A Decomposition of the Labour Market Participation of Married Women in Three Countries: Australia, Canada and the United States of America

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A decomposition of the labour market participation of married women in three countries: Australia, Canada and the United States of America

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ABSTRACT

This study examines cross-national variation in the labour force participation of married women in Australia, Canada and the United States of America (USA), three countries of similar socio-economic development, in order to assess the observed differences in their labour market behaviour. While cross-national variation in labour force participation may be explained by a number of factors, a decomposition of the variation in cross-national labour market participation rates is explored in this study.

Initially, a basic model of female labour force participation is presented using data from the Luxembourg Income Study (LIS). The results of the basic model show that the probability of married women participating in the labour market in all three countries is inversely associated with the number of children under the age of 18 years, while higher education and age at younger ages are associated with a higher probability.

Two applications of the estimates are presented in the study: a simulation and a decomposition of the variation in cross-national labour force participation. The simulation exercise indicates that variation in cross-national labour force participation rates for married women can be explained by both country-specific characteristics and the measured differences in the responses to those characteristics.

The decomposition of the differential in labour force participation into the effect of country-specific characteristics and the effect of responses shows that if the responses of married women in Canada are imposed on the characteristics of Australian women, then participation is higher. On the other hand, if the characteristics for either Canada or the USA are applied to the behavioural responses in Australia, then the labour market participation of married women is also higher. This confirms that differences in country-specific characteristics and responses both contribute to explaining cross-national variation.
1.0 Introduction

This study examines cross-national variation in the labour force participation of married women in three countries that are similar in terms of their socio-economic development: Australia, Canada and the United States of America (USA). During the course of the twentieth century, women have entered the labour market in unprecedented numbers. This historic trend toward the increased labour market participation of women, particularly married women, is an international phenomenon. Between 1970 and 1990, large numbers of women entered the labour markets of the economies that comprise the Organisation of Economic Cooperation and Development (OECD). Blau et al. (1998: 81) note that the growth in female labour force participation has been accompanied by pronounced changes in the patterns of employment of women over the life cycle: younger cohorts of women tend to remain in the labour force throughout their adult life, even if and when they have children. While the observed trends are common to all three countries, there are noticeable differences between Australia, Canada and the USA.

One of the striking features concerning female labour force participation in the three countries is the difference between their age-participation profiles over time. In comparing age-participation profiles for Australia, Canada and the USA, the Australian experience is intriguing. The age-participation profiles show that female participation rates have changed dramatically with each successive decade, especially for women in their thirties and forties. An examination of these profiles reveals that women in Australia continue to leave the labour force for marriage, child-bearing and child-raising responsibilities. In North America, on the

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1 Australia, Canada and the USA are characterised by a number of common features: they are all democratic, industrialised and modern nations that share similar economic and social characteristics. In addition, there are common trends in all three countries: demographic trends, and an historic trend toward the greater involvement of women in the labour force. See, for instance, Sorrentino (1990); Statistics Division of the United Nations Secretariat (1999); and United Nations (1991).

2 For instance, see Blau et al. (1998); Gunderson (1998); and U.S. Department of Labor Women's Bureau (1999).


4 See Figures 1, 2 and 3 this study.
other hand, there has been a tendency for most women to remain labour force participants during these years of the family life cycle.

Cross-sectional estimates from the Luxembourg Income Study (LIS) are presented in Table 1 and show female labour force participation rates for two categories of women based on marital status using the third wave of the LIS database: 1989-90 for Australia; 1991 for both Canada and the USA.5 The labour market participation rates of women classified in the LIS data as never married were relatively similar: 78 percent in Australia, and 80 percent in both Canada and the USA.6 On the other hand, there was a significant difference in the participation rates of women classified in the LIS data as married: 71 percent in Australia, 79 percent in Canada and 75 percent in the USA.

This cross-national variation may be explained by a number of factors: one set of factors focuses on the demand side of the labour market; an alternative set of focuses on the supply side of the labour market.7 While a number of potential explanations have been posited in the literature to explain cross-national variation in the labour force behaviour of women, the difficulties of observing and measuring the independent variation in all these factors has meant that the empirical research has largely been inconclusive. This study is concerned with a decomposition of cross-national variation in the labour force behaviour of married women.

Section two investigates female labour force participation in Australia, Canada and the USA using both aggregate time series data and cross-sectional data. First, the section discusses aggregate time series data on labour force participation for all women. As the subject of this study is the divergence in labour force participation rates of married women in Australia, Canada and the USA, it is important to establish the degree of variation. In

5 The Luxembourg Income Study is a set of internationally comparable unit record data files, housed in Differdange, Luxembourg. These data sets are accessible to remote users through the Internet site at http://lissy.ceps.lu.

6 The fourth chapter of my dissertation provides estimates for the labour force participation rates of women classified in the LIS data as never married. These probit estimates show that there is no statistically significant difference in labour market participation rates in the three countries for this category of women.

7 This is discussed in greater detail in the first chapter of my dissertation.
addition, it is essential to determine what a conventional model of female labour force participation can offer by way of an explanation for cross-national variation. With this in mind, a basic model of female labour force participation, is presented in and estimated using cross-sectional data for married women.

Two applications of these estimates follow: a simulation and a decomposition of the variation in cross-national labour force participation. These are presented in section three. The final section, section four, provides concluding comments.

2.0 The basic model of female labour force participation

Figures 1, 2 and 3 show that female participation rates have changed dramatically over time with each successive decade, especially for women in their thirties and forties.\(^8\)

The decline in participation for women over the age of 50 years reflects the fact that many of these women may never have participated in the labour force. Again, the differences across the three countries for female labour force participation are quite noticeable, particularly in the 25-to-34 age group. Consider three points in time between two age categories of women: the 20-to-24 age group and the 25-to-34 age group in 1979, 1989 and 1998. In 1979, there was a decrease in female labour force participation in all three countries from the younger age group to the older. In 1989, there was a decrease in female labour force participation in Australia and Canada, but the USA showed an increase from the younger to the older age group. On the other hand, in 1998, there was an increase in female labour force participation in Canada and the USA, but Australia continues to show a decrease from the younger age group to the older. This indicates that younger cohorts of women tend to remain in the labour force throughout their adult life in North America, even if and when they have children. In contrast, the decrease in labour force participation in Australia demonstrates that, on average, more women continue to withdraw from the labour market during the child-bearing and child-rearing years of the family life cycle.

While a discussion of how labour force participation rates of women vary by age is informative, it does not highlight the influence of a number of different factors that are the

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\(^8\) A comparison of female and male participation rates over time shows that the labour force participation rates of women have climbed steadily toward the rates of men.
underlying determinants of female labour market participation. In multiple regression analysis, the estimated regression coefficients indicate the separate and independent impact of each of the explanatory variables while controlling for the effect of the other variables in the regression equation.

This study is concerned with labour supply choices at the extensive margin. Assume that a woman will participate in the labour market if the utility from participation, \( u^p \), exceeds the utility from non-participation, \( u^n \). That is, a woman will participate in the labour market if the difference between the utility in the two states is positive

\[
(2.1) \quad u^p_i - u^n_i = \Delta u_i
\]

The empirical literature indicates that the difference in utility between the two states will depend on the individual-specific characteristics of a person, \( X_i \), and \( \epsilon_i \), which is a stochastic component assumed to be independently and identically normally distributed with zero mean over observations:

\[
(2.2) \quad \Delta u_i = \beta^\prime X_i + \epsilon_i
\]

where \( \beta \) is a vector of parameters to be estimated. In the data used for the estimation, there is only one observation for each woman. Hence, \( \epsilon_i \) incorporates both persistent unobserved differences between women and individual-specific transitory shocks.

One does not observe utilities, however, only the decision of whether, or not, to participate in the labour market. Labour force participation, \( lfp \), is a dichotomous variable

\[
(2.3) \quad lfp = 1 \text{ if } \Delta u_i > 0 \\
\quad lfp = 0 \text{ if otherwise.}
\]

The probability of labour force participation can be expressed as

\[
(2.4) \quad \text{Prob} (lfp = 1) = \text{Prob} (\epsilon_i > -\beta^\prime X_i) \\
\quad = 1 - F (-\beta^\prime X_i)
\]

where \( F \) is the cumulative normal distribution function. The parameter vector, \( \beta \) can be estimated by maximising the likelihood function

\[
(2.5) \quad L = \prod_{lfp = 1} F (-\beta^\prime X_i) \prod_{lfp = 0} [1 - F (-\beta^\prime X_i)]
\]

The set of parameters \( \beta \) reflects the impact of changes in \( x \) on the probability of female labour force participation. The estimating equations are bivariate probits on the probability of engaging in paid employment in the labour market.
2.1 The data

Cross-sectional data from the Luxembourg Income Study (LIS) database are used to examine the probability of labour market participation for married women in the three countries. One of the major advantages of using this database is the cross-national comparability that is inherent in the data files because the statistical information has been standardised. The unit record data files available from the LIS database, however, limit the choice of survey years for the empirical analysis: the 1989-90 Income and Housing Cost and Amenities administered by the ABS; the 1991 Survey of Consumer Finances conducted by Statistics Canada in April as the annual supplement to the Labour Force Survey; and the 1991 Work Experience Survey, which is a supplement to the Current Population Survey conducted in March for the U.S. Bureau of Labor Statistics.

The surveys are retrospective and contain information on the labour force participation of the aggregate population aged 15 years and over. Each survey identifies demographic characteristics such as age and the state (province) of residence; household characteristics such as the number of dependent children; individual-specific characteristics such as educational attainment and marital status; and labour-market characteristics such as the number of weeks worked and the number of weeks unemployed in the reference year. With cross-sectional data, it is possible to take account of the available characteristics of each individual woman in the database, and to relate the differences in the observable characteristics of these women to differences in their observed labour market behaviour. Thus, one can compare the probabilities of labour force participation of married women in the three economies and examine the differences in the determinants of participation.

Despite the advantage of comparability inherent in the LIS data files because of the process of standardisation, one needs to be aware of two major problems. One is the inability to control for unobserved individual-specific characteristics that may affect the labour force behaviour of women. Examples of such characteristics are ability, individual

---

9 Each year, the Australian Bureau of Statistics (ABS), Statistics Canada and the U.S. Bureau of the Census conduct a number of surveys. Selected official national surveys are sent to LIS for standardisation to form a database of variables that are comparable for the entire sample.

10 In the USA, the information pertains to the aggregate population aged 16 years and over.
preferences for household activities over labour market activities, and motivation. Second, year-to-year correlation in the labour force participation of women is an important factor: the best predictor of a woman’s participation in the labour market in the current year is her labour force behaviour in the previous year.\textsuperscript{11} A point-in-time database, such as the data provided by LIS, does not allow the researcher to test the importance of continuity in labour force participation.

2.2 Sample selection

Selection criteria are imposed to create the required samples for the analysis in this study. The sample selected comprises married women, with or without dependent children, who choose whether, or not, to participate in the labour market. Age is the first selection criterion: individuals under the age of 21 years and those who are eligible for an age pension or are close to retirement age are excluded from the sample.\textsuperscript{12} As the focus of the analysis is on married women who are less likely to be in the process of acquiring an education or retiring from the labour market, women aged 21 to 54 years are included in the sample.

The second sample selection criterion is the type of household.\textsuperscript{13} Nuclear families consist of parents and their children, which may be extended vertically (for example, including grandparents in addition to parents and their children) or horizontally (for example, including siblings of the household head or spouse, perhaps with their children). In this study, single family households are selected. Thus, some women who are recorded as not

\textsuperscript{11} See Nakamura and Nakamura (1994) who find that after controlling for weeks of market work in the previous year, the probability of current employment rises, rather than falls.

\textsuperscript{12} Until recently, the retirement age to be eligible for a pension in Australia was 60 years for women and 65 years for men. It was possible for women in Australia to withdraw from the labour force and receive income from superannuation funds at 55 years of age and for men to receive a superannuation payment at the age of 60 years. As older women will be looking toward claiming superannuation entitlement in Australia, and could be expected to behave differently, they are excluded from the sample.

\textsuperscript{13} The household is seen as a composite of individuals, held together by some common bond such as family ties, friendship, and economic consideration. Thus, family units are a subset of all households.
living in a single family household are omitted from the sample. For example, an unmarried, adult daughter living with her parents is not included.

2.3 Specification of the model

In analysing labour force participation, neoclassical theory points to the relationships between the labour supply of women and a number of observable individual-specific characteristics. The variables included in early empirical studies of female labour force behaviour, measured by labour force participation or the number of hours worked, were usually limited to those that were attributed a value by the market, such as wages and household income (Killingsworth and Heckman 1986: 186-88). According to Humphrey and Rubery (1986: 86), it is an uncontroversial fact that the ‘fundamental supply-side characteristic’ that distinguishes women in the labour market, namely their primary responsibility for social reproduction, generates a distinctive pattern in their entry to and exit from labour force participation. As the link between the role of women in both paid production and reproduction received greater acknowledgment in the literature, empirical studies introduced other variables in the specification of labour force participation models such as the number of children and the ages of these children.

Heckman (1993: 116) asserts that the main advance in the study of labour supply in the past twenty years has come in recognising and interpreting the variety of different labour supply functions that coexist in the empirical literature. He author maintains that a crucial theoretical distinction is that between labour force participation, or employment choices, (that is, labour supply choices at the extensive margin) and choices about hours of work for labour force participants (that is, choices at the intensive margin). Further, he finds that participation (employment) decisions generally manifest greater responsiveness to wage and income variation than do hours-of-work equations for workers.

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14 Major early empirical work on this topic include Cain (1966); and Bowen and Finegan (1969).
Neoclassical theory posits that an individual is more likely to participate in the labour market if the expected market wage exceeds the reservation wage. The reservation wage is a convenient way of analysing how different variables influence the decision of whether, or not, to participate in the labour force. A variable is likely to increase labour force participation if it raises the expected market wage; it is likely to reduce participation in the labour market if it raises the reservation wage. While the value of non-market time is influenced by preferences, it also depends on the demands placed on the non-market time of an individual. For instance, the presence of small children, especially pre-school age children, is likely to augment the value of household time and discourage female labour force participation. Thus, women with pre-school age children in the family and relatively expensive day care opportunities are likely to have higher reservation wages than single, career-oriented women without any children. *Ceteris paribus*, the latter may be expected to have higher labour force participation rates. The causation, of course, could be in the opposite direction: women who are more committed to the labour market or face more attractive labour market opportunities may decide to have fewer children. A woman who is strongly attached to the labour force prior to the birth of her first child, however, is likely to remain in the labour force after bearing children. Hence, it is difficult to distinguish between these two possible explanations for the association between the presence of children in the family and the labour force participation of women.

Higher non-earned income may afford an individual the choice of not having to work in the labour market. Thus, there is a negative association between the non-earned income and the labour force participation of women. Juhn and Murphy (1997) find that the participation decisions of married women have become less sensitive to the income of partners in recent years and more sensitive to their own market opportunities.

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15 Explanations of the neoclassical model of labour supply are given in Deaton and Muellbauer (1985); and Killingsworth (1983).

16 For instance, see Connelly (1992); and the U. S. Department of Labour Women’s Bureau.

17 For instance, Maassen van den Brink (1994); and Nakamura and Shaw (1994).

18 See, for example, Browning (1992); and Willis (1987).
Education and training appear to increase market productivity and, hence, labour market earnings. This would lead one to expect that education would be positively associated with labour force participation. According to Blau et al. (1998: 98), the positive effect of education on the labour force participation of women may be reduced to the extent that higher educational attainment also raises the productivity of their non-market time. For example, if the time that more educated women spend with their children contributed more to the achievement levels of these children than time spent by less educated women, then the productivity of non-market time would be raised.

Econometric studies of the determinants of labour force participation generally confirm these theoretical expectations. According to Cleveland et al. (1996: 133), in the extensive literature on female labour supply the presence of pre-school children has been identified as a crucial determinant of that supply. Nakamura and Nakamura (1994: 304) assert that child status variables are responsible for the largest share of the explained variation in most empirical models of female labour supply.

The greatest potential strains between market work and family commitments occur when there are young children in the home (Bielby 1992). The presence of children in the family, especially young children, is expected to increase the reservation wage and lower the probability of participation. This may be because child care costs would be incurred if the mother participated in the labour market, or because of the increased productivity of the mother in home production (Connelly 1992: 83). The presence of small children in the family has been, and continues to be, a deterrent to the labour force participation of women in Australia. In their survey of econometric studies on the labour market behaviour of Canadian women, Nakamura and Nakamura (1994) found that the most important determinant of the probability that a married woman would work in the labour market were typically child status variables. In the USA, Leibowitz and Klerman (1995) find that the labour force participation of mothers with children under age six rose from 30 percent in

19 According to the U. S. Department of Labor Women’s Bureau, educational attainment is a reliable predictor of labour force participation.

20 For instance, Evans (1996); and Young (1990).
1970 to 59 percent in 1990; the decomposition suggests that only about half of this increase can be explained by demographic and socioeconomic factors, with the rest demanding further research. According to the U. S. Department of Labor Women’s Bureau (1999), mothers with children between the ages of 14 to 17 years, none younger, participated in the labour force at a rate of 79.4 percent in 1998; mothers with children between the ages of six to 13 years, none younger, 77.9 percent; with children less than six years of age, 65.2 percent; and with children under the age of three, 62.2 percent.

The most notable characteristic of the current division of household labour is that, whether employed in the labour market or not, women continue to do the majority of housework.21 The responsibility for the care of the home and the children imposes constraints on the decisions of a woman regarding market work and reduces her total amount of disposable time. According to Maassen van den Brink (1994: 3), the problem of combining paid employment with the care of children and with family life is seen as a major cause of the low labour force participation rates of women. Moreover, such low rates are often attributed to the limited availability and high cost of child care arrangements.22

According to Nakamura and Nakamura (1985: 179) the second most important determinants of the probability of labour force participation of married women are typically non-earned income variables. Economic theory posits a negative correlation between male earnings and female propensities to be in engaged in market work for married women. This implies that the loss of the earnings of her partner encourages the labour force participation of a married woman. In her review of recent research findings of the labour force participation of women in Australia, Evans (1996) asserts that while non-earned income should have a negative effect on female labour force participation, the empirical evidence for it is mixed. The author notes that while a few aggregate-level results support the hypothesis, individual level studies that control for age or cohorts are uniformly against a non-earned income effect in both direct studies of labour force participation.

21 See, for example, Marini and Shelton (1993); Presser (1994); and Shelton and John (1996).

22 A number of studies indicate that substantial numbers of women report that they would enter the labour market if suitable child care were available at reasonable cost. For instance, Cattan (1990); Cleveland et al. (1996); and O’Connell and Bloom (1987).
Rising female participation rates over the last few decades can be accounted for by the improved educational attainment of women from generation to generation.23 Evans (1996) shows that the effect of education is to encourage the labour market participation of women in Australia; Nakamura and Nakamura (1985) find that the probability of working in the labour market in Canada is positively related to the educational level of women; England and Farkas (1986) find similar effects for education in a number of other countries. The impact of education on labour force participation has been interpreted as a 'wage pull' effect: highly educated women command higher wages and so forego more earnings if they do not participate in the labour market. Consequently, a rise in female earnings is likely to draw women into the labour force.

A study conducted by the Australian Bureau of Statistics (1990) found an inverse relationship between marriage and the time that women spend in paid labour market activity. At the same time, marriage had little observable impact on the time men spent in paid employment. Similar to these findings, Shelton (1992: 57) cites empirical research confirming that marital status has a different meaning for men than for women with respect to time spent in the labour market. In her study of the trends in the economic well-being of women in the USA from 1970 to 1995, Blau (1998) finds that the challenges of combining market work with family responsibilities pose serious obstacles for women, but do not affect men to the same extent.

The explanatory variables upon which the analysis is conditioned are: the number of children in the family, the square of the number of children, non-earned income, educational attainment of the woman under observation, her age, and the square of her age. This is termed the basic model of female labour force participation in this study. It is estimated and analysed in order to determine what a conventional model can offer by way of an explanation for cross-national differences in female labour force participation.

2.4 Descriptive statistics

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23 See Killingsworth and Heckman (1986: 120-23).
Table 2 provides descriptive statistics for the factors associated with female labour force participation of married women. While there are several statistically significant differences, particularly noticeable are the differences in the proportion of married women in each educational category in the three countries. The differences among the three countries are confirmed by the pair-wise t-statistics comparing the average means for country-specific characteristics. There are, however, three exceptions: no statistically significant difference is found for age, nor the non-earned income variable between Australia and Canada; nor for the number of children in the family between Canada and the USA.

As a broad generalisation, the average level of education for married women in North America was higher compared to the same category of women in Australia. Married women in Australia had more children under the age of 18 years, on average, than married women in North America. While there was no statistically significant difference in the average age of married women in Australia and Canada, married women in Australia and Canada were significantly younger than those in the USA.

2.5 Probit results

Table 3 reports probit parameter estimates for the determinants of the probability of labour force participation of married women. In addition, model test statistics for the predictor set are shown. If the model has predictive power, then this should be reflected in some degree by all of the measures.

As in previous econometric studies, the results reported in Table 3 generally confirm the theoretical expectations of the factors affecting female labour force participation. The results in Table 3 show the inhibiting effect of children on the labour force participation of married women, indicated by the large negative coefficients. In North America, the signs

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24 A word of caution is given by Aldrich and Nelson (1984: 56-9) and Demaris (1992: 56) that it may not be prudent to rely on only one measure for assessing predictive efficacy in maximum likelihood estimation, particularly in view of the lack of a consensus on which measure is most appropriate. Heeding this advice, the strategy adopted here is to report a number of different measures in Table 3. For a discussion of these measures see, for instance, Aldrich and Nelson (1984: 55-58); Demaris (1992); and Hosmer and Lemeshow (1989).

25 For instance, Cleveland et al. (1996); and Nakamura and Nakamura (1992, 1994).
of the coefficients for the non-earned income variable are negative. This shows that, *ceteris paribus*, women with greater financial resources other than their own labour market earnings are less likely to participate in the labour market.

*Ceteris paribus*, the probability of married women participating in the labour market is directly associated with education in all three countries: the regression coefficients show that higher education is associated with a higher probability of labour force participation. Likewise, labour market participation is directly associated with age for younger age groups.

### 3.0 Extending the basic model

The previous section utilised a conventional model of female labour force participation to explore cross-national differences. Two applications of the estimates are presented in this section: a simulation and a decomposition.

Since probit parameter estimates from the maximum likelihood estimation have a non-linear relationship with the probability of female labour force participation, it is important to understand the relative quantitative impact of the explanatory variables. This can be achieved by simulating the probability of labour force participation for a representative woman in each country. Using the probit equations, the probability of labour force participation for a representative woman is calculated for each country. Next, characteristics are varied, one at a time, and the change in the probability of labour force participation of married women is noted in order to highlight the effects of differences in behavioural responses among the three countries.

Following the simulation exercise, the differential in cross-national labour force participation of married women is decomposed into the effect of country-specific characteristics and the effect of behavioural responses (as shown by the probit parameter estimates of the model).

#### 3.1 Simulation

Results of the simulation exercise are reported in Table 4. The baseline scenario is for a married woman aged 21 years, with less than a complete high school education, one
child, and no source of income other than her own earnings. Using the probit equations, the probability of labour market participation for this representative woman is calculated for each country. The first row of Table 4 reports the baseline results. Notice that the representative woman has a different probability of labour force participation in each country, that is, 52.0 percent in Australia compared with 63.4 percent in Canada. This difference is larger than the actual difference in labour force participation rates between these two countries (71 percent for Australia; 79 percent for Canada). In the USA, the representative married woman is estimated to have a 64.2 percent labour market participation rate (75 percent is the observed rate). This suggests that differences in country-specific characteristics may have a substantial contribution to make in explaining cross-national differences in the labour force participation of married women.

Next, characteristics are varied, one at a time, and the change in the probability of labour market participation is calculated. Such a simulation highlights the effect of differences in behavioural responses among the three countries. First consider the differences in the responses in each of the three countries to the child variables. For example, if the representative woman did not have any children, rather than one child, then the probability of labour force participation for married women in Australia increases by 8.5 percent; in Canada by 7.3 percent; and by 6.3 percent in the USA. Notice that the magnitude of the effect of children on the labour market behaviour of married women is far greater in Australia than in North America.

On the other hand, if the representative woman had three children (rather than the baseline case of a married woman with one child), then her probability of labour market participation decreases by 12.4 percent in Australia; 13.2 percent in Canada; and 11.7 percent in the USA. In this case, the effect of additional children is similar in the three countries.

In general, there are substantial differences between Australia and North America. The differences in the magnitude of the responses in the probability of labour force participation of married women to child variables lend some support to the hypothesis that
cross-national differences in attitudes toward the paid employment of mothers may be an important factor in explaining the variation in participation rates.\textsuperscript{26}

Second, consider a change in the level of educational attainment. If the representative woman had completed a high school education, then her probability of participation in the labour market increases by 7.1 percent in Australia, 10.1 percent in Canada and 10.7 percent in the USA. On the other hand, if the representative woman had a university education instead of less than high school, then her probability of labour force participation increases by 15.4 percent in Australia, 20.1 percent in Canada and 18.7 percent in the USA. These simulation results highlight the important effect of the cross-national differences attributable to the responses of higher education, although the magnitude of the effect of higher education is smaller in Australia than in North America.

3.1 Decomposition of the differential

One way to explore the differential in cross-national labour force participation is to decompose it into the effect of country-specific characteristics and the effect of behavioural responses (as shown by the probit parameter estimates of the model). Assume that labour market participation for individual \( i \) in country 1 at time \( t \) can be written as:

\[
lp_{1it} = \beta_{1i} X_{1it} + \mu_{1it}
\]

and labour force participation for individual \( i \) in country 2 at time \( t \) can be written as:

\[
lp_{2it} = \beta_{2i} X_{2it} + \mu_{2it}
\]

where \( \beta_{1i} \) and \( \beta_{2i} \) are defined so that \( E(\mu_{1it} | X_{1it}) = 0 \) and \( E(\mu_{2it} | X_{2it}) = 0 \). The difference in mean labour force participation rates for year \( t \) can be written as:\textsuperscript{27}

\[
lp_{1mt} - lp_{2mt} = (X_{1mt} - X_{2mt}) \beta_{1t} + (\beta_{1t} - \beta_{2t}) X_{2mt}
\]

where \( lp_{mt} \) and \( X_{mt} \) denote the mean labour force participation rates and country-specific characteristics for all individuals in a given country. In equation (2.8), the first term on the right-hand side is the component of the differential that can be attributed to differences in

\textsuperscript{26} It is also possible that differences in child care arrangements may be an important factor in explaining cross-national variation in the labour market participation rates of married women.

\textsuperscript{27} This follows the Oaxaca (1973) decomposition cited in Doiron and Riddell (1994: 508).
average country-specific characteristics that influence labour force participation. The second term in the equation represents differences in the estimated coefficients and is associated with cross-national differences in the impacts of those characteristics on the probability of labour force participation. The decomposition in equation (2.8) is, however, for a linear ordinary least squares (OLS) model and utilises the fact that the OLS regression line passes through the sample means of the data.

The decomposition presented by Even and Macpherson (1994) is an extension of the one proposed by Oaxaca (1973) for the linear regression model to a non-linear regression model. In applying this method, one calculates the predicted probability of the dependent variable under review for each individual observation in the sample and then averages over all the observations. The decomposition of the differential is calculated by computing the average probability when the explanatory variables are held constant. Hence, the decomposition of average predicted probabilities is linear. Moreover, the decomposition involves averaging estimated probabilities or predicted values over all individuals in the sample (Doiron and Riddell 1994: 510).

Following this method, one calculates the probability of labour force participation for each individual in each country. Second, one predicts the labour force participation density if each individual in the reference country retained their own characteristics, but the impacts of those characteristics on the probability of labour force participation were those of the country with which the comparison is made. The difference in female labour force participation rates can be written as:

\[
(2.9) \quad \text{lfp}, - \text{lfp}, = (\text{lfp}, - \text{lfp},) + (\text{lfp}, - \text{lfp},)
\]

where \( \text{lfp}, \) and \( \text{lfp}, \) are the labour force participation density if each individual in each country retained her own characteristics and the impacts of these characteristics on the probability of labour force participation were those of her own country of residence; \( \text{lfp}, \) is the labour force participation density if each individual in the reference country retained the own characteristics, but the impacts of each characteristic on the probability of labour force participation were those of the country with which the comparison is made.

\[28\] An alternative method, based on Taylor series approximation, is outlined by Doiron and Riddell (1994).
The first term on the right-hand side of equation (2.9) represents the portion of the gap associated with differences in country-specific characteristics that influence labour force participation. The second term is associated with differences in the impacts of those characteristics on the probability of labour force participation. As an illustration, consider the difference in labour force participation between Canada \((lfp_1 = 78.59\text{ percent})\) and Australia \((lfp_2 = 70.63\text{ percent})\), a difference of 7.96 percent. If Australian married women were to retain their own characteristics, but the impact of each characteristic on the probability of labour force participation were those of Canadian women \((lfp_0 = 74.18)\), then the gap associated with differences in country-specific characteristics that influence participation is 4.41 while the gap associated with differences in the impacts of those characteristics on the probability of participation is 3.55.

Table 5 shows the results for labour market participation after one predicts the probability of labour force participation for each individual observation in the sample and then takes the average over all observations. The results indicate that if the responses of married women in Canada are imposed on the characteristics of married women in Australia, then female labour force participation is higher than using own-country behavioural responses. The predicted labour force participation rate for married women in Australia, given their own country-specific characteristics and responses is 70.6 percent. If Australian married women had the responses of married women in Canada, then their labour force participation rate would be 73.8 percent.

On the other hand, if the characteristics for either Canada or the USA are applied to the probit coefficients of Australia, then the labour force participation of married women is also higher. If Australian married women had the characteristics of married women in Canada, then their labour force participation rate would be 74.18 percent. Likewise, if Australian married women had the characteristics of married women in the USA, then their participation rate would be 75.83 percent. Differences in country-specific characteristics make a substantial contribution in explaining cross-national differences in the probability of labour market participation of married women.

The upper panel in Table 6 shows the results of the decomposition of the differential in predicted probabilities of labour force participation into characteristics and in behavioural
responses (or coefficients). These results indicate that the more important explanation in accounting for variation between Australia and Canada is the impact of responses on the probability of labour force participation: 55.53 percent of the total difference. On the other hand, it is the difference attributable to characteristics that are extremely important in explaining variation in the female labour force participation between Australia and the USA: 130 percent of the total difference. Further information about these differences can be obtained by examining the role of individual explanatory variables.

The lower panel in Table 6 reports the contribution that each explanatory variable makes to the ‘differences in characteristics’ component of the total variation. These decompositions are based on factor shares, the linear approximation method suggested by Even and Macpherson (1994). The authors attribute to each factor a share of the gap ascribed to characteristics equal to the share of this factor in the total impact on labour force participation. Doiron and Riddell (1994: 511) note that this method is a linear, exact decomposition of the gap in the average predicted probabilities.29

In comparing Australia with North America generally, the contribution of the number of children and educational attainment are the characteristics most consequential in contributing to cross-national variation in labour force participation. The more important characteristic of the two is the contribution of educational attainment, particularly the role of a university education. For instance, 86.50 percent of the difference in labour force participation between married women in Australia and Canada is attributable to the effect of a university education while 51.98 percent of the differential between Australia and the USA is attributable to this characteristic. The differential between Australia and the USA can be further explained by a number of additional factors: 51.99 percent to the impact of age, 45.86 percent by the completion of a high school education, and 21.25 percent to the number of children.

4 Summary of findings

29 Doiron and Riddell (1994: 519) apply both a linear decomposition and a first order Taylor series approximation in their analysis of the impact of unionisation on male-female earnings differences in Canada. The authors find that the results are similar.
This study examined cross-national variation in the labour market participation of women in Australia, Canada and the USA. An examination of the cross-sectional data using the third wave of the LIS database revealed that average labour force participation rates for married women aged between 21 and 54 years were different in Australia, Canada and the USA. In particular, it was noted that married women in Australia had more children under the age of 18 years, on average, than those in North America; and that there was a greater proportion of married women in Australia with less than a high school education.

In general, the results of the basic model of labour force participation for married women confirms a priori theoretical expectations. In addition, the analysis indicates that the explanatory variables of the basic model are relevant in explaining the probability of female labour force participation. The results of the basic model showed that the probability of married women participating in the labour market in all three countries was inversely associated with the number of children under the age of 18 years, while higher education and age at younger ages were associated with a higher probability. The parameter estimates for the non-earned income variables were significantly negative in North America.

The simulation exercise established that variation in cross-national the labour force participation rates of married women could be explained by both country-specific characteristics and the measured differences in the responses to those characteristics. Participation rates were lower in Australia compared with North America both because married women in Australia had more children and because Australian women were less likely to participate in the labour market when children were present.

The decomposition of the differential into the effect of country-specific characteristics and the effect of responses showed that if the responses of married women in Canada were imposed on the characteristics of Australian women, then participation was higher. On the other hand, if the characteristics for either Canada or the USA were applied to the behavioural responses in Australia, then the labour market participation for married women was also higher. This confirms that differences in country-specific characteristics have a substantial contribution to make in explaining cross-national variation.
The results of this study indicate that there is significant cross-country variation in the labour force participation of married women, much of which remains to be explained. It is necessary to conduct further research into this area.
Table 1

Labour force participation for women aged between 21 and 54 years

using the third wave of the Luxembourg Income Study (LIS) data.

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Never married women</td>
<td>0.78 (0.0236)</td>
<td>0.80 (0.0149)</td>
<td>0.80 (0.0157)</td>
<td>-1.56</td>
<td>-1.26</td>
<td>0.28</td>
</tr>
<tr>
<td>Married women</td>
<td>0.71 (0.0061)</td>
<td>0.79 (0.0048)</td>
<td>0.75 (0.0064)</td>
<td>-11.14*</td>
<td>-4.81*</td>
<td>3.38*</td>
</tr>
</tbody>
</table>

Source: Estimates from the Luxembourg Income Study (LIS).

Note 1: The statistics in the first three columns are weighted means with standard errors shown in parentheses.

Note 2: The statistics in the last three columns are pair-wise t-statistics to test the null hypothesis that the overall means of the samples are equal. The means of the samples are statistically different at the 0.05 level of significance when their t-statistics are greater than 1.96.

Note 3: While Statistics Canada and the various national statistical agencies in the USA use the calendar year in the construction of their surveys, the Australian Bureau of Statistics (ABS) uses a different construct. This is the financial year that commences on July 1 in one calendar year and ends on June 30 of the following calendar year.
Figure 1

Age-participation profiles of women in Australia

Figure 2

Age-participation profiles of women in Canada

Figure 3

Age-participation profiles of women in the USA

Table 2
Descriptive statistics for married women aged between 21 and 54 years

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>lfp rate</td>
<td>0.71 (0.0061)</td>
<td>0.79 (0.0048)</td>
<td>0.75 (0.0064)</td>
<td>-11.14*</td>
<td>-4.81*</td>
<td>3.38*</td>
</tr>
<tr>
<td>Number of children</td>
<td>1.44 (0.0169)</td>
<td>1.30 (0.0136)</td>
<td>1.31 (0.0176)</td>
<td>5.25*</td>
<td>3.84*</td>
<td>-0.85</td>
</tr>
<tr>
<td>Non-earned income</td>
<td>29071.92 (0.2778)</td>
<td>31190.67 (0.2301)</td>
<td>35559.14 (0.3738)</td>
<td>-1.23</td>
<td>-12.94*</td>
<td>-14.03*</td>
</tr>
<tr>
<td>Age</td>
<td>35.51 (0.0952)</td>
<td>35.74 (0.1115)</td>
<td>36.13 (0.1309)</td>
<td>-1.15</td>
<td>-2.61*</td>
<td>-3.85*</td>
</tr>
</tbody>
</table>

Education

|----------------------|-------------------|-------------|----------|------------------------------------------|---------------------------------------|                                   |
| Less than high school| 0.45 (0.0066)     | 0.22 (0.0049) | 0.12 (0.0048) | 25.62*                                   | 38.75*                                 | 16.37*                            |
| Completed high school| 0.12 (0.0043)     | 0.27 (0.0052) | 0.39 (0.0072) | -21.16*                                  | -32.84*                                | -13.34*                           |
| Post secondary       | 0.34 (0.0063)     | 0.38 (0.0057) | 0.27 (0.0065) | -5.47*                                   | 7.35*                                  | 12.84*                            |
| University           | 0.09 (0.0039)     | 0.13 (0.0040) | 0.22 (0.0062) | -2.84*                                   | -19.15*                                | -17.79*                           |
| Number               | 5.614             | 7.219       | 4.593    |                                          |                                       |                                   |

Source: Estimates from LIS.

Note 1: All variables in the table are continuous, except for education which is categorical. The mean values for the categorical educational variables represent the proportion of individual observations in each category.

Note 2: The statistics in the first three columns are weighted means with standard errors shown in parentheses.

Note 3: The statistics in the last three columns are pair-wise t-statistics to test the null hypothesis that the means of the three sample are equal. The sample means are statistically different at the 0.05 level of significance when their t-statistics are greater than 1.96, the critical value applicable in a large sample.

Non-earned income is expressed in 1991 U.S. dollars.
Table 3

Basic model of labour force participation:

Probit parameter estimates for married women aged between 21 and 54 years

The dependent variable is labour force participation (= 1 if the sum of weeks of full time employment, weeks of part time employment and weeks of unemployment in the reference year is positive; = 0 otherwise)

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Intercept</td>
<td>-2.5032*</td>
<td>-1.5200*</td>
<td>0.1123</td>
</tr>
<tr>
<td></td>
<td>(0.5426)</td>
<td>(0.5218)</td>
<td>(0.1616)</td>
</tr>
<tr>
<td>Number of children</td>
<td>-0.3791*</td>
<td>-0.3483*</td>
<td>-0.3380*</td>
</tr>
<tr>
<td></td>
<td>(0.0608)</td>
<td>(0.0587)</td>
<td>(0.0171)</td>
</tr>
<tr>
<td>Number of children squared</td>
<td>0.0322*</td>
<td>0.0195*</td>
<td>0.0239*</td>
</tr>
<tr>
<td></td>
<td>(0.0141)</td>
<td>(0.0143)</td>
<td>(0.0038)</td>
</tr>
<tr>
<td>Non-earned income (1991 U.S. dollars)</td>
<td>0.0019</td>
<td>-0.0104*</td>
<td>-0.0080*</td>
</tr>
<tr>
<td></td>
<td>(0.0015)</td>
<td>(0.0013)</td>
<td>(0.0003)</td>
</tr>
<tr>
<td>Education: less than high school</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Completed high school</td>
<td>0.2872*</td>
<td>0.4681*</td>
<td>0.5103*</td>
</tr>
<tr>
<td></td>
<td>(0.0921)</td>
<td>(0.0684)</td>
<td>(0.0258)</td>
</tr>
<tr>
<td>Post secondary education</td>
<td>0.4538*</td>
<td>0.8135*</td>
<td>0.7325*</td>
</tr>
<tr>
<td></td>
<td>(0.0642)</td>
<td>(0.0676)</td>
<td>(0.0284)</td>
</tr>
<tr>
<td>University education</td>
<td>0.6450*</td>
<td>1.0699*</td>
<td>0.9930*</td>
</tr>
<tr>
<td></td>
<td>(0.1143)</td>
<td>(0.1027)</td>
<td>(0.0313)</td>
</tr>
<tr>
<td>Age</td>
<td>0.2004*</td>
<td>0.1666*</td>
<td>0.0626*</td>
</tr>
<tr>
<td></td>
<td>(0.0319)</td>
<td>(0.0301)</td>
<td>(0.0092)</td>
</tr>
<tr>
<td>Age squared</td>
<td>-0.0029*</td>
<td>-0.0025*</td>
<td>-0.0012*</td>
</tr>
<tr>
<td></td>
<td>(0.0004)</td>
<td>(0.0004)</td>
<td>(0.0001)</td>
</tr>
</tbody>
</table>

Continued on next page
Table 3 continued

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Model statistics</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>-2 Log likelihood</td>
<td>217.096</td>
<td>430.484</td>
<td>3106.302</td>
</tr>
<tr>
<td>Hosmer Lemeshow Goodness-of-fit-statistic</td>
<td>9.645</td>
<td>17.631</td>
<td>7.82</td>
</tr>
<tr>
<td>$R^2_L$-statistic</td>
<td>0.094</td>
<td>0.149</td>
<td>0.492</td>
</tr>
<tr>
<td>Gamma</td>
<td>0.362</td>
<td>0.441</td>
<td>0.426</td>
</tr>
<tr>
<td>Number of observations</td>
<td>5,614</td>
<td>7,219</td>
<td>4,593</td>
</tr>
</tbody>
</table>

Source: Estimates from LIS.

Three variables in the LIS data identify the extent of labour force attachment for each respondent in the reference year:

1) weeks worked full time (the Canadian file for reference year 1991 does not differentiate between full-time weeks and part-time weeks of market work);
2) weeks worked part time
3) weeks unemployed.

These three variables range from zero to 52 weeks. For the purpose of this study, one dichotomous variable, termed labour force participation, is constructed from these three. This takes the value of one if the sum of weeks of full time employment, weeks of part time employment and weeks of unemployment in the reference year is positive; zero otherwise.

Note: The numbers presented in each column are probit parameter estimates with standard errors shown in parentheses.
Table 4

Predicted changes in the probability of labour force participation
of married women in response to variation in characteristics

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Australia</th>
<th>Canada</th>
<th>USA</th>
</tr>
</thead>
<tbody>
<tr>
<td>Baseline case</td>
<td>0.52</td>
<td>0.634</td>
<td>0.642</td>
</tr>
<tr>
<td>Variation in the number of children</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Number of children = 0</td>
<td>0.085</td>
<td>0.073</td>
<td>0.063</td>
</tr>
<tr>
<td>Number of children = 2</td>
<td>-0.07</td>
<td>-0.069</td>
<td>-0.117</td>
</tr>
<tr>
<td>Number of children = 3</td>
<td>-0.124</td>
<td>-0.132</td>
<td>-0.043</td>
</tr>
<tr>
<td>Variation in non-earned income (expressed in 1991 U.S. dollars)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Family income less own earnings = 15,000</td>
<td>*</td>
<td>-0.037</td>
<td>-0.028</td>
</tr>
<tr>
<td>Family income less own earnings = 30,000</td>
<td>*</td>
<td>-0.075</td>
<td>-0.057</td>
</tr>
<tr>
<td>Family income less own earnings = 45,000</td>
<td>*</td>
<td>-0.114</td>
<td>-0.086</td>
</tr>
<tr>
<td>Variation in education</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>High school education</td>
<td>0.071</td>
<td>0.101</td>
<td>0.107</td>
</tr>
<tr>
<td>Post secondary education</td>
<td>0.108</td>
<td>0.162</td>
<td>0.147</td>
</tr>
<tr>
<td>University education</td>
<td>0.154</td>
<td>0.201</td>
<td>0.187</td>
</tr>
<tr>
<td>Variation in age</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Age = 30 years</td>
<td>0.115</td>
<td>0.077</td>
<td>-0.013</td>
</tr>
<tr>
<td>Age = 40 years</td>
<td>0.109</td>
<td>0.06</td>
<td>-0.047</td>
</tr>
<tr>
<td>Age = 50 years</td>
<td>-0.04</td>
<td>-0.076</td>
<td>-0.16</td>
</tr>
</tbody>
</table>

Source: Calculations based on estimates from LIS.

Note 1: The baseline case is a married woman aged 21 years who has less than complete high school education, has one child, and no source of income other than her own earnings.

Note 2: An asterisk indicates an insignificant result.
Table 5
Simulation of the probability labour force participation
for married women aged between 21 and 54 years, 1989-90

<table>
<thead>
<tr>
<th>Probit coefficients</th>
<th>Characteristics</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Australia (1)</td>
</tr>
<tr>
<td>Australia (1)</td>
<td>70.63</td>
</tr>
<tr>
<td>Canada (2)</td>
<td>73.84</td>
</tr>
<tr>
<td>USA (3)</td>
<td>68.28</td>
</tr>
</tbody>
</table>

Source: Calculations based on estimates from LIS.

Note 1: The numbers in each column are predicted labour force participation rates for married women aged between 21 and 54 years in 1989-1991. To calculate these, one predicts the probability of labour market participation for each individual observation in the sample and then averages over all the observations.

Note 2: The predicted labour force participation rate is calculated as $X_i\beta$, where $i$ represents either Australia, Canada or the USA; $\beta_i$ are vectors of country-specific coefficients and $X_i$ are vectors of country-specific characteristics. Row 1 is calculated by using country-specific characteristics and applying the estimated probit coefficients for Australia; row 2 by using country-specific characteristics and the estimated coefficients of Canada; and row 3 by using country-specific characteristics and the coefficients of the USA.
Table 6
Decomposition of cross-national labour force participation into characteristics and responses

<table>
<thead>
<tr>
<th></th>
<th>Australia/Canada</th>
<th>Australia/USA</th>
<th>Canada/USA</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total difference</td>
<td>0.0796</td>
<td>0.0741</td>
<td>0.0395</td>
</tr>
<tr>
<td>Characteristics</td>
<td>0.0354</td>
<td>0.052</td>
<td>-0.0112</td>
</tr>
<tr>
<td>(percent)</td>
<td>44.47</td>
<td>130</td>
<td>-28</td>
</tr>
<tr>
<td>Responses (coefficients)</td>
<td>0.0442</td>
<td>-0.012</td>
<td>0.0507</td>
</tr>
<tr>
<td>(percent)</td>
<td>55.53</td>
<td>-30</td>
<td>128</td>
</tr>
</tbody>
</table>

Contribution of individual characteristics to the difference

<table>
<thead>
<tr>
<th></th>
<th>Australia/Canada</th>
<th>Australia/USA</th>
<th>Canada/USA</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of children</td>
<td>0.0592</td>
<td>0.2125</td>
<td>0.0071</td>
</tr>
<tr>
<td>Number of children squared</td>
<td>-0.02</td>
<td>-0.0623</td>
<td>-0.0033</td>
</tr>
<tr>
<td>Non-earned income</td>
<td>0.0011</td>
<td>0.0674</td>
<td>0.0479</td>
</tr>
<tr>
<td>(1991 U.S. dollars)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Completed high school</td>
<td>0.0596</td>
<td>0.4586</td>
<td>-0.0651</td>
</tr>
<tr>
<td>Post secondary education</td>
<td>0.0294</td>
<td>-0.1831</td>
<td>0.0915</td>
</tr>
<tr>
<td>University education</td>
<td>0.865</td>
<td>0.5198</td>
<td>0.9063</td>
</tr>
<tr>
<td>Age</td>
<td>-0.047</td>
<td>0.5199</td>
<td>-0.0413</td>
</tr>
<tr>
<td>Age squared</td>
<td>0.0527</td>
<td>-0.5328</td>
<td>0.0569</td>
</tr>
</tbody>
</table>

Source: Calculations based on estimates from LIS.

1 The method used to determine the contribution of individual characteristics to variation in cross-national labour force participation is based on factor shares. It is the approach used by Even and Macpherson (1994); shown as equation (2.9) in this study.

Note: Those characteristics that contribute more to the explanation of differences between countries are presented in bold type.
BIBLIOGRAPHY


