The Economics of Abuse

Audra J. Bowlus
The University of Western Ontario
Department of Economics
London, Ontario N6A 5C2

`abowlus@julian.uwo.ca`

Shannon N. Seitz*
Queen's University
Department of Economics
Kingston, Ontario K7L 3N6

`seitz@qed.econ.queensu.ca`

July 9, 2000

Abstract

Domestic abuse affects a surprising number of families. However, little is known about the effects of abuse on the behavior of women. In this paper, we develop and estimate an economic model of abuse, where the determinants of domestic violence and its consequences for the employment and marital status decisions of women are considered. Within the model, abuse affects employment via effects on productivity (wages) and on the utility from leisure. In turn, employment decisions can influence the level of abuse in the marriage. As an initially unobserved characteristic of marriage, domestic violence the gains to marriage as the level of abuse is revealed. In contrast to the majority of past work, which considers highly select samples of abused women, we estimate the model using a representative Canadian data set on domestic violence. Our analysis reveals four main findings. First, domestic abuse is less likely to occur in households where women and their spouses are employed, suggesting domestic abuse may be a response, in part, to economic stress. Second, women abused in current marriages are less likely to be employed, consistent with reductions in labor market productivity. Divorced women abused in past marriages are also less likely to work, indicating long term effects of domestic violence on employment. Third, domestic abuse is a dominant factor in the decisions to divorce and remarry, which in turn are major determinants of employment. Finally, the results show that the use of non-random samples and the failure to control for the simultaneity of employment, marriage and abuse results in misleading inferences regarding the effects of employment on abuse propensities, the effects of domestic abuse on employment and the relationship between remarriage and abuse.

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 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 result 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 non-trivial, for in addition to missed days at work, many women access social, medical and judicial services as a result of spousal abuse.[5]

Considering the costs and prevalence of abuse, 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, it is first necessary to understand the causes and consequences of domestic abuse for women. In the past, the private nature of domestic violence and the resulting unavailability of data made it difficult to analyze domestic abuse. However, surveys detailing the prevalence 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 interest as their documentation of the costs of violence illustrates the extent to which abuse affects victims' health. Others demonstrate the usefulness of economic frameworks for studying abuse by estimating the number of incidents of violence in abusive marriages (Tauchen, Witte and Long, 1991; Farmer and Tiefenthaler, 1997; Kingston-Riechers, 1998), the effects of abuse on employment (Lloyd 1997a, 1997b), the relationship between abuse and divorce (Kingston-Riechers, 1998), and the relationship between the price of alcohol and abuse (Markowitz, 1999).

In this paper, we construct and estimate an economic model of domestic abuse. Our model integrates both the determinants of abuse and several important relationships between abuse, marriage and employment. With regard to the determinants of domestic

---

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

[2]See table 4. The VAWS defines domestic violence as including any of the following activites: 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, is well-documented and includes dental damage, long term physical ailments, drug and alcohol addictions, and psychological disorders (Day, 1995).

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

violence, we consider the role of socio-economic characteristics of women and their spouses, identified as predictors of abuse in past studies. We also test the hypothesis that the employment decisions of women are endogenous to abuse propensities within marriage to capture the notion that women may be able to influence the level of abuse by altering their behavior.

The inter-relationships between abuse, marriage and employment are incorporated in our model as follows. To examine the relationship between marital status and domestic abuse, 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). Because abuse is often difficult to observe before marriage,[6] we model abusive behavior as an initially unobserved, match-specific characteristic that lowers the gains to marriage. We analyze the effects of domestic violence on employment by allowing abuse to influence the productivity and hence the market wage of abused women, similar to the effects of illness on employment. Given the severity of the abuse endured by many women, it is likely that the health-related side effects of violence have significant, and possibly long-term, negative effects on labor supply.[7] In addition, domestic abuse is allowed to affect utility from leisure when leisure time is spent with an abusive spouse. 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.[8]

The model is estimated using a large, random sample of Canadian women from the VAWS. These data contain detailed information on domestic violence as well as standard economic variables and other background characteristics of women and their spouses. Our estimation procedure preserves the sequential nature of marital status decisions, the dependence of current employment on abuse and the entire marital history and the dependence of current abuse on the employment decision in the model. It also controls for unobserved heterogeneity to allow for correlated preferences over work, domestic violence and marriage and to address the issue of sample selection in the marriage market.

Our analysis addresses two important shortcomings of the existing literature. First, a majority of 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

---

[6]82% of all currently married and abused women report that the first incident of domestic abuse occurred during marriage in the VAWS. In marriages characterized by repeated assaults, previous studies report abuse started during marriage or pregnancy in 40% of cases (Gelles, 1975; Rounsaville, 1978).

[7]The health literature reports past illnesses may adversely affect labor market outcomes for up to fifteen years (Bartel and Taubman, 1979, 1986; Chirikos and Nestel, 1985).

[8]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), Seitz (1999) and van der Klaauw (1996).

partners in Santa Barbara County, California and had sought some form of assistance. Farmer and Tiefenthaler (1997) consider two samples. The first is a sample of 211 women in Omaha, Nebraska who called the police due to an incident of domestic violence. The second is a sample of 340 abused women in Charlotte, North Carolina. The use of such highly select samples may present an inaccurate portrayal of the prevalence of abuse, as these data are more likely to exclude women who left abusive relationships after learning their spouse's behaviour. In contrast, we use the 1993 VAWS. To our knowledge, this is one of the most representative data sets available on domestic violence and we are the first to investigate the effects of domestic abuse on labor supply using such data.[9]

Second, while past studies consider various aspects of the economic determinants and implications of domestic violence, they ignore potentially important relationships between marriage, labor supply and abuse. Previous studies assume personal income and the employment status of women are exogenous to the level of violence in marriage (Tauchen, Witte and Long, 1991; Farmer and Tiefenthaler, 1997; Kingston-Riechers, 1998), assume domestic violence is exogenous to the employment decision (Lloyd, 1997a, 1997b) and do not control for potential selectivity bias that may result from using samples of currently married and abused women. Recent work on female labor supply has identified links between marriage, divorce and employment decisions (Johnson and Skinner, 1986; van der Klaauw, 1996). In combination with evidence from the abuse literature, these studies suggest that ignoring the relationship between employment and marital status decisions may have important consequences for any inference regarding domestic violence. In fact, in specifications where it is assumed unobserved preferences for work, abuse and marriage are uncorrelated, the results of our analysis suggest women who participate in the labor force are more likely to be abused, women who are abused in current marriages are more likely to work and women abused in past marriages are more likely to remarry. However, specifications that control for the simultaneity of marriage, employment and abuse lead to different conclusions.

After controlling for correlation in preferences over marriage, abuse and employment, the results of our analysis reveal the following findings. First, abuse is less likely to occur in households where women or their partners are employed, consistent with the hypothesis that reductions in economic stress may reduce the likelihood of abuse. Second, domestic abuse inflicted by current spouses has a significant, negative effect on employment. Women in their first marriages are 30% less likely to be employed if they experience high severity abuse. In contrast, the results from the uncorrelated model suggest women in their first marriages are 2.5% more likely to work if abused. The results also point to substantial long-term health effects of domestic violence on market wages. In particular, the effect of domestic abuse on market wages translates into a 52% reduction in current period employment for

---

[9]Kingston-Riechers (1998) also utilizes the VAWS in her doctoral dissertation. The first two chapters are conducted on samples of currently married and physically abused women and currently married women, respectively. The third chapter considers a sample of ever-married women but only addresses the relationship between domestic abuse and divorce. Lloyd (1997a, 1997b) conducts her analysis on a random sample of 824 women in a low-income neighborhood of Chicago. Markowitz (1999) utilizes the representative National Family Violence Survey for the U.S. but only considers a sample of currently married or cohabiting women.

divorced women abused in past marriages. Third, domestic abuse is a dominant factor in the choice of marital status, where violence in a first marriage increases the utility from divorce and decreases the utility from remarriage. Considering the significance of divorce and remarriage in the employment equation, this finding indicates the indirect effects of domestic abuse on employment are also important. Finally, readily observed characteristics of women play only a minor role in the divorce decision relative to abuse information. That is, initially unobserved information is central to future marital status decisions.

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. 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. This is in contrast to most surveys involving abuse-related subject matter, where samples tend to be limited to abused women seeking services (Tauchen, Witte and Long, 1991; Farmer and Tiefenthaler, 1997) 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 frequency and severity of abuse, data on previous marriages and personal background information on respondents and their spouses, including violence in the family of origin.[10]

The VAWS does have some drawbacks. Although rich in abuse-related information, other relevant information is sparse. The data only contain information on the current employment status of the respondents, personal income and household income are grouped into categories, and no data are directly available on wage rates, hours worked and spousal income.[11] Data are available on the education and labor force status of current but not past spouses. There is only limited information on the composition of the current household, and it is not possible to determine the timing of births. Finally, the sample statistics may not provide an accurate depiction of domestic abuse. Considering the highly sensitive nature

---

[10]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.

[11]Kingston-Riechers (1998) attempts to deal with the problem of missing spousal income data by predicting income using the 1993 Canadian Survey of Consumer Finances (SCF). We adopt a reduced form approach instead for two reasons. First, the average characteristics of individuals in the VAWS and 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 there is non-random selection into marital histories. That is, the spousal income distribution may differ across first and remarriage markets.

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.[12]

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. 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.[13] Any women reporting that they are currently married but not living with their spouse are eliminated from the sample (112).[14] Since this paper deals with domestic abuse, women who report never being married are excluded from the sample (352).[15] 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.

A number of past studies on domestic violence have considered samples of currently married and physically abused women. The sample of currently married women is the relevant sample to consider if the occurrence of abuse is exogenous and the role of abuse in the divorce decision is ignored. We present sample statistics for currently married women in table 1,[16] where the sample is subdivided by the severity of abuse in the current marriage. 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

---

[12]It is also possible that non-response to the survey as a whole may be correlated with abuse. We are not able to directly address this issue. However, Statistics Canada, recognizing the sensitive nature of the survey, consulted a wide range of experts while constructing the questionnaire to mitigate the degree of non-response in the survey. 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. A total of 19,309 eligible respondents were contacted, resulting in a response rate of 63.7% (Statistics Canada, 1994a). In light of the relatively low response rate, we compared the VAWS with the 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 Appendix ?? for further details.

[13]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, 1993b). Note that 8% of all currently married women are reported as living common-law.

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

[15]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.

[16]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, 1994b).

involves kicking, biting, beating, choking, threatening to use or using a gun or knife, or sexual assault. 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.[17] Abusive spouses are much more likely to have violent family backgrounds[18] and to have been unemployed in the past twelve months than non-abusive spouses. They are also less likely to have a 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.

However, the sample of currently married women may not be an appropriate sample of women to consider when discussing domestic abuse, for women who suffered more severe abuse may be more likely to divorce. 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%.[19] This finding is surprising in light of the psychology literature that contends abused women tend to be caught in a cycle of violence and are unable or unwilling to leave abusive spouses.[20] The statistics in table 2 likely differ from past studies because of our use of a representative sample. Many psychological studies utilize small samples of women in shelters or in counseling. Such samples underestimate divorce rates among abused women, as they exclude women who left relationships after learning of their spouse's abusive behavior.

Tables 3 and 4 presents additional evidence that the sample of currently married women is not a random sample of women, as 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 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 in table 5. In general, abused

---

[17]Fleming (1997) also reports that one-third of abused women witnessed domestic violence against their mothers.

[18]Strauss, Gelles and Steinmetz (1980) report that men who witnessed their fathers abuse their mothers are three times more likely to abuse their wives.

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

[20]For example, Dutton (1995, p. 167) comments: "Casual discussion with police or other professionals typically generates an account of a woman who needed police intervention to save her life, who agreed to charge her husband, and who was given shelter in a transition home. After a few weeks, despite the support of transition house staff and in the absence of face-to-face contact with her husband, she decides abruptly to return to the marriage and drop the charges. The state is left without its key witness if it proceeds to trial, the police mutter knowingly about 'these women always dropping the charges,' and inexperienced transition-home workers wonder what they did wrong."

women are less likely to participate in the labor force or to choose full-year employment than women experiencing no abuse. Evidence in table 6 on personal incomes of women in various marital states is also suggestive of the effects of violence on wages and labor supply. While the results are mixed for women experiencing low severity abuse, the data indicate that total personal incomes are lower for women experiencing high severity abuse within each marital state than for women who are not abused. With few exceptions, this finding is consistent across marital states. Overall, the sample statistics suggest standard economic characteristics of women and their spouses differ across the abused and non-abused samples and that domestic abuse is an influential factor in both marital and employment choices.

3   Model

Although rich in abuse-related information, the VAWS is a cross-sectional data set with incomplete marital and employment histories. We, therefore, construct a parsimonious model of employment, marriage and abuse, bearing in mind the limitations of the data. The model explicitly considers the determinants of abuse. In particular, the effect of employment decisions on the level of abuse in marriage is taken into account when women choose their labor force status. The model also incorporates important aspects of marital and labor force status decisions within a multi-state, finite horizon framework. Marital status decisions are sequential in nature, women are forward-looking and the labor force status decision in each period depends on the entire marital history.[21]

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 (ϵ_i) that is realized upon entering marital state i, $i = S, M, D, R$. Women also have unobserved preferences over work (ϵ_P) that are assumed to be known in the initial marital state (S), time invariant and independent of i. The latter assumption is relaxed in section 4. All women are initially single and must decide whether to enter the marriage market given their expected gains to marriage. For simplicity, the matching process is not modeled in this paper; instead, it is assumed that men and women sort in the marriage market on observed attributes such as age and education and that women can use personal information to form expectations regarding their potential match. We make the implicit assumption that women who decide to enter the marriage market will necessarily

---

[21]Van der Klaauw (1996) and Seitz (2000) estimate a dynamic models of labor force participation and marital status choices, where current utility depends on whether women are single or married in the current period and the preceding period. However, they do not analyze the relationship between current decisions and the entire marital history.

match and that the only means of rejecting a spouse is through divorce.

Marriages may also have initially unobserved match-specific characteristics that influence the utility from marriage. Domestic abuse is treated as one such characteristic of the marriage. It is assumed that the presence and severity of abuse is determined by three factors. First, exogenous characteristics of women and their husbands may in part determine domestic abuse within marriage. As a result, women use personal information to assess the expected value of abuse. Second, women may influence the level of abuse they receive through their behavior. Thus, we allow decisions regarding employment to affect the level of abuse. Finally, a match-specific, initially unobserved component of the marriage (ϵ_A) influences the level of abuse. It is assumed that women know the distribution of the stochastic component of abuse in the marriage market but do not observe their particular realization until after the marriage has formed.

Implicitly, we assume the incidence of abuse within the marriage is not under the direct control of the spouse. Instead, abuse is treated as a predetermined response to the particular combination of personal and match-specific characteristics of the marriage. Previous studies (most notably Tauchen, Witte and Long, 1991) model the incidence of abuse in marriage as a choice of the husband, where men receive utility from domestic violence and allocate abuse to their wives, subject to her reservation utility level. We do not adopt this approach for two reasons. First, the high divorce rates in abusive marriages do not support the notion that domestic abuse is the result of strategic decision-making on the part of the male, where men explicitly take their spouse's reservation utility levels into account when allocating abuse. Second, work in the psychology literature suggests that abusive men are in a state of 'uncontrolled rage' at the point they abuse their wives.[22]

Let V_S, V_M, V_D and V_R represent the values of being in the single, married, divorced and remarried states, respectively, β 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.[23] During the initial period in each state, ϵ_i, $(i = S, M, D, R)$ is revealed and any initially unobserved information, including information on abuse, is realized. At the start of the following period, women must decide to remain in the current marital state or progress to the next one. The latter occurs 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

$$V_S = U(C, 1 - P | \epsilon_S, \epsilon_P) + \beta \max\{V_{S'}, E(V_{M'})\}$$

subject to

$$C = wP + M_S$$

---

[22]See the characterization of Walker's (1979) cycle of violence as described in Dutton (1995, p. 125).

[23]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.

where consumption while single depends on labor (w) as well as non-labor (M_S) income and primes denote the following period.[24] To determine the expected utility from marriage, women take expectations over ϵ_M, spousal characteristics (Z_M) and the level of abuse in marriage (A_M), conditional on personal characteristics (Z_F). If the expected utility from marriage exceeds that from remaining single, women enter the marriage market. The value of being in the married state is

$$V_M = U(C, 1 - P, A_M | \epsilon_M, \epsilon_P) + \beta \max\{V_{M'}, E(V_{D'})\}$$

subject to

$$C = w(A_M)P + M_M$$
$$A_M = h(Z_F, Z_M, P, \epsilon_A).$$

While married, women may consume personal labor and non-labor (M_M) income.[25] The true level of domestic abuse is revealed after marriage and is assumed to negatively affect the utility from leisure, the market wages of married women and the gains to marriage while married to an abusive spouse. The function determining the level of abuse within marriage depends on personal characteristics of the female and her spouse as well as her participation decision. The female's current employment decision is also allowed to influence the severity of abuse in the current marriage.

Once the level of domestic abuse and ϵ_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

$$V_D = U(C, 1 - P | \epsilon_D, \epsilon_P) + \beta \max\{V_{D'}, E(V_{R'})\}$$

subject to

$$C = w(A_M)P + M_D$$

where income available for consumption is now comprised of labor income and any non-labor income (M_D) while divorced.[26] Although it is assumed abuse does not affect the utility from leisure after the marriage has dissolved and does not directly influence the utility gains from divorce, it is allowed to have long-term effects on the market wage. If the expected value of divorcing exceeds that of remaining married, women divorce. Once divorced, they must decide whether to re-enter the marriage market. Women evaluate the expected utility from remarriage by taking expectations over ϵ_R, spousal characteristics, non-labor income and

---

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

[25]Non-labor income in this context includes spousal labor income. We make the implicit assumption that women consume a constant fraction of spousal income while married.

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

the level of abuse in the second marriage (A_R). The value of being in the remarried state is given by

$$V_R = U(C, 1 - P, A_R | \epsilon_R, \epsilon_P) + \beta \max\{V_{R'}, E(V_{D_2'})\}$$

subject to

$$C = w(A_R, A_M)P + M_R$$
$$A_R = h(Z_F, Z_R, P, \epsilon_A),$$

where V_{D_2} denotes the value of a second divorce, M_R represents non-labor income while remarried and Z_R denotes the characteristics of the second spouse. The market wage may be influenced by abuse suffered in both first and second marriages, while the gains to marriage and the utility from leisure while remarried depend on the level of abuse in the current marriage. If the expected returns to remarriage are higher than the returns from remaining divorced, women remarry.

It is assumed that ϵ_i, as well as its underlying distribution, does not change over time.[27] Therefore, women who decide to remain in state i once ϵ_i is realized always remain in state i. As a result, the value functions for the end states can be expressed as

$$V_{i'} = U(C, 1 - P, A_{i'} I(i = M, R) | \epsilon_i, \epsilon_P) + \beta V_{i'}$$

subject to

$$C = w(AH_i)P + M_i$$
$$A_i = h(Z_F, Z_i, P, \epsilon_A) * I(i = M, R), i = S, M, D, R$$

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

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

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.

The model presented above is able to account for several important relationships between abuse, marital status and employment. First, the determinants of domestic abuse are

---

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

an integral component of the model, including the possibility that women's employment decisions may influence abuse propensity within marriage. Second, domestic abuse has a direct effect on the gains to marriage and, therefore, an indirect effect on employment through the choice of marital status. Third, abuse is allowed to influence market wages. Abuse in current and past marriages has health effects on productivity, decreasing wages as a result. Finally, domestic abuse in current marriages has a direct negative effect on leisure and is expected to increase employment. The model therefore predicts abuse in a past marriage will have a negative effect on current employment decisions. However, considering the opposing health and leisure effects, we must turn to the data to determine the net effect of abuse in current marriages on labor market behavior.

Although several important relationships are incorporated in the model, a number of caveats should be raised before proceeding to estimation. First, there may exist important relationships between fertility, employment, marital status and abuse. However, as mentioned earlier, the data contain only limited information about the composition of the current household and it is not possible to determine the timing of births. Due to the limitations imposed by the data and the complexity inherent in modeling the timing and number of children, fertility decisions are not incorporated in this paper. Second, the dynamics of labor supply decisions have been found to be important in previous work (e.g., Eckstein and Wolpin, 1989; van der Klaauw, 1996), but are not addressed here as no information is available in the data on employment histories and labor market experience. Since domestic abuse may increase or reduce employment, experience may also be positively or negatively affected by abuse, leading to dual effects on the wage. Unfortunately, we are unable to identify the separate effects of health and experience on the wage due to limitations of the data. Third, the process by which women meet and select spouses is not modeled in this paper. Spousal characteristics, such as education, are treated as exogenous. It may be the case that characteristics of the spouse are correlated with unobservables determining marital status decisions and abuse propensities, resulting in biased estimates. All of these issues are worthy of further attention. However, given the limitations of the data they are beyond the scope of the current paper.

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 a second time. Therefore, we estimate reduced form transitions between marriage, divorce and remarriage, the current employment decision and the probabilities of experiencing abuse in current and past marriages.

4.1 Specification of the Abuse Probabilities

Data on the severity and frequency of abuse in current and previous marriages is available in the VAWS. For the purposes of our analysis, abuse is defined as an indicator equal to one if women experienced high severity abuse. This definition of abuse is adopted for two reasons. First, the data on abuse severity is richer than that on abuse frequency. Abuse severity is split into categories based on specific activities, while the frequency data are categorical in nature and top-coded at 11, limiting their accuracy and usefulness for estimation. Second, it is likely that high severity abuse, more so than frequent, low-severity abuse, is the primary determinant of health-related effects of domestic violence.[28]

Abuse severity is estimated for past and current marriages, where the relevant sample of women for the former is ever-divorced women and for the latter, currently married women. The econometric specification differs from the model in this regard, as abuse in the model is defined in terms of first marriages and remarriages. The decision to estimate abuse for current and past marriages is based on the differences in data availability across marriages. In particular, information on a complete set of spousal characteristics, including education, labor force status, abuse and family background information, is available for all current marriages. However, information on the education and labor force status of spouses is not available for past marriages. Estimating abuse probabilities for current and past marriages allows us to use information on a full set of spousal characteristics for all current marriages. In contrast, if the model were estimated on first and second marriages, spousal education and labor force status information could only be used to estimate abuse in remarriages. Abuse severities are estimated as logits and personal characteristics of women and their spouses are assumed to determine the severity of abuse within marriage.

For all marriages, information on the age, education and family backgrounds of women are included in the abuse function. For past marriages, age is measured by age at marriage, while the woman's current age is considered the relevant measure for current marriages. As stated above information on spousal characteristics varies across marriages. For past marriages, only information on the family background of the spouse, a strong predictor of domestic abuse in previous studies, is available. For current marriages, information on the spouse's education and employment status, including any unemployment in the past year, is available and included in the current abuse function in addition to his family background information. Many women reported that they did not possess information on their spouses family background.[29] Instead of excluding these women we include an indicator variable for this category. This lack of information may capture other aspects of the marriage, such as difficulties with communication, which may also be related to abuse in the marriage. Finally, the respondent's employment status is included as a potential determinant of abuse severity in the current abuse specification to test the hypothesis that women can influence

---

[28]Both high and low severity abuse were incorporated in a previous version of this paper that treated domestic abuse as exogenous. Only high severity abuse appeared to significantly influence the employment decision in this specification.

[29]383 women reported they did not know whether their first spouse had a violent family background.

the level of abuse within marriage by altering their behavior.

4.2   Specification of the Marital History Choice Probability

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.[30] The reduced form representation of utility in each marital state is specified as

$$U(w(AH_i), M_i, A_i I(i = M, R), \epsilon_i) = X_i \alpha_i + \epsilon_i, \quad i = M, D, R$$

Following van der Klaauw (1996), we assume ϵ_M, ϵ_D and ϵ_R are $i.i.d.$ extreme value, which yields convenient analytic solutions for the expected value functions. The probability that women remain married can be represented by

$$P(M = 1 | X_M, X_D, X_R) = \frac{\exp(X_M \alpha_M + \beta V_{M'})}{\exp(X_M \alpha_M + \beta V_{M'}) + \exp(X_D \alpha_D + \beta E \max\{V_{D'}, V_{R'}\})}, \quad (1)$$

where $V_{M'} = \ln(\exp(X_M \alpha_M))$ and $\beta E \max\{V_{D'}, V_{R'}\} = \beta \ln(\exp(X_D \alpha_D) + \exp(X_R \alpha_R))$. 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, (1) represents the probability of observing married as the end state. The corresponding probability that women divorce is

$$P(D = 1 | X_M, X_D, X_R = 1) = P(M = 1 | X_M, X_D, X_R).$$

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

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

The probability of observing divorced as an end state is therefore

$$P(D' = 1 | D = 1, X_D, X_R) P(D = 1 | X_M, X_D, X_R).$$

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

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

---

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

and the probability of observing remarried as an end state is

$$P(R' = 1|D = 1, X_D, X_R)P(D = 1|X_M, X_D, X_R).$$

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 relative to marriage. Explanatory variables determining the choice of marital history are chosen in conjunction with the theoretical model. The vector of characteristics determining the utility from divorce (X_D) includes the woman's wage (w) and non-labor income while divorced (M_D). The woman's education, age at marriage and the presence of abuse in the first marriage proxy[31] her market wage, as there is no direct information on wages. Since the data do not contain a reliable measure of non-labor income, no proxies for M_D are included in the estimation.[32]

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) and the expected level of abuse when remarried $(E(A_R))$. 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 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. The expected level of abuse in the remarriage market is conditioned on personal characteristics (Z_F), including domestic abuse in the woman's family background and education.

4.3 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 includes the woman's wage rate, non-labor income and divorce and remarriage indicators. The woman's wage is proxied by her education, age, province

---

[31]As mentioned earlier, domestic abuse is estimated for past and current marriages. The inclusion of a measure of abuse in the first marriage in the divorce equation implies the restriction that the effect of current abuse on the utility from divorce for currently married women is equal to the effect of past abuse on the utility from divorce for currently divorced women.

[32]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.

dummies,[33] the presence of a child in the woman's household[34] and the presence of abuse in both current and previous marriages. To be as consistent with the model as possible, past and current abuse are interacted with the marital history in the employment equation so that a distinction can be made between abuse in first and second marriages for women within each marital history. Information on the current husband's education and employment status is used to proxy his labor income. 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.

4.4 Identification

The model is identified through the imposition of the following exclusion restrictions. First, it is assumed that information on violence in the family of origin for women and their spouses only influences behaviour through its effect on abuse. In particular, coming from a violent home may increase the likelihood of entering a violent relationship, but will not change the gains to marriage, divorce or employment in any other way. This assumption implies that family background information on women and their spouses is excluded from the divorce and employment equations. The decision to remarry is a function of the expected level of abuse in remarriage. Since violence in the family of origin is a determinant of abuse in the model, it is assumed that family background information on the female, but not on her ex-husband, will be included in the remarriage decision. The exclusion restrictions on family background allow for the identification of the divorce, remarriage and employment equations. Second, it is assumed that the presence of children affect the employment probability but do not determine current domestic abuse. This exclusion restriction, which identifies the current abuse equation,[35] is supported by the data: sample statistics presented in table 1 suggest that the fraction of married with children does not vary depending on the presence or severity of domestic violence in the household.[36].

4.5 Unobserved Heterogeneity

Before proceeding with estimation, two econometric issues must be addressed. First, although the theoretical model assumes preferences over work, abuse and marital status are

---

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

[34]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.

[35]The inclusion of abuse and marital history interactions in the employment equation also aids in the identification of the current abuse equation.

[36]We have also estimated the probability of experiencing high severity abuse in the current marriage as a function of the presence of children. The results, available upon request, suggest that children do not have a significant effect on the abuse probability

uncorrelated, it is likely this assumption is violated in practice. Since divorce, remarriage, participation and abuse are inter-dependent in the model, failure to control for endogeneity will result in biased estimates. 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 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. This potential selection bias poses problems for the estimation of the remarriage decision as well as for the abuse functions. 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

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

where u_j is an i.i.d. random extreme value error and A_P and A_C denote abuse in past and current marriages, respectively. In addition, we make the following assumptions. First, for identification purposes, we normalize θ_M to zero. Since θ_M is normalized to zero, θ_D and θ_R should be interpreted as relative to unobserved preferences for marriage. Second, for simplicity, we assume that unobserved preferences for remarriage are proportional to unobserved preferences for divorce ($\theta_R = \varphi \theta_D$). It is likely the same unobservables that determine the remarriage decision also determine the divorce decision, although the effect of unobservables on remarriage may be of a different sign and magnitude than the effect of unobservables on divorce. The same unobservables are assumed to determine abuse in past and current marriages ($\theta_{AC} = \theta_{AP}$). Finally, it is assumed the $\theta_j, \ j = D, P, AP$ follow a discrete distribution where

$$\theta_{AP} = 0, \theta_D = 0 \text{ and } \theta_P = 0 \text{ with probability } p_1$$
$$\theta_{AP} = \rho_3, \theta_D = 0 \text{ and } \theta_P = 0 \text{ with probability } p_2$$
$$\theta_{AP} = 0, \theta_D = \rho_1 \text{ and } \theta_P = 0 \text{ with probability } p_3$$
$$\theta_{AP} = 0, \theta_D = 0 \text{ and } \theta_P = \rho_2 \text{ with probability } p_4$$
$$\theta_{AP} = 0, \theta_D = \rho_1 \text{ and } \theta_P = \rho_2 \text{ with probability } p_5$$
$$\theta_{AP} = \rho_3, \theta_D = 0 \text{ and } \theta_P = \rho_2 \text{ with probability } p_6$$
$$\theta_{AP} = \rho_3, \theta_D = \rho_1 \text{ and } \theta_P = 0 \text{ with probability } p_7$$
$$\theta_{AP} = \rho_3, \theta_D = \rho_1 \text{ and } \theta_P = \rho_2 \text{ with probability } p_8$$

and

$$\sum_{i=1}^{8} p_i = 1.$$

We estimate the parameters ρ_1, ρ_2, ρ_3, φ, $p_1 - p_7$ in conjunction with the parameters of primary interest in the model using maximum likelihood.

5   Results

The parameter estimates for the abuse probabilities and employment and marital history decision rules are presented in tables 7 to 11, respectively. Results from two versions of the model are presented to assess the importance of correlated unobserved heterogeneity across abuse, marriage and employment decisions. First, the model is specified under the assumptions that divorce, remarriage, current employment and abuse are uncorrelated and that there is no sample selection in the remarriage market. Second, a fully correlated version of the model is estimated, where an unobserved tolerance for abuse and unobserved preferences for divorce, remarriage and employment abuse are allowed to be correlated. For each specification, the model is estimated with the discount factor fixed at 0.95.[37]

Tables 7 and 8 presents the parameter estimates for the abuse functions. The results indicate that younger and less-educated women are more likely to be abused in both past and current marriages in the correlated specification. In the uncorrelated specification, men with high school and post-secondary educations are more likely to abuse. This effect becomes negative and insignificant in the correlated specification. Men with less than full-year employment are more likely to abuse. One possible interpretation of this result is that economic stress may be an important contributor to the prevalence of abuse.[38] Spousal unemployment is also positively correlated with abuse as expected; however, this effect also becomes insignificant once we incorporate controls for unobserved heterogeneity. In both current and past marriages, the presence of abuse in the family backgrounds of women and their spouses are strong predictors of abuse.

Interestingly, in the specification where abuse is assumed to be exogenous to the employment and marital status decisions the results suggest that women who choose to work in the current period are slightly more likely to be abused: women who are employed in the current period are 0.4% more likely to be abused in their current marriages.[39] This finding is consistent with Kingston-Riechers (1998), where the percentage of the year women work is positively related to the number of incidents of violence in abusive marriages. However,

---

[37]As reported by others, for example van der Klaauw (1996), difficulties were encountered when attempting to estimate the discount factor. A myopic version of the model, with the discount factor fixed at zero, was also estimated. Results are available from the authors upon request.

[38]Tauchen, Witte and Long (1991) consider economic stress as a determinant of abuse in their model of domestic violence.

[39]Average derivates are available from the authors upon request.

once the exogeneity assumption is relaxed, the results indicate women who are employed in the current period are 8.5% less likely to be abused. The change in the sign and magnitude of the employment coefficient across specifications indicates that employment should not be treated as exogenous to abuse and that employment behavior influences the likelihood of abuse in marriage.[40]

The parameter estimates for employment are presented in tables 9 and 10. Within our model, domestic abuse is predicted to have two effects on the employment decision. For women abused in current marriages, domestic violence is predicted to have a positive effect on employment through reductions in leisure and a negative effect through the negative effect of abuse on the wage. The estimated coefficient on abuse in current marriages therefore measures the net effect of abuse on employment. The effect of abuse from past marriages on current period employment has a more straightforward interpretation. The effect of abuse from past marriages on current period leisure is assumed to be zero, therefore the abuse parameters from past marriages capture only the indirect effect of abuse on employment through the wage. It is expected that past abuse has a negative effect on employment, while the predicted net effect of current period abuse is indeterminate.

The estimates presented in tables 9 and 10 indicate that the estimated effect of violence in current marriages for both married and remarried women is small in magnitude and positive under the assumption that abuse is exogenous to marital status decisions. However, consistent with the results in tables 7 and 8, the effect of current abuse on employment becomes negative and significant once controls for unobserved heterogeneity between abuse and employment are incorporated in the model. This result suggests the negative health effect of abuse outweighs the decrease in utility from leisure while abused for currently married women. The correlated and uncorrelated specifications generate markedly different predictions regarding the effects of domestic abuse on employment. For example, currently married women are 2.5% more likely to work if abused in the uncorrelated specification. In contrast, currently married women are 30% less likely to work if abused in the correlated specification. These latter results are consistent with Lloyd's (1997b) findings of a negative (although generally insignificant) effect of abuse on employment.[41]

The final row of table 9 suggests abuse has a significant, negative effect on employment for women in the divorced state in both specifications, indicating abuse has long-term effects

---

[40]The change in the sign of the employment parameter is not sensitive to the form of heterogeneity introduced in estimation. We also estimate a linear probability model for current abuse using ordinary least squares (OLS) and instrumental variables (IV) to assess the robustness of our results. When the probability of current abuse is estimated using OLS, the results indicate that employed women are 0.2% more likely to be abuse. In contrast, IV estimation of the current abuse probability suggests employed women are 3.4% less likely to be abused. Full regression results are available upon request.

[41]As is the case for the probability of experiencing abuse in the current marriage, the estimated effect of current abuse on the employment probability is robust to the form of unobserved heterogeneity introduced in estimation. Estimating the employment probability via OLS suggests currently abused women are more likely to work; IV estimation results suggest current abused women are less likely to work. Furthermore, the effect of past abuse on employment is negative and larger in magnitude than the effect of current abuse as consistent with the results in table ??.

on the wage. The effect of abuse on divorce is more pronounced in the correlated specification, where the model predicts divorced women who experienced abuse in past marriages are 52% less likely to work in the current period. Interestingly, the effects of past domestic abuse on currently remarried women is small and insignificant in both specifications. It is also of interest to note that the negative effects of abuse are greater for divorced women abused in past marriages than for currently married and abused women. This finding is consistent with the predictions of the model, as the parameter estimate for abuse in past marriages is capturing a pure wage effect, while the coefficient on abuse in current marriages captures both wage and leisure effects on employment. If the effects of abuse on the wage diminish over time, the parameter for abuse in a past marriage for divorced women provides a lower bound on the leisure effect of abuse on employment. Interpreted in this way, the reduction in the utility from leisure as a result of current period abuse increases the probability of working by at least 22%. The marital history also has a highly significant effect on employment: divorce and remarriage are among the most influential factors in the employment equation. Holding everything else constant, divorced and remarried women are 28% and 17% more likely to choose full-year employment, respectively, than married women as consistent with previous work (See Seitz (1999).).

Considering the importance of divorce in the employment decision, it is of interest to examine the role of domestic abuse in the choice of marital status. Table 11 shows that the utility from divorce is increasing in the presence of abuse during marriage. This result can be interpreted as a decrease in the gains from marriage when married to an abusive spouse and is consistent with the predictions of the model. A similar result holds for remarried women in the uncorrelated specification. However, abuse in a past marriage has a strong negative effect on the probability of remarriage in the correlated specification. Conditional on divorce, abuse in a past marriage is likely capturing the probability of experiencing abuse in subsequent marriages. It is interesting to note that the effects of age and education on the utility from divorce and remarriage are minor relative to the effects of abuse-related information. This is consistent with our model in the sense that unobservables in the marriage market appear to be the driving force behind divorce decisions.

Comparison of the log likelihood values in table 8 reveals the correlated model outperforms the uncorrelated specification.[42] The estimated heterogeneity parameters for the former, presented in table 12, indicate there are two primary groups in the population: women with low preferences for work and divorce, a low tolerance for abuse, but high preferences for remarriage (47%) and women with high preferences for work and remarriage, a high tolerance for abuse, but low preferences for divorce (44%). The results indicate a positive correlation between unobserved preferences for work and an unobserved tolerance for abuse. One possible interpretation is that the heterogeneity terms are capturing unobserved preferences for leisure: women who have a high unobserved preference for leisure

---

[42]The correlated and uncorrelated models are not nested. However, comparing 2 times the change in the log likelihood values of the uncorrelated and fully correlated specifications (147.77) with a $\chi^2(6)$ critical value is suggestive of significant improvements in the likelihood when moving from the uncorrelated to the correlated specification.

have high reservation wages and are less likely to tolerate abuse because abuse is endured during leisure time. As expected, φ is negative in both specifications, indicating a negative correlation between preferences over the divorced and remarried states. Table 13 shows that the model tends to overestimate the likelihood of abuse in current and past marriages. However, the model provides a good fit to the data in all other respects, where the predicted employment, divorce and remarriage rates are not significantly different from the true values.

6   Conclusion

An economic model of domestic abuse is developed and estimated in this paper, where the determinants of abuse and the inter-relationships between abuse, marital status and employment are considered. The results suggest economic stress may be intricately tied to the likelihood of abuse, as abuse is less likely to occur in households where women and their spouses are employed. Women who are abused in current and past marriages are less likely to work, suggesting domestic violence has significant and long-term effects on market wages. In fact, the results indicate that abuse in a past marriage reduces the probability of working in the current period by 52% for currently divorced women and that women currently in their first marriages are 30% less likely to work if abused. 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 gains from divorce and decreases the gains from remarriage. In turn, divorce and remarriage have significantly positive effects 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. Abused women work less and in turn this may lead to higher levels of abuse. However, the evidence presented on the importance of abuse in the divorce decision also highlights the fact that many women respond to domestic violence by leaving the relationship. This finding is in stark contrast to the common portrayal of abused women as unable or unwilling to leave violent relationships. The results also illustrate the importance of controlling for correlations in unobserved preferences for work, marriage and abuse as many findings differ substantially across the correlated and uncorrelated specifications. In particular, assuming abuse is exogenous to employment and marriage decisions or assuming employment status is an exogenous determinant of abuse leads to misleading conclusions regarding the relationships between domestic violence, employment and marriage. This paper is the first to illustrate the links between abuse, marital status and employment. Understanding the nature of these relationships is an important step in determining the most appropriate policy measures for addressing this issue.

Table 1: Sample Statistics for Currently Married Sample, by Abuse Severity

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	22.3447	21.5906	21.1027
marriage	(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 spouse's	0.0598	0.1033	0.1159
family background	(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-secondary	0.2746	0.3049	0.2943
	(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

Note: standard errors in parentheses.

Table 2: Divorce Rates by Abuse in First Marriage

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

References

[1] Bartel, Ann and Taubman, Paul. "Health and Labor Market Success: The Role of Various Diseases." *Review of Economics and Statistics* 71 (February 1979): 1-8.

[2] Bartel, Ann and Taubman, Paul. "Some Economic and Demographic Consequences of Mental Illness." *Journal of Labor Economics* 4 (April 1986): 243-256.

[3] Becker, Gary S. *A Treatise on the Family.* Enlarged Edition. Cambridge, Mass.: Harvard University Press, 1991.

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 university	0.4812	0.5203	0.4771
	(0.0080)	(0.0246)	(0.0183)
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-secondary	0.2756		0.2958
	(0.0071)		(0.0167)
Spouse has university	0.1991		0.2084
	(0.0064)		(0.0149)
Observations	3912	454	777

Note: Standard errors in parentheses.

[4] Becker, Gary S., Landes, Elisabeth M., and Michael, Robert T. "An Economic Analysis of Marital Instability." *Journal of Political Economy* 85 (December 1977): 1141-1187.

[5] Chirikos, Thomas N. and Nestle, Gilbert. "Further Evidence on the Economic Effects of Poor Health." *Review of Economics and Statistics* (February 1985): 61-69.

[6] Day, Tanis. *The Health-Related Costs of Violence Against Women in Canada*. Center for Research on Violence Against Women and Children, 1995.

[7] Dobash, R.E. and Dobash, R.P. "Wives: The Appropriate Victims of Marital Assault." *Victimology* (1978): 426-442.

[8] Dutton, D.G. *The Domestic Assault of Women: Psychological and Criminal Justice Perspectives*. Vancouver: UBC Press, 1995.

Table 4: Abuse-related Characteristics by Marital History

Variable	Married	Divorced and Single	Remarried
Violence in family background	0.1609 (0.0059)	0.2660 (0.0217)	0.2235 (0.0153)
Violence in current spouse's family	0.0970 (0.0047)		0.1035 (0.0112)
Don't know current spouse's family background	0.0689 (0.0041)		0.0550 (0.0084)
Violence in past spouse's family background		0.1809 (0.0189)	0.1847 (0.0142)
Don't know past spouse's family background		0.1396 (0.0171)	0.1191 (0.0119)
Low severity abuse in current marriage	0.1127 (0.0051)		0.1051 (0.0113)
High severity abuse in current marriage	0.0353 (0.0030)		0.0464 (0.0077)
Low severity abuse in past marriage		0.1604 (0.0181)	0.1444 (0.0129)
High severity abuse in past marriage		0.3704 (0.0238)	0.3238 (0.0172)
Observations	3912	414	744

Note: standard errors in parentheses.

Table 5: Within History Comparisons of Labor MarketIndicators 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)

Note: standard errors in parentheses.

Table 6: Within History Comparisons of Personal Income by Abuse Severity (% of Women in Each Income Category)

Marital State	No Income	Less than 10,000	10,000-20,000	20,000-30,000	30,000-40,000	$\geq 40,000$
Married						
No abuse	12.43	21.10	20.31	20.68	14.36	11.12
Low severity	11.40	21.10	19.86	20.29	13.22	14.13
High severity	13.94	26.73	25.78	16.05	12.56	4.94
Divorced						
No abuse	0.00	10.60	27.30	19.53	22.72	19.85
Low severity	0.42	2.86	27.64	28.33	27.03	18.55
High severity	0.22	15.99	37.08	18.21	9.95	18.55
Remarried						
Current Marriage						
No abuse	7.36	17.43	20.82	18.32	14.20	21.88
Low severity	6.91	19.86	28.13	18.45	12.56	14.10
High severity	4.21	34.82	33.30	9.12	9.28	9.26
Previous Marriage						
No abuse	6.52	16.46	20.85	16.73	12.94	26.50
Low severity	6.75	14.85	19.44	28.07	12.64	18.25
High severity	8.43	23.46	25.51	15.31	15.76	11.54

Table 7: Parameter Estimates for Abuse in Past Marriages ($\beta = 0.95$)

Variable	Heterogeneity between abuse, employment and marital status	No heterogeneity
Family background of woman	0.3191**	0.3946**
	(0.1040)	(0.0113)
Family background of past spouse	1.7007**	0.9748**
	(0.2198)	(0.0113)
Don't know family background	1.2116**	0.7556**
of past spouse	(0.2067)	(0.0113)
High school	-0.8289**	-0.2407**
	(0.2489)	(0.0115)
Post-secondary or university	-1.0824**	-0.4220**
	(0.2335)	(0.0115)
Age at first marriage	-0.1205**	-0.1347**
	(0.0096)	(0.0030)
Intercept		2.0400**
		(0.0127)

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

Table 8: Parameter Estimates for Abuse in Current Marriages ($\beta = 0.95$)

Variable	Heterogeneity between abuse, employment and marital status	No heterogeneity
Employed	-2.6271**	0.1049**
	(0.2224)	(0.0113)
Family background of woman	0.4495**	0.6711**
	(0.1740)	(0.0113)
Age	-0.0680**	0.0092**
	(0.0064)	(0.0021)
High school	-1.2544**	-0.9680**
	(0.1654)	(0.0113)
Post-secondary or	-0.9949**	-0.9262**
university	(0.1468)	(0.0113)
Spouse has high school	-0.1071	0.1916**
	(0.1447)	(0.0113)
Spouse has post-secondary	-0.0855	0.1895**
	(0.1440)	(0.0113)
Spouse has university	-1.0357**	-0.8356**
	(0.0989)	(0.0113)
Spouse worked 52 weeks	-0.9218**	-0.3342**
	(0.2035)	(0.0113)
Spouse is unemployed	-0.3272	0.6223**
	(0.2226)	(0.0113)
Family background of current	2.2103**	2.2697**
spouse	(0.1523)	(0.0113)
Don't know family background	1.0897**	1.1457**
of current spouse	(0.1878)	(0.0113)
Quebec	-1.3165**	-0.3952**
	(0.2663)	(0.0113)
Ontario	-0.8825**	-0.0580**
	(0.2362)	(0.0113)
Prairie	-0.9866**	-0.1792**
	(0.2912)	(0.0113)
Maritime	-1.0389**	-0.1154**
	(0.2765)	(0.0113)
Intercept		-3.5052**
		(0.0113)
Log Likelihood	-7777.0460	-7810.9310

Notes: Standard Errors in Parentheses. *Coefficient significant at the 5 percent level. **Coefficient significant at the 1 percent level.

Table 9: Parameter Estimates for Employment Decision ($\beta = 0.95$)
Marital Status and Domestic Abuse

Variable	Heterogeneity between abuse, employment and marital status	No heterogeneity
Divorced	2.8393**	0.9642**
	(0.3178)	(0.1270)
Remarried	1.6520**	0.3877**
	(0.1833)	(0.0982)
High severity current abuse	-5.2987**	0.1106
(married)	(0.8654)	(0.1265)
High severity current abuse	-0.6440**	0.3406
(remarried)	(0.4499)	(0.3373)
High severity past abuse	0.4231	-0.0170
(remarried)	(0.3239)	(0.1408)
High severity past abuse	-7.3607**	-0.5037**
(divorced)	(0.8771)	(0.1242)
Log Likelihood	-7777.0460	-7810.9310

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

Table 10: Parameter Estimates for Employment Decision ($\beta = 0.95$) Standard Characteristics

Variable	Heterogeneity between abuse, employment and marital status	No heterogeneity
Age	0.2850**	0.1779**
	(0.0457)	(0.0320)
$\text{Age}^2/100$	-0.3750**	-0.2262**
	(0.0589)	(0.0405)
High school	1.0408**	0.7479**
	(0.1817)	(0.0822)
Post-secondary or university	1.6103**	1.0593**
	(0.1792)	(0.0836)
Child	-1.1702**	-0.6267**
	(0.1380)	(0.0692)
Spouse has high school	0.3413*	0.2093*
	(0.1689)	(0.0842)
Spouse has post-secondary	-0.0080	0.0038
	(0.1724)	(0.0865)
Spouse has university	0.0401	-0.0219
	(0.1734)	(0.0980)
Spouse worked 52 weeks	0.8024**	0.5006**
	(0.1785)	(0.0712)
Quebec	-0.6191**	-0.2522**
	(0.1896)	(0.0786)
Ontario	0.3012	0.2604**
	(0.1716)	(0.0748)
Prairie	0.1305	0.1380
	(0.1950)	(0.0873)
Maritime	-0.3897	-0.2500*
	(0.2353)	(0.0985)
Intercept		-3.7312**
		(0.6076)
Log Likelihood	-7777.0460	-7810.9310

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

Table 11: Parameter Estimates for Divorce and Remarriage ($\beta = 0.95$)

Variable	Heterogeneity between abuse, employment and marital status	No heterogeneity
Divorce Parameters		
High severity abuse in past marriage	7.6697** (0.7782)	1.4576** (0.0117)
Age at first marriage	0.0192** (0.0074)	0.0100** (0.0012)
High school	0.1762 (0.1086)	0.0315 (0.0242)
Post-secondary or university	0.3435** (0.1060)	0.1832** (0.0251)
Intercept		-1.5503** (0.0115)
Remarriage Parameters		
High severity abuse in first marriage	-5.5790** (0.1731)	0.9557** (0.0113)
Family background of woman	0.1012 (0.0974)	0.0644** (0.0113)
Age at first marriage	-0.2168 (0.1731)	-0.2082** (0.0022)
High school	0.2509 (0.1447)	0.3468** (0.0127)
Post-secondary or university	0.4430** (0.1382)	0.5567** (0.0127)
Intercept		3.3897** (0.0127)
Log Likelihood	-7777.0460	-7810.9310

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

Table 12: Parameter Estimates for Heterogeneity Distribution ($\beta = 0.95$)

Variable	Heterogeneity between abuse, employment and marital status
ρ_1	-8.0968**
	(0.7751)
ρ_2	-7.3167**
	(0.8229)
ρ_3	4.2015**
	(0.2448)
φ	-1.2602**
	(0.0456)
p_1	0.0002
p_2	0.0000
p_3	0.0000
p_4	0.0839
p_5	0.4736
p_6	0.0000
p_7	0.4423
p_8	0.0000

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

Table 13: Comparison of Actual and Predicted Employment, Divorce, Re-marriage and Abuse Rates from Forward-Looking Model with Unobserved Heterogeneity Between Abuse, Employment and Marital Status

	Actual	Predicted
Employment	0.6021	0.6118
	(0.0069)	(0.0022)
Divorce	0.0928	0.0984
	(0.0041)	(0.0014)
Remarriage	0.1409	0.1494
	(0.0049)	(0.0016)
Abuse in past marriage	0.3423	0.3834
	(0.0139)	(0.0031)
Abuse in current marriage	0.0371	0.0786
	(0.0028)	(0.0015)

Note: standard errors in parentheses.

[9] Eckstein, Zvi and Wolpin, Kenneth. "Dynamic Labor Force Participation of Married Women and Endogenous Work Experience." *Review of Economic Studies* 56 (July 1989): 375- 390.

[10] Farmer, Amy and Tiefenthaler, Jill. "An Economic Analysis of Domestic Violence." *Review of Social Economy* (Fall 1997): 337-358.

[11] Fleming, J.B. *Stopping Wife Abuse.* Garden City, New York: Anchor, 1979.

[12] Gelles, R.J. "Violence and Pregnancy: A note on the extent of the problem and needed services." *The Family Co-ordinator*, 24 (1975): 81-86.

[13] Greaves, Lorraine, Hankivsky, Olena, and Kingston-Riechers, JoAnn. *Selected Estimates of the Costs of Violence Against Women.* Centre for Research on Violence Against Women and Children, 1995.

[14] Gritz, R. Mark. "The Impact of Training on the Frequency and Duration of Employment." *Journal of Econometrics* 57 (May/June 1993): 21-51.

[15] Ham, John C. and Lalonde, Robert J. "The Effect of Sample Selection and Initial Conditions in Duration Models: Evidence From Experimental Data on Training." *Econometrica* 61 (January 1996): 175-205.

[16] Heckman, James J. "Sample Selection Bias as a Specification Error." *Econometrica* 47 (January 1979): 153-161.

[17] Heckman, J. and Singer, B. "A Method For Minimizing the Impact of Distributional Assumptions in Econometric Models For Duration Data." *Econometrica* 52 (March, 1984): 271-320.

[18] Johnson, William R. and Jonathan Skinner. "Labor Supply and Marital Separation." *American Economic Review* 76 (June 1986): 455-469.

[19] Kingston-Riechers, JoAnn. "Does Economic Status Affect the Frequency of Domestic Abuse?" McMaster University, 1997.

[20] Kingston-Riechers, JoAnn. "*Wife Assault and Socioeconomic Characteristics.*" Unpublished Ph.D. dissertation, McMaster University, 1998.

[21] Lloyd, Susan. "The Effects of Domestic Violence on Women's Employment." *Law and Policy*, 1997 (a).

[22] Lloyd, Susan. "The Effects of Violence on Women's Employment." Institute for Policy Research Working Paper 97-4 (1997 (b)).

[23] Markowitz, Sara. "The Price of Alcohol, Wife Abuse, and Husband Abuse." NBER Working Paper 6916 (January 1999).

[24] Okun, L. *Woman Abuse: Facts Replacing Myths.* Albany, NY: State University of New York Press, 1986.

[25] Peters, H. Elizabeth. "Marriage and Divorce: Informational Constraints and Private Contracting." *American Economic Review* 76 (June 1986): 437-454.

[26] Rounsaville, B. "Theories in Marital Violence: Evidence From a Study of Battered Women." *Victimology* 3 (1978): 11-31.

[27] Seitz, Shannon N. "Labor Supply, Divorce and Remarriage" University of Western Ontario, Working Paper 9903 (March 1999).

[28] Seitz, Shannon N. "Employment and the Sex Ration in a Two-Sided Model of Marriage" Queen's University, mimeo (July 2000).

[29] Statistics Canada. "The Violence Against Women Survey: Highlights." *The Daily*, Thursday, November 18, 1993. (a)

[30] Statistics Canada. *Violence Against Women Survey*, Control Form, 1993. (c)

[31] Statistics Canada. *Violence Against Women Survey*, Public Use Micro Data File Documentation and User's Guide, 1994 (a).

[32] Statistics Canada. "Wife Assault in Canada." *Canadian Social Trends*. Autumn 1994 (b).

[33] Straus, M.A. and Gelles, R.J. "Societal Change and Change in Family Violence From 1975 to 1985 as Revealed in Two National Surveys." *In Physical Violence in American Families: Risk Factors and Adaptations to Violence in 8,145 Families*, edited by M.A. Straus and R.J. Gelles, pp. 113-127. New Brunswick, NJ: Transaction Books, 1992.

[34] Straus, M.A., Gelles, R.J. and Steinmetz, S. *Behind Closed Doors: Violence in the American Family.* Garden City, New York: Anchor/Doubleday, 1980.

[35] Tauchen, Helen V., Witte, Ann Dryden, and Long, Sharon K. "Domestic Violence: A Nonrandom Affair." *International Economic Review* 32 (May 1991): 491-511.

[36] Van den Berg, G.J., Lindeboom, M. and Ridder, G. "Attrition in Longitudinal Panel Data and the Empirical Analysis of Dynamic Labor Market Behavior." *Journal of Applied Econometrics* 9 (October/December 1994): 421-435.

[37] Van der Klaauw, Wilbert. "Female Labor Supply and Marital Status Decisions: A Life-Cycle Model." *Review of Economic Studies* 63 (April 1996): 199-235.

[38] Walker, Lenore. *The Battered Woman.* New York: Harper & Row, 1979.

[39] Weis, J. G. "Family Violence Research Methodology and Design." *In Family Violence*, edited by L. Ohlin and M. Tonry, pp. 117-162. Chicago: University of Chicago Press, 1989.