

A Time Series Analysis of Female Labour Force Participation Rates Disaggregated by Marital Status
Le taux d'activité de la main-d'oeuvre féminine et le statut matrimonial

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Article abstract

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A Time Series Analysis of Female Labour Force Participation Rates Disaggregated by Marital Status

William D. Walsh

This paper analyzes the cyclical behavior of the labour force participation rates, adds a marital status dimension to the customary age categories generally used and includes separate measures of the additional and of the discouraged worker effect.

This paper makes two main contributions to the analysis of the cyclical behaviour of labour force participation rates: first, the use of hitherto unexplored Canadian data to add a marital status dimension to the customary age categories employed in the time series analysis of female labour force participation; and, second, the application of an empirical model that measures additional worker and discouraged worker effects separately. A marital status classification provides time series analysis with some of the theoretical advantages of cross-section analysis -- namely, a closer link to the utility-maximizing theory of income-leisure choice.¹ Thus, for example, marital status (or family unit membership) is an important determinant of the presence or absence of an additional worker effect. Clearly, the analysis of propositions such as this requires an empirical model that allows for the separate measurement of additional worker and discouraged worker effects.²

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¹ For a recent cross-sectional study of married female labour force participation in Canada see GUNDERSON (1977). FLEISHER and RHODES (1976) is a study of cross-section data for the U.S. that provides a reconciliation of differences in cross-sectional and time series findings on labour force participation. ALBAN and JACKSON (1976, 416) have similarly commented upon the need for time series data classified by marital status to improve upon the measurement of the cyclical sensitivity of the labour force participation of female workers.

² For Canada, the only time series model that includes separate additional worker and discouraged worker effects that this author is aware of is that of KUCH and SHARIR (1978). Earlier U.S. analyses of this kind include STRAND and DERNBURG (1964), DERNBURG and STRAND (1966) and BARTH (1968). However, none of these studies is set in the context of the difference that marital status might make to the cyclical responsiveness of the labour force behaviour of secondary workers.

In the following section of the paper the hypothesized labour force behaviour of females in different marital status-age categories is outlined. An empirical model for testing these hypotheses is explained in section three and the regression results based upon this model are presented in section four. The main conclusions are summarized briefly in the final section of the paper.

HYPOTHESES

The hypotheses that are examined here follow from two basic observations. First, the labour force decisions of individuals who are members of a family unit, as distinct from those of unattached individuals, are influenced not only by their own economic circumstances but also by the personal attributes and economic circumstances of other family members. Second, the female population, categorized by age-marital status groups, is a potential source of secondary workers³ -- individuals whose choice between customary activities and labour force participation is importantly influenced by variations in economic activity.

The most general hypothesis that these considerations lead to is that females of all age-marital status groups are subject to the discouraged worker effect, while only those age-marital status groups with a family unit connection are subject to the additional worker effect. Considering the discouraged worker effect first, improving economic conditions raise the likelihood of securing employment which, *ceteris paribus*, increases the attractiveness of labour force participation in comparison to customary activities and, therefore, encourages secondary workers to enter the labour force and/or delay their exit from it. Conversely, worsening economic conditions discourage the entry of secondary workers into the labour force and/or hasten the exit of such workers from the labour force. While it seems plausible, as a first approximation, that the discouraged worker effect applies to females of all age-marital status groups, it must also be acknowledged that this effect is likely to be relatively weak for those groups whose mean participation rate is high, perhaps most notably, prime-age single females.⁴

³ In common with other studies, secondary workers are individuals whose principal (or customary) activity is outside the labour force. The common examples of alternative customary activities are household and family care duties, educational activities and retirement and other leisure-time pursuits.

⁴ Although a high mean participation rate indicates that the principal activity of the group is labour force participation, it is not possible, *a priori*, to assign such *groups* exclusively to the primary work force. This follows from the fact that groups with high mean participation rates still may contain appreciable numbers of *individuals* who respond to variations in economic conditions as secondary workers. All that is permissible is the acknowledgement that where the group participation rate is high, *ceteris paribus*, the number of potential secondary workers is low and the discouraged worker effect (and, where relevant, the additional worker effect as well) is, therefore, likely weak.

In contrast to the own-substitution basis of the discouraged worker effect, the additional worker effect is based upon a cross-substitution or other-income effect. Specifically, the additional worker response to variations in economic activity is explained by the efforts of secondary workers to stabilize family income in the face of variations in the income of primary workers. Declining economic activity and rising jobless rates among primary workers induces secondary workers to leave temporarily their preferred customary activities to enter the labour force in an effort to sustain family income. Conversely, increasing economic activity and falling unemployment rates among primary workers permit secondary workers to remain in or return to their preferred customary activities.

Married females seem to represent the most obvious source of additional workers in the secondary labour force. Additionally, it is plausible to expect that the strength of the additional worker effect among married women varies with age. Specifically, it is expected that the additional worker effect is strongest for prime-aged married females and relatively weaker for younger and older married females.⁵ The rationale of a relatively strong additional worker effect for prime-aged married females is the likelihood of their belonging to family units for whom the implications of income loss are particularly severe. That is, payments on long term debt (for example, home mortgage payments) and the need to accumulate assets (for example, to meet retirement needs or to finance the post-secondary education-training of children) tend to peak during the family's middle years and joblessness on the part of the primary worker in such a family thus creates a particularly pressing incentive for the secondary worker(s) to enter the labour market in an attempt to sustain family income.

Younger married female, on the other hand, are more likely to belong to family units that, in comparison to the family units of prime-aged married females, have lower long term debt commitments, a more distant time horizon for the purposes of asset accumulation and debt retirement, and, perhaps most significantly, a higher probability of containing pre-school age children. These factors reduce the incentive for (or ability of) young married females to respond to variations in economic conditions as additional workers.

Similarly, a life-cycle view of the family's debt-asset accumulation process points to a relatively weaker additional worker effect for older married females. Specifically, for the family units of older married females, large amounts of long term debt have been retired, asset accumulation targets

⁵ For the purposes of this study, younger, prime-age and older groups are the age categories 15-24 years, 25-54 years and 55 years and over, respectively.

have been largely met and this accumulation serves to support family income in the event of the temporary unemployment of the family's primary worker. Thus, in comparison to prime-aged married females, older married females experience a lesser incentive to respond to variations in economic conditions as additional workers.

Although the additional worker effect is most obviously a likely attribute of married females, additional worker behaviour is clearly not the exclusive domain of married females. Thus, younger single females who are members of a family unit and as well have a customary activity (for example, education-training) that is outside the labour force may be subject to the additional worker effect. Similarly, females who are divorced, separated or widowed ("other" marital status designations)⁶ may be part of various forms of family unit with ex-spouses and/or sons and daughters and their labour force participation may, therefore, follow the additional worker pattern.

The remaining hypotheses here are ancillary ones dealing with the short run labour supply response of females to variations in the wage terms of employment. First, it must be noted that, *a priori*, the response of all categories of secondary worker to wage rate acceleration or deceleration⁷ is not predictable. For married and other females and younger single females, wage rate acceleration increases the attractiveness of labour force participation relative to customary activities, but it also improves the income of the primary worker in the family and reduces the need for secondary worker participation. The group labour force participation rates for these females may, thus, rise, fall or remain unaffected by wage rate acceleration (or deceleration). Only for prime-aged and older single females is it possible to hypothesize a positive relationship between labour force participation and wage rate acceleration.⁸

6 Females who are divorced, separated, or widowed are grouped in the "other" marital status designation by Statistics Canada.

7 Clearly wage rates exert both long run and short run influences on labour supply. It is assumed that the long run effect of wage rates on labour force participation is measured by the trend level of the wage rate, while the short run wage effect on labour supply is captured by deviations from the wage rate trend. Since the present analysis explicitly deals only with the short run wage effect, the relevant wage variable is a detrended series that reflects variation in the wage rate about its trend level. The wage variable is described additionally in the section following and in footnote 15.

8 The positive association hypothesis does not assume the absence of an own-income effect, but rather that this latter effect is only detectable in group participation rates in the longer run and our interest here is in the short run.

Second, the 1971 revisions to the *Unemployment Insurance Act*⁹ liberalized the qualification requirements and raised the benefits paid under the Act so increasing the return to labour force attachment. Again, however, it is not possible to hypothesize unambiguously the impact of this increased return on the group labour force participation rates of the female population--higher, lower, or unchanged participation rates are possible. That is, for all age-marital status groups, the substitution and income effects¹⁰ operate in opposite directions, and, moreover for married females, younger single females and divorced, separated and widowed females, increased unemployment insurance benefits available to a jobless primary worker reduce the urgency of additional worker behaviour by the secondary worker in the family unit.

THE EMPIRICAL MODEL

The outlined hypotheses are tested by means of the following regression equation:

$$(1) PR = a + \sum_{i=1}^{11} b_i SD_i + c ER + d URPM + e WDT + f UIR + g T + \epsilon,$$

where PR is a particular group participation rate, the SD_i comprise a set of monthly seasonal dummies, ER is the aggregate employment rate (employment-population ratio), URPM is the prime-age (25-54 years) married male unemployment rate, WDT is a measure of wage rate deviation from the wage rate trend, UIR is an unemployment insurance revisions dummy variable, T is a time trend and ϵ is the error term.¹¹

The variables that are appropriate to the separate measurement of the discouraged worker effect and the additional worker effect must be sensitive to cyclical variations in labour market conditions, but they must also reflect different aspects of variation in the rate of economic activity. The ER and URPM variables meet this criterion rather well. Both variables are obviously cyclically sensitive, but ER is indicative of swings in the

⁹ See *Unemployment Insurance Act, 1971, Statutes of Canada 1970-71-72*, Ch. 48, Ottawa, Queen's Printer.

¹⁰ This potential income effect follows from the fact that the requirements and the definitions of job research for the purposes of the *Unemployment Insurance Act* and the Labour Force Survey are not the same. It is possible, therefore, to collect unemployment insurance benefits while being outside the labour force from the perspective of the Labour Force Survey.

¹¹ The sources of the data on these variables are noted in Table 1 below.

overall state of demand while URPMM emphasizes the effect of demand variation on primary worker job loss.¹²

On the basis of this distinction, the aggregate employment rate (ER) can be used to capture the discouraged worker effect¹³ while the prime-age married male unemployment rate (URPMM) is used to capture the additional worker effect.¹⁴ More specifically, the ER variable is an index of demand pressure and, therefore, measures the job-opportunity incentive for secondary workers to substitute between labour force participation and customary activities and in equation (1), $c > 0$. On the other hand, URPMM provides an index of primary worker joblessness and hence, a gauge of the pressure on secondary workers to enter the labour market in an attempt to support family income. Married, divorced, separated and widowed females of all age groups and young single females are expected to respond to variations in economic conditions as additional workers so that $d > 0$ in equation (1) for these groups. For prime aged and older single females who are not subject to the additional worker effect $d = 0$ in equation (1).

The wage variable in equation (1), WDT, is defined as the per cent deviation of average hourly earnings in manufacturing from the trend value

¹² It can be noted here that the correlation of monthly ER and URPMM data for the sample period of this study, 1966-1975, yields a relatively low correlation coefficient of -0.1766.

¹³ The discouraged worker effect might alternatively be measured by group specific employment rates (see, for example, KUCH and SHARIR (1978))--age-marital status employment rates in this paper. The aggregate employment rate, however, is a superior measure for both theoretical and statistical reasons. First, from a theoretical perspective, it seems likely that there is some degree of substitution in production among specific groups of secondary workers and, additionally, that a secondary worker's perception of the plentifulness or scarcity of job opportunities is formed from knowledge of the overall state of demand in the labour market rather than knowledge of group specific demand conditions only. From a statistical viewpoint, the use of the aggregate employment rate minimizes the "near-identity" (positive) bias that may be introduced when a *group specific* participation rate (labour force/population) is regressed on the *same* group specific employment rate (employment/population). The aggregate employment rate also minimizes the problem of correlated measurement errors.

¹⁴ Ideally, the additional worker effect would be captured by the aggregate primary worker unemployment rate, or, even better, primary worker unemployment rates specifically appropriate to the various female age-marital status groups. Such unemployment rates, of course, are not available, but in their absence the prime-age married male unemployment rate serves the purpose very well. That is, prime-age married males are obviously an important category of primary worker and it seems very probable that their rate of joblessness will be closely related to that of other groups of primary workers. In the context of this study, the prime-age married male unemployment rate has the further desirable property of being virtually free of variation caused by changes in the supply of labour--both autonomous changes and changes induced by variation in the rate of economic activity.

of average hourly earnings in manufacturing.¹⁵ In accord with the hypotheses developed above, $e \geq 0$ in equation (1) for married, divorced, separated and widowed females of all age groups and for young single females; and $e > 0$ in equation (1) for prime-aged and older single females.

The 1971 revisions to the *Unemployment Insurance Act* became fully effective at the beginning of 1972, so that for the 1966-1975 period¹⁶ analyzed here, the UIR dummy variable is defined as follows:

$$\begin{aligned} \text{UIR} &= 0, \text{ January, 1966 December, 1971;} \\ &= 1, \text{ January, 1972 December, 1975.}^{17} \end{aligned}$$

For the reasons noted in the preceding section, the UIR coefficient $f \geq 0$ in equation (1) for all groups of secondary workers.

All of the continuous independent variables in the analysis (ER, URPM, and WDT) enter equation (1) after seasonal adjustment using the

¹⁵ The wage rate enters equation (1) in detrended form because the study is interested in isolating the effect of short run variation in the wage rate on labour force participation. The use of the percent deviation from trend rather than the ratio to trend does not affect the estimated coefficient on the WDT variable.

The trend value of average hourly earnings is obtained from the following regression equation: $(2) \ln W = \ln A + rt$; where W is average hourly earnings in manufacturing, A is a constant, r is the trend rate of growth in W and t measures time (in months). Average hourly earnings in manufacturing provide the best available index of the cyclical movements in the wide variety of wage rates that may influence the labour force decisions of secondary workers. Money wages are used on the grounds that the short run labour supply response is likely to reflect an appreciable measure of money illusion. It follows that the influence of secular increases in the real rate on labour supply is included in the time trend term in equation (1). The definition of the wage variable in this study is similar to the approach in SWAN (1974, 422-423).

¹⁶ The period 1966-1975 is the longest time period for which definitionally consistent data is available. That is, labour force data classified by sex, age and marital status are unavailable prior to 1966 and the revised Labour Force Survey changed several important definitions following 1975.

¹⁷ As with any dummy variable, it must be acknowledged that the estimated UIR coefficient may reflect not only the effect of the revisions to the unemployment insurance programme, but also the effect of other changes in the labour market that were approximately coincident with these revisions. Examples of such changes *might* include an increase in house-acquisition pressure for labour force entry on the part of females who would otherwise be secondary workers and the increased availability of part-time employment. Both these factors are related in turn, at least in part, to changes in the age structure of the population. Anything like a complete identification of such influences is much beyond the purposes of the present study, but their possible presence means that the estimated UIR coefficient must be interpreted with some caution.

TABLE 1

**Labour Force Participation Rate Regression Estimated From Equation (1)
for Female Age-Marital Status Groups, Canada, 1966-1975**

<i>Age-Marital Status Groups</i>	<i>Constant</i>	<i>ER</i>	<i>URPMM</i>	<i>URPMM_t</i>	<i>WDT</i>	<i>UIR</i>	<i>T</i>	<i>R²</i>	<i>D-W</i>	<i>RHO</i>
Married Females, 15-24 yrs. (i)	4.0771 (0.2312)	0.5602 (1.7489)**	0.0452 (0.1204)		-0.2105 (-2.0147)**	-2.1018 (-2.3651)**	0.1711 (9.1427)***	0.9799	2.2964	0.8111 (15.1254)
(ii)	-2.0051 (-0.1258)	0.6440 (2.1966)**		0.7282 (2.1247)**	-0.2108 (-2.0134)**	-1.7891 (-2.0454)**	0.1566 (8.6392)***	0.9802	2.3661	0.8147 (15.2642)
Married Females, 25-54 yrs.	-16.7495 (2.2829)**	0.8292 (6.2635)***	0.3537 (2.1963)**		0.0132 (0.3835)	-0.2635 (-0.7692)	0.1057 (16.3288)***	0.9933	2.0483	0.7095 (10.9832)
Married Females 55 yrs. and over	-3.8480 (-0.4625)	0.3288 (2.2102)**	0.1917 (1.0106)		-0.1315 (-4.1751)***	-0.8032 (-2.3856)**	0.0183 (2.8736)***	0.7717	2.0105	0.5411 (7.0186)
Single Females, 15-24 yrs.	-76.5923 (-5.2026)***	2.2436 (8.5125)***	0.8948 (2.6777)**		0.0848 (1.5466)	0.9316 (1.5314)	-0.0230 (-2.0060)**	0.9829	1.8246	0.5649 (7.4683)
Single Females, 25-54 yrs.	73.3606 (4.6505)***	0.1687 (0.5973)	-0.1858 (-0.5196)		-0.0159 (-0.2693)	0.5899 (0.9001)	0.0000 (0.0012)	0.5625	1.9724	0.5720 (7.6077)
Single Females, 55 yrs. and over	-20.6622 (-0.6163)	1.1508 (1.8936)**	-0.0853 (-0.1184)		-0.1809 (-0.9826)	-2.1115 (-1.2751)	-0.0747 (-2.2514)**	0.8318	2.1676	0.7800 (13.6009)
Other Females, 25-54 yrs.	-13.6945 (-0.5378)	1.3835 (3.0290)***	0.6071 (1.0586)		0.2143 (2.1463)**	1.5612 (1.4353)	-0.0534 (-2.6269)**	0.7152	2.2299	0.6053 (8.2953)
Other Females, 55 yrs and over	-2.8420 (-0.3223)	0.3208 (2.0364)**	0.4030 (1.9971)**		-0.0758 (-2.4361)**	-0.7708 (-2.1981)***	0.0193 (-2.8879)***	0.8038	1.9260	0.5191 (6.6257)

Notes:

- The labour force participation rate, employment, unemployment and labour force population data are obtained by request from the Labour Force Survey Division of Statistics Canada. The ER and URPMM variables are calculated from these data, WDT, as noted in the text, is calculated from average hourly earnings in manufacturing. The latter data are obtained from the following sources: for 1966-71, Statistics Canada (72-206) *Employment, Earnings and Hours* (Ottawa, annual); for 1972-74, Statistics Canada (72-002) *Employment Earnings and Hours* (Ottawa, monthly); and for 1975, Statistics Canada (11-003) *Canadian Statistical Review* (Ottawa, monthly).
- The *t* statistics are in parentheses below the estimated coefficients. One-tailed tests are used for the aggregate employment rate (ER) and prime age married male unemployment rate (URPMM) variables in all equations and for the WDT variable in the equations for single females, 25-54 years and single females, 55 years and over. A two-tailed test is used for all other variables. Significant at the 0.10 level, *; significant at the 0.05 level, **; and significant at the 0.01 level or better, ***.
- The adjustment for auto-correlation is made with the Cochrane-Orcutt iterative technique.
- The estimates of the seasonal dummies (the SD_t's) in equation (1) are presented in Table 2.

Table 2

Estimated Regression Coefficients for The Monthly Seasonal Dummy Variables in Equation

Age-Marital Status Groups ¹	SD_1	SD_2	SD_3	SD_4	SD_5	SD_6	SD_7	SD_8	SD_9	SD_{10}	SD_{11}
Married Females, 15-24 yrs. (i)	-0.6460 (-2.0627)**	-0.5151 (-1.2997)	-0.5562 (-1.2417)	-0.6642 (-1.3838)	-0.6131 (-1.2335)	-0.1555 (-0.3097)	-0.8199 (-1.6578)	-0.7290 (-1.5380)	0.9905 (2.2515)**	1.3085 (3.4326)***	0.5109 (1.7802)*
(ii)	-0.6947 (-2.2618)**	-0.4834 (-1.2182)	-0.5282 (-1.1919)	-0.6445 (-1.3638)	-0.6041 (-1.2368)	-0.1479 (-0.3004)	-0.7907 (-1.6319)	-0.7865 (-1.6893)*	0.9511 (2.2111)**	1.2173 (3.2390)***	0.4743 (1.6875)*
Married Females, 25-54 yrs.	-0.7499 (-5.4835)***	-0.6161 (-3.6189)***	-0.3493 (-1.8401)*	-0.1280 (-0.6357)	-0.0171 (0.0827)	-0.3204 (-1.5335)	-1.9154 (-9.2792)***	-1.8219 (-9.1444)***	-0.0043 (-0.0229)	0.2460 (1.4929)	0.2036 (1.6075)
Married Females, 55 yrs. and over	0.0113 (0.0666)	0.0399 (0.1967)	0.1420 (0.6485)	0.0257 (0.1131)	0.2561 (1.1117)	0.0600 (0.2595)	-0.5886 (-2.5608)**	-0.5300 (-2.3538)**	-0.0812 (-0.3742)	0.0360 (0.1814)	0.2572 (-1.6095)
Single Females, 15-24 yrs.	-1.4771 (-4.9855)***	-1.6544 (-4.6454)***	-1.4032 (-3.6303)***	-1.1961 (-2.9747)***	2.1130 (5.1666)***	7.2131 (17.5587)***	13.5680 (33.2601)***	11.4322 (28.6705)***	0.2529 (0.6604)	0.2359 (0.6786)	0.0210 (0.0755)
Single Females, 25-54 yrs.	-0.1480 (-0.4679)	-0.0999 (0.2624)	0.2871 (0.6937)	0.6149 (1.4268)	1.0184 (2.3220)**	0.4696 (1.0657)	-0.3526 (-0.8060)	-0.2942 (-0.6884)	0.0622 (0.1516)	0.2171 (0.5843)	0.2789 (0.9399)
Single Females, 55 yrs. and over	-0.1804 (-0.2989)	-0.0020 (-0.0026)	0.1550 (0.1809)	0.1795 (0.1960)	0.4297 (0.4536)	1.0565 (1.1044)	-0.5006 (-0.5309)	-1.0419 (-1.1509)	0.9472 (1.1239)	0.7824 (1.0670)	0.2104 (0.3791)
Other Females, 25-54 yrs.	-0.5100 (-1.0173)	-0.7549 (-1.2397)	-0.7483 (-1.1234)	-0.0949 (-0.1362)	-0.2960 (-0.4163)	-0.3129 (-0.4376)	-1.2149 (-1.7135)*	-1.0336 (-1.4966)	-0.0553 (-0.0840)	-0.1732 (-0.2921)	0.0132 (0.0282)
Other Females, 55 yrs. and over	0.4136 (2.2674)**	0.3869 (1.7882)*	0.5270 (2.2656)**	0.5040 (2.0964)**	0.4224 (1.7338)*	0.2391 (0.9784)	-0.5891 (-2.4236)**	-0.6961 (-2.9179)***	0.0857 (0.3713)	0.1589 (0.7506)	0.1082 (0.6298)

Notes:

- See note 2 of Table 1 for the interpretation of the significance of the bracketed t statistics.
- With respect to the seasonal dummy coefficients for married females, 15-24 years, the first set of estimates (i) are derived from equation (1) using the contemporaneous form of the prime-age married male unemployment rate (URPMM) and the second set of estimates (ii) are derived from equation (1) using URPMM lagged one period (URPMM₋₁).

method of moving averages.¹⁸ The SD_i 's are a set of monthly seasonal dummy variables with $SD_1 = 1$ for January, and 0 for the remaining months of the year, $SD_2 = 1$ for February, and 0 for the rest of the year, etc. Seasonal variation in group participation rates, thus, is measured by the b_j coefficients and clearly $b_j \geq 0$ in equation (1).

Finally, the net influence of all secular variables on labour force participation is captured by the time trend term (T) in equation (1).¹⁹ No secular theory of labour force participation is offered here so that the trend term coefficient $g \geq 0$.

THE REGRESSION RESULTS

Equation (1) is fitted to monthly participation rate data on eight²⁰ age-marital status groups of females in Canada for the period 1966-1975. Most of the regression results are presented in Table 1, but to facilitate the exposition the estimates of the monthly seasonal dummies in equation (1) are presented separately in Table 2.

It is assumed initially that secondary workers change their labour force status (inside or outside the labour force) quickly in response to changes in the short term economic climate.²¹ Thus, equation (1) is fitted to the data in contemporaneous form²² and these results are reported in Tables 1 and 2. Additionally, however, supplementary tests of a variety of lag assumptions-

18 The ER, URPM and WDT variables are subject to seasonal as well as cyclical movements. Seasonally adjusting these variables permits them to measure only their cyclical (and irregular) impact on labour force participation. Seasonal variations in labour force participation are then isolated in the seasonal dummies. In the absence of this procedure, it is possible that the estimated coefficients for ER, URPM and WDT, which are intended to capture short run cyclical variations in labour supply, will be distorted by the effect of seasonal variation. For some additional explanation of this approach see SWAN (1974, 422-24).

19 T is measured in months beginning with January, 1966 = 1 and ending with December, 1975 = 120.

20 The younger (15-24 years) other female category is not included in the analysis here because of the small size of this group--for this reason Labour Force Survey data on this group is not available for some months in 1966 and 1967.

21 This is a common assumption in the literature. For example, ALBAN and JACKSON (1976) and KUCH and SHARIR (1978) employ monthly contemporaneous models and SWAN (1974) employs a quarterly contemporaneous model.

22 It should be noted that the contemporaneous equation form employed here minimizes the likelihood of any bias problems attributable to lack of independence of the error term. That is, common measurement errors are not serious because the dependent variable is an age-marital status *specific* female participation rate while the relevant explanatory variables are the *aggregate* employment rate (ER) and an age-marital status *specific male* unemployment rate (URPM). See also SWAN (1974, 420-21) and the sources cited therein.

--simple one period lags and Almon lags--on ER, URPM and WDT are conducted. With the single exception of a simple one period lag on URPM in the equation for young married females, also reported in Tables 1 and 2, these lag tests produce less satisfactory results than does the contemporaneous form of equation (1).

Consider now the findings on the discouraged worker effect. The ER regression coefficient is positive and significant at the 10% level or better for seven of the eight female age-marital status groups.²³ Clearly discouraged worker behaviour is widely descriptive of the female labour force. Only single females in the 25-54 years age group do not conform to this pattern and this result is not unexpected. That is, the high mean participation rate of prime-aged single females²⁴ perhaps places this group more properly in the primary labour force and, thus, much reduces the scope for discouraged worker response to variations in job opportunities.

In contrast, the results in Table 1 include some exceptions to the hypothesized marital status-age pattern of additional worker effects. Most notably, additional worker behaviour is expected for married females of all ages, but the URPM or URPM₋₁ regression coefficients are positive and statistically significant for only two (prime-age and younger) of the three married female age groups. At the same time, however, the married female results can be interpreted as conforming to the expected age variation in the strength of additional worker behaviour. As noted above, life-cycle arguments suggest that additional worker behaviour is less likely for younger (here 15-24 years) and older (here, 55 years and over) married females than it is for prime-age married females (here, 25-54 years). The results of Table 1 manifest this pattern in the form of the statistically insignificant additional worker behaviour (as expected the sign on the URPM coefficient is positive) of older married females and the lagged effect of primary worker job-holding status on the labour force participation

23 In a test to determine whether or not these discouraged worker findings are purely the result of the inclusion of the group specific employment rate in the aggregate employment rate, equation (1) is re-run using an employment rate that deducts out the relevant female age-marital status employment rate and that of prime age married males. Netting out the group specific component of the job opportunities variable understandably reduces the magnitude of this variable's effect. Even so, the same seven of eight employment rate coefficients remain statistically significant with only that for young married females becoming marginally (the 15% level) significant.

24 The mean monthly participation rates for the period 1966-1975 are as follows: married females, 15-24 years, 25-54 years and 55 years and over, respectively, 44.25%, 35.53% and 15.43%; single females, 15-24 years, 25-54 years and 55 years and over, respectively, 50.22%, 82.34% and 36.56%; and other females, 25-54 years and over, respectively, 60.74% and 14.68%.

by the $URPMM_{-1}$ elasticity coefficient²⁷ for married females, 15-24 years, are, respectively, 0.0340, 0.0609, 0.0939 and 0.0556.

There are two particularly noteworthy aspects to these calculations. The first is that discouraged worker behaviour is much stronger for younger and older single females than it is for all other age-marital status groups. While these particular strengths were not predicted, they can be readily rationalized. Young single females in preparing for a career, not unexpectedly, show a pronounced tendency to sample the labour market when it is particularly strong. The exceptional inclination of older single females to enter the labour market during periods of relatively plentiful employment opportunities is perhaps best explained by the desire to take periodic advantage of the substantial work experience that single females tend to accumulate during their prime years.

A second point to emphasize is that in spite of the prevalence and strength of the discouraged worker effect for the female labour force, it is not possible to conclude unambiguously that the discouraged worker effect exerts a *net* dominance over the additional worker effect. The net dominance of the additional worker or discouraged worker effect clearly depends as well upon the relative magnitudes of changes in the employment rate (ER) and the prime-age married male unemployment rate (URPMM) and this comparison varies with the time period being analysed.²⁸ In light of the fact that the age-marital status groups that exhibit significant additional worker behaviour comprise a large majority of the female population,²⁹ it is conceivable for the aggregate female labour force to show a net additional worker effect in some time periods. On the basis of these observations, it is not particularly surprising that various studies focusing only on the net response of labour force participation rates to cyclical variation in economic activity often yield conflicting results.³⁰

Finally, some of the main features of the supplementary regression results merit explicit mention. First, short run wage change (WDT) exerts a significant net influence on the labour force participation of only four of

27 The URPMM elasticity coefficient is given by $(\partial PR / \partial URPMM)$. $(URPMM/PR)$, evaluated at the variable means. The mean value of URPMM is 3.42% and the mean PR (participation rate) values are given in footnote 24. The $URPMM_{-1}$ elasticity coefficient is defined and evaluated in the same way. The mean value of $URPMM_{-1}$ is 3.39%. Elasticity coefficients are calculated only where the relevant regression coefficient is statistically significant.

28 Recall here that the correlation of monthly ER and URPMM data for the sample period in this study, 1966-1975, yields a relatively low correlation coefficient of -0.1766.

29 In December, 1975, for example, married females 25-54 years, married females, 15-24 years, single females 15-24 years, and other females, 55 years and over comprised 41.8%, 7.5% 17.9% and 8.9% respectively, and, in sum 76.1% of the total female population.

30 For a review of some of the Canadian findings see SWAN (1974, 428-29).

of younger married females (URPMM is insignificant while $URPMM_{-1}$ is significant). This delayed labour force response of young married females to primary worker job loss is consistent with the need to arrange for the care of pre-school age children.²⁵

For single females the observed pattern of additional worker behaviour is as expected--specifically, a statistically significant additional worker effect for young single females and the absence of such behaviour for the other age groups of single females. It follows that meaningful numbers of young single females remain attached to a family unit insofar as their labour market decisions are concerned.

The different additional worker behaviour of the other female groups--statistically significant for other females in the 55 years and over group and statistically insignificant for other females in the 25-54 years group--is somewhat puzzling in that additional worker effects are hypothesized for both groups. It nevertheless seems plausible that separated, divorced and widowed females of greater than 55 years age are more likely to make labour market decisions as dependent members of a family unit than are prime age (25-54 years) females in these marital status categories.

Turning now to the relative strengths of the discouraged worker and additional worker effects, elasticity calculations indicate that discouraged worker behaviour is not only more prevalent across female age-marital status groups, but is also of greater strength than is additional worker behaviour. The strength of the discouraged worker effect is measured by the ER elasticity coefficients calculated as follows:²⁶ for married females, 15-24 years, 25-54 years and 55 years and over, respectively, 0.6900 (0.7915 in the $URPMM_{-1}$ equation), 1.2723, 1.1612; for single females, 15-24 years and 55 years and over, respectively, 2.4352 and 1.7156; and for other females 25-54 years and 55 years and over, respectively 1.2417 and 1.1914. In contrast, the magnitudes of the observed additional worker effects as measured by the URPMM elasticity coefficients for married females 25-54 years, single females, 15-24 years and other females, 55 years and over and as measured

25 Somewhat paradoxically, there is evidence that the ultimate (lagged) additional worker behaviour of younger married females is stronger than the contemporaneous additional worker response of prime-age married females. See the URPMM and $URPMM_{-1}$ elasticity calculations below.

26 The ER elasticity coefficient is given by $(\partial PR / \partial er) \cdot (ER / PR)$, evaluated at the variable means. The mean value of ER is 54.51% and the mean PR (participation rate) values are given in footnote 24. Elasticity coefficients are calculated only where the relevant regression coefficient is statistically significant.

the eight female marital status-age groups. For three of these four groups, younger and older married females and older other females, the negative WDT coefficient indicates that the dominant response in these groups is to short run wage variation as this affects the income of primary workers-- positive wage change raises the income of primary workers and induces reduced secondary worker labour force participation.³¹ It is furthermore of interest to note that these three female groups are the only ones for which the net influence of the UIR variable on labour force participation is significant. And again, this net influence is negative which suggests that these secondary worker groups also respond to the unemployment insurance programme primarily as this programme and changes in it influence the income of primary workers.³²

Second, the time trend coefficients in Table 1 indicate that for the 1966-1975 period the overall rising trend in female participation is exclusively explained by increased married female participation-- the T regression coefficient is insignificant for prime-age single females and is significantly negative for the other four single and other female groups.

Third, on the basis of the number of statistically significant seasonal dummies reported in Table 2, it is clearly possible to distinguish a seasonally sensitive component of the female labour force and a seasonally insensitive component.³³ The seasonally sensitive female labour force includes (with the number of significant SD_j coefficients in brackets); married females in the 15-24 years (four or five) and 25-54 years (five) groups; single females, 15-24 years (eight); and other females, 55 years and over (seven). It is further interesting to note that within the seasonally sensitive female labour force the pattern of seasonal supply variation is a mutually exclusive one. Thus, young single females are the only female source of seasonal labour supply during the late spring and summer months. Only young and prime-aged married females make a seasonally significant contribution to labour

31 It may be noted that for older married females the absence of additional worker behaviour is entirely consistent with a significant net response to primary worker short run wage change. This follows from the fact that the measured response of a group participation rate to an economic variable depends upon the number of individuals within the group who are sensitive to the variable and as well the degree to which these individuals and their degree of sensitivity varies from one variable to the next.

32 This inference is suggestive only because as noted above a negative net response to UIR could reflect the operation of an own-income effect. Recall also that the UIR dummy variable may not provide a clean estimate of the effects of the revisions to the unemployment insurance programme. See footnote 17.

33 In Table 2 monthly seasonal variation in labour supply is measured relative to the month of December.

supply during the fall months and only older other females make a significant seasonal contribution during the winter months.³⁴

Summary and Conclusions

In terms of the central issue of this study--the age-marital status pattern of discouraged and additional worker effects in the female labour force--the results, with a few exceptions, are consistent with the hypothesized short run labour supply behaviour. Thus, discouraged worker behaviour is observed for all but the most work-committed age-marital status group--prime-aged single females--while additional worker behaviour is more limited, notably being a significant aspect of the labour force attachment of younger and prime-age married females, younger single females and older other females. The pattern of additional worker effects across the married female age groups is generally consistent with a life-cycle interpretation of this pattern.

Although the results also show that discouraged worker behaviour is stronger than is additional worker behaviour, this finding alone cannot be used to draw conclusions on the net dominance of discouraged worker and additional worker effects on female participation rates classified by age and marital status or on the aggregate female participation rate.

To the limited extent that the wage variables, WDT and UIR, do exert a significant short run net influence on the female labour force, it is the wages of primary workers that appear to be most relevant. The complete absence of any positive effect of the 1971 revisions to the *Unemployment Insurance Act* on female labour force participation suggests that any increase in insurance-induced unemployment during the 1972-1975 period must be attributable to increased labour force participation and/or unemployment by males and/or increased unemployment by females already in the labour force.³⁵

Finally, striking differences in the time trend and seasonality of female labour supply across age-marital status groups are reported in Tables 1 and 2, respectively. Married females alone are responsible for the rising trend in female participation. The seasonality of female labour supply is almost ex-

³⁴ A complete explanation of this pattern of seasonal substitution is not possible here, but it appears that such an explanation would include the competitive weight of young single females during the summer months, and as well the voluntary inclination of married females to leave the labour force during these months to care for school-age children. See also ALBAN and JACKSON (1976, 417-418).

³⁵ On the question of insurance-induced unemployment see, for example, GRUBEL, MAKI and SAX (1975) and the additional literature cited in OSTRY and ZAIDI (1979, 169).

clusively accounted for by young and prime age married females, young single and older other females--and each of these groups make seasonal additions to the labour force at different times of the year.

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Le taux d'activité de la main-d'oeuvre féminine et le statut matrimonial

Cet article a pour objet d'apporter une double contribution à l'analyse des taux cycliques d'activité: d'une part, par l'utilisation de statistiques canadiennes encore inexploitées, de façon à ajouter la dimension du statut matrimonial aux groupes d'âge ordinaire utilisés dans l'analyse des séries chronologiques de l'activité de la main-d'oeuvre féminine et, d'autre part, par l'application d'un modèle empirique qui mesure séparément les effets du travailleur additionnel et du travailleur découragé.

Les hypothèses étudiées résultent de deux observations fondamentales. En premier lieu, les décisions des femmes qui appartiennent à une unité familiale, si on les distingue de celles des célibataires, sont influencées, non seulement par leurs propres conditions économiques, mais aussi par la situation personnelle et les conditions économiques des autres membres de la famille. En second lieu, la population féminine est une source potentielle de travailleurs additionnels, c'est-à-dire de personnes dont le choix entre les tâches domestiques et la participation à la population active est fortement marqué par les variations de l'activité économique.

L'hypothèse la plus probable, c'est que, d'une façon générale, les femmes de tous les groupes d'âge sont sujettes à la situation du travailleur découragé, tandis que seules les femmes qui vivent au sein d'une entité familiale peuvent parfois être sujettes à la situation du travailleur additionnel. Si l'on considère d'abord la situation du travailleur découragé, on se rend compte que l'amélioration des conditions économiques augmente la probabilité de recherche d'un emploi: les femmes se présentent alors sur le marché du travail ou elles ne le quittent pas si elles s'y trouvent déjà. Par contre, des conditions économiques mauvaises les découragent d'entrer sur le marché du travail ou les incitent à s'en retirer. S'il paraît plausible que la situation de travailleur découragé s'applique à tous les groupes d'âge chez les femmes, il faut reconnaître que cet état est relativement faible pour les groupes dont le taux moyen de participation est élevé, principalement les célibataires de 25 à 54 ans.

Dans cette dernière catégorie, on retrouve aussi la situation de travailleur additionnel qui s'explique par les efforts de travailleurs d'appoint pour stabiliser le revenu de la famille face à la variation des gains du gagne-pain principal. Une activité économique à la baisse et un taux de chômage à la hausse chez le gagne-pain principal incitent les travailleurs d'appoint à quitter leurs tâches habituelles pour entrer sur le marché du travail dans un effort pour subvenir aux besoins de la famille. Par contre, l'amélioration de l'activité économique et la baisse du taux de chômage chez les gagne-pain principaux permettent aux travailleurs d'appoint de demeurer à la maison.

Il semble que les femmes mariées soit la source principale de travailleurs additionnels dans la main-d'oeuvre d'appoint. De plus, il faut s'attendre à ce que la condition plus forte de travailleur additionnel chez les femmes mariées varie en fonction de l'âge. Particulièrement, on peut estimer que la situation de travailleur additionnel soit la plus marquée chez les femmes mariées d'âge moyen (25-54 ans) et relativement plus faible chez les plus jeunes (15-24 ans) et chez les plus âgées (55 ans et plus) des femmes mariées. La raison de cet état de choses, c'est qu'il est probable que les femmes mariées d'âge moyen appartiennent à des unités familiales pour qui les consé-

quences d'une perte de revenus sont particulièrement pénibles. Ainsi, le remboursement de dettes à longue échéance ou le paiement des études post-secondaires des enfants tend à atteindre un sommet pendant la période d'âge moyen et, à ce moment, le manque à gagner du travailleur principal de la famille pousse le travailleur d'appoint à entrer sur le marché du travail.

La jeune femme mariée, au contraire, appartient plutôt à une unité familiale où, comparativement, il y a moins de dettes à rembourser, où l'on dispose d'une période plus longue pour les rembourser et où il y a de bonnes chances d'y avoir des enfants d'âge préscolaire. Ces facteurs sont de nature à réduire la possibilité de la jeune femme mariée de réagir aux variations des conditions économiques en tant que travailleur additionnel.

La situation est la même chez la femme mariée plus âgée qui a également de bonnes chances d'appartenir à une unité familiale où il n'y a plus de dettes à rembourser, où l'on a réussi à se procurer les biens désirés et où l'on a de côté des épargnes qui permettent de faire face à l'éventualité du chômage temporaire du gagne-pain principal.

Enfin, il faut ajouter que, bien que la situation de travailleur additionnel soit l'attribut des femmes mariées, ce comportement ne leur est pas exclusif. De jeunes célibataires qui sont membres d'une unité familiale et qui s'occupent à une activité qui ne relève pas du champ de la main-d'oeuvre peuvent être sujettes à la condition de travailleur additionnel. La même observation peut s'appliquer en certaines circonstances aux séparées, aux veuves et aux divorcées.

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