research to deal mostly with one dimension of labour supply (participation rate), virtually ignoring the other dimensions of market work. These studies, no doubt, have provided valuable insights into the labour supply process. If extended, however, to encompass more dimensions, like hours willing to work etc., these studies could, perhaps, alter the existing conclusions.

3. Empirical studies have tried to estimate the aggregate labour supply (total or of a specific group) by a single equation model which implies that all the independent variables are exogenous. This treatment overlooks the fact that responses of labour supply to changes in certain variables (especially wage rates) bring about feed-back effects which modify these variables and thereby cloud the interpretation of the results.[61]

The motivation in undertaking the present study stems from the following:

(i) Lack of extensive Canadian empirical studies highlighting the great number of factors which might affect the labour force behaviour of wives.

(ii) The results of investigations carried out in the United States suggest the possibility of further research in the field of married women participation rates.

(iii) The availability of more detailed unpublished statistical data in order to examine the influence of many factors on the labour force status of married women.

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[60] B.G. Spencer and D.C. Featherstone, *op. cit.*, p. 85.

[61] To the best of my knowledge, only Cain has attempted a simultaneous equation system. The results were not satisfactory, and "the experiment must be judged a failure", as Cain puts it. See Cain, *op. cit.*, p. 149.

CHAPTER III

THE MODEL, THE HYPOTHESES TO BE TESTED AND THE DATA

The purpose of this chapter is to develop a model for deriving the market labour supply function of married women, and to use this model to examine a number of hypotheses pertaining to the factors which affect the labour behaviour of married women. It also contains a brief discussion of the statistical data which will be used in the empirical testing of the model.

The model developed for deriving the market labour supply function of wives is based on the theory of consumer choice. The family[1] is considered as the appropriate decision making unit, which attempts to maximize its utility (a function of its income, the leisure of each member, and the housework performed by the wife) subject to its income and time constraints. For simplicity it is assumed that the family consists of two adult members, husband and wife.[2]

The family utility function is:[3]

$$U = U(L_H, L_W, HK, I) \qquad \text{(III.1)}$$

subject to its income and time constraint:

$$I = OY + (T-L_H)\,W_H + (T-L_W-HK)\,W_W + HKW_F \qquad \text{(III.2)}$$

where:
L_H = husband's leisure time.
L_W = wife's leisure time.
HK = wife's housework time.
I = total family income, including value of housework.
OY = family income other than earnings.
T = total available time per person in the supply period (e.g., a day).
W_H = husband's wage rate per unit of time (e.g., per hour).
W_W = wife's wage rate in market work, per unit of time.
W_F = wife's wage (imputed) rate in housework, per unit of time.[4]
$(MW) = T-L_W-HK)$ = wife's labour supply in the market.
$(MW)_H = (T-L_H)$ = husband's labour supply in the market.

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[1] A family is defined as a number of individuals bound together by legal or extra-legal ties, who pool their resources and make joint decisions concerning expenditures and allocation of time of each individual member.

[2] The model can easily be generalized to a family of more than two members by including the leisure time of the additional members as an argument in the family's utility function and their market income as a component of the total income.

[3] The rationale for including HK as an argument in the family's utility function is that, apart from the utility derived from the wife's imputed wages for housekeeping, the family's utility is positively affected if the work is performed by the wife. For example, even though some of the work performed by the wife (i.e. child-care) could be performed by a hired housekeeper, members of the family would in general derive greater utility if the work were performed by the wife.

[4] The wife's wage rate for housework can be defined as the cost of obtaining the same services in the market.

The utility function, U, is assumed to possess the usual properties, and is maximized subject to the income and time constraint (III.2).[5] Equilibrium conditions can be derived by using a Lagrange multiplier, λ, and maximizing (III.3).[6]

$$L = U(L_H, L_W, HK, I) + \lambda\,[OY + (T\text{-}L_H)\,W_H + (T\text{-}L_W\text{-}HK)\,W_W + HKW_F\text{-}I] \quad \text{(III.3)}$$

The first order conditions are:

$$\begin{aligned} U_1 - \lambda W_H &= 0 \\ U_2 - \lambda W_W &= 0 \\ U_3 - \lambda(W_W\text{-}W_F) &= 0 \\ U_4 - \lambda &= 0 \\ OY + (T\text{-}L_H)\,W_H + (T\text{-}L_W\text{-}HK)\,W_W + HKW_F &= I \end{aligned} \quad \text{(III.4)}$$

$$\text{where } U_1 = \frac{\partial U}{\partial L_H},\ U_2 = \frac{\partial U}{\partial L_W}, \text{ etc.}$$

Changes in wages and income will alter the allocation of time of family members, but the new allocation of time based on the new wages and income will still satisfy equations (III.4).

The magnitude of the effect of income and wage changes on the allocation of time of family members can be determined by allowing all variables to vary simultaneously. This is accomplished by total differentiation of equations (III.4), and the results can be presented in matrix notation as follows:

$$\begin{bmatrix} U_{11} & U_{12} & U_{13} & U_{14} & -W_H \\ U_{21} & U_{22} & U_{23} & U_{24} & -W_W \\ U_{31} & U_{32} & U_{33} & U_{34} & -(W_W\text{-}W_F) \\ U_{41} & U_{42} & U_{43} & U_{44} & -I \\ -W_H & -W_W & -(W_W\text{-}W_F) & -I & 0 \end{bmatrix} \begin{bmatrix} dL_H \\ dL_W \\ dHK \\ dI \\ d\lambda \end{bmatrix} = \begin{bmatrix} \lambda dW_H \\ \lambda dW_W \\ \lambda d(W_W\text{-}W_F) \\ 0 \\ -dOY\text{-}(T\text{-}L_H)dW_H \\ -(T\text{-}L_W\text{-}HK)dW_W\text{-}HKdW_F \end{bmatrix} \quad \text{(III.5)}$$

$$\text{where: } U_{11} = \frac{\partial U_1}{\partial L_H},\ U_{12} = \frac{\partial U_1}{\partial L_W}, \text{ etc.}$$

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[5] U is assumed to be a function such that first and second order partial derivatives exist and that:

$$d^2U = \sum_{i=1}^{N} \sum_{j=1}^{N} U_{ij}dx_idx_j < 0 \text{ subject to } dU = \sum_{i=1}^{N} U_idx_i = 0$$

where x_i = arguments in the U function, and U_i and U_{ij} = first and second partial derivatives. See R.G.D. Allen, *Mathematical Economics*, MacMillan Co., Ltd., (2nd ed.), London, 1963, pp. 654-660, and J.R. Hicks, *Value and Capital*, Oxford, at the Claredon Press, (2nd ed.), 1962, pp. 305-307.

[6] The same basic derivation has been used by: (a) M. Kosters, in his unpublished Ph.D. Dissertation, "Income and Substitution Parameters in a Family Labor Supply Model", University of Chicago, May, 1966, (b) M.S. Cohen, S.A. Rea Jr, and R.I. Lerman, in their publication, *A Micro-Model of Labor Supply*, B.L.S. Staff Paper 4, U.S. Department of Labor, 1970.

From the preceding system (III.5) the market labour supply function of husband and wife can be derived. The wife's market labour supply, (MW), function is derived by solving the system for dL_W and dHK, deriving d(MW), since $(MW) = T-(L_W + HK)$, and integrating the equation for d(MW).

Solution of the system (III.5) by Cramer's Rule for dL_W and dHK, yields:

$$dL_W = \frac{\lambda D_{12}}{D} dW_H + \left[\frac{\lambda D_{22}}{D} + \frac{\lambda D_{32}}{D}\right] dW_W - \frac{\lambda D_{32}}{D} dW_F$$

$$- [dOY + (T\text{-}L_H)\, dW_H + (T\text{-}L_W\text{-}HK)\, dW_W + HKdW_F]\, \frac{D_{52}}{D} \qquad \text{(III.6)}$$

where D is the determinant of the matrix of equations (III.5) and Dij the cofactor of the (i,j) element.[7]

$$dHK = \frac{\lambda D_{13}}{D} dW_H + \left[\frac{\lambda D_{23}}{D} + \frac{\lambda D_{33}}{D}\right] dW_W - \frac{\lambda D_{33}}{D} dW_F$$

$$- [dOY + (T\text{-}L_H)\, dW_H + (T\text{-}L_W\text{-}HK)\, dW_W + HKdW_F]\, \frac{D_{53}}{D} \qquad \text{(III.7)}$$

The change in the wife's leisure time (L_W) with respect to changes in income (OY), other things being equal is:

$$\frac{\partial L_W}{\partial OY} = -\frac{D_{52}}{D} \text{ (income effect).} \qquad \text{(III.8)}$$

For the calculation of a pure substitution effect, a change in the wage rate (W_W) is required to be accompanied by a change in income so that the family is neither better off nor worse off (i.e. remains on the same indifference curve), which means dU equal to zero.

Hence:

$$dU = U_1 dL_H + U_2 dL_W + U_3 dHK + U_4 dI = 0 \qquad \text{(III.9)}$$

using equations (III.4) and substituting into (III.9) yields:

$$dU = \lambda W_H dL_H + \lambda W_W dL_W + \lambda(W_W\text{-}W_F)\, dHK + \lambda dI = 0$$

Hence:

$$W_H dL_H + W_W dL_W + (W_W\text{-}W_F)\, dHK + dI = 0 \qquad \text{(III.10)}$$

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7 The sign is embodied in D_{ij} and it is equal to $(-1)^{i+j}$ times the minor of the (i+j) element. The labour supplied to the market, $(T\text{-}L_H)$ and $(T\text{-}L_W\text{-}HK)$ by the husband and wife respectively, and the wife's homework (HK), in equation (III.6) and subsequent equations, are equilibrium values determined in the maximization of U, given exogenously determined wage rates and income other than earnings.

Since $\lambda \neq 0$ it can be seen from equation (III.10) that the right hand side of the last equation of (III.5) must be equal to zero for an income compensated wage change. Therefore:

$$\left(\frac{\partial L_W}{\partial W_W}\right)_{\bar{u}} = \frac{\lambda D_{22}}{D} + \frac{\lambda D_{32}}{D} \tag{III.11}$$

Similarly in making a compensating variation in income:

$$\left(\frac{\partial L_W}{\partial W_H}\right)_{\bar{u}} = \frac{\lambda D_{12}}{D} \text{ and } \left(\frac{\partial L_W}{\partial W_F}\right)_{\bar{u}} = -\frac{\lambda D_{32}}{D} \tag{III.12}$$

Equation (III.6) can be written:

$$dL_W = \left(\frac{\partial L_W}{\partial W_H}\right)_{\bar{u}} dW_H + \left(\frac{\partial L_W}{\partial W_W}\right)_{\bar{u}} dW_W + \left(\frac{\partial L_W}{\partial W_F}\right)_{\bar{u}} dW_F$$

$$+ [dOY + (T\text{-}L_H)\, dW_H + (T\text{-}L_W\text{-}HK)\, dW_W + HK dW_F] \left(\frac{\partial L_W}{\partial OY}\right)$$

$$= \left[\left(\frac{\partial L_W}{\partial W_H}\right)_{\bar{u}} + (T\text{-}L_H)\frac{\partial L_W}{\partial OY}\right] dW_H + \left[\left(\frac{\partial L_W}{\partial W_W}\right)_{\bar{u}} + (T\text{-}L_W\text{-}HK)\frac{\partial L_W}{\partial OY}\right] dW_W$$

$$+ \left[\frac{\partial L_W}{\partial W_F}_{\bar{u}} + (HK)\frac{\partial L_W}{\partial OY}\right] dW_F + \left(\frac{\partial L_W}{\partial OY}\right) dOY \tag{III.13}$$

By the same reasoning:

$$dHK = \left[\left(\frac{\partial HK}{\partial W_H}\right)_{\bar{u}} + (T\text{-}L_H)\frac{\partial HK}{\partial OY}\right] dW_H + \left[\left(\frac{\partial HK}{\partial W_W}\right)_{\bar{u}} + (T\text{-}L_W\text{-}HK)\frac{\partial HK}{\partial OY}\right] dW_W$$

$$+ \left[\left(\frac{\partial HK}{\partial W_F}\right)_{\bar{u}} + (HK)\frac{\partial HK}{\partial OY}\right] dW_F + \left(\frac{\partial HK}{\partial OY}\right) dOY \tag{III.14}$$

Labour supplied by the wife in the market is:

$(MW) = T\text{-}(L_W+HK)$,

Therefore:

$$d(MW) = -d(L_W+HK),$$

$$\frac{\partial(MW)}{\partial OY} = -\frac{\partial L_W}{\partial OY} - \frac{\partial HK}{\partial OY}$$

$$\left[\frac{\partial(MW)}{\partial W_W}\right]_{\bar{u}} = -\left(\frac{\partial L_W}{\partial W_W}\right)_{\bar{u}} - \left(\frac{\partial HK}{\partial W_W}\right)_{\bar{u}}$$

$$\left[\frac{\partial(MW)}{\partial W_H}\right]_{\bar{u}} = -\left(\frac{\partial L_W}{\partial W_H}\right)_{\bar{u}} - \left(\frac{\partial HK}{\partial W_H}\right)_{\bar{u}}$$

$$\left[\frac{\partial(MW)}{\partial W_F}\right]_{\bar{u}} = -\left(\frac{\partial L_W}{\partial W_F}\right)_{\bar{u}} - \left(\frac{\partial HK}{\partial W_F}\right)_{\bar{u}} \qquad \text{(III.15)}$$

Equations (III.13), (III.14) and (III.15) yield the equation:

$$d(MW) = \left[-\left[\left(\frac{\partial L_W}{\partial W_H}\right)_{\bar{u}} + \left(\frac{\partial HK}{\partial W_H}\right)_{\bar{u}}\right] - (T-L_H)\left[\frac{\partial L_W}{\partial OY} + \frac{\partial HK}{\partial OY}\right]\right]dW_H + \left[-\left[\left(\frac{\partial L_W}{\partial W_W}\right)_{\bar{u}}\right.\right.$$

$$\left.\left. + \left(\frac{\partial HK}{\partial W_W}\right)_{\bar{u}}\right] - (T-L_W-HK)\left[\frac{\partial L_W}{\partial OY} + \frac{\partial HK}{\partial OY}\right]\right]dW_W$$

$$+\left[-\left[\left(\frac{\partial L_W}{\partial W_F}\right)_{\bar{u}} + \left(\frac{\partial HK}{\partial W_F}\right)_{\bar{u}}\right] - HK\left[\frac{\partial L_W}{\partial OY} + \frac{\partial HK}{\partial OY}\right]\right]dW_F + \left[-\frac{\partial L_W}{\partial OY} - \frac{\partial HK}{\partial OY}\right]dOY$$

or

$$d(MW) = \left[\left(\frac{\partial(MW)}{\partial W_H}\right)_{\bar{u}} + (T-L_H)\frac{\partial(MW)}{\partial OY}\right]dW_H + \left[\left(\frac{\partial(MW)}{\partial W_W}\right)_{\bar{u}}\right.$$

$$\left. + (T-L_W-HK)\frac{\partial(MW)}{\partial OY}\right]dW_W + \left[\left(\frac{\partial(MW)}{\partial W_F}\right)_{\bar{u}} + HK\frac{\partial(MW)}{\partial OY}\right]dW_F$$

$$+\left(\frac{\partial(MW)}{\partial OY}\right)dOY \qquad \text{(III.16)}$$

Integration of equation (III.16) yields the market labour supply function of wife:

$$(MW) = \alpha + \left[\left(\frac{\partial(MW)}{\partial W_H} \right)_{\bar{u}} + (\hat{MW})_H \frac{\partial(MW)}{\partial OY} \right] W_H + \left[\left(\frac{\partial(MW)}{\partial W_W} \right)_{\bar{u}} + (\hat{MW}) \frac{\partial(MW)}{\partial OY} \right] W_W$$

$$+ \left[\left(\frac{\partial(MW)}{\partial W_F} \right)_{\bar{u}} + (\hat{HK}) \frac{\partial(MW)}{\partial OY} \right] W_F + \left(\frac{\partial(MW)}{\partial OY} \right) OY \qquad \text{(III.17)}$$

where the circumflex denotes (previous) equilibrium values.

The coefficient of the husband's wage rate in equation (III.17) is comprised of an income effect $(\hat{MW})_H \frac{\partial(MW)}{\partial OY}$ and a cross substitution effect $\left(\frac{\partial(MW)}{\partial W_H} \right)_{\bar{u}}$ which is the effect of a change in (W_H) on (MW) other things being equal. If the cross substitution effect is assumed to be zero equation (III.17) can be written as follows:[8,9]

$$(MW) = \alpha + \frac{\partial(MW)}{\partial OY} \left[(\hat{MW})_H W_H + OY \right] + \left[\left(\frac{\partial(MW)}{\partial W_W} \right)_{\bar{u}} + (\hat{MW}) \frac{\partial(MW)}{\partial OY} \right] W_W$$

$$+ \left[\left(\frac{\partial(MW)}{\partial W_F} \right)_{\bar{u}} + (\hat{HK}) \frac{\partial(MW)}{\partial OY} \right] W_F \qquad \text{(III.18)}$$

Equation (III.18) expresses the quantity of market labour supplied by the wife as a function of family income, excluding her own earnings (I–W), and the wife's wage rate in market work (W_W) and housework (W_F). Therefore, the market labour supply function corresponding to III.18 can be written as:

$$(MW) = f(I\text{-}W, W_W, W_F) \qquad \text{(III.20)}$$

However, the preceding labour supply function has been derived under the implicit assumption of *ceteris paribus*, which implies, in particular, that tastes and preferences are the same among individuals. This is not true in the real world and it would be unsatisfactory simply to ignore the issue. Many other variables which

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[8] This assumption is made for facilitating the empirical analysis because data on (OY) are often not available and when they can be obtained they are not accurate.

[9] From equation (III.17) the effect of a change in market wage rate of the wife, other things being equal, on her market labour supply can be derived:

$$\frac{\partial(MW)}{\partial W_W} = \left(\frac{\partial(MW)}{\partial W_W} \right)_{\bar{u}} + (\hat{MW}) \frac{\partial(MW)}{\partial OY} \qquad \text{(III.19)}$$

The second term of the right hand side is the income effect, which depends on the equilibrium value $(\hat{MW})$, and the first term is the pure substitution effect.

create individual differences must be controlled before determining the effect of the variables of equation (III.20) on the labour supply of married women.

For this purpose a "basket variable" (0) is introduced into equation (III.20) which stands for all those empirical variables which can be expected to affect tastes and preferences and which are discussed later in this chapter. Thus, equation (III.20) becomes:

$$(MW) = f(I\text{-}W, W_W, W_F, 0) \tag{III.21}$$

Data limitations and the fact that many variables which could be hypothesized to affect tastes and preferences are unobservable, forced me to use a limited number of control variables in the empirical analysis. No doubt these variables inadequately control over tastes and preferences and leave a great deal to be desired. The omitted variables are included in the error term (E) along with random factors.[10]

The market labour supply function for married women, after introducing the error term, can be written as:

$$(MW) = f(I\text{-}W, W_W, W_F, 0, E) \tag{III.22}$$

This is the basic model used for the empirical analysis of the current study.[11] It was assumed that all relationships between (MW) and explanatory variables were linear and additive,[12] and multiple regression (ordinary least squares) techniques were employed in investigating the influence of several variables on the wife's decision whether or not to participate in the labour force.

The cross-sectional micro-data used to estimate the preceding model were obtained from a household survey conducted in April 1968 by the Dominion Bureau of Statistics (now Statistics Canada) on the incomes of Canadians in 1967. This survey is referred to as the Survey of Consumer Finances 1968 (SCF68), and is a sample survey based on the same complex survey design as the Labour Force

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[10] We assume (or hope) that the net effects of the omitted variables are random and can therefore be included in the error term.

[11] A limitation of this model is that all the independent variables are treated as exogenous: the same limitation exists in the models of all previous studies mentioned in Chapter II. A simultaneous equation model, which might be an appropriate one for investigating labour force participation rates, was not attempted because of several limitations of the data: (a) only cross-sectional data were available, (b) the number of available explanatory variables used in the current study was limited and this would create identification problems in a simultaneous equation system with more than two equations, and (c) data on key variables, such as wage rates, were not available.

[12] Instead of introducing interaction terms into the model, separate regressions have been run by the wife's age, level of income, region, and residence.

Survey.[13] Information on incomes and labour force status for all persons 14 years of age and over was collected in the SCF68.[14]

This information was fully integrated with the data collected in the Labour Force Survey in April, 1968, since the same people who were surveyed in the SCF68 were in the Labour Force Survey sample in that month. Thus, the SCF68 became a good source of information for analysis, since the data available in the Person-Family File provide information on each family plus detailed data on each family member 14 years of age and over, concerning his (her) labour force status at the time of survey and in 1967, income, personal characteristics, etc.

The original sample selected for the SCF68, 31,887 households, was the largest ever for such a survey in Canada. Of the 31,887 households in the sample 3,002 were vacant, and the remaining 28,885 occupied households contained 31,045 family units. Of these family units, 22,641 (1,002 farm and 21,639 non-farm family units) provided "satisfactory returns",[15] constituting a response rate of 72.9%.[16]

For the purpose of this study, the sample was further restricted to include only complete non-farm families[17] with husband and wife present, and to exclude members of the armed forces. Thus the final sample used for the empirical analysis contained 15,557 "economic families".[18]

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[13] For a detailed description of technical and statistical methodology used in the Labour Force Survey see: Dominion Bureau of Statistics, Catalogue 71-504, *Methodology, Canadian Labour Force Survey*, Queen's Printer, Ottawa, January, 1966.

[14] The section concerning the micro-data is drawn from the publication of the Dominion Bureau of Statistics, Catalogue 13-534, *Income Distributions by Size in Canada 1967*, Queen's Printer, Ottawa, 1970.

[15] Returns which, in addition to personal and household data, provided complete income information are defined as "satisfactory returns".

[16] These figures refer to "economic family" which is defined as "a group of two or more persons living together and related to each other by blood, marriage or adoption", whereas the "census family" is defined as "a husband and wife (with or without children who have never married) or a parent with one or more children never married, living together in the same dwelling".

[17] A family in which one or more of its members receives at least half of his income from farming operations is defined as a farm family. Therefore farm employees working for wages are not defined as farmers.

[18] The "economic family" is taken as the "family unit" in the current study because, according to its definition, it is closer to the "spending unit" than the "census family". In any event, transforming economic family data to a census family basis involves no change in the great majority of cases. Particularily in our restricted sample, most of the households contain only one family under either definition. An estimate of the number of "census families" and "economic families" in Canada in 1968 shows that their ratio (census families/economic families) is 1.008, which indicates that the number of family units defined either way differs only marginally. See Dominion Bureau of Statistics, Catalogue 13-538, *Family Incomes (Census Families) 1967*, Information Canada, 1972, p. 9.

In testing the model with the preceding cross-sectional disaggregated data, the dependent variable was a dichotomous variable arbitrarily assigned the value of one if the wife was in the labour force at some time during 1967, and the value of zero if she was not in the labour force in 1967. The use of a dichotomus variable as the dependent variable is justified by the fact that in the family's decision concerning the wife's allocation of time, the basic choice is work in the market or no work in the market.[19] A model with a dichotomous dependent variable is a linear probability model and some estimation problems are created. These problems are briefly discussed in Appendix C.

On the next several pages, the independent variables included in the model and their expected influence, on *a priori* grounds, on the market labour supply of married women are discussed.

The wife's market labour supply function (equation III.18) has been derived from a family utility function[20] by making an assumption that the cross substitution effect of husband's wage rate changes on wife's market labour supplied is zero. This assumption implies that husband's leisure and wife's leisure and housework are independent,[21] so that the coefficient of the variable (I–W), total family income[22] excluding wife's earnings, carries only an income effect. This effect, as economic theory suggests and cross-sectional empirical studies support (see Chapter II) is expected to be negative, since the "wife's freedom" from the market is assumed to be a normal good.

While the theoretical expectation of the direction of the effect of this variable on the market labour supply of married women is clear, a question of considerable importance arises in cross-sectional empirical studies with disaggregated data: is the observed relation between reported family income, excluding wife's earnings, and the labour force status of married women a response to the "permanent income"[23] or to deviation of the reported income from "permanent income" or to both of these? Mincer[24] takes the position that the observed

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[19] As a second step another dimension of labour supply, the extent of participation, could be investigated by constructing a variable measuring the hours that the wife wanted to be in the labour force during 1967. Unfortunately, data for constructing such a variable were not available.

[20] On the existence of such a utility function see: P.A. Samuelson, "Social Indifference Curves", *Quarterly Journal of Economics*, February, 1956.

[21] See J.M. Henderson and R.E. Quandt, *Micoeconomic Theory*, McGraw-Hill Book Company, New York, 1958, p. 29.

[22] In a generalized model which includes families with more than two potential wage earners (see footnote 2 page 31), this variable includes the market earnings of all family members, excluding wife's earnings, and income from other sources. In this case, the assumption of zero cross substitution effects implies that the leisure of each family member is independent of the leisure of the other family members and the leisure and the housework of the wife.

[23] For the definition of "permanent income" see M. Friedman, *A Theory of the Consumption Function*, Princeton for NBER, 1957.

[24] J. Mincer, *op. cit.*, pp. 73-74.

relation is the outcome of two effects: "the responsiveness of labor force behaviour 'of married women' (1) to husband's long-run income position and (2) to current deviations of that income from its normal level".[25]

The individual worker, according to the traditional theory, allocates his time between leisure and market work so as to maximize his utility.[26] This theory suggests that a permanent rise in the market wage rate produces both a negative income effect and a positive substitution effect on the labour supplied in the market, on the assumption that leisure is a normal good. Which effect will be stronger cannot be determined by a priori analysis, but the prevalent notion today, empirically supported, is that the negative income effect is the dominant one.

However, because of the three-way choice of married women in allocating their time and the important role of household responsibilities, in addition to the market wage rate[27] (market potential earnings) another economic variable – the housework wage rate (non-market potential earnings) – appears to be important in determining the market labour supply of married women.

A rise in either wage rate produces a negative income effect[28] on the total work supplied by married women (market work and housework) and is, also, accompanied by a substitution effect. But, while the substitution effect of a rise in the housework wage rate is operating in the same direction as the negative income effect on the market labour supply of married women, the substitution effect of a change in the market wage rate is pulling in the opposite direction from the income effect. The net effect of a market wage change on the market labour supply of married women cannot be determined a priori. However, because of the three-way choice of married women in allocating their time, a reallocation of work between the two sectors (market-home) might take place as a result of an increase in the market wage rate which altered the relative prices of wage goods and home production goods. Therefore, this substitution effect could be expected to be large enough to outweigh the negative income effect. Of course, the magnitude of this substitution effect at a moment of time depends on the substitutability between goods and services in the two sectors and on "transitory" variations in other variables (see Chapter II, pp. 18-20). On the basis of the preceding discussion, it could be hypothesized that an increase in the market wage rate would have a positive effect on the market labour supply of married women,

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[25] In the current study we include in the regressions the variable "husband's weeks unemployed in 1967" in order to control, to some minor extent at least, deviation from the normal level of income.

[26] For an illustration of this theory by an indifference curve analysis, see T. Scitovsky, *Welfare and Competition*, Richard D. Irwin, Inc., Chicago, 1951, pp. 83-92.

[27] The relevant economic variables should be measured net of income taxes, and estimates of the expected market wage rate should take into consideration the probability of finding a job and all the associated expenses of searching for a job.

[28] It is assumed that leisure is a normal good, and that market and home productivities of women are unrelated.

whereas an increase in the housework wage rate would decrease married women's market work. However, a direct empirical test of these hypotheses is impossible, because it is difficult, or probably impossible, to obtain from the available data an accurate estimate of the market potential earnings of each individual wife, in particular, for those married women not already working. Moreover, the housework wage rate is unobservable. Consequently, we are forced to resort to proxy variables.

From the available data, the most appropriate proxy for the potential market earnings of married women is their formal educational achievement. It is hypothesized that the higher the educational achievement of a wife, the higher her market potential earnings, therefore the higher the probability she would be in the labour force. It is recognized that education is not the ideal proxy for capturing a pure market wage effect for several reasons. Individuals with the same formal level of education may have a wide range of market potential earnings depending on the quality and type of education, their previous work experience, and other personal characteristics. Moreover, formal education may affect (and have been affected by) tastes for market work.

The size and composition of the family, and whether the family lives in a rented home or in a home it owns, are important family characteristics in determining the family's demand for housework. Three independent variables are introduced into the model to take care of variations in the demand for housework, and consequently of variations in the unobservable housework wage of the wife.

The presence of young children, in particular, children of pre-school age, increases the housework to be done and the value of the mother's presence in the home. It is hypothesized that the presence of children, particularly young children, in the family is negatively associated with the probability of the wife's seeking employment in the market.

The presence of adults other than the husband and wife in the family may exert a positive or a negative influence on the wife's labour force participation. On the one hand, the presence of other adults might reduce the burden of the wife's housework and the need of her presence in the home by providing child-care and taking over part of the housework. This would enable the wife to seek employment in the market. On the other hand, the presence of other adults who might be dependent and requiring attention would increase both the housework and the need of the wife's presence in the home. This would lower the wife's probability of engaging in market work. Whether the net outcome is a positive or negative effect is an empirical question. However, since it is felt that in most cases the extra adults are "healthy" retired parents of either the husband or wife, it is assumed that the positive effect dominates.

The third variable introduced to take care of variations in demand for housework is the tenure status – renting or home ownership – of the family. If the family owns the home in which it lives, home responsibilities will usually be increased; consequently, the probability that the wife will engage in market work would decrease. Moreover, all three variables representing the presence of children, other adults in the family, and home ownership of the family offer some control over tastes for housework.

The husband's labour force status is expected to influence the labour force behaviour of married women since the husband's wages and salary is usually the major source of the family's income. Two variables related to the husband's labour force status – "husband's weeks unemployed in 1967" and "husband did not work in 1967"[29] – are introduced into the model in order to take care, to some extent, of "transitory" and of "more permanent" deviations from the normal level of the family's income. On a priori grounds, the first variable is expected to have a positive effect on the wife's labour force participation, since entrance to the labour force would be a way to restore the family's economic position, and at the same time the husband would be able to help out with the housework.[30] At first glance, the wife's labour force behaviour response to the second variable – husband did not work in 1967 – would seem to be the same as her response to her husband's unemployment. However, the variable – husband did not work in 1967 – indicates a more permanent situation with regard to the husband's labour force status and the wife's response will depend on the cause which keeps the husband out of the labour force. The effect of this variable on the wife's market work may be positive (e.g., husband attending school) or negative (e.g., retired husband with accumulated assets, prematurely retired husbands because of poor health requiring attention at home). Therefore, the overall net effect on the wife's labour force participation is an empirical question.

The family's socio-economic status should be expected to influence the wife's labour force behaviour by affecting, apart from the family's income, the family's social values and the family's attitudes towards the wife's market employment. The occupation of husband is used as an independent variable in our model in the hope it will capture the independent effect of family's social values and attitudes to the wife's market labour supply. This variable has been selected because the husband's occupation is often used to classify the family's socio-economic status. It is hypothesized that the higher the husband's occupa-

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[29] According to information provided by the Consumer Finance Research Staff, Statistics Canada, this category of labour force status is equivalent to "husband not in the labour force".

[30] The theoretical model does not include a term in the utility function for housework performed by the husband because of the arguments in footnote 2 on page 13. However, for some small proportion of families and under special circumstances, husband's housework may be important.

tional level (i.e., professional, managerial), the more liberal the family's attitudes to the wife's market employment; therefore, the higher the wife's propensity to participate in the labour force.

The wife's age is associated with a number of family events and characteristics, and individual characteristics of the wife such as: family cycle, family income, education, work experience, etc. These events and characteristics are important to the wife's labour force participation decisions, so that the observed relationship between wife's age and her labour force participation most probably and to a large extent stems from the association between wife's age and these other factors. However, even if all these factors are controlled, age can be postulated as an independent variable affecting the wife's market labour supply because it can stand for unquantifiable factors such as: (a) individual's health, (b) geographical and job-mobility, and (c) tastes for market work and housework. Increasing age, most likely, is associated with both declining health and mobility, and older women are expected to be more conservative regarding market work. Therefore, age, per se, should be expected to negatively affect the labour force participation of married women.

The wife's immigration status (immigrant or Canadian-born) is associated with personal, demographic and family characteristics which can be expected to influence her labour force participation decisions. However, even if all these factors are controlled, the immigrant wife may still demonstrate, at least for some years after her immigration, a different pattern of labour force behaviour than her Canadian-born counterpart. The following reasons might account for this:

(a) Immigration is often motivated by the desire to improve the family's financial position. This can be done by the wife's entrance into the labour force, since the husband,[31] in particular if he comes from a non-English speaking country,[32] will likely be engaged in low paying jobs, at least for some time after his immigration. The propensity of the immigrant wife to participate in the labour force might be reinforced by the "dream" of accumulating money in order to return to their own country, a "dream" which in the vast majority of cases never materializes.

(b) Immigration to a new and unknown country might be accompanied by a feeling of insecurity, in particular for the first few years of immigration. This

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[31] From those who responded to the question of immigration status in the sample it was found that about 95% of immigrant women are married to immigrant men.

[32] The majority of the post-war immigrants (1946-66) come from non-English speaking countries. See Dominion Bureau of Statistics, Special Labour Force Studies, No. 6, *Labour Force Characteristics of Post-War Immigrants, 1956-67*, by N.H.W. Davis, and M.L. Gupta, Queen's Printer, Ottawa, 1968, pp. 36-37.

could lead to increased labour force participation of the wife in an attempt to increase the family's financial security.

(c) On the other hand, because of the different socio-cultural background, intrinsically, the immigrant wife may be less motivated to market work than her Canadian counterpart. However, under the influence of the new socio-cultural environment, the immigration motive, the opportunities of the Canadian labour market which offers more light and part-time jobs (in particular for those who come from developing countries), the old traditions may break down relatively fast. Thus the immigrant wife's socio-cultural background may not be a barrier to her labour force participation for any extended period of time.

Taking into account all these considerations, it should be expected that the positive effect of the immigration motive and feelings of insecurity on the immigrant wife's labour force participation will dominate the negative influence of the socio-cultural effect even during the early period after her arrival. Thus, the hypothesis advanced for testing is that the immigrant wife will demonstrate a higher propensity to participate in the labour force than her Canadian-born counterpart, until she is integrated into the Canadian social and cultural stream.

Finally, area variables are introduced into the wife's market labour supply function. These variables are neither "determinants" of the market labour supply nor proxies for specific variables. They stand as proxies for interregional and interarea (metropolitan, non-metropolitan, urban-rural, etc.) differences which stem from a number of variables (unquantifiable or for which data are not available) such as: wife's potential earnings, composition of industry, local labour market conditions, tastes for market work, socio-cultural background, etc. Since it is not possible to control for these variables, instead of ignoring them completely area variables are introduced in order to improve the model's specification.

The basic model (equation III.22) has been derived from the microtheory of consumer choice. The same model is applied to another set of data, some published but mostly unpublished, from the 1961 Census of Canada.[33] However, the actual numerical specification of the market labour supply function of married women in this case is based on cross-sectional aggregative data which are averages within 174 cities, towns, villages and municipal subdivisions with a population of 10,000 and over.

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[33] All the statistics related to family in the 1961 Census are based on the "Census family" definition.

The use of aggregative data introduces the well-known problem of "linear aggregation of economic relations."[34] This problem may be serious when microrelationships (individual relationships) are deduced from macrorelationships (relationships among averages of cities in our case), because of the existing aggregation bias of the macrocoefficients.[35] It is obvious that when macro-relationships are interpreted as such, the aggregation problem is ignored.

In the following paragraphs the macrovariables used in testing the model are discussed, along with some advantages of the aggregation. The expected influence of these variables on the market labour supply of married women is expected to be the same as the corresponding microvariables, and their influence is not discussed unless there are some peculiarities associated with the macrovariables.

The dependent variable in this set of data is the labour force participation rate (in per cent) of married women, husband present, during the census week in 1961.

An advantage of the cross-sectional aggregative data is that they provide information on the average earnings of female wage earners. This variable is used as a "better" proxy for the potential market earnings of married women in estimating our basic model (equation III.22).

The family's income excluding wife's earnings is represented by the average earnings of husband[36] which is usually the major component of the family's income. This variable being aggregative (area average), has the advantage of being free of "transitory" deviations and errors of individual incomes, thus coming closer to the normal income concept. However, this variable, average earnings of husband, is subject to deviations itself depending on the deviations from the normal level of economic activity of the area. The response of the labour force to

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[34] The problem has appeared in the sociological literature under the name "ecological correlation". See, W.S. Robinson, "Ecological Correlation and the Behaviour of Individuals", *American Sociological Review*, 1950, pp. 351-357.

In Econometrics this problem is referred to as "linear aggregation problem". For an extensive discussion of the problem, see H. Theil, *Linear Aggregation of Economic Relations*, North Holland Publishing Co., Amsterdam, 1954, and H.A.J. Green, *Aggregation in Economic Analysis*, Princeton University Press, Princeton, New Jersey, 1964.

[35] For a brief and concise summary of the aggregation problems and aggregation bias, see H. Theil, *Principles of Econometrics*, John Wiley and Sons, Inc., New York, 1971, pp. 556-573.

[36] Note that both variables, average earnings of females and average earnings of husband refer to the 12 months preceding the census week. They are used as proxies for the average earnings of the census year.

these "transitory" deviations from the normal level of economic activity, which represent changes in demand for labour, introduced the controversy over the "additional worker" hypothesis and the "discouraged worker" hypothesis. According to the former hypothesis, abnormally low economic activity in the area, which indicates that many bread-winners have lost their jobs, would attract secondary workers, in particular married women, into the labour force in an attempt to stabilize the income flow of the family. On the other hand, the latter hypothesis claims that when demand for labour falls, secondary workers would be discouraged from entering the labour force and some workers would leave the labour force. Consequently the labour force participation rate would decline. Now, it is believed that both forces operate at the same time, with no clear consensus as to which effect dominates and to how the two effects interrelate. The male unemployment rate, which is believed to be a good barometer of the level of economic activity, is used as a variable which is expected to capture the net effect of these two forces operating in opposite directions.

The aggregative data provide information which enables us to investigate: (a) the effect of the relative abundance in the area of job opportunities for females, and (b) the sociocultural factor and its effect on the labour force participation rate of married women.

The variable used as a measure indicating the area differential in providing employment opportunities for females is female occupation mix, defined as the percentage of the total labour force who are in white collar occupations such as managerial, professional and technical, clerical, and sales. It is obvious that this variable is expected to be positively related to the labour force participation rate of married women since these occupations provide more attractive opportunities, lighter work, and higher demand for females than other occupations demanding mostly male labour (primary occupations, and blue collar occupations).

In a bilingual and multicultural country like Canada, the differences in socio-cultural background between different population groups should be expected to affect the labour force behaviour of married women, since these differences influence the general attitude of the community and the attitude of married women towards market employment and the role of wife and mother. The percentage of Roman Catholic wives in total husband-wife families is used as an independent variable in order to capture the socio-cultural effect on the labour force participation rate of this population group, which is most prominent in the case of the French Canadian population.[37] The hypothesis advanced to be tested

[37] Data limitations forced us to investigate the sociocultural effect of only one population group. This does not mean that all the other population groups are considered as having the same socio-cultural background, but that they are different from the one under consideration.

is that this variable will negatively affect the market labour supplied by married women of this population group. French Canadian married women seem to place a different value on working outside the home because of their background, education (until recently classical education was dominant), religion, tradition, etc.[38]

Other aggregative variables used in estimating the model using cross-sectional aggregative data are variables representing: presence of young children in the family, educational achievement of the wife, presence of other adults (in addition to the husband and wife) in the family, and the regional location of the city.

Recapitulating, in this chapter a model based on the theory of consumer choice was developed, from which model the market labour supply function of married women was derived. The theoretical framework for analysing the labour force participation of married women and the hypotheses to be tested were presented, and the statistical data used for the empirical work were discussed. The empirical findings are discussed in the next two chapters.

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[38] See: (a) N.W. Taylor, "French Canadians as Industrial Entrepreneurs", *Journal of Political Economy*, February, 1960, (b) G. Rocher, "Pattern and Status of French Canadian Women", *International Social Science*, Vol. XIV, No. 1, 1962 and (c) F. Elkin, *The Family in Canada*, Canadian Conference on the Family, Ottawa, April, 1964.

CHAPTER IV

ESTIMATION OF THE LABOUR SUPPLY MODEL USING MICRO-DATA FROM THE SCF68

This chapter discusses the empirical results obtained by using regression techniques and fitting the linear probability model[1] developed in the preceding chapter to the 15,557 cross-sectional observations on "economic families" from the SCF68.

The analysis here is concerned with the study and investigation of whether and how the wife's decision to participate or not to participate in the labour force at some time during 1967 is related to a number of variables such as: other adults in the family, ownership of the home, husband's weeks unemployed in 1967, whether the husband worked in 1967, family income, husband's occupation, place of residence, age of wife, presence of young children in the family, education of wife, and immigration status of wife. All the variables, with the exception of those that pertain to the number of other adults in the family and the number of husband's weeks unemployed in 1967, were represented by dummy variables – variables taking the value of one if particular characteristics are present and the value of zero if they are not. For example, the variable REG1 takes the value one if the family's residence is in the Atlantic Provinces, the value zero otherwise.[2]

Thus, the regression analysis involves sets of dummy variables representing the factors previously mentioned. The five regions of Canada, for example, are represented by five dummy variables. Another set of eight dummy variables represented the husband's occupation, and so on. However, representation of factors by sets of dummy variables introduces an estimation difficulty due to the fact that each set of dummy variables sums up to a unit column vector. This would not permit estimation of the regression equation parameters, since there is a constant term in the specification of the regression equations which would cause singularity in the moments matrix. It is obvious that estimation of the regression equations requires the imposition of additional constraints. We have adopted the constraining technique, which is common practice, of omitting one dummy

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[1] The reader is reminded that the dependent variable is a dichotomous variable assigned the value of one if the wife was in the labour force at sometime during 1967, and the value of zero if she was not in the labour force in 1967.

[2] Use of dummy variables is a useful device in a multiple regression framework because: (a) they permit the introduction into the regression analysis of qualitative characteristics which are not measured on a numerical scale, e.g., sex, occupation, etc., (b) they may reduce the effect of existing errors in the independent variables, and (c) they take account, to some extent, of nonlinear effects of continuous variables. In addition, dum,y variables can be used to include interaction terms in the regression analysis. Interactions were handled in our analysis by rerunning the regression for subgroups, such as: age of wife, residence, and level of family income.

variable from each set in the specification of the regression equations.[3] The category represented by the omitted variable in a particular set is considered as the reference category for the interpretation of the coefficients of the remaining variables in the same set. The estimated coefficient of any other variable in the set must be interpreted as an estimate of the difference between the original coefficient of that variable and the original coefficient of the omitted variable.[4] It follows that use of the t-test for testing whether the estimated coefficients of individual variables (from a set of dummy variables) are significantly different from zero is in effect testing the significance of the difference between the original coefficient of that variable and the omitted one. Moreover, it is often more important to test the statistical significance of the coefficients of the whole set of dummy variables representing one factor rather than individual coefficients within the set. This can be determined by using the available standard F-test.

In Appendix A, the estimated regression equations are presented in Tables A.1 to A.9 along with the definitions and symbols of the relevant variables. Each table displays the results of two regression equations, and for each regression the estimated coefficients and their t-values (ratio of the estimated regression coefficient to its estimated standard error) are given along with the value of the F-test (at the bottom of the column) for each set of dummy variables. In addition, for each regression equation the following information is provided: mean of the dependent variable, number of observations (N), the value of the overall F-statistic (F), the coefficient of multiple determination (R^2) and the same coefficient corrected for the degrees of freedom ($\bar{R}^2$), and the standard deviation of residuals (SEE).

We now turn to discuss the empirical findings in conjunction with the postulated hypotheses and compare them with previous studies in Canada and the United States. The first estimated regression shown in Table A.1 contains the regression results from the overall sample of 15,557 married women, husband

[3] There are other types of constraints which can be used in order to avoid the problem of singularity in the moments matrix: (a) the constant term can be omitted from the specification of the regression equations, when only one set of dummy variables is involved, (b) the weighted sum of the coefficients of each set of dummy variables is constrained to zero, in which case the constant term is equal to the mean value of the dependent variable, and the estimated coefficients are differences from this mean value. All constraining techniques yield identical results (calculated values of the dependent variable). See: (a) A.S. Goldberger, *Econometric Theory*, John Wiley and Sons Inc., New York, 1964, pp. 218-227. (b) E. Melichar, "Least-Squares Analysis of Economic Survey Data", *Proceedings of the Business and Economic Statistics Section of the American Statistical Association, 1965*, pp. 373-385.

[4] For example, if a factor is represented, in a specified regression equation with constant terms, by three dummy variables, X_1, X_2, X_3 with original coefficients β_1, β_2, β_3, respectively, the adopted constraining technique requires omission of one variable, let us say X_1. The estimated coefficients of X_2 and X_3, let us say $\hat{C}_2$ and $\hat{C}_3$, represent estimates of $(\beta_2 - \beta_1)$ and $(\beta_3 - \beta_1)$ respectively.

present, of all ages.[5] These results are discussed in some detail before discussing the results of those regressions which controlled for: (a) wife's age, (b) place of residence (region, and metropolitan - non-metropolitan), (c) level of family's income (excluding wife's earnings). The mean of the dependent variable is .365, indicating that 36.5% of married women were in the labour force sometime during 1967.[6] The value of the overall F-statistic is 86.41 which shows that there is a highly significant association between the dependent and the independent variables.[7] The coefficient of multiple determination (R^2) is only .2004, or .1981 after correction for degrees of freedom ($\bar{R}^2$).[8] This indicates that the overall explanatory power of the regression equation is not great. However, this should not be a cause for alarm, a low R^2 is a typical and expected feature of cross-section regression analysis involving individual families as observations, because of the great relative importance of neglected factors (e.g., tastes for market-work), which create a very large random element.

The variable OWH, representing the tenure status of the family (home ownership against any other status), carries a statistically significant negative coefficient.[9] The sign of the coefficient is in conformity with the postulated hypothesis and its magnitude of – 0.035 must be interpreted to mean that the wife in a family which owns its home is about 3.5% less likely to be in the labour force than a wife of a family which does not own its home.[10]

Thus, the empirical findings support the hypothesis that home ownership increases the demand for housework and consequently reduces the probability that the wife will be in the labour force. However, the magnitude of the coefficient of this variable might have been affected (in the same direction) by the relatively stronger tastes for housework of married women who live in owned

[5] All the estimated regression equations presented in Tables A.1 to A.9, except the last equation of Table A.9, are unweighted regressions. For a brief discussion concerning weighted regression see Appendix C.

[6] It is obvious that this participation rate should be higher than the participation rate at a moment-in-time. The average participation rate, for example, in April 1968 was 27.7 (the time of the SCF68).

[7] The value of the overall F-statistic in all regressions presented in Tables A.1 to A.9 shows that there is a significant (at the 1% level) association between dependent and independent variables.

[8] Evaluation of the numerical value of this coefficient is possible only by comparison with the numerical value of the same coefficients obtained for similar studies. The R^2 in this study is higher, or at least not lower, than similar studies in the United States and Canada. For example, see G.G. Cain, *op.cit.*, and B.G. Spencer and D.C. Featherstone, *op. cit.*

[9] The test of significance is based on the t-value which is given in the brackets under the estimated individual coefficients. A t-value is the ratio of the estimated coefficient to its estimated standard error. All the significance tests in this study are conducted at the 5% level of significance, unless otherwise stated. All the t-tests conducted are two-tail tests.

[10] In discussing the effect of a variable on the wife's labour force participation we always assume "other things equal".

homes,[11] and the family's accumulated assets for which the variable OWH served as a proxy.

In contrast, in the United States both Cain[12] and Bowen and Finegan[13] used a dummy variable in their studies indicating whether or not the family owned its home, but they found no significant relationship between it and the wife's labour force participation.[14]

The coefficient of the variable AD, other adults in the family, is strongly significantly different from zero and bears a positive sign indicating that the net impact of the presence of other adults in the family is to increase the probability that the wife will be in the labour force.[15]

Spencer and Featherstone[16] in their study using Canadian data based on the "economic family" definition, and a dummy variable representing the presence of an adult other than the husband and wife in the family found that the positive effect dominates the relation between the presence of such a person in the family and wife's labour force participation. Studies using United States data found no evidence supporting any significant relation between the presence of other adults and wife's labour force status.[17]

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[11] For example, Bowen and Finegan argue that "wives who have a strong taste for staying home, working in the garden, and so on, might be expected to encourage their husbands to live in a house rather than an apartment." See Bowen and Finegan, *op. cit.*, p. 107.

[12] Cain, *op. cit.*, p. 95.

[13] Bowen and Finegan, *op. cit.*, p. 107.

[14] To the best of my knowledge, a variable indicating the tenure status – renting or home ownership – of the family has not been used in previous Canadian studies.

[15] It is worth mentioning that we have run the same regressions (for the overall sample, and by the wife's age, level of income, and place of residence) using the same set of data and the "census family" definition, which yielded 16,014 observations. In general, the estimated regressions (results are not shown) were only marginally different than those presented in Tables A.1 to A.9.

One might have expected the variable AD to behave differently in the regression based on the "census family" definition data because it includes only adult children never married and living with their parents, whereas in the case of "economic family" definition the variable includes all adult persons related by blood, marriage or adoption to husband-wife families in our sample (for the two family definitions see Chapter III, page 38, footnote 16). The regression results differ only slightly in the magnitude of the coefficient (with "census family" data the estimated coefficient was 0.044 whereas with "economic family" data 0.055). This reinforces the evidence that the presence of any "other adult" in the family increases the probability that the wife will be in the labour force.

[16] Spencer and Featherstone, *op. cit.*, see pp. 46, 55, 64, and 84.

[17] See: (a) R.N. Rosett, "Working Wives: An Econometric Study", in *Studies in Household Economic Behavior*, ed. T.F. Dernberg *et al.*, Yale University Press, New Haven, 1958, pp. 51-100. (b) Cain *op. cit.*, p. 95. He tried two variables, (i) parents living in (housework substitutes), expecting a positive effect, and (ii) other adults living in (market work substitutes) expecting a negative effect. Both variables were insignificant.

Thus, the empirical findings support a positive relation between the presence of other adults in the family and the wife's labour force participation in Canada which might perhaps be interpreted as indicating closer family relations[18] than in the United States due to socio-cultural differences.

The family income excluding wife's earnings, I-W, was introduced into the regression analysis in the form of a set of dummy variables representing eleven income groups. The reference category is the case in which I-W is less than $2,000. The dummy variable approach has the advantage of permitting us to study variations of the effect of I-W changes on the labour force participation of married women at different levels of family income, and to investigate the shape of the relationship between I-W and labour force participation. The regression results demonstrate a pronounced negative relationship between I-W and labour force participation of married women, as was expected on the basis of economic theory. All ten estimated coefficients of the dummy variables are negative, steadily increasing in magnitude from the bottom to the top of the income scale, and statistically significant. This indicates that the wife's propensity to participate in the labour force monotonically declines as I-W rises. However, there is a sharp break at the level of $6,000, below which the effect of changes in I-W on the participation rate of married women is smaller than the effect of changes in I-W above that level. Married women with I-W of $2,000 to $6,000 are 4.5% to 8.2% (depending on the income group to which they belong) less likely to be in the labour force than those who have I-W less than $2,000, whereas, married women with I-W over $6,000 are 12.7% to 33.6% (depending on the income group) less likely to be in the labour force than their counterparts with I-W less than $2,000. When the variables representing I-W are taken as a group the F-test (shown at the bottom of the column) indicates that they are statistically significant at the 1% level, which implies that the factor I-W has a strong influence on the labour force participation of married women.

These findings are, in general, consistent with the empirical results of previous studies both in Canada[19] and the United States[20] which have found a negative association between measures of family income and the wife's labour force participation.

The variable HDNW, husband did not work in 1967,[21] carries a negative and statistically significant coefficient the magnitude of which indicates that a wife with husband not in the labour force is 16.4% less likely to be in the labour force than her counterpart with labour force participant husband. At first glance, this result appears not to be reasonable nor consistent with economic theory on

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[18] By closer family relations it is meant that the Canadian family may more often include other relatives, and that adult children may remain within the family (as "family" is defined in Chapter III, page 31, footnote 1) longer.

[19] See: (a) Ostry, *op. cit.*, (b) Spencer and Featherstone, *op. cit.*

[20] See: (a) Bowen and Finegan, *op. cit.*, (b) Cohen *et al.*, *op. cit.*

[21] Recall that this category is equivalent to "husband not in the labour force".

the basis of an argument parallel with that of the "additional worker" effect. However, a possible explanation may be that the labour force status "husband not in the labour force" is more "permanent"[22] than "husband unemployed". Therefore the effect of this variable on the wife's labour force participation represents a "longer-run" response,[23] and probably strongly depends on the cause which keeps the husband out of the labour force. For example, a negative impact on the wife's labour force participation would be expected in cases such as:

(a) husband retired with his wife retired as well, and living from accumulated assets and/or their pensions or other transfer payments,[24]

(b) husband prematurely retired because of poor health requiring attention at home,

(c) both husband and wife are attending school.

On the other hand, a positive effect on the labour force participation of married women would be expected when only the husband is attending school, or if he is out of the labour force because of structural unemployment.[25]

Spencer,[26] using Canadian data, found that a married woman whose husband is not in the labour force is more likely to be in the labour force than her counterpart whose husband is a labour force participant. However, in separate regressions by the age of wife the coefficient of the variable "husband not in the labour force" was almost in all cases statistically insignificant.[27]

Bowen and Finegan found[28] that the "adjusted"[29] labour force participation rate of all married women 14-54 years old with husband not in the labour force was significantly lower than their counterparts with unemployed husbands[30] but not significantly different than those with husbands at work. However, when they extended their analysis to older married women, 55-64 and

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[22] Especially in this study in which the information on the labour force status of the husband applies to the whole year.

[23] The additional worker effect is a short-run response.

[24] In the overall sample there were 1690 married women whose husbands were not in the labour force during 1967; 447 and 909 of those married women were in the age groups 55-64 and 65 and over (retirement age) respectively, and 1,222 families out of those 1,690 had family income excluding wife's earnings less than $4,000.

[25] Moreover part of the lower labour force participation of married women with husbands not in the labour force might be due to special family and personal characteristics of this group which are not controlled in the regression with the variable HDNW which stands as a proxy for those characteristics.

[26] B.G. Spencer, *Determinants of the Labour Force Participation of Married Women: A Micro-Study of Toronto Households,* Working Paper No. 72-08, Department of Economics, McMaster University, Hamilton Ontario, March, 1972.

[27] Notice that Spencer's study was based on a restricted sample of husband-wife families including only once-married women under 45 years old and living in the Metropolitan Toronto area.

[28] Bowen and Finegan, *op. cit.*, pp. 147-154, and 323-325.

[29] For the definition of the "adjusted" participation rates see Chapter II page 25, footnote 48.

[30] They interpret this finding as a supporting evidence of the hypothesis that transitory decreases in the husband's earnings have a stronger effect on the labour force participation of married women than "permanent" reductions in husband's earnings.

65-74 years old, there was an apparent reversal of the pattern with lower labour force participation of married women with their husbands not in the labour force than their counterparts with their husbands still in the labour force (at work or unemployed).

Cohen,[31] using United States data for all married women, husband present, 22 years old and over, found that married women whose husbands are not in the labour force are less likely to be in the labour force themselves than their counterparts with husbands in the labour force. This result is in agreement with the findings of the current study.[32]

The variable HWU, representing the husband's weeks of unemployment in 1967, was used to reflect the effect of transitory loss in family's income. The expectation was that HWU would have a positive effect on the wife's labour force participation. The coefficient of this variable carries a negative sign and it is statistically insignificant as well. This result appears rather puzzling. However, this variable should be interpreted in conjunction with the I-W variable which represents the reported family income, excluding wife's earnings, for 1967.[33] Such an interpretation reveals that there is an overall positive effect on the wife's labour force participation. For example, if the husband had a loss of $1,000 because he was unemployed for some weeks in 1967 the reported family income I-W will be lower by this amount from the "normal" level of family's I-W. This would place the family to a lower income group, let us say from I-W6 to I-W5. The difference between the coefficient of I-W6 and I-W5 is 0.045 which indicates that the wife's probability of being in the labour force is increased by 4.5% because of the unemployment of her husband.[34,35] The magnitude of the positive effect

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[31] Cohen, M.S., *et al.*, *op. cit.*, pp. 75-76.

[32] In Cohen's study a set of dummy variables representing the husband's employment status – unemployed, employed, and not in the labour force – was used with reference category "husband unemployed". In another specification interaction variables between wife's age and "husband not in the labour force" were introduced into the regression equation. In this case, the coefficient of the variable "husband not in the labour force", for the age group 22-34 years old, turned out to be positive but statistically insignificant indicating no significant difference between this category and "husband unemployed" category. The interaction variables for all the other age groups bear significant negative coefficients larger in magnitude (after correcting for the coefficient of the reference category, 22-34 years old) than the negative coefficient of "husband employed" category. These results are quite similar to the findings of the current study (See Tables A.1 to A.4, regressions by wife's age) when one considers the differences in the age groups specified in the two studies.

[33] A feature of the data used in this study is that the length of the observation period is one year and the information concerning both HWU and I-W apply to the same year.

[34] Even if the negative coefficient of HWU was statistically significant the overall effect of husband's unemployment on the wife's labour force participation would be positive because of the small magnitude of this coefficient. In the above example, if the income loss was due to husband's unemployment of 10 weeks the positive effect would be reduced to 0.043.

[35] In another specification of the model the variable I-W was omitted. This led to a statistically significant positive coefficient of HWU of the magnitude of 0.011 which provides additional support for the above argument. Furthermore, in a specification in which HWU was omitted the coefficients of all the remaining variables and their t-values remained almost the same.

depends on the duration of husband's unemployment,[36] his weekly earnings, and the "normal level" of family's I-W.[37]

This finding, that the unemployment of husband has a positive effect on the labour force participation of married women, is consistent with the "additional worker"[38] hypothesis, and the empirical evidence of previous studies. However, some points can be raised concerning the independent variables used and their interpretation in these studies:[39]

(a) The information concerning the employment status of the husband applies to the time of survey whereas the reported family income refers to the preceding year. Although current employment status should affect current income, there is no reason to expect that the variables actually used accurately reflect this effect.

(b) In these studies (including the current one) there is no appropriate control variable for the local labour market conditions. Consequently, the coefficient of the variable "husband unemployed" is probably capturing some of the discouraged-worker effect.[40] Therefore different bodies of survey data (collected at different times) may yield different results concerning the effect of husband's employment status on the wife's labour force participation, depending on the local labour market conditions at the time of survey.

(c) A "pure"[41] additional worker effect can be estimated from the data of a survey if the following conditions are satisfied:

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[36] Spencer used a variable, "duration of husband's unemployment last year", to investigate the effect of duration of husband's unemployment on the wife's labour force participation and he found "that a wife is more likely to be in the labour force if her husband was unemployed more than one week than if he was not. The effect is especially strong if he was unemployed for less than two months". However, he does not interpret his results in conjunction with the income variable, in spite of the fact that the information for both variables apply to the same year. See Spencer, *op. cit.*, p. 18.

[37] The means of the variable HWU for families with I-W, below $4,000, from $4,000 to $7,999, and $8,000 and over are 4.68, 1.42 and 0.64 respectively (this mean depends on the percentage of the families, in each category of I-W, with husband unemployed sometime during 1967 and the duration of his unemployment). In any event, it may be interpreted as an indication that unemployment is either more frequent or each spell is of longer duration in the low income category.

[38] Additional workers are defined as persons "who are in the labour force because the usual breadwinners in the family are unemployed and who, if this were not the case, would not seek work". See W.S. Woytinsky, *Three Aspects of Labour Dynamics*, Social Science Research Council, Washington, p. 105.

[39] See: (a) Bowen and Finegan, *op. cit.*, (b) Cohen *et al.*, *op. cit.*, (c) Spencer and Featherstone, *op. cit.*

[40] This point was mentioned by Bowen and Finegan, however, they believe that the correlation between "the unemployment of particular husbands and the unemployment rates in the areas in which they lived" is very weak. Bowen and Finegan, *op. cit.*, p. 149.

[41] This "pure" effect will include the positive incentive for married women to enter the labour force because of the transitory loss in family's income due to husband's unemployment, and the positive effect which will stem from the fact that the husband, being unemployed, may well substitute for the wife in the performance of some housework (e.g., child-care).

(i) both the family's income variable and the employment status of husband refer to the same period, and the income variable is adjusted for the transitory loss due to husband's unemployment so that it will represent the "normal" level of family's income, excluding wife's earnings,

(ii) an appropriate variable is included in the model to control the local labour market conditions, and

(iii) the variable "husband's weeks unemployed" is weighted by the husband's weekly earnings so that it will reflect the transitory loss of family income.

Occupation of husband, OCCH, appears to have a statistically significant influence on the wife's labour force status. The set of dummy variables representing husband's occupation taken as a group is significant at the 1% level. Three of the individual occupation variables are significant. The general pattern which emerges from the regression coefficients, which is not completely in agreement with the postulated hypothesis, indicates that the highest propensity to participate in the labour force occurs among women married to men in the clerical occupation group, and the lowest among women with husbands in the "blue collar" occupation group. The wives of professionals show a relatively low propensity to participate in the labour force, ranking second from the bottom of the scale, and married women with husbands in the remaining occupations show no significant difference in their labour force participation from that of wives with husbands in the managerial occupation – the reference category.[42]

Having discussed the variables HDNW, I-W and OCCH, one point deserving comment is that in another specification of the model the variables HDNW and OCCH were omitted. This led to statistically insignificant coefficients for the I-W variables below the $6,000 level.[43] The most apparent explanation is that introduction of the variables HDNW[44] and OCCH into the model, by capturing the independent effect of husband's occupation, permits the I-W variable to single

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[42] No attempt is made to explain the pattern which emerges from the empirical findings because we believe that there are many complicated factors for which the occupation of husband may stand as a proxy: for example, OCCH may stand as proxy for the family's expectations concerning future income, economic incentives and differences in satisfactions, goals, and aspirations, social values and subjective welfare, etc. Also, there may be multicollinearity among OCCH, EDW and I-W.

Furthermore, no comparison with the empirical findings of other studies is made because differences in definitions and classifications of occupations would render this difficult or meaningless. For empirical results and some explanations provided in attempting to explain their findings, see: (a) Ostry, *op. cit.*, pp. 33-35 and (b) Bowen and Finegan, *op. cit.*, pp. 154-158.

[43] It was found in a previous Canadian study that differences in the income of family's head below the level of $6,000 has no effect on the wife's labour force participation. See Spencer, *op. cit.*, p. 11. Notice that Spencer has no variable representing husband's occupation in his model.

[44] The variable HDNW, husband did not work in 1967, indicates no occupation in 1967 and serves as an "occupational category".

out the "pure" effect of family's income on the labour force participation of married women.[45]

The region, REG, in which the family lives and the place of family's residence, RES (rural-urban, size of city), were introduced as independent variables neither as "determinants" of the labour force status of married women nor as proxies for specific variables, but in order to capture some of the effects of a number of unquantifiable factors or of factors for which data were not available. In a vast country like Canada one should expect significant differences between regions in a number of factors such as: labour market conditions, seasonal fluctuations, wife's potential earnings,[46] socio-cultural background, quality and fields (classical, non-classical, etc.) of education, and population composition.[47] Further, the place of family's residence should be expected to affect the decision of married women concerning their labour force status. Urban married women have more employment opportunities open to them than their rural counterparts, social and family attitudes in urban areas may be less conservative towards market work of married women, and housework substitutes are more available in urban than in rural areas.

The empirical findings reveal that both variables REG and RES have a significant impact on the labour force participation of married women. Both sets of dummy variables are significant at the 1% level. All the individual coefficients of the dummy variables representing the regions and the size of the urban center in which the family resides are positive and statistically significant.[48] The pattern which emerges is that married women in the Prairie Provinces have the highest, and married women in eastern Canada (Quebec, Atlantic provinces) the lowest propensity to participate in the labour force, with those married women in Ontario and British Columbia ranking second and third (from highest to lowest)

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[45] Husband's earnings is the major component of I-W, therefore a correlation should be expected between I-W and husband's occupation. A simple relation between labour force participation of married women and I-W would underestimate the family's income effect on the wives' labour force participation by failing to allow for the fact that "high occupation" is associated with high I-W and vice versa. The "occupational" variable HDNW is capturing the effect of a special case. The participation rate of wives with husband not in the labour force in 1967 was only 16.6%, whereas 72.3% of those families had I-W less than $4,000. Omission of the variable HDNW alone from the model had the effect of drastically reducing the magnitude of the coefficients of I-W. For an explanation of how using dummy variables adequately allows for the problem of correlation between two variables, without interaction between them, see J.N. Morgan and J.A. Sonquist, "Problems in the Analysis of Survey Data and a Proposal," *Journal of American Statistical Association*, June 1963, pp. 415-434.

[46] F.T. Denton, *An Analysis of Interregional Differences in Manpower Utilization and Earnings*, Economic Council of Canada, Staff Study No. 15, Queen's Printer, Ottawa, April, 1966.

[47] S. Ostry, *Provincial Differences in Labour Force Participation*, Dominion Bureau of Statistics, 1961 Census Monograph, Queen's Printer, 1968.

[48] The reference categories of REG and RES are Quebec and rural areas respectively. The urban centers are represented by three dummy variables according to their size (see Appendix A).

respectively. Urban married women demonstrate a higher tendency to be in the labour force than their rural counterparts. These findings are consistent with the empirical evidence of previous Canadian studies.[49] Differences in the size of the urban center in which the family lives do not seem to have any substantial influence on the decision of married women to enter the labour force since the magnitude of the three coefficients of the variables representing the size of the urban center differ only marginally.

The five dummy variables of EDW, representing the level of wife's education, are all statistically significant at the 1% level, either as a group or individually considered. The wife's education shows a marked positive relation to her market work and this positive effect rises with educational attainment, e.g., a married woman who has completed high school is 18.2% more likely to be in the labour force than a married woman who has not completed elementary school (reference category), whereas a married woman with university degree is 30% more likely to be in the labour force than her counterpart in the reference category.[50]

The wife's education is used as a proxy variable for her market potential earnings. However, it must be emphasized that the magnitudes of the positive coefficients of EDW most probably over-estimate the positive effect of market potential earnings[51] because the variable EDW is likely capturing some of the effect of non-pecuniary aspects of more pleasant and interesting jobs available to women with higher education, tastes for market work, and greater employability of more educated women.[52]

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[49] See (a) Ostry, *The Female Worker in Canada, op. cit.*, and (b) Spencer and Featherstone, *op. cit.*

[50] The relatively small increment in the probability of labour force participation of married women with university degree compared with those married women with some college or university education is puzzling. An explanation might be that the latter category may include, apart from "drop-outs", all those married women with vocational and technical training who may be strongly attached to the labour force.

[51] Assuming that EDW is a good proxy for the wife's market potential earnings and it is capturing the whole effect of this variable.

[52] In addition, Bowen and Finegan argued that "there are some spurious positive relations to be expected which we cannot control. There are good reasons to think that educational attainment is positively related to intelligence, to ambition, and probably to physical and mental health as well – and that these characteristics are in turn related to labour force participation". We do not agree with this argument because in a great many cases the educational attainment of a person depends on factors external to him (her) such as place and time of birth, family and social environment, financial position of his (her) family, educational systems, etc. See W.G. Bowen and T.A. Finegan, "Educational Attainment and Labour Force Participation", *American Economic Review, Papers and Proceedings of the American Economic Association,* May 1966, pp. 567-582.

The general finding of a pronounced positive relation between wife's education and her labour force membership is consistent with both the postulated hypothesis and the findings of the previously mentioned Canadian and United States studies.

The four dummy variables, IMS, representing the wife's immigration status, as a group, appear to be significant at the 1% level. The coefficients of the individual variables within the group reveal that immigrant married women demonstrate a different pattern of labour force participation compared to their Canadian-born counterparts, which is the reference category. The impact of being an immigrant married woman on her labour force participation depends on the length of time she has been in Canada. Three dummy variables were constructed to be used in describing the immigrant married women's length of time in Canada.[53] The variable IMS4 represents immigrant married women at the early period of their arrival in Canada (1965 to April 1968). The positive but insignificant coefficient of this variable supports the hypothesis that immigrant wives, even at the early period of their immigration, offer market work at least as much as their Canadian-born counterparts. IMS3 represents those married women who landed in Canada from 1946 to 1964. The positive and significant coefficient of this variable supports the hypothesis that immigrant married women have a higher labour force membership than their native Canadian counterparts. The magnitude of the coefficient indicates that immigrant wives are 4.7% more likely to be in the labour force than the Canadian-born married women. The negative and statistically insignificant coefficient of the variable IMS2, which represents those immigrant wives who arrived in Canada before 1946, indicates that this category of immigrant married women have labour force behaviour similar to their Canadian-born counterparts.[54] These findings are consistent with the postulated hypothesis that the immigrant wife will demonstrate a higher propensity to participate in the labour force than her Canadian-born counterpart, until she is integrated into the Canadian social and cultural stream.

The child status variable, CH, has an important bearing on the labour force participation of married women, as is indicated by the magnitudes of the individual coefficients and their statistical significance at the 1% level, as well as by the strong statistical significance of the three CH dummy variables as a group.

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[53] The time intervals were arbitrarily assigned. We thought that immigrant women at least for three years after their arrival in Canada, will face problems of communication (those who do not speak either of the official languages) and adaptation to a new socio-cultural environment, which problems will relatively reduce their propensity to participate in the labour force. The second time interval, 1946 to 1964, was hypothesized to be long enough for permitting the immigrant women to be assimilated into the Canadian social and cultural stream. Thus, those immigrant women who landed in Canada before 1946 were expected to have labour force behaviour similar to their Canadian-born counterparts.

[54] The category "not ascertained" represented by IMS5 is not a useful classification from a research standpoint and any attempt at interpreting the meaning of the coefficient will only be speculation.

The reference category represents families without any children under 16 years old. The empirical findings reveal that the presence of young children in the preschool age alone, variable CH1, or together with children 6 to 15 years old, variable CH3, is a strong deterrent to mother's market work. The probability that a wife will be in the labour force is about 34% lower if there is at least one child under 6 years old present, whether alone or in a combination with children 6 to 15 years old, than if there are no children under 16 years old. This strong negative effect of the presence of youngsters on the mother's labour force participation seems to be reasonable, since children in the preschool age require more attention and care and their presence in the family increases the value of the mother's presence in the home. Furthermore, this strong negative effect seems to dominate and outweigh all the effects which one might argue are associated with the presence of older children and which would reduce the burden of the wife's housework, e.g., older children could look after young children or take over part of the housework.

Married women with only children 6 to 15 years old living at home, variable CH2, are 12.3% less likely to be in the labour force than their counterparts without children under 16 years old living at home. The presence of children only in this age range seems to be a deterrent to the wife's labour force participation, however not as strong a deterrent as the presence of preschoolers.[55] These findings show that the age of children has a great deal to do with the influence of their presence on the decision of married women to allocate their time.

This empirical evidence is, in general, consistent with previous studies and in agreement with the postulated hypothesis that the presence of young children, in particular children of preschool age, increases the demand for housework and consequently the cost of housework, and the value of the wife's presence in the home.

The set of dummy variables AGE, representing the wife's age, turned out to be significant at the 1% level, either as a group or individually considered. The hypothesized negative relation between wife's age and her labour force participation is strongly supported by the coefficients of all the individual AGE variables. The reference category is the age group "less than 25 years old". Thus, married women in the age brackets 25-34, 35-44, etc., are 9.8%, 17.3%, etc., respectively, less likely to be in the labour force than their counterparts who are less than 25 years old. The regularity of the wife's declining probability of being in the labour

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[55] Two previous Canadian studies in analysing the labour force participation of married women, in the "all ages" group, suggest that the presence of children in the age ranges 6-14 years old alone is not a deterrent to the wife's labour force participation. However, in investigating the labour force participation of married women by age groups they found evidence that the presence of children in the age groups 6 to 14 is a deterrent to wife's market work. See (a) Spencer and Featherstone, *op. cit.*, pp. 45 and 52-54, and (b) Allingham and Spencer, *op. cit.*, pp. 14 and 16-17.

force as her age increases, up to the age group 45-54, is impressive. In the next two age categories (55-64 and 65 +) the negative increments are larger, but it is reasonable to assume that these larger increments of declining probability are due to earlier retirement of married women compared to men.

A further consideration is that the negative effect of age per se might probably be overestimated because the age variable might serve as a proxy for other factors which negatively affect the wife's labour force participation; factors which are not controlled in the model. Such factors are: (a) age discrimination, which is a common practice, in particular for women, (b) family's asset accumulation, since the probability of having accumulated assets increases with the length of time married, and (c) expected future family income, excluding wife's earnings.[56]

The negative relationship between wife's age and her labour force participation is supported by evidence of previous studies.[57]

The preceding model, with the same explanatory variables, except age, was estimated for six age-of-wife groups in an attempt to investigate different patterns of labour force behaviour and differential impacts of the various factors on the labour force participation of married women from one age group to another. The estimated equations are presented in Appendix A – Tables A.1 to A.4.

Next we discuss briefly the general picture that emerges with respect to the labour force participation rate, the explanatory power of the regression equations, and the behaviour of the various explanatory factors in the age-of-wife groups. The peak participation rate, 59.9% occurs in the age group less than 25 years old. Thereafter, the labour force participation of married women is gradually declining up to the age group of 35-44 years old, and rising to a second peak, although lower than the first one (39.0%), at the age group 45-54.[58] After the second peak

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[56] Mincer found that the labour force participation response of married women to transitory family income is very strong. The expected future income – "permanent income" – of young husbands, in particular educated husbands, is higher than their current income. Thus, the young wives' response to the negative transitory income will be to join the labour force. See J. Mincer, *op. cit.*

[57] See: (a) Spencer and Featherstone, *op. cit.*, p. 70, (b) Spencer, *op. cit.*, p. 13, and (c) Allingham and Spencer, *op. cit.*, p. 14.

[58] Some explanations for the two-peaked participation profile of married women might be that: (i) married women in the youngest group (first peak) respond strongly to the negative transitory component of the family income I-W (see footnote 55 of this chapter), and in addition, this age group includes almost all the newly married couples without children and with strong financial needs, (ii) the age group 45-54 years old (second peak) consists of wives with reduced childcare responsibilities (their children are at school or they have left home) which increases the probability that married women will "re-enter" the labour market.

This two-peaked participation profile of married women has been noticed in previous Canadian studies using 1961 Census data. See: (a) Ostry, *The Female Worker in Canada, op. cit.*, and (b) Allingham, *Women Who Work: Part I, op. cit.*

the participation rate is declining again with a sharp drop in the 65 and over age range.

The total explanatory power of the regression equations is continually decreasing with increasing age groups. The R^2 and $\bar{R}^2$ are .3269 and .3115, respectively, in the regression equation for married women less than 25 years old, gradually reaching their minimum values of .0997 and .0707, respectively, in the regression equation for the oldest group, 65 years old and over. This continual decline of the total explanatory power of the regression equations indicates that the element of random variation is increasing along with increasing age.

The variable OWH,[59] representing the family's tenure status (home ownership against any other status), consistently carries a negative sign but its coefficient is statistically insignificant in all age groups compared with the negative and significant coefficient of this variable in the "all-observations" case. A plausible explanation might be that separation of the observations by the wife's age (which groups the families in stages of the life cycle) makes the sample for each group more homogeneous, and may result in increasing multicollinearity which affects the magnitude of the estimated coefficients, their standard errors, and consequently the t-values of the coefficients.[60]

The impact of the presence of other adults in the family, variable AD, on the wife's labour force participation is positive and statistically significant in all regression equations by age classification, as it was when all ages were considered together. However, the magnitude of this positive effect is declining after the group 25-34 years old. The decline of this positive effect along with the wife's age might be rationalized on the grounds that young wives are more apt to enter the labour force because of stronger financial needs, lack of accumulated assets, and lower present than expected future family income but they stayed home because of the presence of young children. Thus, availability of a suitable housework substitute (another adult) in the home increases the propensity of a young wife to enter the labour force more than her older counterpart.

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[59] The comments on the explanatory variables refer to all age groups except the oldest one, 65 years old and over. For this age group (and perhaps the age group 55-64) a separate study should be carried out taking into consideration other important factors affecting the labour force status of older people, e.g., the social security system, private and public pension plans, accumulated assets, welfare payments, property income, employment opportunities for aged people, age discrimination, etc.

[60] For a discussion of how multicollinearity affects the least-squares estimates of the coefficients, their standard errors and t-values, see: A.G. Goldberger, *Econometric Theory*, John Wiley and Sons, Inc., New York, 1964, pp. 192-194.

The reader is reminded that "multicollinearity is a matter of degree rather than of all or nothing" and "multicollinearity is a property of the sample data and not of the population". See A.G. Goldberger, *Topics in Regression Analysis*, The MacMillan Company, New York, 1968, p. 80.

The husband's weeks of unemployment in 1967, variable HWU, carries a statistically insignificant coefficient which is negative for the first two age groups. Thereafter, the coefficients turn out to be positive with increasing magnitude along with age group. This might be interpreted as indicating that the additional worker effect is stronger for older married women than their younger counterparts. However, the reader must remember that this variable should be interpreted in conjunction with the variable representing the family's income, I-W.

The variable "husband did not work in 1967", HDNW, bears a negative coefficient which is statistically significant in all regression equations except for the age group 25-34, as it was in the "all-observations" case. However, there is no particular pattern in the behaviour of this variable. The magnitude of the coefficient fluctuates from one age group to another.

The region in which the family lives appears to have a significant impact on the wife's labour force participation decision in all age classifications, except the less than 25 years old age group, as indicated both by the statistical significance of the group as a whole (F-value) and the significance and magnitude of the individual coefficients within the group. The general pattern that emerges, for all age groups except the youngest one, is quite similar to the one described previously for the case of "all-observations" regression equation. The regional factor does not seem to influence the decision of married women less than 25 years old in choosing their employment status. A plausible explanation might be that economic pressure on many young wives to find a job may be very strong, outweighing the importance of regional differences in other factors, and/or that the influence of socio-cultural factors affecting attitudes towards market work of married women had diminished substantially for the currently young people.

The set of dummy variables RES, representing the family's place of residence, urban-rural (if urban the size of the city) remains, as in the aggregate case, statistically significant in all regression equations, except the one for the 55-64 years old age bracket. However, the magnitude and statistical significance of the coefficients of individual variables within each group indicates, in contrast to the aggregate regression, that the size of the centre where the family lives is a factor affecting the decision of married women (in some age groups) in allocating their time.

The F-values for the sets of dummy variables representing the family income less wife's earnings, I-W, reveal that this factor is statistically significant in all five age regressions. The negative coefficients of all individual variables (with an exception of four positive but insignificant coefficients in the 25-34 age group) in all age brackets show that the negative relationship between I-W labour force participation holds for all ages. However, at the lower range of I-W, in particular the two younger groups, the individual coefficients are statistically insignificant.[61] In addition it is observed that the negative impact of the family income factor, by and large, is stronger for older married women than their younger counterparts.

As a group, the occupation of husband variables, OCCH, are significant in three age group regressions and insignificant in the other two (25-34 and 45-54).[62] The individual occupation variables behaved without any pattern, and only a few of them are statistically significant in some age groups.

The strong positive impact of the wife's education on her labour force participation, revealed in the aggregate regression equation, is supported for all age groups as indicated by the magnitude of the positive individual coefficients and their statistical significance at the one per cent level (with the exception of EDW2 which is insignificant in most cases), and the statistical significance of the set of dummy variables EDW as a group in all age-of-wife estimated equations. The general pattern, indicated in the "all-observations" regression, of a steadily rising positive effect along with the wife's educational attainment is observed in each age category, with a puzzling performance, in some age groups, of the variable EDW6, representing wives with university degree, which carried a positive and significant coefficient lower in magnitude than the coefficient of the variable EDW5, representing wives with some college or university education.[63]

The results of the aggregate equation indicated that immigrant wives have different labour force behaviour than their Canadian-born counterparts until they are assimilated into the Canadian social and cultural life. The regression results for the specific age groups imply that the immigrant wife's age plays an important role in her labour force behaviour. The variables IMS are insignificant, either as a group or individually considered, for the age groups less than 25 and 55-64. This might be interpreted as indicating that the wife's age at the time of immigration is important in explaining her labour force behaviour. Those who immigrated at a young age may be integrated rapidly into the Canadian social and cultural stream,

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[61] Lack of sensitivity in the labour force participation of young married women to changes of I-W in the low range of family income may be the result of a combination of factors such as: (a) young wives may still be at school with their husband at school as well; such families will fall in the low range of I-W; and (b) young wives with husbands with low earnings, probably have low market earning ability and low employability, both of which will not encourage them in entering the labour force when there is a change in I-W, in particular when young children are present.

[62] We have estimated the same equations, for these two age groups (25-34 and 45-54), by considering all the variables of I-W and OCCH together as one group (results are not shown). The two factors together as a group were statistically significant at the 1% level as indicated by the F-test.

[63] In the youngest age group, less than 25 years old, variable EDW5 representing wives with some college or university education carries a coefficient lower in magnitude than the coefficient of the variable EDW4 representing wives who finished high school. An explanation may be that married women who were still enrolled in school were not excluded from the sample.

whereas those who immigrated at an older age, let us say late forties, may not have improvement of their financial position as their motivation (e.g., parents desire to join their children, forced immigration for political reasons), so that they do not demonstrate a different labour force behaviour than their native Canadian-born counterparts. The variables IMS, as a group, in the remaining age groups are statistically significant (in the 45-54 age group only at the 10 per cent level), and their individual coefficients in each group demonstrate a pattern of immigrant wives labour force behaviour similar to the one revealed by the all ages regression equation (with a deviation in the 25-34 age group where the variable IMS3 is not significant).[64]

The negative association, and a similar pattern with the one revealed by the "all-observations" equation, between the presence of children (in all three child status categories) and the wife's labour force participation are present in all estimated equations controlled for the wife's age. The child status factor CH is statistically significant at the 1% level in each of the four age groups, and all the individual coefficients are negative[65] and significant (except CH1 in the 45-54 age group). However, this negative effect is weaker for the older wives (35-44 and 45-54) than their younger counterparts, as the magnitude and statistical significance of the individual coefficients indicates.

Three separate equations, in the same form as the aggregate one, were estimated in attempting to investigate the existence of differences in the labour force behaviour patterns of married women in different income groups.[66] The results are presented in Appendix A – Tables A.4 and A.5.

The mean of the dependent variable shows that the highest labour force participation rate of married women occurs in the middle-income group 41.3%, compared with 32.1% and 31.6% in the low-income group and upper-income group respectively. The striking lower participation rate in the low-income group, compared with the participation rate in the middle-income group, might be partially explained by the fact that the low-income group includes most of the families with husband not in the labour force in 1967 whose wives were of the retirement age (see footnote 24 in the current chapter). Moreover, "poverty" is associated with: (a) personal characteristics which reduce the employability of the

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64 This might be interpreted as reinforcing the previous argument that immigration at a young age may speed up the assimilation into the Canadian stream of social and cultural life.

65 The variable CH2, in the less than 25 years old group, was included in the equation because some families might have children in this age category (6 to 15 years old) from previous marriage of the husband or under guardianship. Its coefficient is positive and insignificant.

66 These observations were classified on the basis of the family's income excluding wife's earnings, I-W, into three income groups. We regarded families with I-W ⩽ \$3,999 as the "low-income" group, families with \$4,000 ⩽ I-W ⩽ \$7,999 as the "middle-income" group, and families with I-W ⩾ \$8,000 as the "upper-income" group.

individual (e.g., educational achievement,[67] training, and health), (b) reduced labour market information concerning job opportunities, and perhaps reduced geographical and occupational mobility. All these factors should have an inverse effect on the labour force participation of married women in the low-income group.

The total explanatory power of the regression equations is declining as we move from the low-income group ($R^2 = 0.27$, $\bar{R}^2 = 0.26$) to the middle-income group ($R^2 = 0.22$, $\bar{R}^2 = 0.21$) and upper-income group ($R^2 = 0.12$, $\bar{R}^2 = 0.11$) indicating that the element of random variation increases with increasing income level.

The variable OWH bears a consistently negative and significant coefficient (at the 10% level in the high-income group) but the magnitude of the negative effect is stronger at the low and upper-income groups. HDNW is negatively associated with the labour force participation of married women, statistically significant, with declining magnitude of the coefficient with rising income group. Whereas the variable AD carries a positive and statistically significant coefficient (except in the low-income group)[68] with increasing magnitude as we move from the low to the upper-income group.

The sets of dummy variables representing region, REG, education of wife, EDW, child status, CH, and wife's age, AGE, are statistically significant in all three income groups. An examination of the individual coefficients of dummy variables within groups reveals that, in general, the same pattern which was described in the "all-observations" regression concerning these factors reappears in all three income groups. However, their impact, positive or negative, on the labour force participation of married women is much stronger in the middle-income group (with the exception of REG) than in the other two income categories. The set of dummy variables representing place of residence, RES, is statistically insignificant in the upper-income group, either as a group or individually considered, indicating that the place of family's residence, urban or rural, and the size of the city where the family lives, do not affect the labour force behaviour of "well-to-do" married women. In the other two income groups the wife's probability of being in the

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[67] The sample distribution of married women with educational achievement of finished high school, some college or university education and university degree, is as follows: low-income group, 13.6%, 2.7%, 1.2%, middle-income group, 23.3%, 4.2%, 1.7%, and upper-income group, 32.0%, 7.4%, 5.2% respectively.

[68] A possible, but speculative, explanation for the insignificant coefficient of AD in the low-income group, might be that families in this income group cannot afford to have other adults (parents of either husband or wife, etc.) living with them, and their own children leave home as soon as possible trying to escape "poverty". This argument is supported to some extent by the data. The mean of the variable AD is .22 in the low-income group, .37 in the middle-income group, and .89 in the upper-income group.

labour force is affected by the place of family's residence, as is indicated by the magnitude and statistical significance of the individual coefficients of the RES variables.

The IMS variables, representing the wife's immigration status, are insignificant, either as a group or individually considered, in the low-income group. This finding may be interpreted as implying that the labour force behaviour of the "poor" married women is independent of their immigration status. The IMS variables, as a group, are significant in the other two income groups (at the 10% level for the upper-income group), and the individual coefficients of the variables demonstrate the same pattern as in the aggregate regression equation.

The statistical significance of the I-W variables in all three income groups indicates that the level of I-W, even within each income group, has a significant influence on the decision of married women to participate or not to participate in the labour force. The set of dummy variables representing the husband's occupation, OCCH, is statistically significant in all three income groups (at the 10% level for the upper-income group).

The husband's unemployment in 1967, HWU, is positively related to the wife's labour force participation only for the low-income group, and statistically insignificant both for the low and upper-income groups. The striking result is that the negative coefficient of HWU is highly statistically significant for the middle-income group. However, interpreting the results in conjunction with the I-W variable, as they should be, the positive "additional worker" effect on the wife's labour force participation is supported in all three income groups. Furthermore, the magnitude of this effect depends on the duration of husband's unemployment, his weekly earnings, and the "normal level" of family's income I-W. For example, let us assume that the husband, in a family of the middle-income category with "normal level" of I-W from \$7,000 to \$7,999 (I-W7), was unemployed for 10 weeks in 1967 and reported income I-W of \$6,500; this would place the family in the I-W6 category, and the wife's probability of being in the labour force would increase overall, because of her husband's unemployment, by 1.9 percentage points (0.109 – 0.060 – 0.003 x 10 = 0.019).[69]

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[69] In this example, if the duration of husband's unemployment was short, let us say three weeks, such as to leave the family in the same I-W category, the overall effect would be negative but very weak (i.e., – 0.003 x 3 = – 0.009). This may indicate that the variable HWU is capturing some of the discouraged worker effect since we do not use any appropriate variable to control for labour market conditions. In addition this might be interpreted as indicating that the discouraged worker effect is stronger in the middle-income group, compared to the other two income categories. Furthermore, the same model, modified by omitting variables I-W, was estimated for the three income groups. The estimated coefficients of the variable HWU were as follows: low-income group, 0.0013 (significant at 10% level, t-value = 1.95), middle-income group, – 0.0020 (significant at 5% level, t-value = – 2.01), and upper-income group, – 0.0001 (insignificant, t-value = – 0.06). It is interesting to note that the coefficients of all the remaining variables and their t-values changed marginally in this specification. These results, in relation to the incidence and duration of husband's unemployment in the three income groups (see footnote 37 in the current chapter), support the preceding arguments.

The estimated equations shown in Appendix A – Table A.6 – are based on a subdivision of the observations according to the family's place of residence in a metropolitan[70] area against any other place of residence.

The labour force participation rate of married women in metropolitan areas is higher by 7.8%, compared with the participation rate of their counterparts living in all other areas. This is not a surprising result because married women in large urban centres: (a) are exposed to many more opportunities for paid employment, (b) perhaps have access to a more adequate system of labour market information and transportation, (c) face more liberal social attitudes towards gainful employment of married women, and (d) have available more market goods substitutes for home produced goods (e.g., restaurants and dry cleaners). In addition, women living in large cities have easier access to education, and residence in metropolitan areas may reduce the fertility rate, which consequently reduces the family's size. All these factors facilitate and encourage the entrance of married women into the labour force.

The element of random variation is larger in the equation for non-metropolitan areas, as it is indicated by the lower total explanatory power of the equation ($R^2 = 0.185$, $\bar{R}^2 = 0.179$), compared with the overall explanatory power of the equation for metropolitan areas ($R^2 = 0.213$, $\bar{R}^2 = 0.210$).

The regression results indicate that there is a differential impact of certain explanatory variables and factors on the labour force participation of married women in the two "areas". The variables OWH, HDNW, and the factors education of wife, EDW, and husband's occupation OCCH, have a stronger effect on the non-metropolitan wives' labour force participation. In particular, the wife's education "post high school", variables EDW5 and EDW6, demonstrates a much stronger positive effect on the participation of non-metropolitan married women. This may be caused by relative scarcity of well educated women in the non-metropolitan areas,[71] since one should expect well educated women to move to large cities searching for more opportunities (in particular those who are married to well educated men because of more employment opportunities for their husbands in large cities). In contrast, variable AD and the variables representing child status and wife's age, reveal a weaker effect on non-metropolitan wives' labour force participation. The weaker effect of AD and child status might be interpreted as indicating that there may be better substitutes available for mother's work in the home (e.g., relatives and neighbours for

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[70] Any centre with population of 30,000 and over is defined as a metropolitan area.

[71] The sample distribution shows that there are 5.4% of married women with some college or university education, and 3.1% with university degree in metropolitan areas, whereas the corresponding percentages in non-metropolitan areas are 3.8 and 1.8, respectively.

babysitting) in non-metropolitan areas than in large cities, and/or lower price of outside help.[72]

The variable HWU is insignificant in both regressions, whereas the region and family's income factors have a significant and quite similar impact on the labour force status of married women in both regressions, with some peculiarities of the individual coefficients of I-W. The variables representing family's residence, in the non-metropolitan case, demonstrate once again the significant influence of urban-rural residence on the labour force status of married women.

Finally, the wife's immigration status is a significant factor affecting the decision only of metropolitan married women in allocating their working time. The variables IMS are statistically significant, as a group, and their individual coefficients demonstrate the same pattern as in the "all-observations" estimated equation. In the regression for non-metropolitan areas the insignificant influence of this factor might be interpreted as a reflection of special characteristics of immigrants attracted by these areas.[73]

The estimated equations for the five regions of Canada are presented in Appendix A – Tables A.7 to A.9. The results indicate that regression equations for Atlantic Provinces and Quebec differ rather substantially, each of them most probably for different reasons, when compared with the estimated equations for the other three regions which remain, more or less, closer to the "all-observations" estimated equation.

An interesting feature to note is the strong resemblance of the regression results for the Atlantic Provinces and for non-metropolitan areas (Table A.6, second equation). The labour force participation rate is 29.2% in Atlantic Provinces, compared with 31.9% in non-metropolitan areas of Canada, and the overall explanatory power of the regression equations is almost equal ($R^2 = 0.179$, $\bar{R}^2 = 0.169$ for Atlantic Provinces, $R^2 = 0.185$, $\bar{R}^2 = 0.179$ for non-metropolitan areas). Moreover, the explanatory variables behaved in a similar way in both equations, even the magnitude and statistical significance of the individual coefficients differ, in general, rather marginally. Furthermore, in a comparison of the regression equation for Atlantic Provinces with the regression equations for the other four regions of Canada we observe a pattern of differential impact of certain variables and factors on the labour force participation of married women similar to the one described in comparing the regression equations of non-metropolitan with metropolitan areas. Variables OWH, HDNW, and factors EDW

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[72] The weaker effect of AD and CH on the participation of non-metropolitan married women was found in previous Canadian studies. See Spencer and Featherstone, *op. cit.*, p. 64, and Allingham and Spencer, *op. cit.*, p. 18.

[73] Immigrant married women are distributed in the IMS2, IMS3, and IMS4 categories as follows: metropolitan areas, 5.7%, 10.7% and 2.1% respectively, non-metropolitan areas, 4.6%, 3.2%, and 0.4% respectively.

and OCCH have a stronger effect (with the exception of OWH in British Columbia, and HDNW in Prairie Provinces), while variable AD and factors CH and AGE reveal a weaker impact on the labour force participation of married women in the Atlantic Provinces than in the other four regions.[74]

The labour force participation rate of married women in Quebec is 28.9%, which is the lowest of any region of Canada. The overall explanatory power of the regression equation for Quebec is the highest ($R^2 = 0.226$, $\bar{R}^2 = 0.216$), compared with the regression equations for the other regions.

One of the residence variables, RES2, is significant. Aside from this, residence gives no evidence of influencing the labour force status of married women in Quebec. The variables EDW5 and EDW6, representing the wife's education "post high school", have a stronger positive effect on labour force participation than in any other region west of Quebec, whereas the wife's age appears to have the strongest negative impact on her labour force participation of any region of the country.

Occupation of husband OCCH appears to have no influence on the wife's labour force status. One of the individual occupational variables, OCCH2, is marginally significant at the 5% level; aside from this all the other individual occupational variables, and the variables as a group, are statistically insignificant.

The most striking result in the equation for Quebec is the strong positive effect of wife's immigration status on her labour force participation. As a group, the four immigration status variables are highly significant. All the individual coefficients of the IMS variables are positive and significant at the 1% level. Moreover, the magnitude of the individual coefficients indicates that the probability of an immigrant wife being in the labour force is 13.8% to 24% higher (depending on the time she has been in Canada) than for her Canadian-born counterpart. The positive and statistically significant coefficient of the variable IMS2, representing immigrant wives landed in Canada before 1946, is not in agreement with the part of the postulated hypothesis in Chapter III, that immigrant married women would demonstrate the same propensity to participate in the labour force with their Canadian-born counterparts when they are integrated into the social and cultural life of the country. This positive and significant coefficient of IMS2 might be interpreted as indicating that immigrants in Quebec are never integrated into the social and cultural stream of this province,

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[74] The sample distribution indicates that rural families represent 44.9% of the population in Atlantic Provinces and 49.5% of the population in non-metropolitan areas. Part of the explanation for the resemblance of the regression results between the equations for Atlantic Provinces and non-metropolitan areas may lie on this urban-rural population distribution.

and/or that this might be a reflection of special characteristics, aspirations, and goals of immigrants who were attracted by this province.

In the other three regions the labour force participation rates of married women range from 39.9% in British Columbia to 44.0% in Prairie Provinces with 41.5% in Ontario, and the overall explanatory power of the regression equations is roughly the same in all three regions.

The regression results indicate differential impact of some variables on the labour force participation between these regions, and differential behaviour of some variables in all three regions compared to the "all observations" regression equation.

Variables OWH, HDNW, CH, and AGE consistently bear a negative coefficient, while variables AD, RES, and EDW consistently carry a positive coefficient. However, the magnitude and statistical significance of the coefficients fluctuate from region to region.

The variables representing family's income I-W are negatively related to the wife's labour force participation, but most of them are statistically insignificant below the $6,000 level of I-W. The coefficient of HWU is positive but insignificant for Ontario and British Columbia, but, surprisingly, negative and significant for the Prairie Provinces. This coefficient should perhaps be interpreted as a reflection of the seasonality of farm employment in this region. When farm workers become unemployed, their wives who are probably in the same occupation, would not have a great chance of obtaining a job in the area.[75]

The variables representing husband's occupation are not significant, either as a group (except at the 10% level in Ontario) or considered one at a time, in any of the three regions.[76] Neither are the variables representing wife's immigration status significant (except, as a group, at the 10% level in Ontario).

The preceding regression results by region indicate the existence of substantial interregional differences in the labour force participation, and a differential impact of some variables on the labour force status of married women in different regions. Part of these differences may be explained by interregional differences in the explanatory variables used in the model. However, there is no

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[75] This might be interpreted as additional evidence that the variable is capturing some discouraged worker effect.

[76] We have estimated the same equations for all regions excluding Atlantic Provinces, by considering all the variables representing I-W and OCCH together. The two factors together as a group were statistically significant at the 1% level in all four regions (results are not shown).

doubt that there are interregional differences in many other omitted[77] factors such as: composition of industry, age and sex distribution of the population, seasonal variation in employment,[78] social and cultural differences, etc., which have a bearing on these interregional differences of labour force behaviour of married women.

In summary, in this chapter the empirical findings obtained from fitting the model to the cross-sectional micro-data from the SCF68 have been discussed. The postulated hypotheses were supported by the empirical evidence (except the one concerning husband's occupation), and all the explanatory variables and factors introduced into the model appear to have a significant influence in determining the labour force status of married women in Canada. When the overall sample was disaggregated by the wife's age, family's income, and family's residence (metropolitan, non-metropolitan, and region), the regression results demonstrated substantially different labour force participation rates, and differential impact and significance of explanatory variables on the labour force behaviour of married women among different groups. The empirical findings obtained from fitting the model to aggregative data from the 1961 Census are discussed in the next chapter.

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[77] The omission of these factors from the model, either due to data limitations or due to their unquantifiable nature, might have affected the performance of some of the included variables. It is conceivable that some of the included explanatory variables in the model might have served as proxies for the omitted ones.

[78] As for the existence of interregional differences in some such factors in Canada see: F.T. Denton, *An Analysis of Interregional Differences in Manpower Utilization and Earnings, op. cit.*

CHAPTER V

ESTIMATION OF THE LABOUR SUPPLY MODEL USING MACRO-DATA FROM THE 1961 CENSUS

The regression results obtained from the application of the model developed in Chapter III to the macro-data from the 1961 Census are analyzed in this chapter.

Part of this analysis consists of the study and investigation of the association between city averages of individual and household characteristics and the labour force participation of married women. In addition, utilization of macro-data permits us to examine and analyse the relationships between labour market variables – unemployment, industrial composition, female earnings – and the wives' labour force behaviour, as well as the effect of socio-cultural differences on the labour force status of married women.

The observations were 174 areas, designated by the census as "cities, towns, villages and municipal subdivisions with a population of 10,000 and over". The dependent variable, in this set of data, was the labour force participation rate of married women, husband present, of the area during the census week in 1961; and all the independent variables (except a set of dummy variables representing the region in which the area is located) were averages within the areas.

Regressions were computed, using either arithmetic or logarithmic specifications,[1] and the results are presented in Appendix B – Tables B.1 and B.2 – along with the names and definitions of the relevant variables. Table B.1 displays the estimated equations for married women 15 years of age and over, as well as separate equations for six subgroups by the wife's age. Table B.2 shows the regression results of the logarithmic equations, and separate regressions based on the subdivision of observations into quartiles on the basis of husband's average annual earnings.[2]

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[1] The linear logarithmic specification is derived from a multiplicative model of the form

$$Y = \beta_0 X_1^{\beta_1} X_2^{\beta_2} \ldots E$$

by taking logarithms of both sides of the equation.

[2] The 174 observations were classified on the basis of husband's average annual earnings, YH, into three income groups. The lowest income group (lowest quartile) consists of 44 observations with YH less than \$3,974, the middle income group (middle two quartiles) consists of 86 observations with YH from \$3,974 to \$4,614, and the upper income group includes 44 observations with YH over \$4,614. These three groups are labelled L, M, and U, respectively.

Each line in Tables B.1 and B.2 shows the results of one regression equation: estimated coefficients and their t-values in parentheses, along with the coefficient of multiple determination (R^2), the same coefficient corrected for degrees of freedom ($\bar{R}^2$), and the standard deviation of residuals (SEE).

A few general comments are in order concerning the labour force participation rate and the regression results presented in Table B.1, before a detailed discussion of the empirical findings on a variable-by-variable basis is undertaken. The labour force participation by age-of-wife groups, as is indicated in Table V.1, is clearly dominated by the family life cycle pattern. The "two-peaked" participation profile, as was described in the previous chapter (page 62 and footnote 58), appears in this set of data as well.

TABLE V.1. Labour Force Participation Rates of Married Women: Canada 1961 and 1968

Wife's age	All ages	< 25	25-34	35-44	45-54	55-64	65+
Participation rates in 1961	19.66	26.76	19.31	22.37	22.87	12.67	2.66
Participation rates in 1968	27.74	40.30	27.30	29.87	32.08	20.85	2.87
% change	41.09	50.59	41.37	33.52	40.27	64.56	7.89

Source: Based on the data used in this study from the 1961 Census and SCF68 (the two sets of data are not strictly comparable).

The independent variables behaved consistently in all regressions (with minor exceptions) and most of them performed as theoretically expected. The overall explanatory power of the regression equations is quite large ($\bar{R}^2$ ranges from .84 to .89) up to the age group 45-54, thereafter it is declining along with age indicating a larger element of random variation for the older age groups. The high explanatory power of the equations, compared with the regression equations using micro-data, is not a surprising result since aggregation tends to reduce the relative importance of neglected variables. Omission of insignificant variables from the "complete" equation and re-estimation of the model shows that the coefficients and t-values of the remaining variables demonstrate an amazing stability. This might be interpreted as indicating lack of serious multicollinearity between the omitted and remaining variables.

The male unemployment rate,[3] UN, at the area level was used as an independent variable to indicate the general economic conditions in the area. This variable permits the study and investigation of the "additional worker" hypothesis in relation to the "discouraged worker" hypothesis. The former hypothesis maintains that low economic activity will result in an influx of secondary workers, in particular married women, into the labour force in an attempt to maintain the income flow of the family when the bread-winner becomes unemployed. The latter hypothesis claims that when economic activity is declining, secondary workers become discouraged from entering the labour force and some workers leave the labour force. Now, it is believed that both forces operate at the same time and the "net" effect on the labour force participation rate depends on the relative strength of these two opposing forces. The sign and magnitude of the coefficient of UN is expected to represent the direction and magnitude of this "net" effect.[4]

The regression results presented in Table B.1 show that the variable UN carries a positive coefficient consistently (with the exception of the less than 25 age group), which lends support to the theory of the dominance of the additional worker effect. However, the coefficient is statistically insignificant in all regression equations indicating that the two opposing forces are cancelling out each other.

An examination of the data revealed that variable UN contained several observations of large values (over 8%, whereas the mean of UN is 3.61). This led us to fit the linear logarithmic equations in which the influence of extreme values is reduced.[5] The regression results, shown in Table B.2, indicate that the additional worker effect prevails. The unemployment variable carried a positive coefficient, consistently significant in the regression equations for all married women, and the 35-44, 55-64 age groups (only at the 10% level for the 35-44 age group). Moreover, the positive coefficient is close to significant at the 10 per cent level for the 45-54 age group. These results may be interpreted as indicating that the true relationship between unemployment rate and labour force participation of married women is positive but the presence of extreme values in UN clouds the statistical results in the arithmetic regression equations.

Cross-sectional and time series studies in the United States are generally in agreement that the discouraged worker effect predominates in the overall labour

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[3] The comments on the explanatory variables refer to all age groups except the oldest one, 65 years old and over (see footnote 59 in Chapter IV).

[4] For the underlying theory of how UN is expected to capture both the additional and discouraged worker effects of cyclical variations of economic activity on the labour force participation, see (a) J. Mincer, "Labour-Force Participation and Unemployment: A Review of Recent Evidence", in *Prosperity and Unemployment*, R.A. Gordon and M.S. Gordon, eds., John Wiley and Sons Inc., New York, 1966, p. 77, and (b) G.G. Cain, *op. cit.*, pp. 63-64.

[5] All the variables in the logarithmic regressions were in logarithms to the base 10, except the regional dummies.

force, in most age-sex groups, and among married women.[6] In contrast, Canadian empirical studies provide conflicting results as it was pointed out in Chapter II.[7] In addition to those Canadian studies discussed in Chapter II, a study by Whittingham,[8] using Canadian cross-sectional data from the 1961 census, investigated changes in the labour force participation among Canadian married women in response to changes in labour market conditions. He found that the discouraged worker effect prevails overall. However, some evidence for the additional worker effect was found among wives with family responsibilities.

The findings of the current study conform more to the empirical results of the time series study by Officer and Andersen[9] in which they found that the additional worker effect prevails in all female age groups, with the exception of teenagers.

Theory suggests, and several empirical studies support,[10] the proposition that the "industrial structure" of an area affects the propensity of women to engage in market work, since employment opportunities for women and the nonpecuniary aspects associated with the jobs are dependent on it.

In the current study the percentage of the labour force (male and female) in an area which was employed in certain occupations – managerial, professional and technical, clerical and sales[11] – was used as a measure of employment opportunities for women, and as a proxy for the "industrial structure" of the area. A positive association was obviously expected between this variable, IM, and the labour force participation of married women.

The empirical results confirm this expectation. The coefficient of the variable IM consistently bears the expected positive sign, and it is statistically significant at the 5% level in the overall regression equation for married women, and at the 1% level in the regression equations for married women in the 25-34, 45-54, and 55-64, age brackets. Moreover, the variable becomes significant at the 1% level in the logarithmic regression equation for the less than 25 years old

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[6] See Chapter II footnote 27 for references.

[7] For a brief discussion of the Canadian studies see Chapter II pages 18-19, and references cited there.

[8] F.J. Whittingham, "Additional and Discouraged Workers Among Married Women in Canada", unpublished Ph.D. dissertation, Queen's University, September, 1971.

[9] Officer and Andersen, *op. cit.*

[10] See: (a) N.B. Belloc, "Labour Force Participation and Employment Opportunities for Women", *Journal of the American Statistical Association*, September 1950, pp. 400-410. (b) P.S. Barth, "A Cross-Sectional Analysis of the Labor-Force Participation Rates in Michigan," *Industrial and Labor Relations Review*, January 1967, pp. 234-249. (c) Cain, *op. cit.*, (d) Bowen and Finegan, *op. cit.*

[11] These occupations, altogether, are heavy demanders of female labour. In 1961, 55.86% of the Canadian female labour force was in these occupations, compared with 30.33% of the male labour force in the same occupations. See, S. Ostry, *The Occupational Composition of the Canadian Labour Force, op. cit.*, Table 5, pp. 55-57.

group. The magnitude of the coefficients, in particular in the logarithmic regression equations, indicates that the "industrial structure" of the community is more important for the very young (less than 25) and old (55-64) wives.[12]

The average annual earnings of husband, variable YH, was used as a proxy for the family's income excluding wife's earnings. The theoretically expected negative relationship between YH and labour force participation of married women is strongly confirmed by the regression results. The coefficient of YH consistently carries a negative sign and is significant at the 1 per cent level in the "all-ages" and the age-of-wife regression equations except for the oldest age group.

A declining sensitivity of the labour force participation to husband's earnings along with increasing wife's age is revealed by the magnitude of the coefficient of YH in the regression equations by age-of-wife groups (e.g., an increment of $1,000 in the annual earnings of husband, YH, will decrease the labour force participation rate of married women by 7% in the less than 25 age group, and only by 2% in the 55-64 age category). This differential response of participation of married women at different ages to changes of husband's earnings might be interpreted as a reflection of differences in family responsibilities over the family life cycle. A large negative effect of YH on the labour force status of young married women may be due to lack of good substitutes for the mother's care of young children in the child rearing age categories.

The market wage facing the wife was represented by the variable W, average annual earnings of full-time female wage earners. The statistical results conform to the expected positive relationship between W and labour force participation of wives. The variable bears a positive and statistically significant coefficient at the 1% level in all estimated equations (with the exception of those in the 55-64 age category, for which group the variable is significant only in the logarithmic equation – Table B.2). The magnitudes of the coefficients of W demonstrate a pattern similar to the one revealed by the coefficient of YH. Their size is steadily declining along with increasing wife's age. A plausible explanation might be, again, that this pattern reflects differences in the family life cycle (e.g., the wage effect might be expected to be stronger on young wives because of relatively stronger financial needs – investing in durable goods, etc., – and lower husband's earnings than their older counterparts).

An examination of the logarithmic regression coefficients of W and YH shows that the "wage" effect (coefficient of W) is stronger than the "income"

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[12] Bowen and Finegan found similar results and their explanation for the importance of the "industry mix" for very young wives is that "lack of previous work experience makes the ready availability of female-type of jobs a crucial factor", and for the older wives that there is a "greater willingness of older wives to continue working (or to return to work) if they have job opportunities in industries where the work is generally lighter and more pleasant". See, Bowen and Finegan, *op. cit.*, pp. 75-76.

effect (coefficient of YH) in all age categories with the exception of the age group 35-44. It should be noted that the coefficient of W does not represent a "pure" substitution effect. It includes a negative income effect and a positive substitution effect (see equation III.19 in Chapter III). A "pure" substitution effect, in elasticity terms, can be derived from equations (III.17) and (III.19) of Chapter III.[13] Inserting into equation (V.III) the observed mean-values of the variables W and YH and their estimated coefficients from the "all-ages" logarithmic equation gives an estimate of the "pure" substitution effect in elasticity terms:

$$E_{\bar{W}} = 1.59 - (-1.149)\frac{2510}{4481} = 2.40$$

Cain's corresponding estimate, with United States 1960 census data, was 0.83.[14] In this differential of the wife's wage substitution effect may lie part of the explanation of the more rapid increase of the labour force participation rates of Canadian wives in the last two decades. Of course, it is realized that the labour force participation rates of married women were much higher in the United States than in Canada at that period of time, which causes the $E_{\bar{W}}$ to be somewhat lower in the former country, other things equal.[15]

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[13] Multiplication of both sides of equation (III.19) by $W_W/(MW)$ and division of the last term by OY/OY yields:

$$E_W = E_{\bar{W}} + E_{OY}\left[\frac{(\hat{MW})\,W_W}{OY}\right] \qquad (V.I)$$

where E_W is the elasticity of the wife's wage, W_W, on her labour supply, (MW), $E_{\bar{W}}$ is the same elasticity but after compensating the family income to offset changes in income that result from changes in W_W, and E_{OY} is the elasticity of (MW) with respect to OY.

Derivation from equation (III.17) of the effect of a change in husband's wage rate, W_H, on the wife's labour supply (under the assumption that the cross substitution effect is zero), multiplication of both sides of resulting equation by $W_H/(MW)$ and division of the last term by OY/OY yields:

$$E_{YH} = E_{OY}\left[\frac{(\hat{MW})\,W_H}{OY}\right] \text{ or } E_{OY} = \frac{E_{YH}\,OY}{(\hat{MW})\,W_H} \qquad (V.II)$$

Using equation (V.II) and substituting into V.I gives:

$$E_{\bar{W}} = E_W - E_{YH}\left[\frac{(\hat{MW})\,W_W}{(\hat{MW})_H\,W_H}\right] \qquad (V.III)$$

E_W and E_{YH}, in practice, are the coefficients of the corresponding variables, W and YH, in the logarithmic equation, $(\hat{MW})_H\,W_H$ and $(\hat{MW})\,W_W$ are the husband's and wife's earnings respectively.

[14] Cain, *op. cit.*, p. 61.

[15] The participation rates in the United States were 22.90, 31.25, and 35.90 (the last figure refers only to married women 22 years old and over), in 1950, 1960, and 1967 respectively, showing a 36.5% and 14.9% change in the periods 1950-1960 and 1960-1967. Sources: Cain, *op. cit.*, p. 125, and Cohen et al., *op. cit.*, p. 215. The changes in the labour force participation rates of married women in Canada in the periods 1951-1961 and 1961-1968 were 96% and 41% respectively. See Tables I.1 and V.1.

Furthermore, it is worth commenting on the finding that the "wage" effect is weaker than the "income" effect in the logarithmic equations only in the 35-44 age group, which group includes most of the married women who "re-enter" the labour force, after their children have grown up and entered school. This finding is consistent with the changes in the participation rates shown in Table V.1 – the same age group demonstrates the smallest increase in participation rates between 1961 and 1968.[16] Moreover, in the estimated equation for this age group (35-44) the variable IM is insignificant, whereas the variable EDW7 is highly significant and bears the largest coefficient, compared with the coefficient of the same variable in the regression equations for all the other age brackets. These results might be interpreted as indicating that labour market considerations are not so important as personal and household characteristics in determining the labour force behaviour of married women who are considering re-entrance into the labour force.

The variable constructed to represent other adults in the family, AD > 15, carries the hypothesized positive coefficient only in the regression equations for the two younger age groups, although statistically insignificant. In all other regression equations the coefficient of the variable contradicts the empirical results obtained from the analysis with micro-data: the coefficient, although significant, is negative. A speculative explanation might be that the variable stands as a proxy for something else: probably as a proxy for a female labour supply variable, and/or possibly the variable is capturing some of the effect of socio-cultural differences between different population groups. The former suggestion is based on the variable's simple correlation coefficient with variable W, in the "all-ages" sample,[17] which is negative and equal to – .664. The speculation that the variable is capturing some of the effect of socio-cultural differences is based on: (a) the simple correlation coefficient between AD > 15 and RC which is .753, and (b) the fact that omission of the variable AD > 15 from the "complete" equation in the "all-ages" case, and re-estimation of the equation (results are not shown) raised the coefficient of RC from – .06 (t-value – 2.64) to – .09 (t-value – 4.19).[18]

Variable EDW7, representing the wife's educational attainment, was introduced into the regression analysis with aggregative data in the hope of

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[16] The largest change in the participation rates is observed in the 55-64 age bracket. This may be due to several reasons such as: (a) improved health conditions of old people in recent years, (b) reduced age discrimination, and (c) increased job opportunities for older women.

[17] It should be noticed that the simple correlation coefficients between AD > 15 and W in the samples by the age-of-wife from the youngest to the oldest group are: – .01, – .09, – .72, – .66, – .65.

[18] In addition to these speculative explanations we should keep in mind the aggregation problem: as Gupta concludes in an empirical study "existence of aggregation bias can sometimes completely distort the sign and the magnitude of the macro parameters as compared with the corresponding micro parameters": see K.L. Gupta, "Aggregation Bias in Linear Economic Models", *International Economic Review*, June, 1971, pp. 293-305.

capturing the effect of nonpecuniary benefits of a job, which are not reflected in the wage rate (e.g., white collar occupations, open to educated women, associated with lighter and more pleasant work, and probably with more fringe benefits, would be more attractive than blue collar jobs even at a lower wage rate). The regression result confirms the expected positive association between education and labour force membership of married women. The coefficient of EDW7 is positive and statistically significant in the regressions for all married women and for married women in the age groups 35-44 and 45-54 (for the 55-64 age group the coefficient is significant only in the logarithmic equation). The variable fails to pass the test of significance in the regressions for the two younger age groups (< 25, 25-34) and the coefficient even bears a negative sign in the less than 25 age group. However, a possible explanation might be that women who were attending school were not excluded from the data used in the regression analysis.

The negative influence of the presence of young children in the family on the mother's labour force participation is supported by the empirical findings of this set of data as well as the micro-data. The variable CH5 carries a consistently negative and significant coefficient in the "all-ages" and in the estimated equations by age of wife (with the exception of the regression equations for married women in the 45-54 age bracket). This negative influence of presence of young children is stronger for younger wives (< 25 and 25-34) than for women over 35 years old. These findings are consistent with the empirical evidence obtained from the analysis with micro-data (see Chapter IV page 66) and previous empirical studies.[19]

The existence of socio-cultural differences between different population groups, which is assured by the bilingual and multicultural nature of Canada, should be expected to influence the labour force behaviour of married women, since socio-cultural differences affect the general attitude of the community towards market employment of married women and the role of wife and mother. The variable RC was used in order to capture the socio-cultural effect on the labour force membership of a large population group – Roman Catholic wives.[20] The hypothesized negative relationship between RC and labour force participation is confirmed by the regression results. The coefficient of the variable RC bears the expected negative sign and is highly significant in all regression equations.

Dummy variables, REG, representing the city's region, were introduced as independent variables into the regression analysis in order to capture some of the effects of a number of unquantifiable factors or of factors for which data were not available.[21] The effect of the REG variables on the labour force participation

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[19] See S. Ostry, *The Female Worker in Canada, op. cit.*, p. 60.

[20] The reader is reminded that all the other population groups are not considered as having the same socio-cultural background, but that they are different from the one under consideration.

[21] In a vast country like Canada interregional differences should be expected in a number of factors. For a brief discussion concerning such factors, see Chapter IV page 58 and references cited there.

rate was expected to be positive, since the omitted one (reference category) was the dummy variable representing areas in Quebec – a region with the lowest participation rate.[22] This expectation is not completely confirmed by the estimated coefficients of the REG variables. The coefficients of REG1 and REG5, representing areas in the Atlantic Provinces and British Columbia respectively, are not significant in any regression equation, and in some of them their coefficients bear a negative sign.[23]

Three separate equations were estimated in an attempt to investigate the existence of differences in sensitivity of the labour force membership of married women in different income groups to changes in the explanatory variables. The husband's average annual earnings was the basis of separating the observations into three income groups[24] (see footnote 2 in this chapter), and the estimated equations – with and without regional dummy variables[25] – are presented in Table B.2.

The mean of the dependent variable reveals that the highest labour force participation of married women occurs in the M income group, 21.7%. The L income category demonstrates the lowest labour force membership of married women,[26] 16.3%, with the U income group having a labour force participation rate falling between the other two groups, 19.0%.[27]

The total explanatory power of each regression equation for the three income groups is quite high, as is indicated by both the R^2 and $\bar{R}^2$, with the

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[22] The labour force participation rates in Atlantic Provinces, Quebec, Ontario, Prairie Provinces, and British Columbia were: 17.7, 11.3, 26.6, 27.0, and 24.5 respectively in the 1961 census week.

[23] In an attempt to shed some light on this matter, we regressed REG5 against all the other independent variables of the "complete" equation in the "all-ages" case. An R^2 of .72 was obtained, and the variables UN and RC were highly significant.

These two variables were dropped from the "complete" equation in the "all-ages" case and the equation was re-estimated. All the REG dummy variables were positive and statistically significant. These results might be interpreted as indicating that the coefficient of REG1 and REG5 are insignificant in the estimated equations (Table B.1), because other explanatory variables, in particular UN and RC, are capturing all the effect of interregional differences between Quebec and the regions represented by REG1 and REG5.

[24] It is realized that the separation of observations representing averages of areas, on the basis of husband's average annual earnings, is not an "ideal" way for investigating differential labour force behaviour patterns of married women in different income groups. However, we could not do any better with the available data.

[25] It should be noticed that L does not include any observation from British Columbia, and U does not include any observation from the Atlantic Provinces. For this reason only three dummy variables were used for the L and U income groups.

[26] Some reasons which might partly explain the low labour force participation rate of married women in the L income group have been discussed in Chapter IV, pages 66-67.

[27] This same pattern is demonstrated by the SCF68 data. The participation rates at the time of survey (April 1968) were: 22.9, 31.9, and 24.3 in the L, M, and U income categories respectively.

lowest explanatory power occuring in the regression equation for the M income category. Introduction of regional dummy variables into the model raised the explanatory power of the equations for the M and U groups by 6% and 4% respectively, but left unchanged the explanatory power of the regression equation for the L income category. However, introduction of the regional variables affected the behaviour and statistical significance of some variables in all three equations.[28]

An examination of the regression results reveals some interesting points. An insignificant but positive relationship exists between labour force participation and unemployment (variable UN) in the regression equations for all three income groups.[29] Estimates of the corresponding logarithmic equations (results are not shown) reveal that the relationship remains positive in all three equations, but it becomes statistically significant in the regression equation for the M income group. This finding might be interpreted as indicating that the additional worker effect dominates only in the M income group.

A Canadian study by Kunin[30] and a United States study by Parker and Shaw,[31] using cross-sectional census tracts data investigated both the discouraged and additional worker hypotheses. Their findings generally support the discouraged worker effect. However, both studies found some evidence for the additional worker effect. This effect existed in the higher income groups, for all females in the Canadian study and for married women in the United States study.

The effect of the area's "industrial structure" varies with the level of income. The coefficient of IM is consistently positive, and statistically significant except in the regression equation for the U income category, and its magnitude declines as we move from the L income group to the U income category. Perhaps this result indicates that the labour force participation rate is more a function of employment opportunities than the level of earnings in the lower income groups.

The regression results show that both variable YH and variable W have the appropriate signs and they are statistically significant with the exception of YH in the regression equation for the M income group, in which its coefficient is significant only at the 10% level. The magnitude of their coefficients reveals a declining sensitivity of the labour force membership of married women to both the husband's earnings and the market wage rate facing the wife with increasing income group.

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[28] It should be noticed that multicollinearity exists in different degrees in the equations for the three income categories. As a consequence, the regression results should be affected in different degrees as well. For example, the simple correlation coefficients between YH and EDW7 in the L, M, and U income groups are: .27, .28, and .91 respectively.

[29] The comments refer to regression equations with regional dummy variables.

[30] Kunin, *op. cit.*

[31] J.E. Parker, and L.B. Shaw, "Labor Force Participation Within Metropolitan Areas", *Southern Economic Journal,* April, 1968.

A negative relationship exists between the participation rate and variable AD > 15. The coefficient of the variable is significant at the 10% level in the regression equations for the L and M income groups, and its magnitude declines along with increasing income category.

The results for the remaining three variables EDW7, CH5 and RC show that their coefficients carry the expected signs (except CH5 in the equation for the L income group), with EDW7 significant[32] only in the L income group and CH5 significant only in the M income category.[33]

Recapitulating, in this chapter the regression results presented in Appendix B which were obtained from the application of the model developed in Chapter III to macro-data from the 1961 census have been discussed. The empirical evidence supported the postulated hypotheses concerning the relationships between the wife's labour force membership and labour market variables as well as socio-cultural factors. Furthermore, the findings supported most of the hypothesized relationships between individual and household characteristics and the labour force status of Canadian married women. The results obtained from the equations controlled for the wife's age and level of income demonstrated substantial differential labour force participation rates, and differential impact and significance of explanatory variables on the labour force status of married women among different age and income groups.

In the next chapter a brief summary of the study is presented along with the conclusions concerning the factors affecting the decision of Canadian married women to seek market employment, and some implications of the study for policy purposes.

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[32] The reader is reminded that multicollinearity exists in different degrees in the equations for the three income groups (see footnote 28 in this chapter).

[33] The negative impact of the factor representing child status, CH, on the participation rate was stronger in the regression equation for the middle income group in the analysis with micro-data as well (see Chapter IV page 67).

CHAPTER VI

SUMMARY, CONCLUSIONS AND IMPLICATIONS

This study has been concerned with the investigation and assessment of the magnitude and direction of several factors which might affect the decision of Canadian married women in allocating their working time between market work and non-market activities. The literature concerning labour supply was reviewed and a brief summary presented in Chapter II. Theoretical suggestions and empirical findings of many previous studies were used in the foundation of the current study.

A model, based on the consumer choice theoretical framework, was developed to examine the influence of certain factors on the quantity of labour supplied to the market by married women, in a family context. Hypotheses concerning the relationships of these factors and the labour force behaviour of married women were postulated and then tested by using regression techniques against two bodies of cross-sectional data; disaggregated data from the 1968 Survey of Consumer Finances (SCF68), and aggregative data from the 1961 Census of Canada. Only one dimension, labour force participation, of the multidimensional labour supply was analyzed.

The empirical findings confirmed most of the postulated hypotheses, and many of the findings of the current study are consistent with the results of previous studies both in Canada and the United States. However, there are some noticeable differences between this study and previous relevant studies in the specification of the model and the performance and interpretation of explanatory variables.

Findings of this analysis indicate that home ownership has a negative influence on the wife's propensity to be in the labour force, and the presence of adults, other than husband and wife, in the family positively affects the wife's probability of engaging in market work. However, the latter statement is not supported by the analysis of macro-data. Moreover, evidence from the study suggests that the husband's labour force status affects the wife's labour force behaviour. The wife is more likely to be in the labour force if her husband is unemployed than if he is employed. The strength of this effect depends on the duration of husband's unemployment, his weekly earnings, and the "normal" level of family income excluding wife's earnings. The husband's labour force status "not in the labour force" negatively affects the wife's labour force membership.

The findings support the conclusion that there is, for all levels of income, a negative relationship between the wife's labour force participation and measures of the family's income excluding wife's earnings. However, the magnitude of the effect of a change in income on the wife's labour force participation is small for low income levels (below $6,000) and much stronger at the upper end of the income scale. Furthermore there is clear evidence consistent with previous studies that the presence of young children, in particular preschoolers, in the family is a strong deterrent to mother's labour force membership.

The region and place (urban-rural) of a family's residence are factors affecting the wife's decision concerning her labour force status. The results show that married women in eastern Canada, particularly Quebec, have the lowest propensity to participate in the labour force and that married women in the Prairie provinces demonstrate the highest tendency to engage in market work. In addition, urban women demonstrate a stronger propensity to participate in the labour force than their rural counterparts. Also, for urban wives, the size of the center in which they reside does not appear to have a substantial influence on their decision to enter the labour force.

The labour force membership of married women varies directly with their formal education. The analysis with micro-data, where the wife's education was used as a proxy for her market potential earnings, reveals a remarkable pattern of increasing labour force participation with rising educational level. Moreover, even when education was used as a proxy for the nonpecuniary aspects of a job, supplementing the wife's market wage variable, the findings indicate a positive relationship between wife's education and her propensity to be in the labour force.

The wife's age appears to have an important bearing on her labour force behaviour. The empirical evidence demonstrates, in a very regular pattern, that increasing age diminishes the wife's probability of being in the labour force. Furthermore, the findings indicate that the wife's immigration status (immigrant, or Canadian-born) affects the decision concerning her labour force status. The immigrant wife demonstrates a different pattern of market work, with a higher labour force membership than her Canadian-born counterpart until she is integrated into the Canadian social and cultural stream. The immigrant wives' differential pattern of market work is affected by the length of time they live in Canada and their age at the time of immigration. In addition, there is evidence that the family's social values and attitudes towards the wife's market employment, represented by the husband's occupation, affect the wife's labour force status.

The results, when the overall sample is disaggregated by the wife's age, family's income, and family's residence (metropolitan, non-metropolitan, and region), show that these factors exert a substantial influence on the relationships between labour force participation and independent variables. Labour force participation varies and demonstrates differential sensitivity to the explanatory variables among different groups.

Moreover, results from the analysis with aggregative data reveal that married women tend to participate more in the labour force in areas with an "industrial structure" demanding more female labour. The market wage rate facing the wife exerts a positive effect on the wife's propensity to engage in market work, and the magnitude of this positive "wage" effect is larger than the magnitude of the negative "income" effect represented by the coefficient of the family's income variable. In addition, the findings support the conclusion that the existence of differences in socio-cultural background among different population groups strongly affects the decision of married women to seek market employment.

A final interesting finding from the analysis with the 1961 census aggregative data is that the results support a positive association between labour force participation of married women and variations in general economic conditions, represented by the city male unemployment rate. This positive association is statistically significant, as indicated by the estimated logarithmic equations, for married women of "all ages" and certain age groups (35-44, 55-64). These findings give support to the overall prevalence of the "additional worker" effect for this population group, which is consistent with the findings of Canadian time series studies, but contradictory to the results of relevant studies in the United States and previous cross-sectional Canadian studies.

The current study has shed some light on the understanding of how certain factors affect and motivate the wife's decision to participate or not to participate in the labour force. In addition, the empirical part of the study has quantified the effect of these factors on the wife's labour force participation. This qualification and quantification of the relationships between labour force participation and factors affecting the participation rate was the main purpose of this study.

Studies of labour supply which deal with both the qualification and quantification of these relationships could be very useful in formulating economic policy because, apart from a pure academic interest, these studies have important policy implications; a few of which are discussed in the following paragraphs in concluding the study.

The direction and magnitude of the net response of the overall labour force and its subgroups to changes in economic conditions is of vital importance to policy makers. For example, a highly positive relationship between the overall labour force participation rate and the unemployment rate would lead to rapid manpower shortages in case of economic expansions and high rates of unemployment in periods of economic recessions.

Knowledge of the sensitivity of the labour force participation of married women to changes in a number of variables could also assist policy makers in formulating intelligent economic policy which would result in pulling secondary workers, in particular married women from low income families, into the labour force as a means of combating poverty.

Moreover, predicting and/or controlling labour force participation rates, which is necessary for successful economic planning, requires knowledge of both the qualitative and quantitative aspects of the relationships between labour force participation and the factors affecting the participation rates.

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APPENDIX A

VARIABLE NAMES AND DEFINITIONS AND REGRESSION EQUATIONS BASED ON SCF68 DATA

Variables Used in Analysis of Labour Force Participation of Married Women with Micro-Data from the 1968 Survey of Consumer Finances.

Variable Name	Definition

MW – (dependent variable) labour force dummy = 1 if the wife was in the labour force sometime in 1967; 0 otherwise.

I-W – total family income (before-tax) excluding wife's earnings: dummy variables

I-W 1 = 1 if I-W $\leq$ 1,999; 0 otherwise
I-W 2 = 1 if 2,000 $\leq$ I-W $\leq$ 2,999; 0 otherwise
I-W 3 = 1 if 3,000 $\leq$ I-W $\leq$ 3,999; 0 otherwise
I-W 4 = 1 if 4,000 $\leq$ I-W $\leq$ 4,999; 0 otherwise
I-W 5 = 1 if 5,000 $\leq$ I-W $\leq$ 5,999; 0 otherwise
I-W 6 = 1 if 6,000 $\leq$ I-W $\leq$ 6,999; 0 otherwise
I-W 7 = 1 if 7,000 $\leq$ I-W $\leq$ 7,999; 0 otherwise
I-W 8 = 1 if 8,000 $\leq$ I-W $\leq$ 8,999; 0 otherwise
I-W 9 = 1 if 9,000 $\leq$ I-W $\leq$ 9,999; 0 otherwise
I-W10 = 1 if 10,000 $\leq$ I-W $\leq$ 10,999; 0 otherwise
I-W11 = 1 if I-W $\geq$ 11,000; 0 otherwise

RES – residence of the family: dummy variables

RES1 = 1 if residence in a Metropolitan centre (centres with population over 30,000); 0 otherwise
RES2 = 1 if residence in a city with population 15,000-29,999; 0 otherwise
RES3 = 1 if residence in an urban area (centres with population under 15,000); 0 otherwise
RES4 = 1 if residence in a rural area; 0 otherwise

REG – region of residence of the family: dummy variables

REG1 = 1 if residence in Atlantic provinces; 0 otherwise
REG2 = 1 if residence in Quebec; 0 otherwise
REG3 = 1 if residence in Ontario; 0 otherwise

REG4 = 1 if residence in Prairie Provinces; 0 otherwise
REG5 = 1 if residence in British Columbia; 0 otherwise

OCCH – occupation of husband in 1967: dummy variables

OCCH1 = 1 if managerial; 0 otherwise
OCCH2 = 1 if professional, technical; 0 otherwise
OCCH3 = 1 if clerical; 0 otherwise
OCCH4 = 1 if sales; 0 otherwise
OCCH5 = 1 if service, recreation; 0 otherwise
OCCH6 = 1 if transportation, communication; 0 otherwise
OCCH7 = 1 if craftsman, production process and related workers; 0 otherwise
OCCH8 = 1 if "Blue collar" – all Blue collar occupations except those in OCCH5 to OCCH7; 0 otherwise

EDW – education of wife: dummy variables

EDW1 = 1 if no schooling or some elementary school; 0 otherwise
EDW2 = 1 if finished elementary school; 0 otherwise
EDW3 = 1 if some high school; 0 otherwise
EDW4 = 1 if finished high school; 0 otherwise
EDW5 = 1 if some college or university; 0 otherwise
EDW6 = 1 if university degree; 0 otherwise

AGE – age of wife: dummy variables

AGE1 = 1 if less than 25 years old; 0 otherwise
AGE2 = 1 if $25 \leqslant AGE \leqslant 34$; 0 otherwise
AGE3 = 1 if $35 \leqslant AGE \leqslant 44$; 0 otherwise
AGE4 = 1 if $45 \leqslant AGE \leqslant 54$; 0 otherwise
AGE5 = 1 if $55 \leqslant AGE \leqslant 64$; 0 otherwise
AGE6 = 1 $AGE \geqslant 65$; 0 otherwise

IMS – immigration status of wife: dummy variables

IMS1 = 1 if born in Canada; 0 otherwise
IMS2 = 1 if immigrant, landed before 1946; 0 otherwise
IMS3 = 1 if immigrant, landed from 1946 to 1964; 0 otherwise
IMS4 = 1 if immigrant, landed after 1964; 0 otherwise
IMS5 = 1 if not ascertained; 0 otherwise

CH – children status: dummy variables

CH1 = 1 if only children under 6 years old; 0 otherwise
CH2 = 1 if only children 6 to 15 years old; 0 otherwise
CH3 = 1 if children of both CH1 and CH2; 0 otherwise
CH4 = 1 if no children under 16 years old; 0 otherwise

OWH – dummy variable = 1 if family owns the home; 0 otherwise

AD – number of adults in the family, other than husband and wife

HWU – husband's weeks unemployed in 1967

HDNW – dummy variable = 1 if husband did not work in 1967; 0 otherwise

TABLE A.1. Regression Equations for Labour Force Participation of Married Women, Husband Present, Based on SCF68 Data

Const. term	OWH	AD	HWU	HDNW	REG	RES
0.670 (25.35)	− 0.035 (− 4.09)	0.055 (11.27)	− 0.0003 (− 0.60)	− 0.164 (− 8.63)	0.023 REG1 (2.02)	0.056 RES1 (5.45)
					0.114 REG3 (10.89)	0.062 RES2 (4.27)
					0.134 REG4 (11.62)	0.054 RES3 (4.22)
Age group: All ages					0.088 REG5 (6.45)	$F = 11.52$
Mean of dep. var. = 0.365					$F = 50.67$	
N = 15,557						
$F = 86.41$						
$R^2 = 0.2004$						
$\bar{R}^2 = 0.1981$						
SEE = 0.4310						
0.735 (9.66)	− 0.042 (− 1.78)	0.083 (2.20)	− 0.0026 (− 1.59)	− 0.268 (− 2.26)	0.021 REG1 (0.63)	0.126 RES1 (4.08)
					0.037 REG3 (1.25)	0.064 RES2 (1.52)
Age group: Less than 25					0.035 REG4 (1.12)	0.081 RES3 (2.09)
Mean of dep. var. = 0.599					− 0.027 REG5 (− 0.72)	$F = 5.78$
N = 1784					$F = 1.15$	
$F = 21.17$						
$R^2 = 0.3269$						
$\bar{R}^2 = 0.3115$						
SEE = 0.4067						

TABLE A. 1. Regression Equations for Labour Force Participation of Married Women, Husband Present, Based on SCF68 Data

I - W	OCCH	EDW	IMS	CH	AGE
− 0.047 I-W2 (− 2.48)	− 0.038 OCCH2 (− 2.47)	0.033 EDW2 (2.78)	− 0.023 IMS2 (− 1.38)	− 0.341 CH1 (− 26.52)	− 0.098 AGE2 (− 7.21)
− 0.064 I-W3 (− 3.40)	0.040 OCCH3 (2.18)	0.106 EDW3 (9.70)	0.047 IMS3 (3.35)	− 0.123 CH2 (− 11.31)	− 0.173 AGE3 (− 11.40)
− 0.078 I-W4 (− 4.20)	0.026 OCCH4 (1.38)	0.182 EDW4 (15.00)	0.013 IMS4 (0.45)	− 0.337 CH3 (− 27.34)	− 0.278 AGE4 (− 17.49)
− 0.082 I-W5 (− 4.45)	0.015 OCCH5 (0.86)	0.287 EDW5 (15.13)	0.027 IMS5 (3.37)	F = 336.92	− 0.422 AGE5 (− 23.97)
− 0.127 I-W6 (− 6.68)	− 0.017 OCCH6 (− 1.04)	0.300 EDW6 (12.21)	F = 5.88		− 0.579 AGE6 (− 26.07)
− 0.173 I-W7 (− 8.77)	− 0.008 OCCH7 (− 0.65)	F = 84.13			F = 171.96
− 0.180 I-W8 (− 8.56)	− 0.068 OCCH8 (− 4.20)				
− 0.213 I-W9 (− 9.35)	F = 7.28				
− 0.242 I-W10 (− 9.80)					
− 0.336 I-W11 (− 16.09)					
F = 41.15					
− 0.050 I-W2 (− 0.94)	− 0.002 OCCH2 (− 0.03)	0.033 EDW2 (0.72)	0.106 IMS2 (0.57)	− 0.429 CH1 (− 19.46)	
− 0.047 I-W3 (− 0.97)	0.014 OCCH3 (0.28)	0.131 EDW3 (3.42)	− 0.001 IMS3 (− 0.01)	0.134 CH2 (0.97)	
− 0.088 I-W4 (− 1.86)	0.000 OCCH4 (0.00)	0.229 EDW4 (5.65)	− 0.104 IMS4 (− 1.79)	− 0.417 CH3 (− 8.40)	
− 0.052 I-W5 (− 1.08)	0.020 OCCH5 (0.34)	0.225 EDW5 (4.04)	0.014 IMS5 (0.66)	F = 130.99	
− 0.120 I-W6 (− 2.40)	− 0.061 OCCH6 (− 1.24)	0.276 EDW6 (3.95)	F = 1.09		
− 0.130 I-W7 (− 2.33)	− 0.027 OCCH7 (− 0.65)	F = 10.41			
− 0.118 I-W8 (− 1.80)	− 0.127 OCCH8 (− 2.59)				
− 0.260 I-W9 (− 3.27)	F = 2.29				
− 0.210 I-W10 (− 1.92)					
− 0.429 I-W11 (− 4.52)					
F = 3.39					

TABLE A. 2. Regression Equations for Labour Force Participation of Married Women, Husband Present, Based on SCF68 Data

Const. term	OWH	AD	HWU	HDNW	REG	RES
0.501 (8.63)	– 0.029 (– 1.87)	0.112 (5.66)	– 0.0015 (– 1.29)	– 0.103 (– 1.49)	0.042 REG1 (1.88)	0.076 RES1 (3.72)
					0.112 REG3 (5.48)	0.080 RES2 (2.71)
					0.142 REG4 (6.19)	0.085 RES3 (3.20)
					0.063 REG5 (2.32)	F = 5.49
					F = 12.33	
0.513 (8.39)	– 0.015 (– 0.80)	0.056 (6.70)	0.0005 (0.40)	– 0.258 (– 4.50)	– 0.025 REG1 (– 1.06)	0.036 RES1 (1.64)
					0.137 REG3 (6.35)	0.104 RES2 (3.31)
					0.161 REG4 (6.73)	– 0.002 RES3 (– 0.07)
					0.172 REG5 (5.95)	F = 4.40
					F = 26.44	

Age group: 25-34
Mean of dep. var. = 0.376
N = 3949
F = 23.58
R^2 = 0.1944
$\bar{R}^2$ = 0.1862
SEE = 0.4371

Age group: 35-44
Mean of dep. var. = 0.367
N = 3793
F = 17.64
R^2 = 0.1583
$\bar{R}^2$ = 0.1493
SEE = 0.4447

TABLE A.2. Regression Equations for Labour Force Participation of Married Women, Husband Present, Based on SCF68 Data

I-W	OCCH	EDW	IMS	CH
0.053 I-W2 (1.06)	– 0.015 OCCH2 (– 0.52)	0.040 EDW2 (1.44)	– 0.081 IMS2 (– 0.66)	– 0.450 CH1 (– 16.98)
0.039 I-W3 (0.86)	0.043 OCCH3 (1.16)	0.156 EDW3 (6.24)	0.001 IMS3 (0.03)	– 0.239 CH2 (– 7.81)
0.026 I-W4 (0.60)	0.055 OCCH4 (1.47)	0.220 EDW4 (8.17)	0.050 IMS4 (1.10)	– 0.474 CH3 (– 17.90)
0.011 I-W5 (0.26)	0.070 OCCH5 (1.97)	0.335 EDW5 (8.49)	0.055 IMS5 (3.48)	F = 140.89
– 0.016 I-W6 (– 0.37)	0.011 OCCH6 (0.33)	0.335 EDW6 (7.28)	F = 3.43	
– 0.100 I-W7 (– 2.26)	0.017 OCCH7 (0.69)	F = 25.58		
– 0.120 I-W8 (– 2.57)	0.015 OCCH8 (0.46)			
– 0.139 I-W9 (– 2.78)	F = 1.27			
– 0.177 I-W10 (– 3.14)				
– 0.229 I-W11 (– 4.63)				
F = 9.60				
– 0.079 I-W2 (– 1.37)	– 0.112 OCCH2 (– 3.71)	0.049 EDW2 (1.97)	– 0.018 IMS2 (– 0.38)	– 0.279 CH1 (– 7.35)
– 0.015 I-W3 (– 0.28)	0.061 OCCH3 (1.62)	0.130 EDW3 (5.75)	0.073 IMS3 (2.89)	– 0.129 CH2 (– 5.52)
– 0.072 I-W4 (– 1.40)	– 0.057 OCCH4 (– 1.53)	0.190 EDW4 (7.35)	0.049 IMS4 (0.70)	– 0.304 CH3 (– 12.46)
– 0.115 I-W5 (– 2.28)	– 0.021 OCCH5 (– 0.60)	0.309 EDW5 (7.75)	0.021 IMS5 (1.23)	F = 68.18
– 0.179 I-W6 (– 3.48)	– 0.041 OCCH6 (– 1.26)	0.305 EDW6 (5.84)	F = 2.36	
– 0.191 I-W7 (– 3.66)	– 0.041 OCCH7 (– 1.78)	F = 19.78		
– 0.174 I-W8 (– 3.26)	– 0.099 OCCH8 (– 3.11)			
– 0.237 I-W9 (– 4.21)	F = 4.33			
– 0.306 I-W10 (– 5.28)				
– 0.371 I-W11 (– 6.95)				
F = 13.34				

TABLE A.3. Regression Equations for Labour Force Participation of Married Women, Husband Present, Based on SCF68 Data

Const. term	OWH	AD	HWU	HDNW	REG	RES
0.363 (6.13)	− 0.003 (− 0.16)	0.035 (3.67)	0.0006 (0.43)	− 0.175 (− 3.91)	0.013 REG1 (0.46)	0.067 RES1 (2.58)
					0.136 REG3 (5.05)	0.024 RES2 (0.67)
					0.148 REG4 (5.05)	0.116 RES3 (3.73)
Age group: 45 - 54					0.105 REG5 (3.06)	F = 5.08
Mean of dep. var. = 0.390					F = 11.39	
N = 3026						
F = 8.42						
R^2 = 0.1014						
$\bar{R}^2$ = 0.0894						
SEE = 0.4655						
0.335 (5.59)	− 0.044 (− 1.62)	0.037 (2.86)	0.002 (1.39)	− 0.187 (− 4.47)	0.019 REG1 (0.58)	0.019 RES1 (0.64)
					0.110 REG3 (3.39)	0.033 RES2 (0.78)
					0.138 REG4 (3.94)	0.036 RES3 (1.03)
Age group: 55 - 64					0.106 REG5 (2.65)	F = 0.43
Mean of dep. var. = 0.265					F = 6.06	
N = 1822						
F = 4.89						
R^2 = 0.0921						
$\bar{R}^2$ = 0.0733						
SEE = 0.4247						

TABLE A.3. Regression Equations for Labour Force Participation of Married Women, Husband Present, Based on SCF68 Data

I-W	OCCH	EDW	IMS	CH
− 0.147 I-W2 (− 2.74)	− 0.004 OCCH2 (− 0.09)	0.030 EDW2 (1.07)	0.027 IMS2 (0.69)	− 0.026 CH1 (− 0.43)
− 0.163 I-W3 (− 3.23)	0.039 OCCH3 (0.97)	0.079 EDW3 (3.01)	0.088 IMS3 (2.56)	− 0.072 CH2 (− 3.94)
− 0.129 I-W4 (− 2.64)	0.063 OCCH4 (1.43)	0.159 EDW4 (5.46)	0.043 IMS4 (0.40)	− 0.187 CH3 (− 4.69)
− 0.138 I-W5 (− 2.80)	0.034 OCCH5 (0.89)	0.310 EDW5 (6.64)	0.030 IMS5 (1.52)	F = 10.16
− 0.191 I-W6 (− 3.83)	0.041 OCCH6 (1.02)	0.314 EDW6 (4.78)	F = 1.95	
− 0.223 I-W7 (− 4.40)	0.040 OCCH7 (1.48)	F = 14.45		
− 0.255 I-W8 (− 4.76)	− 0.022 OCCH8 (− 0.59)			
− 0.235 I-W9 (− 4.24)	F = 1.05			
− 0.256 I-W10 (− 4.38)				
− 0.397 I-W11 (− 7.75)				
F = 8.89				
− 0.069 I-W2 (− 1.70)	− 0.080 OCCH2 (− 1.50)	0.046 EDW2 (1.60)	− 0.054 IMS2 (− 1.65)	
− 0.163 I-W3 (− 3.78)	0.018 OCCH3 (0.34)	0.107 EDW3 (3.66)	0.040 IMS3 (0.82)	
− 0.156 I-W4 (− 3.65)	0.087 OCCH4 (1.43)	0.186 EDW4 (5.43)	0.008 IMS4 (0.04)	
− 0.150 I-W5 (− 3.45)	0.010 OCCH5 (0.20)	0.337 EDW5 (5.66)	0.009 IMS5 (0.39)	
− 0.186 I-W6 (− 3.77)	0.008 OCCH6 (0.13)	0.308 EDW6 (3.73)	F = 1.09	
− 0.255 I-W7 (− 4.81)	− 0.019 OCCH7 (− 0.51)	F = 11.06		
− 0.264 I-W8 (− 4.71)	− 0.146 OCCH8 (− 3.04)			
− 0.288 I-W9 (− 4.61)	F = 3.06			
− 0.243 I-W10 (− 3.66)				
− 0.346 I-W11 (− 6.81)				
F = 5.48				

TABLE A.4. Regression Equations for Labour Force Participation of Married Women, Husband Present, Based on SCF68 Data

Const. term	OWH	AD	HWU	HDNW	REG	RES
0.231 (4.55)	– 0.031 (– 1.86)	0.009 (0.66)	0.0021 (1.53)	– 0.205 (– 4.88)	0.038 REG1 (1.72)	0.020 RES1 (1.12)
					0.042 REG3 (2.03)	0.050 RES2 (1.96)
					0.038 REG4 (1.69)	0.005 RES3 (0.27)
Age group: 65 +					0.012 REG5 (0.46)	$F = 1.43$
Mean of dep. var. = 0.052					$F = 1.51$	
$N = 1183$						
$F = 3.43$						
$R^2 = 0.0997$						
$\bar{R}^2 = 0.0707$						
SEE = 0.2133						
0.701 (13.95)	– 0.049 (– 2.73)	0.009 (0.64)	0.0010 (1.47)	– 0.213 (– 5.71)	0.013 REG1 (0.65)	0.053 RES1 (2.80)
					0.075 REG3 (3.22)	0.008 RES2 (0.32)
					0.078 REG4 (3.30)	0.036 RES3 (1.70)
Income level: I-W ⩽ 3,999 (all ages)					0.024 REG5 (0.86)	$F = 2.87$
Mean of dep. var. = 0.321					$F = 4.82$	
$N = 3568$						
$F = 35.48$						
$R^2 = 0.2711$						
$\bar{R}^2 = 0.2634$						
SEE = 0.4007						

TABLE A.4. Regression Equations for Labour Force Participation of Married Women, Husband Present, Based on SCF68 Data

I-W	OCCH	EDW	IMS	CH	AGE
− 0.014 I-W2 (− 0.70)	− 0.200 OCCH2 (− 3.61)	0.012 EDW2 (0.70)	0.003 IMS2 (0.19)		
− 0.014 I-W3 (− 0.60)	− 0.060 OCCH3 (− 0.95)	0.032 EDW3 (1.71)	0.060 IMS3 (1.43)		
− 0.096 I-W4 (− 3.40)	0.105 OCCH4 (1.43)	0.068 EDW4 (3.29)	− 0.211 IMS4 (− 1.61)		
− 0.078 I-W5 (− 2.46)	− 0.171 OCCH5 (− 3.22)	0.083 EDW5 (2.30)	− 0.030 IMS5 (− 1.89)		
− 0.044 I-W6 (− 1.25)	0.000 OCCH6 (0.00)	0.039 EDW6 (0.67)	F = 2.40		
− 0.078 I-W7 (− 1.94)	− 0.091 OCCH7 (− 1.92)	F = 2.88			
− 0.112 I-W8 (− 2.40)	− 0.183 OCCH8 (− 3.59)				
− 0.091 I-W9 (− 1.87)	F = 5.32				
− 0.083 I-W10 (− 1.35)					
− 0.098 I-W11 (− 2.39)					
F = 2.20					
− 0.054 I-W2 (− 2.98)	− 0.010 OCCH2 (− 0.19)	0.032 EDW2 (1.73)	− 0.025 IMS2 (− 0.96)	− 0.274 CH1 (− 10.25)	− 0.092 AGE2 (− 3.35)
− 0.069 I-W3 (− 3.77)	0.033 OCCH3 (0.62)	0.105 EDW3 (5.62)	0.045 IMS3 (1.22)	− 0.053 CH2 (− 2.21)	− 0.124 AGE3 (− 3.96)
F = 7.52	− 0.021 OCCH4 (− 0.41)	0.224 EDW4 (9.59)	− 0.048 IMS4 (− 0.93)	− 0.277 CH3 (− 10.09)	− 0.229 AGE4 (− 7.27)
	0.000 OCCH5 (0.00)	0.291 EDW5 (6.58)	− 0.019 IMS5 (− 1.25)	F = 52.16	− 0.321 AGE5 (− 9.95)
	− 0.108 OCCH6 (− 2.56)	0.310 EDW6 (4.88)	F = 1.24		− 0.488 AGE6 (− 14.00)
	− 0.049 OCCH7 (− 1.34)	F = 26.40			F = 41.92
	− 0.159 OCCH8 (− 4.28)				
	F = 7.27				

TABLE A.5. Regression Equations for Labour Force Participation of Married Women, Husband Present, Based on SCF68 Data

Const. term	OWH	AD	HWU	HDNW	REG	RES
0.602 (18.32)	– 0.024 (– 2.03)	0.052 (6.42)	– 0.003 (– 2.74)	– 0.170 (– 5.03)	0.013 REG1 (0.78)	0.070 RES1 (4.74)
					0.123 REG3 (8.15)	0.091 RES2 (4.37)
					0.160 REG4 (9.74)	0.076 RES3 (4.10)
Income level: 4,000 ⩽ I-W ⩽ 7,999 (all ages)					0.097 REG5 (4.78)	F = 9.94
Mean of dep. var. = 0.413						
N = 7621					F = 35.23	
F = 54.72						
R^2 = 0.2152						
$\bar{R}^2$ = 0.2113						
SEE = 0.4373						
0.479 (8.44)	– 0.031 (– 1.78)	0.062 (8.21)	– 0.0005 (– 0.24)	– 0.146 (– 2.83)	0.050 REG1 (1.99)	0.031 RES1 (1.27)
					0.125 REG3 (6.49)	0.043 RES2 (1.31)
					0.126 REG4 (5.74)	0.020 RES3 (0.65)
Income level: I-W ⩾ 8,000 (all ages)					0.113 REG5 (4.57)	F = 0.73
Mean of dep. var. = 0.316						
N = 4348					F = 13.12	
F = 15.36						
R^2 = 0.1193						
$\bar{R}^2$ = 0.1116						
SEE = 0.4382						

TABLE A.5. Regression Equations for Labour Force Participation of Married Women, Husband Present, Based on SCF68 Data

I-W	OCCH	EDW	IMS	CH	AGE
– 0.010 I-W5 (– 0.71)	– 0.043 OCCH2 (– 1.68)	0.037 EDW2 (2.11)	– 0.046 IMS2 (– 1.55)	– 0.379 CH1 (– 22.00)	– 0.086 AGE2 (– 4.89)
– 0.060 I-W6 (– 4.03)	0.026 OCCH3 (1.03)	0.119 EDW3 (7.37)	0.037 IMS3 (1.88)	– 0.146 CH2 (– 9.11)	– 0.172 AGE3 (– 8.49)
– 0.109 I-W7 (– 6.87)	– 0.000 OCCH4 (– 0.00)	0.216 EDW4 (12.07)	0.063 IMS4 (1.46)	– 0.373 CH3 (– 21.61)	– 0.278 AGE4 (– 12.84)
F = 20.48	– 0.023 OCCH5 (– 0.93)	0.292 EDW5 (10.06)	0.044 IMS5 (3.82)	F = 217.68	– 0.464 AGE5 (– 18.46)
	– 0.024 OCCH6 (– 0.98)	0.348 EDW6 (8.27)	F = 5.41		– 0.651 AGE6 (– 17.41)
	– 0.039 OCCH7 (– 2.08)	F = 49.03			F = 96.09
	– 0.056 OCCH8 (– 2.31)				
	F = 2.47				
– 0.033 I-W9 (– 1.62)	– 0.037 OCCH2 (– 1.72)	0.020 EDW2 (0.72)	0.007 IMS2 (0.22)	– 0.286 CH1 (– 10.02)	– 0.095 AGE2 (– 2.37)
– 0.059 I-W10 (– 2.63)	– 0.003 OCCH3 (– 0.10)	0.072 EDW3 (2.86)	0.064 IMS3 (2.61)	– 0.116 CH2 (– 6.01)	– 0.152 AGE3 (– 3.63)
– 0.150 I-W11 (– 8.34)	0.050 OCCH4 (1.61)	0.106 EDW4 (4.06)	– 0.026 IMS4 (– 0.40)	– 0.294 CH3 (– 12.52)	– 0.251 AGE4 (– 5.80)
F = 28.06	0.029 OCCH5 (0.82)	0.252 EDW5 (7.32)	0.030 IMS5 (1.88)	F = 60.24	– 0.382 AGE5 (– 8.21)
	– 0.000 OCCH6 (– 0.01)	0.241 EDW6 (6.17)	F = 2.30		– 0.490 AGE6 (– 7.92)
	0.022 OCCH7 (1.11)	F = 16.70			F = 25.72
	– 0.034 OCCH8 (– 0.94)				
	F = 1.84				

TABLE A.6. Regression Equations for Labour Force Participation of Married Women, Husband Present, Based on SCF68 Data

Const. term	OWH	AD	HWU	HDNW	REG	I-W
0.729 (20.02)	– 0.025 (– 2.30)	0.068 (10.11)	0.0004 (0.43)	– 0.132 (– 4.95)	0.034 REG1 (1.99)	– 0.036 I-W2 (– 1.11)
					0.105 REG3 (8.17)	– 0.028 I-W3 (– 0.91)
					0.143 REG4 (9.79)	– 0.067 I-W4 (– 2.28)
Metropolitan areas (all ages) Mean of dep. var. = 0.397					0.092 REG5 (5.25)	– 0.061 I-W5 (– 2.12)
N = 9014					F = 28.95	– 0.112 I-W6 (– 3.81)
F = 58.06 R^2 = 0.2137						– 0.170 I-W7 (– 5.66)
$\bar{R}^2$ = 0.2101 SEE = 0.4349						– 0.172 I-W8 (– 5.48)
						– 0.205 I-W9 (– 6.23)
						– 0.205 I-W10 (– 5.92)
						– 0.330 I-W11 (– 10.64)
						F = 26.59
0.648 (16.68)	– 0.044 (– 3.15)	0.035 (4.93)	– 0.0005 (– 0.71)	– 0.211 (– 7.70)	0.010 REG1 (0.62)	– 0.056 I-W2 (– 2.40)
					0.123 REG3 (6.66)	– 0.083 I-W3 (– 3.50)
					0.108 REG4 (5.73)	– 0.084 I-W4 (– 3.53)
Non-metropolitan areas (all ages) Mean of dep. var. = 0.319					0.076 REG5 (3.45)	– 0.099 I-W5 (– 4.06)
N = 6543					F = 20.30	– 0.133 I-W6 (– 5.14)
F = 33.61 R^2 = 0.1854						– 0.156 I-W7 (– 5.64)
$\bar{R}^2$ = 0.1799 SEE = 0.4223						– 0.169 I-W8 (– 5.52)
						– 0.199 I-W9 (– 5.68)
						– 0.314 I-W10 (– 7.72)
						– 0.292 I-W11 (– 9.29)
						F = 12.63

TABLE A. 6. Regression Equations for Labour Force Participation of Married Women, Husband Present, Based on SCF68 Data

OCCH	EDW	IMS	CH	AGE	RES
− 0.020 OCCH2 (− 1.10)	0.017 EDW2 (1.02)	0.011 IMS2 (0.51)	− 0.369 CH1 (− 22.64)	− 0.117 AGE2 (− 6.67)	
0.053 OCCH3 (2.44)	0.114 EDW3 (7.28)	0.070 IMS3 (4.37)	− 0.130 CH2 (− 9.15)	− 0.213 AGE3 (− 10.87)	
0.014 OCCH4 (0.62)	0.172 EDW4 (10.24)	0.025 IMS4 (0.77)	− 0.371 CH3 (− 22.72)	− 0.332 AGE4 (− 16.18)	
0.028 OCCH5 (1.26)	0.253 EDW5 (10.27)	0.048 IMS5 (4.39)	F = 240.69	− 0.493 AGE5 (− 21.45)	
− 0.008 OCCH6 (− 0.37)	0.268 EDW6 (8.71)	F = 7.82		− 0.667 AGE6 (− 22.22)	
0.018 OCCH7 (1.15)	F = 42.24			F = 133.02	
− 0.012 OCCH8 (− 0.47)					
F = 2.20					
− 0.068 OCCH2 (− 2.39)	0.051 EDW2 (3.12)	− 0.063 IMS2 (− 2.35)	− 0.285 CH1 (− 13.54)	− 0.068 AGE2 (− 3.11)	0.049 RES2 (3.32)
0.015 OCCH3 (0.46)	0.098 EDW3 (6.33)	− 0.029 IMS3 (− 0.97)	− 0.106 CH2 (− 6.31)	− 0.107 AGE3 (− 4.45)	0.044 RES3 (3.44)
0.078 OCCH4 (2.25)	0.202 EDW4 (11.31)	− 0.052 IMS4 (− 0.68)	− 0.281 CH3 (− 14.97)	− 0.188 AGE4 (− 7.43)	F = 8.32
− 0.011 OCCH5 (− 0.38)	0.354 EDW5 (11.58)	0.002 IMS5 (0.17)	F = 94.57	− 0.308 AGE5 (− 11.11)	
− 0.033 OCCH6 (− 1.28)	0.383 EDW6 (8.99)	F = 1.74		− 0.450 AGE6 (− 13.39)	
− 0.049 OCCH7 (− 2.52)	F = 48.46			F = 43.12	
− 0.113 OCCH8 (− 5.01)					
F = 7.88					

TABLE A.7. Regression Equations for Labour Force Participation of Married Women, Husband Present, Based on SCF68 Data

Const. term	OWH	AD	HWU	HDNW	RES	I-W
0.659 (13.53)	−0.050 (−2.61)	0.029 (3.21)	0.0007 (0.80)	−0.192 (−5.23)	0.052 RES1 (2.73)	−0.034 I-W2 (−1.10)
					0.013 RES2 (0.57)	−0.078 I-W3 (−2.53)
					0.038 RES3 (1.62)	−0.088 I-W4 (−2.81)
Atlantic Provinces (all ages)					F = 2.80	−0.116 I-W5 (−3.60)
Mean of dep. var. = 0.292						−0.191 I-W6 (−5.45)
N = 3451						−0.136 I-W7 (−3.57)
F = 18.19						−0.153 I-W8 (−3.41)
R^2 = 0.1795						−0.213 I-W9 (−4.44)
$\bar{R}^2$ = 0.1696						−0.228 I-W10 (−3.97)
SEE = 0.4146						−0.270 I-W11 (−6.13)
						F = 5.99
0.793 (14.21)	−0.019 (−1.16)	0.042 (4.79)	−0.0011 (−1.07)	−0.096 (−2.36)	0.036 RES1 (1.58)	−0.123 I-W2 (−2.85)
					0.075 RES2 (2.00)	−0.043 I-W3 (−1.02)
					0.030 RES3 (1.12)	−0.099 I-W4 (−2.44)
Quebec (all ages)					F = 1.50	−0.124 I-W5 (−3.05)
Mean of dep. var. = 0.289						−0.131 I-W6 (−3.15)
N = 3248						−0.181 I-W7 (−4.17)
F = 22.89						−0.190 I-W8 (−4.21)
R^2 = 0.2264						−0.191 I-W9 (−3.78)
$\bar{R}^2$ = 0.2165						−0.226 I-W10 (−4.34)
SEE = 0.4015						−0.329 I-W11 (−7.24)
						F = 8.39

TABLE A.7. Regression Equations for Labour Force Participation of Married Women, Husband Present, Based on SCF68 Data

OCCH	EDW	IMS	CH	AGE
– 0.064 OCCH2 (– 1.74)	0.035 EDW2 (1.55)	– 0.077 IMS2 (– 1.45)	– 0.227 CH1 (– 8.19)	– 0.083 AGE2 (– 2.86)
0.079 OCCH3 (1.95)	0.092 EDW3 (4.69)	– 0.082 IMS3 (– 1.41)	– 0.093 CH2 (– 4.19)	– 0.163 AGE3 (– 5.04)
0.070 OCCH4 (1.53)	0.243 EDW4 (10.30)	– 0.255 IMS4 (– 2.08)	– 0.251 CH3 (– 10.28)	– 0.214 AGE4 (– 6.22)
– 0.021 OCCH5 (– 0.54)	0.335 EDW5 (8.61)	0.012 IMS5 (0.76)	F = 40.83	– 0.310 AGE5 (– 8.42)
– 0.030 OCCH6 (– 0.83)	0.382 EDW6 (6.13)	F = 2.32		– 0.412 AGE6 (– 9.04)
– 0.033 OCCH7 (– 1.19)	F = 32.08			F = 20.31
– 0.125 OCCH8 (– 3.91)				
F = 6.18				
– 0.062 OCCH2 (– 1.96)	0.013 EDW2 (0.59)	0.138 IMS2 (2.51)	– 0.370 CH1 (– 14.28)	– 0.191 AGE2 (– 6.84)
0.010 OCCH3 (0.27)	0.072 EDW3 (3.51)	0.240 IMS3 (6.99)	– 0.162 CH2 (– 7.08)	– 0.273 AGE3 (– 8.96)
– 0.067 OCCH4 (– 1.69)	0.178 EDW4 (7.61)	0.152 IMS4 (2.16)	– 0.333 CH3 (– 13.25)	– 0.371 AGE4 (– 11.31)
0.033 OCCH5 (0.96)	0.305 EDW5 (6.40)	0.031 IMS5 (1.93)	F = 83.61	– 0.539 AGE5 (– 14.72)
– 0.026 OCCH6 (– 0.75)	0.359 EDW6 (7.15)	F = 14.36		– 0.692 AGE6 (– 14.46)
0.002 OCCH7 (0.07)	F = 22.50			F = 56.48
– 0.017 OCCH8 (– 0.48)				
F = 1.76				

TABLE A.8. Regression Equations for Labour Force Participation of Married Women, Husband Present, Based on SCF68 Data

Const. term	OWH	AD	HWU	HDNW	RES	I-W
0.758 (13.01)	− 0.042 (− 2.48)	0.063 (5.89)	0.0002 (0.13)	− 0.145 (− 3.69)	0.033 RES1 (1.50)	0.017 I-W2 (0.37)
					0.087 RES2 (2.57)	− 0.003 I-W3 (− 0.07)
					0.056 RES3 (1.90)	− 0.034 I-W4 (− 0.79)
Ontario (all ages)					F = 2.57	− 0.033 I-W5 (− 0.80)
Mean of dep. var. = 0.415						− 0.071 I-W6 (− 1.69)
N = 4324						− 0.123 I-W7 (− 2.85)
F = 26.13						− 0.124 I-W8 (− 2.77)
R^2 = 0.2001						− 0.158 I-W9 (− 3.29)
$\bar{R}^2$ = 0.1925						− 0.210 I-W10 (− 4.19)
SEE = 0.4428						− 0.276 I-W11 (− 6.24)
						F = 10.72
0.759 (12.37)	− 0.010 (− 0.45)	0.091 (6.65)	− 0.0051 (− 2.63)	− 0.264 (− 5.67)	0.136 RES2 (4.99)	− 0.052 I-W2 (− 1.14)
					0.092 RES3 (2.08)	− 0.079 I-W3 (− 1.77)
					0.123 RES4 (4.07)	− 0.064 I-W4 (− 1.49)
Prairie Provinces (all ages)					F = 8.64	− 0.065 I-W5 (− 1.50)
Mean of dep. var. = 0.440						− 0.113 I-W6 (− 2.48)
N = 2888						− 0.237 I-W7 (− 5.06)
F = 18.45						− 0.257 I-W8 (− 5.21)
R^2 = 0.2100						− 0.257 I-W9 (− 4.89)
$\bar{R}^2$ = 0.1986						− 0.340 I-W10 (− 5.72)
SEE = 0.4445						− 0.441 I-W11 (− 8.85)
						F = 15.37

TABLE A.8. Regression Equations for Labour Force Participation of Married Women, Husband Present, Based on SCF68 Data

OCCH	EDW	IMS	CH	AGE
– 0.030 OCCH2 (– 1.07)	0.031 EDW2 (1.21)	– 0.039 IMS2 (– 1.26)	– 0.378 CH1 (– 15.22)	– 0.075 AGE2 (– 2.82)
0.025 OCCH3 (0.74)	0.138 EDW3 (5.49)	– 0.002 IMS3 (– 0.07)	– 0.149 CH2 (– 7.01)	– 0.143 AGE3 (– 4.81)
0.056 OCCH4 (1.54)	0.179 EDW4 (6.62)	0.053 IMS4 (1.16)	– 0.405 CH3 (– 16.56)	– 0.276 AGE4 (– 8.94)
0.037 OCCH5 (1.11)	0.266 EDW5 (6.81)	0.028 IMS5 (1.75)	F = 118.33	– 0.461 AGE5 (– 13.32)
– 0.015 OCCH6 (– 0.43)	0.249 EDW6 (5.50)	F = 1.73		– 0.631 AGE6 (–14.60)
0.004 OCCH7 (0.19)	F = 18.68			F = 57.49
– 0.053 OCCH8 (– 1.52)				
F = 1.75				
– 0.030 OCCH2 (– 0.85)	0.041 EDW2 (1.32)	– 0.017 IMS2 (– 0.53)	– 0.358 CH1 (– 11.57)	– 0.084 AGE2 (– 2.57)
0.034 OCCH3 (0.76)	0.097 EDW3 (3.33)	0.027 IMS3 (0.80)	– 0.082 CH2 (– 3.14)	– 0.180 AGE3 (– 4.85)
0.000 OCCH4 (0.01)	0.130 EDW4 (4.18)	– 0.055 IMS4 (– 0.71)	– 0.281 CH3 (– 9.22)	– 0.277 AGE4 (– 7.31)
– 0.032 OCCH5 (– 0.79)	0.230 EDW5 (5.16)	0.029 IMS5 (1.46)	F = 54.43	– 0.407 AGE5 (– 9.64)
– 0.018 OCCH8 (– 0.47)	0.306 EDW6 (5.05)	F = 1.00		– 0.572 AGE6 (– 10.55)
– 0.033 OCCH7 (– 1.14)	F = 9.19			F = 27.76
– 0.072 OCCH8 (– 1.86)				
F = 0.97				

TABLE A.9. Regression Equations for Labour Force Participation of Married Women, Husband Present, Based on SCF68 Data

Const. term	OWH	AD	HWU	HDNW	RES	I-W
0.639 (7.19)	– 0.076 (– 2.78)	0.100 (5.41)	0.0008 (0.47)	– 0.081 (– 1.36)	0.092 RES1 (2.80)	– 0.102 I-W2 (– 1.62)
					0.133 RES2 (3.16)	– 0.139 I-W3 (– 2.20)
					0.065 RES3 (1.53)	– 0.103 I-W4 (– 1.60)
British Columbia (all ages)					F = 3.79	– 0.030 I-W5 (– 0.47)
Mean of dep. var. = 0.399						– 0.133 I-W6 (– 2.15)
N = 1646						– 0.214 I-W7 (– 3.38)
F = 10.67						– 0.178 I-W8 (– 2.65)
$R^2 = 0.2143$						– 0.287 I-W9 (– 4.17)
$\bar{R}^2 = 0.1942$						– 0.226 I-W10 (– 2.97)
SEE = 0.4396						– 0.398 I-W11 (– 6.11)
						F = 7.79
0.685 (25.41)	– 0.034 (– 4.09)	0.057 (11.51)	– 0.0005 (– 0.79)	– 0.152 (– 7.85)	0.052 RES1 (4.83)	– 0.054 I-W2 (– 2.67)
					0.075 RES2 (4.72)	– 0.054 I-W3 (– 2.68)
					0.053 RES3 (3.96)	– 0.075 I-W4 (– 3.85)
Age group: All ages (Weighted Regression Equation)					F = 10.50	– 0.077 I-W5 (– 4.02)
Mean of dep. var. = 0.371						– 0.115 I-W6 (– 5.86)
N = 15557						– 0.172 I-W7 (– 8.46)
F = 87.89						– 0.176 I-W8 (– 8.19)
$R^2 = 0.2032$						– 0.204 I-W9 (– 8.79)
$\bar{R}^2 = 0.2009$						– 0.238 I-W10 (– 9.62)
SEE = 0.4318						– 0.331 I-W11 (– 15.59)
						F = 42.44

TABLE A.9. Regression Equations for Labour Force Participation of Married Women, Husband Present, Based on SCF68 Data

OCCH	EDW	IMS	CH	AGE	REG
0.051 OCCH2 (1.08)	0.045 EDW2 (0.90)	0.008 IMS2 (0.19)	− 0.328 CH1 (− 7.89)	− 0.021 AGE2 (− 0.47)	
0.046 OCCH3 (0.83)	0.093 EDW3 (2.00)	0.052 IMS3 (1.36)	− 0.082 CH2 (− 2.42)	− 0.029 AGE3 (− 0.60)	
0.101 OCCH4 (1.75)	0.155 EDW4 (3.28)	− 0.098 IMS4 (− 1.34)	− 0.364 CH3 (− 8.98)	− 0.203 AGE4 (− 4.09)	
0.067 OCCH5 (1.22)	0.306 EDW5 (5.23)	0.030 IMS5 (1.17)	F = 36.16	− 0.340 AGE5 (− 6.09)	
0.028 OCCH6 (0.54)	0.241 EDW6 (2.98)	F = 1.28		− 0.554 AGE6 (− 7.94)	
0.038 OCCH7 (1.07)	F = 8.03			F = 18.38	
− 0.011 OCCH8 (− 0.23)					
F = 0.79					
− 0.040 OCCH2 (− 2.70)	0.029 EDW2 (2.47)	− 0.014 IMS2 (− 0.83)	− 0.359 CH1 (− 28.02)	− 0.102 AGE2 (− 7.50)	0.018 REG1 (1.25)
0.025 OCCH3 (1.41)	0.111 EDW3 (9.83)	0.049 IMS3 (3.72)	− 0.134 CH2 (− 12.23)	− 0.174 AGE3 (− 11.47)	0.113 REG3 (12.24)
0.019 OCCH4 (1.00)	0.177 EDW4 (14.35)	0.033 IMS4 (1.19)	− 0.354 CH3 (− 28.54)	− 0.288 AGE4 (− 18.16)	0.132 REG4 (11.36)
0.018 OCCH5 (1.07)	0.281 EDW5 (14.53)	0.028 IMS5 (3.47)	F = 369.84	− 0.445 AGE5 (− 25.20)	0.085 REG5 (6.46)
− 0.024 OCCH6 (− 1.40)	0.295 EDW6 (12.28)	F = 6.13		− 0.613 AGE6 (− 27.36)	F = 51.66
− 0.008 OCCH7 (− 0.64)	F = 80.15			F = 191.30	
− 0.056 OCCH8 (− 3.45)					
F = 5.32					

APPENDIX B

VARIABLE NAMES AND DEFINITIONS

AND REGRESSION EQUATIONS BASED ON 1961 CENSUS DATA

Variables Used in Analysis of Labour Force Participation Rates of Married Women with 1961 Census Data.

174 Observations from incorporated cities, towns, villages and other municipal subdivisions with population of 10,000 and over. Variables have been broken down into six groups by the age of wife.

Variable Name	Definition
PR	(dependent variable) labour force participation rate of married women, husband present, during the census week (in per cent).
UN	male unemployment rate, as percentage of male labour force. It does not include persons looking for work for the first time.[1] 1961 Census, Bulletin 3. 3-1, Tables 4, 5.
IM	White Collar workers (males and females: managerial, professional and technical, clerical and sales) as a percentage of labour force.[1] 1961 Census, Bulletins 3. 1-4, 3. 1-5, 3. 1-6.
YH	Average annual earnings ($/yr) of husband.
NCH < 15	Husband-wife families with no children 15 years old and under (in per cent).
REG	region of city: dummy variables

REG1 = 1 if city in Atlantic Provinces; 0 otherwise

REG2 = 1 if city in Quebec; 0 otherwise

REG3 = 1 if city in Ontario; 0 otherwise

REG4 = 1 if city in Prairie Provinces; 0 otherwise

REG5 = 1 if city in British Columbia; 0 otherwise

W – average annual earnings ($/yr) of full-time female wage earners.[1]

EDW7 – per cent of wives, in husband-wife families, with university degree.

CH5 – per cent of husband-wife families with one or more children under 6 years of age.

RC – per cent of Roman Catholic wives, in husband-wife families.[2]

AD > 15 – number of persons over 15 years of age in husband-wife families (including husband and wife), average per family for each city.

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[1] The variables UN, IM and W are not broken down by age group, and they are used for all age groups.

[2] Source for variables PR, YH, NHC ≤ 15, W, EDW7, CH5, RC, AD>15: 1961 Census unpublished tabulations.

TABLE B.1. Regression Equations for Labour Force Participation Rates of Married Women, Husband Present, Based on 1961 Census Data

Eqn. No.	Age group	Const. term	UN	IM	YH	AD>15	W	EDW7	CH5
1	All ages..........	51.77	.17	.08	– .0047	– 12.04	.0072	.35	– .13
		(5.61)	(1.00)	(2.16)	(– 6.78)	(– 3.84)	(5.12)	(2.16)	(– 3.12)
2	All ages..........	50.19		.08	– .0048	– 10.98	.0072	.36	– .13
		(5.52)		(2.03)	(– 6.99)	(– 3.72)	(5.10)	(2.25)	(– 3.03)
3	Less than 25	54.75	– .03	.06	– .0070	1.02	.0130	– .06	– .51
		(1.72)	(– .14)	(1.16)	(– 5.31)	(.07)	(6.43)	(– .46)	(– 6.86)
4	Less than 25	56.56		.07	– .0069		.0130	– .06	– .51
		(7.37)		(1.20)	(– 5.45)		(6.54)	(– .49)	(– 6.95)
5	Less than 25	55.91		.06	– .0072		.0132		– .50
		(7.42)		(1.10)	(– 6.40)		(6.79)		(– 7.31)
6	25-34	61.17	.19	.09	– .0045	3.30	.0072	.07	– .66
		(4.32)	(1.17)	(2.36)	(– 5.53)	(.56)	(4.92)	(.69)	(– 8.73)
7	25-34	69.34	.22	.10	– .0041		.0067		– .69
		(10.26)	(1.34)	(2.67)	(– 6.65)		(4.96)		(– 10.29)
8	25-34	70.58		.09	– .0042		.0064		– .68
		(10.51)		(2.60)	(– 6.76)		(4.79)		(– 10.20)
9	35-44	63.74	.24	.02	– .0053	– 9.44	.0061	.54	– .24
		(6.62)	(1.19)	(.63)	(– 8.13)	(– 2.98)	(4.02)	(3.68)	(– 3.91)
10	35-44	65.59	.25		– .0052	– 9.94	.0060	.57	– .24
		(7.17)	(1.21)		(– 8.28)	(– 3.24)	(4.00)	(4.01)	(– 3.93)
11	35-44	61.74			– .0053	– 7.99	.0061	.58	– .25
		(7.19)			(– 8.57)	(– 3.06)	(4.04)	(4.06)	(– 3.94)
12	45-54	43.27	.12	.08	– .0046	– 4.07	.0055	.42	– .17
		(6.45)	(.62)	(1.89)	(– 7.40)	(– 2.26)	(3.52)	(2.60)	(– 1.06)
13	45-54	43.19		.07	– .0047	– 3.73	.0054	.42	– .18
		(6.45)		(1.81)	(– 7.47)	(– 2.18)	(3.48)	(2.64)	(– 1.13)
14	45-54	44.17		.09	– .0046	– 4.51	.0053	.40	
		(6.65)		(2.37)	(– 7.44)	(– 2.88)	(3.40)	(2.54)	
15	55-64	29.40	.16	.09	– .0022	– 2.52	.0013	.19	
		(2.24)	(1.05)	(3.02)	(– 5.13)	(– 1.87)	(1.09)	(1.45)	
16	55-64	22.37	.18	.09	– .0022	– 2.15	.0013	.17	
		(4.71)	(1.15)	(2.97)	(– 5.16)	(– 1.82)	(1.14)	(1.38)	
17	55-64	23.57		.09	– .0019	– 2.05	.0009		
		(5.00)		(2.87)	(– 5.15)	(– 1.78)	(.82)		
18	65 + ...	25.60	.01	– .00	– .0003	.55	.0003	.08	
		(2.45)	(.07)	(– .06)	(– 1.79)	(.59)	(.50)	(1.23)	
19	65 + ...	25.80			– .0003	.54	.0002	.08	
		(2.53)			(– 1.91)	(.60)	(.51)	(1.24)	
20	65 + ...	27.17			– .0003		.0002	.08	
		(2.74)			(– 1.85)		(.34)	(1.30)	

TABLE B. 1. Regression Equations for Labour Force Participation Rates of Married Women, Husband Present, Based on 1961 Census Data

RC	REG1	REG3	REG4	REG5	NCH≤15	R^2	$\bar{R}^2$	SEE	Eqn. No.
- .06 (- 2.64)	.88 (.69)	5.37 (4.33)	4.74 (3.37)	- .29 (- .18)		.88	.87	3.10	1
- .06 (- 2.63)	.88 (.70)	5.56 (4.54)	4.83 (3.44)	.23 (.15)		.88	.87	3.10	2
- .15 (- 5.21)	.77 (.41)	3.88 (2.16)	4.40 (2.20)	- 2.94 (- 1.22)		.85	.84	4.63	3
- .15 (- 5.37)	.79 (.42)	3.84 (2.18)	4.39 (2.23)	- 3.04 (- 1.36)		.85	.84	4.60	4
- .14 (- 5.52)	.87 (.46)	4.15 (2.54)	4.64 (2.44)	- 2.82 (- 1.29)		.85	.84	4.59	5
- .06 (- 3.18)	1.24 (.96)	4.80 (3.85)	5.14 (3.59)	- .64 (- .39)		.88	.87	3.18	6
- .07 (- 3.43)	1.23 (.96)	4.61 (3.90)	5.06 (3.57)	- .76 (- .46)		.88	.87	3.16	7
- .06 (- 3.33)	1.23 (.96)	4.83 (4.12)	5.13 (3.62)	- .06 (- .04)		.88	.87	3.17	8
- .08 (- 3.48)	.03 (.02)	6.93 (5.35)	6.78 (4.34)	1.56 (.88)		.90	.89	3.40	9
- .08 (- 3.46)	.02 (.02)	6.90 (5.34)	6.80 (4.36)	1.49 (.84)		.90	.89	3.39	10
- .08 (- 3.45)	.01 (.00)	7.06 (5.48)	6.83 (4.37)	2.11 (1.25)		.90	.89	3.39	11
- .14 (- 5.33)	- 1.34 (- .84)	3.92 (2.75)	4.05 (2.42)	1.68 (.88)		.88	.87	3.67	12
- .14 (- 5.38)	- 1.27 (- .80)	4.07 (2.90)	4.13 (2.48)	2.08 (1.16)		.88	.87	3.66	13
- .14 (- 5.57)	- 1.83 (- 1.21)	4.19 (2.99)	3.99 (2.40)	2.13 (1.19)		.88	.87	3.66	14
- .09 (- 4.59)	- .88 (- .68)	2.45 (2.15)	2.16 (1.65)	.13 (.08)	- .07 (- .58)	.77	.75	2.95	15
- .09 (- 4.57)	- .64 (- .52)	2.40 (2.11)	2.20 (1.69)	.06 (.04)		.77	.75	2.94	16
- .10 (- 5.19)	- .54 (- .44)	2.17 (2.01)	1.99 (1.55)	.56 (.40)		.76	.75	2.95	17
- .02 (- 2.56)	.61 (1.06)	1.31 (2.54)	.22 (.37)	.84 (1.24)	- .24 (- 2.33)	.45	.41	1.37	18
- .02 (- 2.50)	.61 (1.07)	1.32 (2.65)	.23 (.38)	.87 (1.41)	- .24 (- 2.39)	.45	.41	1.36	19
- .02 (- 2.53)	.56 (.99)	1.26 (2.58)	.17 (.30)	.81 (1.33)	- .24 (- 2.39)	.45	.42	1.36	20

TABLE B. 2. Regression Equations for Labour Force Participation Rates of Married Women, Husband Present, Based on 1961 Census Data

Eqn. No.	Age group	Const. term	UN	IM	YH	AD >15	W	EDW7	CH5
		Logarithmic equations							
1	All ages	2.56 (3.07)	0.08 (2.01)	0.20 (2.47)	– 1.45 (– 7.81)	– 2.95 (– 5.91)	1.59 (6.97)	0.11 (2.11)	– 0.43 (– 4.35)
2	Less than 25	– 0.19 (– 0.17)	0.02 (0.37)	0.34 (3.22)	– 1.63 (– 6.28)	0.31 (0.17)	2.41 (8.91)	– 0.02 (– 0.65)	– 0.68 (– 3.09)
3	25-34	3.60 (3.45)	0.06 (1.35)	0.24 (2.50)	– 1.76 (– 7.40)	1.12 (1.30)	2.09 (8.91)	0.06 (1.11)	– 1.96 (– 5.88)
4	35-44	4.10 (4.73)	0.09 (1.94)	0.05 (0.60)	– 1.63 (– 8.83)	– 1.98 (– 3.94)	1.51 (6.67)	0.15 (3.21)	– 0.80 (– 5.37)
5	45-54	2.34 (3.36)	0.06 (1.54)	0.16 (2.18)	– 1.21 (– 7.98)	– 2.09 (– 6.86)	1.24 (5.87)	0.11 (3.17)	– 0.03 (– 0.42)
6	55-64	1.47 (0.61)	0.12 (2.23)	0.24 (2.16)	– 1.01 (– 5.27)	– 1.57 (– 3.55)	1.06 (3.38)	0.13 (2.61)	
7	65+	10.55 (1.40)	0.12 (1.29)	0.03 (0.15)	– 0.28 (– 1.24)	0.20 (0.23)	0.62 (1.28)	0.13 (1.79)	
		Equations by level of income							
	Inc. level:								
8	L	35.97 (1.76)	0.07 (0.25)	0.245 (2.45)	– 0.007 (– 2.59)	– 13.70 (– 2.01)	0.015 (5.44)	0.60 (1.43)	0.02 (0.19)
9	M	54.46 (2.72)	– 0.18 (– 0.63)	0.220 (2.94)	– 0.003 (– 1.32)	– 11.29 (– 1.83)	0.006 (2.13)	– 0.55 (– 1.81)	– 0.13 (– 1.77)
10	U	57.17 (2.99)	0.09 (0.24)	0.004 (0.07)	– 0.003 (– 2.75)	– 9.48 (– 1.48)	0.005 (1.91)	– 0.01 (– 0.06)	– 0.16 (– 2.16)
11	L	41.03 (1.96)	0.04 (0.14)	0.270 (2.65)	– 0.009 (– 3.23)	– 12.42 (– 1.75)	0.013 (4.43)	1.05 (2.15)	0.13 (1.09)
12	M	42.46 (2.35)	0.11 (0.39)	0.180 (2.72)	– 0.004 (– 1.80)	– 10.14 (– 1.87)	0.007 (2.86)	0.06 (0.21)	– 0.14 (– 2.00)
13	U	44.63 (2.56)	0.22 (0.62)	0.001 (0.02)	– 0.004 (– 3.94)	– 7.34 (– 1.28)	0.005 (2.46)	0.36 (1.57)	– 0.09 (– 1.31)

TABLE B. 2. Regression Equations for Labour Force Participation Rates of Married Women, Husband Present, Based on 1961 Census Data

RC	REG1	REG3	REG4	REG5	NCH≤ 15	R^2	$\bar{R}^2$	SEE	Eqn. No.
Logarithmic equations									
– 0.06 (– 1.30)	0.10 (3.07)	0.10 (3.60)	0.10 (2.71)	– 0.05 (– 1.15)		0.88	0.87	0.087	1
– 0.17 (– 3.00)	0.10 (2.44)	0.10 (2.80)	0.13 (3.14)	– 0.01 (– 0.18)		0.78	0.76	0.117	2
– 0.15 (– 2.86)	0.13 (3.67)	0.12 (3.71)	0.14 (3.62)	– 0.02 (– 0.35)		0.85	0.84	0.099	3
– 0.08 (– 1.60)	0.11 (3.22)	0.13 (4.47)	0.14 (3.82)	– 0.01 (– 0.11)		0.89	0.88	0.089	4
– 0.12 (– 2.64)	0.05 (1.47)	0.06 (2.07)	0.06 (1.68)	– 0.04 (– 0.85)		0.89	0.88	0.085	5
– 0.14 (– 2.41)	0.10 (1.76)	0.08 (1.83)	0.07 (1.28)	– 0.07 (– 0.98)	– 0.02 (– 0.02)	0.76	0.74	0.135	6
– 0.16 (– 1.95)	0.17 (2.02)	0.26 (3.40)	0.13 (1.54)	0.11 (1.02)	– 5.72 (– 1.55)	0.45	0.41	0.219	7
Equations by level of income									
– 0.06 (– 1.99)						0.91	0.89	2.666	8
– 0.13 (– 4.62)						0.81	0.79	4.014	9
– 0.14 (– 4.79)						0.88	0.85	2.850	10
– 0.08 (– 1.50)	– 2.94 (– 1.11)	1.77 (0.62)	– 0.87 (– 0.26)			0.92	0.89	2.631	11
– 0.07 (– 2.08)	1.82 (0.88)	5.56 (2.55)	5.00 (2.01)	– 1.98 (– 0.65)		0.87	0.85	3.378	12
– 0.09 (– 3.05)		5.06 (3.28)	2.97 (1.35)	1.88 (0.89)		0.92	0.89	2.445	13

APPENDIX C

SOME ESTIMATION PROBLEMS

Ordinary least squares (OLS) techniques were employed in fitting the single equation models in the current study. An alternative estimating method, weighted least squares, has been proposed in the econometric literature[1] for eliminating bias and in particular for increasing efficiency[2] of the estimates when the error terms do not have constant variance.[3]

Consider, e.g., the following linear model

$$Y = X\beta + \epsilon \tag{C.1}$$

where: Y is an (n x 1) vector of observations on the dependent variable.

X is an (n x k) nonstochastic matrix of observations on the k independent variables.

β is a (k x 1) vector of parameters to be estimated.

ϵ is a (n x 1) vector of error terms.

We assume the rank of X is $k \leqslant n$ and

$$E(\epsilon) = 0$$

$$E(\epsilon\,\epsilon') = \sigma^2 V \tag{C.2}$$

where V is a square diagonal matrix (n x n) and σ^2 is a scalar.

If we assume that V is given by:

$$\begin{bmatrix} 1/w_1 & 0 & \dots & 0 \\ 0 & 1/w_2 & & 0 \\ . & . & . & . \\ . & . & . & . \\ . & . & & .\,. \\ 0 & 0 & \dots & 1/w_n \end{bmatrix} = V \tag{C.3}$$

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[1] For example see, L.R. Klein, *A Textbook of Econometrics*, Row, Peterson and Company, New York, 1953, pp. 305-313.

[2] For a definition of efficiency see Klein, *ibid.*, p. 53.

[3] As Klein puts it "efficiency rather than bias is a more important reason for making wieghted estimates of structural equations when the disturbances do not have a variance independent of Z" (Z is the independent variable.) See Klein, *ibid.*, p. 309.

where w_i are given weights usually provided along with the sample survey data,[4] and premultiply the model (C.1) by the matrix

$$\begin{bmatrix} \sqrt{w_1} & 0 & \ldots & 0 \\ 0 & \sqrt{w_2} & & 0 \\ \cdot & \cdot & \cdot & \cdot \\ \cdot & \cdot & \cdot & \cdot \\ \cdot & \cdot & & \cdot\,\cdot \\ 0 & 0 & & \sqrt{w_n} \end{bmatrix} = \sqrt{W} \qquad \text{(C.4)}$$

we obtain:

$$Y^* = X^* \beta + \epsilon^* \qquad \text{(C.5)}$$

where $Y^* = \sqrt{W}\, Y$, $X^* = \sqrt{W}\, X$, and $\epsilon^* = \sqrt{W}\, \epsilon$.

It can be shown that application of ordinary least squares to the transformed variables (model C.5) would yield BLUE estimates of β with variance covariance matrix:[5]

$$E\,(\epsilon^*\, \epsilon^{*\prime}) = \sigma^2\, I \qquad \text{(C.6)}$$

However, we have certain reservations concerning the assumptions made in the preceding procedure:

(a) We have to assume the matrix V as known, with diagonal elements equal to the reciprocal of the given weights. This is a strong assumption since the weights in sample surveys are designed to provide unbiased estimates of certain aggregates (e.g., average income) and not to increase the efficiency of estimates in regression analysis in which the variables to be used are unknown to those who design the weights.

(b) The second assumption, that the off-diagonal elements of the matrix V are zero, is also questionable, since the survey data are a clustered stratified

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[4] Weights are provided along with the SCF68 data. They are assigned to each individual observation and the weights are the same over all variables.

[5] The outlined procedure is a special case of generalized least squares (GLS) techniques. For a description of GLS techniques see, Goldberger, *op. cit.*, pp. 232-235.

sample, so that the observations are most probably correlated. Consequently the off-diagonal elements of V are not zero.[6]

Moreover, when the dependent variable is dichotomous, as in our analysis with the SCF68 data, use of weighted data in the regression analysis will not produce efficient estimates (i.e., estimates of minimum variance) even if the assumptions of the preceding outlined procedure are true because equation (C.6) is untenable.[7] In addition, a small experimentation with both weighted and unweighted micro-data from the SCF68 discloses that we get nearly the same regression results.[8]

There are some other statistical problems associated with a model with a dichotomous dependent variable. Such a model has heteroskedastic disturbances and the application of ordinary least squares yields unbiased estimates of the coefficients β, but their variance-covariance matrix is biased and inconsistent which invalidates the conventional tests of hypotheses, and therefore the F and t-tests must be regarded only as approximate.[9]

Bowen and Finegan[10] in their study to explain labour force participation dealt with a dichotomous dependent variable and used ordinary least squares for estimating the parameters. However, they investigated the implications of the biased and inconsistent ordinary least squares estimates of the variance of the coefficients on the hypothesis testing. They calculated "more accurate" standard errors of the estimated coefficients and compared these with the standard errors obtained from ordinary least squares.[11] They found that in their particular

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[6] Less rigourously, in regression analysis using the "population" (which is obtained by duplicating the sample records, or by multiplying the sample data by the given weights) instead of an "unrepresentative" sample in which some classes of the population are oversampled, the resulting efficiency of estimation would depend on the skewness of the frequency distribution of the variables in the population. An "unrepresentative" sample which has observations evenly spaced over the range of the variables may give more efficient estimates than the "population" with unevenly spaced observations.

[7] Goldberger shows that in a linear probability model the error terms are heteroskedastic varying with the independent variables and the assumption of homoskedastic disturbances is untenable. See Goldberger, *op. cit.*, pp. 248-249.

[8] See Appendix A for unweighted and weighted regression equations for "all-ages" in Tables A.1 and A.9 respectively.

[9] For an extensive discussion of this problem see the note written by O. Ashenfelter in Bowen and Finegan, *The Economics of Labor Force Participation, op. cit.*, pp. 644-648.

[10] Bowen and Finegan, *ibid.*

[11] For the method followed in the calculation and comparison of the standard errors, see Bowen and Finegan, *op. cit.*, pp. 644-648.

sample the differences were of "moderate size". In addition, they found that there was a "tendency for the approximate standard error estimates to be larger than the more accurate standard error estimates". If their results are assumed valid for this study then all the significant findings based on the F and t statistics would be reconfirmed with the "more accurate" standard error estimates.

Moreover, in a model with a dichotomous dependent variable, all the observations for this variable must be either zero or one. However, the calculated values of the dependent variable from a regression equation would not be expected to be zero or one but they would be expected to lie in the zero-one interval. These values may be interpreted as a probability; for example in the current study, this would be the probability that a married woman with given characteristics will be in the labour force. Although, because of the linear functional formulation of the model, there is no guarantee that the calculated values will lie between the zero-one interval, the assumption seems to be common practice and to be accepted as a reasonable one for the majority of cases.[12] For these reasons ordinary least squares and unweighted data were used throughout our regression analysis.

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[12] For an extensive and almost exhaustive survey of the economic literature related to statistical problems associated with dichotomous dependent variables, see A. Buse, *A Technical Report on Binary Dependent Variables as Applied in the Social Sciences,* Human Resources Research Council, Edmonton, Alberta, March 1972.