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Luxembourg Income Study Working Paper Series

Working Paper No. 99

**Determinants of Women's Labour-Force Participation:
An Econometric Analysis for Five Countries**

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DRAFT -- Comments Welcome

Determinants of Women's Labour-Force Participation:
An Econometric Analysis for Five Countries

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1. Introduction

Estimates obtained using the Luxembourg Income Study (LIS)¹ indicate wide variation in women's rates of labour-force participation for similarly affluent countries.² In the late 1980's, 77 percent of women aged 25 to 55 were labour-market participants in Canada; 75 percent were labour-market participants in the US; 70 percent were participants in Australia; 62 percent were participants in (then West) Germany; only 50 percent were participants in the Netherlands.

Understanding such cross-country differences is important for international comparisons of the level and distribution of well-being. First, differences in labour-force participation will affect cross-country comparisons of levels of economic well-being. Differences in rates of labour-force participation indicate differences in the relative quantities of paid and unpaid work within a country. If countries differ in terms of women's labour-force participation rates, then we will obtain inaccurate pictures of relative levels of economic well-being when we compare only money incomes from paid employment across countries. Second, differences in labour-force participation can affect the distribution of well-being within households. A number of recent studies have indicated that women's well-being within the household is connected to women's market earnings.³ Thus, if countries differ in terms of women's labour-force participation rates, they may differ in terms

¹ The Luxembourg Income Study is a set of internationally comparable microdata sets, housed in Luxembourg, but easily accessible to remote users via the EARN/BITNET system. See Smeeding, et al., 1985, for a detailed description of this data source.

² See also Wolff, 1989 and McLanahan and Casper, 1992.

³ See, for example, Browning, et.al., 1993; Phipps and Burton, 1992; Schultz, 1990; Thomas, 1990.

of within-household distributions of well-being. Third, it is possible that different rates of labour-force participation among women affect relative inequality in household incomes.⁴ Finally, since in many countries, women's labour-force participation rates have increased dramatically in recent years, it may be informative to employ international comparisons when predicting future trends in women's labour-market behaviour for any one country.

A number of hypotheses to explain differences across countries in women's labour-force participation have appeared in the literature. First, some hypotheses focus on 'demand side' explanations. For example, differences across countries in the relative growth rates of jobs which are traditionally held by women may be an important factor. For example, the greater relative importance of the manufacturing sector in Germany may have impeded entry to the labour market for women in that country (Erler, 1988). Similarly, more rapid growth in the availability of part-time work may have promoted female labour-market participation in some countries. These are both structural arguments. It is also possible that differences in the timing and severity of business cycles are key to understanding differences in women's labour-market behaviour. Changes in relative rates of unemployment may have affected women's labour-market participation, particularly if, as some have argued, women serve as a 'reserve army.' (See Bakker, 1988 or Humphries and Rubery, 1988 for discussions of this point.)

An alternative set of hypotheses focus on 'supply side' reasoning. For example, differences in the structure of income taxation may well have played a role, discouraging the labour-market participation of women in countries

⁴ See, for example, Cancian, Danziger and Gottschalk, 1993 or Cancian and Schoeni, 1992.

with joint (family) taxation where lower-income wives will face their husband's higher marginal tax rates (Wolff, 1989). Changes in relative rates of inflation or in tax and transfer policies may have changed the relative importance of women's earnings for the support of families. Differences in marriage/divorce patterns across countries may have affected participation rates if single women (with or without children) are more likely to look for paid employment.

Differences in policies which 'enable' the market participation of women (Humphries and Rubery, 1988) may also have had an important role. Enabling policies include, for example, the provision of day-care, maternity leave and parental leave for the care of sick children (or elderly parents). The availability of such policies differs widely across the countries studied. Canada has a relatively generous system of maternity leaves (17 weeks of maternity leave at 50% of earnings until a ceiling payment is reached, with an additional 10 weeks of parental leave (which can be taken by either mother or father) again compensated at 60 percent of earnings (up to the ceiling payment)). However, there are no leaves generally available for employed parents with sick children. Neither maternity leave nor leave for parents with sick children are guaranteed in the US. Germany, on the other hand, provides 14 weeks of maternity leave at a flat rate (and employers are required to 'top up' this benefit to 100 percent of regular earnings for higher-income employees) with an additional 18 weeks of extended maternity benefits compensated at a flat rate. In addition, parents are entitled to an annual allotment of 5 days (compensated with 100 percent of salary) for the care of sick children. (This can be taken by either parent.) Moreover,

breast-feeding mothers in Germany work two hours less each day but are paid full salary (Canada, 1986).⁵

Finally, attitudes toward the paid employment of women -- particularly married women with young children -- may differ substantially even across the affluent developed countries mentioned above. That is, it is possible that individuals in some countries adhere more closely to 'traditional' values (see McLanahan and Casper, 1992) emphasizing the importance of mothers remaining at home with young children. Or, as Erler (1988) remarks in her discussion of the labour-market participation of German women, it may be that 'new values', perhaps connected with the Green Party, have emerged making German women sceptical of the value of what is produced in the market and emphasizing instead the importance of caring work outside the market. Of course, attitudes will shape social policy and business decisions so that many of the hypotheses suggested above are fundamentally interconnected.

It is not possible to examine in detail all of these hypotheses within a single paper. Thus, this research focusses on three hypotheses which may help to explain the differences in the observed labour-force participation rates of women and which can be examined using micro-data from the Luxembourg Income Study. These include: the importance of income needs, the role of marriage patterns, and the effects of children. First, are women with sources of income other than their own earnings (e.g., spouse's income, transfers) less likely to participate in the labour market? If so, is the response to other incomes sources the same in all countries? Are other resources equally available in all countries?

⁵ Similar provisions for breast-feeding mothers are made in Italy and France, two countries not studied here.

Second, does marital status have the same impact on the probability of a woman participating in the labour market in all countries? We might expect different effects of marriage both because the legal/institutional implications of marriage differ (e.g., laws concerning taxes, assets differ across countries) and/or because social expectations about what it means to be a 'wife' differ. There may also simply be important differences across countries in rates of marriage.

Third, do women in all countries studied have the same number (and age) of children? Do children have the same effect on mother's labour-market participation in all countries? If it is true either that some countries have put in place policies which are more supportive of women's market participation or that prevailing attitudes in some countries are more favourable toward women's labour-market participation than others (or what seems more likely, that some countries with attitudes in favour of market participation put in place policies which support participation), then we should observe that women with children are more likely to be labour market participants in some countries than others, controlling for other important characteristics such as the women's age and level of education.

Separate probit equations to predict the probability of labour-force participation for women (aged 25-55) in Australia, Canada, Germany, the Netherlands and the United States are estimated using LIS micro-data. The LIS data provide the possibility of estimating identically specified equations and thus enable direct cross-country comparisons. By using econometric techniques, this research is able to build upon the earlier LIS study by Wolff (1989) to assess the influence of, for example, children and marital status, on women's labour-force participation holding constant the influence of other

important factors such as age and education. The specification of the probit equations and the data employed to estimate them is discussed in Section 2. Section 3 discusses regression results. Section 4 makes use of the estimated equations to simulate changes in labour-force participation in response to particular demographic characteristics. Section 5 looks briefly at the determinants of the choice between part-time and full-time employment for labour-market participants since many of the arguments cited above are also relevant to this aspect of labour-market behaviour. Section 6 concludes and offers suggestions for future research.

2. Methodology

Assume that a woman will choose to participate in the labour market if her utility from participating u_i^p exceeds her utility from non-participation, u_i^{np} . That is, she will participate when $u_i^p - u_i^{np} = \Delta u_i$, the difference between her utility in the two states, is positive. From the discussion above, we assume that this utility difference will depend on personal characteristics of the woman, x_i , as well as a normally distributed random error, e_i :

$$\Delta u_i = \beta' x_i + e_i \quad (1)$$

where β is a vector of parameters to be estimated.

Of course, we do not observe utilities. We observe only the dichotomous variable, labour-force participation, Lfp :

$$Lfp_i = 1 \text{ if } \Delta u_i > 0$$

$$Lfp_i = 0 \text{ otherwise.}$$

From this, we can derive an expression for the probability of labour-force participation:

$$\text{Prob} (Lfp_i = 1) = \text{Prob} (e_i > -\beta'x_i)$$

$= 1 - F(-\beta'x_i)$, where F is the cumulative normal distribution function.

Finally, the parameter vector, β , can be estimated by maximizing the following likelihood function:

$$L = \prod_{Lfp_i = 0} F(-\beta'X_i) \prod_{Lfp_i = 1} [1 - F(-\beta'X_i)]$$

The prediction that women's labour-force participation is more likely when family resources are low relative to needs is tested through the inclusion in the probit equation of a variable constructed as household gross income less the women's labour-market earnings (if any). The expectation is that labour-force participation will be negatively related to other income sources.

The hypothesis that differences in marriage/divorce patterns are an important reason for international differences in rates of female labour-force participation is examined by including a categorical variable for marital status (married or living together or not) in the probit equation. If there is any validity to this hypothesis then we should find that, controlling for other important factors, being 'married' is associated with a lower probability of labour-force participation.

The effects of children on women's labour-force participation is examined through the inclusion of four 'child' variables. Number of children and number of children squared are included to allow for non-linear effects from the presence of additional children in the household. A categorical variable indicating that the youngest child is a baby or toddler (less than three years of age) is included. The hypothesis is that the very youngest children are likely to exert the largest influence on women's labour-force participation either because of social attitudes about mothers of infants working outside the home or because of inadequate childcare possibilities for the very young. A second categorical variable to indicate that the youngest child is 3-5 years of age is included. Again, it is likely, for reasons given above, that pre-school children will exert a strong negative influence on mother's labour-market participation. However, this effect is predicted to be slightly smaller than that for infants and toddlers since day-care/pre-school is often easier to find for these children.

Finally, categorical variables to indicate 'low' and 'high' levels of education ('medium' education is the excluded category)⁶ and continuous variables for the woman's age and its square are included as important controls.

3. Data

Data for this analysis are taken from the Luxembourg Income Study (LIS), a set of internationally comparable microdata sets, housed in Luxembourg, but easily accessible to remote users via the EARN/BITNET system. The LIS dataset

⁶ These are fairly rough measures of level of education, but were helpful for making international comparisons.

for Australia is the 1985-86 Income and Housing Survey (7,560 observations); the dataset for Canada is the 1987 Survey of Consumer Finance (10,999 observations); the dataset for Germany is the 1984 Germany Panel Survey (6,174 observations); the dataset for the Netherlands is the 1987 Survey of Income and Program Users (12,693 observations); the dataset for the USA is the 1986 March Current Population Survey (11,614 observations). This particular group of affluent developed countries was chosen for study because they exhibit an interesting range in rates of labour-force participation and because data on labour-market behaviour and levels of education was sufficient to carry out the necessary econometric work.⁷

From each dataset a subsample for analysis was selected which satisfied the following criteria:

1. The reference individual or spouse was a woman aged between 25 and 55.⁸
2. The woman had recorded her level of education.

The second condition was a practical necessity, the first was used to focus the analysis on women less likely to be in the process of acquiring an education or retiring. Of course, excluding women aged less than 25 years excludes many women with young children (though many remain -- see Table 1).

For women in Australia, Canada, Germany and the United States, a labour-force participant is defined as someone for whom the sum of weeks of full-time employment, weeks of part-time employment and weeks of unemployment was

⁷ I would have liked to include Sweden in the analysis, but decided against this option on the grounds that there is no information about education for Swedish women.

⁸ Thus, some women who are 'other family members' are omitted from the analysis. For example, an unmarried, adult daughter living with her parents would not be included.

positive. For women in the Netherlands, a labour-force participant is someone with the labour-force status of 'looking for work' or 'in the labour force' (categories 2 and 3 of the labour-force status variable).⁹

Variable means and standard deviations for the five country samples are reported in Table 1.¹⁰

As noted in the introduction, labour-force participation rates vary substantially across the countries. Rates of participation are highest in Canada and the US and lowest in Germany and the Netherlands. Means of other variables also differ somewhat across the countries. German women are the oldest with an average age of 39.5 years while women in Australia and the Netherlands are youngest with average ages of 37.63 and 37.67, respectively.¹¹

Women in Australia have the largest average number of children (1.37). Thus, it is possible (if additional children discourage labour-market participation) that women in Australia are less likely to be labour-market participants than women in Canada or the US because they have more children. On the other hand, women in Germany have, on average, fewer children (0.99) than women elsewhere. It is therefore not possible that differences in

⁹ Weeks of employment/unemployment are not reported for women in the Netherlands, necessitating a slightly different way of measuring labour-force participation.

¹⁰ These means are unweighted to correspond with the unweighted probit regressions. (It is not possible to use weights when using the probit procedure in SPSS.) However, weighted and unweighted means are in general qualitatively very similar. Patterns discussed in the text are also valid for the weighted means. See Appendix 2, Table A for the weighted means.

¹¹ Recall that the sample is restricted to women between the ages of 25 and 55.

numbers of children explain why German women are less likely to participate than Canadian, Australian or US women.

Women in Australia and the Netherlands are most likely to have an infant or toddler (18 percent in both cases) while women in Germany are least likely to have an infant or toddler (9 percent). These percentages presumably correspond with German women being the oldest; women in Australia and the Netherlands the youngest. If young children discourage the labour-market participation of mothers, then it is again possible that the presence of more young children can partially explain lower participation rates in Australia and the Netherlands than in the US and Canada. However, this cannot be a factor in explaining the lower rates of participation in Germany.

Women in the US are noticeably less likely to be 'married' than women in any of the other countries studied -- only 76 percent report being married. In contrast, 86 percent of women in the Netherlands and Germany are 'married.' Thus, if marital status is a significant predictor of labour-force participation, then it is possible that differences in marriage patterns is a factor in explaining differences between the US, on the one hand, and Germany and the Netherlands on the other.

Finally, women in the United States have, in absolute terms (i.e., in 1986 US dollars), the highest average incomes other than their own earnings available to them (\$26,140). Women in Germany are least well-off in terms of other available resources (\$18,250 - US 1986). Thus, even if other income discourages labour-market participation, differences in the availability of other income are unlikely to emerge as an important explanation for differences in labour-market participation rates across countries, since the

country with highest other income (the US) also has one of the highest participation rates.¹²

3. Estimation Results

Parameter estimates for the five probit equations are presented in Table 2. Consider, first, the influences of the demographic control variables (age and education). In all countries, lower levels of education are associated with lower probabilities of labour-force participation.¹³ Higher levels of education are associated with higher probabilities of labour-force participation. Age is a statistically significant predictor of labour-force participation in all countries, though age profiles differ slightly across the countries. The probability of labour-force participation peaks at roughly 30 years, though the highest probability of participation occurs at 33.8 years in the US and at only 28.5 years in Germany.¹⁴ Thus, other things equal, the probability of labour-force participation declines with age beyond 30 years. However, older women are relatively more likely to be labour-market participants in the US than in Germany.

Next, consider the variables linked to the hypotheses under investigation. Other factors equal, being 'married' significantly reduces women's labour-force participation in Germany and the Netherlands, exerts no

¹² Conversions to 1986 US dollars are made using OECD purchasing power parities (1987).

¹³ The exception is Germany where the low-education dummy variable is only statistically significant at a very low level. Recall that these education categories are only roughly comparable across the countries. Thus, I do not wish to emphasize differences in coefficient estimates for particular categories.

¹⁴ The probability of labour-force participation peaks at 30.93 years in Australia, at 32.35 years in Canada and at 29.83 years in the Netherlands.

statistically significant influence in Canada or the United States and increases the probability of labour-force participation in Australia. Thus, if rates of marriage in Germany and the Netherlands (currently 86 percent of women are 'married' in both countries) fell to the level observed in the United States (76 percent) then women's labour-market participation would increase in these countries. However, this factor cannot explain, for example, why participation rates are much higher in Canada, where rates of marriage are very similar to those observed in Germany and the Netherlands.

Higher income other than the woman's own earnings is associated with lower women's labour-force participation only in the United States where women have the highest alternative income sources of all countries studied.¹⁵ Thus, differences across countries in the need for women's earnings does not appear to explain differences across countries in rates of labour-force participation, though this may be an important difference between behaviour in the United States and behaviour in the group of other countries studied.¹⁶

Finally, as predicted, the presence of children significantly reduces the probability of women's labour-force participation in all countries

¹⁵ I also experimented with other equivalent income as an explanatory variable, thinking that this might be a more appropriate indicator of family need. Results were not affected -- other equivalent income was only significant in the US.

¹⁶ Again, it should be emphasized that with this cross-sectional data it is not possible to observe the effects of changes in the cost-of-living within particular countries which may have influenced participation decisions. Thus, changes in cost-of-living may be important across time, less so across countries. Paukert (1982) reports survey evidence indicating that 'economic necessity' is the major reason given by European women when asked why they are labour-market participants (p. 42). Dookey (1988) emphasizes the importance of wives' earnings in maintaining the economic well-being of married couples with children relative to single parents. Thus, I do not believe that the results reported here should be taken to mean that economic necessity is not an important motivation for women's labour-market participation.

studied, though the magnitude of the effect differs by country. (This point will be illustrated with a simulation analysis later in section 4.) First and second children are associated with larger reductions in the probability of labour-force participation than third and fourth children, though a woman with three children will have a lower probability of labour-force participation than an otherwise similar woman with only one child.

Also, as predicted, pre-school children are associated with substantially lower probabilities of labour-force participation in every country, though again the magnitude of the effect differs across countries. In all countries but Germany, infants and toddlers (less than three years) reduce mother's labour-force participation by a larger degree than older pre-schoolers (3-5 years).

4. Simulation Results

Since coefficient estimates from the probit equations have a non-linear relationship with the probability of labour-force participation, it is helpful for understanding the relative quantitative importance of explanatory variables to calculate probabilities of labour-force participation for 'sample' women in each country. Results of such a simulation exercise are reported in Table 3. The baseline scenario is for a woman who is 25 years of age, has a 'medium' level of education, 1 child 6 years or older, no income other than her own earnings and is not married. Using the estimated probit equations, the probability of labour-force participation for this sample woman is calculated for each country and reported in the first row of Table 3. Next, particular characteristics are, in turn, varied and the change in the probability of participation is calculated.

Notice, first, that the baseline sample woman has a different probability of labour-force participation in each country, though the differences are not so great as the observed differences in labour-force participation rates. For example, the sample woman is estimated to have a 92.3 percent chance of being a labour-market participant in the US and an 87.3 percent chance of being a labour-market participant in Germany. This difference is not so large as the actual difference in labour-market participation rates between these two countries (75 percent for the US; 62 percent for Germany). Similarly, in Canada, the sample woman has an 88.4 percent chance of participation while in the Netherlands, she has a 78.0 percent chance of participation. Again, this difference is less than the difference in actual participation rates (77 percent for Canada; 50 percent for the Netherlands), suggesting that differences in socioeconomic variables must play at least a small role in explaining cross-country differences in rates of women's labour-market participation.

Simulation results indicate that differences in responses are very important. Consider the role played by marital status. If all other characteristics of the sample woman are held constant, but her marital state is changed from single to 'married' we observed no response in the probability of labour-market participation in Canada or the United States. In Australia, the probability of participation increases by 7.4 percentage points. In Germany, the probability of participation falls by 13.2 percentage points while in the Netherlands, it falls by 7.5 percentage points. Thus, holding constant all other relevant factors (including number and ages of children), married women in Germany are much less likely to participate in the labour-market than women in any other country.

A further experiment suggests that it is differences in the response to marital status across countries rather than differences in the number of women who are 'married' which is most important for understanding differences in observed labour-force participation rates. Consider an experiment in which German women had the same rate of marriage as US women (a 10 percentage point drop).¹⁷ If we evaluate the probability of participation using the estimated probit equation for German women and the German sample means and then compare this with the probability of participation calculated in the same way except substituting the US rate of marriage, the probability of participation increases by only 2 percentage points. Thus, the important factor seems to be that there is a bigger response to being married for German women rather than that there are more German women who are married which is significant for understanding the difference between the US and German participation rates.

A second experiment involves holding all other characteristics of the sample woman constant, but increasing the other income sources available to her.¹⁸ As mentioned above, this will only result in changes in the probability of labour-market participation in the United States. If the sample woman has \$15,000 US (1986) rather than zero other income, her probability of participation will fall by 1.8 percentage points. If other income sources increase from zero to \$45,000 US (1986), her probability of

¹⁷ Of course, such an experiment is not intended to be realistic. Such a major social change in Germany would presumably bring with it changes in behaviour and institutions which might change the responsiveness of women's labour-market participation to marital status. This exercise is intended merely to be illustrative.

¹⁸ The sample woman is again single for this second experiment. Thus, each experiment involves one change from the original baseline case.

labour-force participation will fall by 6.2 percentage points. Thus, the role played by other income sources is noticeable but not enormous in the US.¹⁹ Other income does not appear to be an explanation for cross-country differences in labour-market participation.

A third set of experiments designed to explore the quantitative importance of differences in responses to the child variables involves 'removing' and 'adding' children. Since all other characteristics of the sample woman are held constant, the children are all assumed to be at least six years of age. First, imagine that the sample woman did not have any children (rather than one child). This has very large implications for the probability of labour-force participation in Australia and the Netherlands. In Australia, the probability of labour-force participation increases by 10.8 percentage points; in the Netherlands by 10.5 percentage points. In Germany, the probability of labour-force participation for a childless sample woman would be 7.8 percentage points higher. Notice that this is smaller than the effect of marriage. In Canada and the US, the effects of 'removing' the child are much smaller, though still significant -- increases of 4.1 and 2.8 percentage points respectively are predicted. (For the US, the effect of 'removing' the child is roughly comparable in quantitative terms, with the effect of adding \$15,000 of other income.)

If, on the other hand, the sample woman were given three children (rather than the base case of one child), her probability of labour-force participation would fall by 14.5 percentage points in Australia, 15.3

¹⁹ Given the higher degree of income inequality in the US than in the other countries studied, and given the importance of other income for the participation decisions of US women, I wondered what would happen to simulated US participation rates if all US women had the average level of other income available to them. Results suggested that participation rates would change only slightly.

percentage points in the Netherlands, 17.5 percentage points in Germany, 8.5 percentage points in Canada and only 6.3 percentage points in the United States.

Such large differences across countries in the magnitude of the response of female labour-force participation to child status lend some support to the hypothesis that differences across countries in prevailing attitudes toward the market participation of mothers may be a very important factor in the explanation of cross-country differences in participation rates. Women in the US and Canada (with higher participation rates) appear much less responsive to the presence of children than women in Australia, Germany or the Netherlands. Since neither Canada nor the US have in place policies which are more supportive of women in the workplace than those available, for example, in Germany,²⁰ it seems that attitudes about the paid employment of mothers are very important determinants of labour-force participation.

A final set of experiments relate to the age of the sample woman's child. (For these experiments, the sample woman is assumed to have just one child.) First, if the child is aged less than three years (rather than 6

²⁰ See the discussion of maternity and parental leaves in the introduction. As well, neither Canada nor the US provides adequate childcare facilities (Kamerman and Kahn, 1981). For example, in Canada, in 1984, only 8.7 percent of children 0-17 months with employed parents had places in licensed day-care centres (Canada, Status of Women, 1986). Germany also lacks a comprehensive system of daycare for children younger than two years. 'Krippen' for infant care have traditionally been designed for the use of low-income families with children and spaces are not generally available for all children with employed parents. However, more than 75 percent of 3 to 5-year olds attend free public kindergarten in Germany, though only for half days (8am to 1pm) in most instances, so this does not really provide sufficient care for parents who are full-time employees. An increasing number of two-year olds are also able to attend these kindergartens, as space permits. It should be noted that the goal of the German kindergartens is to 'promote the physical, spiritual, social and emotional development of young children' and that these facilities are also used by families where the mother is not employed outside the home.

years or older), then the probability of labour-market participation falls in all countries. The drop is most dramatic in Australia -- a full 31.2 percentage points. This is substantially larger than in any other country. The Netherlands ranks second in magnitude of response -- a drop of 14.0 percentage points. Responses are much smaller in Canada (-8.5 percentage points) and Germany (-7.6 percentage points). Finally, the response to having an infant or toddler rather than a school-aged child is smallest in the US (-5.5 percentage points).

One hypothesis outlined above was that women would be somewhat less responsive to the presence of an older pre-schooler than to the presence of an infant/toddler (though more responsive than to an older child). This effect is pronounced in Australia and the Netherlands and apparent, though very small, in Canada. There is not much difference in the behaviour of women whose youngest child is 3-5 and women whose youngest child is 0-2 in the US. In Germany, women with older pre-schoolers are slightly less likely to be market participants than those with infants or toddlers.

It is again clear from this experiment with age of youngest child that labour-market responses to this variable vary markedly across countries. Again, this would lend credibility to the idea that prevailing attitudes about the labour-market participation of mothers with young children differ across countries and that these differences play an important role in explaining differences in observed rates of labour-force participation.

To summarize the results concerning children, labour-force participation rates are lower in Australia than Canada and the US both because women in Australia have more children (and a higher percentage of infants/toddlers) and because women in Australia are much less likely to participate in the labour

market when children are present. An additional simulation exercise emphasizes this point. The probability of labour-force participation is calculated using the Australian probit equation evaluated at the Australian means except with respect to the child variables. Using the Canadian mean child characteristics, predicted participation rates in Australia would increase by 2 percentage points; using the US mean child characteristics, predicted participation rates would increase by 3 percentage points.²¹

On the other hand, differences in response to the presence of children rather than differences in number of children is the more important factor in explaining the difference between labour-market participation in the Netherlands and labour-market participation in Canada/US (women in the Netherlands have fewer children, though more infants/toddlers than women in Canada/US). Similarly, differences in response to children rather than differences in number of children is the more important factor in explaining differences between participation rates in Germany and in Canada/US. (German women have fewer children and fewer young children.)

5. Estimation Results for Part-time versus Full-time Labour-Market Participation

An important dimension of labour-market participation is whether it is part-time or full-time. As is evident from Table 4, rates of part-time employment vary substantially across the countries studied. In Canada and the US, 27 percent of labour-market participants were part-time employees. In

²¹ However, note that differences in child characteristics cannot explain why Australian participation rates (70 percent) exceed German participation rates (62 percent). Using the German mean child characteristics, Australian participation rates would increase by 7 percentage points!

Australia and Germany, 45 and 46 percent, respectively, of labour-market participants were part-time employees.²² Thus, the countries with the highest rates of participation (of those studied) have the lowest rates of part-time employment.

An interesting question is then whether the same factors which influence the participation decision (e.g., marital status, children, other income sources) also influence the decision about the intensity of participation. Table 4 presents probit parameter estimates of the determinants of part-time versus full-time labour-market participation for women with some market participation in the survey year. Explanatory variables are the same as those employed for the estimation of the determinants of any participation and hence can be directly compared with the results reported in Table 2.

Some differences between the two sets of results are apparent. First, education plays a much less important role in sorting market participants between part-time and full-time employment than in influencing the participation decision. Women with higher educations in Australia and Canada are less likely to be part-time employees. Other than this, the education variables are not statistically significant. Similarly, age is less universally important. (Older women are more likely to be part-time workers in Germany; less likely to be part-time workers in the US.)

Number of children is very important in all countries. The probability of part-time employment increases with number of children. In Australia,

²² Observations for which there were no recorded weeks of either part-time or full-time employment (i.e., the woman was unemployed throughout the survey year) were excluded. Otherwise, a woman was defined as a part-time worker if she had more weeks of part-time employment than weeks of full-time employment. Since weeks of work were not recorded for the Netherlands, this analysis focusses only on Australia, Canada, Germany and the United States.

women whose youngest child is an infant or toddler are more likely to be part-time workers. This variable is not statistically significant in the other countries. This is an important difference between the labour-force participation and the part-time/full-time results. Having an infant or toddler acts as a significant deterrant to market participation. However, for women who do participate, those with infants and toddlers are not more likely than others to work part-time. On the other hand, women whose youngest child is between 3 and 5 years are more likely to be part-time workers in all countries.

Women who are married (or equivalent) are more likely to be part-time workers than non-married women in all countries. This is a difference from the results for participation (where marital status significantly reduced the probability of participation only in Germany and the Netherlands and increased the probability of participation in Australia). This result presumably reflects the fact that it is very difficult for single women to survive financially with only a part-time job. It is interesting, however, that other available income is only a statistically significant determinant of part-time versus full-time employment status in Canada and the US. (The probability of part-time employment increases with the amount of other income available.)

6. Conclusions

What explains the large differences in the market participation rates of women across affluent developed countries? A wide variety of hypotheses have been proposed in the literature. This paper explores three possible explanations: 1) differences across countries in the availability of and response to income other than the woman's own earnings; 2) differences in

patterns of marriage/divorce and/or differences in behavioural response to marital status 3) differences in attitude toward the market participation of women with children and/or differences in numbers and ages of children. To examine these issues, identically-specified probit equations are estimated for Australia, Canada, Germany, the Netherlands and the United States using micro-data from the Luxembourg Income Study.

Differences across the countries in the amount of 'other income' available to women does not appear to be a major factor. Women in the US are the only ones whose participation decisions are influenced by other income sources -- the higher the alternative income sources, the less likely labour-market participation. At the same time, US women have the highest alternative incomes sources (in absolute terms).

Results indicate that differences in marital patterns may play a small role. Other things equal, married (or equivalent) women in the Netherlands and Germany are less likely to participate in the labour market than single women. And, significantly more women are married in these countries than in the United States. Thus, this factor may explain part of the difference in observed behaviour between the Netherlands and Germany and the US. However, rates of marriage are very similar in Canada, the Netherlands and Germany, yet Canada has a much higher rate of women's labour-market participation.

Finally, results suggest that differences in attitudes toward the market participation of women with children may be extremely important in the explanation of differences in observed labour-market participation rates across countries. Women in Australia are both more responsive to the presence of a child and have more children (and more younger children) than women in Canada and the US, for example. Women in the Netherlands and Germany have

fewer children, but are less likely to participate in the labour market when they do have children than women in Canada or the US.

By employing comparable micro-data from the Luxembourg Income Study this paper was able to systematically explore several important hypotheses about why women's labour-market participation might differ across affluent developed countries. A limitation is that these data are cross-sectional. As emphasized, for example, by Nakamura and Nakamura (1985), there is a high degree of year-to-year correlation in women's market behaviour. Cross-nationally comparable panel data are not readily available, however Appendix 1 indicates how the LIS data can be used as a 'pseudo panel' and emphasizes the importance of last year's labour-market behaviour in predicting this year's participation. Finally, however, micro-data analyses are unable to consider some of the more structural hypotheses discussed in the introduction (e.g., that women's labour-market participation may be higher in countries which have experienced relatively faster growth in the service rather than the manufacturing sector). Empirical testing of these hypotheses constitutes another important avenue for future research.

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Appendix 1 -- The Continuity of Women's Labour-Market Behaviour

Nakamura and Nakamura (1985) emphasize the importance of year-to-year correlation in the labour-market behaviour of women -- that is, the best predictor of a woman's labour-market participation this year is her labour-market behaviour last year. Of course, this hypothesis cannot be tested using standard cross-sectional data. However, the LIS data for Australia, Canada, Germany and the US include a variable which records the woman's labour-market status on the day (or week) of the survey as well as her labour-market behaviour during the previous year. (Surveys ask retrospective information about incomes, labour-market behaviour, etc. during the previous year.) This information can be employed to create 'pseudo-panel' information and thus to test the hypothesis about the importance of continuity in labour-market participation.

Appendix Table 1 reports probit parameter estimates for labour-market participation during the survey week including all of the explanatory variables as defined in the rest of this paper with the addition of a variable indicating weeks worked during the previous year. (Note that all of the other demographic characteristics are also for the previous year. Thus, the woman will actually be older at the time of survey than she was during the previous year, her marital status may have changed, her child status may have changed, etc. Clearly, this 'pseudo panel' information is much less desirable than a true panel would be.)

Results emphasize the importance of continuity. Weeks worked in the previous year is overwhelmingly the most important factor in explaining this year's labour-market participation. Moreover, when weeks worked last year is included as an explanatory factor, the importance of other variables (e.g.,

number of children) becomes much less important than was indicated in the purely cross-sectional estimates reported in the main body of the paper.

This result emphasizes that countries with higher participation rates today are likely to have higher participation rates tomorrow -- women who have once joined the labour-market are unlikely to leave in large numbers (other than for short periods for maternity purposes). Of course, this does not help to explain how these differences emerged in the first place. Hence these results are not emphasized in this paper. They will be developed for other purposes in future research.

APPENDIX 1 TABLE A

PROBIT PARAMETER ESTIMATES OF LABOUR-FORCE PARTICIPATION IN THE SURVEY WEEK

| | Australia | Canada | Germany | US |
|--|--------------------|---------------------|--------------------|---------------------|
| Weeks worked in previous year | 0.047 (39.431) | 0.050 (48.514) | 0.061 (30.193) | 0.057 (49.455) |
| Dummy = 1 if low education | -0.122 (-1.338) | -0.403 (-7.230) | 0.100 (0.910) | -0.234 (-3.429) |
| Dummy = 1 if high education | -0.005 (-0.050) | 0.183 (2.796) | -0.230 (-1.484) | 0.009 (0.111) |
| Woman's age | 0.065 (1.656) | 0.146 (4.219) | 0.129 (1.935) | 0.028 (0.816) |
| Woman's age squared | -0.001 (-2.248) | -0.002 (-4.505) | -0.002 (-1.827) | -0.0004 (-0.996) |
| Number of children | 0.046 (0.681) | -0.054 (-1.050) | 0.004 (0.032) | 0.100 (2.081) |
| Number of children squared | -0.012 (-0.728) | 0.005 (0.433) | 0.007 (0.171) | -0.025 (-2.731) |
| Dummy = 1 if child < 3 years | -0.422 (-4.867) | -0.299 (-3.741) | -0.436 (-2.541) | -0.228 (-2.763) |
| Dummy = 1 if child 3-5 years | -0.155 (-1.674) | -0.085 (-1.055) | -0.113 (-0.708) | -0.235 (-2.753) |
| Family income less woman's earnings/1000 | -0.002 (-1.391) | -0.0004 (-0.361) | -0.002 (-1.261) | -0.005 (-4.042) |
| Dummy = 1 if married or equivalent | -0.089 (-1.060) | 0.005 (0.071) | -0.012 (-0.074) | -0.113 (-1.572) |
| Constant | -1.486 (-2.030) | -3.360 (-5.123) | -3.859 (-3.033) | -1.155 (-1.735) |
| Survey Date Labour-Force Participation | 0.63 | 0.71 | 0.60 | 0.71 |
| Number of Observations | 3989 | 5947 | 1982 | 6017 |

Note: T-Ratios are presented in parentheses.

APPENDIX 2 TABLE A

VARIABLE MEANS AND STANDARD DEVIATIONS FOR ALL WOMEN, AGED 25-55. WEIGHTED.

| | Australia | Canada | Germany | U.S. | Netherlands |
|---|-------------------------------|-------------------------------|-------------------------------|-------------------------------|-------------------------------|
| Labour force participation | 0.70 (0.46) | 0.78 (0.41) | 0.62 (0.49) | 0.75 (0.43) | 0.53 (0.50) |
| Dummy = 1 if low level of education | 0.53 (0.50) | 0.33 (0.47) | 0.26 (0.44) | 0.15 (0.36) | 0.50 (0.50) |
| Dummy = 1 if medium level of education | 0.10 (0.30) | 0.35 (0.48) | 0.65 (0.48) | 0.51 (0.50) | 0.44 (0.50) |
| Dummy = 1 if high level of education | 0.37 (0.48) | 0.32 (0.47) | 0.09 (0.29) | 0.13 (0.34) | 0.06 (0.23) |
| Age | 37.70 (8.21) | 38.34 (7.98) | 40.24 (8.24) | 38.22 (8.05) | 38.16 (7.93) |
| Number of children < 18 years | 1.36 (1.22) | 1.16 (1.17) | 0.89 (0.96) | 1.21 (1.24) | 1.16 (1.12) |
| Dummy = 1 if preschooler < 3 years | 0.18 (0.39) | 0.14 (0.34) | 0.08 (0.28) | 0.15 (0.35) | 0.15 (0.36) |
| Dummy = 1 if preschooler 3-5 years | 0.11 (0.31) | 0.11 (0.31) | 0.10 (0.30) | 0.11 (0.31) | 0.10 (0.30) |
| Family income less woman's earnings/1000, in own currency | 25.35 ³ (21.39) | 35.87 ⁴ (22.70) | 48.74 ⁵ (34.25) | 26.54 ⁶ (24.50) | 54.00 ⁷ (34.74) |
| Family income less woman's earnings/1000, in 1986 U.S. dollars | 21.06 | 26.09 | 18.32 | 26.54 | 24.86 |
| Family income less woman's earnings/median gross income for country | 1.20 | 1.16 | 1.25 | 1.11 | 1.29 |
| Dummy = 1 if married or equivalent | 0.84 (0.36) | 0.80 (0.40) | 0.86 (0.35) | 0.76 (0.43) | 0.83 (0.38) |
| Number of observations | 2740 | 5114 | 9769 | 46264 | 2807 |

³1985/86 Australian dollars

⁴1987 Canadian dollars

⁵1984 German marks

⁶1986 U.S. dollars

⁷1987 Netherlands guilder

TABLE 1
VARIABLE MEANS AND STANDARD DEVIATIONS FOR ALL WOMEN, AGED 25-55

| | Australia | Canada | Germany | U.S. | Netherlands |
|---|-------------------------------|-------------------------------|-------------------------------|-------------------------------|-------------------------------|
| Labour force participation | 0.70 (0.46) | 0.77 (0.42) | 0.62 (0.49) | 0.75 (0.43) | 0.50 (0.50) |
| Dummy = 1 if low level of education | 0.53 (0.50) | 0.39 (0.49) | 0.25 (0.43) | 0.16 (0.36) | 0.50 (0.50) |
| Dummy = 1 if medium level of education | 0.10 (0.31) | 0.33 (0.47) | 0.66 (0.47) | 0.51 (0.50) | 0.45 (0.50) |
| Dummy = 1 if high level of education | 0.36 (0.48) | 0.28 (0.45) | 0.09 (0.29) | 0.13 (0.34) | 0.05 (0.22) |
| Age | 37.63 (8.16) | 38.17 (7.94) | 39.45 (8.11) | 38.18 (8.01) | 37.67 (7.85) |
| Number of children < 18 years | 1.37 (1.22) | 1.31 (1.20) | 0.99 (0.99) | 1.24 (1.26) | 1.22 (1.11) |
| Dummy = 1 if preschooler < 3 years | 0.18 (0.38) | 0.14 (0.35) | 0.09 (0.29) | 0.15 (0.36) | 0.18 (0.38) |
| Dummy = 1 if preschooler 3-5 years | 0.12 (0.32) | 0.12 (0.33) | 0.11 (0.32) | 0.12 (0.32) | 0.10 (0.31) |
| Family income less woman's earnings/1000, in own currency | 25.23 ¹ (20.74) | 32.97 ² (20.50) | 48.55 ³ (35.40) | 26.14 ⁴ (23.95) | 52.84 ⁵ (29.04) |
| Family income less woman's earnings/1000, in 1986 U.S. dollars | 20.96 | 23.98 | 18.25 | 26.14 | 24.33 |
| Family income less woman's earnings/median gross income for country | 1.20 | 1.06 | 1.24 | 1.10 | 1.27 |
| Dummy = 1 if married or equivalent | 0.84 (0.36) | 0.83 (0.38) | 0.86 (0.35) | 0.76 (0.43) | 0.86 (0.34) |
| Number of observations | 3989 | 5947 | 1982 | 6017 | 2246 |

¹1985/86 Australian dollars

²1987 Canadian dollars

³1984 German marks

⁴1986 U.S. dollars

⁵1987 Netherlands guilder

TABLE 2

PROBIT PARAMETER ESTMATES OF WOMEN'S LABOUR-MARKET PARTICIPATION

| | Australia | Canada | Germany | U.S. | Netherlands |
|------------------------------------|---------------------|--------------------|---------------------|---------------------|--------------------|
| Dummy = 1 if low education | -0.157 (-2.135) | -0.426 (-9.533) | -0.105 (-1.455) | -0.740 (-15.108) | -0.402 (-6.825) |
| Dummy = 1 if high education | 0.381 (4.863) | 0.293 (5.488) | 0.379 (3.132) | 0.111 (1.913) | 0.359 (2.481) |
| Woman's age | 0.153 (4.65) | 0.159 (5.728) | 0.107 (2.335) | 0.095 (3.696) | 0.119 (2.772) |
| Woman's age squared | -0.002 (-5.930) | -0.002 (-7.057) | -0.002 (-3.274) | -0.001 (-4.348) | -0.002 (-3.669) |
| Number of children | -0.354 (-6.196) | -0.264 (-6.332) | -0.589 (-6.610) | -0.241 (-6.764) | -0.497 (-7.563) |
| Number of children squared | 0.042 (3.071) | 0.022 (2.307) | 0.070 (2.473) | 0.017 (2.420) | 0.068 (4.138) |
| Dummy = 1 if child < 3 | -0.804 (-11.121) | -0.365 (-5.540) | -0.311 (-2.547) | -0.310 (-5.135) | -0.415 (-4.512) |
| Dummy = 1 if child 3-5 | -0.443 (-5.764) | -0.269 (-4.138) | -0.398 (-3.667) | -0.275 (-4.418) | -0.324 (-3.154) |
| Family income woman's/1000 | 0.006 (0.526) | -0.001 (-1.516) | -0.0009 (-0.955) | -0.008 (-8.592) | -0.001 (-1.214) |
| Dummy = 1 if married or equivalent | 0.204 (2.918) | -0.018 (-0.317) | -0.494 (-4.504) | 0.051 (0.999) | -0.232 (-2.492) |
| Constant | -1.192 (1.931) | -1.006 (1.890) | 0.153 (0.173) | -0.160 (-0.325) | -0.530 (-0.649) |

Note: T-Ratio's are presented in parentheses.

TABLE 3
PREDICTED CHANGES IN PROBABILITY OF LABOUR FORCE PARTICIPATION
IN RESPONSE TO CHANGES IN SOCIOECONOMIC CHARACTERISTICS

| | Australia | Canada | Germany | U.S. | Netherlands |
|--|-----------|--------|---------|--------|-------------|
| Base Case ¹ | 0.642 | 0.884 | 0.873 | 0.923 | 0.780 |
| Low level of education | -0.060 | -0.105 | * | -0.170 | -0.135 |
| High level of education | +0.130 | +0.048 | +0.063 | +0.015 | +0.091 |
| Age = 35 | +0.017 | +0.021 | -0.012 | +0.014 | -0.002 |
| Age = 45 | -0.157 | -0.059 | -0.129 | -0.011 | -0.140 |
| Age = 55 | -0.479 | -0.358 | -0.434 | -0.107 | -0.453 |
| Number of children = 0 | +0.108 | +0.041 | +0.078 | +0.028 | +0.105 |
| Number of children = 2 | -0.088 | -0.044 | -0.096 | -0.031 | -0.096 |
| Number of children = 3 | -0.145 | -0.085 | -0.175 | -0.063 | -0.153 |
| Child < 3 | -0.312 | -0.087 | -0.076 | -0.055 | -0.140 |
| Child 3-5 | -0.173 | -0.061 | -0.102 | -0.048 | -0.107 |
| Family income less woman's earnings/1000 = 15 ² | * | * | * | -0.018 | * |
| Family income less woman's earnings/1000 = 30 | * | * | * | -0.038 | * |
| Family income less woman's earnings/1000 = 45 | * | * | * | -0.062 | * |
| Married or equivalent | +0.073 | * | -0.132 | * | -0.075 |

Note: An asterisk denotes a variable not exerting a statistically significant influence on the probability of labour force participation.

¹The base is a woman who is 25 years old, has medium education, 1 child 6 or older, no income other than the woman's and is not married.

²These categories are in terms of 1986 US\$.

TABLE 4
PROBIT PARAMETER ESTIMATES OF PART-TIME VERSUS FULL-TIME EMPLOYMENT
FOR LABOUR-MARKET PARTICIPANTS

| | Australia | Canada | Germany | US |
|--|--------------------|--------------------|--------------------|--------------------|
| Dummy = 1 if low education | 0.075 (0.830) | -0.034 (-0.664) | 0.052 (0.528) | 0.050 (0.753) |
| Dummy = 1 if high education | -0.174 (-1.915) | -0.130 (-2.552) | -0.062 (-0.484) | -0.058 (-0.961) |
| Woman's age | 0.033 (0.831) | -0.039 (-1.247) | 0.123 (2.085) | -0.061 (-2.086) |
| Woman's age squared | -0.000 (-0.150) | 0.001 (1.746) | -0.001 (-1.537) | 0.001 (2.412) |
| Number of children | 0.497 (7.357) | 0.325 (6.828) | 0.620 (5.145) | 0.316 (7.922) |
| Number of children squared | -0.063 (-3.476) | -0.040 (-3.442) | -0.118 (-2.650) | -0.034 (-3.983) |
| Dummy = 1 if child < 3 years | 0.359 (4.003) | 0.050 (0.702) | -0.155 (-0.894) | 0.106 (1.525) |
| Dummy = 1 if child 3-5 years | 0.395 (4.141) | 0.184 (2.598) | 0.323 (1.987) | 0.149 (2.055) |
| Family income less woman's earnings/1000 | 0.001 (0.784) | 0.003 (2.984) | 0.002 (1.410) | 0.006 (5.335) |
| Dummy = 1 if married or equivalent | 0.547 (6.002) | 0.336 (5.385) | 0.722 (5.815) | 0.293 (4.873) |
| Constant | -2.262 (-3.009) | -0.832 (-1.401) | -4.137 (-3.662) | -0.342 (-0.612) |
| Percent of observations = 1 (Part-time employees) | 0.45 | 0.27 | 0.46 | 0.27 |
| Number of observations | 2634 | 4444 | 1174 | 4512 |

Note: T-ratios are present in parentheses.