DEPARTMENT OF ECONOMICS

WORKING PAPER SERIES

2003-01

McMASTER UNIVERSITY

Department of Economics
Kenneth Taylor Hall 426
1280 Main Street West
Hamilton, Ontario, Canada
L8S 4M4

http://www.mcmaster.ca/economics/

The Impact of Lifecycle Events on Women's Labour Force Transition: a panel analysis

Sung-Hee Jeon*

Department of Economics, McMaster University

Melbourne Institute of Applied Economic and Social Research, The University of Melbourne

April 2007

Abstract:

This panel study explores the impact of different lifecycle events on women's labour force transitions. Whether the factors that determine entry into the labour force differ from the factors that determine withdrawal from the labour force is explicitly investigated. The results demonstrate that labour force transitions – entry and withdrawal – occur more frequently among young women. The event of childbirth is strongly associated with labour force withdrawal, while marital separation and reductions in family earnings are strongly associated with labour force entry. Moreover, labour force transition probabilities are more sensitive to income-reducing events than to income-supplementing events.

JEL classifications: J12; J13; J21
Keywords: Labour Force Transitions; Women; Labour Force Participation; Longitudinal Data.

* *Correspondence*: Sung-Hee Jeon, Melbourne Institute of Applied Economic and Social Research, The University of Melbourne, Tel: 61-3-83442191, Email:shjeon@unimelb.edu.au

1. Introduction

In this paper women's labour force transitions and their association with 'trigger events' over their lifecycle are examined. Included is an explicit investigation of both aspects of women's labour force transitions: labour force entry and withdrawal. The factors which determine entry to and exit from the labour force are assessed.

In Canada, during the 1970's and 1980's, the labour market participation of women grew steadily from less than 50% up to 70%; throughout the 1990's it remained at around 75%. This is lower than the relevant male participation rates (Beaudry and Lemieux 1999; Chaykowski and Powell 1999). The labour force participation rates of Canadian women and men in the 1990's, by age group, are given in table A.1. The average labour force participation rate of prime-age men is over 90% while the average labour force participation rate of prime-age women is consistently less than 80%. This leads us to question whether the women's labour market participation rate has reached a long-run steady-state level. If the labour force participation rate is constant at the long-run steady-state level in each period, the labour force participation rate equals the labour force entry rate divided by the total labour force transition rate, which is the sum of the labour force entry and withdrawal rates. An explanation of female participation needs to relate their lifecycle behaviour to labour force transition.[1]

This study explicitly investigates some dynamics of women's labour market participation, labour force entry and withdrawal, and the association of those transitions with lifecycle events. The results provide a complementary summary of the degree to which transitions are associated with particular events.

[1] $LFR_t = (1\text{-}LWR_t) * LFR_{t-1} + LER_t * (1\text{-} LFR_{t-1})$, where LFR is calculated as number of women in labour force in period *t* divided by the population of women over 19 years old in period *t* (a state probability), LWR is calculated as the number of women withdrawn from labour force in period *t* divided by the number of women in the labour force in period *t-1*, and LER is calculated as the number of women entered into the labour force in period *t* divided by the number of women not in the labour force in period *t-1*. NLFR (1-LFR) is the number of women not in the labour force in period t / population of women over 19 years old in period t. If $LFR_t = LFR_{t-1}$ then $LFR_t = LER_t / (LER_t + LWR_t)$

Women's labour market participation is particularly interesting, because their lifecycle events are different to those of men. Obviously, giving birth is unique to women; childcare and housework are still more likely to be perceived as women's work within the family. A US study (Akerlof and Kranton 2000) shows that when men do all the market work, they contribute on average about 10% of house work, but as their share of outside work falls, their share of housework rises to no more than 37%.[2] An identity model of behaviour illustrates how the identity of 'woman' influences the decision to participate in the labour market (Akerlof and Kranton 2000). Gender is not an identity solely of choice; it is an assigned identity which is associated with different ideal physical attributes and prescribed social behaviour. The identity model shows that if women's identity is enhanced by work at home, they will have weaker labour force attachment than do men.

Considering the more traditional (neoclassical) model of female labour supply, the wife's labour supply is commonly defined as conditional on the husband's income. Consequently in this model, a married woman conditions her labour supply on her husband's labour supply decision. This makes the wife the secondary earner in the household. Thus, a woman's labour force participation is more elastic, with respect to changes in wage and non-labour income and other fixed costs, than is that of the primary male earner. Although it is an inconclusive argument that women would be treated as secondary earners in families,[3] it is observable that women's labour force transitions generally occur more frequently than those of men. One example would be women's labour force transition associated with childbearing and childcare. A woman who once

[2] According to the specialization hypothesis (Becker 1965), there will be a negative monotonic relationship between the share of home work done by one partner and that same partner's share of market work.

[3] Mroz (1987) undertakes an exogeneity test for non-wife's income variables, and he finds that it could not be rejected at reasonable levels of significance. On the other hand, Hausman and Ruud (1984) suggest that the joint labour supply model (family labour supply model) in which the family utility function is maximized subject to a family budget constraint could not be rejected. Aronsson (1994) also tests the hypothesis, using Swedish data, that the husband's hours of work are weakly separable, both from the wife's hours of work and from household consumption. The hypothesis of weak separability is rejected in his study

withdrew from the labour force because of caring for children may re-enter after her children have grown up.

In the first part of this study, the probability of entry and withdrawal from the labour force *conditional* on experiencing trigger events such as marriage, divorce, childbirth, and the financial consequences of changes in the employment status of other household members is estimated. In the process, we estimate 1) unconditional probabilities of entry and withdrawal from the labour force, 2) unconditional probabilities of each trigger event, 3) probabilities of labour force transitions conditional on lifecycle events and 4) probabilities of lifecycle events conditional on labour force transitions. Such statistics give us a descriptive measure of the relative importance of various lifecycle events in labour force transitions. They can be used to construct a (descriptive) decomposition of the fraction of all transitions that is accounted for by each of the different lifecycle events. This methodology is adopted from Jenkins and Schluter (2003).[4] The analysis is extended by estimating random effects panel probit models of labour force transitions with a set of control variables including trigger events, age, regional dummies, educational dummies and a correction term for sample selection bias. A two-step sample selection correction method is employed for a dynamic panel data model with a binary outcome, as suggested by Orme (1997).[5]

The study results show that the event of childbirth is strongly associated with labour force withdrawal, while marital separation and decreases in family earnings are strongly associated with labour force entry. In addition, labour force transition probabilities are more sensitive to income-reducing events than to income-supplementing events. Assessing the importance of various events as root causes of transitions may have important policy applications. Recognizing

[4] Jenkins and Schluter (2003) examine whether cross-national differences in child poverty and entry and exit rates arise from cross-national differences in the prevalence of trigger events experienced by households and household members, or by cross-national differences in entry and exit probabilities conditional on experiencing those trigger events.

[5] The approach here is similar to Bruce (2000) who uses a transition probit and Orme's sample selection correction to analyze the self-employment transitions.

the relevance of the dynamic dimension to explanations of labour force participation has implications for policy making related to women's labour market participation.

The paper proceeds as follows. Section 2 summarizes what we know about women's labour market participation in relation to lifecycle events, and it discusses a potential pitfall in the interpretation of findings from common empirical models. Section 3 describes the data, with explanations of the key definitions that are the basis of this exploratory analysis. Section 4 examines trigger events and labour force transitions with three types of statistics. Section 5 presents the multivariate methods and reports the estimation results. Section 6 contains concluding remarks.

2. Empirical literature on women's labour market participation and a potential pitfall in the interpretation of findings

It is not surprising that the effects of childbearing and childcare on women's labour market activities have received a lot of attention from researchers. Nakamura and Nakamura (1992), Blundell, Ham and Meghir (1998), and Barrow (1999) report significant negative consequences of childcare on women's labour force participation. Yet Gunderson (1998) has shown that the magnitude of the negative effect of childcare on women's labour supply has declined over time. Carrasco (2001), Chun and Oh (2002) and Francesconi (2002) find strong negative effects from fertility for women's labour force participation. Dex et al. (1998) and Gutierrez-Domenech (2005) find that after giving birth, education is an important factor for the continuity of employment. Regardless of the countries studied, childbearing/caring has a negative impact on women's labour market attachment. In particular, empirical evidence shows that changing work patterns surrounding the birth of children (especially first births) provide crucial information on individual heterogeneity of the preference for work. Some studies demonstrate that women who return to work shortly after the birth of a first child are considerably more likely to be persistent workers throughout their lives (Mott and Shapiro 1983; Shapiro and Mott 1994).

In this study, labour force withdrawals associated with child birth and care are examined, but also labour force entries associated with becoming free from childcare. This paper also contributes to the findings on exits by accessing the relative importance of childbearing/caring compared to other events.

The effect of marital status on women's labour supply is another strand of research. Johnson and Skinner (1986; 1988) are interested in the effect of divorce on women's labour supply. They find that women's labour supply is positively associated with divorce. Johnson and Skinner (1986) suggest that women who subsequently divorce increase their labour supply and labour force participation in the three years prior to separation. In their later study, Johnson and Skinner (1988) examine the correlation between increased labour supply among separated women and changes in observable characteristics (for example, fall in family income and the rise in the woman's after-tax wage rate). They address the problem that unobservable factors related to marital status are also important determinants of the change in women's labour force participation. In addition, Nakamura and Nakamura (1996) study the dynamics of women's labour supply using US panel data from the 1969 to 1979 waves of the Michigan Panel Study of Income Dynamics (PSID). Although it provides a descriptive analysis of the dynamics of labour supply, they find significant impacts from divorce and childbirth on women's labour supply, not only in the event year but also in the year prior to it. [6] Here, the impact of marriage and separation on women's labour force transitions is studied taking into account the financial consequences of these events.

As an empirical strategy, probit (or logit) models for a binary outcome are generally used by researchers to estimated women's labour market participation, conditional on women's

[6] Nakamura and Nakamura (1996) estimate probit equations for the probability that women start work in year *t,* and for the probability that women continue to work in year *t,* using two sub-samples, which include all women who did not work in year *t*-1 and all women who worked in *t*-1 respectively. In addition, they estimate equations for the annual hours of work in year *t* using two sub-groups of women who did not work in *t*-1 but who worked in year *t* and women who worked in *t*-1 and also in *t* respectively. They also examine the effect of expected events on women's labour supply decisions by defining events over three years *t*-1, *t* and *t*+1.

characteristics such as marital status, children, education, and family income. However, using such models systematically imposes that labour force entry and withdrawal (which are responses to changes in wages, income and fixed costs) are symmetric responses. Suppose Y_t and Y_{t-1} are (time) independent, where Y is a binary outcome and a function of Xs, then the marginal effects of a change in X on the binary outcome of Y are symmetric.[7] The systematic symmetry occurs not only with the probit model. It is imposed with other static state models: $Y_t = f(X_t)$ like the logit and linear probability models. Most studies simply focus on one side of labour force responses (in most cases labour force participation or entry). However, they implicitly (or explicitly) regard the labour force response to changes in wages, income and fixed costs as symmetrical. This creates a potential pitfall in the interpretation of the existing empirical literature. For instance, the magnitude of the marginal effect of a decrease in family income on labour force entry is assumed equal to the magnitude of the marginal effect of an increase in family income on labour force withdrawal. In the panel perspective, this study explicitly investigates whether the factors which determine entry into the labour force differ from the factors which determine withdrawal from the labour force. This approach also allows us to identify asymmetries in women's labour force entry and withdrawal responses to changes in lifecycle events.

3. Data and definitions

Data are used from survey reference years 1993 to 2000 of the Canadian Survey of Labour and Income Dynamics (SLID). The SLID is a longitudinal survey with a rotating panel structure. The first wave of the first panel was in 1993. The original sample of respondents was followed and interviewed at one-year intervals for the next six years. The second six-year panel

[7] If Y_t and Y_{t-1} are independent, where Y is labour force participation status, *Pr(labour force entry)* = $Pr(Y_t=1 \mid Y_{t-1}=0) = Pr(Y_t=1 \mid Y_{t-1}=1) = Pr(Y_t=1)$ and *Pr(labour force withdrawal)* = $Pr(Y_t=0 \mid Y_{t-1}=1) = Pr(Y_t=0 \mid Y_{t-1}=0) = Pr(Y_t=0) = 1 - Pr(Y_t=1)$. For the probit model, where $\Phi(\cdot)$ is a standard normal cumulative distribution function, $\Pr(Y=1) = \Phi(X\beta)$ and $\Pr(Y=0) = 1 - \Phi(X\beta)$. The marginal effect of one element (j) of X on Y=1 is $\frac{\partial \Pr(Y=1)}{\partial X_j} = \phi(X\beta)\beta_j$ and on Y=0 is $\frac{\partial \Pr(Y=0)}{\partial X_j} = -\phi(X\beta)\beta_j$.

began in 1996. Each wave comprises two separate interviews. One is a labour interview in January; the other is an income interview in May.[8] For both interviews, the reference year is the previous calendar year. There are two reasons to use SLID for this study. First this panel study of female labour supply in Canada fills a gap in the literature. Second, from an international perspective the SLID data have some unique attractive features. SLID has more accurate income data compared with the self-reported (surveyed) income data of other panel studies. There are two potential sources of income data for SLID: respondents can either report income sources during the interview or grant permission to Statistics Canada to obtain their tax file data from Revenue Canada for the purpose of the survey. In effect, well over half of SLID's income data comes directly from Revenue Canada (63% in 1994 and over 80% in 2000). In addition, SLID provides clear information regarding marital status, and the child's relationship to the woman. The 'marital status' variable includes seven coding categories: married (legal marriage), common-law, separated, divorced, widowed, single (never married) and separated common-law. Own birth children can be separated from step, adopted and foster children. Accurate income and demographic information is critical in reducing measurement errors in estimates of labour force transition rates, especially when investigating asymmetric responses to changes in income and other demographic variables.

The sample panel for analysis includes 14598[9] women aged 19 to 65: 7025 from the first SLID panel (1993 to 1998), and 7573 from the second SLID panel (1996 to 2000). For the descriptive analysis that follows, the data are pooled from all eight years. Because the events of interest are infrequent, pooling the data from different years is necessary to give reliable results. The women are grouped into four age categories based on their ages in each year: 19 to 30, 31 to

[8] From 2005, the 'income' and 'labour' interviews were combined into a single interview each January.
[9] Since only one-third of all women in the unbalanced panel are present for all survey years, and labour force transitions have been defined on the basis of two consecutive waves, this reduces the size of the sample further. The balanced sample panel (in which there is no missing information through all sample data years) includes 14598 different women.

40, 41 to 50 and 51 to 65. This is because the incidence of lifecycle events associated with labour force transitions varies significantly with age.

Definitions of labour force transitions and trigger events are based on the same two consecutive years. A woman's labour force transition is an entry if she is a participant in period *t* conditional on being a non-participant in the previous period *t-1*. Conversely, a woman's labour force transition is a withdrawal if she is a non-participant in period *t* conditional on being a participant in the previous period *t-1*. SLID has a variable for annual labour force status, but the coding of the variables makes it difficult to identify an individual's labour force status. Labour force transitions are therefore defined on the basis of changes in monthly labour force status for September of each year. Labour force transition rates are calculated using the labour force status for March to check for significant differences from those calculated using September data. No significant difference is shown. Labour force transition rates in September are given in table 2, and those in March are given in appendix table A.2.

First consider demographic events associated with women's labour force transitions. Demographic trigger events related to labour force withdrawal are marriage, childbirth, and childcare for pre-school children. Demographic trigger events related to labour force entry are divorce (separation, or loss of spouse) and absence of responsibility for children. Applying the same rule, trigger events are defined on the basis of changes between two consecutive survey reference years. For example, a woman is counted as newly married, including common-law relationships, if her marital status changed from single to married between two years. Some 'lifecycle event' derived variables provided by Statistics Canada are utilized. For example, there is a family life event flag indicating whether a person became a birth parent during the survey reference year.[10] Also, childbirth is separated from other reasons for living with children in each reference year (for example, step, adopted and foster). In addition, changes in the composition of a household because of marriage or separation may also have important financial consequences

[10] There is also a variable indicating the occurrence of the first child's birth.

for women. A woman may have access to a higher income via income-sharing with a working partner because of (re)marriage. Divorce, separation or death may result in the loss of a spouse's income. We attempt to decompose the effect on labour force transitions of marriage and divorce into the impact of the trigger event itself and the impact of its financial consequences.

Another key class of trigger events can be summarized as changes in the financial conditions of the family. Women's labour force transitions are precipitated by events such as changes in family members' labour market attachment, or changes in family earnings. Women's labour supply, known as the added worker effect, may be an important aspect of the household consumption-smoothing response to their husband's job displacement (Stephens 2002; Seitchik 1991). Examples of income-supplementing events include an unemployed spouse or any other family member getting a job, and an already-employed spouse or any other member's increasing labour earnings (for example, a change in job, promotion, or working longer hours) or other income. On the other hand, examples of income-reducing events include job loss by an employed spouse or any other family member, and a decrease in the earnings of spouses or of other family members.[11]

It is quite difficult to define reliably other family members' labour market activity in the data. Therefore, we define two different trigger events, relating to changes in earnings (and income) of other family members, as proxies indicating the occurrence of financial events in a woman's life time. First, we compute other family members' earnings by subtracting the woman's earnings from the total earnings of the family; then the event is counted when other family earnings increase or decrease by 20% or more between two consecutive years. The threshold of 20% is chosen to ensure that transitory earnings variations are not counted as events. These changes in family earnings, however, may also correspond to changes in the number of earners in the family. To separate out the effect of those changes, it might be desirable to have

[11] Also we can think of special needs for family expenditure such as buying a house (paying a mortgage), a car or any other durable goods (see for example, Fortin, 1995).

more disaggregated measures of the financial events affecting these households. Here, an event of 'pure earnings changes' is defined to denote changes in family earnings that occur without an increase or decrease in the number of earners, not including the woman, in the family.

4. Trigger events and labour force transitions

Suppose that there is a set of mutually exclusive trigger events $j=1,\ldots, J$, and that all labour force withdrawal decisions occur because of one such event.

$$pr \text{ (labour force withdrawal)} = \sum_{j=1}^{J} pr(\text{ labour force withdrawal via event } j)$$

Then, among those women with a chance of withdrawal from the labour force between one year and the next, the proportion who withdraw is indicated by the sum of the proportions of women who withdraw in association with each of the different events.

$$= \sum_{j=1}^{J} pr(\text{ labour force withdrawal} \mid \text{event } j) * pr \text{ (event } j)$$

By the rules of joint probability, each term on the right-hand side can be rewritten as the product of the probability of withdrawal, conditional on event occurrence, and the probability of each event.

Similarly, the probability that women with a likelihood of entry will enter the labour force because of a set of mutually exclusive trigger events $k=1,\ldots,K$ can be related to the probabilities of each event and the probability of labour force entry, conditional on event occurrence:

$$pr \text{ (labour force entry)} = \sum_{k=1}^{K} pr(\text{ labour force entry} \mid \text{event } k) * pr \text{ (event } k).$$

In this approach, we would also consider the potentialities for a labour force transition associated with each event for the average woman. The relative importance of events is then summarized directly by considering the fraction of all transitions that are accounted for by each of the

different events: *pr*(event *j* | withdrawal) for each event *j*, and *pr* (event *k* | entry) for each event *k*. Using Bayes' Rule, these statistics are related to each other by:

$$1 = \sum_{j=1}^{J} pr(\text{ event } j \mid \text{labour force withdrawal})$$

and

pr (event *j* | labour force withdrawal) =

pr (labour force withdrawal | event *j*) * *pr* (event *j*) / *pr* (labour force withdrawal)

for labour force withdrawal, and

$$1 = \sum_{k=1}^{K} pr(\text{ event } k \mid \text{labour force entry})$$

and then

pr (event *k* | labour force entry) =

pr (labour force entry | event *k*) * *pr* (event *k*) / *pr* (labour force entry)

for labour force entry.

In the next subsection, labour force transition rates are examined using three types of statistics: first, the prevalence of each trigger event: *pr(event)*; second, the probability of labour force transitions conditional on experiencing such events: *pr(labour force transition | event)*; and finally, the fraction of all transitions[12] accounted for by each event: *pr(event | labour force transition)*. The focus is on the short-term effects of these events on labour force transitions; both are measured over an interval of one year.

Before exploring labour force transition rates, we review the differences between state probabilities and transition probabilities. Figure 1 shows labour force participation rates of women by survey year, and table 1 shows labour force participation rates by age and demographic characteristics. Over the eight years captured by SLID, there is no significant change in Canadian women's labour force participation rates. The rate is very stable at around

[12] I focus on the subset of events most likely to be important.

74%.[13] All the age groups shown in table 1, except the oldest group, have a labour force participation rate 3 to 7 percentage points above the average rate for all women. [14] The participation rate of the oldest group is much lower at 51%. Looking at the marital status of women, there is no dramatic difference in labour force participation between single women and married women. The difference is about 3 percentage points in the 19-30 and 41-50 age groups. On the other hand, across all age groups, differences in labour force participation rates between women living with and without pre-school children are more substantial than differences in the participation rates by marital status. In the first three age groups the differences in labour force participation rates between those living with and without pre-school children are between 7 and 14 percentage points. Thus, the data confirm well-known cross-sectional patterns that the presence of pre-school children is associated with a significantly reduced probability of labour force participation. Next, we turn to an analysis of labour force transitions (rather than state probabilities), which exploits the panel nature of the data.

4.1. Labour force transitions and the prevalence of trigger events by age group

Table 2 shows the annual rates of labour force entry and withdrawal for women broken down by age group. For all women, the average entry rate is 18.1% and the average withdrawal rate is 6.6%.[15] Transition rates are substantially different across age groups, and this supports a separate examination of labour force transitions and trigger events in each age group. Women aged between 19 and 30 have higher rates of both labour force entry and withdrawal than the rest of the sample. The entry rate is 19.8 percentage points higher than the average entry rate for all women, and the withdrawal rate is 2.6 percentage points higher than the average withdrawal rate for all women.

[13] This figure is quite close to the labour force participation rates derived from the Labour Force Survey and presented in table A.1 in the appendix.
[14] It is not possible to distinguish cohort effects from age effects with this short panel.
[15] The computed labour force participation rate (on page 1, footnote1) using labour force transition rates: 0.181/(0.181+0.066) =0.733 is very close to the actual labour force participation rates in table 1.

Table 3 exhibits prevalence of each trigger event in the analysis by age group. Being newly married, newly living with pre-school children[16] and giving birth are first considered as demographic events associated with labour force withdrawal. The incidence of these events falls with age. Regarding demographic events associated with labour force entry, women aged 19 to 30 have the greatest likelihood of becoming separated from their partner, while women aged 31 to 40 are the most likely to become free from the care of pre-school children. As discussed in section 3, changes in overall family earnings and income, and changes in family earnings and income without changes in the number of earners, are considered as financial events associated with labour force transition. For the prevalence of 'pure' increases or overall increases in family earnings and income, there are no notable differences across age groups except for a slight decrease in the oldest age group. The incidence of both 'pure' decreases and overall decreases in family members' income and earnings is slightly higher in the youngest and oldest age groups relative to the middle age groups. Over all age groups, family earnings are increased without changes in the number of earners rather than by adding earners in the family. Roughly half of the incidence in falling family earnings is because of losing earners in the family.

4.2. Trigger events and their association with the labour force transitions of women

Table 4 reports the estimated probabilities of labour force transitions conditional on having experienced each trigger event. Regarding labour force withdrawal, the probabilities associated with childbirth or recently living with pre-school children are relatively large for the age groups 19 to 30 and 31 to 40.[17] Marriage is actually associated with a reduced probability of labour force withdrawal in the age group 19 to 30. The probability of withdrawal conditional on 'newly married' (6.9%) is significantly smaller than the unconditional probability of withdrawal (9.2%). The financial events of increases in pure family earnings do not raise or lower the

[16] This indicates that the person is newly living with one or more of her pre-school aged children (first child birth, step, adopted, foster) (pre-school aged = 0 to 5) as of December 31 of the reference year.
[17] The estimates of the other age groups cannot be released because of the small number of observations.

probability of labour force withdrawal. Yet financial changes, either with or without an increase in the number of earners in the family, have a more significant impact on the labour force withdrawal of women than the event of recent marriage for the age group 19 to 30. The probability of withdrawal associated with pure total income increase (10.9%) is greater than the probability of withdrawal associated with the experience of recent marriage (6.9%).

Turning to labour force entry, among women within the age group 19 to 30 experiencing a new separation 38.6% entered the labour force; among women in the age group 31 to 40 experiencing the same event, 42.6% entered the labour force. Marital separation is significantly associated with an increased probability of labour force withdrawal in the age group 31 to 40. For other events, about one-third of women aged 19 to 40 experiencing the event of being free from the childcare of pre-school children enter the labour force. Decreases in family earnings are associated with a high likelihood of entry into the labour force for all age groups. Particularly in the middle age group, the probabilities of entry conditional on having experienced a recent separation are larger than the probabilities of entry conditional on any other events. Moreover, the event of a new separation itself, not the financial consequences of the event, is relatively more important regarding a woman's decision to enter the labour force. For the age group 31 to 40, although both events of separation and family pure earning (total income) decreases are significantly associated with an increased probability of labour force entry, the marginal effect of being newly separated on labour force entry is 15%. On the other hand, the marginal effect of family pure earning decreases on labour force entry is 8%.[18]

As pointed out earlier, the factors that determine withdrawal from the labour force may differ from the factors that determine entry. Overall, the estimates reported in table 4 show that the effect of changes in family earnings on women's labour force participation decisions is not

[18] The marginal effects of event (X) on labour force entry (E) can be calculated by $\Pr(E \mid X = 1) - \Pr(E \mid X = 0)$. This equals $\frac{1}{\Pr(X = 0)}\left[\Pr(E \mid X = 1) - \Pr(E)\right]$.

symmetric. Women's labour force participation decisions are more sensitive to income-reducing events than to income-supplementing ones. For example, over 30% of women within the age groups 19 to 30 and 31 to 40 who experience a decrease in family earnings enter the labour force, while less than 10% of women experiencing an increase in family earnings withdraw from the labour force. It implies that we need to be careful in interpreting estimates from conventional methods on labour force participation (for example probit and logit). Asymmetry is more dramatic when comparing the probability of labour force withdrawal conditional on the event of becoming newly married, with the probability of labour force entry conditional on the event of becoming newly separated (7% compared to 39% among women aged 19 to 30, and 6% compared to 43% among women aged 31 to 40). The event of a new separation has a much larger impact on the labour supply decision of women than the event of becoming newly married. Separation is actually associated with an increased probability of labour force entry in all age groups, while being newly married is significantly associated with a reduced probability of labour force withdrawal in the age group of 19 to 30.

To check the robustness of these results, the transition analysis is extended by defining labour force transitions on the basis of changes in labour force status between years *t-1* and *t+1* conditional on experiencing an event between years *t-1* and *t*. The results of this extension, presented in the appendix in tables A.3.a and A.3.b, show a very similar pattern to the results presented above. Most probabilities are somewhat higher. Only the probability of withdrawal associated with childbirth is slightly lower. This result also supports the findings of Mott and Shapiro (1983) and Shapiro and Mott (1994) which demonstrate that more persistent workers are more likely to return to work shortly after giving birth.

Lastly, table 5 reports the incidences of events conditional on labour force transitions. It is interesting that a large fraction (more than 60%) of all labour force entries are not associated with any of the events considered in this study: labour force entries may occur for a rather more diverse set of reasons than were considered. Across all age groups, the largest share of all entries

is associated with a decrease in family earnings. In addition, consideration of the proportion of all labour force withdrawals accounted for by each event suggests that the main reasons for withdrawal from the labour force are less diverse than the reasons for labour force entry noted in table 5. The events of childbirth and family earnings increases associated with labour withdrawal represent relatively large fractions (22.8% and 26.6%) of the total number of labour force withdrawals in the youngest age group. On the other hand, for the rest of the age groups, increases in other family earnings (for example job gains) account for a large share of all labour force withdrawals. About 23.8%, 22.1% and 15.3% of labour withdrawals in the age groups 31 to 40, 41 to 50 and 51 to 65, respectively, are associated with increases in other family members' earnings.

5. Multivariate analysis of labour force transitions

The analysis is extended by estimating a random effects probit model of women's labour force transitions with a set of control variables including trigger events, age, regional dummies, educational dummies, and a correction term for sample selection bias.

The main assumption of the random effects probit model is

$$P(y_{it}=1 \mid X_{it}, \nu_i) = \Phi(X_{it}\beta + \nu_i), \qquad t=1,\ldots,T \qquad (4.1.1)$$

and $\nu_i \mid X_i \sim Normal(0, \sigma_v^2)$

where, ν_i is the unobserved individual effects; ν_i and X_i (X_{it} for all *t*) are independent and ν_i has a normal distribution. Since the variance of the latent variable model is unity, the relative importance of the unobserved effect is measured as $\rho = \frac{\sigma_v^2}{\sigma_v^2 + 1}$, which is the proportion of the total variance contributed by the panel level variance component. These statistics lead to a simple test for the presence of the unobserved effects: the likelihood ratio test for the null hypothesis that $\rho = 0$. When ρ is zero, the panel level variance component is unimportant and the panel estimator is not different from the pooled estimator.

We turn now to a potential source of bias resulting from a problem with sample selection. In estimating the determinants of labour force withdrawal or entry, the group of women who have a possibility of withdrawing from the labour force, or who have a possibility of entering the labour force, is a non-randomly selected sample. On average, women in the risk set of labour force withdrawal have higher labour force participation rates, and women in the risk set of labour force entry have lower labour force participation rates. This initial labour force state is likely to be correlated with unobserved individual characteristics. To correct for such sample selection bias, we follow the method suggested by Orme (1997). First, an initial stage probit is estimated,[19] which is a probit regression for labour force participation in the year the individuals are first observed.[20] Then, a generalized residual ($\hat{\upsilon}_{i,0}$) is calculated from the initial stage probit and this is included as a regressor in the transition probit regressions. To summarize, labour force transitions (*LFT*) between two consecutive years, *t-1* and *t*, are modelled using a random effects panel probit with specification:

$$LFT_{i,t}^{*} = \alpha' E_{i,t} + \beta' X_{i,t} + \gamma \hat{\upsilon}_{i,0} + \mu_i + \varepsilon_{i,t} \quad (4.1.2)$$

$$LFT_{i,t} = \begin{cases} 1 & if \quad LFT_{i,t}^{*} > 0 \\ 0 & otherwise \end{cases}$$

where $LFT_{i,t}^{*}$ (labour force transition: withdrawal or entry) is a latent variable that equals one if individual i changes labour force status at time *t*, $E_{i,t}$ are trigger events[21] between two consecutive years, *t-1* and *t*, and $X_{i,t}$ are demographic variables including age, age squared, regional dummies, level of education dummies, a current student dummy and a panel dummy. $\hat{\upsilon}_{i,0}$ is the generalized

[19] In the initial stage probit, the right hand side variables include age, age squared, other family members' total earnings, a dummy for living with spouse, a dummy for living with pre-school children, regional dummies, level of education dummies, a current student dummy and a panel dummy.
[20] SLID is individual level longitudinal data and two panels are used (the first panel is from 1993 to 1998, the second panel is from 1996 to 2001); therefore, the first observed year is either 1993 or 1996.
[21] Only the subset of events is included; these are considered in table 5 in the random effect probit estimation. The first reason is to force on the most important events, and to reduce a potential problem arising from that some events may occur simultaneously. In addition, the trigger events are treated as exogenous variables in the random effects probit. Although existence of the endogeneity of trigger events is debatable, it is a reasonable assumption that the trigger events are exogenous in this exploratory analysis.

residual from the initial stage probit for labour force participation ($LFP_{i,0}$), $\mu_i \sim N(0,1)$ is an (*iid*) individual random effect which is not correlated with an individual's initial observed labour force status,[22] and $\varepsilon_{i,t}$ is a (*iid*) error term having zero mean and known variance.

5.1. Transition probit estimates

Initially 3831 women and 10767 women are in the risk sets for labour force entry and withdrawal respectively. To proceed appropriately with the sample selection correction method, multiple labour force transitions are not modelled for the same individual. Each woman is followed until she makes her first labour force transition (either entry or withdrawal). About 70% of women provide more than three years of data: 1735 entries (859 from the first panel and 876 from the second panel) and 2445 withdrawals (1234 from the first panel and 1211 from the second panel) are observed. The results from the initial stage probit are presented in table 6. Women participating in the labour force are more likely to be living with a spouse and are less likely to be living with pre-school children. The earnings of other family members are negatively correlated with the probability of labour force participation. In addition, there is no statistically significant difference in labour force participation between women from the first and second panels.[23]

Tables 7 and 8 provide results from the random effects probits for labour force withdrawal and entry respectively. The overall stories from estimates are consistent with table 4, which shows the probabilities of labour force transition conditional on trigger events. In table 7, women giving birth and experiencing an increase in pure family earnings are significantly more likely to withdraw from the labour force. Child birth has the greatest effect on the probability of

[22] ν_i (the unobserved individual effects which is likely correlated with initial labour force state) in equation (4.1.1) is decomposed into two parts in the equation (4.1.2); $\hat{\upsilon}_{i,0}$ (the correction term) and μ_i (the unobserved individual effects).

[23] Each panel contains six waves (one-year intervals for 6 years); therefore, the panels are not long enough to model business cycle effects.

labour force withdrawal. Table 8 reveals that women experiencing a separation, or a decrease in pure family earnings, are significantly more likely to enter the labour force. Separation has the largest effect on the probability of labour force entry. On the other hand, the events of being newly married (in table 7), and of 'becoming free from the childcare of pre-school children' (in table 8), do not have significant effects on women's labour force withdrawal and labour force entry respectively. Sample selection correction is important in both labour force withdrawal and entry estimates. The coefficient on the generalized residual from the initial stage probit is statistically significant in both transition probits. On the importance of allowing for the individual random effect, the likelihood ratio test for the null hypothesis that $\rho = 0$ is strongly rejected in the probit for labour force entry, but the likelihood ratio test for the null hypothesis that $\rho = 0$ could not be rejected for labour force withdrawal. Thus the pooled labour force withdrawal probit estimates are reported in table 7. In the case of labour force withdrawal, it may be that the sample selection correction captures most of the unobserved individual heterogeneity. Finally, there is no finding of significant difference between the panels with respect to labour force entry; however, there is a positive and significant coefficient on the panel dummy in the labour force withdrawal probit.

6. Conclusions and discussion

At the beginning of this paper it was argued that a panel perspective on the labour force transitions of women would provide a better understanding of women's labour market participation. If women's labour force participation rates remain constant over time, an explanation of their participation needs to relate their behaviour to labour force transition, because labour force participation is decomposed into labour force entry and withdrawal. Thus the primary determinants of those transitions could be different. This exploratory analysis specifically focuses on the association of women's labour force transitions with particular trigger events that occur in their lives.

Regarding methods, the probability of labour force entry and withdrawal is estimated as being conditional on trigger events such as marriage, separation, childbirth, free from childcare, and changes in the earnings of other household members. There is an explicit investigation of whether the factors that determine (re-)entry into the labour force differ from the factors which determine withdrawal. Subsequently, a random effects transition probit model is estimated to examine labour force transitions within a multivariate setting.

The results show that labour force transitions, not only entry but also withdrawal, occur more frequently among young women aged between 19 and 30. The event of childbirth is strongly associated with women's labour force withdrawal, while the events of separation and decreases in family earnings are strongly associated with women's labour force entry. Also, there are asymmetries in women's labour force entries and withdrawals with respect to contrary events. For example, labour transitions are more sensitive to income-reducing events than to income-supplementing events. In table 4, over 30% of women within the age groups 19 to 30 and 31 to 40, who experience a decrease in family earnings, enter the labour force; less than 10% of women experiencing an increase in family earnings withdraw from the labour force. Why do we see such asymmetric effects of changes in family earnings on women's labour force entry and withdrawal? Work affects a person's utility in two ways. There is a direct effect derived from the activities and interactions associated with working itself. These direct effects can be positive, such as personal satisfaction from accomplishing important tasks, providing valued services, and social connections through work colleagues, or they can be negative, such as frustration, anxiety and stress associated with work. There is also an indirect (though often a primary) benefit from work: work provides income with which to purchase goods and services that increase a person's utility. In other words, these are work incentives: self achievement and financial well-being. Since labour supply of women, as secondary earners, could be more flexible than that of a primary earner in the family, we may observe how those two work incentives play their roles in a process of women's labour supply decisions. Here, we observe an asymmetric response of women's labour

force withdrawal and entry with respect to increases and decreases in family income. The magnitude from an increase in family income is smaller than the magnitude from a decrease in family income. Substantial increases in family income release a woman from her share of the family's financial burden; however, one is still motivated to work by an incentive of self achievement because the value of her time for work is also high. Women's labour withdrawal, associated with family income increases, would be, therefore, less sensitive. Substantial decreases in the family's income threaten the financial well-being of a family. Women's labour force entry associated with income decreases would be more sensitive, even after taking into account the negative utility arising from working.

Also, the probability of entry conditional on becoming separated is larger than the probability of labour force withdrawal conditional on getting married. Indeed, recent marriage is actually associated with a reduced probability of labour force withdrawal, while separation is associated with an increased probability of labour force entry in the age group 19 to 30. These results may partially reflect asymmetric behaviour when women are faced with the financial consequences of separation. However, the emotional and sociological effects of separation are also important factors in determining women's labour force entry. The results show that the marginal effect of separation is larger than the marginal effect of pure income decreases on entry.

From the policy point of view, support for women's childbearing and caring is the most effective way to reduce women's labour force withdrawals. Assisting women's childbearing and caring, especially infants and young pre-school children, are important to prevent women from leaving the labour market. The study shows that child birth has the greatest effect on the probability of women's labour force withdrawal, and women are less likely to (re-)enter the labour force after their children have grown up. This asymmetry could be more than a behavioural reason, but it could also be due to outdated labour skills years later. The latter factor may be the barrier for women returning to the labour force. Thus, the availability of retraining after the child-caring period would be also important in encouraging women to (re-)enter the

labour force. Childbearing (and subsequently child-caring) seems to be the single most important and persistent remaining issue for the continuity of women's labour market attachment.[24] Last, an improvement in the accessibility of childcare would not only mean increasing the quantity of childcare but also improving its quality. Quality of childcare is also a major concern for mothers when they make a decision to withdraw from the labour market due to child-caring.[25]

This study is an exploratory analysis on the labour force transitions of women. These observed asymmetric labour supply behaviours of women are of interest, but the shortcoming is that these asymmetric behaviours could not be predicted by traditional labour supply models. Developing structural longitudinal labour supply models, in which asymmetric behaviour can be explained, would be good task for future research on women's labour supply patterns.

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[24] Also, to find out women's willingness of continuing of work outside is very important factor for policy implications because there is also a negative income effect of childcare benefit on women's work

[25] The effect of childcare on children's well being and child development is ambiguous. See Baker, Gruber and Milligan (2005)

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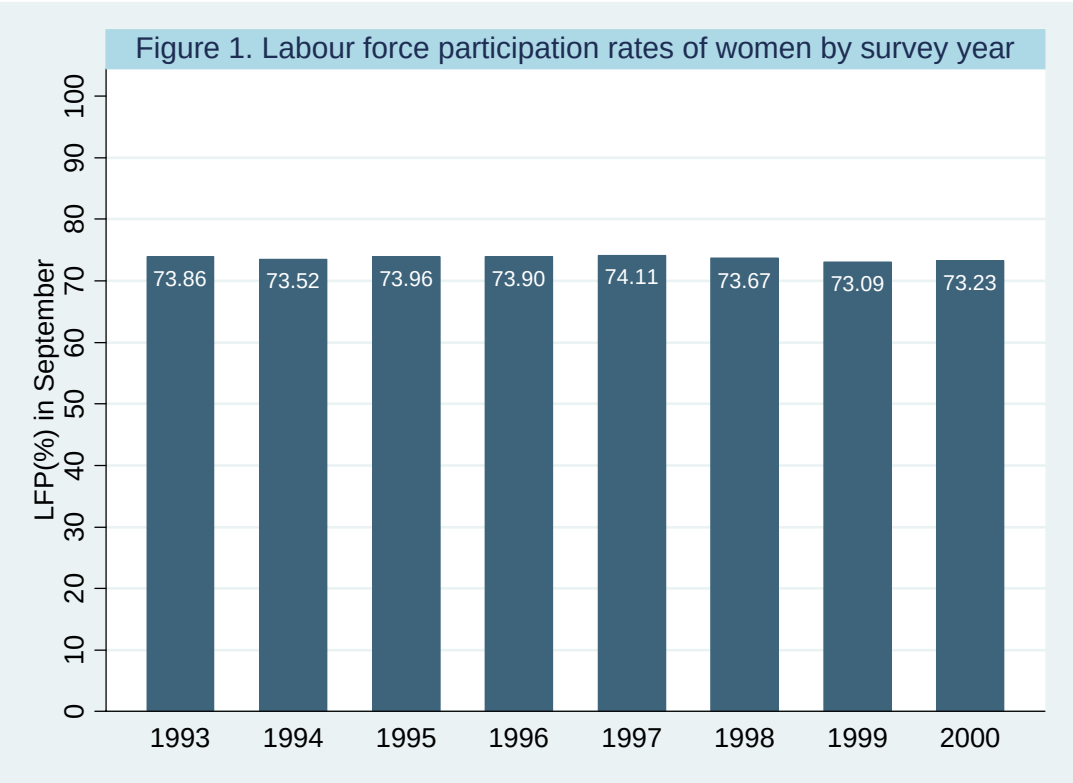
Figure 1. Labour force participation rates of women by survey year
LFP(%) in September
0
10
20
30
40
50
60
70
80
90
100
73.86
73.52
73.96
73.90
74.11
73.67
73.09
73.23
1993
1994
1995
1996
1997
1998
1999
2000

TABLE 1. Women's labour force shares and participation rates by age and demography

Age category	Demographics	Population Share (%)	LFP (%)	Std. Err.
19-30	**all**	100.0	77.00	0.0034
	single	44.5	75.16	0.0052
	married	55.5	78.48	0.0044
	no pre-school children	60.8	82.64	0.0039
	pre-school children	39.2	68.25	0.0060
31-40	**all**	100.0	81.35	0.0025
	single	19.0	82.41	0.0056
	married	81.0	81.10	0.0028
	no pre-school children	65.1	84.19	0.0029
	pre-school children	34.9	76.06	0.0046
41-50	**all**	100.0	81.21	0.0026
	single	21.7	83.62	0.0053
	married	78.3	80.55	0.0030
	no pre-school children	96.6	81.45	0.0027
	pre-school children	3.4	74.57	0.0158
51-65	**all**	100.0	51.21	0.0037
	single	25.4	51.22	0.0074
	married	74.6	51.20	0.0043
	no pre-school children	99.9	51.21	0.0037
	pre-school children	0.1	50.00	0.1336

TABLE 2. Annual rates of labour force entry and withdrawal for women

(pooled data - September)

Age category	Entry rate	Std. Err.	Withdrawal rate	Std. Err.
All	0.1810	0.0029	0.0660	0.0011
19-30	0.3793	0.0092	0.0921	0.0031
31-40	0.2696	0.0072	0.0508	0.0017
41-50	0.1878	0.0067	0.0425	0.0016
51-65	0.0504	0.0026	0.1096	0.0034

The statistics are based on pooled data. Total number of women at risk of labour force entry is 5840 and total number of women at risk of labour force withdrawal is 12350 in September.

TABLE 3. Incidence of the trigger events by age group

Withdrawal

Age category	19-30		31-40		41-50		51-65	
	pr(event)	Std. Err.	pr(event)	Std. Err.	pr(event)	Std. Err.	pr(event)	Std. Err.
Newly married	0.0602	0.0025	0.0168	0.0010	0.0093	0.0008	0.0061	0.0009
Newly having pre-school children	0.0536	0.0024	0.0189	0.0011	0.0015	0.0003	--	--
Child birth	0.0944	0.0031	0.0423	0.0016	0.0013	0.0003	--	--
Family earnings increased	0.2454	0.0046	0.2095	0.0032	0.2236	0.0034	0.1877	0.0043
Family total income increased	0.2246	0.0044	0.1908	0.0031	0.2170	0.0034	0.1868	0.0043
Family pure earnings increased	0.1623	0.0039	0.1538	0.0028	0.1365	0.0028	0.1263	0.0036
Family pure total income increased	0.1477	0.0038	0.1395	0.0027	0.1345	0.0028	0.1307	0.0037

Entry

Age category	19-30		31-40		41-50		51-65	
	pr(event)	Std. Err.	pr(event)	Std. Err.	pr(event)	Std. Err.	pr(event)	Std. Err.
Newly separated	0.0203	0.0027	0.0140	0.0019	0.0074	0.0015	0.0030	0.0006
Free from pre-school children	0.0278	0.0031	0.0806	0.0044	0.0197	0.0024	--	--
Family earnings decreased	0.1841	0.0073	0.1204	0.0052	0.1507	0.0061	0.1720	0.0045
Family total income decreased	0.1777	0.0072	0.1167	0.0052	0.1345	0.0059	0.1497	0.0042
Family pure earnings decreased	0.0766	0.0050	0.0741	0.0042	0.0736	0.0045	0.0822	0.0033
Family pure total income decreased	0.0773	0.0050	0.0770	0.0043	0.0642	0.0042	0.0813	0.0033

Note: 1. Labour force transitions and events each refer to changes between years t-1 and t.
2. Numbers too small to be reported

TABLE 4. Labour force transitions conditional on trigger events, *Pr(transition|event)*

Withdrawal

Age category	19-30		31-40		41-50		51-65	
	Rate	Std. Err.	Rate	Std. Err.	Rate	Std. Err.	Rate	Std. Err.
Pr (withdrawal)	0.0921	0.0031	0.0508	0.0017	0.0425	0.0016	0.1096	0.0034
Newly married	0.0690*	0.0109	0.0593	0.0144	0.0360	0.0158	0.2157*	0.0576
Newly having pre-school children	0.1929*	0.0181	0.1053*	0.0176	--	--	--	--
Child birth	0.2226*	0.0144	0.0969*	0.0113	--	--	--	--
Family earnings increased	0.0998	0.0064	0.0578*	0.0040	0.0420	0.0035	0.0895*	0.0072
Family total income increased	0.1031	0.0068	0.0560	0.0042	0.0409	0.0035	0.1112	0.0080
Family pure earnings increased	0.1052	0.0081	0.0574	0.0047	0.0484	0.0047	0.0884*	0.0088
Family pure total income increased	0.1087*	0.0086	0.0566	0.0049	0.0486	0.0048	0.1139	0.0096

Entry

Age category	19-30		31-40		41-50		51-65	
	Rate	Std. Err.	Rate	Std. Err.	Rate	Std. Err.	Rate	Std. Err.
Pr (entry)	0.3793	0.0092	0.2696	0.0072	0.1878	0.0067	0.0504	0.0026
Newly separated	0.3860	0.0645	0.4259*	0.0673	0.2800	0.0898	--	--
Free from pre-school children	0.3974	0.0554	0.2774	0.0254	0.1791	0.0468	--	--
Family earnings decreased	0.4352*	0.0218	0.3348*	0.0219	0.2148	0.0182	0.0586	0.0067
Family total income decreased	0.4589*	0.0223	0.3341*	0.0223	0.2188	0.0193	0.0796*	0.0083
Family pure earnings decreased	0.3442	0.0324	0.3474*	0.0282	0.2280	0.0265	0.0570	0.0096
Family pure total income decreased	0.3502	0.0324	0.3311*	0.0274	0.2156	0.0279	0.0785*	0.0112

Note: 1. Labour force transitions and events each refer to changes between years t-1 and t.
2. Numbers too small to be reported.
3. I test the statistical significance of the differences between unconditional transition probability and transition probability conditional each trigger event. (* Statistically significant at the 5% level.)

TABLE 5. Trigger events conditional on labour transitions, *pr (event |exit)*

Withdrawal

Age category	19-30		31-40		41-50		51-65	
	Rate	Std. Err.	Rate	Std. Err.	Rate	Std. Err.	Rate	Std. Err.
Newly married	0.0451	0.0072	0.0196	0.0048	0.0078	0.0035	0.0120	0.0036
Newly having pre-school children	0.1122	0.0110	0.0391	0.0068	--	--	--	--
Child birth	0.2280	0.0147	0.0807	0.0095	--	--	--	--
Family earnings increased	0.2659	0.0154	0.2384	0.0149	0.2214	0.0164	0.1533	0.0119
Family total income increased	0.2512	0.0151	0.2103	0.0142	0.2088	0.0161	0.1895	0.0130
Family pure earnings increased	0.1854	0.0136	0.1736	0.0132	0.1554	0.0144	0.1019	0.0100
Family pure total income increased	0.1744	0.0133	0.1553	0.0127	0.1538	0.0143	0.1358	0.0113

Entry

Age category	19-30		31-40		41-50		51-65	
	Rate	Std. Err.	Rate	Std. Err.	Rate	Std. Err.	Rate	Std. Err.
Newly separated	0.0207	0.0044	0.0222	0.0046	0.0110	0.0041	--	--
Free from pre-school children	0.0291	0.0052	0.0829	0.0086	0.0188	0.0054	--	--
Family earnings decreased	0.2113	0.0125	0.1495	0.0111	0.1724	0.0150	0.2000	0.0212
Family total income decreased	0.2150	0.0126	0.1446	0.0109	0.1567	0.0144	0.2366	0.0226
Family pure earnings decreased	0.0695	0.0078	0.0955	0.0091	0.0893	0.0113	0.0930	0.0154
Family pure total income decreased	0.0714	0.0079	0.0945	0.0091	0.0737	0.0103	0.1268	0.0177

Note: 1. Labour force transitions and events each refer to changes between years t-1 and t.
2. Numbers too small to be reported

TABLE 6. Initial stage probit results

Variable	Coef.	Std.
Age	0.1173***	*0.0079*
Age squared	-0.0017***	*0.0001*
Living with spouse	0.1079***	*0.0311*
Living with kids	-0.5628***	*0.0324*
Family earnings	0.0000***	*0.0000*
Region-Atlantic	-0.2364***	*0.0337*
Region-QUE	-0.2291***	*0.0343*
Region-Prairies	0.0816**	*0.0354*
Region-BC	0.0374	*0.0470*
Graduated high school	0.4297***	*0.0367*
Non-university postsecondary certificate	0.6240***	*0.0313*
University certificate or Bachelor's degree	0.9434***	*0.0475*
More than Bachelor	1.1774***	*0.0847*
Full-time student	-0.5102***	*0.0382*
Panel 2	-0.0245	*0.0237*
Constant	-1.2479***	*0.1545*
N	14598	

Note:
* Statistically significant at the 10% level.
** Statistically significant at the 5% level.
*** Statistically significant at the 1% level.

TABLE 7. Pooled labour force withdrawal probit

Variable	Coef.	Std.
Age	-0.1305***	*0.0090*
Age squared	0.0017***	*0.0001*
Married	-0.0850	*0.0750*
Childbirth	0.6804***	*0.0458*
Pure earnings increase	0.05998**	*0.0285*
Region-Atlantic	0.0824***	*0.0299*
Region-QUE	0.0249	*0.0312*
Region-Prairies	-0.0552*	*0.0299*
Region-BC	0.0058	*0.0384*
Graduated high school	-0.1280***	*0.0397*
Non-university postsecondary certificate	-0.2220***	*0.0379*
University certificate or Bachelor's degree	-0.3163***	*0.0500*
More than Bachelor	-0.4240***	*0.0717*
Full-time student	0.4907***	*0.0325*
Panel 2	0.0612***	*0.0205*
Generalized residual	0.2410***	*0.0836*
Constant	0.6992***	*0.2138*
N	43371	

Note:
* Statistically significant at the 10% level.
** Statistically significant at the 5% level.
*** Statistically significant at the 1% level.

TABLE 8. The random effects labour force entry probit

Variable	Coef.	Std.
Age	0.1004***	*0.0177*
Age squared	-0.0018***	*0.0002*
Separation	0.3603**	*0.1513*
Free from childcare	-0.0652	*0.0877*
Pure earnings decrease	0.1220*	*0.0653*
Region-Atlantic	-0.1256**	*0.0573*
Region-QUE	-0.1534***	*0.0586*
Region-Prairies	0.0869	*0.0614*
Region-BC	0.0781	*0.0820*
Graduated high school	0.2754***	*0.0691*
Non-university postsecondary certificate	0.6048***	*0.0696*
University certificate or Bachelor's degree	0.9585***	*0.1071*
More than Bachelor	1.2956***	*0.1799*
Full-time student	0.0634	*0.0627*
Panel 2	0.0423	*0.0395*
Generalized residual	0.4592***	*0.1102*
Constant	-1.8029***	*0.2863*
N	12904	
/lnsig2u	-1.0835	*0.1946*
sigma_u	0.5817	*0.0566*
P	0.2528	*0.0368*

Note:
1. Likelihood ratio test of ρ =0: chibar2(01) = 43.31, Prob >= chibar2 = 0.000
2. * Statistically significant at the 10% level.
   ** Statistically significant at the 5% level.
   *** Statistically significant at the 1% level.

Appendix

TABLE A.1. Participation rate (%) of men and women by age

	Women			*Men*		
year	**age 25-34**	**age 35-44**	**age 45-54**	**age 25-34**	**age 35-44**	**age 45-54**
1991	77.2	78.3	69.8	92.4	93.6	90.6
1992	76	77.5	70.7	91.3	92.6	89.8
1993	75.7	78.4	71.5	91.4	92.7	89.5
1994	75.6	78.2	71.1	91	92.6	89.7
1995	76.1	78.2	71.9	90.9	92.2	89.4
1996	77.1	78.4	71.5	91.2	91.9	88.8
1997	77.9	79.1	72.9	91.2	92.4	88.5
1998	78.6	79.3	74.2	91.9	92.4	88.4
1999	79.2	79.9	74.9	91.5	92.6	88.7
2000	79.7	80.2	75.5	91.6	92.4	88.9

TABLE A.2. Annual rates of labour force entry and withdrawal for women using March data

(pooled data - March)

Age category	**Entry rate**	**Std. Err.**	**Withdrawal rate**	**Std. Err.**
All	0.1799	0.0029	0.0656	0.0011
19-30	0.3638	0.0087	0.0990	0.0032
31-40	0.2550	0.0069	0.0511	0.0017
41-50	0.1824	0.0066	0.0410	0.0016
51-65	0.0520	0.0027	0.1018	0.0033

The statistics are based on pooled data. Total number of women at risk of labour force entry is 5907 and total number of women at risk of labour force withdrawal is 12296 in March.

TABLE A.3.a Labour force withdrawal in extended time gap

Age category	19-30		31-40		41-50		51-65	
	Rate	Std. Err.	Rate	Std. Err.	Rate	Std. Err.	Rate	Std. Err.
Newly married								
Pr(withdrawal at *t* |event)	0.0690	0.0109	0.0593	0.0144	0.0360	0.0158	0.2157	0.0576
Pr(withdrawal at *t+1* |event)	0.1072	0.0145	0.0731	0.0176	--	--	0.2162	0.0677
Newly having pre-school children								
Pr(withdrawal at t|event)	0.1929	0.0181	0.1053	0.0176	--	--	--	--
Pr(withdrawal at *t+1* |event)	0.2040	0.0201	0.1452	0.0227	--	--	--	--
Child birth								
Pr(withdrawal at t|event)	0.2226	0.0144	0.0969	0.0113	--	--	--	--
Pr(withdrawal at *t+1* |event)	0.2205	0.0156	0.1423	0.0148	--	--	--	--
Family earnings increased								
Pr(withdrawal at t|event)	0.0998	0.0064	0.0578	0.0040	0.0420	0.0035	0.0895	0.0072
Pr(withdrawal at *t+1* |event)	0.1231	0.0078	0.0732	0.0051	0.0590	0.0047	0.1480	0.0104
Family total income increased								
Pr(withdrawal at t|event)	0.1031	0.0068	0.0560	0.0042	0.0409	0.0035	0.1112	0.0080
Pr(withdrawal at *t+1* |event)	0.1310	0.0084	0.0721	0.0053	0.0601	0.0048	0.1767	0.0113
Family pure earnings increased								
Pr(withdrawal at t|event)	0.1052	0.0081	0.0574	0.0047	0.0484	0.0047	0.0884	0.0088
Pr(withdrawal at *t+1* |event)	0.1236	0.0096	0.0705	0.0058	0.0592	0.0060	0.1509	0.0128
Family pure total income increased								
Pr(withdrawal at t|event)	0.1087	0.0086	0.0566	0.0049	0.0486	0.0048	0.1139	0.0096
Pr(withdrawal at *t+1* |event)	0.1306	0.0103	0.0694	0.0061	0.0611	0.0061	0.1849	0.0137

Note: Numbers too small to be reported.

TABLE A.3.b Labour force entry in extended time gap

Age category	19-30		31-40		41-50		51-65	
	Rate	**Std. Err.**	**Rate**	**Std. Err.**	**Rate**	**Std. Err.**	**Rate**	**Std. Err.**
Newly separated								
Pr(entry at *t* |event)	0.3860	0.0645	0.4259	0.0673	0.2800	0.0898	--	--
Pr(entry at *t+1* |event)	0.4286	0.0707	0.4651	0.0761	--	--	--	--
Free from pre-school children								
Pr(entry at *t* |event)	0.3974	0.0554	0.2774	0.0254	0.1791	0.0468	--	--
Pr(entry at *t+1* |event)	0.5625	0.0620	0.3800	0.0307	0.2909	0.0612	--	--
Family earnings decreased								
Pr(entry at *t* |event)	0.4352	0.0218	0.3348	0.0219	0.2148	0.0182	0.0586	0.0067
Pr(entry at *t+1* |event)	0.5817	0.0233	0.4297	0.0257	0.2864	0.0229	0.0744	0.0087
Family total income decreased								
Pr(entry at *t* |event)	0.4589	0.0223	0.3341	0.0223	0.2188	0.0193	0.0796	0.0083
Pr(entry at *t+1* |event)	0.5747	0.0237	0.4132	0.0258	0.2801	0.0238	0.0895	0.0101
Family pure earnings decreased								
Pr(entry at *t* |event)	0.3442	0.0324	0.3474	0.0282	0.2280	0.0265	0.0570	0.0096
Pr(entry at *t+1* |event)	0.4751	0.0371	0.4626	0.0331	0.3122	0.0337	0.0584	0.0113
Family pure total income decreased								
Pr(entry at *t* |event)	0.3502	0.0324	0.3311	0.0274	0.2156	0.0279	0.0785	0.0112
Pr(entry at *t+1* |event)	0.4660	0.0361	0.4298	0.0318	0.2934	0.0352	0.0808	0.0131

Note: Numbers too small to be reported