MODELLING THE PARTICIPATION RATES OF MEN AND WOMEN IN THE CANADIAN ECONOMY

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Major paper written in order to fulfil the requirements of ECO-7999

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May, 1993

"... Whether the objective facts are subject to causality is a question, the answer to which necessarily depends on the theory from which we start. Therefore, it will never be possible to decide whether the world is causal or not. Up to now we possess for the description of atomic events only a statistical theory.

... It is therefore an uncritical attitude to declare the statistical character of nature to be a fact. It may only be excused by the fact that up to now we do not have any other theory."

Albert Einstein, in a letter to Herbert Samuel
dated October, 1937.

1. INTRODUCTION

Some studies have suggested that the extent of non-participation in the labour force may be explained by the cyclical nature of the economy, relating employment efforts to the tightness or looseness of the labour market. This line of thinking has produced two hypotheses, often used to explain the cyclical response of labour supply. They are the so-called **Discouraged-Worker** and **Added** or **Secondary-Worker** hypotheses. The view that married women had weak ties to the labour force due to their role as mothers and financial dependence on their husbands led many to conclude that women were secondary workers with great volatility in their labour force participation; aptly depicted by Killingsworth (1983). Unemployment, disability, or a reduction in the earnings capacity of a working spouse were primary considerations for labour market participation.

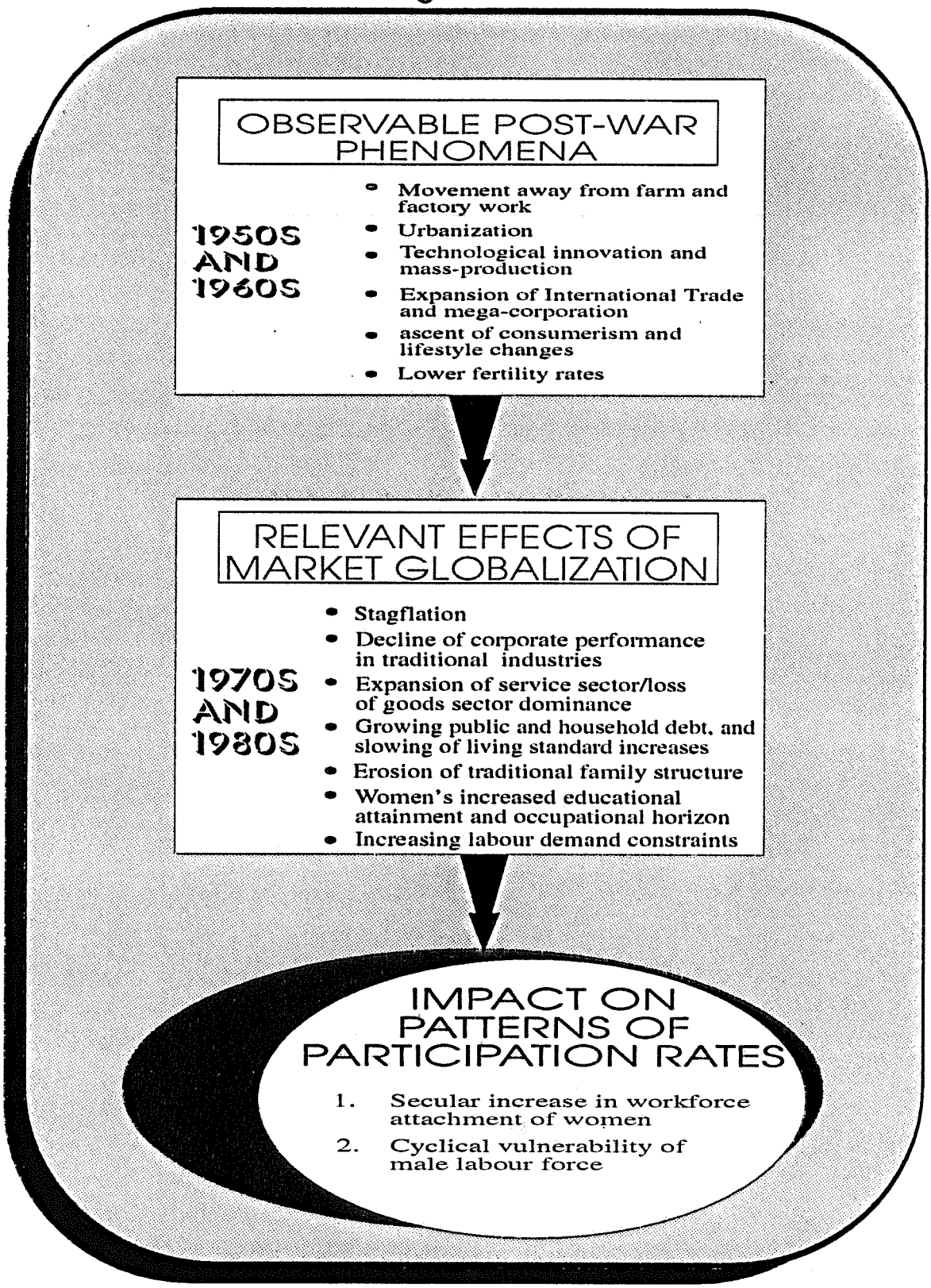
Kuch and Sharir (1978) were among the first to test this approach in the Canadian context, based on the sample period of April, 1953 to December 1974. They made use of employment/population ratios (EPR) as a proxy to labour force market conditions in order to explain participation rates. In 1983, Hasan and DeBrouker had shown that the most important variable in the determination of the number of individuals who cease to look for work because they think that **no work is available**, is the EPR. Based on Canadian labour force data for the period of February, 1977 to August, 1982, the elasticity estimate at the mean of the EPR seasonally adjusted for the entire working age population, shows that an increase of 1 per cent in the EPR reduces the number of discouraged workers by 31.1 per cent.

This would appear to justify the approach favoured by Kuch and Sharir, later incorporated within the Conference Board of Canada's Medium-Term Forecasting Model (MTFM). Overall, the modelling of these two hypotheses yielded quite good results in the case of women, but performed poorly as predictors of male participation rates.

From a theoretical perspective, the number of hours per week or weeks per year an individual is willing to work largely depends on the real wage. The resulting labour supply schedule is often explained by a combination of the income and substitution effects. While the income effect renders the worker better off as the real wage rises, he or she is incited to consume more goods including leisure and thus work less hours. On the other hand, the substitution effect acts as an offsetting force and motivates the individual to offer more of his or her labour because the price of time away from work is higher when the real wage increases.

As Hall and Taylor (1991) point out, however, a good deal of empirical evidence suggests that long-run labour supply schedules are almost vertical and thus invariant to changes in the real wage.

Figure 1


OBSERVABLE POST-WAR PHENOMENA
1950S AND 1960S
• Movement away from farm and factory work
• Urbanization
• Technological innovation and mass-production
• Expansion of International Trade and mega-corporation
• ascent of consumerism and lifestyle changes
• Lower fertility rates
RELEVANT EFFECTS OF MARKET GLOBALIZATION
1970S AND 1980S
• Stagflation
• Decline of corporate performance in traditional industries
• Expansion of service sector/loss of goods sector dominance
• Growing public and household debt, and slowing of living standard increases
• Erosion of traditional family structure
• Women's increased educational attainment and occupational horizon
• Increasing labour demand constraints
IMPACT ON PATTERNS OF PARTICIPATION RATES
1. Secular increase in workforce attachment of women
2. Cyclical vulnerability of male labour force

We can therefore conclude that, in the long-run, the income and substitution effects come close to cancelling each other out. Therefore, we must search for an alternative explanation to the long-run changes in labour force participation which have occurred over the past 20 or so years.

The purpose of this paper is to present empirical evidence which may suggest that the employment/population approach to participation rate modelling could be improved, as well as to propose an alternate model. In so doing, certain economic factors which may have affected the patterns of labour force attachment will be outlined.

Since the 1970's, new patterns in the labour force attachment of men and women appear to have emerged. Certain factors, themselves shaped by even larger, more global forces at play which began at an even earlier period, contribute towards a better understanding of the new work patterns which now exist. These larger influences are placed within their historical context in figure 1 on the next page. It is possible to identify certain quantifiable factors which appear to have emerged from many of the general socioeconomic developments illustrated on the previous page.

Many corporations where a large segment of the male labour force tends to be concentrated have experienced a relative decline and increased volatility with regards to their profit margins. Moreover, significant changes have taken place as regards the types of jobs available in our economy. Such changes have implications regarding skills requirements, conditions and hours of work.

Other changes have occurred, such as shifts in family structure and in the roles of family members, the rapid increase in the overall educational attainment of women, as well as the expansion of women's occupational horizons which now extend into traditionally male-dominated jobs.

The rest of this paper will be structured as follows:

Section two will highlight the reasons why the traditional employment/population ratio approach to the modelling of participation rates should be revised. **Section three** will describe the theoretical underpinnings of the revised model, citing various historical developments through empirical data. **Section four** will outline the key elements to the revised model, examining the five factors listed above.

While **section five** will comment on the data used in the revised model, **section six** will propose a new set of participation rate equations, and test their respective statistical significance. Finally, **section seven** will consist of a brief conclusion.

2. WHY THE TRADITIONAL MODEL SHOULD BE REVIEWED

2.1 Shortcomings of the secondary-worker hypothesis

The secondary worker hypothesis suggests that while married women tend to enter the labour force in greater numbers when household income deteriorates, it also presumes that these women will, by and large, withdraw from the labour force if and when their husband's previous income and employment conditions are restored to their original levels (or better). However, this hypothesis does not offer a plausible explanation for the long-term rise in female participation rates, even though it performs well statistically in terms of modelling the labour force participation of women.

The most important factor in the growth of the female labour force has been the entry of wives into the labour market. Data on participation rates of Canadian women indicate that during periods of post-recession growth, married women do not appear to withdraw from the labour market, as one would presume under the secondary worker hypothesis. If anything, the adherence of women to the labour force during such periods seemed to increase more than usual, let alone decrease.

Since 1975, there has only been one instance where the annual average EPR of female spouses decreased. That was during the recessionary 1981 to 1982 transition, even though the secondary-worker hypothesis would have it increasing so as to supplement declining family income. This subset of female labour supply was behaving more like family heads, according to the traditional paradigm.

Most would agree that women's attachment to the labour force has not remained invariant through time, and that, increasingly, we are finding that men and women are competing head-on for many of the same jobs. This argument suggests that the complementary position held by the sexes in the labour market is gradually vanishing, giving way to a more competitive labour environment. It is quite evident that Canadian women now participate in the labour market in a larger range of jobs than ever before. A study done by Karen D. Hughes (1990) shows that the number of occupations that had a very low proportion of women[1] dropped from 224 in 1971 to 162 in 1986. It is within such non-traditional occupations that relative changes in female representation occurred over this 15-year period. Furthermore, women's share of all university degrees granted in Canada increased sharply in almost every discipline.

Evidence in the form of increased tenure, education, and occupational spread all point to a strengthening of women's attachment to the labour force, thus offsetting the effects of the boom and bust cycles of the economy on a woman's decision to join the labour force.

From a demographic standpoint, married women have seen their labour force participation rates increase dramatically over the last twenty or so years. While it was generally believed that the lower the husband's income, the more likely the wife was to enter the labour market, this traditional relationship between a husband's income and a wife's work status no longer applies. The participation rates of women is rising in husband-and-wife households of all selected income classes. It is generalized and widespread to the point of spanning virtually all income strata.

Abdul Rashid [2] (1991) noted that in 1970, the proportion of Canadian working wives ranged from 29.7% when the husband's annual income was $60,000 or more, to 51.5% when his income was in the low $20,000's; a spread of 22 percentage points. By 1985, this range had declined to less than 9 percentage points, whereby 62.3% of women whose husbands averaged over $60,000, were income earners. Thus, a husband's income appears to have little effect on his wife's probability of engaging in labour market activity. Meanwhile, however, the real average earnings of women increased at twice the rate for men over this same period[3].

Another piece of evidence which mitigates against the secondary-worker hypothesis is the evolving age-earnings profile of women. Work experience will continue to increase over the working life of an individual if his or her attachment to the labour force is stable. Because earnings tend to increase with work experience, (up to a certain age threshold), and since age is often used as a proxy for experience, we expect overall earnings to rise with age, reach a peak, and then decline. A. Rashid (1991) has found that this relationship is clearly demonstrated by the age-earnings profile of men, from 1970 to 1985.

He also found that, in 1970, this was not the case for the earnings profile of women. Earnings remained relatively flat across the age spectrum. But as the incidence of working women increased (outstripping the female adult population growth), and as tenure and work experience rose, especially in the 25 to 44 age group, women's earnings began to display some correlation with the age variable, thus losing its traditional flat shape. Thus, by 1985, it started to look more and more like the age-earnings profile of men, as a consequence of the increasing number of women with long-term labour force attachment.

2.2 Pitfalls of the discouraged-worker hypothesis

Discouraged workers are defined as jobless persons who want to work and yet are not job-hunting because they believe, for various reasons, that no suitable work is available. The discouraged-worker hypothesis stipulates that men, whose attachment to the workforce is strongest as a group, tend to increase and decrease their labour force participation rate in sync with economic cycles.

Thus, as the economy picks up, the participation rate of men will rise. However, as we enter a recession and the economy slows down, an increasing number of men will become the casualties of a weakening economy, and many will withdraw from the labour force, believing that their prospects of finding work are bleak.

While at the trough of a recession the number of discouraged workers may be important, estimates have shown that as a proportion of the entire labour force, it is still quite small. In the wake of the 1982-1983 recession, discouraged workers represented 1.6 per cent of the Canadian labour force as at March, 1983. By the beginning of 1992, in the midst of another recession, this percentage had dropped to 0.7 per cent. The low number of discouraged workers during the recent economic recession has been examined by Ernest B. Akyeampong (1992). His results indicate that they are due to such factors as the declining share of youths in the working age population, an increase in educational enrolment, a growing trend towards early retirement, and an apparent shift of some potentially discouraged workers into the "waiting for recall" group [4], concentrated chiefly among adult males.

Thus, the widely held view that the number (and proportion) of discouraged workers increases during a cyclical downturn was barely realized this past recession. Their number in March 1992 was only half the level recorded at March 1983. Is the discouraged-worker hypothesis therefore still applicable today?

2.3 Testing of the traditional model

From a general perspective, the employment/population ratio (EPR) approach to the modelling of participation rates offers a descriptive method for predicting future values of participation rates, aiming for a high degree of correlation between this dependant variable and those on the right-hand side of the equation. However, the employment variable used on the right-hand side is simply a component of the identity "labour force = employment + unemployment".

The EPR approach does not really strive to determine what effect(s) one or several exogenous variables might have on participation rates. There is really no attempt made to identify relevant factors which may signal a change in an individual's degree of attachment to the labour force.

The EPR of male heads of families has dropped from 0.82 in 1975 to under 0.74 in 1990. Male heads of family units accounted for over 70 per cent of the total male labour force in 1975. By 1990, their proportion had dropped to 60 per cent. Secular trends of the past 20 years or so indicate that men are slowly losing their dominance of labour markets, regardless of changing economic cycles. Conversely, the labour market attachment of women (married women in particular) has been steadily gaining strength.

The EPR of married women has gradually risen from 0.38 in 1975 to 0.56 in 1991, an increase of 46 per cent over the 16-year period; This phenomenon applies to all of the G-7 countries, although slightly more pronounced in Canada. **The one notable exception is Japan, where the traditional family structure has remained relatively intact, its goods-producing industries have actually grown slightly [5], and where living standards are still on the rise.** Japan is in fact the only G-7 member country where women have not accounted for most of the increase in the number of labour force participants during the past quarter century.

The essence of temporal change in the relative workforce attachment of men and women appears to be coincident with the shifting industrial structure of nations and the slowing growth of living standards in terms of real disposable family income [6]; all of which have been taking place since the 1970s. Figure 2 on the next page aptly illustrates the close relationship between changes in the male labour force attachment and the proportion of male employment in male-dominated industries, as well as the high correlation between the trends in the workforce attachment of women and the proportion of female employment in female-dominated industries. Male-dominated industries include manufacturing, construction, mining and forestry, while the female-dominated ones consist of finance, insurance & real estate, and community, business & personal services. These issues will be raised in section 3 of this paper.

Although the theoretical validity of the EPR model is challenged, at least as regards a modern industrialized service economy, it is still useful to verify the statistical fit of the discouraged-worker and secondary-worker hypothesis in the Canadian context. Using the most recent Canadian annual data, the two OLS linear regression equations of the log-linear form, depicted on page 9, yielded the best results.

In the two equations shown on this page and the next, the following variable definitions apply:

a. **MPRATE** is the participation rate of men aged 15 years and over.
b. **EPRM** is the employment/population ratio of these same men.
c. **WPRATE** is the participation rate of women 15 years and over.
d. **EPRF** is the employment/population ratio of these same women.
e. The variable **YEAR** runs from 1975 to 1991.

Note: All the Logs used in this study are base 10 logarithms.

(A) Canadian Participation Rates of Men - 15 years of age or older

(After adjustment for serial correlation via Hildreth-Lu technique)

Log(MPRATE) = -0.0176 + [(0.3616)*Log(EPRM)] - [(0.0978)*Log(EPRF)]

t-statistic : [-7.43] [7.40] [-2.02]

RBARSQ = 0.7992 F(2,13) = 30.85 D-W = 1.21 RHO = 0.81

The original OLS specification of this regression yielded a Durbin-Watson statistic of 0.40 so that adjustments for the autocorrelated error terms had to be made. The Hildreth-Lu technique was employed. Appendix 1 gives full details of the results of this OLS regression, before and after applying the Hildreth-Lu technique.

Notice that the t-statistic associated with the employment/population ratio of women (EPRF) is barely acceptable at the 0.05 level of significance. Thus, even if we were to concede that the EPRF variable is a good proxy for the secondary-worker hypothesis (which appears debatable from a theoretical standpoint), this hypothesis does not offer a statistically robust explanation of male participation rates.

Removal of the last four years of data so as to eliminate the effects of the most recent recession yields quasi-identical results regarding the coefficients of the constant term and of Log(EPRM).

As regards Log(EPRF), however, not only are the coefficients sizeably different, but its corresponding t-ratio (for the 1975 to 1987 regression) of -0.81 indicates that the Log(EPRF) variable is statistically insignificant. This would appear to reinforce the argument that women are increasingly competing with men for many of the same jobs. Consult appendix 1 for further details.

(B) Canadian Participation Rates of Women - 15 years of age or more

Log(WPRATE) = -0.0122 - [0.3031 * Log(EPRM)] + [0.7958 * Log(EPRF)]

t-statistic : **[-5.84]** **[-6.61]** **[17.06]**

RBARSQ = 0.9537 **F(2,13) = 155.55** **D-W = 1.58** **RHO = 0.81**

The original EPR specification of the female participation rate model included the variable YEAR. The latter proved to be statistically insignificant, however, and was dropped from the equation. While both log(EPRM) and log(EPRF) were effective in yielding a good fit, the D-W statistic associated with this OLS regression was 0.39, indicating that the error terms were serially correlated; (see appendix 1). Thus, after applying the Hildreth-Lu technique, equation 2 results (shown above) were obtained. In this case, both the discouraged-worker and the secondary-worker effects are clearly evident from the results, with all of the a-priori expectations (regarding the signs of the coefficients) being met. However, it might be argued that these results warrant a different interpretation.

Whereby the log(EPRF) would be referred to as the discouraged-worker effect by the pundits of the traditional hypothesis, some of the facts cited earlier on in this study indicate that women were not withdrawing in droves from the labour force during either of the 1982-83 and 1990-91 recession. Except for the year 1991, the participation rate of women has either increased or at the very worse remained stable in **every year since Statistics Canada has been recording such data.**

Moreover, the log(EPRM), in this case depicting the secondary-worker hypothesis, should be a substitute labour activity variable, increasing in magnitude when the EPR of women is on the decline.

The Canadian data on the labour force activity of men appear to contradict this notion. Canadian men have been much more vulnerable to cyclical fluctuations than their female counterparts. During the last two recessions, while the participation rate of women either remained constant or declined slightly, these recessions had devastating impacts on the employment of men, resulting in male participation rate decreases of 2.3 per cent and 2.5 per cent respectively. This is contrary to what the secondary-worker hypothesis would have us believe.

3. UNDERPINNINGS OF REVISED MODEL

The end of the Second World War paved the way for the establishment of a prosperous industrialized society and, with the advent of urbanization, families saw their standards of living increase noticeably virtually every year. Industrialized societies experienced a steady agglomeration of people within the newly created suburban environment, at the expense of rural farming areas. The net effect, of course, was a gradual reduction of rurally-located time-consuming labour-intensive manual work; all of which encouraged lower fertility rates.

These developments were, de facto, paving the way for a change in values and lifestyle at the heart of the family unit. All that would be required is some catalyst to alter the traditional family roles of men and women. The expanding role (and structure) of international trade, aided by the tremendous diffusion of new technologies, as well as by the advent and expansion of the mega-corporation, soon provided that catalyst.

By the end of the 1960's, the goods-producing sectors began losing ground when more efficient and cost-effective means of production were introduced abroad and relatively cheaper sources of labour were sought after, namely in third-world and newly industrialized countries. Canada was well on its way to becoming a service-oriented economy. While, in 1971, (according to Census of Canada estimates), service industries accounted for 58 per cent of employment, by 1991, the proportion was almost at 73 per cent.

The industrial make-up of the Canadian economy has in fact undergone a dramatic transformation, all within a few years' time. Over the 1971 to 1991 period, the share of employment in manufacturing and construction fell from 26 per cent to 21 per cent. This led to the stagnation of employment in certain male-dominated jobs, particularly in the primary, processing and fabricating occupations. Such male-dominated industries as mining, forestry and construction have been shown to experience considerably higher-than-average permanent lay-off rates during expansion years, while manufacturing tends to have higher lay-offs than all other industries during a recession year.[7]

While Baldwin and Gorecki (1990) concluded that most of the reallocation of jobs resulting from lay-offs was related to intra-industry shifts among firms rather than across industries, the goods-producing sector has nonetheless seen a slight decline in the number of labour hours of work since at least 1975. It is the services-producing sector which has registered all of the net hourly-adjusted employment gains over this 17-year period.

These findings are compatible with data on aggregated industrial profit margins published in Statistics Canada's "Corporate Financial Statistics", suggesting that from the perspective of profitability, corporations concentrated in the goods-producing sector have been generally more vulnerable to economic cycles.

Using the 1971, 1981 and 1986 census data, F.T. Denton, P.C. Pineo and B.G. Spencer (1991) noted that while women's employment has become increasingly concentrated in service industries, there was considerable stability in the male/female proportions of workers in the various industries.

While on the one hand the primary processing and manufacturing industries have failed to register the kind of productivity gains required to keep up with those achieved in many other countries, these industries have also been hurt by the fluctuating value of the Canadian dollar. These facts are consistent with corporate financial data which indicate that certain industries, primarily in the services-producing sector, have proven to be (at least since the 1970's), relatively less vulnerable to cyclical fluctuations in the economy.

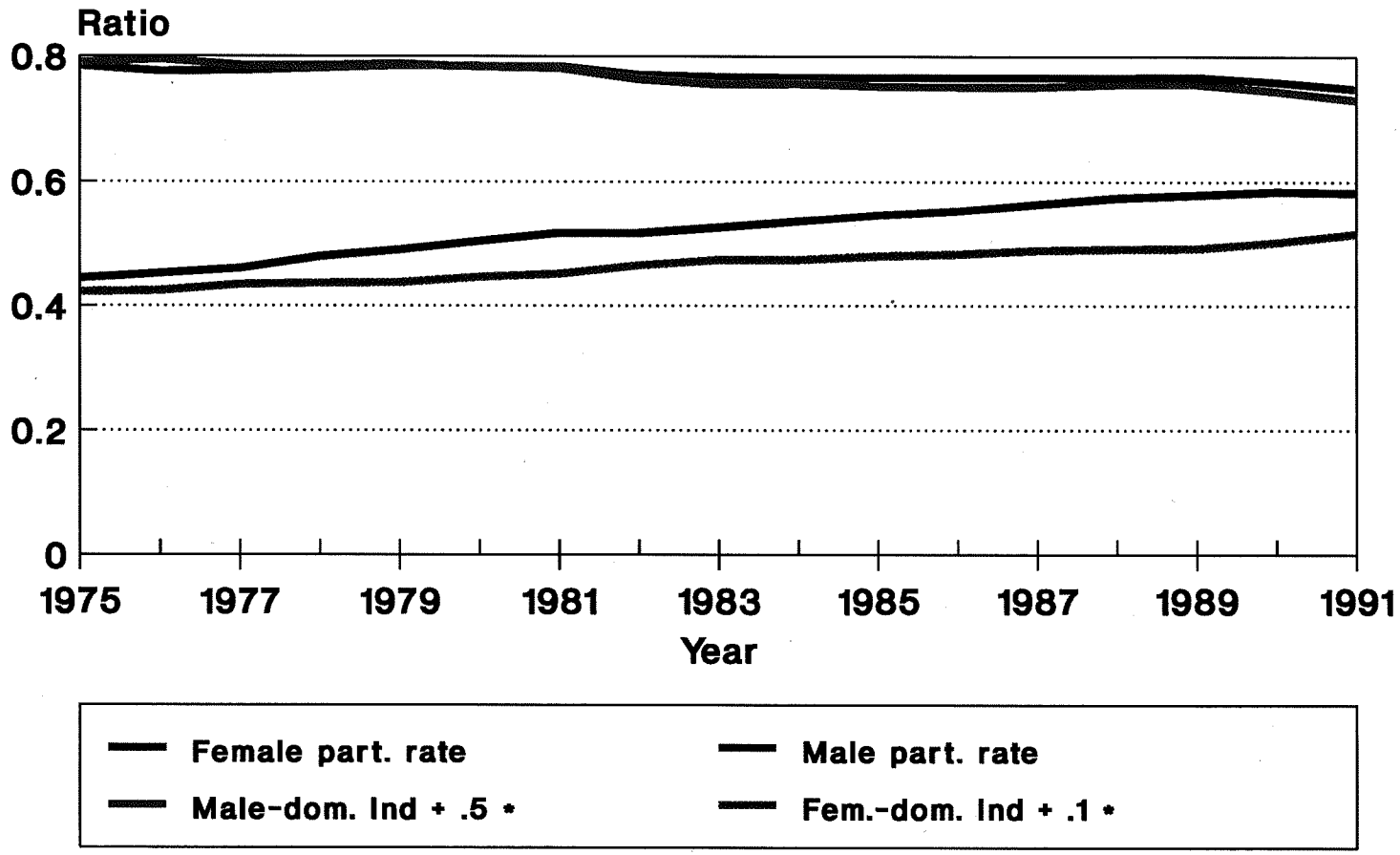
All these facts may point to a link between the industrial distribution of employment across the sexes, and their divergent patterns regarding the labour market attachment of men and women.

As illustrated by figure 3 on the next page, mean disposable income (in 1991 dollars) of the average Canadian family has been decreasing since 1976. While real net disposable income (NDI) was increasing by anywhere between 5 and 9 per cent per year for the period 1961-1976, NDI was declining, on average, by roughly 0.5 per cent yearly over the 1976-1991 period.

Since expectations are formed on the basis of past experience, it would not be unreasonable to suggest that, by the mid-1970's, the average Canadian family's anticipated increases in living standards were not likely being realized.

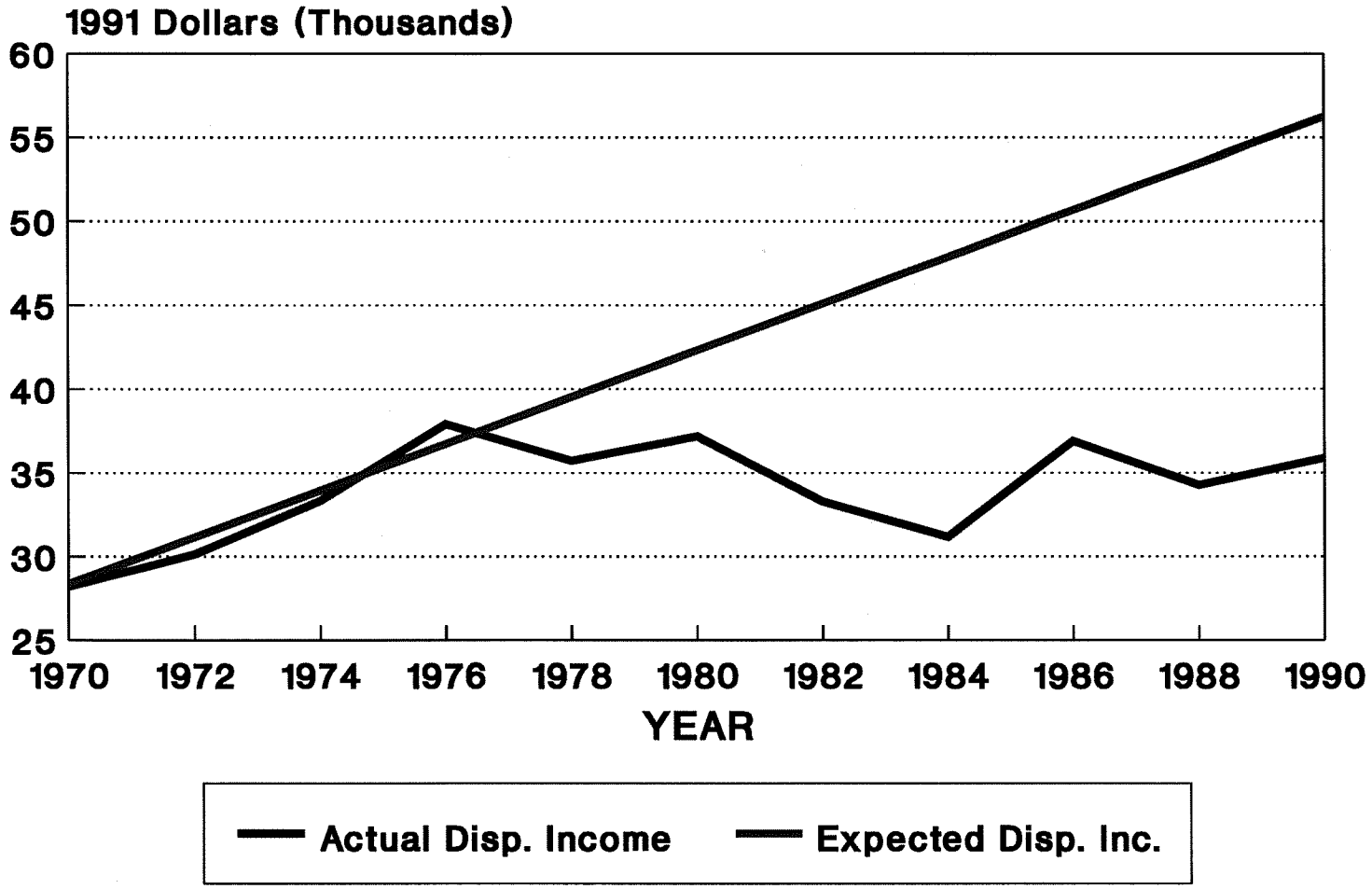
At the same time, an industrial transformation was taking place, which was dismantling the male stronghold on the labour market, while opening up (or expanding) under-developed sectors of the economy where men were not as solidly entrenched, and where a pool of relatively inexpensive (and relatively more flexible) labour supply was crucial in order to ensure its survival in a world where increasing competitiveness was the going trend.

FIGURE 2
EMPLOYMENT AND PARTICIPATION RATES



* ratio of employed men (women) in sex-dominated industries over total male (female) employment, plus a constant.

FIGURE 3
MEAN REAL DISPOSABLE INCOME PER FAMILY



Expected income based on 1961 to 1976 trend in mean family disposable income.

Moreover, H. Pold and F. Wong (1990) have shown that, in 1977, while the average labour income [8] in the services-producing sector was only 87 per cent of the average computed for the goods-producing industries, this inter-sector income gap had grown to 83.5 per cent by 1988. The two authors suggest that the higher rates of unionization, the preponderance of adult men, and the slower employment growth in the goods-producing sector, versus the high levels of youth and female employment and the higher rate of part-time employment in the services-producing sector may account for the different income patterns in the two sectors.

It is well documented that the services-producing sector typically consists of smaller firms than those of the goods-producing sector.

While the majority of job growth during the last two decades has taken place within small and medium-sized firms, the Labour Market Activity Survey data indicate that women are more apt to offer their services to smaller firms. It has been suggested that this is partly because the required level of job-search intensity is not as high, and also because small firms tend to offer potentially less rigid and more personalized working arrangements to their employees (perhaps as a trade-off for lower wages).

J. Barth, J. Cordes and S. Haber (1987), upon examination of US labour force data, concluded that women have a generally higher probability of finding employment in a small establishment than do men with the same characteristics. Moreover, their findings revealed that married women in particular have a higher tendency (towards small-firm employment) than unmarried women.

The fact that women are still assuming the lion's share of child-rearing responsibilities may offer some explanation as to why this is so. The burden of child care may often constrain a mother's availability both for job search and paid work outside the home.

She may instead opt for more flexible working arrangements and shorter travel time, as a trade-off for higher wages. Such reasoning is somewhat different from saying that women are secondary workers whose entrance into the labour force is a temporary phenomenon which will "correct" itself as soon as the family budget is balanced. While household disposable income is being squeezed by rising taxes at all levels, the entrance of women into the labour force is increasingly becoming a lifestyle choice.

A recent Canadian study has also demonstrated that there appears to be gender segregation by firm size.

Using data from the 1986 Labour Market Activity Survey, R. Morissette (1991) found that while the probability of being in a large firm [9] is generally higher for male workers than for female workers, he also concluded that jobs in larger firms are more likely to be unionized (thus less flexible), better covered by pension plans, less subject to permanent lay-offs, and paid higher wages, on average.

Even after controlling for occupational segregation between the sexes, Morissette's results still indicate that male workers are more likely than their female counterparts to work in large firms. He suggests two alternative explanations: either women prefer working in smaller firms, or they have been historically exposed to discriminatory hiring practices in large firms.

Morissette also points out that small firms account for 43 per cent of employment in retail trade and services combined, where 64 per cent of female employment is found (based on 1991 statistics). Conversely, small-firm employment is much less important in forestry, mining, manufacturing, wholesale trade, transportation, storage, communications, electric power, gas and water utilities, all of which, in 1991, accounted for 39 per cent of total male employment.

Thus, empirical evidence seems to suggest that, in addition to the demographic characteristics of the Canadian population, the level and degree of change in workforce attachment may also be influenced by such factors as the industrial breakdown of employment, firm size, occupational segregation, the sex differences in educational attainment, the level of job-search intensity, as well as by the level of competitiveness (or corporate profit levels) of Canadian firms.

Section four will examine the evolution in time of all those factors cited above for which annual data can be readily derived.

4. KEY ELEMENTS TO BE EXAMINED

4.1 Demographic Characteristics of the Labour Force: changing proportions of male and female family heads and unattached individuals

As noted by M. N. Bhrolchain (1990), the last 20 years has seen major changes in the pattern of births, marriages, and the structure of households. These can be summarized as a reduction in the centrality of marriage combined with a fall in total fertility rates.

These shifts may be explained in part by economic considerations, particularly the increased labour force participation of women, which may themselves be partly explained by demographic factors. This illustrates why the complex relationship between economics and demography cannot be ignored. Hence, the demographic aspect of this study warrants that, for the purposes of data dissemination at least, family-based labour force statistics should be examined. The concept of family, considered herein as interchangeable with the notion of household, specifically excludes unattached individuals.

More formally, a family is defined as a group of two or more persons who are living together in the same dwelling and who are related by blood, marriage or adoption. Moreover, the head of a family is determined by the respondent's perception of headship and as such is solely a statistical device which has no direct economic connotation.

However, after due consultation with officials from Statistics Canada's Household Surveys Division, it appears reasonable to postulate that the majority of respondents tend to associate family headship with the bearing (at least historically) of the largest part of the households' financial responsibilities. As for the definition of unattached individuals, it is taken to include those persons either living alone or related to no one else in the dwelling where he/she lives.

Of the total Canadian adult population (15 years of age and over), family heads and unattached individuals consist of those with the highest degree of financial responsibility, having to ensure their own livelihood, and possibly that of dependents. Thus, their labour force attachment should theoretically be stronger than that of other population subsets. If their numbers, taken as a percentage of the entire adult population, is increasing through time, it is reasonable to expect that the participation rates of the Canadian

population to be increasing as well. The opposite also holds true. Given the statistics on disposable family income shown in an earlier section, it is not surprising to see more and more husband-and-wife households relying on a second income to maintain or increase their living standards. From 1975 to 1991, the employment/population ratio of married women has gone from 0.383 to 0.559, an increase of 46 per cent in only 16 years. What's more, most of the increase in the number of wives on the labour market is attributable to relatively young families. M. Moore (1989), using data from the 1968 and 1986 Surveys of Consumer Finances, has shown that in 1986, 74 per cent of families in which the husband was under the age of 45 had two earners, compared with 48 per cent of remaining husband-and-wife families.

In addition, the author found that wives' contribution to total family income was higher among young dual-earner couples than among older ones. Indeed, wives' earnings made up nearly a third of the total income of dual-earner families in which the husband was under the age of 45, compared to about a quarter of total income in the case of remaining dual-earner families. Wives of dual-earner families who had a university degree were found to provide an even larger share of their family's total income. Combining this with the fact that, from 1970 to 1985, the average annual rate of increase in women's earnings was twice the annual rate for men [10], we can expect that an increasing proportion of husband-and-wife families will consist of the wife being the main breadwinner.

Furthermore, with the increase of single parent families, more and more women are in a situation where there is no husband present to depend upon financially, other than for the receipt of child support payments.

Thus, these trends should indicate that the proportion of female family heads is on the rise, while that of men is gradually declining. As expected, results from the Labour Force Survey indicate that female family heads, taken as a percentage of the adult women population, have doubled from 6.9 per cent in 1975 to 14 per cent in 1991. Conversely, the equivalent figure for male heads of families has declined from 64.9 per cent to 57.9 per cent over the same period.

The erosion of the traditional family structure is evident in Canada, as in most other industrialized countries. Not only are married women putting off having children, but increasingly, men and women are postponing marriage altogether, often choosing to live alone or to share accommodations with non spouses or non relatives, at least for the short term. These persons, described as unattached individuals, tend not to be financially dependent, and must strive to be employed in order to provide for themselves.

As a percentage of the adult population, both unattached men and women have increased their respective population shares since 1975, but the proportion of unattached males has increased at a relatively faster pace.

However, combining family heads with unattached individuals, we get that the male proportion decreased slightly from 75.5 per cent to 73.3 per cent since 1975. In the case of women, this subset increased by well over 50 per cent, from 19.8 per cent to 30.5 per cent over the same period. See appendix 2 for details of the annual data. The evolving differences in financial responsibility between the sexes, whether motivated by necessity or by design, is partly reflected through the demographic characteristics of the Canadian population.

These demographic changes may offer part of the solution towards explaining the divergent trends regarding labour force participation of men and women. In sections 5 and 6, the male and female proportions of family heads and unattached individuals will be referred to as MHEADPOP in the case of the male model, and WHEADPOP within the female model.

4.2 Differing Patterns of Work Intensity as reflected by "Hours of Work at Main Job"

Although the aggregate labour force activities of Canadian men and women have evolved quite differently, there are some signs indicating that, in many ways, they have begun to converge. This is partly reflected in the hours of work of men and women. For the purposes of this study, the weekly hours of work of men and women in their main jobs will be compared. A person's main job is defined as being the one which accounts for the largest number of weekly hours of work.

Given their distinct industrial, occupational and skills profiles, as well their differences regarding their availability for (and willingness to assume) paid work (as previously cited, women still assume the larger share of child-rearing responsibilities), such factors certainly appear to mitigate in favour of men and women displaying significantly different average weekly hours of work in any given year, not to mention dissimilar trends over time in that respect. Denton et. al. (1991) concluded quite convincingly that the age and sex distribution of employment differ markedly among industries.

They also state that, unlike men, about half of the jobs held by women were in the clerical, sales and service occupations in all three of the 1971, 1981 and 1986 census years.

Interestingly, however, although their results show that by 1986, there was still a high degree of sex segregation, the level of such segregation was on the decline. K. Hughes (1990) identifies 21 occupations in which women recorded dramatic advancement over the period of 1971 to 1986. Over this 15-year period, the author found that, within those 21 occupations (consisting of 6 managerial, 5 sales and service, and the rest falling within the professional and technical occupations), there was a 560 per cent increase in the number of women into these historically non-traditional occupations, compared with an 85 per cent increase in total female employment. Another important fact which the author unveils is that women in the non-traditional occupations are much more likely to work full-time, full-year than the average female workers. This will affect women's mean annualized number of weekly hours worked.

While in relation to men, a much higher proportion of women either work part-time or are engaged in other non-standard work arrangements, the increasing number of women engaging in occupations traditionally dominated by men is beginning to alter some of the historical patterns of women's paid work. In this respect, two patterns are emerging.

First off, the percentage of women's hours of part-time work is not increasing as quickly as in the case of men. Secondly, the number of weekly full-time hours worked by women, averaged over the entire adult female population, is rising. As women increase their attachment to the workforce, they are increasingly seeking, (training for) and obtaining non traditional jobs (as they are referred to in the literature). In addition, except for women with very young children, we have seen an increase in the proportions of women working full-year (whether full-time or part-time) rather than part-year. Moreover, proportionately less working women are voluntarily withdrawing from the labour force.

Conversely, since the male labour force has proven more vulnerable to recessions, as shown by the magnitude of (mostly permanent) male-dominated lay-offs, particularly in the manufacturing industry during the last two recessions, the transition to a service economy has had deleterious effects on the employment of men. The problems faced by many firms in the goods-producing sector have had an impact on employment growth. The majority of new jobs, particularly as regards part-time, part-year and temporary employment, have been created in the services-producing sector. As H. Krahn (1991) concludes, the growth of part-time, part-year or temporary jobs is clearly part of the transition to a service-dominated economy.

Out of all existing forms of non-standard employment, part-time work is the most prevalent type, and is most common in retail trade and other consumer services. Furthermore, data on "involuntary" part-time employment indicate that, since 1975, there has been a secular increase in the incidence of this kind of work.

G. Betcherman (1991) and his research team found that the proportion of part-time work that was involuntary rose from 11 per cent in 1975, to 22.2 per cent in 1989. This would suggest that the incidence of part-time work is influenced, not only by labour supply, but also by labour demand conditions. The latter appears to be lacking in some of the standard participation rate models.

In the past twenty years or so, whenever there has been an economic downturn, we have witnessed a rather sudden year-over-year increase in the percentage of part-time male employment. The new highs in the percentage of male part-time workers, achieved during the recession, tend not to resorb themselves during the post-recession period, and would increase further during the following recession. The data reveal that from 1981 to 1983, the relative magnitude of part-time employment went from 13.5 per cent of total employment, to 15.4 per cent. After the recovery, the percentage of part-time work stabilized, and hovered around the 15.4 per cent mark, up until the beginning of the next recession in 1990. By the following year (1991), it had jumped to 16.4 per cent; coincident with the recessionary loss of jobs.

It may be plausible to conjecture that a rise in non-standard employment, as proxied by the increase in the percentage of part-time work (for lack of more complete data), is a signal that labour demand conditions have tightened.

One could posit that an increase in this type of employment is really a sign that certain segments of the labour force are withdrawing from the workforce so as either to further their skill levels through increased educational attainment, to retire early (at least for those aged 55 or more), or perhaps to rely (at least temporarily) on their spouse or some government transfer program(s) for current income. Thus, a rise in under-employment may, at times, be seen as a signal for a decrease in labour force participation.

The variables "actual full-time weekly hours worked at main job per adult Canadian (15 years or over)" and the "percentage of part-time hours actually worked at main job" will serve as proxies to illustrate, respectively, the constraining effects of the industrial transformation of the economy (a demand consideration), and women's shifting patterns of occupational choices (a labour supply factor). At the aggregate level, significant changes in the duration and type of employment, and in the number of hours worked, may signal either a rise or fall in labour force participation.

The variable "male actual full-time weekly hours worked at main job per male adult Canadian" will be denoted by MFTHPO, while the equivalent for women will be shown as WFTHPO. The variable "male part-time hours worked as a percentage of all hours worked by men at main job" will be denoted as MPPTHR. The corresponding variable for women will be shown as WPPTHR. Sections 5 and 6 of this paper will make use of these variables.

4.3 Trends in Educational Attainment

A study by C.W. Stout (1992) reveals that between 1975 and 1990, women became the majority of bachelor degree[11] recipients. Coincidentally, female representation in almost all male-dominated disciplines increased. In fields such as veterinary medicine, zoology, law, medicine, and business management & commerce, women increased their representation to the point where, by 1990, these disciplines could no longer be considered as male-dominated.

This shift in educational choices has allowed women to enter occupations and professions in which they have traditionally been only a small minority. These emerging educational patterns are ultimately changing the face of long-term employment, and consequently strengthening women's attachment to the labour force. C. Haggar-Guénette (1991) has shown that, during the 1980's, about two-thirds of adults over the age of 29 taking credit courses in recognized institutions were women. What's more, the vast majority of these women were from outside the labour force.

Based on 1971, 1976, 1981 and 1986 Census data, as well as on a special compilation of university degrees and certificates (above the bachelor level) granted by sex each year, it can be shown that the per cent of Canadian women (aged 15 or more) with a university degree or graduate level certificate has increased by nearly 130 per cent, from 4.2 per cent in 1975, to 9.7 per cent in 1991.

By contrast, the corresponding percentage increase for men over the same period was relatively more modest at just under 55 per cent. Hence, the ratio of Canadian women with a university education (as defined above) over all Canadian recipients of university degrees and certificates, has gone from 34.5 per cent in 1975, to 44.2 per cent in 1991.

A note of caution is warranted, however, when interpreting these gender-specific numbers in absolute terms.

Due to a lack of more complete data, the annual labour force statistics on the number of university degrees granted each year were used as guideposts in order to derive (by method of adjusted interpolation) the number of university-educated Canadian men and women, for those years between each of the actual census data estimates of 1971, 1976, 1981 and 1986. The Labour Force Survey estimate was used in 1991 since the census data for that year are not yet released.

In other words, the annual labour force data were ultimately used to arrive at inter-censal estimates. Although the absolute percentages quoted above for a given year may be slightly biased, much of this upward bias has been corrected.

The derived educational attainment time series indicate that women, in the main, have shown relatively more resolve in furthering their education, at least at the university level. It is conjectured that approximately the same conclusions would be drawn at the college level, except maybe for graduates of certain technical trades. If women are investing massively in furthering their education and skill levels, it is likely due to the fact that they plan to search for and obtain a stable job for themselves at some time in the short or medium term. Thus, as their levels of education rises, so does their probability of entering (and staying in) the labour force.

This is confirmed by the relative differences in both the employment/population (EPR) ratios and the unemployment rates of the university-educated labour force vis-a-vis the average labour force. In 1990, for instance, the annualized EPR of women with university degrees was 45 per cent higher than the average for all female labour force participants. Significantly smaller differences (23 per cent) were found to exist in the case of men, during that same year.

Similarly, the unemployment rate of the university-educated female labour force was slightly more than half (52 per cent) that of the total female labour force. In the case of men, the corresponding percentage difference was 42 per cent. Such data may well serve to justify why skills are increasingly becoming necessary in today's modern open economy. They may also be an indication that, as women increase their level (and share of) skills overall, it is quite likely that an even further increase in the attachment of women to the labour force will occur. This apparent relationship between education and labour force attachment would reasonably justify computing a relative measure of educational attainment as a potential explanatory variable of participation rates.

With data compiled on the estimated number of Canadian men and women who have obtained either a university certificate, diploma or degree, a measure of relative educational attainment (at least at the university level) can be devised. By dividing the percentage of university-educated men (or women) by the proportion of university-educated Canadians (regardless of sex), one can hope to gauge the relative progression of men (or women) in terms of attainment of university education.

The "University coefficient of representation by sex" will herein be defined as the gender-based percentage of university-educated (15 and over) population divided by the aggregate percentage of university-educated (15 and over) population. The female university coefficient of representation will be referred to as WDEGCO and the equivalent male coefficient as MDEGCO.

Each of these variables, depicted in appendix 2, will be included in the revised model of male and female participation rates.

4.4 Corporate Profit Margins, by Major Industrial Aggregate

During times of recession, demand for labour appears to play a relatively enhanced role in determining the outcome of labour force participation. Evidence collected over the past 20 or years would suggest that the effect of labour demand on the ultimate levels of Canadian labour force participation will increase over time. This country's percentage of foreign indebtedness and relatively high labour costs[12] have reached crippling levels and are effectively eliminating whatever comparative advantage Canadian businesses may have enjoyed in the past.

Canada's non-accelerating inflation rate of unemployment (NAIRU) is steadily climbing, and while the non-traditional, low paying and low tenure jobs[13] within the traditional services[14] (minus retail trade) have been responsible for a relatively large share of employment growth[15] , it is these industries which are creating the highest percentage of low skilled, non-traditional (part-time and temporary) jobs. There is still a demand, in many industries (and occupations), for highly skilled work where considerable training and education is required.

However, since 1974 at least, the non-agricultural goods-producing industries have proven quite vulnerable to economic downturns.

In fact, even highly skilled occupations within financially troubled firms have not managed to escape the ravages of the last three recessions.

It is therefore safe to suggest that labour supply considerations cannot wholly account for the massive lay-offs and substantially reduced job vacancies experienced over the course of the last three cyclical downturns. This study endeavours to include some measure of labour demand which acts to constrain the existing industrial mix of labour supply. As previously stated, the percentage of part-time hours worked introduces some degree of demand constraint, particularly in the case of men where the incidence of involuntary part-time work tends to be higher.

As a purer measure of labour demand, some measure of corporate financial performance will be introduced within the labour force participation rate equations of men and women.

As mentioned earlier in this paper, it has been aptly documented that men and women are differently distributed across industries, and that, over the years, there has been remarkable stability in the industrial distribution of employment by sex.

The idea, therefore, would be to pro-rate some indicator of corporate performance as measured for each industrial aggregate, by the gender-based distribution of employment by major industrial group. Such an approach would then allow the computation of both a male employment-weighted and a female employment-weighted average corporate performance indicator.

The measure of corporate to be used in this study is the "net profits after-taxes as a percentage of total income", or "net profit margin". Net profit after-taxes is the net of all book profits and losses reported. It includes non-recurring items and dividends received and is after provision for taxes. Total income is the sum of the net sales of products and services, rental income, commissions, bond interest, mortgage interest, other interest, dividends and other income (which includes sundry income not specified elsewhere, such as royalties). Net sales of products and services imply that sales and excise taxes, discounts, rebates, refunds and intra-company sales have been deducted from total income.

The industrial distribution of data follows the 1960 Standard Industrial Classification code, published under Statistics Canada's catalogue 12-501E. For matters of convenience and compatibility with the available industrial employment figures, eight standard industrial aggregates were derived, and are shown on the next page.

(1) Agriculture;
(2) Other Primary Industries
(forestry, fishing & trapping and mining);
(3) Manufacturing;
(4) Construction;
(5) Transportation, Communication and Other Utilities (T.C.O.U.);
(6) Trade (wholesale and retail);
(7) Finance, Insurance and Real Estate (F.I.R.E.);
(8) Other Services.

For each of these, the number of male and female actual hours worked at main job, as well as the net profit margin (as defined above), were compiled. The actual hours of work, by sex, will serve as the employment weights to the profit margins computed for each of the 8 industrial groups.

Three different results can thus be derived, result "A" being an industrial aggregate net profit margin weighted by male actual hours worked at main job. Result "B" is simply an equivalent ratio for women; that is, an industrial aggregate net profit margin weighted by female actual hours worked at main job. Finally, the industrial aggregate net profit margin weighted by total actual hours worked at main job (irregardless of gender) depicts result "C".

Results A, B and C represent, in short, the average annual corporate profit position of Canadian industry, adjusted for the gender-based concentration of employment. The idea behind using such data is simple. The past twenty years have been a period of considerable stability in the male/female proportions of workers in the various industries.

Since women tend to be concentrated in industries which have fared relatively better (in the past twenty or so years) than those where the bulk of male employment is found, particularly in times of recessions, women, in the aggregate sense, have often been in a relatively better position in order to either profit from opportunities for employment growth, or to (at least partially) avoid the nefarious effects of recessions.

From the three employment-weighted profit margins, it is possible to derive some sex-based corporate profitability coefficient or ratio which provides a relative measure of comparative advantage or disadvantage attributable to the differences in the employment distribution of men versus women.

To this effect, a gender-based industrial aggregate profit margin **ratio** will be used.

The industrial aggregate female profit margin ratio is defined as being equal to result B depicted previously, divided by result C. Similarly, the industrial aggregate profit margin ratio of men is equal to result A defined above, also divided by result C. The computation of these ratios, for each of the years 1973 to 1987, are shown in appendix 3.

It is important to realize, however, that industrial profit deterioration does not translate into immediate withdrawal from the labour force. But if aggregate corporate profits have significantly dropped off in a given industry, this may imply lower (or even negative) employment growth within that industry in the coming year(s). But as regards the existing labour force within the industry, the rate of unemployment may rise, under-employment may result, intra-industry labour turnover may augment, so that ultimately, it may take two or more years before drops in corporate performance (in this case at the industrial level) result in lower participation rates, either within a particular industry, or economy-wide.

Consequently, in order to take into account this lagged effect, a three-year moving average of the male and female-based industrial aggregate profit margin ratios will be used as the gender-adjusted corporate profitability ratios to enter into the participation rate equations. This not only slows the change response of labour force attachment of men and women, but it also smooths it out somewhat, thus allowing for intra-industry and inter-industry labour rotation to absorb displaced workers, as well as to acknowledge that the employment-to-unemployment transition is an intermediate step before total labour force withdrawal.

As was the case for the measures of work intensity, the actual hours of work data was drawn from the Labour Force Survey and is available by industrial breakdown since 1975, through readily published annual averages. The corporate financial data was drawn from Statistics Canada's annual catalogue entitled "Corporate Financial Statistics". This data, available since 1965, reflects the financial operations and financial positions of corporations in Canada as shown in the audited financial statements of the corporations.

It is based on the actual number of corporations that filed tax returns and financial statements in a given year, with the Department of National Revenue - where the corporations were classifiable by industry. This financial data is published on the same standard industrial basis as the labour force data, thus allows a "rapprochement" between the two.

There is one caveat, however. The "Corporation Financial Statistics" catalogue was last published in 1987.

Currently, the publications which are available, such as the "Quarterly Financial Statistics for Enterprises", are based on the 1980 Standard Industrial Classification for Companies and Enterprises (SIC-C). This classification allows for a more meaningful classification of companies and enterprises which engage in more than one activity.

The problem, however, is that the post-1987 labour force survey data is not structured according to this new classification system. It is now impossible to match labour force data with corporate financial data, without going through some crude approximation exercise, which ultimately leaves many companies and enterprises (such as the holding companies) unclassified, while producing erroneous (or questionable) industrial matches in others.

Henceforth, after 1987, gender-based industrial aggregate profit margin ratios cannot be derived. Consequently, the participation rate equations specified within this paper will be estimated according to two different annual time periods:

A. from 1975 to 1991, without a corporate profit level variable;

B. from 1975 to 1987, with such a variable.

5. DESCRIPTION OF THE DATA USED IN THE MODEL

This section highlights the sources of the raw data, emphasizing the survey methods used to gather the data. It will also briefly cover the issue of data reliability (i.e., measurement error).

5.1 Employment, labour force, participation rates and population data by various groupings

These data are obtained through the Labour Force Survey, conducted by Statistics Canada. The survey results are based on monthly interviews carried out in about 62,000 representative households across the country, involving some 115,000 respondents.

Once a household is selected, it remains in the sample for a period of six months.

In terms of non-sampling error, one of the major sources of this type of error is the rate of non-response.

The non-response rate for the Labour Force Survey is among the lowest in the world for a survey of this type. In 1990, the rate averaged less than 6 per cent.

Insofar as the sampling error is concerned, all of the estimates at the national (Canada total) level fall within a 5 per cent standard deviation, with the majority being within a range of 0.0 per cent to 1.0 per cent.

Based on Statistics Canada's alphabetical designation of percentage standard deviation, the alphabetic indicators for the country-wide aggregates range between "A" (0.0% to 0.5% standard deviation), and "D" (2.6% to 5.0% standard deviation). The most frequent sampling error designation encountered equates to a "B" (0.6% to 1.0% standard deviation).

5.2 Actual hours of work at main job

These data are also obtained through the Labour Force Survey, described above. For the purposes of this study, a special compilation of hours of work at main job was performed. The hours have been disaggregated by major industry and sex.

Disaggregation by age and sex carries with it very little additional sampling error. However, a further breakdown by major industrial groupings conveys a higher level of sampling error.

As was the case for the employment and population figures, the alphabetic indicators of standard deviation for the country-wide hours of work by major industry range between "A" (0.0% to 0.5% standard deviation), and "D" (2.6% to 5.0% standard deviation). However, the most frequent designation encountered for the "hours of work" estimates by industrial groupings was "C", indicating a percentage standard deviation ranging between 1.1% and 2.5%.

5.3 Educational attainment

Data on university educated Canadians were gathered from two sources: 1986 Census data on population and dwelling characteristics, and from the Statistics Canada annual catalogue entitled "Universities: Enrolment and Degrees".

The 1986 Census data obtained regarding the highest university degree or graduate-level certificate obtained by Canadians are based on a 20 per cent sample.

It is a derived variable obtained from the educational qualifications question which asked for **all** degrees, certificates or diplomas to be reported. University certificates or diplomas are normally connected with professional associations in fields such as accounting, banking, insurance, etc..

If a bachelor degree is a normal prerequisite for a university certificate or diploma course, then the latter is classified as a university certificate above the bachelor level. For the purposes of this study, this hierarchical sequence will not matter since what is important is that people with some university designation get counted (no more than once). Detailed sample census data were not collected for people living in institutional collective dwellings such as homes for the elderly, hospitals and correctional institutions.

As regards the "university enrolment and degrees" data, the information is obtained from the administrative records of Canadian degree-granting institutions mostly in a computerized format. A data base, called the University Student Information System (USIS) is then created. All data are subject to validity and relationship edits by the universities, in some cases by the provinces and by Statistics Canada.

The graduation survey collects information on the qualification counts for the calendar year ending in December. This means that each student attending a university in a fall session is counted only once annually, regardless of the number of programs in which the student may be enroled.

At graduation, however, it is the number of degrees and certificates awarded that are counted, not the individual students who received them. Although this implies that the same student may receive more than one degree in the same year, it is rather uncommon. Thus, the difference between the number of degrees and the number of graduates is negligible.

The objective was to compute, for each year from 1975 to 1991, the estimated number of Canadians with at least one of the following: a graduate level certificate, a bachelor (or first professional) degree, a masters degree, or an earned doctorate. It was possible to match the Census data's definition of these designations with that of the annual granting of certificates, diplomas and degrees information from the USIS.

Using historical Census data for the years 1971, 1976, 1981 and 1986, as well as Labour Force Survey estimates of men and women with university degrees in 1991 (since 1991 census data is not yet available), the USIS university designation granting information was then utilized in order to derive inter-censal data.

The USIS data served as a means of gauging the degree of uneven progression between the census year estimates. They were used as a method of calibrating the interpolated estimates of missing data.

Had the USIS data for men and women been used on their own, the resulting estimates would have been biased upwards due to double counting because Canadians can (and often do) receive more than one degree (or graduate-level certificate) during their lifetime. In this case, however, any such bias is almost completely eliminated because the benchmark data used as a guidepost stem from the historical census estimates. In any event, when a ratio of the male (female) percentage of university-educated men (women) divided by the overall percentage of university-educated Canadian adults is taken to compute coefficients used in the participation rate equations, the remaining bias, (if any), will be in both the numerator and the denominator, and will largely cancel each other out. In the end, it is the progression of men and women as regards educational attainment (expressed as a percentage of their respective population) that is of interest.

The measure is not quite perfect, but may nevertheless yield interesting results, at least in terms of the impact of the relative intensity of educational pursuit of men and women on their respective labour force attachment.

5.4 Corporation Income and Profits

The two financial elements used in this study were derived by Statistics Canada from corporation income tax returns submitted to Revenue Canada. A corporation's income tax return typically consists of a T2 form, and a set of financial statements and support schedules. These financial statements, usually in the form of a Balance Sheet and Income and Retained Earnings statement, are prepared after an independent annual audit of the corporation's books is performed. They are the main sources of data contained in this publication, encompassing over 600,000 corporations.

They include joint ventures and partnerships of participating corporations, unincorporated branches of foreign incorporated companies, limited dividend housing corporations, other public and private corporations, federal proprietary Crown corporations and their subsidiaries, provincial Crown corporations, federal agency Crown corporations and cooperatives. Credit Unions, insurance carriers, religious organizations, foreign business corporations, trusteed pension funds, municipally owned corporations, and inactive corporations are not included.

No data derived from personal income tax returns are included. In the overall economy, although the number of unincorporated businesses is large, their relative impact in most industrial groupings is marginal, except in agriculture, forestry and fishing and some trade and service industries. In instances where corporations have merged or re-organized, the data have been adjusted to ensure a proper matching of operating and balance sheet items, to avoid double counting of assets and liability, and to maintain year-to-year consistency.

In a few cases, data have been estimated to reflect returns of large corporations for which actual data had not yet been received. The revision for the preceding year reflects the inclusion of late filed returns and gives effect to any changes in industrial classification. To take advantage of these corrections, revised data in every year from 1973 to 1986 was used. For the year 1987, the last year in which detailed industrial data was available in this form, the preliminary data had to be used, since no revisions were ever made.

There are a number of problems which undermine the accuracy of the data as compiled in Statistics Canada's annual catalogue 61-207 entitled "Corporation Financial Statistics".

While the financial data presented in this catalogue are assembled on a calendar year basis, corporate income tax returns relate to a fiscal year period. Thus, data for corporations whose fiscal periods do not coincide with the calendar year include data applicable to the prior calendar year.

In 1987 alone, however, over 60 per cent of total sales were reported by corporations whose fiscal year-end occurred either in October, November or December; almost or precisely coincident with the calendar year-end period.

Since the source documents for this data are the financial statements filed by corporations with the Department of National Revenue, this means that a corporation is classified in its entirety to a single Standard Industrial Classification (SIC) even if, as is the case with many of the larger corporations, it is engaged in a variety of industrial activities, some of which relate to activities in other SIC's.

Such problems are relatively acute in the case of vertically integrated industries, where there are significant amounts of inter-establishment transfers. As an outcome of such cases, certain conventions have been adopted in the classification of corporations for financial statistics purposes.

Industrial classification changes, amalgamations and mergers, changes in accounting methods, and asset revaluations, may all cause noticeable, year-to-year financial changes in aggregated corporate performance compiled for a given SIC , even if "real" sales and net revenues at the company level remained virtually unchanged from one year to the next.

Clearly, these corporate financial data are not without potential flaws, which is added justification for the use of smoothing by means of moving averages, as carried out in this paper.

Insofar as data reliability is concerned, non-sampling errors are minimized through training of personnel, stringent and continuous manual controls over the analysis and transcription of financial data, extensive mechanical edits and subject matter scrutiny.

As regards sampling errors, they are reduced through the analysis and proper classification of corporate characteristics into strata where each stratum represents a group of corporations which are more or less similar in size and behaviour. No quantifiable reliability measures, however, exist for each financial item. In spite of this shortcoming, the transcribed portion of the universe accounts for 83 per cent of total assets, 62 per cent of total revenue and 71 per cent of total pre-tax profits.

The major setback in the use of these corporate financial statistics is due to the discontinuation of catalogue 61-207, thus making it impossible to build a continuous corporate financial time series up to 1991.

6. SPECIFICATION OF REVISED MODEL

A revised model of participation rates for men and women will now be specified using ordinary least-squares estimates, and tested against annual data for the period of 1975 to 1991. The formal specification of the right-hand variables will be derived from the elements described in section 4. In most cases, the variables used in the participation rate equation (PRE) of women will be symmetrical to those used in the male PRE, unless they are found to be statistically significant for one gender, and not for the other.

Since the main intent of this paper is to elaborate on the **changing patterns** of workforce attachment over time, rather than on the magnitude of participation rates in any given year, it was decided that a log-linear specification, (as most often used in previous Canadian models), would be appropriate.

Sub-section 6.1 will briefly describe each of the variables tested within the participation rate equations. Their actual values, for each of the years under study, are depicted in the various tables of appendices 2 and 3.

6.1 Summary of Explanatory Variables

In all, four types of variables will be considered for each PRE specification: one demographic variable, two work intensity variables, one educational attainment variable, and one measure of corporate profitability. The data behind these variables are annualized averages (based on the calendar year). What follows is a brief description of each variable.

(A) Demographic variable

This variable is defined as the gender-specific sum of family heads and unattached individuals, divided by the own-gender adult population (15 years of age or more). The data are shown in the appendix 2 table entitled "Male and Female Demographic Characteristics". The male demographic ratio is referred to as MHEADPOP, while the female demographic ratio is known as WHEADPOP.

(B) Two work intensity variables

The first of the two, denoted as MFTHPO in the case of men, and WFTHPO for women, depicts the total gender-specific average number of full-time actual weekly hours of work at main job, divided by the own-gender total adult population (aged 15 +).

MFTHPO and WFTHPO are taken to reflect, (at least in part), the on-going occupational shift of the last few years, and the uneven employment growth (and demand), in terms of numbers and job type, by industry and firm size.

The second work intensity variable, shown as MPPTHR and WPPTHR for men and women respectively, represent the part-time hours actually worked at main job, divided by the total actual hours worked at main job.

Part-time employment, used as a proxy for under-employment (thereby a demand function), is significantly affected by economic downturns, as have been the participation rates of men. As for women, there has also been a secular increase in the percentage of part-time hours worked. But since a much higher portion of these hours of part-time work are voluntary in the case of women (not so for men), this may be an indication of their increase in workforce attachment.

(C) Corporate profit level variable

Since the relative industrial distribution of male and female employment is quite different, and has remained generally stable over the past 20 years, different corporate performances at the industrial level may have created unequal job opportunities and job losses across the industrial spectrum. Men and women may have benefitted (or suffered) unequally because of the relatively homogeneous concentration of their respective labour force across industries.

This variable is formally defined herein as being the industrial aggregate net profit margin weighted by the gender-specific actual hours worked at main job, divided by the industrial aggregate net profit margin weighted by the total actual hours worked at main job. From this definition are generated two profit margin ratios: one for men, and one for women. Since a response lag is anticipated, a three-year moving average profit margin ratio is used in the model, and is denoted as MMAPMR in the case of men, and WMAPMR in the case of women. As mentioned in section 4, the data for MMAPMR and WMAPMR are only available up to (and including) 1987.

(D) Relative educational attainment variable

The ratio of the percentage of university-educated men (as previously defined) divided by the overall percentage of university-educated Canadians (aged 15 or more) will be denoted as MDEGCO. The corresponding female ratio will be shown as WDEGCO.

Here is a summary of the variables used in the participation rate equations which follow:

VARIABLE NAME	VARIABLE DESCRIPTION
MPRATE	Participation rate of men (aged 15 or more)
WPRATE	Participation rate of women (aged 15 or more)
MHEADPOP	Sum of male family heads and unattached individuals, divided by the total male adult population (15 years of age or more).
WHEADPOP	Sum of female family heads and unattached individuals, divided by the total female adult population (15 years of age or more).
MFTHPO	Men's average number of full-time actual weekly hours of work at main job, per male adult (aged 15 +).
WFTHPO	Women's average number of full-time actual weekly hours of work at main job, per female adult (aged 15 +).
MPPTHR	Male part-time hours actually worked at main job, divided by the total hours actually worked by men, at their main job.

VARIABLE NAME **VARIABLE DESCRIPTION** (Continued)

WPPTHR	Female part-time hours actually worked at main job, divided by the total hours actually worked by women, at their main job.
MDEGCO	The percentage of university-educated men divided by the overall percentage of university-educated Canadian adults.
WDEGCO	The percentage of university-educated women divided by the overall percentage of university-educated Canadian adults.
MMAPMR	Industrial aggregate net profit margin weighted by the male number of actual hours worked at main job, divided by the industrial aggregate net profit margin weighted by the total number of actual hours worked at main job.
WMAPMR	Industrial aggregate net profit margin weighted by the male number of actual hours worked at main job, divided by the industrial aggregate net profit margin weighted by the total number of actual hours worked at main job.

In sub-section 6.2, those equation specifications which demonstrated the best statistical goodness-of-fit while remaining consistent with prior expectations, will be presented.

6.2 Specification of Labour Force Participation Rate Equations

In each of the specifications highlighted below, several alternatives were attempted in order to obtain the best possible fit in terms of the adjusted coefficient of determination (Corrected R*2), the Durbin-Watson (DW) statistic, the t-ratios and F-statistic. These include the trial inclusion of time trend functions.

Full details of each equation, along with their corresponding inter-variable correlation matrix, are given in appendix 3.

(A) Male Labour Force - 1975 to 1991

The annualized average participation rates of men reached a peak of 0.785 in 1979, and decreased by almost two full percentage points during the 1981-83 recession. From 1984 to 1989, they remained, in a remarkably stable fashion, at their new all-time lows reached in 1983. The recovery did not exercise any upward pressure on male participation rates. Then the 1990-92 recession caused them to drop further, to well below the .750 mark.

Log(MPRATE) = -0.145 + (0.143)*Log(MFTHPO) + (0.020)*Log(MPPTHR) + (1.091)*Log(MHEADPOP)
[-2.74] [3.74] [1.22] [4.78]

Corrected R*2 = 0.925 F(3, 13) = 66.315 D-W = 1.82

(The t-ratios, enclosed in square brackets, indicate that while the coefficient associated with Log(MPPTHR) is significant only at the 85 per cent confidence level, all other coefficients are significant at the 99 per cent level.)

This specification, in the absence of the MMAPMR variable (since it is not available for the years 1988 to 1991), offers the most logical fit, even though there is collinearity between the Log(MPPTHR) and Log(MHEADPOP) variables. Another specification offered a much better corrected R*2 value, but the intercept took on an unrealistic value. Moreover, the correlation coefficient between two of the explanatory variables (MDEGCO and YEAR), was over 0.99, an indication of extreme multi-collinearity.

Thus, the successful specification retains three of the explanatory variables under consideration:

The first one is **MHEADPOP**, a demographic indicator which measures the decline of male domination as regards the average household's structure. The erosion of the traditional family nucleus has brought about a decrease in the husband's status as the main bread winner. It is assumed that there is a direct relationship in the decline of the proportion of men defining themselves as the head of the family, and the earnings capacity of working husbands vis-a-vis the earnings of other family members within the household.

Within this specification, the variable Log(MHEADPOP) is statistically very significant, as its corresponding t-ratio indicates.

The second variable, **MFTHPO**, corresponds to the relative extent and type of full-time work performed by men in relation to the male adult population. It is expressed as the average number of weekly full-time hours actually worked taken as a percentage of the male population (aged 15 +), rather than as merely a function of the employed. As expected, this variable has proven extremely vulnerable to the last two recessions. While in 1979, its value was 27.68 hours (essentially the same as in 1975), it dropped to 24.60 hours by the end of the early 1980's recession. It then began to gradually increase so that by 1989, it was up to 26.72 hours. Massive lay-offs and accelerated erosion of Canada's industrial base brought about, as during the 1981-83 recession, relatively higher growth in population than in full-time work. As a result, the 1991 annualized average MFTHPO value was 24.18 hours, almost 10 per cent less than in 1989.

The Log(MFTHPO) variable is significant at the 99 per cent confidence level. In addition, the correlation coefficient between Log(MFTHPO) and Log(MHEADPOP) is 0.67, which is quite acceptable given the 17 years of annual data and the degree of correlation between the dependent variable and each of the two explanatory variables.

The third variable, **MPPTHR**, corresponds to the relative importance of male part-time work relative to the total actual hours worked by men. Its value rises whenever there is a cyclical downturn in the economy. MPPTHR serves as a male proxy variable of the amount of contingent work assumed by men, as a proportion of all paid male work. It is the less significant of the three explanatory variables. Nonetheless, its overall importance appears to warrant inclusion into the model. However, it is highly correlated with MHEADPOP, and thus introduces some degree of collinearity within the model.

The multicollinearity between Log(MPPTHR) and Log(MHEADPOP) has introduced some measure of imprecision into the estimation of the regression parameters, in that the standard errors of the regression coefficients are increased. The estimators, however, are still unbiased. This is preferable to eliminating one of the explanatory variables, which may result in biased estimators.

Comparing this model to that of the traditional employment/population ratio model using the same 17 years of annual data is also revealing. The **corrected R*2** of the revised model is 0.925, compared with 0.799 in the case of the traditional model. Thus the goodness-of-fit is much higher for the alternative model.

Consult appendix 3 for full details concerning the statistical parameters of the proposed specification.

(B) Male Labour Force - 1975 to 1987

An OLS regression with only 13 years of observation was also performed in order that the potential effects of the corporate profitability variable MMAPMR be tested. The specification is shown below:

Log(MPRATE) = -0.296 + (0.235)*Log(MFTHPO) + (0.060)*Log(MPPTHR)
[-11.39] [13.24] [8.75]

+ (0.259)*Log(MMAPMR) + (0.363)*Log(MHEADPOP)
[8.24] [3.12]

Corrected R*2 = 0.989 F(4, 8) = 274.310 D-W = 2.03

As the t-ratios (shown in square brackets) indicate, the estimated coefficients are all significant at the 99 per cent confidence level. The addition of the logarithm of the three-year moving average of the male-weighted profit margin ratio has considerably strengthened the model. Moreover, all of the estimated coefficients, except for the one associated with MHEADPOP, are noticeably more significant than for the 1975 to 1991 male participation rate model.

Perhaps the slight weakening of the coefficient associated with Log(MHEADPOP) is due to this variable's relatively high level of collinearity with the variable Log(MMAPMR). In an alternate specification where Log(MHEADPOP) had not been included, the t-ratio associated with Log(MMAPMR) was above 10, even higher than that of its current specification. This is in keeping with the fact that the standard errors of regression coefficients where multicollinearity is present are increased, thereby diminishing their corresponding t-ratio.

While the majority of male employment growth has been concentrated within the services-producing industries, it nevertheless remains that the bulk of employees within such cyclically vulnerable industries as forestry, mining and manufacturing have been men. The gender specificity of employment (by broad industrial class) has been a fact of surprising stability over the years. The measure of relative corporate performance (measured on an industrial basis) used in this paper merely represents an attempt to introduce a demand constraint, and to measure the different responses of the male and female labour forces, given their dissimilarities as regards their employment distribution. The **MMAPMR** variable is the means by which this demand constraint is introduced into the male participation rate equation.

It is not so surprising to see that Log(MMAPMR) is correlated with the Log(MHEADPOP) because of the earnings significance behind the latter variable, and because of the correlation between employment and corporate viability. It is suspected that the majority of married men who have lost their jobs during the last two recessions were the main breadwinner of the family up until their job loss. Almost all of them would have considered themselves as the family head.

The last two recessions could be viewed as periods of massive lay-offs from firms (largely concentrated in cyclically vulnerable industries) whose profits had plummeted or disappeared altogether, and now found themselves in some financial difficulty. In a nutshell, we have that profit decline beyond a certain threshold eventually leads to a drop in employment. If a larger share of corporate profit deterioration occurs in firms where men are inordinately concentrated, male employment (and consequently male earnings) will be more severely affected than in the case of women. One would therefore expect a decrease in the number of male family heads, particularly in those instances where married women are already engaged in (paid) work outside the home.

Since the dual-earner family has become the norm, the link between corporate downfall and the decline of male family heads, given the industrial concentration of employment, is even more plausible.

(C) Female Labour Force - 1975 to 1991

The annualized average participation rates of women has been rising at least since 1975, reaching a peak of 0.584 in 1990. It decreased for the first time in 1991. Even then, the decrease was slight. What has caused the labour force attachment of women to advance so undeterred over the last twenty years? The female participation rate model shown below may provide some clues.

Log(WPRATE) = -0.419 + (0.334)*Log(WFTHPO) + (0.170)*Log(WPPTHR)
[-11.40] [6.44] [4.00]

+ (0.646)*Log(WDEG)
[6.71]

Corrected R*2 = 0.999 F(3, 13) = 3669.984 D-W = 2.44

(The t-ratios, enclosed in square brackets, indicate that all coefficients are significant at the 99 per cent level.)

This specification, in the absence of the WMAPMR variable (since it is also not available for the years 1988 to 1991, as in the case of men), offers the best fit, even though there is some collinearity between Log(WDEG) and the two other explanatory variables. Again, comparing this model to that of the traditional employment/population ratio model using the same 17-year data base, a better statistical fit is obtained, despite the fact that the traditional approach yielded a very tight relationship, at least for the purposes of short-term forecasting. The **corrected R*2** of the revised model is 0.999, versus 0.954 in the case of the traditional approach. (Consult appendix 3 for full details).

More importantly, it is surmised that this alternative model is based on a more credible theoretical foundation.

As explained earlier in this study, women are increasing their rate of human capital investment [16] at a higher rate than men. Since there is a positive relationship between educational attainment and labour force participation, and since the labour force is increasingly becoming competitive, it is not surprising to see that women have been relatively more successful than men in augmenting their attachment to the labour force over the past 20 or so years.

In addition, women are increasing their representation in many occupations historically dominated by men. Given that hours of work are shown to vary between industries and occupations, one would expect female penetration into non-traditional fields of work would be correlated with average weekly hours of work. Here, two effects are examined.

On the one hand, the type of, (and hourly commitment to), full-time work will shift as women enter new occupational streams. By gradually re-orienting the spectrum of women's work towards employment which offers higher wages, better working conditions and a heightened sense of responsibility and commitment, the end result can only be one of increased labour force participation rates. This effect is proxied by the variable WFTHPO.

In addition, while an increasing number of women are seeking (and obtaining) full-time employment, data from the past 20 or so years have shown that part-time work has also contributed to attracting more women within the ranks of the labour force. This might explain why the sign associated with the variable WPPTHR is positive.

The increased levels of human capital investment therefore exert an influence on the type (and quantity) of work performed by women. This may explain, to some degree, the high correlation between WDEG and the variables WFTHPO and WPPTHR.

While for women, the most significant explanatory variables are WFTHPO and WDEG, the educational attainment variable MDEG does not even figure in the male participation equation. The most prominent independent variable in the case of male participation rates, both in terms of statistical significance and the size of the coefficient, is the male family head variable MHEADPOP. Since the participation rates of men can be typically described as being cyclically vulnerable, explanatory variables which are also highly affected by economic cycles (such as the proportion of men who qualify as the (economic) head of a family, and the full-time hours worked per adult male), will offer a better statistical fit than variables such as educational attainment which tend to be linear.

As for women, such factors as the proportion of full-year full-time hours of work, and the increase (relative to men) in the proportion of university educated women have been rising in a quasi-linear fashion. The same can be said of female participation rates.

(D) Female Labour Force - 1975 to 1987

As in the case of the male labour force, an OLS regression with only 13 years of observations is also performed, thus allowing to verify the effects of WMAPMR. The specification is as follows:

Log(WPRATE) = -0.765 + (0.368)*Log(WFTHPO) + (0.991)*Log(WDEG)
[-11.10] [7.59] [41.27]

- (0.003)*Log(WMAPMR)
[-4.47]

Corrected R*2= 0.999 F(3, 9)= 4507.36 D-W= 2.53 RHO= -0.425

Although the previous 17-year female participation equation yielded excellent results, the F-statistic associated with this 13-year model may even have slightly improved the model's performance. Notice the dramatic increase in the t-ratio associated with the WDEG variable.

Even more revealing is the very slight contribution of WMAPMR to the prediction of WPRATE. Since the services producing sector, where the female labour force is largely concentrated, has not suffered nearly as much as the goods-producing sector, and since, in any event, cyclical demand constraints have not deterred women in their quest to join the labour force in ever increasing numbers, a variable such as WMAPMR will not affect the workforce attachment of women in the same way the equivalent variable MMAPMR has affected that of men. However, the sign of Log(WMAPMR) is wrong. It is counter to expectations. If profit levels increase, attachment to the labour force is not expected to drop, except in the case where the profit margin improvements came about through an increase in the capital intensity (or mechanization) of production, which often leads to lower levels of employment.

But why would the profit level variable's direction of overall effect on labour force participation be different for men and women? It could be that the WMAPMR variable serves as an inverse proxy for the part-time hours of work variable WPPTHR. It would appear reasonable to assume that a general weakening of the financial performance of corporations, usually observable on an industry-wide basis during periods of recession, eventually leads to a decline in full-time work, and to an increase in contingent employment (which comprises part-time work). Thus, as aggregate corporate profit levels decrease, the incidence of part-time work rises, serving to attract more women to the female labour force. Such an argument would explain the inverse relationship between WMAPMR and WPRATE.

It would be interesting to specify the same model as the one put forward for the 1975 to 1991 period. The results are as follows:

Log(WPRATE) = -0.446 + (0.363)*Log(WFTHPO) + (0.180)*Log(WPPTHR)
[-7.00] [4.38] [2.42]

+ (0.612)*Log(WDEG)
[3.72]

Corrected R*2= 0.998 F(3, 9)= 1611.32 D-W= 2.26

Comparing the results of the above model with those of the 17-year period female participation rate equation shows that the coefficients are quasi-identical in both cases. Consult appendix 4 for details.

Only a limited number of observations (13 in all) are available to perform a modified Chow test to verify for structural consistency. The fact that the above specification yields pretty much the same results against two different time periods is comforting.

7. CONCLUSION

It may be argued that the discouraged-worker and additional-worker hypotheses have not been entirely successful in assessing the impact of the industrial transformation of the Canadian economy on labour force participation.

The dramatic changes in the industrial makeup of our economy appear to have contributed to the stagnation of living standards throughout North America. These changes have affected the nature and distribution of available jobs, as well as the conditions and hours of work. Natural resources, manufacturing and construction no longer account for Canada's major share of production and employment where the male labour force once flourished.

It is interesting to note that in a country like Japan, whose manufacturing base has remained intact over the years, the relative participation rates of men and women have hardly changed. Hence, one may argue that the events of the last three decades as regards the emergence of a service economy played a role in altering the relative long-term family structure and labour force status of men and women. These events accelerated the change in values and priorities already in motion, due initially to urbanization and consumerism.

It is not unreasonable to postulate that the caring and nurturing skills essential to women within the confines of their traditional family roles were eventually to bear fruit in the form of paid work, found in many service occupations. Women generally excel in jobs requiring communicative abilities and people skills. This may help to explain why a large concentration of female employment is currently found in such industries as finance, insurance & real estate, as well as in community, business & personal services.

The rapid re-orientation of our economy most likely accelerated the erosion of the traditional family structure, while acting as a catalyst of change in the attitudes of women regarding the importance of investing in their own human capital. Women are assuming an increasing share of financial responsibilities, and, by the same token, striving (more intensely than men) to further their education. It would therefore appear inappropriate to assume that women's attachment to the labour force was, in the aggregate sense, only a temporary phenomenon.

Along with these changes in family roles and human capital investment, the type of work women were pursuing was also gradually beginning to change. The occupational barriers (whether self-imposed or by design) which may have existed thirty years ago regarding female employment, have largely disappeared.

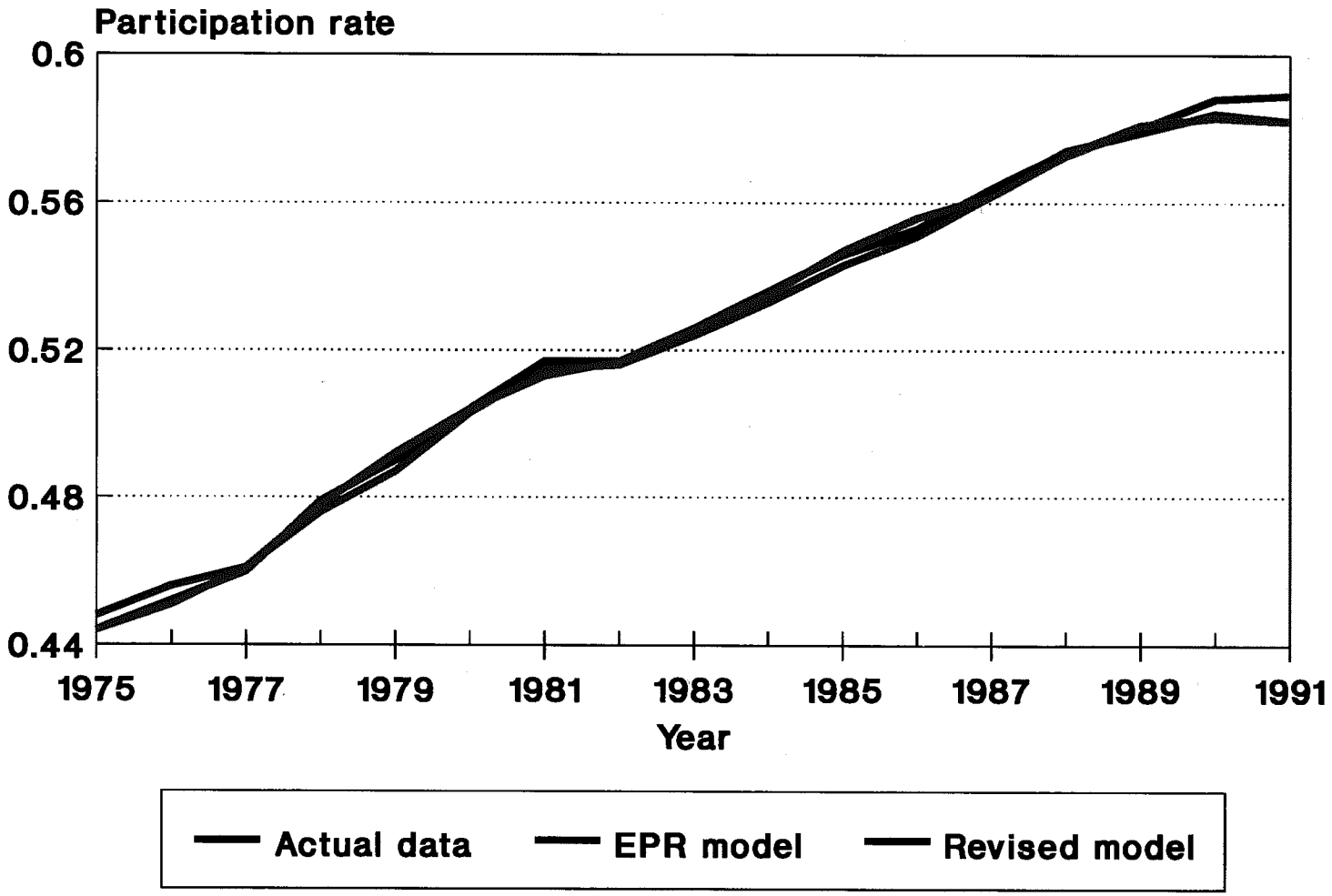
This is reflected in the evolution of female hours of work, moving gradually from part-year work, towards either full-year part-time or full-year full-time work.

These facts appear to indicate that women are striving to maintain and in fact strengthen their attachment to the labour force. Increasingly, women are competing head-on with men for much of the same jobs. The female participation rate equation proposed within this study attempts to capture the secular increase in the workforce attachment of women. In addition, it seeks to introduce a demand constraint variable apparently lacking from the EPR models of participation rates. For predictive purposes, however, the alternate equation only modestly outperforms the traditional approach.

In fact, the industrial and occupational orientation of women are such that corporate performance levels by industry have, up to now, played only a minor role in impeding the adherence of women to the Canadian labour force. This is why the WMAPMR variable contributed so little in the 1975 to 1987 female participation rate equation, its estimated coefficient being equal to -0.00346.

Figure 4 on the next page shows the actual versus the estimated rates of female participation, using the traditional EPR model and the newly proposed method, for the 1975 to 1991 period. Since both the EPR and revised model have an adjusted-R^2 of well over 0.985, fits are very tight in each case. One can see, however, that the revised model has outperformed the EPR model over the recessionary period of 1990-91. The estimated 1990 and 1991 participation rates of the revised model turned downwards, in line with the actual data. Other statistical indicators such as the F-statistic and the standard error of the estimate also suggest that the revised method offers a slight improvement over an already exceptional goodness-of-fit obtained through the EPR model.

FIGURE 4
FEMALE PART. RATES: EST. VS ACTUAL



EPR stands for Empl./Population ratio

The outcome of male labour force participation is in stark contrast to that of women. The shape of the male participation rate is testimony to that effect. The last two recessions have greatly affected men's adherence to the labour force, simply because many firms within male-dominated industries such as manufacturing, forestry, mining and construction often resort to lay-offs in large numbers. Moreover, dire financial straights experienced by several corporations during the last two recessions resulted in a loss of many more jobs held by men than by women.

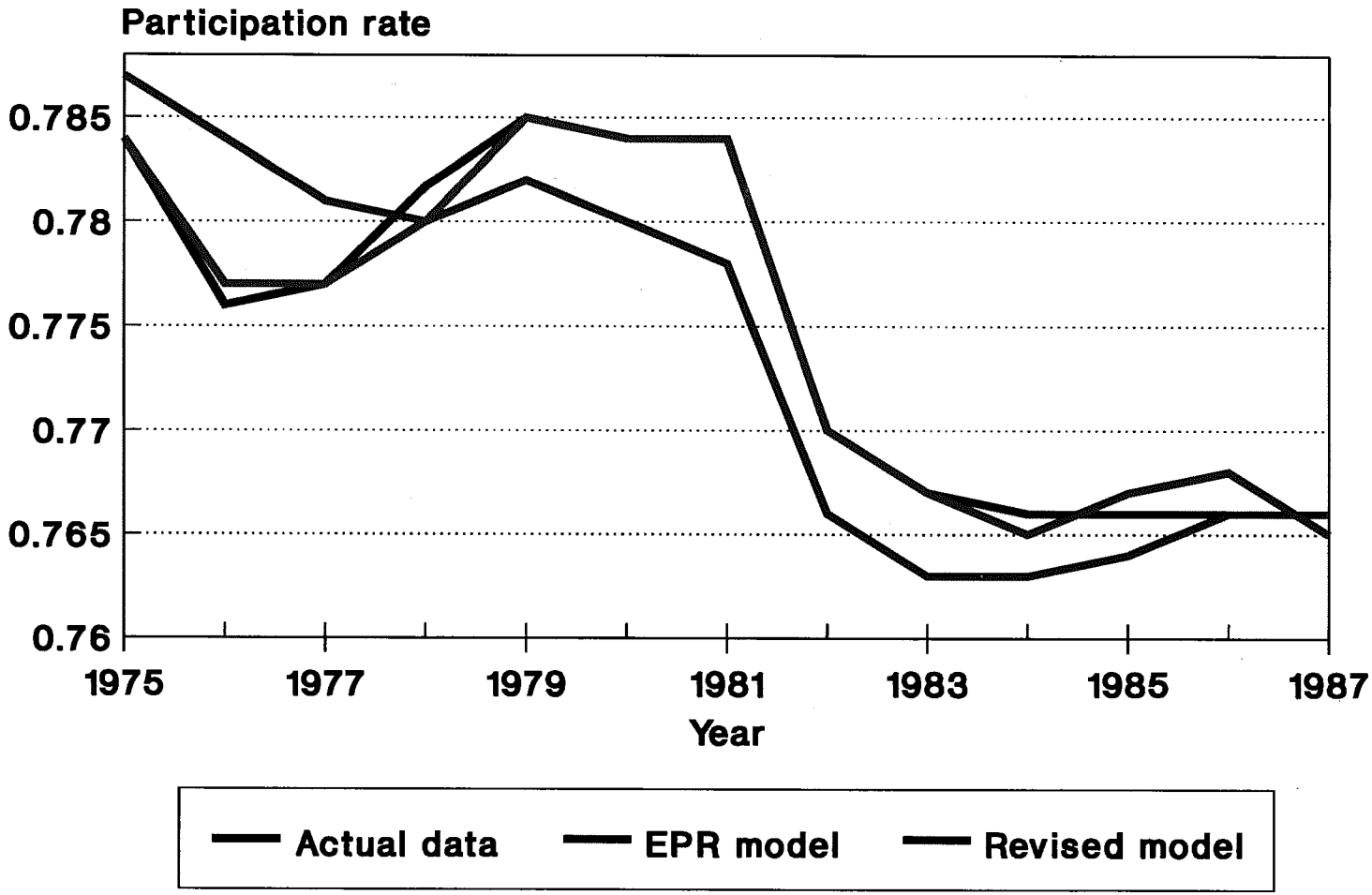
Many of those laid off chose either to retire (if their age and years of pensionable service allowed them to do so) or to go back to school. Others ended up on welfare with no real hope (or aspirations) of re-employment. This was also a signal for younger men thinking of joining the labour force to further their education instead.

While part of the reason why male participation rates are vulnerable to economic cycles is explained by their historic (and surprisingly stable) concentration in certain recession-prone or high turnover industries, it is also due to the fact that their rates of participation are relatively high overall, in comparison to those of women. Consequently, there is a lesser number of potential male candidates ready to join the labour force and replace those men leaving the workforce. The net result is pro-cyclical labour force participation rates, hence the usefulness of the traditional theory as a first approximation.

The introduction of one or more demand constraint variables was an attempt to improve upon the EPR model's results. The indicator chosen, a variant of industrially assigned corporate profit margins, proved to be quite significant, both in terms of its contribution to the equation, and level of statistical significance. Figure 5 on the next page shows the plot of the actual versus the estimated male participation rates using the EPR model, as well as the revised model which includes the MMAPMR variable. It therefore appears that the revised model offers a noticeably better fit than the traditional EPR model, although over the 1985 to 1987 period, the new model does not perform as well. Its replication of turning points is excellent, and its only weakness appears to be in periods of relatively constant participation rates.

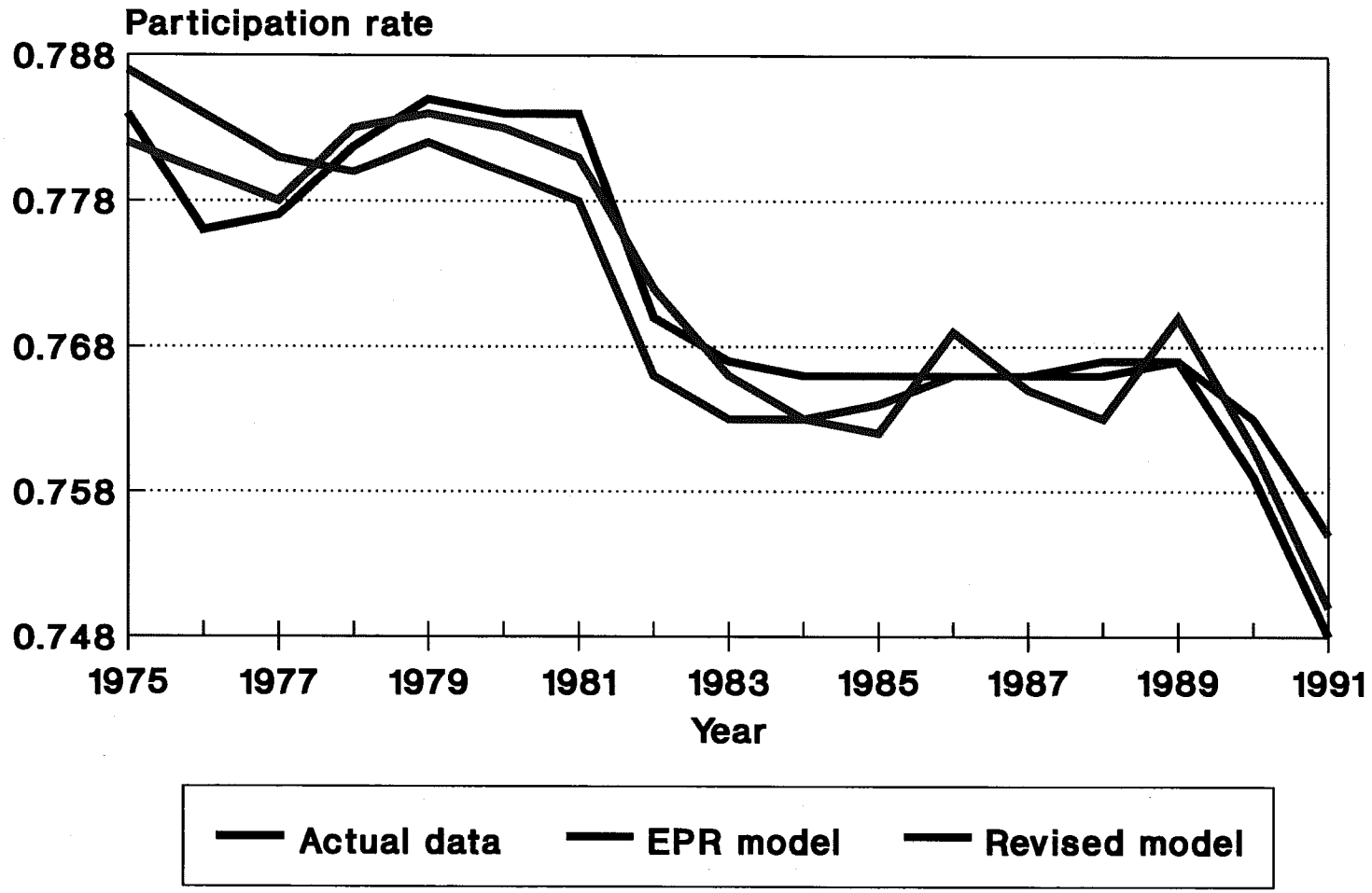
This is also true of the revised model without the MMAPMR variable. As shown in figure 6 (immediately following figure 5), the revised model again tracks the cyclical fluctuations better than the EPR model, but again its performance over the period of 1985 to 1989 (when male participation rates were constant) is somewhat weaker.

FIGURE 5
MALE PARTICIPATION RATES: EST. VS ACTUAL



EPR stands for Empl./Population ratio
Revised model with MMAPMR variable

FIGURE 6
MALE PARTICIPATION RATES: EST. VS ACTUAL



EPR stands for Empl./Population ratio
Revised model without MMAPMR variable

In the case of women, however, the demand variable WMAPMR contributes very little to the female participation rate equation. Moreover, since the EPR model of female labour force participation yields a relatively high statistical goodness-of-fit, the alternate approaches (with and without WMAPMR) suggested in this paper offer only a very modest improvement overall.

While labour demand appears to have played an important role in constraining the labour force participation of men, it should eventually also play a more significant role in the levels of female labour force participation. As the participation rates of women increase, and as a further overlap of occupations across gender occurs, labour activities of men and women will be more and more subject to the same socio-economic effects. Perhaps the only prevailing difference will be one of asymmetric distribution of employment across industries and firm size. However, even those differences will dim over time.

In retrospect, one can identify some key reasons as to why women have so dramatically increased their labour force participation rates. Some were motivated primarily by their desire to raise family consumption. Others, by choosing to postpone marriage (or even to divorce), inherited more financial responsibilities than the women typically found within traditional families. Many of these women, while either acquiring a taste for their new found autonomy or being forced by circumstance, opted to remain in the workforce. These events appear to have paved the way to a gradual change in women's outlook towards work and family. This is particularly true of women under the age of 35, an increasing proportion of which are choosing to pursue a career while postponing marriage and child-rearing.

A combination of these factors, and still others, have been crowned with success regarding women's efforts to join the ranks of the labour force. By furthering their education, expanding their occupational horizons, and choosing (through luck or predisposition) relatively less vulnerable industries to work in, we have witnessed the secular ascension of women into the workforce.

This study has endeavoured to measure the impact of family structure, education, work patterns, and industrial shifts on the labour force participation of men and women in the Canadian economy.

Since the alternate model proposed herein is not considered to be a variant of the traditional model, running econometric tests for nonnested or separate models was deemed to be unnecessary.

Although the results are generally positive, the limitations regarding the lack of historical continuum for the profit margin variable would warrant the use of an alternative labour demand indicator. Perhaps the ratio of wages, salaries and supplementary income (discounted by the mean increase per employed person) over the adult population by sex would be interesting to examine. If the employment/population ratio drops, one would assume that it would affect the level of (increase-adjusted) per capita earnings. However, at the present moment, there are no readily available time series on aggregate earnings by sex.

Another factor worth examining concerns the extent to which the potential labour supply has been fully utilized. For instance, it is reasonable to suspect that the absolute levels of participation rates may themselves affect the response of aggregate levels of labour force participation to several macroeconomic indicators. As the potential army of adult men and women outside the labour force shrinks, there is less slack available to increase participation rates, but likely a higher probability to have rates decline in response to adverse economic conditions. It would thus be interesting to investigate the elasticity effects of various economic stimuli on labour force participation rates.

In closing, it was previously mentioned earlier in this study that women in general have constituted a cheaper source of labour. Whether this phenomenon has been favourable to the entry of women into the labour force needs to be more closely examined.

NOTES

[1] To differentiate occupations according to relative gender representation, Karen D. Hughes divides the percentage of female (male) representation of a specific occupation, by the percentage of female (male) representation in the total labour force. Labelling this ratio as a coefficient of representation, she defines those occupations as having a very low proportion of women as being all occupations whose female coefficient values fall under 0.25.

[2] All income figures quoted in Abdul Rashid's 1991 study are based on 1985 constant dollars. The 1970 income band for husbands at the low end of the spectrum ($20,000 to $24,999) is different from that shown in 1985 ($15,000 to $19,999), due maybe to the constant dollar conversion, or perhaps because census data were reported and/or compiled differently in each case. Nonetheless, the point made by the author, regarding married women's propensity to engage themselves in paid work, remains valid.

[3] US empirical studies by Ashenfelter and Heckman (1974) and Killingsworth (1983) have concluded that the increase in married women's labour force participation rates was a response to an increase in real wage opportunities. This would appear to be an exception to Hall and Taylor's generalization regarding the (long-term) response of labour supply to changes in the real wage.

[4] The "waiting for recall" group is defined as those individuals who have been temporarily laid-off, but are expecting to return to work with their former employer.

[5] In a recent comparative study of labour force participation, R. Chawla (1990) shows, using OECD data, that the proportion of Japan's employed persons working in the manufacturing, construction, mining and quarrying, electricity gas and water industries rose slightly from 32.4 per cent in 1965, to 33.8 per cent in 1987. Meanwhile, the percentage of workers in equivalent industries dropped significantly in all other G-7 countries.

[6] Based on figures published on an on-going basis by the Fraser Institute, the average net disposable annual income of Canadian families (expressed in constant 1991 dollars) reached a peak of $37,915 in 1976, and since then has fluctuated at lower levels. By 1991, it had reached an average annualized level of $35,313.

[7] Using data from the Labour Market Activity Survey, G. Picot (1992) concludes that permanent lay-offs are higher-than-average in the (male-dominated) forestry, mining and construction industries during years of economic expansion. During a recession, however, lay-offs tend to increase more quickly in manufacturing than in other industries. Permanent lay-offs are defined as workers who are laid-off from a company and do not return for at least 12 months.

[8] Labour income estimates consist of total wages and salaries, director's fees, bonuses, commissions, tips and gratuities, taxable allowances and retroactive wages. It also includes supplementary labour income, comprising employer payments towards health and welfare schemes, pension plans, worker's compensation and unemployment insurance funds. Excluded from labour income is the monetary value of fringe benefits such as subsidized meals, merchandise, loans, housing, recreational and daycare facilities. Factors affecting average labour income are divided into two types:

1. Those that influence an individual's labour income, such as the rate of labour compensation, overtime hours worked, and the like.

2. Factors which do not affect an individual worker's labour income include the industrial, occupational and provincial distributions of paid workers, as well as shifts in the proportions of part-time and full-time hours worked.

[9] R. Morissette (1991) defines small firms as having less than 20 employees, large firms as having 500 or more employees, and medium-sized firms as having between 20 and 499 employees. Small firms account for 27 per cent of all paid hours of work in the Canadian economy.

[10] The census data reveal that female-to-male earnings increased by 7 percentage points from 1970 to 1985, although, in real terms (after adjusting for price changes), the annual rate of income in the earnings of women was 1.84 per cent, compared to 0.91 per cent for men.

[11] This includes first professional degrees. Awarded at the undergraduate level, these degrees differ from bachelor's degrees in that they require a prior degree and/or a professional licence to practice a profession.

[12] Roy-Mayrand, F. (1988) points out that, over the period of 1972 to 1987, the ratio of wage increases in major collective settlements in Canada to wage increases in the United States has averaged 1.8:1 overall.

[13] Low-tenure employment is defined as those workers with less than three months of on-going tenure within the same job, and has been used, in the past, as a proxy for short-term work.

[14] The traditional services sub-sector consist of retail trade, accommodation, food and beverages, amusement and recreation, and personal services. These industries are "traditional" in the sense that they represent the old "Main Street" variety of services. For further details, see Betcherman, G. (1991).

[15] For the period of 1967 to 1989, the average annual rate of employment growth in the accommodation, food and beverages, amusement and recreation, and personal services industries was 4.2 per cent; well above the total Canadian employment growth of 2.4 per cent. Moreover, by 1984, the above-noted industries accounted for almost one quarter of all employment in the Canadian economy.

[16] University education was used as a proxy for human capital investment.

REFERENCES

Akyeampong, E., (1992), "Discouraged workers - where have they gone?", **Perspectives on Labour and Income**, Quarterly, Catalogue 75-001E, autumn 1992. Ottawa: Statistics Canada, pp. 38-44.

Ashenfelter, O. and Heckman, J. (1974), "The estimation of Income and Substitution Effects in a Model of Family Labour Supply", **Econometrica, 42**, pp. 73-85.

Baldwin, J. and Gorecki, P., (1990), "Structural change and the adjustment process: perspectives on firm growth and worker turnover". Catalogue EC22-166/1990E. Ottawa: Statistics Canada and the Economic Council of Canada.

Barth, J., Cordes, J. and Haber, S., (1987), "Employee characteristics and firm size: are there systematic empirical relationships?", **Applied Economics**, 1987, **19**, pp. 555-567.

Betcherman, G. et al., (1991), Employment in the Service Economy, **Economic Council of Canada**, Ottawa: Supply and Services Canada.

Bhrolchain, M. (1990), "Family Matters: Trends and Explanations", in the **Economic Review**, September 1990 edition, pp.9-12.

Chawla, R., (1990), "Labour force participation: An international comparison", **Perspectives on Labour and Income**, Quarterly, Catalogue 75-001E, winter 1990. Ottawa: Statistics Canada, pp. 62-69.

Chawla, R., (1992), "The changing profile of dual-earner families", in **Perspectives on Labour and Income**, Quarterly, Catalogue 75-001E, summer 1992. Ottawa: Statistics Canada, pp. 22-29.

Cousineau, G., (1990), "On the relevance of the discouraged and additional worker hypotheses as they apply to the participation rates of Canadian men and women aged 25 to 54: recent empirical evidence", Term paper written for graduate course entitled **Economic models with policy applications**, University of Ottawa.

Denton, F., Pineo, P. and Spencer, B., (1991), The demographics of employment, McMaster University.

Hall, R., and Taylor J., (1991), Macroeconomics, W. W. Norton & Company, New York, London, Third Edition.

Haggar-Guénette, C., (1991), "Lifelong learning: Who goes back to school?", **Perspectives on Labour and Income**, Quarterly, Catalogue 75-001E, winter 1991. Ottawa: Statistics Canada, pp. 24-30.

Hasan, A. and De Broucker, P.(1983), Unemployment, Employment, and Non Participation in Canadian Labour Markets, **Economic Council of Canada**, Ottawa: Supply and Services Canada.

Heckman, J. and MaCurdy, T., (1980), "A life cycle model of female labor supply", **Review of Economic Studies, no. 47**, pp. 47-54.

Horry, I., Palda, F., and Walker, M., (1992), Tax Facts 8, The Fraser Institute, Vancouver, Canada, 8th edition.

Huet, M., (1985), "Les caractéristiques de l'emploi féminin", **Problèmes Économiques**, no. 1928, pages 13-17.

Hughes, K., (1990), "Trading places: Men and women in non-traditional occupations, 1971-86", **Perspectives on Labour and Income**, Quarterly, Catalogue 75-001E, summer 1990. Ottawa: Statistics Canada, pp.58-68.

Killingsworth, M. (1983), Labor Supply, Cambridge University Press, Cambridge.

Krahn, H., (1991), "Non-standard work arrangements", **Perspectives on Labour and Income**, Quarterly, Catalogue 75-001E, winter 1991. Ottawa: Statistics Canada, pp.35-43.

Kuch, P., and Sharir, S., (1978), "Added-and Discouraged-worker effects in Canada, 1953-74", **Canadian Journal of Economics, XI**, no. 1, February, 1978.

Miller, C., (1991), "Married women's tastes and the decision to participate in the labour market: results from a fixed effects model", **Applied Economics, 23**, pages 1499-1509.

Malinvaud, E., (1969), Méthodes statistiques de l'économétrie, Deuxième édition, Dunod, Paris, 1969

Mincer, J., (1991), "Education and Unemployment of Women", **Working Paper No. 3837**, National Bureau of Economic Research, Cambridge, MA 02138, September 1991.

Moore, M., (1989), "The Characteristics of dual-earner families", **Income Analytic Report No. 3**, cat. 13-588 no. 3. Ottawa: Statistics Canada.

Morissette, R., (1991), "Canadian Jobs and Firm Size: Do Smaller Firms Pay Less?", **Research Paper no. 35**, Business and Labour Market Analysis Group, Analytical Studies Branch, Ottawa: Statistics Canada.

Picot, G., (1992), "Workers on the move: permanent layoffs", **Perspectives on Labour and Income**, Quarterly, Catalogue 75-001E, autumn 1992. Ottawa: Statistics Canada, pp. 18-25.

Pold, H. and Wong, F. (1990), "The price of labour", **Perspectives on Labour and Income**, Quarterly, Catalogue 75-001E, autumn 1990. Ottawa: Statistics Canada, pp. 42-49.

Rashid, A., (1991), "Women's earnings and family incomes", **Perspectives on Labour and Income**, Quarterly, Catalogue 75-001E, summer 1991. Ottawa: Statistics Canada, pp. 27-37.

Roy-Mayrand, F., (1988), "Comparing trends in labour costs in Canada and in the United States", **Canadian Economic Observer,** Catalogue 11-010, Vol. 1, No. 3 Monthly, 1988. Ottawa: Statistics Canada, pp. 35-51.

Stout, C., (1992), "A degree of change", **Perspectives on Labour and Income**, Quarterly, Catalogue 75-001E, winter 1992. Ottawa: Statistics Canada, pp. 14-19.

Various Statistics Canada catalogues

APPENDIX 1

1. | OLS REGRESSION OF LOG(MPRATE) VERSUS LOG(EPRM),LOG(EPRF) |

MALE LABOUR FORCE - 1975 TO 1991

CORRELATION MATRIX (WITH T-VALUES)

	Log(MPRATE)	Log(EPRM)	Log(EPRF)
Log(MPRATE)	1.00000	0.85803	-0.74033
Log(EPRM)	6.47026	1.00000	-0.53497
Log(EPRF)	-4.26531	-2.45237	1.00000

MEAN OF DEPENDENT VARIABLE -0.11282

VARIABLE	MEAN	ESTIMATED COEFFICIENT	STD. ERROR	T-VALUE
CONSTANT TERM		-0.08996	0.01225	-7.34527
Log(EPRM)	-0.15132	0.27601	0.05275	5.23188
Log(EPRF)	-0.32481	-0.05821	0.01827	-3.18591

SOURCE OF VARIATION	DF	SUM OF SQUARES	MEAN SQUARE	F-STATISTIC
MEAN	1 0			
REGRESSOR:X 1	1	0.00040	0.00040	67.40157
X 2	1	0.00006	0.00006	10.15001
RESIDUAL	14	0.00008	0.00001	
TOTAL	17	0.21691		

COEFFICIENT OF DETERMINATION (R*2).....	0.8470807402
CORRECTED R*2 (r*2).....	0.8252351317
F-STATISTIC FOR SIGNIFICANCE OF REGRESSION(2, 14)	38.7757904996
STANDARD ERROR OF THE ESTIMATE.....	0.0024272513
DURBIN-WATSON STATISTIC.....	0.3965828970
COEFFICIENT OF VARIATION (AT THE MEAN OF Y)..(%)	-2.1515047179

REMARK: From the D-W statistic, one can verify that d* = 0.40 lies beneath the lower bound of 1.02 for the case of 2 explanatory variables and 17 observations (at the alpha = .05 level of significance). This confirms that the error terms are correlated. Consequently, the Hildreth-Lu technique will be employed in an attempt to render the error terms independent of one another.

2. | HILDRETH-LU TECHNIQUE APPLIED TO OLS REGRESSION IN 1. |

MALE LABOUR FORCE - 1975 TO 1991

** CONVERGENCE OBTAINED AFTER 1 ITERATIONS **

INITIAL ESTIMATE OF RHO IS 0.81
FINAL ESTIMATE OF RHO IS 0.8
STANDARD ERROR OF RHO IS 0.15

CORRELATION MATRIX (WITH T-VALUES)

	Log(MPRATE)	Log(EPRM)	Log(EPRF)
Log(MPRATE)	1.00000	0.87838	0.30421
Log(LEPRM)	6.87627	1.00000	0.56538
Log(LEPRF)	1.19488	2.56473	1.00000

MEAN OF DEPENDENT VARIABLE -0.02367

VARIABLE	MEAN	ESTIMATED COEFFICIENT	STD. ERROR	T-VALUE
CONSTANT TERM		-0.01762	0.00237	-7.42880
Log(EPRM)	-0.03259	0.36162	0.04886	7.40178
Log(EPRF)	-0.05864	-0.09781	0.04851	-2.01616

SOURCE OF VARIATION	DF	SUM OF SQUARES	MEAN SQUARE	F-STATISTIC
MEAN	1 0			
REGRESSOR:X 1	1	0.00011	0.00011	57.63429
X 2	1	0.00001	0.00001	4.06489
RESIDUAL	13	0.00003		
TOTAL	16	0.00911		

COEFFICIENT OF DETERMINATION (R*2).....	0.8259686343
CORRECTED R*2 (r*2).....	0.7991945780
F-STATISTIC FOR SIGNIFICANCE OF REGRESSION(2, 13)	30.8495890969
STANDARD ERROR OF THE ESTIMATE.....	0.0013920375
DURBIN-WATSON STATISTIC.....	1.2098155990
COEFFICIENT OF VARIATION (AT THE MEAN OF Y)....(%)	-5.8802327545

** NOTE THAT CONSTANT TERM IS RHO(1-ALPHA) **
ORIGINAL CONSTANT TERM IS -0.0881116708

STANDARD ERROR 0.01186082224

REMARK: From the D-W statistic, one can verify that d* = 1.21 lies between the lower and upper bounds of 1.02 and 1.54 for the case of 2 explanatory variables and 17 observations. It therefore remains uncertain whether the error terms are correlated. However, the graphic depiction of the error terms leads me to believe, (with some doubt remaining), that the error terms are independent.

3. | OLS REGRESSION OF LOG(MPRATE) VERSUS LOG(EPRM),LOG(EPRF) |

MALE LABOUR FORCE - 1975 TO 1987

CORRELATION MATRIX (WITH T-VALUES)

	Log(MPRATE)	Log(EPRM)	Log(EPRF)
Log(MPRATE)	1.00000	0.91566	-0.61980
Log(EPRM)	7.55554	1.00000	-0.59201
Log(EPRF)	-2.61945	-2.43628	1.00000

MEAN OF DEPENDENT VARIABLE -0.11085

VARIABLE	MEAN	ESTIMATED COEFFICIENT	STD. ERROR	T-VALUE
CONSTANT TERM		-0.07495	0.01352	-5.54445
Log(EPRM)	-0.14946	0.27975	0.05070	5.51788
Log(EPRF)	-0.34003	-0.01738	0.02224	-0.78150

SOURCE OF VARIATION	DF	SUM OF SQUARES	MEAN SQUARE	F-STATISTIC
MEAN	1 0			
REGRESSOR:X 1	1	0.00021	0.00021	55.06612
X 2	1	0.00000	0.00000	0.61074
RESIDUAL	10	0.00004		
TOTAL	13	0.15999		

COEFFICIENT OF DETERMINATION (R*2).....	0.8477393760
CORRECTED R*2 (r*2).....	0.8172872512
F-STATISTIC FOR SIGNIFICANCE OF REGRESSION(2, 10)	27.8384310316
STANDARD ERROR OF THE ESTIMATE.....	0.0019512907
DURBIN-WATSON STATISTIC.....	0.6003303084
COEFFICIENT OF VARIATION (AT THE MEAN OF Y)....(%)	-1.7603017766

REMARK: From the D-W statistic, one can verify that d* = 0.60 lies beneath the lower bound of 0.89 for the case of 2 explanatory variables and 13 observations (at the alpha = .05 level of significance). This confirms that the error terms are correlated. Consequently, the Hildreth-Lu technique will be employed in an attempt to render the error terms independent of one another.

4. | HILDRETH-LU TECHNIQUE APPLIED TO OLS REGRESSION IN 3. |

MALE LABOUR FORCE - 1975 TO 1987

** CONVERGENCE OBTAINED AFTER 1 ITERATIONS **

INITIAL ESTIMATE OF RHO IS 0.71
FINAL ESTIMATE OF RHO IS 0.7
STANDARD ERROR OF RHO IS 0.2061552813

CORRELATION MATRIX (WITH T-VALUES)

	Log(MPRATE)	Log(EPRM)	Log(EPRF)
Log(MPRATE)	1.00000	0.85302	0.22049
Log(EPRM)	5.16885	1.00000	0.40402
Log(EPRF)	0.71485	1.39667	1.00000

MEAN OF DEPENDENT VARIABLE -0.03397

VARIABLE	MEAN	ESTIMATED COEFFICIENT	STD. ERROR	T-VALUE
CONSTANT TERM		-0.02374	0.00415	-5.72123
Log(EPRM)	-0.04643	0.29657	0.05965	4.97181
Log(EPRF)	-0.09503	-0.03721	0.04605	-0.80793

SOURCE OF VARIATION	DF	SUM OF SQUARES	MEAN SQUARE	F-STATISTIC
MEAN	1 0			
REGRESSOR:X 1	1	0.00006	0.00006	25.78923
X 2	1	0.00000	0.00000	0.65275
RESIDUAL	9	0.00002		
TOTAL	12	0.01393		

COEFFICIENT OF DETERMINATION (R*2).....	0.7460638687
CORRECTED R*2 (r*2).....	0.6896336173
F-STATISTIC FOR SIGNIFICANCE OF REGRESSION(2, 9)	13.2209914071
STANDARD ERROR OF THE ESTIMATE.....	0.0015001317
DURBIN-WATSON STATISTIC.....	0.9996209118
COEFFICIENT OF VARIATION (AT THE MEAN OF Y)....(%)	-4.4157227332

** NOTE THAT CONSTANT TERM IS RHO(1-ALPHA) **
ORIGINAL CONSTANT TERM IS -0.07912604558
STANDARD ERROR 0.01383025548

REMARK: From the D-W statistic, one can verify that d* = 1.00 lies between the lower and upper bounds of 0.89 and 1.54 for the case of 2 explanatory variables and 13 observations. It therefore remains uncertain whether the error terms are correlated.

OLS REGRESSION OF LOG(WPRATE) VERSUS LOG(EPRM),LOG(EPRF)

FEMALE LABOUR FORCE - 1975 TO 1991

CORRELATION MATRIX (WITH T-VALUES)

1.00000	-0.63776	0.98973
-3.20689	1.00000	-0.53497
26.82055	-2.45237	1.00000

MEAN OF DEPENDENT VARIABLE -0.28238

VARIABLE	MEAN	ESTIMATED COEFFICIENT	STD. ERROR	T-VALUE
CONSTANT TERM		-0.05272	0.01346	-3.91773
LOG(EPRM)	-0.15132	-0.43955	0.05797	-7.58281
LOG(EPRF)	-0.32481	0.91184	0.02008	45.41568

SOURCE OF VARIATION	DF	SUM OF SQUARES	MEAN SQUARE	F-STATISTIC
MEAN	1 1			
REGRESSOR:X 1	1	0.01013	0.01013	1423.72908
X 2	1	0.01467	0.01467	2062.58365
RESIDUAL	14	0.00010	0.00001	
TOTAL	17	1.38048		

COEFFICIENT OF DETERMINATION (R*2).....	0.9960003574
CORRECTED R*2 (r*2).....	0.9954289799
F-STATISTIC FOR SIGNIFICANCE OF REGRESSION(2, 14)	1743.1563644665
STANDARD ERROR OF THE ESTIMATE.....	0.0026670668
DURBIN-WATSON STATISTIC.....	0.3867229769
COEFFICIENT OF VARIATION (AT THE MEAN OF Y)....(%)	-0.9444870184

REMARK : The Durbin-Watson Statistic indicates that the residual error terms are autocorrelated. The Hildtreth-Lu technique is employed in an attempt to resolve the problem in the OLS regression which follows.

HILDRETH-LU ADJUSTMENT OF OLS REGRESSION OF
LOG(WPRATE) VERSUS LOG(EPRM) AND LOG(EPRF)

FEMALE LABOUR FORCE - 1975 TO 1991

** CONVERGENCE OBTAINED AFTER 1 ITERATION: INITIAL ESTIMATE OF RHO IS 0.82
FINAL ESTIMATE OF RHO IS 0.81
STANDARD ERROR OF RHO IS 0.1466075

CORRELATION MATRIX (WITH T-VALUES)

1.00000	0.24970	0.90836
0.96484	1.00000	0.59863
8.12716	2.79626	1.00000

MEAN OF DEPENDENT VARIABLE -0.04687

VARIABLE	MEAN	ESTIMATED COEFFICIENT	STD. ERROR	T-VALUE
CONSTANT TERM		-0.01224	0.00210	-5.83654
LOG(EPRM)	-0.03109	-0.30313	0.04586	-6.60927
LOG(EPRF)	-0.05536	0.79578	0.04666	17.05571

SOURCE OF VARIATION	DF	SUM OF SQUARES	MEAN SQUARE	F-STATISTIC
MEAN	1 0			
REGRESSOR:X 1	1	0.00003	0.00003	20.20725
X 2	1	0.00047	0.00047	290.89728
RESIDUAL	13	0.00002		
TOTAL	16	0.03567		

COEFFICIENT OF DETERMINATION (R*2).....	0.9598894834
CORRECTED R*2 (r*2).....	0.9537186347
F-STATISTIC FOR SIGNIFICANCE OF REGRESSION(2, 13)	155.5522634554
STANDARD ERROR OF THE ESTIMATE.....	0.0012695106
DURBIN-WATSON STATISTIC.....	1.5799750784
COEFFICIENT OF VARIATION (AT THE MEAN OF Y)....(%)	-2.7086825547

NOTE THAT CONSTANT TERM IS RHO(1-ALPHA): ORIGINAL CONSTANT TERM IS -0.06440952
STANDARD ERROR = 0.01103556

REMARK : The D-W statistic of 1.58 lies above its upper boundary of 1.54 for the case of 2 explanatory variables and 17 observations. This allows me to ascertain that the error terms are independent at the 0.05 level of significance.

OLS REGRESSION OF LOG(WPRATE) VERSUS LOG(EPRM) AND LOG(EPRF)

FEMALE LABOUR FORCE - 1975 TO 1987

CORRELATION MATRIX (WITH T-VALUES)

1.00000	-0.70287	0.98822
-3.27720	1.00000	-0.59201
21.41914	-2.43628	1.00000

MEAN OF DEPENDENT VARIABLE -0.29642

VARIABLE	MEAN	ESTIMATED COEFFICIENT	STD. ERROR	T-VALUE
CONSTANT TERM		-0.03828	0.01170	-3.27168
LOG(EPRM)	-0.14946	-0.44920	0.04389	-10.23556
LOG(EPRF)	-0.34003	0.95659	0.01925	49.69900

SOURCE OF VARIATION	DF	SUM OF SQUARES	MEAN SQUARE	F-STATISTIC
MEAN	1 1			
REGRESSOR:X 1	1	0.00691	0.00691	2421.37634
X 2	1	0.00705	0.00705	2469.99022
RESIDUAL	10	0.00003		
TOTAL	13	1.15621		

COEFFICIENT OF DETERMINATION (R*2).....	0.9979597527
CORRECTED R*2 (r*2).....	0.9975517032
F-STATISTIC FOR SIGNIFICANCE OF REGRESSION(2, 10)	2445.6832838809
STANDARD ERROR OF THE ESTIMATE.....	0.0016890604
DURBIN-WATSON STATISTIC.....	0.8087786270
COEFFICIENT OF VARIATION (AT THE MEAN OF Y)....(%)	-0.5698244179

REMARK : The D-W Statistic of 0.81, which lies below its lower-boundary value of roughly 0.90 for the case of 2 explanatory variables and 13 observations, indicates that the residual error terms are autocorrelated. The Hildtreth-Lu technique is thus employed in an attempt to resolve the first-order autocorrelation problem in the OLS regression which follows.

HILDRETH-LU ADJUSTMENT OF OLS REGRESSION OF
LOG(WPRATE) VERSUS LOG(EPRM) AND LOG(EPRF)

FEMALE LABOUR FORCE - 1975 TO 1987

CONVERGENCE OBTAINED AFTER 1 ITERATION: INITIAL ESTIMATE OF RHO IS 0.61
FINAL ESTIMATE OF RHO IS 0.6
STANDARD ERROR OF RHO IS 0.230940

CORRELATION MATRIX (WITH T-VALUES)

1.00000	-0.14886	0.94916
-0.47605	1.00000	0.15507
9.53489	0.49637	1.00000

MEAN OF DEPENDENT VARIABLE -0.11150

VARIABLE	MEAN	ESTIMATED COEFFICIENT	STD. ERROR	T-VALUE
CONSTANT TERM		-0.01872	0.00443	-4.22222
LOG(EPRM)	-0.06134	-0.42538	0.04561	-9.32662
LOG(EPRF)	-0.12944	0.91836	0.02998	30.62952

SOURCE OF VARIATION	DF	SUM OF SQUARES	MEAN SQUARE	F-STATISTIC
MEAN	1 0			
REGRESSOR:X 1	1	0.00003	0.00003	21.46486
X 2	1	0.00152	0.00152	938.16765
RESIDUAL	9	0.00001		
TOTAL	12	0.15076		

COEFFICIENT OF DETERMINATION (R*2).....	0.9907085506
CORRECTED R*2 (r*2).....	0.9886437840
F-STATISTIC FOR SIGNIFICANCE OF REGRESSION(2, 9)	479.8162562919
STANDARD ERROR OF THE ESTIMATE.....	0.0012743778
DURBIN-WATSON STATISTIC.....	1.7000862548
COEFFICIENT OF VARIATION (AT THE MEAN OF Y)....(%)	-1.1429503699

NOTE THAT CONSTANT TERM IS RHO(1-ALPHA): ORIGINAL CONSTANT TERM IS -0.04679838
STANDARD ERROR = 0.01108383

REMARK: A D-W statistic of 1.70 for the case of 2 explanatory variables and 13 observations is sufficient to assume that autocorrelation in the error terms has been eliminated.

APPENDIX 2

Average Real Net Disposable Income of Economic Families In Constant (1991) Dollars

Year	Average Income	Averages Taxes Paid	Net Disposable Income	Expectations Based on 1961 to 1976 Income Trends
1961	$23,116	$7,008	$16,108	$15,844
1969	$37,574	$10,390	$27,184	$26,986
1972	$42,720	$12,584	$30,136	$31,164
1974	$46,943	$13,607	$33,336	$33,950
1976	$50,502	$12,587	$37,915	$36,735
1978	$50,643	$14,925	$35,718	$39,520
1981	$51,756	$16,523	$35,233	$43,698
1984	$49,712	$18,538	$31,174	$47,877
1986	$52,048	$15,141	$36,907	$50,662
1987	$52,722	$18,696	$34,026	$52,055
1988	$53,669	$19,401	$34,268	$53,447
1989	$55,423	$18,546	$36,877	$54,840
1990	$54,537	$18,648	$35,889	$56,233
1991	$53,131	$17,818	$35,313	$57,625

Sources

(1) "Income Distribution by Size in Canada - 1991", Catalogue 13-207 Annual, December 1992. Ottawa: Statistics Canada.

(2) Horry, I., Palda, F. and Walker, M., "Tax Facts 8", The Fraser Institute, Vancouver, Canada, 8th edition, 1992.

Male and Female Demographic Characteristics

Based on the Labour Force Survey of Canadians aged 15 years and Over

Participation Rates and Employment / Population Ratios - Canada

Annual averages

Year	Participation rates of Men (MPRATE)	Participation rates of Women (WPRATE)	EPR of Unattached Males + Unit Heads *Men*	EPR of Unattached Females + Unit Heads *Women*	EPR *Married Women*
1975	0.784	0.444	0.7956	0.4598	0.383
1976	0.776	0.452	0.7906	0.4637	0.394
1977	0.777	0.460	0.7824	0.4631	0.402
1978	0.781	0.479	0.7811	0.4721	0.421
1979	0.785	0.490	0.7875	0.4804	0.437
1980	0.784	0.504	0.7827	0.4859	0.454
1981	0.784	0.517	0.7789	0.4981	0.468
1982	0.770	0.517	0.7411	0.4747	0.462
1983	0.767	0.526	0.7281	0.4734	0.468
1984	0.766	0.536	0.7255	0.4775	0.484
1985	0.766	0.546	0.7279	0.4845	0.496
1986	0.766	0.553	0.7289	0.4848	0.514
1987	0.766	0.564	0.7295	0.4959	0.526
1988	0.766	0.574	0.7335	0.5005	0.544
1989	0.767	0.579	0.7315	0.5028	0.555
1990	0.759	0.584	0.7207	0.5042	0.564
1991	0.748	0.582	0.6942	0.4888	0.559

* EPR stands for Employment/Population Ratio.

Source: Historical Labour Force Statistics - 1991, Household Surveys Division, catalogue 71-201 annual. Ottawa: Statistics Canada.

Male and Female Demographic Characteristics

Based on the Labour Force Survey of Canadians aged 15 years and Over

Annual Averages

	Percentage of 15 years and over Male Population			Percentage of 15 years and over Female Population		
Year	*Male Family Heads*	Unattached Males	*TOTAL (MHEADPOP)*	*Female Family Heads*	Unattached Females	*TOTAL (WHEADPOP)*
1975	0.6494	0.1060	0.7554	0.0691	0.1286	0.1977
1976	0.6462	0.1095	0.7557	0.0665	0.1346	0.2011
1977	0.6423	0.1123	0.7546	0.0709	0.1322	0.2030
1978	0.6422	0.1149	0.7571	0.0737	0.1372	0.2108
1979	0.6395	0.1168	0.7563	0.0761	0.1391	0.2153
1980	0.6366	0.1198	0.7564	0.0783	0.1406	0.2189
1981	0.6291	0.1262	0.7553	0.0841	0.1451	0.2291
1982	0.6290	0.1236	0.7526	0.0881	0.1473	0.2353
1983	0.6230	0.1246	0.7476	0.0953	0.1488	0.2441
1984	0.6098	0.1343	0.7441	0.1003	0.1513	0.2516
1985	0.6056	0.1358	0.7414	0.1092	0.1534	0.2626
1986	0.6053	0.1408	0.7461	0.1126	0.1552	0.2678
1987	0.5992	0.1430	0.7423	0.1179	0.1589	0.2768
1988	0.5906	0.1468	0.7374	0.1262	0.1608	0.2870
1989	0.5928	0.1503	0.7431	0.1273	0.1657	0.2929
1990	0.5860	0.1515	0.7375	0.1333	0.1650	0.2983
1991	0.5785	0.1542	0.7327	0.1396	0.1657	0.3053

* A person living alone or who is related to no one else in the dwelling where he/she lives, is defined as "unattached".

Source: Historical Labour Force Statistics - 1991, Household Surveys Division, catalogue 71-201 annual. Ottawa: Statistics Canada.

Employment and Actual Hours Worked at Main Job, by Sex
1975 to 1991

1. Actual Hours Worked at Main Job (in thousands)

	Male Actual Hours Worked At Main Job			Female Actual Hours Worked At Main Job		
Year	*Full-Time*	*Total*	*Percent Part-Time (MPPTHR)*	*Full-Time*	*Total*	*Percent Part-Time (WPPTHR)*
1975	223,147	227,306	1.83%	93,856	103,520	9.34%
1976	222,354	226,571	1.86%	94,901	105,366	9.93%
1977	225,015	229,501	1.95%	97,049	108,255	10.35%
1978	232,084	236,664	1.94%	104,005	116,307	10.58%
1979	240,284	245,205	2.01%	108,489	121,949	11.04%
1980	239,943	245,087	2.10%	112,125	126,571	11.41%
1981	240,112	245,685	2.27%	114,961	130,237	11.73%
1982	226,659	232,440	2.49%	112,999	128,747	12.23%
1983	226,042	232,343	2.71%	114,637	131,402	12.76%
1984	229,972	236,519	2.77%	119,024	136,272	12.66%
1985	236,475	243,183	2.76%	123,054	141,556	13.07%
1986	240,323	247,397	2.86%	128,606	147,492	12.80%
1987	245,023	252,133	2.82%	132,916	152,142	12.64%
1988	255,693	263,103	2.82%	140,727	161,001	12.59%
1989	262,250	269,841	2.81%	147,436	168,141	12.31%
1990	256,749	264,695	3.00%	149,125	169,882	12.22%
1991	244,593	253,019	3.33%	144,044	165,192	12.80%

Note : A job where a person works the most hours during the reference week is defined as his or her "main job".

Sources:

1. " Labour Force Annual Averages 1975-1983", Labour Force Survey Division, catalogue 71-529 annual. Ottawa: Statistics Canada.

2. " Labour Force Annual Averages 1981-1988", Household Surveys Division, catalogue 71-529 annual. Ottawa: Statistics Canada.

3. "Labour Force Annual Averages", Household Surveys Division, catalogue 71-220 annual. Ottawa: Statistics Canada.

4. "The Labour Force", Household Surveys Division, catalogue 71-001, Vol. 45, No. 12. Ottawa: Statistics Canada.

Employment and Actual Hours Worked at Main Job, by Sex
1975 to 1991

2. Weekly Hours Worked per person 15 years of age and over

	Adult Male Population Aged 15+ ('000)	Male Weekly Hours Actually worked at Main Job, per Adult Male aged 15+		*Adult Female Population Aged 15+ ('000)*	Female Weekly Hours Actually worked at Main Job, per Adult Female aged 15+	
		Full-Time Hours (MFTHPO)	TOTAL Hours		Full-Time Hours (WFTHPO)	TOTAL Hours
1975	8026	27.80	28.32	8297	11.31	12.48
1976	8207	27.09	27.61	8494	11.17	12.40
1977	8373	26.87	27.41	8678	11.18	12.47
1978	8526	27.22	27.76	8851	11.75	13.14
1979	8680	27.68	28.25	9022	12.02	13.52
1980	8847	27.12	27.70	9206	12.18	13.75
1981	8994	26.70	27.32	9374	12.26	13.89
1982	9103	24.90	25.53	9505	11.89	13.55
1983	9189	24.60	25.28	9616	11.92	13.66
1984	9273	24.80	25.51	9723	12.24	14.02
1985	9358	25.27	25.99	9831	12.52	14.40
1986	9452	25.43	26.17	9945	12.93	14.83
1987	9572	25.60	26.34	10070	13.20	15.11
1988	9692	26.38	27.15	10197	13.80	15.79
1989	9814	26.72	27.50	10326	14.28	16.28
1990	9958	25.78	26.58	10472	14.24	16.22
1991	10117	24.18	25.01	10629	13.55	15.54

Sources:

1. " Labour Force Annual Averages 1975-1983", Labour Force Survey Division, catalogue 71-529 annual. Ottawa: Statistics Canada.

2. " Labour Force Annual Averages 1981-1988", Household Surveys Division, catalogue 71-529 annual. Ottawa: Statistics Canada.

3. "Labour Force Annual Averages", Household Surveys Division, catalogue 71-220 annual. Ottawa: Statistics Canada.

4. "The Labour Force", Household Surveys Division, catalogue 71-001, Vol. 45, No. 12. Ottawa: Statistics Canada.

Male and Female Representation of Canadians with University Degrees
1975 to 1991

Year	Estimates of the Population aged 15 and over with University Degrees *			University Educated *Men as a % of Male (15 & over) Population*	University Educated *Women as a % of Female (15 & over) Population*	Coefficient of Representation By Sex **	
	Men	*Women*	*Total*			Men (MDEGCO)	Women (WDEGCO)
1975	663,636	349,215	1,012,851	8.27%	4.21%	1.3326	0.6783
1976	706,535	379,835	1,086,370	8.61%	4.47%	1.3235	0.6875
1977	746,672	416,625	1,163,297	8.92%	4.80%	1.3071	0.7037
1978	787,760	456,543	1,244,303	9.24%	5.16%	1.2903	0.7203
1979	829,511	498,234	1,327,745	9.56%	5.52%	1.2741	0.7363
1980	869,085	539,904	1,408,989	9.82%	5.86%	1.2587	0.7514
1981	908,150	582,030	1,490,180	10.10%	6.21%	1.2446	0.7653
1982	942,159	621,007	1,563,167	10.35%	6.53%	1.2321	0.7777
1983	976,084	661,470	1,637,554	10.62%	6.88%	1.2198	0.7899
1984	1,011,225	703,404	1,714,629	10.91%	7.23%	1.2081	0.8015
1985	1,047,579	747,042	1,794,621	11.19%	7.60%	1.1970	0.8125
1986	1,085,050	793,430	1,878,480	11.48%	7.98%	1.1854	0.8238
1987	1,126,877	837,239	1,964,116	11.77%	8.31%	1.1773	0.8315
1988	1,168,863	882,176	2,051,039	12.06%	8.65%	1.1695	0.8390
1989	1,210,613	928,036	2,138,649	12.34%	8.99%	1.1617	0.8464
1990	1,252,350	975,441	2,227,791	12.58%	9.31%	1.1533	0.8542
1991	1,295,000	1,026,000	2,321,000	12.80%	9.65%	1.1441	0.8628

* Estimate of the number of Canadians whose highest educational standing includes at least one of the following: bachelor or first professional degree, university certificate above bachelor level, master's degree, or earned doctorate.

** Defined as within-group proportion of university educated (15 and over) population, divided by the aggregate proportion of university educated (15 and over) population.

Sources:

A. Table 1 of Canada 1986 Census, Population and Dwelling Characteristics - Schooling and Major Field of Study, Statistics Canada catalogue 93-110.

B. Special compilation of university degrees, diplomas and certificates granted by sex and year in Canada, prepared by the Education, Culture and Tourism Division of Statistics Canada.

C. "Historical Labour Force Statistics - 1991", Household Surveys Division, catalogue 71-201 annual. Ottawa: Statistics Canada.

APPENDIX 3

Industrial Aggregate of Gender-Weighted Net Corporate Profits
Expressed as a function of Total Income

	Corporation Profits weighted by Yearly Male Actual Hours Worked, by Industry			Corporation Profits weighted by Yearly Female Actual Hours Worked, by Industry		
Year	Corporate Profits as a per cent of Total Income	Male Profit Margin Ratio	*3-year Moving Average Profit Margin Ratio* (MMAPMR)	Corporate Profits as a per cent of Total Income	Female Profit Margin Ratio	*3-year Moving Average Profit Margin Ratio* (WMAPMR)
1973	5.40%	1.0328	***N/A***	4.84%	0.9252	***N/A***
1974	5.42%	0.9828	***N/A***	5.73%	1.0385	***N/A***
1975	4.62%	0.9887	1.0014	4.79%	1.0246	0.9961
1976	4.54%	0.9841	0.9852	4.77%	1.0339	1.0323
1977	4.18%	0.9862	0.9863	4.36%	1.0290	1.0292
1978	5.22%	0.9752	0.9818	5.62%	1.0501	1.0377
1979	5.70%	0.9961	0.9858	5.77%	1.0079	1.0290
1980	5.43%	0.9955	0.9889	5.50%	1.0087	1.0222
1981	4.48%	0.9762	0.9893	4.79%	1.0448	1.0205
1982	3.02%	0.9292	0.9670	3.66%	1.1274	1.0603
1983	3.68%	0.9456	0.9503	4.27%	1.0953	1.0892
1984	4.54%	0.9369	0.9372	5.38%	1.1092	1.1106
1985	4.13%	0.9179	0.9335	5.14%	1.1407	1.1151
1986	4.05%	0.8890	0.9146	5.40%	1.1860	1.1453
1987	5.48%	0.9268	0.9112	6.63%	1.1210	1.1492

Note: Profit Margin ratio is defined as the sex-weighted profit margin over the aggregate margin.

Sources

1. "Corporate Financial Statistics", Industrial Organization and Finance Division, Statistics Canada, Catalogue 61-207 Annual.
2. Special compilation of the monthly Labour Force Survey data, prepared by the Household Surveys Division of Statistics Canada.

ANNUAL HOURS WORKED AND CORPORATE FINANCIAL STATISTICS BY MAJOR INDUSTRY GROUPING

YEAR = 1973

Industry	Percent After-Tax Profit on Total Income	*Estimated* Male Actual Hrs Worked at Main Job ('000)	*Estimated* Female Actual Hrs Worked at Main Job ('000)	Total Income ('000,000)	Net Profit After Taxes ('000,000)
Agriculture	9.33%	21,231	3,581	$1,319.9	$123.2
Other Primary Industries	14.57%	8,213	530	$10,389.1	$1,514.0
Forestry				725.2	36.0
Fishing & Trapping				60.7	4.2
Mining				9,603.2	1,473.8
Manufacturing	5.27%	55,125	15,634	$78,640.5	$4,141.8
Construction	2.60%	22,467	1,182	$13,293.5	$345.1
T. C. O. U.	6.84%	26,355	4,702	$17,443.2	$1,193.3
Trade	2.95%	40,556	18,886	$70,638.4	$2,084.2
Wholesale Trade				38,503.1	851.8
Retail Trade				32,135.3	1,232.4
F. I. R. E. *	7.87%	8,324	8,881	$15,708.6	$1,236.5
Service	4.26%	40,955	44,499	$10,033.9	$427.5
Aggregate	**5.23% ****	**223,226**	**97,896**	**$217,467.1**	**$11,065.6**

* Excludes investment companies.

** Pro-rated by the actual hours worked (both sexes) at main job

		Profit Margin Ratios
Male-Weighted Profits as a percent of Total Income :	**5.40%**	1.0328
Female-Weighted Profits as a percent of Total Income :	**4.84%**	0.9252

Note: Profit Margin ratio is defined as the sex-weighted profit margin over the aggregate margin.

Sources

1. "Corporate Financial Statistics", Industrial Organization and Finance Divlsion, Statistics Canada, Catalogue 61-207 Annual.

2. Special compilation of the monthly Labour Force Survey data, prepared by the Household Surveys Division of Statistics Canada.

ANNUAL HOURS WORKED AND CORPORATE FINANCIAL STATISTICS BY MAJOR INDUSTRY GROUPING

YEAR = 1974

Industry	Percent After-Tax Profit on Total Income	*Estimated* Male Actual Hrs Worked at Main Job ('000)	*Estimated* Female Actual Hrs Worked at Main Job ('000)	Total Income ('000,000)	Net Profit After Taxes ('000,000)
Agriculture	6.21%	22,038	3,780	$1,736.2	$107.9
Other Primary Industries	11.68%	8,525	560	$13,635.9	$1,592.3
Forestry				813.1	25.2
Fishing & Trapping				68.3	3.5
Mining				12,754.5	1,563.6
Manufacturing	5.33%	57,220	16,501	$98,985.1	$5,272.3
Construction	2.90%	23,321	1,247	$17,023.9	$494.5
T. C. O. U.	6.41%	27,357	4,963	$21,299.9	$1,365.7
Trade	3.05%	42,097	19,933	$90,827.3	$2,769.3
Wholesale Trade				50,963.7	1,273.6
Retail Trade				39,863.6	1,495.7
F. I. R. E.	12.20%	8,640	9,373	$25,543.0	$3,116.5
Service	5.62%	42,512	46,968	$12,937.6	$726.5
Aggregate	**5.52%** *	**231,709**	**103,326**	**$281,988.9**	**$15,445.0**

* Pro-rated by the actual hours worked (both sexes) at main job

		Profit Margin Ratios
Male-Weighted Profits as a percent of Total Income :	**5.42%**	0.9828
Female-Weighted Profits as a percent of Total Income :	**5.73%**	1.0385

Note: Profit Margin ratio is defined as the sex-weighted profit margin over the aggregate margin.

Sources

1. "Corporate Financial Statistics", Industrial Organization and Finance Division, Statistics Canada, Catalogue 61-207 Annual.

2. Special compilation of the monthly Labour Force Survey data, prepared by the Household Surveys Division of Statistics Canada.

ANNUAL HOURS WORKED AND CORPORATE FINANCIAL STATISTICS BY MAJOR INDUSTRY GROUPING

YEAR = 1975

Industry	Percent After-Tax Profit on Total Income	Male Actual Hrs Worked at Main Job ('000)	Female Actual Hrs Worked at Main Job ('000)	Total Income ('000,000)	Net Profit After Taxes ('000,000)
Agriculture	4.96%	20,094	3,545	$1,892.2	$93.8
Other Primary Industries	10.89%	7,773	525	$14,899.4	$1,622.5
Forestry				835.9	0.6
Fishing & Trapping				66.9	0.8
Mining				13,996.6	1,621.1
Manufacturing	4.25%	52,173	15,476	$107,351.9	$4,564.1
Construction	3.29%	21,264	1,170	$20,587.1	$678.3
T. C. O. U.	5.47%	24,944	4,655	$24,663.2	$1,350.2
Trade	2.63%	38,384	18,695	$101,140.3	$2,663.5
Wholesale Trade				55,284.4	1,040.4
Retail Trade				45,855.9	1,623.1
F. I. R. E.	11.11%	7,878	8,791	$28,834.8	$3,202.4
Service	4.51%	38,762	44,050	$15,345.9	$692.1
Aggregate	**4.67%** *	**211,272**	**96,907**	**$314,714.8**	**$14,866.9**

* Pro-rated by the actual hours worked (both sexes) at main job

		Profit Margin Ratios
Male-Weighted Profits as a percent of Total Income :	**4.62%**	0.9887
Female-Weighted Profits as a percent of Total Income :	**4.79%**	1.0246

Note: Profit Margin ratio is defined as the sex-weighted profit margin over the aggregate margin.

Sources

1. "Corporate Financial Statistics", Industrial Organization and Finance Division, Statistics Canada, Catalogue 61-207 Annual.

2. Special compilation of the monthly Labour Force Survey data, prepared by the Household Surveys Division of Statistics Canada.

ANNUAL HOURS WORKED AND CORPORATE FINANCIAL STATISTICS BY MAJOR INDUSTRY GROUPING

YEAR = 1976

Industry	Percent After-Tax Profit on Total Income	Male Actual Hrs Worked at Main Job ('000)	Female Actual Hrs Worked at Main Job ('000)	Total Income ('000,000)	Net Profit After Taxes ('000,000)
Agriculture	5.44%	19,147	3,628	$2,247.9	$122.3
Other Primary Industries	11.20%	8,420	493	$17,352.7	$1,943.6
Forestry				1,029.8	21.6
Fishing & Trapping				89.9	3.2
Mining				16,233.0	1,918.8
Manufacturing	3.78%	52,501	16,398	$120,035.2	$4,541.8
Construction	3.18%	21,852	1,224	$22,364.2	$710.3
T. C. O. U.	5.22%	24,528	4,919	$30,021.9	$1,568.6
Trade	2.43%	37,372	18,533	$112,923.4	$2,748.2
Wholesale Trade				61,174.5	1,114.2
Retail Trade				51,748.9	1,634.0
F. I. R. E.	11.23%	8,017	9,111	$33,306.7	$3,740.7
Service	4.65%	38,680	44,262	$18,129.6	$842.4
Aggregate	**4.61%** *	**210,517**	**98,568**	**$356,381.6**	**$16,217.9**

* Pro-rated by the actual hours worked (both sexes) at main job

		Profit Margin Ratios
Male-Weighted Profits as a percent of Total Income :	**4.54%**	0.9841
Female-Weighted Profits as a percent of Total Income :	**4.77%**	1.0339

Note: Profit Margin ratio is defined as the sex-weighted profit margin over the aggregate margin.

Sources

1. "Corporate Financial Statistics", Industrial Organization and Finance Division, Statistics Canada, Catalogue 61-207 Annual.

2. Special compilation of the monthly Labour Force Survey data, prepared by the Household Surveys Division of Statistics Canada.

ANNUAL HOURS WORKED AND CORPORATE FINANCIAL STATISTICS BY MAJOR INDUSTRY GROUPING

YEAR = 1977

Industry	Percent After-Tax Profit on Total Income	Male Actual Hrs Worked at Main Job ('000)	Female Actual Hrs Worked at Main Job ('000)	Total Income ('000,000)	Net Profit After Taxes ('000,000)
Agriculture	4.63%	18,183	3,686	$2,496.3	$115.7
Other Primary Industries	11.84%	8,674	605	$21,381.7	$2,530.7
Forestry				1,259.8	42.2
Fishing & Trapping				110.8	5.8
Mining				20,011.1	2,482.7
Manufacturing	3.46%	52,759	15,698	$132,011.6	$4,561.1
Construction	2.42%	21,659	1,289	$23,546.2	$569.2
T. C. O. U.	5.20%	24,787	4,852	$36,051.8	$1,873.1
Trade	2.20%	38,372	19,274	$125,183.8	$2,759.7
Wholesale Trade				67,038.8	1,036.9
Retail Trade				58,145.0	1,722.8
F. I. R. E.	10.46%	8,677	9,717	$38,016.7	$3,977.2
Service	4.14%	39,806	46,034	$21,577.7	$892.6
Aggregate	**4.24%** *	**212,917**	**101,155**	**$400,265.8**	**$17,279.3**

* Pro-rated by the actual hours worked (both sexes) at main job

		Profit Margin Ratios
Male-Weighted Profits as a percent of Total Income :	**4.18%**	0.9862
Female-Weighted Profits as a percent of Total Income :	**4.36%**	1.0290

Note: Profit Margin ratio is defined as the sex-weighted profit margin over the aggregate margin.

Sources

1. "Corporate Financial Statistics", Industrial Organization and Finance Division, Statistics Canada, Catalogue 61-207 Annual.

2. Special compilation of the monthly Labour Force Survey data, prepared by the Household Surveys Division of Statistics Canada.

ANNUAL HOURS WORKED AND CORPORATE FINANCIAL STATISTICS BY MAJOR INDUSTRY GROUPING

YEAR = 1978

Industry	Percent After-Tax Profit on Total Income	Male Actual Hrs Worked at Main Job ('000)	Female Actual Hrs Worked at Main Job ('000)	Total Income ('000,000)	Net Profit After Taxes ('000,000)
Agriculture	7.19%	18,340	3,640	$3,087.7	$222.1
Other Primary Industries	13.54%	9,214	701	$22,986.8	$3,113.0
Forestry				1,464.4	62.4
Fishing & Trapping				162.8	17.7
Mining				21,359.6	3,032.9
Manufacturing	4.23%	54,839	16,942	$153,599.1	$6,491.7
Construction	2.48%	21,956	1,349	$25,265.2	$627.4
T. C. O. U.	6.22%	26,242	5,328	$42,112.7	$2,620.4
Trade	2.51%	39,709	20,051	$144,323.6	$3,621.2
Wholesale Trade				78,655.6	1,449.1
Retail Trade				65,668.0	2,172.1
F. I. R. E.	11.30%	8,715	10,452	$46,208.5	$5,219.8
Service	5.94%	41,042	50,323	$25,782.5	$1,532.5
Aggregate	**5.35%** *	**220,057**	**108,786**	**$463,366.1**	**$23,448.1**

* Pro-rated by the actual hours worked (both sexes) at main job

		Profit Margin Ratios
Male-Weighted Profits as a percent of Total Income :	**5.22%**	0.9752
Female-Weighted Profits as a percent of Total Income :	**5.62%**	1.0501

Note: Profit Margin ratio is defined as the sex-weighted profit margin over the aggregate margin.

Sources

1. "Corporate Financial Statistics", Industrial Organization and Finance Division, Statistics Canada, Catalogue 61-207 Annual.

2. Special compilation of the monthly Labour Force Survey data, prepared by the Household Surveys Division of Statistics Canada.

ANNUAL HOURS WORKED AND CORPORATE FINANCIAL STATISTICS BY MAJOR INDUSTRY GROUPING

YEAR = 1979

Industry	Percent After-Tax Profit on Total Income	Male Actual Hrs Worked at Main Job ('000)	Female Actual Hrs Worked at Main Job ('000)	Total Income ('000,000)	Net Profit After Taxes ('000,000)
Agriculture	6.78%	18,879	3,695	$4,034.4	$273.4
Other Primary Industries	17.00%	9,843	804	$33,320.4	$5,664.3
Forestry				1,870.6	100.7
Fishing & Trapping				240.7	23.6
Mining				31,209.1	5,540.0
Manufacturing	4.96%	57,208	18,547	$182,923.2	$9,063.9
Construction	2.78%	22,476	1,481	$28,463.5	$791.6
T. C. O. U.	7.17%	27,217	5,903	$46,526.7	$3,337.7
Trade	2.72%	40,340	21,999	$170,750.2	$4,651.8
Wholesale Trade				94,428.6	1,991.4
Retail Trade				76,321.6	2,660.4
F. I. R. E.	11.96%	8,752	10,776	$57,771.3	$6,908.3
Service	5.74%	44,287	51,070	$29,909.8	$1,717.1
Aggregate	**5.72%** *	**229,002**	**114,275**	**$553,699.5**	**$32,408.1**

* Pro-rated by the actual hours worked (both sexes) at main job

		Profit Margin Ratios
Male-Weighted Profits as a percent of Total Income :	**5.70%**	0.9961
Female-Weighted Profits as a percent of Total Income :	**5.77%**	1.0079

Note: Profit Margin ratio is defined as the sex-weighted profit margin over the aggregate margin.

Sources

1. "Corporate Financial Statistics", Industrial Organization and Finance Division, Statistics Canada, Catalogue 61-207 Annual.

2. Special compilation of the monthly Labour Force Survey data, prepared by the Household Surveys Division of Statistics Canada.

ANNUAL HOURS WORKED AND CORPORATE FINANCIAL STATISTICS BY MAJOR INDUSTRY GROUPING

YEAR = 1980

Industry	Percent After-Tax Profit on Total Income	Male Actual Hrs Worked at Main Job ('000)	Female Actual Hrs Worked at Main Job ('000)	Total Income ('000,000)	Net Profit After Taxes ('000,000)
Agriculture	5.27%	17,719	3,706	$4,880.6	$257.1
Other Primary Industries	16.75%	10,571	1,026	$39,438.0	$6,607.6
Forestry				2,272.8	210.8
Fishing & Trapping				233.5	7.4
Mining				36,931.7	6,389.4
Manufacturing	4.72%	57,232	18,864	$201,426.8	$9,497.8
Construction	2.81%	21,394	1,492	$32,098.8	$901.9
T. C. O. U.	6.66%	27,159	5,874	$54,893.8	$3,655.8
Trade	2.55%	39,602	22,527	$192,757.9	$4,920.8
Wholesale Trade				106,953.7	1,995.2
Retail Trade				85,804.2	2,925.6
F. I. R. E.	11.07%	9,661	11,591	$72,432.4	$8,016.8
Service	5.56%	44,624	53,578	$35,815.7	$1,990.9
Aggregate	**5.45% ***	**227,962**	**118,658**	**$633,744.0**	**$35,848.7**

* Pro-rated by the actual hours worked (both sexes) at main job

		Profit Margin Ratios
Male-Weighted Profits as a percent of Total Income :	**5.43%**	0.9955
Female-Weighted Profits as a percent of Total Income :	**5.50%**	1.0087

Note: Profit Margin ratio is defined as the sex-weighted profit margin over the aggregate margin.

Sources

1. "Corporate Financial Statistics", Industrial Organization and Finance Division, Statistics Canada, Catalogue 61-207 Annual.

2. Special compilation of the monthly Labour Force Survey data, prepared by the Household Surveys Division of Statistics Canada.

ANNUAL HOURS WORKED AND CORPORATE FINANCIAL STATISTICS BY MAJOR INDUSTRY GROUPING

YEAR = 1981

Industry	Percent After-Tax Profit on Total Income	Male Actual Hrs Worked at Main Job ('000)	Female Actual Hrs Worked at Main Job ('000)	Total Income ('000,000)	Net Profit After Taxes ('000,000)
Agriculture	4.30%	17,887	3,925	$5,947.6	$255.9
Other Primary Industries	9.13%	10,903	1,164	$41,338.6	$3,772.6
Forestry				2,152.8	66.0
Fishing & Trapping				258.8	-5.4
Mining				38,927.0	3,712.0
Manufacturing	4.04%	56,736	18,586	$224,580.3	$9,075.6
Construction	2.25%	21,962	1,672	$41,779.9	$939.3
T. C. O. U.	6.38%	26,160	6,249	$65,166.3	$4,156.8
Trade	2.25%	40,227	22,804	$220,621.1	$4,967.0
Wholesale Trade				123,266.5	1,947.2
Retail Trade				97,354.6	3,019.8
F. I. R. E.	10.46%	8,737	11,350	$96,744.2	$10,115.0
Service	4.77%	46,168	55,969	$43,839.5	$2,090.0
Aggregate	**4.59%** *	**228,780**	**121,719**	**$740,017.5**	**$35,372.2**

* Pro-rated by the actual hours worked (both sexes) at main job

		Profit Margin Ratios
Male-Weighted Profits as a percent of Total Income :	**4.48%**	0.9762
Female-Weighted Profits as a percent of Total Income :	**4.79%**	1.0448

Note: Profit Margin ratio is defined as the sex-weighted profit margin over the aggregate margin.

Sources

1. "Corporate Financial Statistics", Industrial Organization and Finance Division, Statistics Canada, Catalogue 61-207 Annual.

2. Special compilation of the monthly Labour Force Survey data, prepared by the Household Surveys Division of Statistics Canada.

ANNUAL HOURS WORKED AND CORPORATE FINANCIAL STATISTICS BY MAJOR INDUSTRY GROUPING

YEAR = 1982

Industry	Percent After-Tax Profit on Total Income	Male Actual Hrs Worked at Main Job ('000)	Female Actual Hrs Worked at Main Job ('000)	Total Income ('000,000)	Net Profit After Taxes ('000,000)
Agriculture	2.74%	16,975	3,957	$6,418.3	$175.8
Other Primary Industries	4.97%	9,073	983	$42,267.0	$2,101.8
Forestry				2,167.4	182.6
Fishing & Trapping				293.9	-2.2
Mining				39,805.7	1,921.4
Manufacturing	1.30%	51,623	17,172	$219,066.5	$2,843.6
Construction	1.61%	19,198	1,540	$42,388.0	$682.5
T. C. O. U.	5.17%	25,253	6,218	$71,389.2	$3,691.5
Trade	1.80%	39,161	21,961	$222,979.4	$4,014.4
Wholesale Trade				120,796.4	987.0
Retail Trade				102,183.0	3,027.4
F. I. R. E.	7.60%	9,032	11,761	$103,338.9	$7,852.3
Service	4.21%	45,447	56,327	$47,395.1	$1,995.3
Aggregate	**3.24% ***	**215,762**	**119,919**	**$755,242.4**	**$23,357.2**

* Pro-rated by the actual hours worked (both sexes) at main job

		Profit Margin Ratios
Male-Weighted Profits as a percent of Total Income :	**3.02%**	0.9292
Female-Weighted Profits as a percent of Total Income :	**3.66%**	1.1274

Note: Profit Margin ratio is defined as the sex-weighted profit margin over the aggregate margin.

Sources

1. "Corporate Financial Statistics", Industrial Organization and Finance Division, Statistics Canada, Catalogue 61-207 Annual.

2. Special compilation of the monthly Labour Force Survey data, prepared by the Household Surveys Division of Statistics Canada.

ANNUAL HOURS WORKED AND CORPORATE FINANCIAL STATISTICS BY MAJOR INDUSTRY GROUPING

YEAR = 1983

Industry	Percent After-Tax Profit on Total Income	Male Actual Hrs Worked at Main Job ('000)	Female Actual Hrs Worked at Main Job ('000)	Total Income ('000,000)	Net Profit After Taxes ('000,000)
Agriculture	2.94%	16,182	4,110	$7,024.1	$206.7
Other Primary Industries	5.19%	9,460	1,016	$45,065.9	$2,337.7
Forestry				2,070.3	47.0
Fishing & Trapping				280.6	-0.9
Mining				42,715.0	2,291.6
Manufacturing	2.44%	50,365	17,747	$234,505.6	$5,715.2
Construction	1.73%	18,325	1,532	$37,938.1	$656.3
T. C. O. U.	6.00%	24,251	6,354	$74,504.8	$4,471.3
Trade	2.25%	38,698	21,972	$231,782.0	$5,220.5
Wholesale Trade				122,365.9	1,535.0
Retail Trade				109,416.1	3,685.5
F. I. R. E.	9.14%	9,588	11,365	$93,432.0	$8,540.8
Service	4.59%	47,788	58,376	$48,148.6	$2,208.9
Aggregate	**3.90%** *	**214,657**	**122,472**	**$772,401.1**	**$29,357.4**

* Pro-rated by the actual hours worked (both sexes) at main job

		Profit Margin Ratios
Male-Weighted Profits as a percent of Total Income :	**3.68%**	0.9456
Female-Weighted Profits as a percent of Total Income :	**4.27%**	1.0953

Note: Profit Margin ratio is defined as the sex-weighted profit margin over the aggregate margin.

Sources

1. "Corporate Financial Statistics", Industrial Organization and Finance Division, Statistics Canada, Catalogue 61-207 Annual.
2. Special compilation of the monthly Labour Force Survey data, prepared by the Household Surveys Division of Statistics Canada.

ANNUAL HOURS WORKED AND CORPORATE FINANCIAL STATISTICS BY MAJOR INDUSTRY GROUPING

YEAR = 1984

Industry	Percent After-Tax Profit on Total Income	Male Actual Hrs Worked at Main Job ('000)	Female Actual Hrs Worked at Main Job ('000)	Total Income ('000,000)	Net Profit After Taxes ('000,000)
Agriculture	3.88%	16,684	4,107	$7,240.9	$281.1
Other Primary Industries	5.59%	9,648	1,109	$51,754.8	$2,894.1
Forestry				2,650.1	73.0
Fishing & Trapping				307.2	4.0
Mining				48,797.5	2,817.1
Manufacturing	3.90%	52,256	18,369	$274,768.3	$10,704.0
Construction	2.15%	18,835	1,475	$38,622.7	$829.2
T. C. O. U.	5.71%	24,534	6,108	$84,098.1	$4,805.9
Trade	2.46%	40,377	23,488	$264,877.0	$6,524.1
Wholesale Trade				142,124.6	2,447.7
Retail Trade				122,752.4	4,076.4
F. I. R. E.	14.19%	9,894	11,872	$97,066.2	$13,770.8
Service	5.37%	47,399	60,381	$55,344.0	$2,971.5
Aggregate	**4.85%** *	**219,627**	**126,909**	**$873,772.0**	**$42,780.7**

* Pro-rated by the actual hours worked (both sexes) at main job

		Profit Margin Ratios
Male-Weighted Profits as a percent of Total Income :	**4.54%**	0.9369
Female-Weighted Profits as a percent of Total Income :	**5.38%**	1.1092

Note: Profit Margin ratio is defined as the sex-weighted profit margin over the aggregate margin.

Sources

1. "Corporate Financial Statistics", Industrial Organization and Finance Division, Statistics Canada, Catalogue 61-207 Annual.

2. Special compilation of the monthly Labour Force Survey data, prepared by the Household Surveys Division of Statistics Canada.

ANNUAL HOURS WORKED AND CORPORATE FINANCIAL STATISTICS BY MAJOR INDUSTRY GROUPING

YEAR = 1985

Industry	Percent After-Tax Profit on Total Income	Male Actual Hrs Worked at Main Job ('000)	Female Actual Hrs Worked at Main Job ('000)	Total Income ('000,000)	Net Profit After Taxes ('000,000)
Agriculture	3.48%	16,820	4,274	$7,427.5	$258.8
Other Primary Industries	5.11%	9,853	1,159	$53,732.8	$2,747.2
Forestry				2,697.7	100.3
Fishing & Trapping				385.7	12.5
Mining				50,649.4	2,634.4
Manufacturing	3.11%	53,300	18,048	$294,710.0	$9,172.3
Construction	2.43%	19,307	1,840	$42,300.9	$1,026.2
T. C. O. U.	4.35%	25,582	6,124	$88,600.0	$3,850.3
Trade	2.38%	41,818	24,661	$289,562.9	$6,883.9
Wholesale Trade				155,634.2	2,688.8
Retail Trade				133,928.7	4,195.1
F. I. R. E.	14.74%	9,661	12,073	$103,916.7	$15,317.2
Service	5.22%	49,693	63,733	$60,203.2	$3,144.9
Aggregate	**4.50%** *	**226,034**	**131,912**	**$940,454.0**	**$42,400.8**

* Pro-rated by the actual hours worked (both sexes) at main job

		Profit Margin Ratios
Male-Weighted Profits as a percent of Total Income :	**4.13%**	0.9179
Female-Weighted Profits as a percent of Total Income :	**5.14%**	1.1407

Note: Profit Margin ratio is defined as the sex-weighted profit margin over the aggregate margin.

Sources

1. "Corporate Financial Statistics", Industrial Organization and Finance Division, Statistics Canada, Catalogue 61-207 Annual.

2. Special compilation of the monthly Labour Force Survey data, prepared by the Household Surveys Division of Statistics Canada.

ANNUAL HOURS WORKED AND CORPORATE FINANCIAL STATISTICS BY MAJOR INDUSTRY GROUPING

YEAR = 1986

Industry	Percent After-Tax Profit on Total Income	Male Actual Hrs Worked at Main Job ('000)	Female Actual Hrs Worked at Main Job ('000)	Total Income ('000,000)	Net Profit After Taxes ('000,000)
Agriculture	3.32%	16,190	4,202	$7,800.5	$258.8
Other Primary Industries	-6.51%	9,586	1,153	$40,367.5	-$2,626.0
Forestry				2,901.6	101.6
Fishing & Trapping				430.3	29.9
Mining				37,035.6	-2,757.5
Manufacturing	4.26%	53,082	19,196	$305,148.2	$12,988.0
Construction	2.52%	20,700	1,823	$48,760.2	$1,229.0
T. C. O. U.	4.45%	25,761	6,743	$90,625.4	$4,030.5
Trade	2.62%	44,273	25,247	$318,583.2	$8,331.9
Wholesale Trade				171,848.5	3,059.9
Retail Trade				146,734.7	5,272.0
F. I. R. E.	18.80%	10,222	12,652	$114,652.7	$21,555.4
Service	4.75%	50,861	66,678	$63,426.7	$3,015.1
Aggregate	**4.55%** *	**230,675**	**137,694**	**$989,364.4**	**$48,782.7**

* Pro-rated by the actual hours worked (both sexes) at main job

		Profit Margin Ratios
Male-Weighted Profits as a percent of Total Income :	**4.05%**	0.8890
Female-Weighted Profits as a percent of Total Income :	**5.40%**	1.1860

Note: Profit Margin ratio is defined as the sex-weighted profit margin over the aggregate margin.

Sources

1. "Corporate Financial Statistics", Industrial Organization and Finance Division, Statistics Canada, Catalogue 61-207 Annual.
2. Special compilation of the monthly Labour Force Survey data, prepared by the Household Surveys Division of Statistics Canada.

ANNUAL HOURS WORKED AND CORPORATE FINANCIAL STATISTICS BY MAJOR INDUSTRY GROUPING

YEAR = 1987

Industry	Percent After-Tax Profit on Total Income	Male Actual Hrs Worked at Main Job ('000)	Female Actual Hrs Worked at Main Job ('000)	Total Income ('000,000)	Net Profit After Taxes ('000,000)
Agriculture	5.40%	15,999	4,094	$8,008.7	$432.1
Other Primary Industries	8.73%	9,629	1,138	$46,052.8	$4,020.9
Forestry				3,283.4	151.7
Fishing & Trapping				559.0	55.6
Mining				42,210.4	3,813.6
Manufacturing	4.39%	53,912	19,184	$321,513.7	$14,128.2
Construction	3.14%	23,110	1,845	$56,818.0	$1,783.2
T. C. O. U.	5.99%	25,646	6,680	$93,315.8	$5,594.1
Trade	2.16%	43,481	26,544	$348,351.0	$7,509.1
Wholesale Trade				191,637.1	3,590.3
Retail Trade				156,713.9	3,918.8
F. I. R. E.	22.49%	10,678	13,336	$125,943.0	$28,323.9
Service	6.11%	52,747	69,443	$69,514.2	$4,247.6
Aggregate	**5.92% ***	**235,202**	**142,264**	**$1,069,517.2**	**$66,039.1**

* Pro-rated by the actual hours worked (both sexes) at main job

		Profit Margin Ratios
Male-Weighted Profits as a percent of Total Income :	**5.48%**	0.9268
Female-Weighted Profits as a percent of Total Income :	**6.63%**	1.1210

Note: Profit Margin ratio is defined as the sex-weighted profit margin over the aggregate margin.

Sources

1. "Corporate Financial Statistics", Industrial Organization and Finance Division, Statistics Canada, Catalogue 61-207 Annual.

2. Special compilation of the monthly Labour Force Survey data, prepared by the Household Surveys Division of Statistics Canada.

APPENDIX 4

OLS REGRESSION OF LOG(MPRATE) VERSUS LOG(MFTHPO),LOG(MPPTHR),LOG(MHEADPOP)

MALE LABOUR FORCE - 1975 TO 1991

CORRELATION MATRIX (WITH T-VALUES)

	Log(MPRATE)	Log(MFTHPO)	Log(MPPTHR)	Log(MHEADPOP)
Log(MPRATE)	1.00000	0.82059	-0.89777	0.92659
Log(MFTHPO)	5.56091	1.00000	-0.81172	0.66874
Log(MPPTHR)	-7.89414	-5.38284	1.00000	-0.91793
Log(MHEADPOP)	9.54267	3.48360	-8.96080	1.00000

MEAN OF DEPENDENT VARIABLE -0.11282

VARIABLE	MEAN	ESTIMATED COEFFICIENT	STD. ERROR	T-VALUE
CONSTANT TERM		-0.14529	0.05301	-2.74098
Log(MFTHPO)	1.41668	0.14258	0.03814	3.73785
Log(MPPTHR)	-1.61124	0.01980	0.01620	1.22209
Log(MHEADPOP)	-0.12614	1.09093	0.22809	4.78295

SOURCE OF VARIATION	DF	SUM OF SQUARES	MEAN SQUARE	F-STATISTIC
MEAN	1 0			
REGRESSOR:X 1	1	0.00036	0.00036	142.71749
X 2	1	0.00008	0.00008	33.35060
X 3	1	0.00006	0.00006	22.87659
RESIDUAL	13	0.00003		
TOTAL	17	0.21691		

COEFFICIENT OF DETERMINATION (R*2).....	0.9386632418
CORRECTED R*2 (r*2).....	0.9245086053
F-STATISTIC FOR SIGNIFICANCE OF REGRESSION(3, 13)	66.3148956008
STANDARD ERROR OF THE ESTIMATE.....	0.0015952781
DURBIN-WATSON STATISTIC.....	1.8199505261
COEFFICIENT OF VARIATION (AT THE MEAN OF Y)....(%)	-1.4140473756

OLS REGRESSION OF LOG(MPRATE) VERSUS LOG(MFTHPO),LOG(MPPTHR),LOG(MMAPMR),LOG(MHEADPOP)

MALE LABOUR FORCE - 1975 TO 1987

CORRELATION MATRIX (WITH T-VALUES)

	Log(MPRATE)	Log(MFTHPO)	Log(MPPTHR)	Log(MMAPMR)	Log(MHEADPOP)
LOG(MPRATE)	1.00000	0.90755	-0.85844	0.89412	0.89695
LOG(MFTHPO)	7.16767	1.00000	-0.90418	0.76545	0.79442
LOG(MPPTHR)	-5.55093	-7.02055	1.00000	-0.90890	-0.89746
LOG(MMAPMR)	6.62183	3.94514	-7.22873	1.00000	0.92887
LOG(MHEADPOP)	6.72857	4.33808	-6.74819	8.31730	1.00000

MEAN OF DEPENDENT VARIABLE -0.11085

VARIABLE	MEAN	ESTIMATED COEFFICIENT	STD. ERROR	T-VALUE
CONSTANT TERM		-0.29630	0.02602	-11.38808
Log(MFTHPO)	1.41852	0.23520	0.01777	13.23698
Log(MPPTHR)	-1.63766	0.06042	0.00691	8.74718
Log(MMAPMR)	-0.01614	0.25893	0.03143	8.23863
Log(MHEADPOP)	-0.12429	0.36252	0.11624	3.11888

SOURCE OF VARIATION	DF	SUM OF SQUARES	MEAN SQUARE	F-STATISTIC
MEAN	1 0			
REGRESSOR:X 1	1	0.00021	0.00021	910.32986
X 2	1	0.00000	0.00000	8.67903
X 3	1	0.00004	0.00004	168.50425
X 4	1	0.00000	0.00000	9.72739
RESIDUAL	8	0.00000		
TOTAL	13	0.15999		

COEFFICIENT OF DETERMINATION (R*2).....	0.9927617565
CORRECTED R*2 (r*2).....	0.9891426348
F-STATISTIC FOR SIGNIFICANCE OF REGRESSION(4, 8)	274.3101303302
STANDARD ERROR OF THE ESTIMATE.....	0.0004756635
DURBIN-WATSON STATISTIC.....	2.0349953711
COEFFICIENT OF VARIATION (AT THE MEAN OF Y)....(%)	-0.4291063340

OLS REGRESSION OF LOG(WPRATE) VERSUS LOG(WFTHPO),LOG(WPPTHR),LOG(WDEG)

FEMALE LABOUR FORCE - 1975 TO 1991

CORRELATION MATRIX (WITH T-VALUES)

	LOG(WPRATE)	LOG(WFTHPO)	LOG(WPPTHR)	LOG(WDEG)
LOG(WPRATE)	1.00000	0.93039	0.90437	0.99709
LOG(WFTHPO)	9.82978	1.00000	0.69395	0.90957
LOG(WPPTHR)	8.20785	3.73279	1.00000	0.91872
LOG(WDEG)	50.61597	8.47704	9.01005	1.00000

MEAN OF DEPENDENT VARIABLE -0.28238

VARIABLE	MEAN	ESTIMATED COEFFICIENT	STD. ERROR	T-VALUE
CONSTANT TERM		-0.41945	0.03679	-11.40005
Log(WFTHPO)	1.09548	0.33356	0.05175	6.44523
Log(WPPTHR)	-0.93048	0.17013	0.04254	3.99896
Log(WDEG)	-0.10841	0.64601	0.09634	6.70539

SOURCE OF VARIATION	DF	SUM OF SQUARES	MEAN SQUARE	F-STATISTIC
MEAN	1 1			
REGRESSOR:X 1	1	0.02155	0.02155	9541.69783
X 2	1	0.00321	0.00321	1423.29212
X 3	1	0.00010	0.00010	44.96230
RESIDUAL	13	0.00003		
TOTAL	17	1.38048		

COEFFICIENT OF DETERMINATION (R*2).....	0.9988206426
CORRECTED R*2 (r*2).....	0.9985484832
F-STATISTIC FOR SIGNIFICANCE OF REGRESSION(3, 13)	3669.9840813686
STANDARD ERROR OF THE ESTIMATE.....	0.0015029286
DURBIN-WATSON STATISTIC.....	2.4351306033
COEFFICIENT OF VARIATION (AT THE MEAN OF Y)..(%)	-0.5322313520

REMARK: From the D-W statistic (d*) of 2.44, we get that (4 - d*)=1.56 lies between its lower and upper bounds of 0.90 and 1.71 respectively, (in the case of 3 explanatory variables and 17 observations, for the level of significance alpha = 0.05).

While it therefore remains unclear as to whether the error terms are correlated with one another, the D-W statistic nevertheless lies nearest its uppermost critical value. A visual inspection of the plot residuals leads me to believe that the error terms are independent.

(1) OLS REGRESSION OF LOG(WPRATE) VERSUS LOG(WFTHPO),LOG(WDEG) AND LOG(WMAPMR)

FEMALE LABOUR FORCE - 1975 TO 1987

CORRELATION MATRIX (WITH T-VALUES)

	LOG(WPRATE)	LOG(WFTHPO)	LOG(WDEG)	LOG(WMAPMR)
LOG(WPRATE)	1.00000	0.92859	0.99684	0.85803
LOG(WFTHPO)	8.29859	1.00000	0.90754	0.94164
LOG(WDEG)	41.62092	7.16715	1.00000	0.85116
LOG(WMAPMR)	5.54081	9.27748	5.37807	1.00000

MEAN OF DEPENDENT VARIABLE -0.29642

VARIABLE	MEAN	ESTIMATED COEFFICIENT	STD. ERROR	T-VALUE
CONSTANT TERM		-0.54730	0.07220	-7.57993
LOG(WFTHPO)	1.08023	0.38075	0.07303	5.21374
LOG(WDEG)	-0.12014	0.99570	0.03498	28.46586
LOG(WMAPMR)	11.02963	-0.00370	0.00120	-3.09291

SOURCE OF VARIATION	DF	SUM OF SQUARES	MEAN SQUARE	F-STATISTIC
MEAN	1 1			
REGRESSOR:X 1	1	0.01206	0.01206	5218.85800
X 2	1	0.00188	0.00188	815.03664
X 3	1	0.00002	0.00002	9.56612
RESIDUAL	9	0.00002		
TOTAL	13	1.15621		

COEFFICIENT OF DETERMINATION (R*2).....	0.9985130015
CORRECTED R*2 (r*2).....	0.9980173353
F-STATISTIC FOR SIGNIFICANCE OF REGRESSION(3, 9)	2014.4869207848
STANDARD ERROR OF THE ESTIMATE.....	0.0015199797
DURBIN-WATSON STATISTIC.....	2.8516927241
COEFFICIENT OF VARIATION (AT THE MEAN OF Y)..(%)	-0.5127830442

REMARK: From the D-W statistic (d*) of 2.85, we get that (4 - d*)=1.15 lies between its lower and upper bounds of 0.82 and 1.75 respectively, (in the case of 3 explanatory variables and 13 observations, for the level of significance alpha = 0.05). Although it remains unclear as to whether the error terms are correlated with one another, a visual inspection of the residuals leads me to believe that the error terms are serially correlated. The Hildreth-Lu technique is applied on the next page.

(2) APPLICATION OF HILDRETH-LU TECHNIQUE TO PRECEDING REGRESSION

FEMALE LABOUR FORCE - 1975 TO 1987

INITIAL ESTIMATE OF RHO IS -0.415; FINAL ESTIMATE OF RHO IS -0.425
STANDARD ERROR OF RHO IS 0.261306812

CORRELATION MATRIX (WITH T-VALUES)

	LOG(WPRATE)	LOG(WFTHPO)	LOG(WDEG)	LOG(WMAPMR)
LOG(WPRATE)	1.00000	0.93386	0.99745	0.86649
LOG(WFTHPO)	8.25734	1.00000	0.91383	0.94155
LOG(WDEG)	44.18169	7.11609	1.00000	0.86059
LOG(WMAPMR)	5.48908	8.83852	5.34342	1.00000

MEAN OF DEPENDENT VARIABLE -0.41940

VARIABLE	MEAN	ESTIMATED COEFFICIENT	STD. ERROR	T-VALUE
CONSTANT TERM		-0.76448	0.06887	-11.10049
LOG(WFTHPO)	1.54014	0.36785	0.04850	7.58529
LOG(WDEG)	-0.16858	0.99080	0.02401	41.26819
LOG(WMAPMR)	15.72932	-0.00346	0.00078	-4.46518

SOURCE OF VARIATION	DF	SUM OF SQUARES	MEAN SQUARE	F-STATISTIC
MEAN	1 2			
REGRESSOR:X 1	1	0.01914	0.01914	11799.52191
X 2	1	0.00276	0.00276	1702.61156
X 3	1	0.00003	0.00003	19.93786
RESIDUAL	8	0.00001		
TOTAL	12	2.13271		

COEFFICIENT OF DETERMINATION (R*2).....	0.9994087245
CORRECTED R*2 (r*2).....	0.9991869962
F-STATISTIC FOR SIGNIFICANCE OF REGRESSION(3, 8)	4507.3571131462
STANDARD ERROR OF THE ESTIMATE.....	0.0012735956
DURBIN-WATSON STATISTIC.....	2.5338408029
COEFFICIENT OF VARIATION (AT THE MEAN OF Y)..(%)	-0.3036699928

** NOTE THAT CONSTANT TERM IS ALPHA X (1 - RHO)
ORIGINAL CONSTANT TERM (ALPHA) IS -0.53647671 STANDARD ERROR = 0.048329114

REMARK: From the D-W statistic (d*) of 2.53, we get that (4 - d*)=1.47 lies between its lower and upper bounds of 0.82 and 1.75 respectively, (in the case of 3 explanatory variables and 13 observations, for the level of significance alpha = 0.05).

It therefore remains unclear as to whether the error terms are correlated with one another. A visual inspection of the plot of residuals leads me to believe that the error terms are independent.

OLS REGRESSION OF LOG(WPRATE) VERSUS LOG(WFTHPO),LOG(WPPTHR) AND LOG(WDEG)

FEMALE LABOUR FORCE - 1975 TO 1987

CORRELATION MATRIX (WITH T-VALUES)

	Log(WPRATE)	Log(WFTHPO)	Log(WPPTHR)	Log(WDEG)
Log(WPRATE)	1.00000	0.92859	0.96795	0.99684
Log(WFTHPO)	8.29859	1.00000	0.81455	0.90754
Log(WPPTHR)	12.78183	4.65714	1.00000	0.97587
Log(WDEG)	41.62092	7.16715	14.82339	1.00000

MEAN OF DEPENDENT VARIABLE -0.29642

VARIABLE	MEAN	ESTIMATED COEFFICIENT	STD. ERROR	T-VALUE
CONSTANT TERM		-0.44601	0.06367	-7.00457
Log(WFTHPO)	1.08023	0.36287	0.08287	4.37900
Log(WPPTHR)	-0.93868	0.17993	0.07435	2.41990
Log(WDEG)	-0.12014	0.61182	0.16443	3.72087

SOURCE OF VARIATION	DF	SUM OF SQUARES	MEAN SQUARE	F-STATISTIC
MEAN	1 1			
REGRESSOR:X 1	1	0.01206	0.01206	4175.93744
X 2	1	0.00186	0.00186	644.17324
X 3	1	0.00004	0.00004	13.84491
RESIDUAL	9	0.00003		
TOTAL	13	1.15621		

COEFFICIENT OF DETERMINATION (R*2).....	0.9981416307
CORRECTED R*2 (r*2).....	0.9975221743
F-STATISTIC FOR SIGNIFICANCE OF REGRESSION(3, 9)	1611.3185277561
STANDARD ERROR OF THE ESTIMATE.....	0.0016992158
DURBIN-WATSON STATISTIC.....	2.2599043026
COEFFICIENT OF VARIATION (AT THE MEAN OF Y)....(%)	-0.5732504503