# The Role of Domestic Abuse in Labor and Marriage Markets:

# Observing the Unobservables

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**Abstract**

In this paper we study the effects of abusive behavior on the labor force and marital status decisions of women. Using a unique Canadian data set on domestic violence, we estimate the effects of abuse on the marital history as well as current employment using a sequential, multi-state model. In our model, spousal abuse affects labor supply through decreases in utility from leisure as well as through reductions in productivity at work and hence the market wage. In addition, abuse is treated as an initially unobserved spousal characteristic that plays a role in the divorce decision, which in turn influences labor supply. Our analysis reveals three main findings. First, the effects of domestic abuse on employment differ across marital histories. Employment is decreasing in the presence of abuse in current and past marriages for married and divorced women, respectively, consistent with a health effect on the wage. In contrast, remarried women are more likely to work if abused in the current, but not the past, marriage. Second, domestic abuse is a dominant factor in the divorce decision, which in turn is a major determinant of employment. Finally, standard economic information such as age and education plays a minor role in the divorce decision relative to the abuse-related information.

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## 1. Introduction

Domestic abuse[1] is a social issue of concern to individuals and policy makers alike. The magnitude of the problem may be surprising: estimates from the most recent and comprehensive data available, the Canadian Violence Against Women Survey (VAWS), indicate that 29% of ever-married Canadian women (Statistics Canada, 1993a, p.4) and 50% of divorced women have been victims of abuse.[2] On an individual level, it is without question that domestic violence damages victims emotionally and physically. Abuse tends to endure over time[3] and results in serious injuries, ranging from bruises and fatigue to death.[4] Considering the evidence that 31% of abused women take time off from their daily activities as a result of domestic violence (Statistics Canada, 1993a, p.6), the physical injuries and stress from abuse are also likely to affect labor market performance and thus impose economic costs on victims. The costs to society are also nontrivial, for in addition to missed days at work, many women access social, medical and judicial services as a result of spousal abuse.[5]

Given the costs and prevalence of abuse in society, there is potential for policy to play an important role in addressing this issue. However, before the most effective means of combating this problem can be determined, we must understand how domestic abuse influences the behavior of women. In the past, the private nature of domestic violence and the resulting unavailability of data made it difficult to assess the effects of domestic abuse. However, surveys detailing the prevalence

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[1]The expressions domestic abuse, domestic violence and spousal abuse shall be used interchangeably in this paper.

[2]See Table 3. Unfortunately, data are not available regarding domestic violence against men. The VAWS defines domestic violence as including any of the following activities: threatening to hit, pushing, grabbing, shoving, slapping, kicking, hitting, biting, beating, choking, threatening to use or using a gun or knife, or sexual assault.

[3]39% of women abused in current marriages and 75% of women abused in past marriages have suffered more than one incident of abuse (Statistics Canada, 1993a).

[4]The list of injuries resulting from violence against women, especially for women who suffer multiple incidents of violence, are well-documented and include dental damage, long term physical ailments, drug and alcohol addictions and psychological disorders (Day, 1995).

[5]Using figures from Greaves, Hankivsky and Kingston-Riechers (1995), Kingston-Riechers (1997) estimates the annual cost of domestic abuse to be at least $1.5 billion to individuals, employers and taxpayers in Canada.

of domestic violence have recently emerged and a series of studies concerning the economic implications of abuse has followed. Day (1995) and Greaves, Hankivsky and Kingston-Riechers (1995) have attempted to measure the economic costs of violence. These studies are of particular interest as their documentation of the costs of violence also illustrates the extent to which abuse affects victims' health. Others estimate the number of incidents of violence in abusive marriages (Tauchen, Witte and Long, 1991; Kingston-Riechers, 1997) and the effects of violence on employment (Lloyd 1997a, 1997b). These latter studies demonstrate the usefulness of economic arguments and frameworks in studying domestic abuse.

In this paper we focus on the effects of abuse on the labor force behavior of women and in doing so address two important shortcomings of the existing literature. First, the aforementioned studies rely on small, select samples. Tauchen, Witte and Long's (1991) sample consists of 125 women who had been physically abused by male partners in Santa Barbara County, California and had sought some form of assistance. Lloyd (1997a, 1997b) conducts her analysis on a random sample of 824 women in a low-income neighborhood of Chicago. In contrast, we utilize the 1993 VAWS.[6] The VAWS contains a large, random sample of Canadian women. Therefore, the results of the survey can be applied to the female population at large. In addition to standard economic variables, the data contain information on domestic abuse and other background characteristics of women and their spouses, data that are generally not available in studies of female labor supply. To our knowledge, this is the most representative data available on domestic violence and we are the first to investigate the effects of domestic abuse on labor supply using such data. A detailed description of the VAWS and sample statistics are provided in Section 2.

Second, the economic frameworks used in past studies have not taken into account the potentially important link between domestic abuse and marital status decisions. In particular, domestic

[6]Kingston-Riechers (1997) does utilize the VAWS, but conducts her analysis on a sample of 877 currently married and physically abused women.

abuse is likely a determinant of divorce, thus giving rise to issues of sample selection and possible indirect effects on labor force behavior. Recent work on female labor supply has identified important inter-relations between marriage, divorce and labor supply decisions (Johnson and Skinner, 1986; van der Klaauw, 1996). To allow for such effects we examine the role of domestic abuse in a model of labor force participation, described in Section 3, that includes marital status as an endogenous choice variable.

To incorporate abuse within an economic framework we draw on several related literatures. In terms of marital status we follow Becker (1991) who suggests the reason for most divorces is imperfect information in marriage markets. Individuals are assumed to match in the marriage market on attributes that do not change unexpectedly over time and are readily observed by agents. However, once a match has been made, new information regarding initially unobserved spousal characteristics may be revealed to women and change the gains to current marriages (Becker, Landes and Michael, 1977).[7] Because abuse is often difficult to observe before marriage,[8] we model abusive behavior as an initially unobserved spousal characteristic that lowers the gains to marriage.

To analyze the effects of domestic abuse on labor supply, we turn to the health literature, where past illnesses have been found to adversely affect labor market outcomes for up to fifteen years (Bartel and Taubman, 1979, 1986; Chirikos and Nestel, 1985). Similar to illness, we allow abuse to influence the productivity and hence the market wage of abused women. Given the severity of the abuse endured by many women, it is likely that the 'health-related' side effects of violence may have significant, and possibly long-term, negative labor supply effects.[9] We also allow abuse to affect the utility women

[7]Cornwell and Rupert (1997) suggest spousal unobservables may also play a role in explaining the marriage wage premium for men, as marital status may capture unobservables that are important to wives and employers.

[8]82% of all currently married and abused women report that the first incident of domestic abuse occurred during marriage.

[9] Domestic abuse may have other effects, e.g. psychological, that lower employment directly and do not necessarily affect the wage. Unfortunately these different hypotheses cannot be sorted out using the VAWS as it does not contain information on wages.

receive from leisure time. That is, women receive less utility from leisure time when married to an abusive spouse and as a result may increase their labor supply. Finally, domestic abuse plays an indirect role in the labor supply decision through the choice of marital status. In particular, domestic abuse increases the probability of divorce and in response, employment is expected to increase.[10]

In Section 4 we discuss the econometric specification of the model. Given limited employment and marital histories in the VAWS data, we estimate a simplified, reduced form version of the model. However, our estimation procedure does preserve the sequential nature of marital status decisions and the dependence of current employment on the entire marital history. It also controls for unobserved heterogeneity to allow for correlated preferences over work and marriage and to address the issue of sample selection in the remarriage market.

The results of our analysis, presented in Section 5, may be summarized as follows. First, domestic abuse inflicted by current and previous spouses has a significantly negative effect on employment, indicating long-term health effects of abuse on market wages. However, remarried women abused in their second, but not their first, marriage tend to increase employment in response to domestic abuse, suggesting the effects of abuse on leisure outweigh the health effects for these women. Second, domestic abuse is a dominant factor in the choice of marital status, where violence in a first marriage increases the utility from divorce and remarriage. Considering the significance of the divorce indicator in the employment equation, this finding indicates that the indirect effect of domestic abuse on employment is also important. Finally, readily observed characteristics of women play only a minor role in the divorce decision relative to abuse-related information. That is, initially unobserved information is central to future marital status decisions.

[10]The positive relationship between divorce and labor force participation has been well established in the literature. See, for example, Johnson and Skinner (1986), Peters (1986), van der Klaauw (1996) and Becker, Landes and Michael (1977).

## 2. The Violence Against Women Survey

The VAWS was conducted between February and June of 1993 and involved telephone interviews of 12,300 women aged 18 and above in all provinces of Canada.[11] The survey dealt with the respondents' experiences of violence since the age of 16 as well as their perceptions of personal safety. The VAWS is particularly valuable in three respects. First, it contains a random sample of Canadian women.[12] This is in direct contrast to other surveys involving abuse-related subject matter, where samples are limited to abused women seeking services (Tauchen, Witte and Long, 1991) or low income families in a restricted geographical area (Lloyd, 1997a, 1997b). Second, survey responses were not restricted to reported incidents alone: all activities considered an offense under the Canadian Criminal code, reported or not, were recorded. As a result, the problem of underestimating the prevalence of violence by restricting responses to reported incidents is mitigated to some extent. Third, the data set contains detailed information about the types and duration of abuse, data on previous marriages and personal background information on respondents and their spouses, including violence in the family of origin.[13]

The VAWS does have some drawbacks. Although rich in abuse-related information, relevant economic information is sparse. The data only contain information on the current employment status of the respondents, personal income and household income are grouped into 11 categories, and no data are directly available on wage rates, hours worked and spousal income.[14] Data are available on the

[11]A total of 19,309 eligible respondents were contacted, resulting in a response rate of 63.7% (Statistics Canada, 1994a). Summary statistics and a description of the data set are available from Statistics Canada (1993a, 1993b).

[12]We have compared the VAWS with the 1993 Canadian Survey of Consumer Finances (SCF). The average characteristics of women are the same with the exception of the proportion of women living in urban areas and in terms of educational attainments. See the Appendix for further details.

[13]Violence in the family of origin information is available as pertains to the respondent, her current spouse and her previous spouse if applicable. In this context, violence in the family of origin refers to incidents of domestic abuse inflicted on the mother by the father.

[14] Kingston-Riechers (1997) attempts to deal with the problem of missing spousal income data by predicting income using the SCF. We adopt a reduced form approach instead for two reasons. First, as illustrated by Kingston-Riechers (1997) and the current paper, the average characteristics of the individuals in the VAWS and

education and labor force status of current but not past spouses. In addition, the sample statistics may not provide an accurate depiction of domestic abuse. Considering the highly sensitive nature of the survey questions, the data may be subject to some degree of under-reporting. It is likely that all women do not fully disclose their experiences regarding domestic abuse to the interviewer out of fear, shame or denial (Okun, 1986; Weis, 1989; Straus and Gelles, 1992; Dutton, 1995). Furthermore, women may be more likely to report abuse in a past marriage than abuse in a current marriage.[15] [16]

To conduct our analysis, the following restrictions are placed on the sample. First, to reduce the number of women currently receiving schooling and women not participating in the labor force for retirement reasons, the age range of the sample is restricted to women aged 25-55 who are not enrolled in school, eliminating 5620 women.[17] Widows are excluded from the sample (87) as our interest lies with endogenous marital dissolutions. Any women with more than two marriages (432) and any currently single women with more than one marriage (259) are removed, for the data only contain information on the current spouse and one past spouse.[18] Any women reporting that they are currently

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SCF samples are quite different with respect to education, an important predictor of wages. The source of this difference in education is unknown and may be due to differences in coding across the data sets. Second, no distinction can be made between spouses from first or second marriages in the SCF and it is likely that there is non-random selection into marital histories. That is, the spousal income distribution may differ across first and remarriage markets.

[15]Statistics Canada, recognizing the sensitive nature of the survey, consulted a wide range of experts while constructing the questionnaire. Interviewers were trained to recognize and respond to signals that the respondent was concerned about being overheard, and telephone numbers of local support services were offered to women reporting current cases of abuse and to women in distress (Statistics Canada, 1994b). In addition, sensitive questions on the survey were prefaced with statements designed to make the respondent more comfortable answering the question.

[16]It is also possible that non-response to the survey as a whole may be correlated with abuse. We are not able to address this issue. However, we note that the VAWS sample, at least in terms of standard characteristics, is representative of Canadian women (see footnote 12).

[17]Respondents are eliminated if they reported attending school at any time in the survey year.

[18] For the purpose of this paper, women are recorded as married if they report being married and living with their spouse or if they report living common-law. The VAWS classifies a relationship as common-law if the woman was living with a man as husband and wife without being legally married (Statistics Canada, 1993c). Note that 8% of all currently married women are reported as living common-law.

married but not living with their spouse are eliminated from the sample (112).[19] Since this paper deals with domestic abuse, women who report never being married are excluded from the sample (352).[20] Finally, all respondents with missing covariate information are eliminated (367). The sample size is thus reduced to 5070 women, of which 77% remain in their first marriage, 8% are divorced and currently single and 15% are remarried.

To account for differences in labor force behavior due to the effects of domestic abuse, we first examine the average individual characteristics of currently married women who are abused by their spouses as compared to those who are not abused. This is the relevant sample if the role of abuse in the divorce decision is ignored. To allow for the possibility that severe abuse has a larger effect on labor market behavior than mild abuse, we divide the information on abuse into two categories according to severity. Women are recorded as experiencing low severity abuse if the highest level of reported abuse involves threatening to hit, pushing, grabbing, shoving or slapping; high severity abuse involves kicking, biting, beating, choking, threatening to use or using a gun or knife, or sexual assault. Table 1[21] shows that key characteristics of women and their current spouses differ across levels of abuse severity, especially in regards to women suffering high severity abuse. Women who experience high levels of abuse are less likely to possess post-secondary and university education and are more likely to come from violent homes than women reporting mild or no abuse. Abusive spouses are much more likely to have violent family backgrounds and to have been unemployed in the past twelve months than non-abusive spouses. They are also less likely to have university education. Despite the differences among the samples, the labor force behavior of abused women is quite similar to that of non-abused women in terms of weeks worked and participation rates.

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[19]One respondent was also eliminated because she did not fall into any of the marital categories.

[20] We do not use single women as our control group because the VAWS does not provide enough information to estimate the initial decision to marry.

[21]Survey weights are used in calculating all statistics to control for variations in non-response rates across provinces and the under- and over-sampling of some regions (see Statistics Canada, 1994).

However, the sample of currently married women may not be an appropriate sample of women to consider when discussing domestic abuse, because women who suffered more severe abuse may be more likely to divorce. In other words, the women for whom we would expect to observe more serious health-related effects from domestic abuse may be precisely the women who are excluded from the sample. Table 2 supports this claim, as divorce rates for women abused in first marriages are dramatically different than those for non-abused women: while the divorce rate for non-abused women is 15%, women who experienced high severity abuse in a first marriage have a divorce rate of 75%.[22] Furthermore, table 3 shows that the average characteristics of women vary considerably across marital histories. Divorced women, even those who have remarried, are more likely to participate in the labor force and are more likely to come from violent homes. In addition, approximately one-half of past marriages are abusive, while only 15% of all current marriages report abuse. Clearly, domestic violence plays a role in the dissolution of many marriages. Since women in the various marital histories are quite different in terms of standard economic and abuse-related characteristics, we examine the within-history comparisons of labor force behavior for abused and non-abused women. Table 4 shows that married women who are abused do not have employment behavior that is markedly different from non-abused married women. However, divorced women who have suffered severe abuse at the hands of a past spouse are less likely to participate and are less likely to choose full-year employment. Furthermore, remarried women abused in the current marriage are less likely to participate and if abused in a past marriage, are less likely to choose full-year employment. Therefore, the sample statistics suggest domestic abuse is an influential factor in both marital and labor status choices and the role of divorce is important when determining the effects of domestic abuse on employment.

[22]Lloyd (1997b) also finds that women who experienced severe abuse are more likely to be divorced in her data on low-income families.

## 3. Model

Although rich in abuse-related information, the VAWS is a cross-sectional data set with incomplete marital and employment histories. Keeping in mind this limitation of the data, we use a simple, multi-state, finite horizon framework to study the relationships between marriage, employment and domestic abuse. Two important aspects of marital and labor force status decisions are incorporated. First, the model captures the sequential nature of marital status decisions and the forward-looking behavior of women. Second, the labor force status decision in each period depends on the entire marital history, not simply on whether a woman is currently married or single.[23]

There are four marital states available to women (single (*S*), married (*M*), divorced (*D*) and remarried (*R*)) and the following transitions between states are permitted. Single women can remain single or move to the married state. Married women can choose to remain married or to divorce, but cannot proceed directly to the remarriage market. Once divorced, women can remain divorced or remarry. Since information is not available on more than one remarriage in the data, it is assumed for simplicity that women who decide to divorce after remarriage remain divorced. The utility received in each state depends on a random component ($\epsilon_i$) that is realized upon entering marital state *i*, *i=S,M,D,R*. Women also have unobserved preferences over work ($\epsilon_P$) that are assumed to be known in the initial marital state (*S*), time invariant, and independent of $\epsilon_i$.[24]

All women are initially single and must decide whether to enter the marriage market given their expected gains to marriage. Following Becker (1991), men and women are assumed to sort in the marriage market on observed attributes such as age and education. However, spouses also have initially unobserved characteristics, such as abusive behavior ($A_M$), that influence the utility from marriage for women. It is assumed that women know the distribution of abuse in the marriage market,

[23]Van der Klaauw (1996) estimates a dynamic model of labor force participation and marital status choices, where current utility depends on whether women were single or married in the current period and the preceding period. However, he does not analyze the relationship between current decisions and the entire marital history.

[24]The latter assumption is relaxed in Section 4.

but do not observe their spouse's realization until after the decision to marry has been made. Abusive behavior is assumed to be an innate characteristic of the husband; however, domestic abuse may still be "match specific" in the sense that characteristics of women may affect their husband's utility from marriage and the level of abuse.[25] As a result, women use personal information ($Z_F$) when assessing the expected value of domestic abuse.

Let $V_S$, $V_M$, $V_D$ and $V_R$ represent the values of being in the single, married, divorced and remarried states, respectively, $\beta$ the discount factor and $C$ the value of a composite commodity representing all consumption goods with the exception of leisure. Labor force participation is denoted $P$, where $P$ is equal to 1 if the woman is working and 0 otherwise; leisure time is (1-$P$). A woman must remain in each marital state for at least one period.[26] During the initial period in each state, $\epsilon_i$ (i=$S$,$M$,$D$,$R$) is revealed and any initially unobserved spousal characteristics, including abuse, are realized. At the start of the following period, the woman must decide to remain in the current marital state or progress to the next one. The latter will occur only if the expected value of the next state is greater than the value of the current state. Thus, beginning with the first marital state, the value of being single can be expressed by

$$\begin{aligned} V_S &= U(C,1-P|\epsilon_S,\epsilon_P) + \beta \max\{V_S', E_{\epsilon_M, A_M|Z_F}(V_M')\} \\ &s.t.\ C = wP + M_S \end{aligned} \tag{1}$$

where consumption while single depends on labor ($w$) as well as non-labor ($M_S$) income and primes

[25]We do not model abuse as endogenous. That is, women cannot influence the level of abuse they receive through their behavior. In particular, abuse is not assumed to be a function of their labor force status. This assumption is consistent with evidence from the VAWS that employment is not a significant predictor of abuse and Kingston-Riechers' (1997) finding that personal and spousal incomes do not have a significant effect on the number of incidents of violence.

[26]We do not specify a particular length of calendar time for each period, but do maintain the notion that it takes time for information to be realized and that transitions between states are not immediate.

denote the following period.[27] To determine the expected utility from marriage, women take expectations over $\epsilon_M$ and the level of abuse in marriage, conditional on personal characteristics. If the expected utility from marriage exceeds that from remaining single, women will enter the marriage market. The value of being in the married state is

$$\begin{aligned} V_M &= U(C, 1-P | A_M, \epsilon_M, \epsilon_P) + \beta \max\{V_M', E_{\epsilon_D}(V_D')\} \\ &s.t.\ C = w(A_M)P + M_M. \end{aligned} \tag{2}$$

While married, women may consume personal labor and non-labor ($M_M$) income,[28] where the true level of domestic abuse is revealed after marriage and is assumed to negatively affect the utility and market wages of married women.

Once the level of domestic abuse and $\epsilon_M$ are revealed, the true gains to marriage are realized and the decision to remain married or to divorce can be made. The value of being in the divorced state is

$$\begin{aligned} V_D &= U(C, 1-P | A_M, \epsilon_D, \epsilon_P) + \beta \max\{V_D', E_{\epsilon_R, A_R | Z_F}(V_R')\} \\ &s.t.\ C = w(A_M)P + M_D \end{aligned} \tag{3}$$

where income available for consumption is now comprised of labor income and any non-labor income ($M_D$) while divorced.[29] Abuse from the first marriage affects the utility from leisure after the marriage has dissolved to allow for long-term psychological effects of abuse, for example. In addition, abuse may have long-term effects on the market wage. If the expected value of divorcing exceeds that of

[27]For notational simplicity we suppress the dependence of the utility function on additional personal and, in the case of marriage, spousal characteristics.

[28]Non-labor income in this context includes spousal labor income. Women tend to be the secondary earners in the household; thus it seems likely they receive a transfer from the husband for consumption purposes. We make the implicit assumption that women consume a constant fraction of spousal income while married as in van der Klaauw (1996).

[29]Non-labor income while divorced could include alimony or other proceeds of divorce settlements, for example.

remaining married, women will divorce. Once divorced they must decide whether to reenter the marriage market or not. Women evaluate the expected utility from remarriage by taking expectations over $\epsilon_R$ and the level of abuse in the second marriage ($A_R$), conditioned on personal characteristics. The value of being in the remarried state is given by

$$\begin{aligned} V_R &= U(C,1-P|A_R,A_M,\epsilon_R,\epsilon_P) + \beta \max\{V_R^{/}, E_{\epsilon_{D2}}(V_{D2}^{/})\} \\ s.t.\ C &= w(A_R,A_M)P + M_R \end{aligned} \tag{4}$$

where $V_{D2}$ denotes the value of a second divorce and $M_R$ represents non-labor income while remarried. The market wage, as well as the utility from leisure, may be influenced by abuse suffered in both first and second marriages. If the expected returns to remarriage are higher than the returns from remaining divorced, women will remarry.

It is assumed that $\epsilon_i$, as well as its underlying distribution, does not change over time.[30] Therefore, women who decide to remain in state $i$ once $\epsilon_i$ is realized always remain in state $i$. As a result, the value functions for the end states can be expressed as

$$\begin{aligned} V_i^{/} &= U(C,1-P|AH_i,\epsilon_i,\epsilon_P) + \beta V_i^{/} \\ s.t.\ C &= w(AH_i)P + M_i, \quad i=S,M,D,R \end{aligned} \tag{5}$$

except for the final period in which the future value of any state is zero. $AH_i$ represents the abuse history in state $i$

$$AH_i = \begin{cases} 0 & if\ i=S \\ A_M & if\ i=M,D \\ A_M,A_R & if\ i=R. \end{cases} \tag{6}$$

[30]Unfortunately, the VAWS does not contain information on the length of time spent in each state. So we are unable to incorporate durations in our econometric analysis. For simplicity and consistency we, therefore, do not model the advent of additional information influencing future decisions to remain in each marital state.

One implication of the model is that the choice of consumption and leisure in each state depends on the entire marital history. Therefore, conditional on being in marital state *i*, women participate in the labor force if the utility received while participating exceeds the utility from not participating

$$U(w(AH_i) + M_i, 0 | AH_i, \epsilon_P, i=1) \geq U(M_i | AH_i, \epsilon_P, i=1), \quad i = S, M, D, R. \tag{7}$$

It is useful to emphasize that domestic abuse influences labor force behavior in three ways. First, domestic abuse has an indirect effect on employment through the choice of marital status. Second, abuse is allowed to have health effects on productivity, decreasing wages and reducing participation. Finally, domestic abuse in a current marriage or remarriage has a direct negative effect on the utility from leisure and is expected to increase employment. Considering the opposing health and leisure effects, we must turn to the data to determine the net effect of abuse on labor market behavior.

## 4. Econometric Specification

The model outlined in Section 3 captures the sequential nature of labor and marital status choices. To structurally estimate this model, complete marital and employment histories are required. Unfortunately, the VAWS only contains information on current labor force status. In addition, the data are not rich enough to allow the estimation of the initial decision to marry and the decision to remain remarried or to divorce. Therefore, we estimate the reduced form transitions between marriage, divorce and remarriage as well as the current employment decision.

### 4.1 Specification of the Marital History Choice Probabilities

In general, the utility women receive in each marital state is not observed by the econometrician, although information on the marital history is available. To be consistent with our model, we assume women choose the marital state in each period that yields the highest level of expected utility. We

implement a two-period version of the model where all women enter the first period married, the divorce decision is made at the beginning of the first period, and the remarriage decision is made at the beginning of the second and last period.[31] The reduced form representation of utility in each marital state is specified as

$$U(w(AH_i), AH_i, M_i, \epsilon_i) = X_i\alpha_i + \epsilon_i \quad i = M, D, R. \tag{8}$$

Following van der Klaauw (1996), the probability that women remain married can be represented by

$$P(M=1|X_M, X_D, X_R) = \frac{\exp(X_M\alpha_M + \beta V_M')}{\exp(X_M\alpha_M + \beta V_M') + \exp(X_D\alpha_D + \beta E\max\{V_D', V_R'\})} \tag{9}$$

where $\beta V'_M = \beta \ln(\exp(X_M\alpha_M))$ and $\beta E\max\{V'_D, V'_R\} = \beta \ln(\exp(X_D\alpha_D) + \exp(X_R\alpha_R))$ under the assumption that $\epsilon_M$, $\epsilon_D$, and $\epsilon_R$ are i.i.d. extreme value. As in the model, women who choose to remain married remain so in subsequent periods, i.e. $P(M'=1|M=1, X_M, X_D, X_R) = 1$. Therefore, (9) represents the probability of choosing married as the end state. The corresponding probability that women divorce is

$$P(D=1|X_M, X_D, X_R) = 1 - P(M=1|X_M, X_D, X_R). \tag{10}$$

Conditional on divorce in the first stage, women remain divorced if the value of being in the divorced state exceeds the value of being in the remarried state

$$P(D'=1|D=1, X_D, X_R) = \frac{\exp(X_D\alpha_D)}{\exp(X_D\alpha_D) + \exp(X_R\alpha_R)}. \tag{11}$$

The probability of choosing divorced as an end state is therefore

[31]This maintains the sequential nature of marital status decisions unlike the alternative of estimating a multinomial logit with three end states.

$$P(D'=1 \mid D=1, X_D, X_R) \cdot P(D=1 \mid X_M, X_D, X_R). \tag{12}$$

The analogous choice probability for entering the remarriage market, conditional on divorce, is

$$P(R'=1 \mid D=1, X_D, X_R) = \frac{\exp(X_R \alpha_R)}{\exp(X_D \alpha_D) + \exp(X_R \alpha_R)} \tag{13}$$

and the probability of choosing remarried as an end state is

$$P(R'=1 \mid D=1, X_D, X_R) \cdot P(D=1 \mid X_M, X_D, X_R). \tag{14}$$

Explanatory variables determining the choice of marital history are chosen in conjunction with the theoretical model as follows. The vector of characteristics determining the utility from marriage ($X_M$) includes the woman's wage ($w$), the presence of abuse in the first marriage ($A_M$) and non-labor income while married ($M_M$). To proxy the market wage, we use age at first marriage, education and the presence of abuse in the marriage. As discussed in Section 3, domestic abuse is assumed to influence both the market wage and the utility from being married and is represented by two indicators of the severity of abuse in the first marriage. We also control for the presence of abuse before marriage. In addition to the presence of abuse, other aspects of the marriage may influence the utility gains to marriage.[32] We proxy these characteristics of the marriage with information on the presence of abuse in the family backgrounds of women and their spouses. Many women reported that they did not possess information on their first spouse's family background.[33] Instead of excluding these women we include an indicator variable for this category. A lack of information may capture other aspects of

[32]A key determinant of the utility from marriage is the presence of children. Unfortunately the VAWS only collected information on whether or not any children were present in the household in 1993. There is no information on the number of children, their ages or who their parents are. Thus it is not possible to determine the presence of children in each marital state.

[33]383 women reported they did not know whether their first spouse had a violent family background.

the marriage, such as difficulties with communication. It is assumed non-labor income can be represented by spousal labor income. Considering the evidence of strong sorting in the marriage market on age and education (Becker, 1991), we assume spousal labor income can be represented by the women's age and education as in van der Klaauw (1996), where age refers to age at first marriage.[34]

The vector of characteristics determining the utility from divorce ($X_D$) includes the woman's wage ($w$), the presence of abuse in the first marriage ($A_M$) and non-labor income while divorced ($M_D$). The woman's education, a measure of age at divorce and the presence of past abuse proxy her market wage, where age at marriage and the difference between current age and age at first marriage capture age at divorce.[35] Since the data do not contain a reliable measure of non-labor income, no proxies for $M_D$ are included in the estimation.[36]

The utility from remarriage is determined by the vector of characteristics ($X_R$) which includes the wage ($w$), non-labor income while remarried ($M_R$), the level of abuse in the past marriage ($A_M$) and the expected level of abuse when remarried ($E(A_R|Z_F)$). Education, age at first marriage and the presence of abuse in the first marriage are included as proxies for the market wage. It is assumed the woman's age and education can proxy non-labor income ($M_R$) as in the case for marriage. The expected level of abuse in the remarriage market is conditioned on the following set of characteristics ($Z_F$). Domestic abuse in the woman's family background and information on domestic abuse in the first marriage may capture characteristics of women that influence the utility gains to marriage and the

[34]Direct information on spousal income, age and education is not available for all first marriages.

[35]There was insufficient data for some groups of women to determine age at divorce. Therefore, the difference between age in 1993 and age at first marriage is included as a proxy for age at divorce. We expect the number of years between the woman's age at marriage and her current age to be positively related to divorce.

[36]No measure of non-labor income was directly available in the data. Although measures of personal and household income were available, both variables are categorical and thus the construction of non-labor income from the difference between the two may be highly inaccurate. In addition, it is not possible to determine the proportion of personal income that constituted non-labor income.

level of abuse in a second marriage. We control for the severity of abuse in the first marriage as well as for the possibility abuse was present before marriage. An indicator of domestic violence in the first spouse's family background is also included.[37] If family background information is available before marriage, it is possible that women with a greater tolerance for abuse may be more likely to match with men who are more likely to abuse.[38]

Since the likelihood function consists of logistic choice probabilities, the parameters for one of the marital states must be normalized to zero for identification purposes. We specify marriage as the base category; therefore, the parameter estimates for the utility gains to divorce and remarriage are interpreted as net effects.[39]

### 4.2 Specification of the Participation Choice Probability

Analogous to the choice of marital status, the econometrician only observes a binary variable indicating whether a woman chooses to participate in the labor force or not. As specified by the model, current labor force status is conditional on the marital history and women participate in the labor force when the utility from participating exceeds the utility from not participating. We estimate the employment decision as a logit, where the relevant vector of characteristics include the woman's wage rate, non-labor income, the presence of abuse in the current marriage, and divorce and remarriage indicators. The woman's wage is proxied by her education, age, province dummies,[40] the presence of

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[37] include an indicator for those women who do not have information on their spouse's family background.

[38]Becker (1991) suggests that individuals may use observed characteristics to forecast unobserved characteristics. This idea may be especially relevant in the case of family backgrounds and domestic violence, as men from violent homes are 3 times more likely to be abusive spouses (Statistics Canada, 1993a).

[39]The parameter estimate for the difference between age and age at first marriage can be interpreted as a pure effect, for this characteristic does not determine the utility from marriage but does influence the utility from divorce.

[40]Province dummies are not included in the marital status choice probabilities because no information is available on the province of residence prior to 1993.

a child in the woman's household,[41] and the presence of abuse in both current and previous marriages. Information on the current husband's education and labor force status, including any unemployment in the current year, is used to proxy his labor income.[42] The measure of labor supply used in estimation is an indicator of whether the woman worked 52 weeks in the survey year. This measure is chosen because in the data labor force participation is defined as working or looking for work in the past year. Our measure of employment is likely a better indicator of significant attachment to the labor force.[43]

### 4.3 Unobserved Heterogeneity

Before proceeding to estimation, two econometric issues must be addressed. First, although the theoretical model assumes preferences over work and marital status are uncorrelated, it is likely this assumption is violated in practice. This does not pose a problem for the estimation of the reduced form marital status decisions. However, since the marital history enters into the employment decision rule, failing to control for endogeneity will result in biased employment parameter estimates. The standard approach to overcome this problem is to instrument marital status in the employment equation; however, it is difficult to identify suitable instruments in the data.[44] Second, the sample of currently married women most likely does not constitute a random sample of ever-married women. For example, as suggested by Becker (1991), the average divorced person is more likely to possess unobserved characteristics that lower their gains to marriage. Since the expected gains from remarriage are generally assumed to be lower than the gains from first marriages (Becker, Landes and

[41]Unfortunately, no information was available on the number and ages of the children in the household. In addition, it is not possible to determine if the woman is the mother of the children.

[42]We assume that the husband's income is exogenous for the purposes of this paper. This assumption is consistent with Nakamura, Nakamura, and Cullen, (1979) who find changes in the husband's mean annual hours of work are negligible over changes in mean hourly wages and the wives employment status among other characteristics for a sample of Canadian families. Therefore, they suggest that the husband's hours of work and thus his earned income may be taken as given when considering the short-run labor force behavior of the wife.

[43]Approximately 19% of the sample reported they worked less than 52 but more than 0 weeks and are coded as not working. It should be noted, however, that 92% of these women worked 40 weeks or less. Estimation results for the model that uses participation as the dependent variable are available from the authors upon request.

[44]Cornwell and Rupert (1997) report a similar problem in their study of marriage wage premiums.

Michael, 1977), a sample selection bias may arise as the sample of remarried women may be more likely to possess above average preferences for marriage. Considering the relatively complex structure of the choice probabilities and the fact that sample selection may occur at two stages in the model, the usual method of controlling for sample selection (Heckman, 1979) cannot be implemented.

One technique for overcoming both complications is to assume a discrete unobserved heterogeneity distribution with a fixed number of points of support and to estimate the locations and masses of the points (Heckman and Singer, 1984). This approach has been used in duration models (for example, Ham and Lalonde, 1996; van den Berg, Lindeboom and Ridder, 1994, and Gritz, 1993) and recently, a structural model of labor force participation and marital status (van der Klaauw, 1996). Following the latter, we re-specify $\epsilon_M$, $\epsilon_D$, $\epsilon_R$ and $\epsilon_P$ as

$$\epsilon_j = \theta_j + u_j, \quad j=M,D,R,P$$

where $u_j$ is an i.i.d. random extreme value error. In addition, we normalize $\theta_M$ to zero and assume $\theta_R=\phi\theta_D$ and $\theta_j$ $j=D,P$ follows a bivariate distribution where

$$\theta_D = 0 \text{ and } \theta_P = 0 \text{ with probability } p_1$$

$$\theta_D = 0 \text{ and } \theta_P = \rho_2 \text{ with probability } p_2$$

$$\theta_D = \rho_1 \text{ and } \theta_P = 0 \text{ with probability } p_3$$

$$\theta_D = \rho_1 \text{ and } \theta_P = \rho_2 \text{ with probability } 1-p_1-p_2-p_3.$$

Since $\theta_M$ is normalized to zero, $\theta_D$ and $\theta_R$ should be interpreted as relative to unobserved preferences for marriage. We estimate the parameters $\rho_1$, $\rho_2$, $\phi$, $p_1$, $p_2$, $p_3$ in conjunction with the parameters of primary interest in the model using maximum likelihood.

## 5. Results

The parameter estimates for the employment and marital history choice probabilities are presented in Tables 5 and 6, respectively.[45] Results from two versions of the model are presented. First, a version of the model allowing for unobserved heterogeneity across the marital and employment

[45]Survey weights are used in the estimation (see footnote 21).

states is estimated. Second, the model is specified under the assumptions that the marital history and current employment are uncorrelated and that there is no sample selection in the remarriage market. For each specification, the model is estimated with discount factors fixed at 0.95 and 0 to compare forward-looking and myopic behavior, respectively.[46]

Of particular interest are the results concerning the relationship between domestic abuse, marital status and employment. Table 5 shows that the effects of domestic violence differ across severity levels and marital states. As expected, high severity abuse in past and current marriages has significant effects on employment, while the effects of low severity abuse are generally insignificant. This finding supports our specification, which distinguishes between high and low severity abuse. For forward-looking women in the married state, high severity abuse significantly lowers the probability of full-year employment as indicated in row 5 of column 1. This result suggests the negative "health effect" of abuse outweighs the decrease in utility from leisure while abused. The final row of table 5 shows that abuse also has a significant, negative effect on employment for women in the divorced state, which is especially important as it indicates abuse influences economic outcomes when women are no longer in abusive marriages. These results are consistent with Lloyd (1997b), who finds abuse has a negative (although generally insignificant) effect on employment.

To allow for the possibility that women in the remarried state may be influenced by abuse in the current marriage differently if abused in a past marriage, we interact high severity abuse from the first and second marriages. The results presented in row 6 indicate that women abused in both first and second marriages are less likely to work, consistent with the results for married and divorced women. However, row 7 shows that women who were not abused in past marriages but are abused in current marriages are significantly more likely to choose full-year employment. For the latter group of women, the results suggest that the effects of current abuse on the utility from leisure dominate the health effect. Another possible interpretation of this finding is that these women may be responding

[46]As reported by others, for example van der Klaauw (1996), difficulties were encountered when attempting to estimate the discount factor.

to an increased probability of divorce, as second marriages tend to be less stable than first marriages in general (Becker, Landes and Michael, 1977) and domestic abuse is likely to increase the probability of divorce. This interpretation is consistent with findings that an increase in the divorce probability is linked to increased labor supply (Johnson and Skinner, 1986; Grossbard-Shechtman, 1993). It is also supported by evidence that women in abusive relationships make plans and take other actions, for example hiding money, to facilitate leaving the marriage (Lloyd, 1997a). Columns 2-4 indicate that failing to incorporate forward-looking behavior and unobserved heterogeneity eliminates the significance of many of the abuse indicators, providing additional support for our model specification. These findings may also account for the insignificance of abuse in the employment equation in previous work (Lloyd, 1997b).

Since the effects of domestic abuse are different for women in different marital states, it is of interest to examine the effects of spousal education and labor force status on employment for married and remarried women. In contrast to abuse, standard spousal information has quantitatively the same effect for married and remarried women with the exception of spousal unemployment. In all cases, spousal unemployment is positively related to employment, consistent with an "added worker effect" (see, e.g. Lundberg, 1985), although in the forward-looking correlated model, it is only significant for married women. It is of interest to note that the sign on the coefficient for spouses working 52 weeks is positive and highly significant in the employment equation. One possible explanation is that the woman's leisure time may yield less utility when she is alone versus time spent with her spouse. Another explanation is sorting in the marriage market on preferences for consumption goods.[47]

The presence of divorce in the marital history has a highly significant effect on employment: in fact, divorce is the most influential factor in the employment equation. Remarried women are also more likely to choose full-year employment than married women. However, this finding is no longer significant when unobserved heterogeneity is incorporated in the model. Considering the importance

[47]In regards to standard economic variables, the results in table 5 are consistent with past studies in the sense that age, the woman's education, and the presence of children have the expected signs. See Killingsworth and Heckman (1986) and Nakamura and Nakamura (1981), for example.

of divorce in the employment decision, it is of interest to examine the role of domestic abuse in the choice of marital status. Table 6 shows that the utility from divorce and remarriage relative to marriage is increasing in the presence of abuse in the marriage. This result can be interpreted as a decrease in utility from leisure when married to an abusive spouse, and is consistent with the predictions of the model.

In regards to other abuse-related information, we expect the family background information to have two effects on the utility from remarriage; a positive effect relative to the utility from marriage and a negative effect through an increase in the expected level of abuse in the second marriage. The results in table 6 suggest that these opposing effects offset each other, as family background information on women and their spouses does not have a significant effect on the utility from remarriage. Interestingly, the lack of information regarding spousal family background information has a significant, positive effect on the gains to remarriage, suggesting this lack of information is a more important determinant of the utility from marriage relative to remarriage than it is a predictor of abuse in second marriages.

Rows 3-6 of table 6 show that education and age have relatively small and mixed effects on the utility from divorce in the correlated, forward-looking model, although the myopic and uncorrelated specifications report the utility from divorce is increasing in education.[48] Table 6 shows that the utility from remarriage is also increasing in education and that the utility from remarriage is greater for women who married for the first time at younger ages, indicating young and educated women may face better prospects in the remarriage market. It is especially interesting to emphasize that the effects of age and education on the utility from divorce are minor relative to the effects of abuse-related information. This is consistent with our model in the sense that spousal unobservables appear to be the driving force behind divorce decisions.

[48]Previous studies report either positive and insignificant effects (Johnson and Skinner, 1986), or mixed and insignificant effects (Becker, Landes and Michael, 1977), of education on divorce probabilities. Lefebvre and Merrigan (1997) also report positive but insignificant effects of university education on divorce using Canadian data.

Comparison of the log likelihood values in Table 5 reveals the forward-looking model with unobserved heterogeneity outperforms the other specifications.[49] The estimated heterogeneity parameters for this case, presented in Table 7, indicate there are two primary groups in the population: women with high preferences for work and remarriage, but low preferences for divorce (55%) and women with low preferences for work and divorce but high preferences for remarriage (40%). As expected, $\phi$ is negative, indicating a negative correlation between preferences over the divorced and remarried states. Table 8 shows that the model provides a good fit to the data, where the predicted marriage, divorce and remarriage rates are not significantly different from the true values.

## 6. Conclusion

This paper utilizes a unique data set on domestic violence to assess the effects of abuse on labor market and marital status behavior. The results indicate that domestic abuse has a negative effect on employment for women in the married and divorced states, consistent with a decrease in the wage due to reduced productivity. These effects are significant and long-term. However, remarried women who were not abused in past marriages increase their employment in response to current abuse, suggesting the leisure effect of abuse outweighs the health effect. The role of "unobservables" in terms of abuse-related information appears to be a determining factor in the marital status decision, where domestic abuse in a first marriage increases the utility from divorce and remarriage. In turn divorce has a significantly positive effect on employment. Thus, domestic abuse has both direct and indirect effects on labor force behavior.

As expected, the dominant effect of abuse on employment is negative. However, the evidence presented on the importance of abuse in the divorce decision also highlights the fact that many women seem to respond to domestic violence by leaving the abusive relationship. The positive relationship between current abuse and employment for remarried women with no prior experiences of abuse may

[49]Comparing 2 times the change in the log likelihood values (29.26) with a $\chi^2(6)$ critical value reveals the unobserved heterogeneity parameters to be significant at a 1% level for the forward-looking case.

also suggest that these women are increasing labor supply in anticipation of a future divorce. This paper is the first to illustrate the important links between abuse, marital status and employment. Understanding the nature of these relationships is key to addressing this social issue, and our results suggest that aiding abused women in becoming more economically independent may be a fruitful avenue for policy.

TABLE 1
Sample statistics for currently married sample, by abuse

| Variable | No Abuse | Low Severity Abuse | High Severity Abuse |
|---|---|---|---|
| Participation rate | 0.8033 | 0.7717 | 0.8099 |
| | (0.0063) | (0.0183) | (0.0291) |
| Worked 52 weeks | 0.5967 | 0.5832 | 0.5632 |
| | (0.0078) | (0.0215) | (0.0368) |
| Age | 39.2485 | 38.3899 | 39.3920 |
| | (0.1325) | (0.3712) | (0.6202) |
| Age at first marriage | 22.3447 | 21.5906 | 21.1027 |
| | (0.0625) | (0.1521) | (0.2877) |
| Child | 0.7233 | 0.7789 | 0.7513 |
| | (0.0071) | (0.0181) | (0.0320) |
| High school | 0.3312 | 0.3301 | 0.2621 |
| | (0.0075) | (0.0205) | (0.0326) |
| Post-secondary or | 0.4858 | 0.4763 | 0.3722 |
| university | (0.0080) | (0.0218) | (0.0358) |
| Violence in family | 0.1515 | 0.2560 | 0.3539 |
| background | (0.0057) | (0.0190) | (0.0354) |
| Violence in current | 0.0741 | 0.1737 | 0.4188 |
| spouse's family | (0.0042) | (0.0165) | (0.0366) |
| Don't know current | 0.0598 | 0.1033 | 0.1159 |
| spouse's family bck. | (0.0038) | (0.0133) | (0.0237) |
| Spouse was unemployed | 0.1076 | 0.1317 | 0.2414 |
| | (0.0049) | (0.0147) | (0.0317) |
| Spouse worked 52 weeks | 0.7876 | 0.7666 | 0.6371 |
| | (0.0065) | (0.0184) | (0.0356) |
| Spouse has high school | 0.2687 | 0.2670 | 0.2784 |
| | (0.0071) | (0.0193) | (0.0332) |
| Spouse has post- | 0.2746 | 0.3049 | 0.2943 |
| secondary | (0.0071) | (0.0201) | (0.0338) |
| Spouse has university | 0.2124 | 0.1565 | 0.0608 |
| | (0.0065) | (0.0158) | (0.0177) |
| Observations | 3945 | 528 | 183 |

Notes: Standard errors are in parentheses.

TABLE 2
Divorce rates by abuse in first marriage

| No Abuse | Low Severity Abuse | High Severity |
|---|---|---|
| 0.1536 | 0.2897 | 0.7472 |
| (0.0058) | (0.0181) | (0.0181) |

Notes: Standard errors are in parentheses.

TABLE 3
Sample statistics by marital history

| Variable | Married | Divorced and Single | Remarried |
|---|---|---|---|
| Participation rate | 0.7914 | 0.8643 | 0.8466 |
| | (0.0065) | (0.0169) | (0.0132) |
| Worked 52 weeks | 0.5834 | 0.6811 | 0.6514 |
| | (0.0079) | (0.0229) | (0.0175) |
| Age | 39.2814 | 38.2037 | 38.4872 |
| | (0.1349) | (0.4251) | (0.2867) |
| Age at first marriage | 22.5581 | 22.5097 | 20.3471 |
| | (0.0630) | (0.2069) | (0.1097) |
| Child | 0.7526 | 0.4764 | 0.6108 |
| | (0.0069) | (0.0246) | (0.0179) |
| High school | 0.3282 | 0.2878 | 0.3301 |
| | (0.0075) | (0.0223) | (0.0173) |
| Post-secondary or | 0.4812 | 0.5203 | 0.4771 |
| university | (0.0080) | (0.0246) | (0.0183) |
| Violence in family | 0.1609 | 0.2660 | 0.2235 |
| background | (0.0059) | (0.0217) | (0.0153) |
| Violence in current | 0.0970 | | 0.1035 |
| spouse's family | (0.0047) | | (0.0112) |
| Don't know current | 0.0689 | | 0.0550 |
| spouse's family bck. | (0.0041) | | (0.0084) |
| Spouse was unemployed | 0.1103 | | 0.1421 |
| | (0.0050) | | (0.0128) |
| Spouse worked 52 weeks | 0.7855 | | 0.7482 |
| | (0.0066) | | (0.0159) |
| Spouse has high school | 0.2685 | | 0.2708 |
| | (0.0071) | | (0.0163) |
| Spouse has post- | 0.2756 | | 0.2958 |
| secondary | (0.0071) | | (0.0167) |
| Spouse has university | 0.1991 | | 0.2084 |
| | (0.0064) | | (0.0149) |
| Violence in past | | 0.1809 | 0.1847 |
| spouse's family bck. | | (0.0189) | (0.0142) |
| Don't know past | | 0.1396 | 0.1191 |
| spouse's family bck. | | (0.0171) | (0.0119) |
| Low severity abuse in | 0.1127 | | 0.1051 |
| current marriage | (0.0051) | | (0.0113) |
| High severity abuse in | 0.0353 | | 0.0464 |
| current marriage | (0.0030) | | (0.0077) |
| Low severity abuse in | | 0.1604 | 0.1444 |
| past marriage | | (0.0181) | (0.0129) |
| High severity abuse in | | 0.3704 | 0.3238 |
| past marriage | | (0.0238) | (0.0172) |
| Observations | 3912 | 414 | 744 |

Notes: Standard errors are in parentheses.

TABLE 4
Within history comparisons of labor market indicators by abuse severity

| Marital State | Participation Rate | Worked 52 Weeks |
|---|---|---|
| Married | | |
| No abuse | 0.7940 | 0.5857 |
| | (0.0070) | (0.0085) |
| Low severity | 0.7641 | 0.5767 |
| | (0.0203) | (0.0236) |
| High severity | 0.8174 | 0.5492 |
| | (0.0320) | (0.0412) |
| Divorced | | |
| No abuse | 0.8868 | 0.7302 |
| | (0.0239) | (0.0335) |
| Low severity | 0.9151 | 0.7268 |
| | (0.0336) | (0.0536) |
| High severity | 0.8137 | 0.5991 |
| | (0.0302) | (0.0380) |
| Remarried | | |
| Current Marriage | | |
| No abuse | 0.8541 | 0.6569 |
| | (0.0142) | (0.0191) |
| Low severity | 0.8158 | 0.6206 |
| | (0.0413) | (0.0517) |
| High severity | 0.7790 | 0.6212 |
| | (0.0701) | (0.0820) |
| Previous Marriage | | |
| No abuse | 0.8640 | 0.7043 |
| | (0.0180) | (0.0240) |
| Low severity | 0.8519 | 0.6471 |
| | (0.0330) | (0.0444) |
| High Severity | 0.8156 | 0.5666 |
| | (0.0240) | (0.0306) |

Notes: Standard errors are in parentheses.

TABLE 5
Parameter Estimates for Employment Decision

| Variable | Forward-looking | | Myopic | |
|---|---|---|---|---|
| | Heterogeneity between employment and marital status | No heterogeneity | Heterogeneity between employment and marital status | No heterogeneity |
| Divorced | 5.2843** | 1.3585** | 1.5490** | 1.3591** |
| | (0.4361) | (0.1396) | (0.2912) | (0.1291) |
| Remarried | 0.1935 | 0.2757** | 0.3330 | 0.2764** |
| | (0.3091) | (0.0591) | (0.2996) | (0.0707) |
| Low severity current abuse | -0.0131 | -0.0764* | -0.0824 | -0.0763 |
| (married) | (0.1718) | (0.0361) | (0.1093) | (0.0669) |
| Low severity current abuse | 0.5607** | -0.0089 | -0.0003 | -0.0092 |
| (remarried) | (0.1784) | (0.0696) | (0.0653) | (0.1135) |
| High severity current abuse | -1.3560* | 0.0427* | 0.0813 | 0.0428 |
| (married) | (0.6557) | (0.0199) | (0.0674) | (0.0588) |
| High severity current and past | -0.8109** | -0.0984 | -0.1799 | -0.0982 |
| abuse (remarried) | (0.2719) | (0.0897) | (0.2169) | (0.1970) |
| High severity current, but not | 4.5927** | 1.0444** | 1.1369* | 1.0445** |
| past, abuse (remarried) | (1.5888) | (0.0880) | (0.5676) | (0.0911) |
| High severity past, but not | 0.5460 | -0.0653 | -0.1038 | -0.0636 |
| current, abuse (remarried) | (0.3594) | (0.1920) | (0.2273) | (0.1901) |
| Low severity past abuse | -0.5558 | 0.0406 | 0.0323 | 0.0379 |
| (divorced) | (0.3210) | (0.2509) | (0.1397) | (0.1889) |
| Low severity past abuse | -0.0201 | -0.3895 | -0.3962* | -0.3861 |
| (remarried) | (0.3044) | (0.3349) | (0.1710) | (0.2629) |
| High severity past abuse | -1.3874** | -0.4896** | -0.5067** | -0.4911** |
| (divorced) | (0.2953) | (0.1435) | (0.1618) | (0.1561) |

Notes: Standard errors are in parentheses. *Coefficient is significant at the 5 percent level. **Coefficient is significant at the 1 percent level.

TABLE 5
Parameter Estimates for Employment Decision, continued

| Variable | Forward-looking | | Myopic | |
|---|---|---|---|---|
| | Heterogeneity between employment and marital status | No heterogeneity | Heterogeneity between employment and marital status | No heterogeneity |
| Age | 0.0924** | 0.1610** | 0.1660** | 0.1610** |
| | (0.0279) | (0.0348) | (0.0378) | (0.0352) |
| Age squared / 100 | -0.1498** | -0.2012** | -0.2069** | -0.2012** |
| | (0.0472) | (0.0441) | (0.0480) | (0.0444) |
| High school | 2.8926** | 0.7480** | 0.8328** | 0.7478** |
| | (0.3724) | (0.0464) | (0.1370) | (0.0736) |
| Post-secondary or university | 3.7644** | 1.0630** | 1.1675** | 1.0629** |
| | (0.4071) | (0.0491) | (0.1558) | (0.0750) |
| Child | -2.0416** | -0.6356** | -0.6964** | -0.6357** |
| | (0.2668) | (0.0677) | (0.1015) | (0.0706) |
| Quebec | -1.3126** | -0.2855** | -0.3018** | -0.2856** |
| | (0.2735) | (0.0531) | (0.0929) | (0.0867) |
| Ontario | 0.5213* | 0.2368** | 0.2521** | 0.2367** |
| | (0.2187) | (0.0503) | (0.0896) | (0.0827) |
| Prairie | 0.0843 | 0.1235* | 0.1330 | 0.1232 |
| | (0.2522) | (0.0574) | (0.1005) | (0.0926) |
| Maritime | -0.9589** | -0.2797** | -0.3132* | -0.2796** |
| | (0.3131) | (0.0626) | (0.1222) | (0.1040) |
| Spouse has high school (married) | 1.2826** | 0.2259** | 0.2576** | 0.2263** |
| | (0.2491) | (0.0538) | (0.0971) | (0.0801) |
| Spouse has high school (remarried) | 1.2869* | 0.0731* | 0.0540 | 0.0730 |
| | (0.5889) | (0.0346) | (0.2205) | (0.0935) |
| Spouse has post-secondary (married) | 0.4331* | -0.0259 | -0.0216 | -0.0261 |
| | (0.2172) | (0.0622) | (0.0902) | (0.0832) |
| Spouse has post-secondary (remarried) | 1.2090* | 0.1373** | 0.1456 | 0.1377** |
| | (0.6018) | (0.0236) | (0.2179) | (0.0532) |
| Spouse has university (married) | 0.7061** | -0.0616 | -0.0485 | -0.0615 |
| | (0.2680) | (0.0611) | (0.0998) | (0.0915) |
| Spouse has university (remarried) | 1.7285** | 0.2308** | 0.2364 | 0.2314** |
| | (0.6397) | (0.0338) | (0.2369) | (0.0859) |
| Spouse worked 52 weeks (married) | 2.2328** | 0.9225** | 1.0606** | 0.9224** |
| | (0.2423) | (0.0677) | (0.2052) | (0.0808) |
| Spouse worked 52 weeks (remarried) | 2.5104** | 1.0821** | 1.2054** | 1.0808** |
| | (0.4300) | (0.0606) | (0.2938) | (0.1102) |
| Spouse was unemployed (married) | 1.5474** | 0.8612** | 1.0109** | 0.8607** |
| | (0.3158) | (0.0800) | (0.2335) | (0.1049) |
| Spouse was unemployed (remarried) | 0.5153 | 0.6988** | 0.8242* | 0.6987** |
| | (0.3703) | (0.0593) | (0.3346) | (0.1152) |
| Intercept | | -3.8497** | | -3.8489** |
| | | (0.6750) | | (0.6727) |
| Log-likelihood | -6359.5132 | -6374.1435 | -6385.3017 | -6385.4943 |

Notes: Standard errors are in parentheses. *Coefficient is significant at the 5 percent level. **Coefficient is significant at the 1 percent level.

TABLE 6
Parameter Estimates for Divorce and Remarriage

| Variable | Forward-looking | | Myopic | |
|---|---|---|---|---|
| | Heterogeneity between employment and marital status | No heterogeneity | Heterogeneity between employment and marital status | No heterogeneity |
| Divorce Parameters | | | | |
| Low severity abuse in | 0.5765** | 0.4739** | 0.7146** | 0.7144** |
| First marriage | (0.1060) | (0.0660) | (0.0825) | (0.0756) |
| High severity abuse in | 1.7463** | 1.5527** | 2.7056** | 2.7019** |
| First marriage | (0.1230) | (0.0606) | (0.0874) | (0.0652) |
| Age at first marriage | 0.0084 | 0.0060 | -0.0906** | -0.0902** |
| | (0.0079) | (0.0042) | (0.0047) | (0.0061) |
| High school | -0.0014 | 0.0111 | 0.1615 | 0.1633** |
| | (0.0857) | (0.0642) | (0.0895) | (0.0416) |
| Post-secondary or | 0.1636* | 0.1493* | 0.4497** | 0.4508** |
| university | (0.0817) | (0.0622) | (0.0892) | (0.0399) |
| Age-age at first marriage | -0.0107** | -0.0091** | -0.0129** | -0.0126** |
| | (0.0031) | (0.0024) | (0.0032) | (0.0032) |
| Intercept | | -1.3769** | | 0.3567** |
| | | (0.0744) | | (0.1346) |
| Remarriage Parameters | | | | |
| Low severity abuse in | -0.0237 | 0.1013 | 0.3261* | 0.3581** |
| first marriage | (0.1461) | (0.1238) | (0.1494) | (0.0723) |
| High severity abuse in | 0.7268** | 0.9505** | 2.0718** | 2.0856** |
| first marriage | (0.1573) | (0.1079) | (0.1247) | (0.0813) |
| Abuse present before | -0.2934 | -0.2656 | -0.0441 | -0.0420 |
| marriage | (0.1818) | (0.1711) | (0.1362) | (0.0780) |
| Family background of | 0.1818 | 0.1656 | 0.0008 | 0.0082 |
| first spouse | (0.1133) | (0.1130) | (0.1521) | (0.0513) |
| Don't know family | 0.4188** | 0.3808** | 0.2085 | 0.1855** |
| background of first spouse | (0.1331) | (0.1308) | (0.1266) | (0.0709) |
| Family background of | -0.0102 | -0.0179 | -0.1840 | -0.1860 |
| Woman | (0.0985) | (0.0972) | (0.1290) | (0.1141) |
| Age at first marriage | -0.2183** | -0.2091** | -0.3009** | -0.2878** |
| | (0.0160) | (0.0144) | (0.0219) | (0.0138) |
| High school | 0.3310* | 0.3203** | 0.3741* | 0.3603** |
| | (0.1356) | (0.0994) | (0.1721) | (0.0907) |
| Post-secondary or | 0.5147** | 0.5258** | 0.7767** | 0.7481** |
| University | (0.1285) | (0.0965) | (0.1664) | (0.0859) |
| Intercept | | 3.4039** | | 4.8547** |
| | | (0.3107) | | (0.3357) |

Notes: Standard errors are in parentheses. *Coefficient is significant at the 5 percent level. **Coefficient is significant at the 1 percent level.

TABLE 7
Parameter Estimates for heterogeneity distribution

| Variable | Forward-looking | Myopic |
|---|---|---|
| $\rho_1$ | -1.6807** | 0.3910** |
| | (0.2519) | (0.0371) |
| $\rho_2$ | -7.7127** | -4.3115** |
| | (0.7867) | (0.8306) |
| $\phi$ | -2.3262** | 13.4406** |
| | (0.3095) | (0.2434) |
| $p_1$ | 0.0014 | 0.0004 |
| $p_2$ | 0.0496 | 0.0493 |
| $p_3$ | 0.5511 | 0.0937 |
| $p_4$ | 0.3979 | 0.8566 |

Notes: Standard errors are in parentheses. *Coefficient is significant at the 5 percent level.
**Coefficient is significant at the 1 percent level.

TABLE 8
Comparison of Actual and Predicted Employment, Marriage, Divorce and Remarriage Rates from Forward-Looking Model with Unobserved Heterogeneity

| | Actual | Predicted |
|---|---|---|
| Employment | 0.6021 | 0.6243 |
| | (0.0069) | (0.0023) |
| Marriage | 0.7662 | 0.7668 |
| | (0.0059) | (0.0026) |
| Divorce | 0.0928 | 0.0896 |
| | (0.0041) | (0.0012) |
| Remarriage | 0.1409 | 0.1435 |
| | (0.0049) | (0.0018) |

Notes: Standard errors are in parentheses.

## Appendix: Comparison of Average Characteristics for the Violence Against Women and 1993 Survey of Consumer Finances Samples

Table A1 compares similar samples from the VAWS and the 1993 SCF, a supplement of the Canadian Labor Force Survey similar to the March Current Population Survey in the U.S., to assess the representativeness of the former data set. Both samples are limited to women between the ages of 25 and 55 who are not attending school. The average characteristics of women in the VAWS and SCF data are similar, with three exceptions. First, total spousal income is higher in the SCF. It is likely that the measure of spousal income reported from the VAWS is inaccurate, as spousal income was constructed as the difference between the categorical variables "Total Personal Income" and "Total Household Income". Second, the proportion of women residing in an urban area is higher in the SCF. It should be noted that P.E.I. was not assigned a "Rural/Urban" indicator in the VAWS, and was thus coded as "Rural". Finally, the proportion of women with some post-secondary education is higher in the SCF and the proportions of women with high school and university degrees is lower. This latter difference could stem from coding or non-response pattern differences across the data sets. However, given the many similarities between the VAWS and the SCF especially in terms of employment patterns, it does not appear the high non-response rate for the VAWS resulted in an unrepresentative sample.

TABLE A1
Comparison of Average Characteristics for the Violence Against Women and Survey of Consumer Finances (1993) Samples[1]

| Variable | SCF93 (1992 Income) | VAW (1993) |
|---|---|---|
| Total personal income | 20448.48 | 21933.72 |
| | (130.0261) | (214.0748) |
| Total spousal income[2] | 39439.08 | 30404.59 |
| | (286.5227) | (257.1105) |
| Age of respondent | 38.6668 | 38.9941 |
| | (0.0582) | (0.1038) |
| Respondent resides in Nfld., N.S., N.B., or P.E.I. | 0.0819 | 0.0859 |
| | (0.0019) | (0.0034) |
| Respondent resides in Quebec | 0.2555 | 0.2694 |
| | (0.0030) | (0.0054) |
| Respondent resides in Ontario | 0.3793 | 0.3624 |
| | (0.0034) | (0.0059) |
| Respondent resides in AB., SK., or MN. | 0.1575 | 0.1657 |
| | (0.0025) | (0.0045) |
| Respondent resides in B.C. | 0.1191 | 0.1165 |
| | (0.0022) | (0.0039) |
| Respondent resides in an urban area[3] | 0.8260 | 0.7456 |
| | (0.0026) | (0.0053) |
| Highest level of education is less than high school | 0.2311 | 0.2071 |
| | (0.0029) | (0.0050) |
| Highest level of education is high school | 0.2632 | 0.3197 |
| | (0.0030) | (0.0057) |
| Highest level of education includes some post-secondary education | 0.3571 | 0.2964 |
| | (0.0033) | (0.0056) |
| Highest level of education is a university degree | 0.1486 | 0.1767 |
| | (0.0025) | (0.0047) |
| Respondent worked in the reference year | 0.7882 | 0.7685 |
| | (0.0028) | (0.0052) |
| Respondent worked or looked for work in the reference year | 0.8129 | 0.8165 |
| | (0.0027) | (0.0047) |
| Number of weeks worked for respondents who reported working | 0.8767 | 0.8906 |
| | (0.0020) | (0.0033) |
| Respondent worked full-time[4] | 0.7652 | 0.7365 |
| | (0.0036) | (0.0061) |
| Respondent worked part-time | 0.2212 | 0.2635 |
| | (0.0035) | (0.0061) |

[1]Standard errors in parentheses.
[2]Derived variable in SCF. In VAW, constructed from "Total Personal Income" and "Total Household Income" (categorical variables).
[3]VAW: P.E.I. was not assigned an indicator and was thus coded as "Rural".
[4]VAW: Applies to respondents reporting full-time work in past year. SCF: Applies to respondents reporting "mostly" working full-time in reference year.

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