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# Three Essays in Applied Labor Economics

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# THREE ESSAYS IN APPLIED LABOR ECONOMICS

by

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ABSTRACT
THREE ESSAYS IN APPLIED LABOR ECONOMICS

by

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The goal of this dissertation is to apply theoretical and empirical methodologies used in the field of labor economics to analyze several topics which have clear policy implications.

Chapter 1 analyzes the relationship between domestic violence and welfare receipt in a more rigorous framework than has been previously possible. It is well documented that there is a strong relationship between abuse and welfare receipt and the assumption has predominantly been that welfare receipt affects the risk of victimization. I show that the direction of impact actually runs in the opposite direction. This finding is critical in light of the welfare reforms of the 1990's. I find that violence decreased the likelihood of using welfare services prior to the reforms, and that this effect is even larger after the reforms took place. However, this negative effect is drastically reduced in the presence of the Family Violence Option.

Chapter 2 broadens the analysis of domestic violence to include women of all income levels. Specifically, I look at how the decision to participate in the workforce affects abuse levels and vice versa. Because attitudes towards domestic violence and women's working status likely vary by income levels, I analyze the relationship in both low and high income households. I find that for women with low income

spouses, employment increases the likelihood of abuse, however, for women with high income spouses, employment decreases the likelihood of abuse.

Chapter 3 attempts to reconcile the observed educational attainment gap between black and white workers with the monetary returns to education literature which predicts that black individuals have higher monetary incentives to invest. I examine the returns to education in a broader sense: the job satisfaction returns to education. I find that job satisfaction is actually declining in education for black workers. Further, it is found that education does not improve the ability of black workers to transition into new jobs that they like better. These results suggest that higher education may create expectations that are not being met by black workers, and one potential explanation for this is that covert discrimination still exists in the workplace.

*This dissertation is dedicated to my family and colleagues. Without your patience and*

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**Chapter 1: "Domestic Violence and Welfare Receipt: Determining the Nature of the Relationship in the Pre- and Post -Welfare Reform Eras"**

**Introduction**

The welfare system has the potential to provide women in low income households who are victims of domestic violence with the resources necessary to become self-sufficient and ultimately enable them to leave their abusive partners. It is because of this potential use of the welfare system that advocates for domestic violence victims were concerned about the Personal Responsibility and Work Opportunity Reconciliation Act of 1996 (P.L. No. 104-193, 110 Stat. 2105 [1996]), which dramatically changed the structure of the welfare system. Among the changes that took place were a reduction in the length of time that individuals and households could receive benefits and stricter working requirements for receiving aid. The worry was that these changes would make the system even more inaccessible to abused women and reduce their outside options (Hetling [2000]). An optional provision called the Family Violence Option (FVO) was proposed because of this concern, which would allow states that adopted it to waive some of the requirements of the program for individuals who identified themselves as victims of abuse. Because of the potential policy implications, it is thus critical to understand the relationship between domestic violence and welfare receipt.

It is well documented that there is a significant overlap between women who are victims of abuse and women who are recipients of welfare assistance. In 1992 the Washington State Institute for Public Policy's "Family Income Study" found that 60 percent of AFDC recipients were also victims of domestic abuse. However, there are

currently many aspects of this relationship that are not understood. Among the questions are whether the act of receiving welfare has an effect on domestic violence levels, if violence has an effect on welfare take-up, or if both are due to unobserved factors. Underlying much of the analysis is a lack of understanding of the motives behind the use of domestic violence. Is violence, for example, used as an instrument to deter certain behaviors?

Most of the existing literature has assumed that welfare receipt affects domestic violence rates, though other theoretical models offer competing views of the relationship. In one view, welfare receipt may provoke violence because it may be seen as an act of defiance and an attempt to leave (see Raphael and Tolman [1997] for example), or, as Kurz (1989) suggests, it may deter violence because the woman has gained more bargaining power in the relationship and the spouse or partner does not want to lose those additional resources. Alternatively, domestic violence may push a woman into welfare possibly because she is no longer able to hold a job, or perhaps as a means to gather resources to leave the relationship. These two variables may also affect each other simultaneously.

Thus far the empirical literature has not reached a consensus as to the sign and the direction of the relationship. This owes largely to the fact that data have been severely limited. Ideally the dataset should be nationally representative, have individual level data on both welfare receipt and domestic violence, and span a period of time that includes both the pre and post reform eras. Various studies have used data that satisfy *some* of these conditions, but none have been able to satisfy all of them.

This paper examines the empirical relationship between domestic violence and welfare receipt. One of its main contributions is to take a theoretically agnostic approach and test multiple theoretical models of the relationship instead of assuming

one particular model. To do so, it uses data from the National Survey of Families and Households (NSFH) that contains individual-level data on both domestic violence and welfare receipt. Although this data has been used in several previous studies of domestic violence, until now it has not been utilized to analyze its relationship with welfare receipt. The dataset also allows for the relationship to be studied using appropriate estimation techniques that allow for potential mutual dependence between the two variables, and its timing enables us to evaluate how the relationship changed after the reforms took place. Ultimately we reject the model previously assumed in the literature and find that the direction of causality is the opposite of what was supposed. In particular, domestic violence is found to have a strong negative effect on welfare receipt, which is at odds with the positive correlation that is typically found in the sociology literature but consistent with some of the findings of the economics literature.

This finding is troubling because it has negative implications for the effect of the welfare reforms on abused women. If women viewed the welfare system as being inaccessible because of their circumstances even before the reforms took place, the changes to the welfare system would make it even less likely for women to use welfare as a means to leave abusive relationships. While the presence of the FVO is found to significantly increase the likelihood that an abused woman will go on welfare, it does not completely eliminate the negative impact of abuse on welfare receipt. This suggests that further policy changes are necessary if welfare is to be considered a means for escaping abuse. Possible solutions may be to increase the amount of aid that victims can receive, making the FVO mandatory for every state, and increasing the number of programs aimed at helping women become self-sufficient that are available.

The remainder of this paper is structured as follows: section 1 discusses the relevant legislative history and empirical literature, section 2 presents several hypothesized relationships between welfare and domestic violence and proposes a method for selecting between empirical models, section 3 describes the data used, section 4 details the model selection process, section 5 presents the results, and section 6 concludes.

## 1. Background

### 1.1 Legislative History

The Personal Responsibility and Work Opportunity Reconciliation Act of 1996 (P.L. No. 104-193, 110 Stat. 2105 [1996]) was motivated by a growing concern about the dependency of welfare-receiving poor. The law instituted the Temporary Assistance for Needy Families (TANF) program to replace the Aid for Families with Dependent Children (AFDC). The main goal was to make welfare a transition to work so that families could ultimately become self-sufficient. Major provisions included imposing stricter work requirements, limiting the lifetime benefits that households can receive, providing aid to families transitioning to work, and allowing states to use funds that would have gone to welfare checks to create public jobs or to provide hiring incentives to potential employers (Administration for Children and Families, 1996).

Specifically, the law stated that families could receive welfare payments for a maximum of two consecutive years before they must enter the workforce. Many states chose even narrower time frames for assistance. These welfare benefits could be renewed at a later date, but the lifetime maximum number of years was limited to only

five cumulative years. The law also increased the amount of aid given to families for child care by $3.5 billion in order to allow mothers to transition into the workforce more easily. Finally, the law allowed states greater liberty to use their funds for other initiatives aimed at increasing employment such as using part of their funds to create jobs for welfare recipients.

One concern that arose was that victims of domestic violence may not be able to meet the new TANF workforce participation requirement, either because physical signs of abuse may be a hindrance to employment or because the level of violence may escalate if the woman chooses to participate in the program. In response, the Family Violence Option (FVO) was created to provide temporary exemptions to the TANF requirements for victims of domestic violence or those at risk of such violence (Legal Momentum [2004]). This concern demonstrates the importance of this study: a proper policy response requires a clear understanding of the relationship between welfare and abuse.

*1.2 Literature*

This relationship garnered much attention particularly after the reforms of 1996. Prior studies of the relationship have been primarily of a theoretical nature, and data limitations have heretofore restricted most empirical studies to calculating correlations between welfare receipt and domestic violence. A few have modeled the relationship, but only by assuming a particular direction of causality—that welfare receipt affects domestic violence rates.

The earliest correlation studies found a very strong positive correlation between welfare receipt and domestic violence (see "The Worcester Family Research Project" or "The Effects of Violence on Women's Employment" for example). These

early studies were very limited in their analysis largely because of the nature of the data that was used. Datasets were typically constrained to a small region of the U.S., and many were limited only to women who were on welfare or were victims of abuse. It was thus not clear whether the higher prevalence of domestic violence among welfare recipients was because these women come from low-income households that tend to be more violent, because the simple act of receiving welfare is interpreted by an abuser as an act of defiance and an attempt to leave the relationship, because domestic violence motivates women to enter the welfare system in order to gain the necessary resources to leave, or because victims are no longer able to work.

Several studies have since emerged that attempt to get at the causal relationship between domestic violence and welfare. Even before the 1996 welfare reforms, Tauchen, Witte and Long (1991) examined data from interviews with 125 women in Santa Barbara County, California who had been physically abused by their partners in 1982 and 1983 and found women who received larger AFDC benefits experienced fewer violent incidents, which stands in contrast to the simpler correlation studies.

Nou and Timmins (2005) and Farmer and Tiefenthaler (2003) find the opposite relationship, consistent with the results of the basic studies discussed above. These studies improved upon previous studies in that they used national-level data and attempted to model the relationship in a way that was previously impossible. Nou and Timmins examine the relationship at the state level and found that higher proportions of households receiving welfare corresponded to higher rates of domestic violence. Farmer and Tiefenthaler found similar results utilizing individual-level data on domestic violence, but were limited to studying the effects of state-level welfare variables such as the average monthly welfare payment.

Clearly data sources that can be used to study this relationship have been limited thus far and no Economics studies have been able to pinpoint the relationship between welfare receipt and domestic violence on an individual level. In addition, no study has yet been able to address the potentially complex relationship between domestic violence and welfare receipt. The analysis that follows attempts to model this complex relationship using data from a source new to the Economics literature to get closer to the true relationship between the two variables.

## 2. Theory

While the empirical literature has focused primarily on how welfare receipt affects domestic violence rates, there is good reason to suspect that the relationship is much more complicated. After all, it also makes sense that domestic violence may influence a woman's choice of whether to go on welfare. There are also a number of other important pieces of information that we do not know.

We don't know what the male's objectives are when considering using violence and if he is more likely to achieve these objectives through violence. Three plausible goals seem at odds. 1) He may gain utility from keeping the relationship intact, and thus may use violence to motivate the partner to remain. 2) He also may want to maintain the dominant position in the household, i.e. have the most bargaining power; working and/or welfare payments increase the wife's bargaining power, and if he feels threatened he may use abuse to prevent it. 3) It is also possible that he wants to "buy" certain behaviors from her, i.e. if she is doing something of which he doesn't approve, he may use violence as an instrument to get her to stop.

Similarly we don't know what the female's objectives are when considering going on welfare. She too may gain utility from keeping the relationship intact and

pleasing her partner, and she wants to minimize the level of violence, which may mean not choosing welfare or using welfare as a means of increasing her threat point and bargaining power. On the other hand, she may go on welfare as a way to acquire resources that would enable her to leave the relationship.

It is also unclear whether the relationship between domestic violence and welfare is driven by the actual presence of violence and welfare receipt, or rather by underlying conditions that are correlated with one or both. To explore the possibilities more fully, consider the following system of equations:

$$(1) \qquad D^* = \alpha_1 X + \alpha_2 Y + \alpha_3 W^* + \alpha_4 W + \epsilon$$

$$(2) \qquad W^* = \beta_1 X + \beta_2 Z + \beta_3 D^* + \beta_4 D + \omega$$

where D* is a latent variable that indicates the underlying state of a relationship, and D is an indicator that takes a value of 1 (indicating a violent relationship) if $D^* \geq 0$. W* is a latent variable that represents the temptation to use welfare, and W is an indicator which takes a value of 1 (indicating receipt of welfare benefits) if $W^* \geq 0$. X is a vector of variables that influence both violence and welfare receipt, Y a vector of variables that influence only violence, and Z a vector of variables that influence only welfare receipt. The error terms $\epsilon$ and $\omega$ may be correlated as well, possibly because unobserved factors affect both outcomes, which will motivate a bivariate probit model in the empirical implementation.

This system nests several potential relationships between violence and welfare receipt. We are particularly interested in the coefficients $\alpha_3$, $\alpha_4$, $\beta_3$, and $\beta_4$. Each may or may not be equal to zero, depending on whether the associated mechanism is empirically relevant.

*2.1 Equation (1): How welfare receipt may affect violence.*

Equation (1) suggests that not only the act of receiving welfare, but the temptation to use welfare as well, can potentially influence whether a woman experiences abuse. Theory unfortunately does not help us determine how these two variables might actually affect domestic violence since the direction of causality is unclear.

For example, if a woman chooses to receive welfare benefits her partner may respond by either becoming abusive or becoming more abusive ($\alpha_4 > 0$). Perhaps the male is abusive to extract some of the money from the welfare benefits, or alternatively he may feel threatened that his partner's receipt of welfare may cause an imbalance in bargaining power, leading him to become violent in order to stop her use of welfare. Women in these situations likely have very low incomes and thus little bargaining power in the relationship, so welfare benefits may not give them sufficient income to leave the relationship. Since the partner feels threatened by her attempt or meditated attempt to leave, and since he knows that she will not be able to leave if she persists, he may use abuse to deter her from continuing to receive welfare benefits, although this strategy may necessitate some sort of transfer payment to the woman to help support herself. Her marginal utility of consumption is high, so she will forego some utility from abuse in exchange for more utility from consumption. A similar logic can be applied to explaining why the temptation to use welfare services might increase the level of violence in a relationship ($\alpha_3 > 0$). This is consistent with what sociologists call "exchange theory" (see Farmer and Tiefenthaler [1997], Tauchen, Witte and Long [1991], and Aizer [2010] for further discussion).

It is also possible that receiving welfare may actually decrease the level of abuse ($\alpha_4 < 0$). In this case the women likely have relatively high incomes compared

to their spouse and thus more bargaining power. If the woman persists in obtaining the additional income that welfare provides, she would have enough resources to leave the relationship if she chooses. Her partner also knows this. If her income is already high, he cannot offer her a transfer payment in exchange for abuse because her marginal utility of consumption is too low. Since he also wants to keep the relationship intact (and perhaps to maintain access to her resources), he may choose low levels of violence or no violence at all. Again, a similar rationale can be applied to the case where $\alpha_3 < 0$, only in that case it is the potential welfare payment, rather than actual receipt, that causes the preemption.

*2.2 Equation (2): How violence may affect welfare receipt.*

Less often discussed in the literature, Equation (2) suggests that domestic violence as well as the underlying state of the relationship may influence whether a woman chooses to receive welfare. Such an effect again may plausibly work in either direction.

For example, if the underlying state of the relationship is bad (D* is high) or the relationship is actually abusive (D=1), a woman may choose to go on welfare ($\beta_3$ and $\beta_4 > 0$). Because adding welfare to her stock of resources may enable her to leave the relationship if she chooses, she can use welfare or the threat of welfare as a method of raising her threat point and deterring violence in the future. Or it may be the case that originally the woman was working and the male felt threatened by it and used abuse to signal his disapprobation, causing her to withdraw from the workforce and use welfare to subsist. It is also possible that if the relationship is significantly bad or abusive, a woman may elect not to receive welfare payments ($\beta_3$ and $\beta_4 < 0$). For example, if the abusive spouse does not want the woman to be on welfare, and if

welfare payments were insufficient to enable her to leave, then abuse may deter the woman from welfare take-up.

It is also important to note that unobserved factors could also be responsible for a correlation between domestic violence and welfare receipt, even if $\alpha_3 = \alpha_4 = \beta_3 = \beta_4 = 0$. Indeed, it is possible that the correlation between the two can be non-zero because of a correlation between the two error terms.

*2.3 Model Selection Procedure*

While some of these proposed mechanisms may seem more valid than others, none is entirely implausible. Instead of supposing one to be the true model, we take an agnostic approach to finding the correct specification.

The system of equations cannot be properly estimated with the bivariate probit model when both $\alpha_4$ and $\beta_4$ are allowed to be non-zero, however we can estimate different model specifications one by one assuming that either $\alpha_4$ or $\beta_4$ are equal to zero. When applied to the data, this exercise should tell us which, if any, of the coefficients of interest are statistically significant and allow us to determine the best model for analyzing the relationship between violence and welfare receipt. A nice feature of this estimation strategy is that it also allows welfare receipt and domestic violence to be related even if $\alpha_3, \alpha_4, \beta_3,$ and $\beta_4$ are all found to be zero through the correlation between the error terms.

Although the full specification of (1) and (2) cannot be estimated due to the identification problem noted by Heckman (1978), a simple model selection exercise can be implemented by assuming different combinations of our key coefficients are equal to zero. We start by assuming that $\alpha_4 = \beta_4 = 0$ implying that actual violence and actual welfare receipt are not important in the system. We want to test whether $\alpha_3$

and $\beta_3$ are significant in this model, but since W* and D* are unobservable we

estimate $\alpha_3$ and $\beta_3$ through different combinations of the estimated coefficients. The

reduced form of the model is:

$$(3) \qquad D^* = \frac{1}{1-\alpha_3\beta_3}[(\alpha_1 + \alpha_3\beta_1)X + \alpha_2 Y + \alpha_3\beta_2 Z + \alpha_3\omega + \epsilon]$$

$$(4) \qquad W^* = \frac{1}{1-\alpha_3\beta_3}[(\beta_1 + \beta_3\alpha_1)X + \beta_3\alpha_2 Y + \beta_2 Z + \omega + \beta_3\epsilon]$$

or for simplicity:

$$(5) \qquad D^* = \lambda_{XD}X + \lambda_{YD}Y + \lambda_{ZD}Z + \Omega_D$$

$$(6) \qquad W^* = \lambda_{XW}X + \lambda_{YW}Y + \lambda_{ZW}Z + \Omega_W$$

where $\lambda_{XD}$ is equal to $\frac{\alpha_1+\alpha_3\beta_1}{1-\alpha_3\beta_3}$ for all X in the D* equation, etc., and $\Omega_D$ and $\Omega_W$ are

composite error terms.

Equations (5) and (6) are estimated jointly using a bivariate probit model to

account for possible correlation between the residuals. We then identify:

$$(7) \qquad \hat{\alpha}_3 = \left.\hat{\lambda}_{ZD}\middle/\hat{\lambda}_{ZW}\right.$$

$$(8) \qquad \hat{\beta}_3 = \left.\hat{\lambda}_{YW}\middle/\hat{\lambda}_{YD}\right.$$

Note that this yields a separate estimate of $\alpha_3$ for each Z variable, and likewise for $\beta_3$.

This allows us to test whether each estimate is significant and if the individual

estimates are statistically equal.

*2.3.1 Sub-models*

Once this baseline model has been run to determine if potential welfare and violence have any impact, we can begin estimating other models that are also theoretically valid. One such model assumes that welfare receipt affects domestic violence, meaning that $\alpha_4$ is non-zero. This is the model that is typically found in the literature. In order to estimate this model, we must also assume that $\beta_3 = 0$ due to coherency conditions. This gives us the following reduced form model:

$$(9) \qquad D^* = (\alpha_1 + \alpha_3\beta_1)X + \alpha_2 Y + \alpha_3\beta_2 Z + \alpha_4 W + \alpha_3\omega + \epsilon$$

$$(10) \qquad W^* = \beta_1 X + \beta_2 Z + \omega$$

Note that if $\alpha_3$ and $\beta_3$ are found to be insignificant, this traditional model simplifies to:

$$(11) \qquad D^* = \alpha_1 X + \alpha_2 Y + \alpha_4 W + \epsilon$$

$$(12) \qquad W^* = \beta_1 X + \beta_2 Z + \omega$$

Another model that is possible to estimate reverses the direction of causality found in the traditional model. This model proposes that domestic violence affects whether a woman will choose to receive welfare, but that welfare receipt has no impact on domestic violence. In other words, $\beta_4$ is assumed to be non-zero. As with the traditional model above, we must also impose the restriction that $\alpha_3 = 0$ as a coherency condition. This gives us the reduced form model:

$$(13) \qquad D^* = \alpha_1 X + \alpha_2 Y + \epsilon$$

$$(14) \qquad W^* = (\beta_1 + \beta_3\alpha_1)X + \beta_3\alpha_2 Y + \beta_2 Z + \beta_4 D + \beta_3\epsilon + \omega$$

Again, if $\alpha_3$ and $\beta_3$ are found to be zero in the baseline model we can simplify the above to:

$$(15) \qquad D^* = \alpha_1 X + \alpha_2 Y + \epsilon$$

$$(16) \qquad W^* = \beta_1 X + \beta_2 Z + \beta_4 D + \omega$$

Likelihood ratio tests between each of the above specifications will help shed light on which of the three model specifications above is most valid given the data available.

## 3. Data

The data analyzed come from the National Survey of Families and Households (NSFH), a nationally representative longitudinal survey of 13,017 adult respondents interviewed in three separate waves: 1987-88, 1992-94, and 2001-2003. Unlike the National Crime Victimization Survey that was examined in previous work, the NSFH contains information on whether and when the respondent received welfare benefits. An additional major advantage is that the questions regarding domestic violence are worded in such a way as to encourage self-reporting[1]; in contrast, many studies have been forced to rely on incidents reported to the local police. Furthermore, the timing of the survey waves allows us both to determine a baseline relationship between domestic violence and welfare receipt before the welfare reforms and analyze how that relationship changed post-reform. Considerable information is also available on the respondent's family background.

Unfortunately, due to funding issues, geographic information for each respondent is unavailable in wave 3, so state-level variables (including potential welfare benefits) for the respondent's state of residence cannot be included. To

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[1] Unlike most data sets, this survey does not require that a violent incident be reported to local authorities making the potential number of incidents reported in the survey higher. The survey question asked "During the past year, how many fights with your partner resulted in him/her hitting, shoving, or throwing things at you?" This question was then reduced to an indicator variable taking on a value of 1 if there were a positive number of incidents reported.

address this issue, two separate samples are created using the NSFH dataset. Sample 1 includes data from waves 1 and 2 only and bases state-level variables on the woman's current state of residence. Sample 2 includes data from all three waves, but the state-level variables are based on the respondent's state of birth.

Both samples are restricted to include only women who are either married or cohabiting with an intimate partner at the time of the interview as domestic violence data are not available for other women. In addition, the primary analysis will be limited to households that have an income below three times the poverty line as very few households with higher incomes would be eligible for welfare in any event. Sample 2 is also restricted due to the nature of wave 3. In addition to the lack of geographical information, wave 3 was limited to include only respondents who had a "focal child" available at the time the wave 2 interview was conducted. A focal child is simply a child of the respondent about whom additional questions were asked at each interview. Because of this, Sample 2 also excludes respondents in waves 1 and 2 who do not fit this same selection criteria. This resulted in only a minor sample reduction (185 observations were lost).

Samples 1 and 2 both include information on the respondent's demographic characteristics such as age and race, her education level, and her income and her spouse's. In addition to these individual and couple characteristics, we are also interested in some state-level variables such as the average monthly welfare benefit per recipient and the unemployment rate. Some variables used in the analysis were created using the information available in the sample. A description of the construction of these variables follows.

*3.1 Constructed Variables*

One of the two outcomes analyzed in the paper is domestic violence. The question regarding violence in the relationship reads: "During the past year, how many fights with your partner (husband/wife) resulted in him/her hitting, shoving, or throwing things at you?" A zero-one indicator variable was created that takes a value of one if the number of such fights was greater than zero, and zero otherwise.[2]

The variable indicating welfare receipt was straightforward to construct in waves 1 and 2, but less so in wave 3. In waves 1 and 2 respondents were asked if they had received any income from public assistance. The only questions pertaining to welfare receipt in wave 3, however, read: "(In the last 12 months did you (or anyone in your entire household) receive. . .) public assistance, including AFDC, general assistance, or payment from any other state welfare program? Include food stamps and energy assistance; do not include Supplemental Security Income (SSI)." and "Who received public assistance income? (ENTER PERSON NUMBER)". This data was combined with the person number information in order to construct a zero-one indicator for any receipt of welfare payments by the respondent in the past 12 months.

Wave 3 also posed some difficulty in creating the respondent's and spouse's income variables since the respondents were not asked about their spouse/partner's income directly. To create the relevant income variables the "respondent's" income was taken from both the main respondent data file and from the spouse data file and the two separate datasets were merged. A composite variable was then created for the respondent's income that was equal to the main respondent's income if the main respondent was female and equal to the spouse's income if the main respondent was

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[2] This question was asked of both married and cohabiting respondents. Two separate indicators were created and then summed to create one composite variable that indicates the occurrence of violent fights regardless of marital status.

male. A similar variable was created for the spouse's income. Couple income then is simply the sum of the two. All income variables were adjusted to be in constant 1988 dollars.

*3.2 Descriptive Statistics*

Table 1.1 presents descriptive statistics from samples 1 and 2. We can see that overall domestic violence rates as well as welfare receipt rates are fairly low in both samples. Though sample 2 is only a slightly modified version of sample 1, it is still important to verify that the data from waves 1 and 2 in both samples are comparable. Indeed, no substantial differences exist for any of the variables, and statistically significant differences are only found for two of the race indicators and a few of the state-level variables (not surprising considering that birth state is used in Sample 2 and state of residence is used in Sample 1). It should also be noted that over 50% of the respondents in waves 1 and 2 are known to be currently living in their state of birth. For welfare recipients and abuse victims this percentage is even higher at 70% and 61% respectively, which strengthens the case for using birth state as a proxy.

However, a number of differences stand out in wave 3 of Sample 2. One such difference occurs in the two variables of interest. Domestic violence rates are slightly higher (though not significantly) and welfare receipt rates are significantly lower than in waves 1 and 2. Since the reforms of the 1990's, which aimed to reduce the number of individuals dependent on welfare, had occurred between waves 2 and 3, this difference is to be expected. Another difference that stands out is in the income of the respondents and of their spouses/partners. It appears that in wave 3 the respondents have significantly more income than in previous waves, but their spouses/partners have significantly less income.

Table 1.2 investigates how domestic violence rates differ with certain key variables like welfare status, income levels, poverty status, race, and education level. We can immediately see from that while there are slight differences in domestic violence levels among different groups of women, most of these differences are not significant. In fact, domestic violence only varies significantly by welfare status and low income status. It appears that welfare recipients have nearly four times the victimization rate as women who are not on welfare, which is consistent with the literature. We also notice that women in low income households are also more likely to be victims of domestic violence, though this difference is only minor compared to the difference in welfare status. This seems to indicate that simply coming from a low income household does not make women more likely to be victims, but rather the act of receiving welfare benefits that makes the difference.

## 4. Model Selection

Using the model selection strategy described in section 2.3, we can now use the NSFH data to determine which theoretical model best describes the relationship between welfare receipt and domestic violence. This exercise is repeated for both samples, though the included variables differ slightly between Sample 1 and Sample 2.

Ideally the model selection process would incorporate testing the model in which welfare receipt and domestic violence are mutually determined. However, this fully nested model is not identified using standard techniques. Thus, only the models which are partially nested will be tested. Three different models will be estimated according to the model selection procedure outlined in section 2. The baseline model

will test whether the potential use of welfare or the underlying state of the relationship have any effect on each other. The traditional model will test the relationship that has been presented in the literature: that welfare receipt affects domestic violence rates. Finally, the non-traditional model will test the reverse relationship: that domestic violence affects whether a woman will receive welfare. Because each of these relationships are theoretically valid, this model selection procedure will give us a better idea of which relationships can be seen in the data as well as allow us to test which model best fits the data.

A bivariate probit model is used initially in the model selection procedure to test whether there is any correlation between the error terms of the two equations. If we cannot reject that the correlation is zero then two separate probit models may be run.

In order to identify both equations in the system, a set of excluded exogenous variables is needed in each equation. In the domestic violence equation, state-level variables indicating whether unilateral divorce is allowed as well as the ratio of single men to single women are included. These variables should only affect the welfare decision indirectly through how they affect the level of violence and the woman's outside option. Stevenson and Wolfers (2006), for example, found that the presence of unilateral divorce laws significantly decreased domestic violence rates, making it a promising candidate for an excluded exogenous variable. The relative supply and demand of single men to women should also affect domestic violence rates because it measures one of the woman's outside options. Women who have better options outside of the relationship should be less willing to tolerate abuse. The higher this ratio is then, the greater the likelihood the woman can find another partner if she

should leave her current relationship. Thus, we expect the effect of this ratio on domestic violence rates to be negative.

Also included in the domestic violence equation is a set of dummy variables indicating the religion observed by the household. Here, atheism is treated as the excluded group. A small literature has examined the relationship between religion and domestic violence and it is typically found that regular attendance of religious gatherings has an inverse relationship with domestic violence rates. Ellison and Anderson (2002), for example, use the NSFH to analyze this relationship and find that even after controlling for various individual and social factors that may affect violence, regular attendance negatively affects violence rates.

The welfare equation includes state-level data on the average monthly welfare benefit and the percentage of residents in the state that receive welfare payments each month and also includes individual data on whether the respondent's family received welfare payments and if her mother worked while she was growing up. The respondent's economic conditions while growing up are likely to be the most reliable excluded exogenous variables in this dataset. This is perhaps because individuals who had exposure to the welfare system while growing up have greater access to knowledge about the welfare system, how to apply, and what benefits they could qualify for. There are numerous studies linking family conditions growing up to welfare usage as an adult. Vartanian (1999), for example, finds that the more years an individual's family was receiving welfare as a child the more likely he/she is to go on welfare as an adult, but that this result is only significant for African Americans.

*4.1 Baseline Model*

The first model run assumes that $\alpha_4 = \beta_4 = 0$, or that actual welfare receipt and actual domestic violence do not matter in the system. In this model the multiple estimates of $\alpha_3$ and $\beta_3$ are tested for equality and significance[3]. The results of the baseline model can be found in Table 1.3.

It immediately stands out that we cannot reject that $\alpha_3 = \beta_3 = 0$ (although it may be that the individual estimates of $\alpha_3$ and $\beta_3$ are poor). In fact, none of the individual estimates of $\alpha_3$ and $\beta_3$ were significantly different from zero. This indicates that the temptation to use welfare services has no influence on whether a relationship is abusive, and that the potential for abuse has no influence on whether a woman chooses to go on welfare.

There is, however, an indirect relationship that emerges between the two variables of interest and that is through the correlation of their error terms. There is a positive and significant correlation of 0.33 to 0.37 in both samples. This indicates that not only is the bivariate probit model more appropriate, but that unobservable factors that affect domestic violence rates also have an impact on whether a woman receives welfare and vice versa.

Also of note is the fact that both equations in Sample 1 have significant excluded exogenous variables and for the most part these excluded exogenous variables seem to be significant in only their respective equations.

*4.2 Traditional Model*

In the next model the assumption that either $\alpha_4 = \beta_4 = 0$ is relaxed by allowing welfare receipt to affect domestic violence. Note that this model is similar to

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[3] Because $\alpha_3$ and $\beta_3$ are both overidentified we will have multiple estimates for them, thus also necessitating the test of equality.

the model that has been commonly assumed in the literature and that the baseline model is nested in this model, thus we can test between both specifications. The results of this model specification can be found in Table 1.4.

Welfare appears to have no impact on domestic violence rates in Sample 1. In fact, hardly any explanatory variables seem to have an impact on domestic violence. Sample 2, however, finds that welfare does have some effect on domestic violence rates in the years after the reforms took place, however, there is still no effect in the years prior to the reforms.

As in the baseline model, both equations have significant excluded exogenous variables, which indicates that this model is indeed identified. We can also reject the baseline model relative to the traditional model through a likelihood ratio test.

*4.3 Non-Traditional Model*

The final model tested reverses the direction of the relationship between domestic violence and welfare receipt and proposes that domestic violence affects a woman's decision of whether to receive welfare. As with the traditional model, the baseline model is nested in this non-traditional model so we may test between the two. The results of this model specification can be found in Table 1.5 (for Sample 1) and Table 1.6 (for Sample 2).

We can see that domestic violence has a significant negative impact on welfare take-up in the years prior to the reforms in both samples. We can also see in Table 1.6 that this negative impact of domestic violence was magnified in the years after the reforms.

The baseline model can also be rejected relative to the non-traditional model through a likelihood ratio test. Finally, due to the higher log likelihoods in both

samples and the significance of the variables of interest in all waves we can reject the traditional model relative to the non-traditional model. This exercise thus implies that the preferred model is:

$$(17) \qquad D^* = \alpha_1 X + \alpha_2 Y + \epsilon$$

$$(18) \qquad W^* = \beta_1 X + \beta_2 Z + \beta_4 D + \omega$$

where $\epsilon$ and $\omega$ are distributed joint normally.

Note that the direction of causality is opposite to what has been presumed in the literature and that, of the three models estimated, the presumed model is not the most preferred model which makes this finding all the more interesting.

## 5. Results

### *5.1 Pre-Reform Analysis*

Table 1.5 presents the full set of estimates from the preferred model. Standard errors are clustered on the respondents' states of residence.

Estimates from the period before the welfare reforms took effect indicate that domestic violence exerted a substantial negative influence on a woman's decision to receive welfare benefits even after taking income, schooling and other variables into account. Going from a non-abusive relationship to an abusive one decreased the likelihood that a woman went on welfare by a factor of 2.2, *ceteris paribus*, implying the average woman in a non-abusive relationship would go from just over a 6 percent chance of going on welfare to only a 3 percent chance if her current relationship were to become abusive.

This result suggests a somewhat troubling potential implication of the PRWORA. If welfare is thought to be one means for women from low income households to gain additional resources needed to flee an abusive relationship and the reforms made it more difficult to receive aid, there could be negative impacts on women who were victims of abuse. Since we have found that women who are in abusive relationships are less likely to use welfare services, the new limits could cause these women to stay in abusive relationships longer because welfare has become a less viable option. While there have been efforts to address this issue through initiatives such as the Family Violence Option, it is by no means certain that a woman would identify herself as being abused or that her state has this type of program.

Many other factors are also important in determining whether a woman receives welfare. All of the results in Table 1.5 have the expected signs, e.g., welfare receipt is less likely for higher income households and for more educated individuals, but more likely for larger households. One result that may not seem sensible is that higher unemployment rates significantly decrease the likelihood that a woman will receive welfare, although this might be explained if the household's income at that time is a poor reflection of its permanent income.

Interestingly enough, the only significant factors determining domestic violence in this model are a person's age, cohabitation status, and several of the religion dummies. Older women are found to be less likely to be victims of abuse. This is confirmed in previous studies which have hypothesized that older individuals typically have had more time to accrue resources and are therefore less likely to tolerate abuse. Older women also typically have had more time to search for a suitable partner who is not abusive. We also see that women in cohabiting relationships are more likely to be victims of abuse than married women. Stets and Straus (1990) found

similar results using data from the National Family Violence Survey. For the most part it also appears that having some religious affiliation reduces the risk of violence as well, a finding that is consistent with those of Ellison and Anderson (2002).

Also note that the value of rho is 0.860, a very strong positive correlation between the error terms of the two equations. The test that rho is equal to zero is rejected and therefore we can conclude that there is in fact some endogeneity that needs to be accounted for in estimation. Thus the bivariate probit model is more appropriate than individual probit models.

Finally, because of the correlation between the error terms of both equations and because domestic violence appears in the welfare equation, it is necessary to satisfy the condition that the excluded exogenous variables in the domestic violence equation be jointly significant. A $X^2$ test of the hypothesis that the coefficients are jointly equal to zero is run on the variables: unilateral divorce, single sex ratio, and religion. The results of the test indicate that at 99 percent confidence we can reject the hypothesis and that the model is indeed identified.

*5.2 Post-Reform Analysis*

A similar bivariate probit model is run for Sample 2, which includes the wave of data that occurred after the welfare reforms took place, to see if our predictions of the effects of the reforms are supported. Additional indicators include whether the data come from wave 3, whether a woman's state of birth has adopted the FVO, and each possible interaction between domestic violence, wave 3 and FVO status. The results of this estimation can be found in Table 1.6.

Domestic violence is still found to exert a significantly large negative influence on a woman's choice to go on welfare, and the effect appears to be

magnified in the post-reform years. This is consistent with what was predicted: the reforms made it less likely that anyone would receive welfare, including abused women. Also of note is the result that women who reported abuse were more likely to go on welfare if their state of birth had adopted the FVO than women who were not victims in that state, suggesting that the FVO at least partially achieved the goal of making welfare more accessible to victims of abuse.

To gain a better understanding of the magnitudes of these changes we can compare the predicted probability of receiving welfare under different combinations of pre and post reform eras, victim status, and FVO status. Table 1.7 presents the predicted probability that a woman will receive welfare given these different combinations of characteristics.

There are several notable estimates. First, women who were victims of abuse were seven times more likely to go on welfare, pre-reform, in states that would ultimately end up adopting the FVO than victims in non-FVO states. We also observe that while there was a dramatic reduction in the probability of receiving welfare for women in FVO states after the reforms took place, the likelihood of going on welfare for women in non-FVO states after the reforms was reduced to essentially zero. Both of these observations suggest that the FVO initiative did at least help alleviate some of the negative impacts of the reforms on victims.

We can also see that victims of abuse in the post-reform era were more likely to receive welfare if their birth state had adopted the FVO. While this effect only brings the likelihood of welfare receipt up to 0.1 percent it is a large effect compared with the likelihood in non-FVO states.

Unfortunately it appears that the overall effect of domestic violence on welfare receipt is negative. Despite the efforts of the FVO to increase access to aid to

victimized women these women are still less likely to use the welfare system than women in safer relationships which suggests that other initiatives may be required to help increase access. Not all states have provisions allowing exemptions from TANF requirements for victims of abuse, so making these provisions a requirement for all states may help improve conditions for victims. Additional programs aimed at helping victimized women become self-sufficient such as education, job-training programs, or welfare-to-work programs specifically targeted at women may also improve conditions for abused women.

Both equations also have excluded exogenous variables that are significant. The state-level variable measuring the percentage of the state's population that receives welfare assistance per month is found to significantly positively increase the likelihood of welfare receipt which is consistent with what is expected. Religion again plays a significant role in determining the likelihood of domestic violence with any kind of religious affiliation diminishing the likelihood of violence. A state having unilateral divorce also significantly reduces the likelihood of domestic violence which is consistent with the earlier findings of Stevenson and Wolfers (2006). The hypothesis that the excluded exogenous variables are jointly insignificant is rejected for the domestic violence equation at 99 percent, again indicating that the model is identified.

## 6. Conclusion and Directions for Future Research

The results found in this study are worrying given the nature of the 1996 reforms since they made it more difficult to receive benefits and limited the amount of time one could collect them. If women are unable to use the welfare system as a

means to escape violent relationships because the system's requirements are too strict given their conditions, and if the welfare system is now cutting back on the number of people who can receive benefits there may be an adverse impact on the rates of domestic abuse. Policy makers have attempted to address this issue by constructing an optional Family Violence Option that states can adopt individually which would help women who identified themselves as being victims by waiving some of the limitations of the new policy, but in light of the results of this study it seems that the reforms still had a substantial negative impact on women who were in violent relationships.

This study did establish that states that ultimately would adopt the FVO had higher rates of victimized women in the system than states that did not adopt the FVO even in the pre-reform era. One extension of this work might be to carefully analyze the pre-reform characteristics of the welfare system in the states that eventually adopted the FVO to see if there are any major differences between them and non-FVO states that make them more accessible to victimized women. Further, states had considerable freedom in how they chose to implement the FVO and could choose which welfare requirements they wanted to waive for victims as well as if they wanted to offer additional services to victims such as referral to battered women's shelters. Analysis of these differences and how they affect welfare receipt for victims may offer even greater insight as to what can be done to improve the system.

Another extension to this research might focus on how the labor force participation of women and domestic violence are related. This study could encompass a wider variety of women since the decision of whether or not to work must be made at all income levels, but the choice to go on welfare or not is only relevant for those with low enough incomes. Such a study could also provide some insight into how the use of domestic violence differs by income levels. It could

answer questions such as whether men with lower incomes were more or less likely to

be threatened by a woman working and contributing a significant amount to a

household's pool of resources.

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# Tables

**Table 1.1: Descriptive Statistics Samples 1 and 2**

| Variable | Average Value (Sample 1) | Average Value (Sample 2: Waves 1 and 2) | Average Value (Sample 2: Wave 3) |
|---|---|---|---|
| Domestic Violence | 0.056 | 0.057 | 0.070 |
| | (0.005) | (0.005) | (0.009) |
| Welfare | 0.066 | 0.066 | 0.007 |
| | (0.005) | (0.006) | (0.003) |
| Age | 39.011 | 38.878 | 53.869 |
| | (0.267) | (0.281) | (0.231) |
| Number of Children | 2.530 | 2.509 | 2.057 |
| | (0.043) | (0.045) | (0.011) |
| Schooling | 11.969 | 12.091 | 10.384 |
| | (0.053) | (0.052) | (0.219) |
| White | 0.747 | 0.770 | 0.744 |
| | (0.009) | (0.009) | (0.016) |
| Black | 0.163 | 0.167 | 0.178 |
| | (0.008) | (0.008) | (0.014) |
| Hispanic | 0.089 | 0.063 | 0.078 |
| | (0.006) | (0.005) | (0.010) |
| Respondent's Income | 5395.696 | 5360.756 | 8681.322 |
| | (157.045) | (163.118) | (489.187) |
| Spouse/Partner's Income | 14049.090 | 14205.580 | 8495.406 |
| | (260.707) | (273.192) | (491.378) |
| Welfare Growing Up | 0.143 | 0.146 | 0.127 |
| | (0.007) | (0.008) | (0.012) |
| Mother Worked | 0.535 | 0.544 | 0.499 |
| | (0.011) | (0.011) | (0.018) |
| Cohabiting | 0.047 | 0.048 | 0.053 |
| | (0.005) | (0.005) | (0.008) |
| Unilateral Divorce | 0.568 | 0.537 | 0.533 |
| | (0.011) | (0.011) | (0.018) |
| Unemployment Rate | 3.301 | 5.846 | 5.541 |
| | (0.056) | (0.033) | (0.029) |
| Single Sex Ratio | 1.094 | 1.093 | 1.077 |
| | (0.001) | (0.001) | (0.002) |
| % Monthly Welfare Recipients | 4.492 | 4.633 | 1.806 |
| | (0.034) | (0.034) | (0.032) |
| Avg. Monthly Welfare Payment | 1368.726 | 1364.482 | 1473.531 |
| | (11.236) | (11.703) | (22.908) |
| SMSA status | 0.702 | N/A | N/A |
| | (0.010) | | |
| Northeast | 0.146 | N/A | N/A |
| | (0.008) | | |
| Northcentral | 0.299 | N/A | N/A |
| | (0.010) | | |
| South | 0.385 | N/A | N/A |
| | (0.035) | | |
| West | 0.171 | N/A | N/A |
| | (0.008) | | |
| Spouse Present at Interview | 0.352 | N/A | N/A |
| | (0.010) | | |
| Number of Observations | 2194 | 2018 | 758 |

Notes:
Standard Errors in Parentheses.
Monetary values in constant 1988 dollars.
Sample restricted to households with a total income below three times the poverty line.
*, **, and *** indicate significant differences at the 90%, 95%, and 99% confidence levels respectively.

**Table 1.2: Domestic Violence Rates Across Groups (Sample 1)**

| Variable | N | Mean | Difference |
|---|---|---|---|
| White | 1640 | 0.057 | 0.003 |
| | | (0.006) | (0.011) |
| Non-White | 554 | 0.054 | |
| | | (0.010) | |
| Black | 358 | 0.059 | 0.003 |
| | | (0.012) | (0.014) |
| Non-Black | 1836 | 0.056 | |
| | | (0.005) | |
| Hispanic | 196 | 0.046 | -0.011 |
| | | (0.015) | (0.016) |
| Non-Hispanic | 1998 | 0.057 | |
| | | (0.005) | |
| On Welfare | 144 | 0.181 | 0.133*** |
| | | (0.032) | (0.033) |
| Not on Welfare | 2050 | 0.047 | |
| | | (0.005) | |
| In Poverty | 669 | 0.060 | 0.005 |
| | | (0.009) | (0.011) |
| Not in Poverty | 1525 | 0.054 | |
| | | (0.006) | |
| No HS Diploma | 482 | 0.058 | -0.003 |
| | | (0.011) | (0.012) |
| HS or Higher | 1712 | 0.055 | |
| | | (0.006) | |

Notes:
Standard Errors in Parentheses.
Sample restricted to households with a total income below three times the poverty line.
*, **, and *** indicate significant differences at the 90%, 95%, and 99% confidence levels.

**Table 1.3: Model Selection Results (Baseline Model)**

| | Sample 1: Pre-Reform | | Sample 2: All Waves | |
|---|---|---|---|---|
| Variable | Coefficient (Welfare Eq.) | Coefficient (D.V. Eq.) | Coefficient (Welfare Eq.) | Coefficient (D.V. Eq.) |
| $D^*$ ($X^2$ test: estimates jointly = 0) | (0.992) | | (0.891) | |
| $W^*$ ($X^2$ test: estimates jointly = 0) | | (0.529) | | (0.886) |
| Wave 3 | | | -0.164 | 0.599** |
| | | | (0.315) | (0.275) |
| Wave 3 x FVO | | | -0.885** | 0.061 |
| | | | (0.414) | (0.257) |
| FVO | | | 0.082 | 0.191 |
| | | | (0.120) | (0.123) |
| Household Size | 0.082*** | 0.010 | 0.085*** | 0.001 |
| | (0.035) | (0.028) | (0.026) | (0.025) |
| Number of Children | -0.011 | -0.010 | $3.71 \times 10^{-4}$ | -0.009 |
| | (0.024) | (0.723) | (0.024) | (0.027) |
| Age | -0.041*** | -0.036*** | -0.041*** | -0.030*** |
| | (0.005) | (0.006) | (0.006) | (0.005) |
| Schooling | -0.075*** | -0.006 | -0.069*** | -0.023*** |
| | (0.020) | (0.020) | (0.021) | (0.009) |
| Log of Resp. Income | -0.046*** | 0.021* | -0.032*** | 0.011 |
| | (0.011) | (0.013) | (0.011) | (0.011) |
| Log of Couple Income | -0.085*** | -0.025 | -0.094*** | -0.029** |
| | (0.014) | (0.018) | (0.014) | (0.013) |
| Black | 0.343** | 0.023 | 0.345*** | 0.032 |
| | (0.101) | (0.117) | (0.132) | (0.099) |
| Hispanic | -0.308 | -0.122 | -0.196 | 0.021 |
| | (0.196) | (0.166) | (0.168) | (0.178) |
| SMSA | 0.092 | -0.063 | | |
| | (0.105) | (0.105) | | |
| Northeast | -0.312* | 0.081 | -0.040 | -0.022 |
| | (0.183) | (0.170) | (0.177) | (0.135) |
| South | -0.084 | -0.093 | -0.185 | -0.225* |
| | (0.107) | (0.101) | (0.119) | (0.122) |
| West | -0.225* | 0.170 | -0.384** | -0.276 |
| | (0.133) | (0.136) | (0.193) | (0.172) |
| Unemployment Rate | -0.040** | -0.019 | -0.093** | -0.012 |
| | (0.017) | (0.019) | (0.040) | (0.036) |
| **Excluded Exogenous Variables** | | | | |
| Welfare: | | | | |
|   Welfare Growing Up | 0.231* | 0.218** | 0.163 | -0.033 |
| | (0.123) | (0.110) | (0.114) | (0.104) |
|   Mother Worked | -0.102 | -0.074 | -0.036 | 0.076 |
| | (0.089) | (0.089) | (0.094) | (0.083) |
|   % Mo. Welfare Recipients | -0.024 | 0.011 | 0.065 | 0.033 |
| | (0.034) | (0.040) | (0.043) | (0.037) |
|   Average Mo. Benefit | $2.31 \times 10^{-5}$ | $1.57 \times 10^{-5}$ | $-2.72 \times 10^{-4}$ | $-7.67 \times 10^{-5}$ |
| | $(8.92 \times 10^{-5})$ | $(1.15 \times 10^{-4})$ | $(1.91 \times 10^{-4})$ | $(9.49 \times 10^{-5})$ |
| Domestic Violence: | | | | |
|   Unilateral Divorce | -0.048 | 0.010 | 0.016 | -0.137 |
| | (0.081) | (0.101) | (0.094) | (0.092) |
|   Single Sex Ratio | 0.611 | -0.034 | 1.073 | 0.351 |
| | (0.485) | (0.803) | (0.658) | (0.783) |
|   Religion Dummies | ✓* | ✓*** | ✓*** | ✓*** |
| Number of Observations | N = 2194 | | N = 2776 | |
| Log pseudolikelihood | L = -823.514 | | L = -976.727 | |
| Wald test of Rho=0: | Rho = 0.365 | p-value = 0.000 | Rho = 0.332 | p-value = 0.000 |

Notes:
Robust standard errors clustered on percentage monthly welfare recipients in parentheses.
All marginal effects are partial elasticities of the form dlogPr(y=1)/dx and are the sum of the direct and indirect effects when applicable.
Samples restricted to households with a total income below three times the poverty line.
Individual dummies indicating religious denomination were also included in the domestic violence equation. The significance test is a test of all dummies being jointly equal to 0.
*, **, and *** indicate significance at the 90%, 95%, and 99% confidence levels.

**Table 1.4: Model Selection Results (Traditional Model)**

| Variable | Sample 1: Pre-Reform | | Sample 2: All Waves | |
|---|---|---|---|---|
| | Coefficient (Welfare Eq.) | Coefficient (D.V. Eq.) | Coefficient (Welfare Eq.) | Coefficient (D.V. Eq.) |
| Welfare | | 0.873 | | 0.270 |
| | | (1.620) | | (0.982) |
|   Welfare x Wave 3 | | | | -4.592*** |
| | | | | (0.756) |
|   Welfare x FVO | | | | 0.847* |
| | | | | (0.498) |
|   Welfare x Wave 3 x FVO | | | | 4.797*** |
| | | | | (0.882) |
| Wave 3 | | | -0.166 | 0.468* |
| | | | (0.318) | (0.253) |
|   Wave 3 x FVO | | | -0.792** | 0.152 |
| | | | (0.385) | (0.267) |
| FVO | | | 0.042 | 0.085 |
| | | | (0.116) | (0.132) |
| Household Size | 0.073** | -0.006 | 0.073*** | -0.013 |
| | (0.036) | (0.032) | (0.025) | (0.027) |
| Number of Children | -0.010 | -0.004 | 0.006 | -0.016 |
| | (0.025) | (0.029) | (0.021) | (0.028) |
| Age | -0.041*** | -0.032*** | -0.040*** | -0.025*** |
| | (0.004) | (0.010) | (0.006) | (0.005) |
| Schooling | -0.082*** | 0.003 | -0.074*** | -0.019** |
| | (0.020) | (0.030) | (0.021) | (0.009) |
| Log of Resp. Income | -0.040*** | 0.027* | -0.027** | 0.015 |
| | (0.011) | (0.015) | (0.012) | (0.011) |
| Log of Couple Income | -0.082*** | -0.009 | -0.085*** | -0.019 |
| | (0.014) | (0.036) | (0.014) | (0.014) |
| Black | 0.326** | -0.019 | 0.322*** | -0.008 |
| | (0.098) | (0.139) | (0.124) | (0.108) |
| Hispanic | -0.336* | -0.065 | -0.175 | 0.061 |
| | (0.201) | (0.174) | (0.174) | (0.181) |
| SMSA | 0.063 | -0.077 | | |
| | (0.102) | (0.106) | | |
| Northeast | -0.278 | 0.128 | 0.002 | -0.037 |
| | (0.199) | (0.172) | (0.167) | (0.129) |
| South | -0.113 | -0.086 | -0.153 | -0.207* |
| | (0.108) | (0.107) | (0.115) | (0.108) |
| West | -0.245* | 0.203 | -0.250 | -0.254 |
| | (0.149) | (0.143) | (0.193) | (0.166) |
| Unemployment Rate | -0.042** | -0.015 | -0.113*** | 0.008 |
| | (0.019) | (0.020) | (0.042) | (0.032) |
| **Excluded Exogenous Variables** | | | | |
| Welfare: | | | | |
|   Welfare Growing Up | 0.244* | | 0.163 | |
| | (0.127) | | (0.107) | |
|   Mother Worked | -0.085 | | -0.049 | |
| | (0.087) | | (0.097) | |
|   % Mo. Welfare Recipients | -0.038 | | 0.077* | |
| | (0.030) | | (0.041) | |
|   Average Mo. Benefit | $2.38 \times 10^{-5}$ | | $-2.803 \times 10^{-4}$ | |
| | $(9.66 \times 10^{-5})$ | | $(1.762 \times 10^{-4})$ | |
| Domestic Violence: | | | | |
|   Unilateral Divorce | | 0.016 | | -0.140 |
| | | (0.103) | | (0.088) |
|   Single Sex Ratio | | -0.267 | | 0.184 |
| | | (0.746) | | (0.738) |
|   Religion Dummies | | ✓*** | | ✓*** |
| Number of Observations | N = 2194 | | N = 2776 | |
| Log pseudolikelihood | L = -841.926 | | L = -991.934 | |
| Wald test of Rho=0: | Rho = -0.086 | p-value = 0.916 | Rho = -0.192 | p-value = 0.630 |

Notes:
Robust standard errors clustered on percentage monthly welfare recipients in parentheses.
All marginal effects are partial elasticities of the form dlogPr(y=1)/dx and are the sum of the direct and indirect effects when applicable.
Samples restricted to households with a total income below three times the poverty line.
Individual dummies indicating religious denomination were also included in the domestic violence equation. The significance test is a test of all dummies being jointly equal to 0.
*, **, and *** indicate significance at the 90%, 95%, and 99% confidence levels.

**Table 1.5: Results of Preferred Model Sample 1 (waves 1 and 2—pre-reform)**

| Variable | Coefficient (Welfare Eq.) | Marginal Effect (Welfare Eq.) | Coefficient (D.V. Eq.) | Marginal Effect (D.V. Eq.) |
|---|---|---|---|---|
| Domestic Violence | -1.127*** | -2.191*** | | |
| | (0.088) | (0.175) | | |
| Household Size | 0.057** | 0.111** | 0.005 | 0.011 |
| | (0.025) | (0.050) | (0.031) | (0.072) |
| Number of Children | -0.001 | -0.003 | 0.015 | 0.034 |
| | (0.022) | (0.042) | (0.032) | (0.074) |
| Age | -0.040*** | -0.078*** | -0.033*** | -0.077*** |
| | (0.004) | (0.008) | (0.005) | (0.011) |
| Schooling | -0.056*** | -0.110*** | -0.021 | -0.049 |
| | (0.016) | (0.031) | (0.022) | (0.051) |
| Log of Resp. Income | -0.013 | -0.026 | 0.015 | 0.035 |
| | (0.010) | (0.019) | (0.013) | (0.029) |
| Log of Couple Income | -0.069*** | -0.134*** | -0.006 | -0.013 |
| | (0.014) | (0.028) | (0.017) | (0.039) |
| Black | 0.189** | 0.368** | 0.037 | 0.086 |
| | (0.076) | (0.148) | (0.112) | (0.259) |
| Hispanic | -0.231 | -0.450 | -0.231 | -0.533 |
| | (0.161) | (0.313) | (0.163) | (0.379) |
| SMSA | 0.002 | 0.004 | -0.039 | -0.091 |
| | (0.085) | (0.165) | (0.125) | (0.288) |
| Northeast | -0.173 | -0.336 | -0.010 | -0.024 |
| | (0.146) | (0.285) | (0.150) | (0.346) |
| South | -0.100 | -0.195 | -0.075 | -0.173 |
| | (0.089) | (0.173) | (0.095) | (0.220) |
| West | -0.058 | -0.112 | 0.203 | 0.467 |
| | (0.120) | (0.233) | (0.127) | (0.295) |
| Unemployment Rate | -0.050*** | -0.096*** | -0.022 | -0.050 |
| | (0.013) | (0.025) | (0.015) | (0.035) |
| **Excluded Exogenous Variables** | | | | |
| Welfare Growing Up | 0.096 | 0.187 | | |
| | (0.070) | (0.138) | | |
| Mother Worked | -0.037 | -0.072 | | |
| | (0.048) | (0.093) | | |
| % Mo. Welfare Recipients | -0.014 | -0.027 | | |
| | (0.025) | (0.048) | | |
| Average Mo. Benefit | $2.29 \times 10^{-5}$ | $4.45 \times 10^{-5}$ | | |
| | $(4.75 \times 10^{-5})$ | $(9.22 \times 10^{-5})$ | | |
| Unilateral Divorce | | | 0.003 | 0.007 |
| | | | (0.083) | (0.191) |
| Single Sex Ratio | | | 0.424 | 0.978 |
| | | | (0.537) | (1.236) |
| Religion Dummies | | | ✓*** | ✓*** |
| Number of Observations | N = 2194 | | | |
| Log pseudolikelihood | L = -846.864 | | | |
| Wald test of Rho=0: | Rho = 0.860 | p-value = 0.008 | | |

Notes:
Robust standard errors clustered on percentage monthly welfare recipients in parentheses.
All marginal effects are partial elasticities of the form dlogPr(y=1)/dx and are the sum of the direct and indirect effects when applicable.
Samples restricted to households with a total income below three times the poverty line.
Individual dummies indicating religious denomination were also included in the domestic violence equation. The significance test is a test of all dummies being jointly equal to 0.
*, **, and *** indicate significance at the 90%, 95%, and 99% confidence levels.

**Table 1.6: Results of Preferred Model Sample 2 (Waves 1, 2, and 3)**

| Variable | Coefficient (Welfare Eq.) | Marginal Effect (Welfare Eq.) | Coefficient (D.V. Eq.) | Marginal Effect (D.V. Eq.) |
|---|---|---|---|---|
| Domestic Violence | -1.345** | -3.215** | | |
| | (0.623) | (1.393) | | |
| D.V. x Wave 3 | -4.746*** | | | |
| | (0.597) | | | |
| D.V. x FVO | 1.122** | | | |
| | (0.437) | | | |
| D.V. x Wave 3 x FVO | 3.924*** | | | |
| | (0.663) | | | |
| Wave 3 | -0.117 | -2.168** | 0.270 | 0.871*** |
| | (0.283) | (0.947) | (0.144) | (0.260) |
| Wave 3 x FVO | -0.699* | | 0.112 | |
| | (0.395) | | (0.279) | |
| FVO | -0.054 | -0.093 | 0.144 | 0.438 |
| | (0.116) | (0.375) | (0.152) | (0.329) |
| Household Size | 0.077*** | 0.190*** | -0.001 | -0.003 |
| | (0.024) | (0.062) | (0.028) | (0.069) |
| Number of Children | 0.013 | 0.033 | 0.016 | 0.039 |
| | (0.021) | (0.051) | (0.028) | (0.070) |
| Age | -0.036*** | -0.089*** | -0.022*** | -0.054*** |
| | (0.005) | (0.016) | (0.005) | (0.013) |
| Schooling | -0.071*** | -0.175*** | -0.014 | -0.034 |
| | (0.020) | (0.054) | (0.009) | (0.021) |
| Log of Resp. Income | -0.028** | -0.069** | 0.009 | 0.022 |
| | (0.012) | (0.031) | (0.011) | (0.028) |
| Log of Couple Income | -0.080*** | -0.197*** | -0.017 | -0.041 |
| | (0.013) | (0.038) | (0.013) | (0.032) |
| Black | 0.273** | 0.675** | -0.071 | -0.175 |
| | (0.128) | (0.326) | (0.112) | (0.277) |
| Hispanic | -0.146 | -0.360 | 0.082 | 0.204 |
| | (0.176) | (0.440) | (0.179) | (0.444) |
| Northeast | -0.033 | -0.081 | -0.031 | -0.076 |
| | (0.165) | (0.409) | (0.140) | (0.346) |
| South | -0.164 | -0.404 | -0.226* | -0.558* |
| | (0.116) | (0.288) | (0.121) | (0.302) |
| West | -0.329* | -0.812* | -0.261 | -0.645 |
| | (0.194) | (0.476) | (0.175) | (0.435) |
| Unemployment Rate | -0.093** | -0.229** | 0.013 | 0.031 |
| | (0.041) | (0.107) | (0.034) | (0.084) |
| **Excluded Exogenous Variables** | | | | |
| Welfare Growing Up | 0.144 | 0.356 | | |
| | (0.100) | (0.247) | | |
| Mother Worked | -0.052 | -0.129 | | |
| | (0.093) | (0.230) | | |
| % Mo. Welfare Recipients | 0.077* | 0.190* | | |
| | (0.039) | (0.102) | | |
| Average Mo. Benefit | $-2.441 \times 10^{-4}$ | -0.001 | | |
| | $(1.637 \times 10^{-4})$ | (0.0004) | | |
| Unilateral Divorce | | | -0.163* | -0.404* |
| | | | (0.097) | (0.242) |
| Single Sex Ratio | | | -0.507 | -1.255 |
| | | | (0.882) | (2.172) |
| Religion Dummies | | | ✓*** | ✓*** |
| | | | | |
| Number of Observations | N=2776 | | | |
| Log pseudolikelihood | L = -996.106 | | | |
| Wald test of Rho=0: | Rho = 0.509 | p-value = 0.001 | | |

Notes:
Robust standard errors clustered on percentage monthly welfare recipients in parentheses.
All marginal effects are partial elasticities of the form dlogPr(y=1)/dx and are the sum of the direct and indirect effects when applicable.
Samples restricted to households with a total income below three times the poverty line.
Individual dummies indicating religious denomination were also included in the domestic violence equation. The significance test is a test of all dummies being jointly equal to 0.
*, **, and *** indicate significance at the 90%, 95%, and 99% confidence levels.

**Table 1.7: Variations in Likelihood of Welfare Receipt**

| Wave 3 x Domestic Violence x FVO | Pr(W=1 \| 3, D, F) | Standard Error |
|---|---|---|
| 0, 0, 0 | 0.070 | 0.015 |
| 0, 0, 1 | 0.064 | 0.012 |
| 0, 1, 0 | 0.005 | 0.006 |
| 0, 1, 1 | 0.044 | 0.035 |
| 1, 0, 0 | 0.058 | 0.025 |
| 1, 0, 1 | 0.015 | 0.011 |
| 1, 1, 0 | $5.09 \times 10^{-11}$ | $9.55 \times 10^{-11}$ |
| 1, 1, 1 | 0.001 | 0.002 |
| Notes: Predicted probabilities are calculated by holding all personal and state-level characteristics constant, but treating every observation as being in wave 3, a victim, and/or in an FVO state. | | |

**Chapter 2: "Women's Employment and Domestic Violence: An Analysis by Income Levels"**

**Introduction**

Women stay in abusive relationships or return to them for various reasons. Among these reasons is a lack of financial independence. It is logical then to suppose that gaining employment or furthering her education could potentially give a woman enough resources to leave the relationship if she chooses or at least increase her bargaining power enough to deter abuse. This, however, is not always the case.

Considerable evidence has shown that a woman's employment may actually provoke abuse. A study conducted by Allard et al in 1996 showed that victims of abuse are fifteen times more likely to have partners that disapproved of their attempts to work or further their education and actively tried to prevent it. Intervention could be non-violent in the form of turning off alarms before work, destroying class notes etc., but could also take a more violent form via abuse before important job interviews and other similar methods. This evidence suggests that programs aimed at increasing educational attainment and improving employment opportunities for women may actually have an unintended negative effect on women who are victims of abuse.

Thus far the literature has been divided as to the direction of the relationship. Does employment provoke a reaction in terms of domestic violence, or does domestic violence influence a woman's decision to work. There has, however, been a consensus that the relationship does depend on several factors, primarily the relative bargaining powers of the man and woman. While many different methods of measuring this bargaining power have been used, the primary idea is that if a woman has a relatively high amount of bargaining power to begin with, employment may

raise her threat point enough that we see a negative relationship between abuse and employment emerge. Conversely, for women with relatively low bargaining power, employment may not raise her threat point enough and a positive relationship between abuse and employment may emerge.

This paper uses a similar theoretical framework to that in the literature and suggests that the relationship is likely different for women with spouses of different income levels. Further, several theoretical relationships between domestic violence and employment are tested to see if the relationship is more complex than the literature has assumed. Ultimately it is found that working has a positive effect on domestic violence for women that are in relationships with lower income men, but that working has a negative effect on domestic violence for women with higher income spouses/partners. There doesn't appear to be any effect of domestic violence on employment for either of these two groups.

If the models of assortative matching in the marriage market are to be believed, these findings suggest that women who have lower income spouses/partners are more likely to also command a lower wage in the labor market. Because of this, they are also less likely to be entirely self-sufficient even if they choose to work. Thus, if their spouse/partner does not approve of their working, employment could increase the level and amount of conflicts and unfortunately not provide her with sufficient resources to leave the relationship. Conversely, women who have higher income spouses/partners are more likely to also command a higher wage in the labor market implying a higher likelihood of becoming self-sufficient. In this case, violence may actually push the woman out of the relationship, and thus will not be used to deter behavior if one of the goals of the spouse is to keep the relationship intact.

These findings are troubling given that women with lower outside options are the ones that could potentially benefit the most from education, employment, and other programs aimed at victims of abuse. Unfortunately, unless such programs significantly improve the bargaining power of abuse victims they may actually have the unintended effect of making matters worse.

The remainder of this paper is structured as follows: section 1 discusses the relevant literature, section 2 presents the various theoretical relationships between employment and domestic violence as well as proposes a method for choosing between the various empirical models, section 3 describes the data used in the analysis, section 4 discusses the model selection process and presents the preferred model of analysis, section 5 presents the results of estimation, and section 6 concludes.

## 1. Literature

To date, the literature has analyzed the relationship between employment status of women and domestic violence from a number of different angles. Some propose that the direction of impact is that working has an impact on whether a woman will experience abuse, while others suggest that domestic violence actually affects whether a woman chooses to work. Regardless of the direction of impact assumed, most studies have suggested that the relationship between the two variables of interest depends at least in part on the characteristics of both the woman and the man. Finally, because the relationship between domestic violence and women's employment is a much bigger issue in developing countries, a lot of focus has been placed on analysis within those regions.

Those studies that maintain that employment has an effect on abuse typically find that the relationship depends upon the relative bargaining powers of both the male and female. For example, Heath (2012) finds in her study in Dhaka that women who have lower levels of education and marry at a young age tend to be more likely to generate abusive reactions from their spouses when they enter the workforce, but that there is no impact on abuse for women with better education who married later. Similarly, Macmillan and Gartner (1999) in a study of Canadian women find that women who choose to work when their husband is unemployed have an increase in the likelihood of abuse whereas women who choose to work when their husband is also employed actually see a decrease in the likelihood of abuse.

Aizer (2010) instead looks at the relationship between the relative wages of men and women instead of the actual employment status of the woman. She finds that increases in the relative wages of women generally decrease the likelihood of domestic violence. Higher wages mean more bargaining power and higher threat points, which means that the higher the wage the less likely violence will be able to be used as a deterrent to employment.

These findings are consistent with theoretical models such as Eswaran and Malhotra (2011), who predict that the effect of employment on domestic violence depends on how employment affects the relative bargaining power and threat point of the woman. Working should increase the decision-making power of the woman in the household. This could potentially lead to conflicts if the husband and wife do not agree on how household resources should be managed. For women who don't see a large increase in their bargaining power, they may see an increase in the level of domestic violence which is being used by the male to regain his dominant role in the household. On the other hand, for women who do receive a substantial increase in

their relative bargaining power, working may actually deter abuse since the male wants to keep the relationship intact and his spouse/partner may leave him if he becomes abusive.

Another strain of the literature proposes that domestic violence impacts a woman's decision to enter the workforce. One such study by Bowlus and Seitz (1998) finds that the effect of domestic violence on employment decisions depends on the marital status of the woman. For married or divorced women, abuse in current or past relationships negatively affects her decision to become employed. However, for women who are re-married current or past abuse increases the likelihood of entering the workforce.

Currently there do not appear to be any studies that look at the relationship between employment status and domestic violence and how the relationship differs by the income level of the spouse. This study proposes a rationale similar to Heath (2012) and Eswaran and Malhotra (2011) to explain why the relationship may differ by income levels. Women in relationships with men of lower incomes likely have lower ability levels and therefore fewer outside options, but women in relationships with higher income men likely have better outside options. This means that women in higher income households are more likely to be able to raise their threat point enough to deter domestic violence in response to employment, but that women in lower income households may not be able to raise their threat point enough.

Finally, no study to date has taken into account the potential dual relationship between domestic violence and employment status, though current studies have shown evidence for both directions of impact. This study will be the first to test multiple potential relationships between abuse and employment to determine the most appropriate model.

## 2. Theory

We have seen that a variety of relationships between women's employment and domestic violence may exist, however, most studies assume one direction of impact or the other and do not allow for other relationships to exist. Given the empirical evidence to date, there seems to be a valid concern that the actual relationship may be more complicated than previously thought.

In addition to the uncertain direction of impact, it is also unclear whether the relationship between domestic violence and employment status is driven by the actual presence of violence and actual employment, or rather by underlying conditions that are correlated with one or both. To explore the possibilities more fully, I adapt Milli's (2013) method to the problem at hand. Consider the following system of equations:

$$(1) \qquad D^* = \alpha_1 X + \alpha_2 Y + \alpha_3 W^* + \alpha_4 W + \epsilon$$

$$(2) \qquad W^* = \beta_1 X + \beta_2 Z + \beta_3 D^* + \beta_4 D + \omega$$

where D* is a latent variable that indicates the underlying state of a relationship, and D is an indicator that takes a value of 1 (indicating a violent relationship) if $D^* \geq 0$. W* is a latent variable that represents the temptation to enter the workforce, and W is an indicator which takes a value of 1 (indicating the respondent being employed) if $W^* \geq 0$. X is a vector of variables that influence both violence and working status, Y a vector of variables that influence only violence, and Z a vector of variables that influence only employment. The error terms $\epsilon$ and $\omega$ may also be correlated, possibly because unobserved factors affect both outcomes. This possible correlation will motivate the bivariate probit model used in the empirical estimation.

This system allows for several potential relationships between violence and employment status. We are particularly interested in the coefficients $\alpha_3$, $\alpha_4$, $\beta_3$, and

$\beta_4$. Each may or may not be equal to zero, depending on which factors are important in determining the relationship.

In the analysis that is carried out in this paper I test three different relationships that are nested in this system. Two of which have been used in the literature, the other is one that proposes an indirect relationship between the two variables of interest. A discussion of the three models that will be estimated follows.

*2.1 Baseline Model: Indirect Effects*

In this baseline model I assume that domestic violence has no direct impact on employment and employment has no direct impact on domestic violence. Rather, the underlying states that determine both violence and employment affect one another. This gives us the following system of equations:

$$(3) \qquad D^* = \alpha_1 X + \alpha_2 Y + \alpha_3 W^* + \epsilon$$

$$(4) \qquad W^* = \beta_1 X + \beta_2 Z + \beta_3 D^* + \omega$$

Again, W* and D* are unobservable in this model and as such $\alpha_3$ and $\beta_3$ cannot be estimated directly.

To estimate $\alpha_3$ and $\beta_3$ I estimate the reduced form of the system above by plugging D* into the W* equation and vice versa. The coefficients of interest then can be found by calculating different ratios of the excluded exogenous variables. There will be multiple estimates of each of these coefficients, so they must also be tested for equality.

It is unclear what relationship will emerge in this scenario as several are theoretically plausible. For instance, a higher temptation to enter the workforce may provoke a reaction in terms of abuse. Further this reaction may differ by income

levels, as women in higher income households likely have higher outside options and may effectively use employment as a deterrent to abuse.

The underlying state of the relationship may also influence a woman's decision of whether to work. Abuse is not the only factor that women consider when choosing to leave or stay. If the relationship is significantly bad, a woman may consider leaving the relationship and thus choose to find employment to increase the amount of resources she has if she does decide to leave. However, if employment would not earn her sufficient resources she may choose not to work and become more compliant with her spouse/partner in order to prevent abuse in the future.

*2.2 Domestic Violence Effect Model*

One of the models that has dominated the literature proposes that a woman's choice to enter the workforce depends on the actual presence of violence in the relationship, but that employment does not influence whether a relationship is abusive. I add to this model by also allowing for domestic violence to have an indirect effect on a woman's choice of employment. This model simplifies the original system of equations to the following:

$$(5) \qquad D^* = \alpha_1 X + \alpha_2 Y + \epsilon$$

$$(6) \qquad W^* = \beta_1 X + \beta_2 Z + \beta_3 D^* + \beta_4 D + \omega$$

As with the baseline model D* is unobservable meaning that $\beta_3$ must again be estimated through ratios of reduced form estimates. Note that if $\beta_3$ is found to be significant in the baseline model, the model can be further simplified and the reduced form estimation will not be necessary.

A woman may choose to start working in response to a relationship becoming abusive. This could be for a number of reasons. She could be attempting to gain the

monetary and social resources that she needs to leave the relationship. She could also choose to work as an attempt to get away from the abuse by spending more time away from home. This suggests that perhaps $\beta_4 > 0$.

This positive relationship is more likely to be observed in higher income households where women typically have better outside options. Working could bring her the resources that she needs to leave, and thus provide the woman with greater bargaining power in the future to deter violent behavior.

On the other hand if working does not provide a significant enough improvement in the woman's bargaining power, i.e. her income from working is not high enough, she may not be able to leave the relationship and abuse may be an effective deterrent to future employment. Situations such as these are very common particularly among low income households (see Allard et al [1996] for examples).

*2.3 Employment Effect Model*

Another model that has dominated the literature suggests that women's employment has an impact on the level of abuse that she experiences but that abuse has no impact on her choice of employment. This analysis also allows for the possibility that the temptation to enter the workforce also influences whether a relationship is abusive. The appropriate system of equations for this model specification is:

$$(7) \qquad D^* = \alpha_1 X + \alpha_2 Y + \alpha_3 W^* + \alpha_4 W + \epsilon$$

$$(8) \qquad W^* = \beta_1 X + \beta_2 Z + \omega$$

A similar method of estimation to the domestic violence effect model will be applied to this model. Again, if $\alpha_3$ is found to be insignificant in the baseline model the estimated model can be further simplified.

The direction of this effect is likely a function of several factors including the spouse's income and the woman's predicted wage should she enter the workforce. On one hand the male may be attempting to control her and feels threatened by her working. It could be that he wants to keep her isolated from friends and family, and entering the workforce would give her access to a wider social network. It could also be that he has strong views on gender roles and feels that her entering the workforce is a signal that he is failing to adequately provide for his family. Both scenarios suggest a positive relationship between women's employment and domestic violence. In other words $\alpha_4 > 0$.

There are some reasons to believe that this relationship may be more likely in households with low incomes. Women who are in a relationship with low income men are more likely to also have low incomes should they choose to work. If this is the case then domestic violence could be an effective deterrent to working since the low income would likely not be enough for the woman to become self-sufficient and ultimately be able to leave if necessary.

Conversely, having two earners in a household eases financial stress which could potentially reduce the number of arguments that could turn violent. The woman may also be able to leave the relationship if her income is high enough. If one of the goals of the spouse is to keep the relationship intact, then he may actually reduce the level of violence or refrain from using it altogether. This suggests that perhaps $\alpha_4 > 0$.

Similarly, there are reasons to believe that this relationship may be more likely in households with high incomes. Women that are in relationships with higher income men are more likely to also have higher incomes should they choose to work. Because higher incomes mean higher threat points and more bargaining power for women, they can use their bargaining power to drive down the level of violence.

*2.4 Model Selection Procedure*

While some of the proposed theoretical relationships may seem more valid than others, none can be completely ruled out. Because of this, a theoretically agnostic approach to finding the correct specification will be used.

Each of the three models will initially be estimated with a bivariate probit model to test the assumption that $\epsilon$ and $\omega$ are correlated with one another. If we cannot reject that the correlation between the two error terms is equal to zero, then two separate probit models will be used instead.

Ideally this model selection procedure would also estimate the full model in which both employment and domestic violence were allowed to simultaneously determine one another. However, the system of equations cannot be properly estimated with the bivariate probit model when both domestic violence and employment are mutually determined (see Heckman [1978]). Thus only models that are partially nested in the full model will be tested.

This estimation strategy will allow us to test all of the previously proposed models in the literature as well as add a layer of complexity by allowing the underlying states determining violence and employment to have an impact. When applied to the data, we should be able to determine which model best fits the data and thus best describes the relationship between employment and domestic violence. A nice feature of this estimation strategy is that it also allows employment and domestic violence to be related even if $\alpha_3$, $\alpha_4$, $\beta_3$, and $\beta_4$ are all found to be zero through the correlation between the error terms.

The model that is selected as the preferred model will be chosen based on whether it shows a significant relationship between the variables of interest, if any

other model specifications find significant relationships, and what the log likelihood of the model is compared with other model specifications.

## 3. Data

The data used in this analysis come from the National Survey of Families and Households (NSFH), a nationally representative longitudinal survey of 13,017 adult respondents interviewed in three separate waves: 1987-88, 1992-94, and 2001-2003. While other data sets such as the National Crime Victimization Survey also have information on both domestic violence and employment status, the NSFH provides a richer set of variables that give information on not only the respondent but the spouse/partner, family environment, and the respondent's experience growing up. In addition, the survey questions regarding domestic violence were worded in such a way as to encourage self-reporting. The survey question reads as "During the past year, how many fights with your partner resulted in him/her hitting, shoving, or throwing things at you?". Because this survey question does not rely on incidents being reported to the police, the potential number of incidence reported is much higher than most other surveys.

Unfortunately, due to funding issues, geographic information for each respondent is unavailable in wave 3, so state-level variables for the respondent's state of residence cannot be included. To address this issue I use state of birth as a proxy for state of residence in all three waves. Birth state is used for two reasons: 1) because over half of the sample still lives in their state of birth, and 2) while I do know whether the respondent's state is the same in wave 3 as it was in wave 2 there may be

non-random reasons why it is not the same, whereas the reasons why current state and birth state are different are much more likely to be random.

Because we are interested in the relationship between domestic violence and employment status and how it differs by income levels, two samples will be drawn from the data set. The first sample, the low income household sample, contains all respondents whose spouse/partner had an income at or below the median value. Likewise, the second sample, the high income household sample, contains all respondents whose spouse/partner had an income above the median value. Spousal income was used in lieu of household income because the cut-off point between low and high income households would become a function of the woman's income as well and therefore be dependent on whether she was working.

Both samples are restricted to include only women who are either married or cohabiting with an intimate partner at the time of the interview as domestic violence data are not available for other women. In addition to the lack of geographical information, wave 3 was limited to include only respondents who had a "focal child" available at the time the wave 2 interview was conducted. A focal child is simply a child of the respondent about whom additional questions were asked at each interview. Because of this, I also exclude respondents in waves 1 and 2 who do not fit this same selection criteria. This resulted in only a minor sample reduction (185 observations were lost).

Information on the respondent's demographic characteristics such as age and race, her education level, and her and her spouse's income are included in the data set. In addition to these individual and couple characteristics, we are also interested in some state-level variables such as the average log wages for men and women, birth rates, and the unemployment rate.

*3.1 Descriptive Statistics*

Table 2.1 presents descriptive statistics for both the low and high income samples. The victimization rate appears to vary slightly by income level with lower income households being slightly more susceptible to violence at 6.3 percent versus only 4.1 percent for higher income households. This pattern is consistent with findings in other surveys including the Bureau of Justice Statistics' Intimate Partner Violence in the U.S. study that finds that the prevalence of domestic violence is the highest for very low income groups and gradually declines as household incomes rise. It is also consistent with the theory that women who have spouses/partners who have higher incomes tend to have better outside options, so that these women are more likely to leave violent partners.

This theory is further supported by the observation that women that have spouses/partners with high incomes have higher education levels than women in low income households, implying that they would likely also have high incomes should they choose to work. One additional implication of this finding is that women in higher income households are also more likely to be able to attract a wider range of potential partners, thus husbands/partners are less likely to be abusive for fear that the woman will leave.

One final thing we notice is that women in lower income households are less likely to be married and more likely to be cohabiting with their partners. This is not surprising, although it is difficult to determine what this may mean in terms of these women's experience with domestic abuse without analyzing the issue further.

**4. Model Selection**

I use the NSFH data to analyze the relationship between a woman's working status and her experience with domestic violence. The model selection procedure discussed in section 2 is run on both "low income" and "high income" households to see if the relationship differs by family background.

Because the fully specified model outlined in section 2 is not identified using standard modeling techniques we can only test models which are partially nested. Thus, three different model specifications will be tested. The baseline model will test whether a woman's temptation to enter the workforce and the underlying state of the relationship have any effect on one another. The second model tests whether abuse has any effect on whether a woman chooses to work. Finally, the third model tests whether a woman working has any effect on whether she experiences abuse. It is obvious based on theory that each of these models could be justified, thus the model selection procedure to be carried out will give us a better idea of which relationship is best fits the data.

A bivariate probit model is run initially to see if there is a significant correlation between the error terms in the domestic violence and working status equations. If no such correlation is found, then two separate probit models may be run without loss of efficiency.

In order to identify each equation in the system, a set of excluded exogenous variables is required for both equations. In the domestic violence equation, state-level variables indicating whether unilateral divorce is allowed as well as the ratio of single men to single women are included. These variables should only affect the welfare decision indirectly through how they affect the level of violence and the woman's outside option. Stevenson and Wolfers (2006), for example, found that the presence of

unilateral divorce laws significantly decreased domestic violence rates, making it a promising candidate for an excluded exogenous variable. The relative supply and demand of single men to women should also affect domestic violence rates because it measures one of the woman's outside options. Women who have better options outside of the relationship should be less willing to tolerate abuse. The higher this ratio is then, the greater the likelihood the woman can find another partner if she should leave her current relationship. Thus, we expect the effect of this ratio on domestic violence rates to be negative.

Further, we might expect these variables to have differing effects for women in higher and lower income households. Women in higher income households likely have better access to the resources necessary to carry out divorce proceedings and thus the impact of unilateral divorce laws is likely higher for them. Similarly, women in higher income households, working or not, likely enjoy an increased ability to attract potential partners and so we might expect the effect of the ratio of single men to single women to have a stronger impact for women in higher income households.

Also included in the domestic violence equation is a set of dummy variables indicating the religion observed by the household. A set of dummies is used in lieu of a simple indicator of religious affiliation because views on gender roles likely differ across religions. For this analysis atheist is treated as the excluded dummy. A small literature has examined the relationship between religion and domestic violence and it is typically found that regular attendance of religious gatherings has an inverse relationship with domestic violence rates. Ellison and Anderson (2002), for example, use the NSFH to analyze this relationship and find that even after controlling for various individual and social factors that may affect violence, regular attendance negatively affects violence rates.

The employment status equation contains information on whether the respondent's mother worked while she was growing up. Blau and Ferber (1991) for example find that women's labor force participation does significantly depend on family background and suggest that having a mother who worked a significant portion of the years her children were growing up provides motivation for women to pursue higher education and a career.

Also included in the employment status equation is a state-level variable that measures the birth rate. It has been shown in numerous studies that there is an inverse relationship between birth rates and women's labor force participation (see Mishra and Smyth [2010] or Bloom et al [2009] for example) suggesting that women may drop out of the workforce to take care of their children if the birth rate is particularly high.

Finally, an estimate of the woman's wage should she choose to work is included in the employment equation. This predicted wage was generated using CPS data from the relevant years to create an out-of-sample estimate. Once the wage equation was estimated with the CPS data, the NSFH data was used to generate a predicted value[4]. It is also logical to think that the predicted earnings for women and a woman's decision to work are highly correlated with one another and that the direction of this relationship depends on whether the income or substitution effects are greater. If the predicted wage of given a number of hours worked per week is high, we may see that an increase in the wage rate actually decreases women's labor force participation on average. Similarly, if the predicted wage given a number of hours

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[4] The excluded exogenous variable in this estimation strategy was the log average earnings of women in the respondent's state.

worked per week is low, we may see that an increase in the wage rate increases women's labor force participation (see Mincer [1962]).

Table 1.2 presents the key results of the model selection procedure. A more detailed discussion of the results will be deferred until the most appropriate model for the data has been chosen.

*4.1 Baseline Model*

The first model estimated that $\alpha_4 = \beta_4 = 0$. In other words, we are estimating whether the temptation to enter the workforce affects violence rates as well as whether the underlying state of the relationship affects women's labor force participation. Recall that due to the nature of the variables of interest W* and D*, the model estimated is a reduced form model. Since the coefficients $\alpha_4$ and $\beta_4$ are estimated using different combinations of coefficients on the excluded exogenous variables there will be multiple estimates for each coefficient. A $X^2$ test is run on these estimates to test whether they are equal to each other and whether they are jointly equal to zero.

Immediately we see that regardless of income level the temptation to work and the underlying state of the relationship do not appear to significantly affect one another. We do, however, observe an indirect relationship between our two variables of interest through the correlation of their error terms. In both the low and high income groups there appears to be a positive correlation between the error terms implying that unobservable factors that affect working status also positively affect domestic violence and vice versa. Because of this significant correlation, the bivariate probit model is indeed appropriate.

For more detailed information on the results of this model, see Table 2A.1 in the Appendix.

*4.2 Domestic Violence Effect*

In the next model the assumption that $\beta_4 = 0$ is relaxed by allowing domestic violence to have a direct effect on whether a woman chooses to work. Further, because both $\alpha_3$ and $\beta_3$ were found to be insignificant in the baseline model they have been excluded from estimation and no reduced form estimation is necessary.

We can see that while domestic violence has a negative effect on working for both income groups, we cannot conclude that this effect is significantly different from zero. However, like the baseline model, we do conclude that there is an indirect relationship between the two variables of interest through the correlation of their error terms and that the bivariate probit model is picking up on that and correcting for it.

Finally, we can see from the full results that are found in Table 2A.2 in the appendix that both equations do have significant excluded exogenous variables in both income groups. For domestic violence it appears that religion has strong predictive power (almost all religion dummies were negative and significant), suggesting that strong religious beliefs are associated with lower domestic violence rates which is consistent with the findings of Ellison and Anderson (2002). For employment status, higher predicted wages for women appear to increase the likelihood of a woman being employed.

*4.3 The Employment Effect*

In the last model we relax the assumption that $\alpha_4 = 0$ by allowing a woman's employment status to affect the likelihood of abuse. Similar to the previous model, we

are assuming that the temptation to work and the underlying state of the relationship have no effect.

This time we see that a woman's choice to work does have a significant impact on the likelihood that she will experience abuse in both income groups and this impact is positive for low income households and negative for high income households. Further, both equations do have significant excluded exogenous variables for both income groups indicating that our system is indeed identified. Finally, we cannot reject that the correlation between the error terms is zero, thus necessitating the bivariate probit model again.

Upon analyzing the results of all three model specifications we can reject the baseline model relative to both the working effect and domestic violence effect models through a likelihood ratio test. In addition, we see that the working effect and domestic violence effect models produce almost identical log likelihoods, but because the variables of interest are only significant in the working effect model and because of the significance of a greater number of excluded exogenous variables we reject the domestic violence effect model in favor of the working effect model. Thus, we arrive at the conclusion that the preferred model based on the model selection exercise is:

$$(9) \qquad D^* = \alpha_1 X + \alpha_2 Y + \alpha_4 W + \epsilon$$

$$(10) \qquad W^* = \beta_1 X + \beta_2 Z + \omega$$

where $\epsilon$ and $\omega$ are distributed joint normally.

## 5. Results

Estimates of the coefficients for the preferred model can again be found in Table 2.3 and corresponding estimates of each variable's marginal effect can be found in Table 2.4.

### 5.1 Low Income Households

The results for the low income household group indicate that there is a strong positive relationship between a woman working and her experience of domestic violence. Specifically, working increases the likelihood that a woman will be a victim of abuse by a factor of 3.3. This implies that for the average woman, the likelihood of abuse increases from just over 6 percent to just under 20 percent if she chooses to work, *ceteris paribus*, which is quite a substantial effect.

There are several possible reasons why we might observe this particular relationship. Among them is the possibility that men with lower incomes may feel increased pressure to provide for their families and may feel a sense of shame if his spouse or partner enters the workforce in order to increase the household income level. This shame could then manifest itself in the form of abuse. Further, since women who are with partners with lower incomes typically have characteristics that make them less able to find employment with high wages (i.e. lower education levels), working may not provide sufficient resources needed to leave the relationship if necessary, and therefore abuse could be used as an effective deterrent for future work.

Also of note is the fact that both equations have several significant excluded exogenous variables, indicating that the model is properly identified. For domestic violence, the religious preference of the spouse appears to matter a great deal. Most

religious denomination dummies were significant and had a negative impact on domestic violence. The respondent's state of birth having a unilateral divorce law was also found to significantly reduce the likelihood of abuse.

For working status, having a mother that worked while she was growing up increased the likelihood that the respondent also worked. Having such a role model while growing up likely created similar ambitions in the respondent as Balu and Ferber (1991) point out.

Finally, the correlation between the error terms in the two equations is quite high (0.885) and the hypothesis that the correlation is equal to zero can be rejected, thus the bivariate probit model is justified.

### 5.2 High Income Households

While a woman being employed had a positive effect on the likelihood of domestic violence for women in low income households, it has a substantial negative effect for women in high income households. Specifically, working decreases the likelihood that a woman will become a victim of abuse by a factor of 5.6 which implies that for the average woman, the likelihood of being abused would drop from about 4 percent to 0.7 percent *ceteris paribus*. In other words, entering the workforce will nearly eliminate the possibility of abuse for the average woman in a high income household.

The fact that working has a negative effect on abuse for women in high income households but a positive effect for women in low income households seems to suggest something about attitudes about women in the workforce as well as differences in the outside options for women in these two income groups. Presumably money issues are less of a problem in high income households, and therefore a

woman choosing to work is likely not seen as a failure to provide for his family on the part of the male, but as an expression of the woman's choice to enter the workforce. As a result, he is less likely to respond to her decision with violence. Indeed, we also see that for women in higher income households, an increase in the proportion of women working drastically reduces the likelihood that she will be abused which suggests that men with higher incomes appear to be more tolerant of women's changing roles in the economy.

On the other hand money issues are often a bone of contention within lower income households. If a woman chooses to enter the workforce in this situation, the male may interpret this as a sign that she thinks that he is not doing an adequate job of providing for his family and may retaliate with violence. Unlike with the high income households, having an increase in the proportion of women in the workforce has no impact on the likelihood of abuse for women in low income households, suggesting that the male's attitude toward women in the workforce is not necessarily a function of what is considered the norm in society.

Further, we also suggested earlier that women in higher income households likely have better outside options. We saw that they were typically more educated and because of this they are likely more able to earn incomes at least as high as the average, and they are also likely better able to attract new partners should they leave. Because their outside options are better, we think this will reduce the likelihood that the spouse/partner will become abusive. Comparing the results from both the low and high income household samples enables us to see just that. A one unit increase in the ratio of single men to single women reduces the likelihood of being victimized by a factor of 2.7 for women in high income households, but has no significant effect for

low income households, suggesting that indeed these women are probably more likely to find a new partner if they chose to, thus deterring any violent acts by her partner.

Again we see that both equations have significant excluded exogenous variables. For domestic violence the ratio of single men to single women matters as well as the religious affiliation of the spouse. For employment status, the predicted wage for the respondent appears to matter. Finally, because we can reject the hypothesis that the correlation between the error terms in both equations is zero, the bivariate probit model is also valid for the high income group.

*5.3 Robustness Check*

As a robustness check, the sample was divided into three income groups instead of two to see if the results were robust to changes in the income cutoff points. A similar model selection procedure was carried out at each income level and it was found that the preferred model for each income level was still one in which employment impacted domestic violence but not vice versa. Coefficients of the preferred model can be found in Table 2.5. Note that these should be compared to the coefficient estimates of the two-income group model specification found in Table 2.3.

The relationship between employment status and domestic violence is still preserved despite the different household income thresholds. Employment appears to have a strong positive influence for both the low and middle income levels, yet a strong negative influence for the high income level. While the excluded exogenous variables do lose some of their predictive power, these results are consistent with what was found earlier, suggesting that the results are indeed robust to changes in the cutoff point.

**6. Conclusion**

The findings of this study are worrying in light of the push to provide more jobs to women in an effort to promote gender equality. They suggest that such efforts may have unintended consequences on the women they are aimed at helping in the form of the risk of increased domestic violence. This paper has shown that women who are in relationships with lower income spouses are actually more likely to become victims of abuse if they enter the workforce. Conversely women who are in relationships with higher income men become less likely to be victimized by entering the workforce.

These results are consistent with models that posit that males may use violence as an instrument to control their wives and to regain the dominant role in the household. Women in lower income households are more likely to have lower outside options, and thus less bargaining power to begin with. By entering the workforce, these women may see an increase in their outside options by entering the workforce, but not enough to effectively allow them to leave the relationship if it becomes abusive. On the other hand, women in higher income households are likely to have higher initial outside options, and thus more bargaining power. Working will also increase their bargaining power, but it has greater potential to raise their bargaining power sufficiently to actually deter violence.

The findings of this study suggest that programs aimed at providing work opportunities for women, particularly those of lower skill levels, may need to have supplementary programs that target domestic abuse as well such as access to counseling, women's shelters, and perhaps educational programs aimed at boosting these women's outside options.

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# Tables

**Table 2.1: Descriptive Statistics (All Waves)**

| Variable | Average Value (Low Income Households) | Average Value (High Income Households) |
|---|---|---|
| Domestic Violence | 0.063 | 0.041 |
| | (0.242) | (0.199) |
| Working | 0.912 | 0.929 |
| | (0.283) | (0.257) |
| Age | 43.715 | 42.312 |
| | (13.081) | (10.437) |
| Education | 11.731 | 13.279 |
| | (4.106) | (3.207) |
| Number of Children | 2.197 | 2.223 |
| | (1.612) | (1.705) |
| Log Spouse Income | 5.542 | 10.723 |
| | (4.641) | (0.494) |
| Black | 0.167 | 0.147 |
| | (0.373) | (0.354) |
| Hispanic | 0.071 | 0.049 |
| | (0.256) | (0.215) |
| Cohabiting | 0.057 | 0.032 |
| | (0.232) | (0.175) |
| Northeast | 0.174 | 0.205 |
| | (0.379) | (0.404) |
| South | 0.399 | 0.370 |
| | (0.490) | (0.483) |
| West | 0.133 | 0.125 |
| | (0.340) | (0.331) |
| Unemployment Rate | 5.733 | 5.700 |
| | (1.344) | (1.278) |
| % Females Working | 0.726 | 0.727 |
| | (0.054) | (0.052) |
| Mother Worked | 0.533 | 0.537 |
| | (0.499) | (0.499) |
| Birth Rate | 14.965 | 14.991 |
| | (2.014) | (1.951) |
| Log Female Earnings | 9.235 | 9.218 |
| | (0.355) | (0.328) |
| Unilateral Divorce | 0.543 | 0.512 |
| | (0.498) | (0.500) |
| Single Sex Ratio | 1.088 | 1.091 |
| | (0.059) | (0.060) |
| Number of Observations | 2920 | 3070 |
| Notes: Standard deviations in parentheses. Income values in constant 1988 dollars. | | |

**Table 2.2: Model Selection Procedure Summary**

| Variable | Low Income Households | | High Income Households | |
|---|---|---|---|---|
| | Coefficient (D.V. Eq.) | Coefficient (Working Eq.) | Coefficient (D.V. Eq.) | Coefficient (Working Eq.) |
| **Baseline Model** | | | | |
| D* ($X^2$ test: estimates jointly equal to 0) p-value in parentheses | | (0.466) | | (0.700) |
| W* ($X^2$ test: estimates jointly equal to 0) p-value in parentheses | (0.925) | | (0.906) | |
| Number of Observations | N = 2920 | | N = 3070 | |
| Log pseudolikelihood | L = -1380.7 | | L = -1175.2 | |
| Wald test of Rho=0: | Rho = 0.213 | p-value = 0.027 | Rho = -0.241 | p-value = 0.007 |
| **Domestic Violence Effect Model** | | | | |
| Domestic Violence | | -0.602 (0.735) | | -1.213 (0.914) |
| **$X^2$ test:** Excluded Exogenous Variables Jointly = 0 p-values in parentheses | (0.000) | (0.490) | (0.000) | (0.124) |
| Number of Observations | N = 2920 | | N = 3070 | |
| Log pseudolikelihood | L = -1408.7 | | L = -1192.1 | |
| Wald test of Rho=0: | Rho = 0.351 | p-value = 0.032 | Rho = -0.613 | p-value = 0.021 |
| **Working Effect Model** | | | | |
| Working | 1.739*** (0.107) | | -2.163** (1.023) | |
| **$X^2$ test:** Excluded Exogenous Variables Jointly = 0 p-values in parentheses | (0.000) | (0.009) | (0.000) | (0.048) |
| Number of Observations | N = 2920 | | N = 3070 | |
| Log pseudolikelihood | L = -1398.0 | | L = -1191.8 | |
| Wald test of Rho=0: | Rho = 0.885 | p-value = 0.000 | Rho = -0.508 | p-value = 0.000 |
| Notes: Robust standard errors clustered on birth state in parentheses unless otherwise noted. *, **, and *** indicate significance at the 90%, 95%, and 99% confidence levels. | | | | |

**Table 2.3: Coefficient Estimates of Preferred Model (Working Effect)**

| Variable | Low Income Households | | High Income Households | |
|---|---|---|---|---|
| | Coefficient (D.V. Eq.) | Coefficient (Working Eq.) | Coefficient (D.V. Eq.) | Coefficient (Working Eq.) |
| Working | 1.739*** | | -2.163** | |
| | (0.107) | | (1.023) | |
| Age | -0.011*** | 0.008 | -0.018*** | -0.005 |
| | (0.003) | (0.005) | (0.004) | (0.004) |
| Education | -0.001 | 0.024 | -0.008 | 0.010 |
| | (0.007) | (0.018) | (0.012) | (0.012) |
| Number of Children | 0.016 | 0.004 | -0.005 | 0.002 |
| | (0.019) | (0.023) | (0.026) | (0.028) |
| Black | -0.012 | -0.078 | 0.125 | 0.050 |
| | (0.080) | (0.085) | (0.120) | (0.134) |
| Hispanic | 0.163 | -0.075 | 0.167 | -0.156 |
| | (0.110) | (0.116) | (0.237) | (0.158) |
| Cohabiting | 0.948*** | 0.069 | 1.817*** | 0.181 |
| | (0.105) | (0.132) | (0.210) | (0.303) |
| Log Spouse Income | -0.006 | 0.010 | -0.028 | -0.084 |
| | (0.008) | (0.008) | (0.094) | (0.069) |
| Northeast | -0.176* | 0.179* | 0.042 | 0.164* |
| | (0.091) | (0.097) | (0.102) | (0.098) |
| South | -0.154** | 0.065 | -0.197* | 0.067 |
| | (0.074) | (0.078) | (0.110) | (0.093) |
| West | -0.282*** | 0.267** | 0.045 | 0.181* |
| | (0.105) | (0.113) | (0.123) | (0.108) |
| Unemployment Rate | -0.003 | 0.026 | 0.013 | -0.004 |
| | (0.028) | (0.030) | (0.035) | (0.032) |
| % Women Working | -0.479 | 1.112* | -1.885* | 0.118 |
| | (0.827) | (0.623) | (1.113) | (0.957) |
| Wave 2 | 0.043 | 0.047 | 0.275** | 0.138* |
| | (0.079) | (0.089) | (0.117) | (0.095) |
| Wave 3 | 0.161* | -0.015 | 0.434*** | 0.216 |
| | (0.142) | (0.149) | (0.133) | (0.154) |
| **Excluded Exogenous Variables** | | | | |
| **Domestic Violence:** | | | | |
| Unilateral Divorce | -0.056* | | -0.010 | |
| | (0.028) | | (0.097) | |
| Single Sex Ratio | -0.206 | | 1.055* | |
| | (0.320) | | (0.600) | |
| Religion | ✓*** | | ✓*** | |
| **Working:** | | | | |
| Mother Worked | | 0.071** | | 0.015 |
| | | (0.033) | | (0.087) |
| Birth Rate | | -0.006 | | 0.010 |
| | | (0.009) | | (0.026) |
| Predicted Wage | | -0.268 | | 0.513*** |
| | | (0.175) | | (0.151) |
| **$X^2$ test:** | | | | |
| Excluded Exogenous Variables Jointly = 0 (p-values in parentheses) | (0.000) | (0.009) | (0.000) | (0.048) |
| Number of Observations | N = 2920 | | N = 3070 | |
| Log pseudolikelihood | L = -1398.0 | | L = -1191.8 | |
| Wald test of Rho=0: | Rho = 0.885 | p-value = 0.000 | Rho = -0.508 | p-value = 0.000 |

Notes:

Robust standard errors clustered on birth state in parentheses unless otherwise noted.

Individual dummies indicating religious denomination were also included in the domestic violence equation. The significance test is a test of all dummies being jointly equal to 0.

All Income values are in constant 1988 dollars.

*, **, and *** indicate significance at the 90%, 95%, and 99% confidence levels.

**Table 2.4: Marginal Effects Estimates of Preferred Model (Working Effect)**

| | Low Income Households | | High Income Households | |
|---|---|---|---|---|
| **Variable** | **Coefficient (D.V. Eq.)** | **Coefficient (Working Eq.)** | **Coefficient (D.V. Eq.)** | **Coefficient (Working Eq.)** |
| Working | 3.260*** | | -5.554** | |
| | (0.223) | | (2.511) | |
| Age | -0.023*** | $4.30 \times 10^{-4}$ | -0.045*** | -0.001 |
| | (0.006) | $(4.82 \times 10^{-4})$ | (0.011) | (0.001) |
| Education | -0.002 | $-2.82 \times 10^{-4}$ | -0.020 | 0.001 |
| | (0.016) | (0.001) | (0.031) | (0.002) |
| Number of Children | 0.038 | -0.004 | -0.013 | $2.59 \times 10^{-4}$ |
| | (0.035) | (0.003) | (0.067) | (0.004) |
| Black | -0.005 | -0.011 | 0.322 | 0.007 |
| | (0.136) | (0.013) | (0.307) | (0.019) |
| Hispanic | 0.319* | -0.012 | 0.429 | -0.023 |
| | (0.173) | (0.019) | (0.607) | (0.023) |
| Cohabiting | 1.781*** | 0.013 | 4.667*** | 0.026 |
| | (0.287) | (0.024) | (0.607) | (0.044) |
| Log Spouse Income | -0.013 | 0.002 | -0.071 | -0.012 |
| | (0.013) | (0.001) | (0.242) | (0.010) |
| Northeast | -0.331 | 0.025 | 0.107 | 0.024* |
| | (0.212) | (0.019) | (0.263) | (0.014) |
| South | -0.296** | 0.009 | -0.505* | 0.010 |
| | (0.137) | (0.015) | (0.287) | (0.013) |
| West | -0.535*** | 0.045** | 0.117 | 0.026* |
| | (0.203) | (0.020) | (0.315) | (0.016) |
| Unemployment Rate | -0.005 | 0.005 | 0.034 | -0.001 |
| | (0.056) | (0.005) | (0.090) | (0.005) |
| % Women Working | -0.915 | 0.245* | -4.841* | 0.017 |
| | (1.747) | (0.130) | (2.567) | (0.140) |
| Wave 2 | 0.078 | 0.019 | 0.705** | 0.020* |
| | (0.144) | (0.015) | (0.307) | (0.012) |
| Wave 3 | 0.387* | -0.001 | 1.115*** | 0.031 |
| | (0.224) | (0.022) | (0.350) | (0.022) |
| **Excluded Exogenous Variables** | | | | |
| **Domestic Violence:** | | | | |
| Unilateral Divorce | -0.105* | | -0.025 | |
| | (0.042) | | (0.249) | |
| Single Sex Ratio | -0.465 | | 2.709* | |
| | (0.594) | | (1.546) | |
| Religion | ✓*** | | ✓*** | |
| **Working:** | | | | |
| Mother Worked | | 0.012** | | 0.002 |
| | | (0.007) | | (0.013) |
| Birth Rate | | -0.001 | | 0.001 |
| | | (0.002) | | (0.004) |
| Predicted Wage | | -0.038 | | 0.088*** |
| | | (0.027) | | (0.025) |
| Number of Observations | N = 2920 | | N = 3070 | |
| Log pseudolikelihood | L = -1396.7 | | L = -1191.8 | |
| Wald test of Rho=0: | Rho = -0.985 | p-value = 0.000 | Rho = 0.804 | p-value = 0.000 |

Notes:

All marginal effects are partial elasticities of the form $d\log Pr(y=1)/dx$ and are the sum of the direct and indirect effects when applicable.

Robust standard errors clustered on birth state in parentheses.

Individual dummies indicating religious denomination were also included in the domestic violence equation. The significance test is a test of all dummies being jointly equal to 0.

All Income values are in constant 1988 dollars.

*, **, and *** indicate significance at the 90%, 95%, and 99% confidence levels.

**Table 2.5: Robustness Check Coefficient Estimates (Working Effect by 3 Income Levels)**

| Variable | Low Income Households | | Middle Income Households | | High Income Households | |
|---|---|---|---|---|---|---|
| | Coefficient (D.V. Eq.) | Coefficient (Working Eq.) | Coefficient (D.V. Eq.) | Coefficient (Working Eq.) | Coefficient (D.V. Eq.) | Coefficient (Working Eq.) |
| Working | 1.723*** | | 1.666*** | | -3.155*** | |
| | (0.133) | | (0.145) | | (0.105) | |
| **Excluded Exogenous Variables** | | | | | | |
| **Domestic Violence:** | | | | | | |
|   Unilateral Divorce | -0.070 | | 0.043 | | -0.119 | |
| | (0.049) | | (0.059) | | (0.093) | |
|   Single Sex Ratio | -0.247 | | -0.026 | | 0.780 | |
| | (0.485) | | (0.393) | | (0.822) | |
|   Religion | ✓*** | | ✓*** | | ✓*** | |
| **Working:** | | | | | | |
|   Mother Worked | | 0.069 | | 0.034 | | 0.007 |
| | | (0.047) | | (0.061) | | (0.102) |
|   Birth Rate | | 0.017 | | 0.017 | | -0.028 |
| | | (0.021) | | (0.021) | | (0.019) |
|   Predicted Wage | | 0.208 | | 0.525*** | | 0.427** |
| | | (0.185) | | (0.201) | | (0.175) |
| **$X^2$ test:** | | | | | | |
| Excluded Exogenous Variables Jointly = 0 | (0.000) | (0.3534) | (0.000) | (0.065) | (0.000) | (0.034) |
| (p-values in parentheses) | | | | | | |
| Number of Observations | N = 2095 | | N = 1809 | | N = 2086 | |
| Log pseudolikelihood | L = -1003.4 | | L = -766.6 | | L = -770.7 | |
| Wald test of Rho=0: | Rho = 0.723 | p-value = 0.008 | Rho = 0.798 | p-value = 0.048 | Rho = -0.327 | p-value = 0.000 |

Notes:

Robust standard errors clustered on birth state in parentheses unless otherwise noted.

Individual dummies indicating religious denomination were also included in the domestic violence equation. The significance test is a test of all dummies being jointly equal to 0.

All Income values are in constant 1988 dollars.

*, **, and *** indicate significance at the 90%, 95%, and 99% confidence levels.

# Appendix: Full Results of Model Selection

**Table 2A.1: Model Selection Coefficient Estimates (Baseline Model)**

| Variable | Low Income Households | | High Income Households | |
|---|---|---|---|---|
| | **Coefficient (D.V. Eq.)** | **Coefficient (Working Eq.)** | **Coefficient (D.V. Eq.)** | **Coefficient (Working Eq.)** |
| D* ($X^2$ test: estimates jointly = 0) | | (0.466) | | (0.700) |
| W* ($X^2$ test: estimates jointly = 0) | (0.925) | | (0.906) | |
| Age | -0.022*** | 0.002 | -0.017*** | -0.004 |
| | (0.005) | (0.003) | (0.005) | (0.004) |
| Education | -0.014** | -0.008 | -0.010 | 0.007 |
| | (0.007) | (0.009) | (0.013) | (0.012) |
| Number of Children | 0.021 | -0.023 | -0.007 | 0.003 |
| | (0.028) | (0.019) | (0.028) | (0.030) |
| Black | -0.076 | -0.068 | 0.118 | 0.045 |
| | (0.105) | (0.084) | (0.126) | (0.132) |
| Hispanic | 0.227 | -0.066 | 0.145 | -0.070 |
| | (0.156) | (0.129) | (0.258) | (0.151) |
| Cohabiting | 1.457*** | 0.082 | 1.891*** | 0.202 |
| | (0.201) | (0.136) | (0.214) | (0.252) |
| Log Spouse Income | -0.003 | 0.003 | -0.027 | -0.087 |
| | (0.009) | (0.008) | (0.087) | (0.070) |
| Northeast | -0.163 | 0.056 | 0.051 | 0.084 |
| | (0.113) | (0.115) | (0.110) | (0.095) |
| South | -0.217** | 0.021 | -0.191 | 0.025 |
| | (0.109) | (0.077) | (0.117) | (0.099) |
| West | -0.299* | 0.228* | 0.031 | 0.183 |
| | (0.163) | (0.135) | (0.134) | (0.120) |
| Unemployment Rate | 0.013 | 0.019 | 0.028 | -0.013 |
| | (0.044) | (0.029) | (0.036) | (0.030) |
| % Women Working | 0.136 | 1.774* | -2.548* | 0.504 |
| | (1.119) | (1.075) | (1.555) | (0.928) |
| Wave 2 | 0.341*** | 0.173* | 0.253** | 0.164* |
| | (0.120) | (0.089) | (0.120) | (0.097) |
| Wave 3 | 0.554*** | 0.129 | 0.384** | 0.253 |
| | (0.204) | (0.175) | (0.179) | (0.167) |
| **Excluded Exogenous Variables** | | | | |
| **Domestic Violence:** | | | | |
|   Unilateral Divorce | -0.116 | -0.161 | 0.002 | -0.131 |
| | (0.090) | (0.098) | (0.101) | (0.085) |
|   Single Sex Ratio | -0.184 | 0.455 | 1.068* | 0.586 |
| | (0.932) | (0.582) | (0.645) | (0.601) |
|   Religion | ✓*** | ✓* | ✓*** | ✓** |
| **Working:** | | | | |
|   Mother Worked | 0.061 | -0.007 | 0.050 | 0.004 |
| | (0.092) | (0.054) | (0.085) | (0.091) |
|   Birth Rate | 0.004 | 0.008 | -0.013 | 0.016 |
| | (0.030) | (0.054) | (0.020) | (0.025) |
|   Predicted Wage | -0.157 | -0.305 | 0.108 | 0.412** |
| | (0.225) | (0.188) | (0.198) | (0.168) |
| Number of Observations | N = 2920 | | N = 3070 | |
| Log pseudolikelihood | L = -1380.7 | | L = -1175.2 | |
| Wald test of Rho=0: | Rho = 0.213 | p-value = 0.027 | Rho = -0.241 | p-value = 0.007 |

Notes:
Robust standard errors clustered on birth state in parentheses unless otherwise noted.
Individual dummies indicating religious denomination were also included in the domestic violence equation. The significance test is a test of all dummies being jointly equal to 0.
All Income values are in constant 1988 dollars.
*, **, and *** indicate significance at the 90%, 95%, and 99% confidence levels.

**Table 2A.2: Model Selection Coefficient Estimates (Domestic Violence Effect Model)**

| Variable | Low Income Households | | High Income Households | |
|---|---|---|---|---|
| | Coefficient (D.V. Eq.) | Coefficient (Working Eq.) | Coefficient (D.V. Eq.) | Coefficient (Working Eq.) |
| Domestic Violence | | -0.602 | | -1.213 |
| | | (0.735) | | (0.914) |
| Age | -0.022*** | 0.002 | -0.018*** | -0.005 |
| | (0.004) | (0.003) | (0.005) | (0.004) |
| Education | -0.014** | -0.007 | -0.012 | 0.009 |
| | (0.007) | (0.009) | (0.014) | (0.012) |
| Number of Children | 0.021 | -0.017 | -0.010 | 0.004 |
| | (0.029) | (0.019) | (0.027) | (0.032) |
| Black | -0.053 | -0.060 | 0.120 | 0.052 |
| | (0.115) | (0.081) | (0.120) | (0.131) |
| Hispanic | 0.210 | -0.066 | 0.191 | -0.088 |
| | (0.149) | (0.121) | (0.259) | (0.152) |
| Cohabiting | 1.455*** | 0.286 | 1.895*** | 0.697 |
| | (0.201) | (0.267) | (0.218) | (0.490) |
| Log Spouse Income | $-2.91\times10^{-4}$ | 0.006 | -0.030 | -0.076 |
| | (0.007) | (0.008) | (0.097) | (0.070) |
| Northeast | -0.174 | 0.138 | 0.039 | 0.136 |
| | (0.113) | (0.106) | (0.105) | (0.099) |
| South | -0.202* | 0.032 | -0.200* | 0.040 |
| | (0.106) | (0.082) | (0.113) | (0.092) |
| West | -0.314** | 0.190 | -0.004 | 0.180 |
| | (0.154) | (0.126) | (0.139) | (0.112) |
| Unemployment Rate | 0.012 | 0.022 | 0.030 | -0.017 |
| | (0.045) | (0.028) | (0.036) | (0.029) |
| % Women Working | -0.087 | 1.212* | -2.245* | 0.085 |
| | (1.126) | (0.723) | (1.356) | (0.887) |
| Wave 2 | 0.313*** | 0.192* | 0.281** | 0.166* |
| | (0.112) | (0.101) | (0.122) | (0.095) |
| Wave 3 | 0.445*** | 0.174 | 0.479*** | 0.222 |
| | (0.127) | (0.196) | (0.144) | (0.158) |
| **Excluded Exogenous Variables** | | | | |
| **Domestic Violence:** | | | | |
| Unilateral Divorce | -0.088 | | 0.016 | |
| | (0.094) | | (0.099) | |
| Single Sex Ratio | -0.130 | | 0.994 | |
| | (0.938) | | (0.618) | |
| Religion | ✓*** | | ✓*** | |
| **Working:** | | | | |
| Mother Worked | | 0.009 | | 0.011 |
| | | (0.052) | | (0.092) |
| Birth Rate | | 0.008 | | 0.009 |
| | | (0.024) | | (0.025) |
| Predicted Wage | | 0.292* | | 0.371** |
| | | (0.169) | | (0.141) |
| **X² test:** | | | | |
| Excluded Exogenous Variables Jointly = 0 | (0.000) | (0.490) | (0.000) | (0.124) |
| p-values in parentheses | | | | |
| Number of Observations | N = 2920 | | N = 3070 | |
| Log pseudolikelihood | L = -1408.7 | | L = -1192.1 | |
| Wald test of Rho=0: | Rho = 0.351 | p-value = 0.032 | Rho = -0.613 | p-value = 0.021 |

Notes:
Robust standard errors clustered on birth state in parentheses unless otherwise noted.
Individual dummies indicating religious denomination were also included in the domestic violence equation. The significance test is a test of all dummies being jointly equal to 0.
All Income values are in constant 1988 dollars.
*, **, and *** indicate significance at the 90%, 95%, and 99% confidence levels.

**Chapter 3: "Do the Job Satisfaction Returns to Education Differ Between Black and White Workers?"**

**Introduction**

The gap in educational attainment between races has been an issue that policymakers have been attempting to address for the past several decades, and while large strides have been made to close the gap a large disparity still exists. Institutions emerged in recent decades that attempt to close this gap in educational attainment (scholarship programs, grants, affirmative action educational policies etc.) and have met with obvious success in increasing the overall percentage of minorities holding degrees. In fact the percentage of black workers who held a bachelor's degree has more than doubled since 1980, but there is still a disparity of over 10 percentage points between black and white individuals holding a bachelor's degree (Digest of Education Statistics, 2009). Since the gap does not appear to be closing, an important question to ask is whether other factors that these institutions do not address are affecting the educational decisions of minorities.

This paper attempts to analyze the returns to education and how the returns differ between black and white workers in an attempt to explain why the educational attainment gap does not appear to be closing. Thus far the literature has focused on the difference in the monetary returns to education between blacks and whites. The general consensus is that black workers tend to earn higher monetary returns to education than white workers. If this were the case, black workers would have more incentive to invest in higher levels of education than white workers, and through the emergence of institutions that seek to increase access to blacks and other minorities

we would expect that the gap in educational attainment would be decreasing. This clearly is not the case.

One potential reason why the estimated returns to education to date are not consistent with the observed gap in educational attainment is that the monetary returns to education are only one part of the story. While increasing one's earnings potential is likely the primary motivator for pursuing higher education, other considerations also exist. Higher education is often sought by individuals to enable them to find a more satisfying job and it is likely that educational attainment affects job satisfaction differently for black and white workers. Since job satisfaction measures how satisfied one is with not only the pay but the other aspects of the job, it may be a better candidate to measure the returns to education by. If black individuals are found to have lower job satisfaction returns to education on average then this may at least partially explain why we still observe a sizable gap in educational attainment between races. After all, a person might not choose to spend four more years in school if they would be happier at their current job.

The purpose of this paper is to extend the literature on the racial differences in the monetary returns to education to a more general measure: the job satisfaction returns to education. Ultimately the results of the analysis carried out indicate that black workers do indeed have lower job satisfaction returns to education than white workers. In fact, education has a negative net impact for black workers after approximately a high school diploma is received, which suggest that there is little incentive for blacks to invest further in education beyond the high school level which *is* consistent with the observed attainment gap.

Further, we find that education has a positive impact on the ability to transition into new employment where job satisfaction is higher for white workers, but very

little net impact on this ability to transition to a new better job for black workers. This finding offers further evidence that hints at why blacks do indeed choose lower levels of education than whites on average.

The remainder of this paper is structured as follows: Part 2 provides a brief review of the relevant literature, Part 3 discusses the data and methodology that will be used, Part 4 presents the results of the study, and Part 5 concludes.

## 1. Literature Review

### 1.1 Monetary Returns to Education

A large part of the decision to invest in education is arguably whether the monetary benefits to investing outweigh the costs. If education is too costly and does not yield a wage that is sufficiently higher than one's current wage, there are no incentives for the individual to invest. The monetary returns to education literature consistently finds positive returns to education, though the magnitudes of these returns vary from study to study (see Card [1999] for example).

The analysis of the monetary returns to education has also been carried out across different demographic groups including across races. Interestingly, the literature indicates that black individuals have higher monetary returns to education than their white counterparts (see Welch [1973] for example). This idea has also been analyzed using sheepskin effects instead of simply using years of education. Belman and Heywood (1991), for example, find that black and other minority workers tend to have higher returns to signals of high productivity, namely higher levels of education, than their white counterparts and the reverse is true for signals of low productivity (low education levels). Regardless of which method of analysis is used, the

conclusion remains the same. Black workers tend to have higher monetary returns to education than white workers.

If this truly is the case, and the monetary returns to education are the only basis for making educational level decisions, then this literature would predict that black individuals would have higher incentives to invest in human capital than white individuals. Further, since scholarship and grant programs, among other institutions, have actively increased access to education for blacks and other minority groups for the past several decades, we would expect that the gap in attainment should have narrowed, but as we have seen this is not the case. There must be other factors in addition to the monetary returns that individuals are taking into account when making their educational decisions, such as the ability to do more interesting work, better fringe benefits, or better working conditions. Thus, an analysis based on a composite variable that takes all of these factors into account would give us a much more complete picture. This paper has argued that a candidate for such a variable is job satisfaction.

*1.2 Education and Job Satisfaction*

Job Satisfaction returns to education are arguably more useful in the decision-making process in that the wage premium associated with higher levels of education may be misleading; it is very possible that higher education levels could produce large monetary gains, but the work itself is not satisfying at all. The education premium on job satisfaction might therefore be more useful in explaining patters in individual choices about education levels. Clearly there are some valid concerns with using job satisfaction, a subjective variable, to evaluate the "returns to education", but as Hamermesh (2001: p.2) points out "Any study of nonwage monetary or even

nonmonetary returns will necessarily ignore some non-pecuniary aspects of these returns…Only one measure, the satisfaction that workers derive from their jobs, might be viewed as reflecting how they react to the entire changing panoply of job characteristics." If we think that low levels of job satisfaction may induce workers to change certain behaviors (i.e. to go back to school or to seek a new job), then the effects of education on job satisfaction, while an imperfect measure, will at least provide a more realistic picture of the education level decision.

An important factor in determining the effects of education on job satisfaction is individual expectations. The way in which individuals form their expectations of pecuniary and non-pecuniary returns to education will influence whether or not higher levels of education will actually result in higher levels of job satisfaction. It is generally thought that increased levels of education increase the expectations of individuals on the various rewards of a job and that higher levels of these rewards are needed to satisfy them, but that education also increases one's ability to obtain a job with these characteristics (Martin and Shehan, 1989). Depending on whether these expectations are met, education may have a positive or negative effect on job satisfaction, and we may also think that these expectations differ by race.

It may be reasonable to assume that a black and a white worker with similar characteristics and the same education level would expect the same job characteristics. However, their ability to obtain jobs with these characteristics may be different either because of discrimination in the labor market or differences in job searching ability.

*1.3 Race and Job Satisfaction*

Although determinants of job satisfaction may be different across races, few studies have analyzed the job satisfaction gap between blacks and whites. Instead most have focused on the differences in job satisfaction between other demographic groups such as men and women, although many studies include an indicator variable for race. In the U.K. Clark and Oswald (1996) and Sloane and Williams (2000) find that black workers tend to have lower levels of job satisfaction than white workers, but only Sloane and Williams find race to be significant in predicting job satisfaction. Bartel (1981) and Clark (1997) on the other hand find that black workers enjoy higher levels of job satisfaction on average. Using U.S. data, Bartel finds that race has become more important over time in predicting job satisfaction while Clark finds that race is insignificant in predicting job satisfaction.

Bartel (1981) which analyzes the differences in job satisfaction across races, but does not allow education's effects on job satisfaction to vary by race. She estimates probits over a period of time on pooled data and attempts to estimate the effect of race on the full wage (pecuniary and non-pecuniary) and the direct effect of race on job satisfaction. The results of Bartel's study suggest that the effect of race on job satisfaction is positive (as predicted) and that race is becoming increasingly more important in predicting job satisfaction. Interestingly education's effects on job satisfaction levels in this model, with the exception of the earliest time period, are all positive and insignificant; in the first period education's returns to job satisfaction are negative and significant.

Clearly a consensus has yet to be reached in the literature not only on the direction of the effects of race on job satisfaction, but whether race is even significant in determining job satisfaction levels as well.

## 2. Data and Methodology

The data used in this study is from the National Longitudinal Survey of Youth 1979, using the survey years between 1989 and 2002 (10 years in total). Throughout the survey years included, the range of ages was between 24 and 45: individuals who were just starting their careers as well as individuals who were well established in their careers. In this survey, the question pertaining to job satisfaction is phrased as follows: "How do/did you feel about your job/assignment with (employer)? Do/did you like it very much, like it fairly well, dislike it somewhat, or dislike it very much?" In order to obtain easily interpretable results, the response values were reduced to a binary variable taking a value of 1 if an individual reported liking their job very much, and a value of 0 otherwise.[5] Education in this data set is measured as the total number of completed years of education and these values range from zero to twenty years. Other variables are included to control for determinants of pecuniary and non-pecuniary rewards, as well as personal and work related characteristics. The sample used has been restricted to include only black and white workers who are not self-employed. Summary statistics for the variables can be found in Table 1.

Note that the binary job satisfaction score was also compared at different levels of education: no high school (NO HS), high school diploma (HS), some college (SC), bachelor's degree (B), and graduate work (G). These categories were determined by the years of schooling completed and were grouped as follows: <12 years, 12 years, between 12 and 16 years, and >16 years respectively. Thus it is not certain that a degree was actually obtained, if applicable. Education levels are also

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[5] The binary job satisfaction variable is defined in this way because most job satisfaction scores were 3's and 4's and almost the entire sample was evenly split between the two scores, thus not much is lost in using a binary variable. Several ordered probit models were run to check whether the results still hold and the results were found to be nearly identical to the ones used for this analysis. For ease of interpretation the results of the probit models will be reported, but the results of the ordered probit models are also available upon request.

compared at both job satisfaction levels. These comparisons can also be found in Table 3.1.

We can clearly see that white workers are more satisfied than black workers on average and that white workers are more likely to receive higher wages. Conversely black workers are more likely to be members of unions, which has typically been found to correspond to lower levels of job satisfaction (see Artz [2010] for example). We can also observe that for every education level, except no high school education, white workers have higher levels of job satisfaction than black workers and that average job satisfaction is not strictly increasing in educational attainment, but it is uncertain whether this is due to the effects of education or if it is a result of differences in average earnings, benefits, and/or other characteristics between black and white workers.

Various probit models were run to examine the interaction between education and job satisfaction. The first four are baseline models that allow us to compare our estimates of education and race's effects on job satisfaction with those found in the larger literature. Models 5 through 8 also include an interacted term for education and race. This allows us to see the differences in education's effects on job satisfaction between races and to see how race's impact on job satisfaction varies across education levels.[6] Finally, a set of other regressions indicate the robustness of the education-race relationships to other variable specifications.

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[6] Equivalent models were run using splines at several "educational milestones" or degree levels as defined in the summary statistics discussion that follows. The end results indicated that the effect of education does not change by degree level, even for the very basic initial models. Thus, the story seems to be a years of schooling story instead of a degree level story.

## 3. Results

### 3.1 Basic Results

Table 3.2 contains the results of the four baseline specifications. The first model estimated simply measures the relationship between education, race, and job satisfaction using a probit model that controls only for gender and age. Model 2 adds controls for personal characteristics to see if the relationship persists after controlling for marital status, whether the respondent lives in a rural or urban area, and family size. Models 3 and 4 add in monetary and non-monetary work related characteristics, respectively. Since the variable specifications here are similar to ones found in the literature, the results of these models can also be compared with those of the literature to see if the findings are consistent.

All four models estimate a negative and significant effect of race on job satisfaction. This result is fairly consistent with the majority of the literature on job satisfaction. In general, being black has been found to be negatively related to job satisfaction, though most estimates have been insignificant (see Sloane and Williams [2000], or Clark, Oswald, and Warr [1996] for example). This negative and significant effect of race on job satisfaction contrasts, however, with the positive and significant effects estimated in Bartel's (1981) earlier work.

We also observe that education has a positive and significant relationship with job satisfaction in all four specifications. This suggests that education does have an impact on job satisfaction beyond the ability to "buy" better working conditions. The literature on education's impact on job satisfaction has been quite divided with some researchers finding a positive effect, some finding negative effects, and other finding insignificant effects. In general we would expect education to increase one's job

satisfaction because it increases the ability to obtain better wages, benefits and to do more interesting work, but once these are controlled for there may be little extra influence on job satisfaction.

The four baseline models estimate therefore seem consistent with theory and the existing literature, but what happens when we allow education's impact to vary by race? This analysis is shown in Table 3.3. Models 5 through 8 add an interacted term for race and education to the specifications from Table 3.2.

*3.2 Results of Interacted Models*

Model 5 shows that the coefficient on the race indicator has switched signs when the interacted terms are included. This indicates that black workers have a higher baseline level of job satisfaction (job satisfaction if the individual has no education) than white workers, but that job satisfaction is decreasing in education for black workers. In particular we find that being black is positively associated with job satisfaction until education reaches 6.7-10.1 years, but the effect becomes negative if education goes beyond that level.[7] In other words, if a black individual chooses to further his/her education beyond the high school level it will actually have a negative impact on job satisfaction.

This result is consistent with an expectations story. Exposure to higher education increases one's expectation of not only the pecuniary aspects of a job, but the non-pecuniary aspects as well. It could be argued then that black workers' expectations of these job characteristics are increasing in education to a point that

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[7] This is determined by finding the level of education at which the marginal effect of the race indicator and the marginal effect of the interacted term are equal. The range given above is the range of values obtained when carrying this analysis out for all four model specifications.

they are not being met, thereby decreasing their satisfaction with their work (see Clark [1997], and Clark and Oswald [1996] for a discussion on expectations).

Another interesting result of these models is that education's effect on job satisfaction is positive and significant for white workers under Models 5 through 7 (and insignificant under Model 8), but the net effect for black workers varies by model specification. The effect of education for blacks appears to be positive when only personal characteristics are controlled for, but becomes negative and significant when we begin to control for work-related characteristics.

This result lends some more support for the idea that expectations are driving the negative effect of education on job satisfaction for black workers. Because education is insignificant for white workers in Model 8, education is not adding anything significant to job satisfaction beyond what it adds to work related characteristics. Since the interacted term for black workers is significant though, we see that education still plays a significant role for black workers even after controlling for work related characteristics. In fact, each additional year of education predicts a lower probability that a black worker reports being very satisfied with his or her job by about 1.1 percent. This means that obtaining a bachelor's degree, something that typically takes four years or more, could lower his or her chances of being very satisfied in their job by nearly five percent. This implies that education is still decreasing job satisfaction for black individuals even after we account for how it affects job characteristics, which is consistent with unmet expectations about the worker's job.

Table 3.3 also includes Wald Tests of whether the education variables are jointly equal to zero as well as the race variables. The results of these tests indicate that while education may not be significant in determining job satisfaction for white

workers in all model specifications, we cannot reject the hypothesis that education and racial interaction with education are jointly equal to zero under any model specification.

*3.3 Robustness Checks*

We saw in the first part of the analysis that even in the midst of numerous personal and job related characteristics there still exists a significant difference in education's effects on job satisfaction between black and white workers. Four robustness checks were run to see if this relationship persists, the results of which can be found in Table 3.4.

Model 9 attempts to get at a potential cause of these unmet expectations via including a term for an individual's comparison wage. Clark (1996) was among the first to use comparison earnings in the analysis of job satisfaction and showed that not only is an individual's income important in determining job satisfaction, but how the individual views their income in relation to what he/she believes they deserve (based on their characteristics) or in relation to what his/her peers earn is also important. A similar measure is included in this analysis to see if the gap in education's returns disappears after accounting for some measure of individual "expectations" of wages.

This comparison wage variable measures the ratio of the respondent's actual income and of what the worker would be predicted to earn if he/she were of the opposite race. The lower the value of this variable (either by a relative decrease in the individual's wage or by an increase in the wages of those the individual compares his/her income to), the lower one's job satisfaction is expected to be. Baxter (1973, 1993) formalized this idea as relative deprivation. An individual will have some

expectations of what they should be earning given their education and background, and if these expectations are not met the worker will be less satisfied on average.

To create this variable, two standard wage regressions are estimated for black and white workers separately. Predicted wages were then generated for white individuals using the black earnings equation and similar predicted wages were created for black individuals. Finally, the ratio of the individual's actual earnings versus their predicted earnings if they were of the other race is taken. This ratio is what is used in the analysis as the comparison wage. Because of colinearity concerns, this comparison wage will replace the respondent's actual income in the analysis.

Interestingly, the coefficient on the comparison wage in Model 9 is positive and significant which agrees with Clark's (1996) earlier findings, but the relationship between education, race, and job satisfaction that was estimated in Models 5 through 8 still persists.

Another question that arises is that because blacks have higher levels of job satisfaction than whites at lower education levels, but the comparison is reversed after a high school diploma is received, perhaps part of what we are observing is a drop-out effect. Thus, the second robustness check estimates Model 9 only for individuals who have completed at least 12 years of education.

The overall result is that our baseline group, individuals with only a high school diploma, experiences no significant differences in job satisfaction by race. This result makes sense because we are cutting out those black workers who were, on average, happier than their white counterparts, and starting at roughly the point where the two experience the same levels of job satisfaction. We also see that despite the fact that blacks and whites are starting from roughly equivalent levels of job

satisfaction, blacks do still receive lower job satisfaction returns to education than whites.

The third robustness check run follows the work of Clark (1997), and asks if this persistent result has a gender component to it. The full model is thus run again, including interactions with gender and education, as well as gender and race. These results can be found in Table 3.4.

It appears that white women with low levels of education are more satisfied than their male counterparts, but black women are less satisfied. Further, the results indicate that women receive lower job satisfaction returns to education than men which agrees with the earlier findings of Clark (1997). We also notice that black females have lower levels of job satisfaction than their white counterparts, but that education's effect on job satisfaction does not differ for black and white females. Finally, there is still a persistent difference in the job satisfaction returns to education between blacks and whites, and it does not appear that this effect varies by gender.

A final robustness check might be to include the AFQT score not only in the comparison wage equation but in the job satisfaction equation as well and to see if AFQT scores affect job satisfaction differently by race and/or by gender. Lang and Manove (2011) show that conditional on ability (AFQT scores) black individuals invest more in education and as such should out earn their white counterparts. However, they propose that because of statistical discrimination this does not necessarily happen. If these results are true, then at least part of the difference in the job satisfaction returns to education should be explained by differences in ability which would be consistent with an expectations story.

The results of this final specification can also be found in Table 3.4. We see that despite controlling for ability, black men have high job satisfaction than white

men when education and ability are low. However, this advantage in job satisfaction is gradually depleted as education and ability increase. We also see a similar result to our previous specification that while there do appear to be some differences between men and women, this effect does not differ significantly by race, suggesting again that most of the significant differences in the education returns to job satisfaction are between black and white men.

Finally, we see that white men enjoy a positive return to education, but receive lower job satisfaction when they are of higher ability. For black men, however, the net effect of education is negative, and while they too have lower levels of job satisfaction as ability increases, this reduction in satisfaction is higher for black men.

These results make sense intuitively in light of Lang and Manove's (2011) work. Higher levels of ability tend to lead individuals into higher levels of education, and if black individuals with a given ability level invest more than their white counterparts then it is also likely that their expectations of their job will be higher. Because of statistical discrimination in the hiring process, or other discriminatory practices in the work place, the expectations of these individuals may be unmet to a greater degree than their white counterparts and these unmet expectations are likely manifesting themselves in the form of lower levels of job satisfaction at higher education levels.

## 4. Extension: Education's Effect on the Ability to Transition to a Better Job

Earlier the idea was put forth that individuals may pursue higher education not only to obtain a better paying job, but to also obtain a job which they are happier with. We have now seen that education does indeed affect job satisfaction differently for

blacks and whites, and that black individuals see negative job satisfaction returns to education. This suggests that black individuals have fewer incentives in terms of job satisfaction to pursue higher levels of education, presumably because they expect that they will not see the benefit in the form of a better job, which is why we still observe a gap in educational attainment between blacks and whites.

A natural extension of these results would be to see how education affects the ability of an individual to move into a new job where their job satisfaction is higher and to see if this effect is different by race. To accomplish this, a Cox model of proportional hazards is run on the data where a "failure" is defined as a person having a new job at the time of interview *and* reporting being more satisfied than they were at their previous job. Here the full job satisfaction variable is used in lieu of the binary job satisfaction variable used in the previous analysis. Because the ability to transition to a new job that one likes better is likely higher when one starts at a lower job satisfaction level (since there are more opportunities for improvement) the Cox model is stratified by the individual's current job satisfaction score. Note that because the sample from each year contains only individuals who were employed at the time of the interview and had a job to report satisfaction for some individuals are missing data for one or more survey years and are excluded from the present analysis. Also note that the analysis does not include those individuals whose job satisfaction scores are 4's since they are unable to transition to a new job that they like any better. The results of this model can be found in Table 3.5.

The results indicate that education has a positive effect on the ability to transition to a new job with higher job satisfaction for white workers. Specifically we find that for each additional year of education there will be roughly a four percent increase in the likelihood of moving into a new job with higher job satisfaction. For

black men, however, education seems to have no net effect on the likelihood of transition. We also see that there is no significant impact of race on this transition ability at low levels of education, but the ability to obtain a new better job moves in opposite directions as education increases with white men being more able and black men being less able to transition.

A final related analysis would be to see how education affects the initial placement in jobs of different satisfaction levels differently for black and white workers. To accomplish this the job placement in the first survey year, 1989, is used as a proxy for the respondent's first job and a multinomial probit model is run to analyze how education affects this initial placement.[8] Results of this estimation are presented in Table 3.6.

We can see that education significantly increases the likelihood of being placed in a job with a job satisfaction score of a 2 or 3 for black workers relative to a score of 4, but that education does not significantly impact this placement into less satisfying jobs for white workers. Further, the predicted probability of being placed in an "initial" job with a job satisfaction score below 4 is higher for black workers than it is for white workers at every score, but the predicted probability of being placed in an initial job with the highest job satisfaction score of 4 is higher for white workers.

These findings support our previous results, and we have now seen that not only does higher education negatively affect whether a black individual will be satisfied with his/her present job, but it also does not help in their initial job placement in terms of job satisfaction nor does it aid their ability to transition to a new job that they like better. The implication of these findings is that there appear to be negative

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[8] In this survey year the average age ranged from 24 to 32. The multinomial probit model was restricted to only individuals who were 26 years of age or younger who are those individuals who are most likely to still be in their first job and indeed are still at the beginning of their career.

returns to education for black workers and that this is perhaps why they are choosing lower levels of education than their white counterparts. The reason for this is still unclear. It could be due to discrimination in the hiring process or in the workplace once a person is hired, but it could also be due to a number of other factors such as white works being able to take advantage of a wider professional network.

## 5. Conclusion

This paper attempted to determine whether there was a significant difference in job satisfaction returns to education across races. In each model estimated it was found that black workers with no education were more satisfied with their jobs than their white counterparts, but that increasing levels of education diminished this effect until it eventually became negative (at or before obtaining a high school diploma). This negative relationship between education and job satisfaction for black workers is consistent with the observed persistent educational attainment gap between black and white individuals in a way that the monetary returns to education literature is not. If we believe that higher expected job satisfaction is one of the motivators for pursuing higher education and lower expected job satisfaction is one deterrent of pursuing higher education then these results may lend some insight as to why we might still observe a sizable gap in educational attainment.

We also established that while education has a positive impact on the ability to transition into new work that is more satisfying for white workers, education actually does not aid this transition ability for black workers. Further, higher levels of education appear to increase the likelihood of having an initial job placement in a job with lower levels of job satisfaction for black workers. This finding lends further

support to the claim that lower expected gains in job satisfaction for black individuals may be one of the driving forces behind why we observe a persistent educational attainment gap between blacks and whites.

Now that it has been established in this paper that a significant difference in the job satisfaction returns to education exists between black workers and white workers until ability (which negatively affects job satisfaction) is accounted for, the next logical step is to attempt to determine why this relationship exists. A further study of the differences in different aspects of job satisfaction between black and white workers could help to pinpoint where this negative effect of education and ability for black workers is coming from. Do black workers get fewer fringe benefits than white workers, is their work less interesting, do they work more hours, is there some form of discrimination going on in the workplace? Knowing why black workers are less happy on average with their work could tell us if there is anything that can be done to close the job satisfaction gap. This in turn should at least diminish the gap in education's effects on job satisfaction and potentially decrease the educational attainment gap in the long run.

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# Tables

**Table 3.1: Descriptive Statistics**

| Variable | White | Black | Difference |
|---|---|---|---|
| Job Satisfaction | 3.349 | 3.249 | 0.100*** |
| | (0.005) | (0.007) | (0.008) |
| Binary Job Satisfaction | 0.456 | 0.393 | 0.063*** |
| | (0.003) | (0.005) | (0.006) |
| Job Satisfaction (No HS: 2,589 obs.) | 0.423 | 0.429 | -0.006 |
| | (0.012) | (0.017) | (0.021) |
| Job Satisfaction (HS: 14,288 obs.) | 0.420 | 0.370 | 0.050*** |
| | (0.005) | (0.007) | (0.009) |
| Job Satisfaction (SC: 8,272 obs.) | 0.474 | 0.382 | 0.091*** |
| | (0.007) | (0.009) | (0.011) |
| Job Satisfaction (B: 5,589 obs.) | 0.465 | 0.422 | 0.043*** |
| | (0.008) | (0.014) | (0.016) |
| Job Satisfaction (G: 3,375 obs.) | 0.560 | 0.499 | 0.061*** |
| | (0.009) | (0.020) | (0.022) |
| Education | 13.640 | 13.245 | 0.395*** |
| | (0.016) | (0.020) | (0.027) |
| Education (JS = 0) | 13.460 | 13.191 | 0.269*** |
| | (0.020) | (0.025) | (0.034) |
| Education (JS = 1) | 13.854 | 13.328 | 0.526*** |
| | (0.024) | (0.035) | (0.045) |
| Hrs./Day | 8.519 | 8.339 | 0.180*** |
| | (0.012) | (0.016) | (0.021) |
| Health Insurance | 0.823 | 0.800 | 0.023*** |
| | (0.002) | (0.004) | (0.005) |
| Retirement Plan | 0.675 | 0.680 | -0.005 |
| | (0.003) | (0.005) | (0.006) |
| Flexible Hours | 0.521 | 0.503 | 0.018*** |
| | (0.003) | (0.005) | (0.006) |
| Training | 0.561 | 0.532 | 0.030*** |
| | (0.003) | (0.005) | (0.006) |
| Union | 0.136 | 0.193 | -0.057*** |
| | (0.002) | (0.004) | (0.004) |
| Public Sector | 0.201 | 0.292 | -0.090*** |
| | (0.003) | (0.004) | (0.005) |
| Weeks Tenure | 266.756 | 237.407 | 29.348*** |
| | (1.620) | (2.343) | (2.904) |
| Log Income | 10.180 | 9.875 | 0.305*** |
| | (0.005) | (0.009) | (0.010) |
| Weeks Unemployed | 1.211 | 2.301 | -1.090*** |
| | (0.031) | (0.070) | (0.066) |
| AFQT score | 57.545 | 29.050 | 28.495*** |
| | (0.174) | (0.222) | (0.301) |
| Family Size | 2.922 | 3.113 | -0.191*** |
| | (0.009) | (0.166) | (0.018) |
| Married | 0.645 | 0.408 | 0.237*** |
| | (0.003) | (0.005) | (0.006) |
| Urban | 0.730 | 0.852 | -0.122*** |
| | (0.003) | (0.003) | (0.005) |
| N = 34,112 | | | |
| Proportion of Sample | 0.697 | 0.303 | |

Notes:
Standard errors in parentheses.
*, **, and *** indicate significant differences at 90, 95, and 99 percent confidence respectively.
Income is measured in constant 2000 dollars.

**Table 3.2: Results of Job Satisfaction Probit Regressions for Baseline Models (No Racial Interactions)**

| Variable | (Model 1) Marginal Effect | (Model 2) Marginal Effect | (Model 3) Marginal Effect | (Model 4) Marginal Effect |
|---|---|---|---|---|
| Black | -0.060*** | -0.053*** | -0.056** | -0.048*** |
| | (0.006) | (0.006) | (0.006) | (0.006) |
| Education | 0.014*** | 0.014*** | 0.007*** | -0.005*** |
| | (0.001) | (0.001) | (0.001) | (0.001) |
| Female | 0.025*** | 0.025*** | 0.038*** | 0.014** |
| | (0.005) | (0.005) | (0.006) | (0.006) |
| Age | 0.003*** | 0.003** | 0.004*** | 0.004*** |
| | (0.001) | (0.001) | (0.001) | (0.001) |
| Personal Characteristics | | ✓ | ✓ | ✓ |
| Work Characteristics | | | ✓ | ✓ |
| Non-Monetary Characteristics | | | | ✓ |
| N=34,112 | | | | |
| Predicted Prob. | 0.437 | 0.437 | 0.436 | 0.434 |

**Table 3.3: Results of Job Satisfaction Probit Regressions for Interacted Models**

| Variable | (Model 5) Marginal Effect | (Model 6) Marginal Effect | (Model 7) Marginal Effect | (Model 8) Marginal Effect |
|---|---|---|---|---|
| Black | 0.067* | 0.080** | 0.093** | 0.111*** |
| | (0.037) | (0.037) | (0.037) | (0.038) |
| Education | 0.016*** | 0.017*** | 0.010*** | -0.002 |
| | (0.001) | (0.001) | (0.001) | (0.002)) |
| Black x Education | -0.010*** | -0.010*** | -0.011*** | -0.011*** |
| | (0.003) | (0.003) | (0.003) | (0.007) |
| $X^2$ test: | | | | |
| Race Variables | 116.48*** | 87.13*** | 96.65*** | 74.65*** |
| Education Variables | 156.17*** | 158.81*** | 46.13*** | 30.02*** |
| | | | | |
| Female | 0.026*** | 0.026*** | 0.039*** | 0.016** |
| | (0.005) | (0.005) | (0.006) | (0.006) |
| Age | 0.003*** | 0.003** | 0.004*** | 0.004*** |
| | (0.001) | (0.001) | (0.001) | (0.001) |
| Personal Characteristics | | ✓ | ✓ | ✓ |
| Work Characteristics | | | ✓ | ✓ |
| Non-Monetary Characteristics | | | | ✓ |
| Comparison Wage | | | | |
| N=34,112 | | | | |
| Predicted Prob. | 0.437 | 0.437 | 0.436 | 0.434 |

**Notes:**
Standard errors in parentheses.
*, **, and *** indicate significance at 90, 95, and 99 percent confidence respectively.
Year dummies indicating survey year also included in each model specification.
Income values are in constant 2000 dollars.

**Table 3.4: Job Satisfaction Probit Regressions for Robustness Check Models (Model 9 is base model)**

| Variable | Model 9 | (Model 9 with No HS dropouts) | (Model 9 with Female Interactions) | (Model 9 with AFQT Interactions) |
|---|---|---|---|---|
| | Marginal Effect | Marginal Effect | Marginal Effect | Marginal Effect |
| Comparison Wage | 0.021*** | 0.024*** | 0.023*** | 0.021*** |
| | (0.004) | (0.004) | (0.004) | (0.004) |
| Black | 0.121*** | 0.057 | 0.165*** | 0.111** |
| | (0.038) | (0.045) | (0.050) | (0.055) |
| Education | $-1.40 \times 10^{-4}$ | 0.002 | 0.002 | 0.009*** |
| | (0.002) | (0.002) | (0.002) | (0.002) |
| Black x Education | -0.012*** | -0.008** | -0.014*** | -0.010** |
| | (0.003) | (0.003) | (0.004) | (0.005) |
| Female | 0.009 | 0.007 | 0.100*** | 0.122*** |
| | (0.006) | (0.007) | (0.040) | (0.041) |
| Female x Black | | | -0.141* | -0.106 |
| | | | (0.070) | (0.077) |
| Female x Education | | | -0.005* | -0.009*** |
| | | | (0.003) | (0.004) |
| Female x Black x Education | | | 0.006 | 0.003 |
| | | | (0.006) | (0.007) |
| AFQT | | | | -0.001*** |
| | | | | $(2.16 \times 10^{-4})$ |
| Black x AFQT | | | | -0.001* |
| | | | | $(4.31 \times 10^{-4})$ |
| Female x AFQT | | | | 0.001* |
| | | | | $(3.17 \times 10^{-4})$ |
| Female x Black x AFQT | | | | $4.40 \times 10^{-4}$ |
| | | | | (0.001) |
| $X^2$ test: | | | | |
| Race Variables | 81.97*** | 74.09*** | 112.82*** | 136.72*** |
| Education Variables | 25.44*** | 6.34* | 22.50*** | 16.85*** |
| Female Variables | N/A | N/A | 35.26*** | 42.64*** |
| AFQT Variables | N/A | N/A | N/A | 58.91*** |
| Number of Observations | 34,112 | 31,523 | 34,112 | 34,112 |
| Predicted Prob. | 0.434 | 0.435 | 0.434 | 0.434 |

**Notes:**
Standard errors in parentheses.
*, **, and *** indicate significance at 90, 95, and 99 percent confidence respectively.
Year dummies indicating survey year also included in each model specification.
Income values are in constant 2000 dollars.

**Table 3.5: Results of Cox Model of Proportional Hazards ("Failure" = Transitioning to New Job With Higher Job Satisfaction)**

| Variable | Hazard Ratio |
|---|---|
| Education | 1.042** |
| | (0.020) |
| Black | 0.672 |
| | (0.742) |
| Black x Education | 0.961*** |
| | (0.015) |
| Female | 0.557 |
| | (0.643) |
| Female x Education | 1.001 |
| | (0.004) |
| N=857 | |
| Log likelihood = -1528.7 | |

**Notes:**
Standard errors in parentheses.
*, **, and *** indicate significance at 90, 95, and 99 percent confidence respectively.
Model is stratified by current job satisfaction score.
The model has been restricted to include only those with current job satisfaction scores of 3 or below (those that actually can transition to better jobs).
The full set of controls is used in estimating this model, but results are omitted from the table.

**Table 3.6: Results of Multinomial Probit Model of Job Satisfaction at "Initial" Job**

| Variable | Job Satisfaction = 1 (Coefficient) | Job Satisfaction = 2 (Coefficient) | Job Satisfaction = 3 (Coefficient) |
|---|---|---|---|
| Black | -1.070 | -0.543 | -0.337 |
| | (0.754) | (0.521) | (0.376) |
| Education | 0.032 | -0.014 | -0.010 |
| | (0.040) | (0.029) | (0.020) |
| Black x Education | 0.090 | 0.078** | 0.050* |
| | (0.056) | (0.039) | (0.028) |
| N = 1353 | | | |
| Predicted Prob. (Black) | 0.020 | 0.085 | 0.513 |
| Predicted Prob. (White) | 0.019 | 0.059 | 0.462 |
| **Notes:** Standard errors in parentheses. *, **, and *** indicate significance at 90, 95, and 99 percent confidence respectively. The full set of controls is used in estimating this model, but results are omitted from the table. | | | |

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- UW-Whitewater Research Seminar, (2012) "Domestic Violence and Welfare Receipt: Determining the Relationship in the Pre and Post Reform Eras"
- Midwest Interdisciplinary Graduate Conference, (2013) Session 4B. "Violence Against Women, Interdisciplinary Approaches and Failure at University of Wisconsin-Milwaukee (UWM):  Discussion Panel"
- Midwest Economic Association Annual Meeting, (2013) Session 10H. "Domestic Violence and Welfare Receipt: Determining the Relationship in the Pre and Post Reform Eras"

**Teaching Experience**

**University of Wisconsin-Whitewater College of Business and Economics**
**Lecturer, 2012-2013**

- Principles of Microeconomics (5 sections)
- Business Statistics (3 sections)

*Honors research projects supervised:*

- Tyler Vandervoot (Fall, 2012)
- Derric Francis (Fall, 2012)

**University of Wisconsin-Milwaukee Economics Department**
**Graduate Teaching Assistant**, **2009-2012**
Principal Instructor:
*Undergraduate Courses:*

- Economic Statistics (7 sections)
- Principles of Microeconomics (5 sections)

*Undergraduate/Graduate Courses:*

- Economics of Employment and Labor Relations (1 section)

## Organizations

- American Economic Association
- Midwest Economic Association
- UWM Violence Against Women Interdisciplinary Research Group

## Service and Enrichment

- Economics Department representative, UWM Open House (2009, 2010)
- IRB Human Subjects Research Training (2011)
- Teaching Mentoring Group, UW-Whitewater (2012)