THE EFFECT OF WELFARE REFORM ON CHILDBIRTH, MARRIAGE, AND DIVORCE

A Dissertation

by

PIMRAK PAKDEETHAI

Submitted to the Office of Graduate Studies of
Texas A&M University
in partial fulfillment of the requirements for the degree of

DOCTOR OF PHILOSOPHY

August 2009

Major Subject: Economics

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ABSTRACT

The Effect of Welfare Reform on Childbirth,

Marriage, and Divorce. (August 2009)

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Chair of Advisory Committee: Dr. Manuelita Ureta

This dissertation contains two essays on the effect of welfare reform on childbirth, marriage, and divorce. In the first essay, I exploit the cross state variation in welfare reform implementation to identify its effect on birth rates. The results from multinomial logit models suggest that the welfare reform significantly increased the probability of marital births. The out-of-wedlock birth rates decreased but this effect is not significant. The strong work incentives decrease birth rates in both marital and non-marital statuses suggesting that bearing a child is not appealing for women who are more progressive in careers. However, the most aggressive welfare policy significantly increases marital birth as expected. Birth rates among teenage girls are not affected by the welfare reform. I further investigate the effect of the family cap policy. Using a semi-natural experiment, I compare the birth rate of women who already have had a second or higher order birth (treatment group) to women who have had one child (comparison group), in states with and without family caps. The difference in difference estimates reveal a strictly negative effect of family caps on the higher order birth rates as expected.

In the second essay, I use reduced-form estimation and cross-state variation in timing of reform adoption to extract both mechanical and behavioral effects of welfare reform on marriage and divorce likelihood. I construct a flow measure of marriage and divorce by matching individuals in the Current Population Survey from March 1988B to 2002 and observing changes in marital status. I introduce a *converse matching*

procedure to detect women who are not in the survey for two consecutive years. I find that the welfare reform has a significantly negative effect on marriage rates and an insignificant effect on divorce rates. The Difference-in-Difference estimates suggest that marriage among disadvantaged women is negatively affected by the welfare reform. I also provide a theoretical model to decompose the effect of welfare reform on marriage due to each of the components of the reform, i.e., time limits, work sanctions, earnings disregards, and maximum cash benefits. My results provide a novel explanation for the effects of work incentives and welfare restrictions on marriage.

ACKNOWLEDGMENTS

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CHAPTER I

INTRODUCTION

Government assistance for families with dependent children (AFDC) had been operating since 1935 and lasted for almost 60 years. Single mothers were primary beneficiaries at the moment while many social problems such as increases in female headship rates, teen motherhood, out-of-wedlock births, welfare caseload, etc., arose. The AFDC opponents argue that welfare may have been responsible for them. In 1996, Clinton passed the Personal Responsibility and Work Opportunity Reconciliation Act of 1996 (PRWORA) and turned welfare to a new chapter of reform by making recipients work.

Purposes of TANF are the followings:

1. To provide assistance to needy families so that children may be cared for in their own homes or in the homes of relatives.

2. To end the dependence of needy parents on government benefits by promoting job preparation, work, and marriage.

3. To prevent and reduce out-of-wedlock pregnancies.

4. To encourage the formation and maintenance of two-parent families.

All the states completely replaced AFDC by the Temporary Assistance for Needy Families (TANF) program between 1996 to 1998. Before the implementation of TANF, some states were granted permission to experiment with some of the TANF provisions such as time limits, family caps, work requirement, etc. These were called

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This dissertation follows the style of *Journal of Political Economy.*

"waivers" and were considered as a first step towards the welfare reform. The new which lead to changes in many social outcomes; e.g, welfare use, labor force participation, education, fertility, and family formations.

The objective of this dissertation is to examine the effect of overall welfare reform on childbirth, marriage, and divorce using the data of Current Population Survey (CPS) March 1988 to 2002. I exploit the cross state variation in welfare reform implementation to identify its effect. Due to the fact that each state receives block grant from the federal government and sets up its own independent program following TANF guidelines, welfare policies vary across states and years. The effect of individual welfare policy is also identifiable from a variation in degree of welfare rules.

The first essay of this dissertation, Chapter II, analyzes the effect of welfare reform on birth rates among adults and teenagers by introducing a multinomial logit model. This model is unique for this type of research question because it allows for the fertility comparison between non-marital, marital child births, and no childbirth. It provides a suitable econometric framework to understand fertility behavior, specifically when the fertility is jointly determined with marriage decisions. The results from multinomial logit models suggest that the welfare reform significantly increased the probability of marital births. The out-of-wedlock birth rates also decreased but this effect is not significant. The strong work incentives decrease birth rates in both marital and non-marital statuses suggesting that bearing a child is not appealing for women who are more exposed to career environment. However, the most aggressive welfare policy significantly increases marital birth. Birth rates among teenage girls are not affected by the welfare reform. I further investigate the effect of the family cap policy. Using a semi-natural experiment, I compare the birth rate of women who already have had a second or higher order birth (treatment group) to women who have had one child (comparison group), in states with and without family caps. The

difference-in-difference estimates reveal a strictly negative effect of family caps on the higher order birth rates as expected.

In the second essay of this dissertation I examine the effect of welfare reform on marriage and divorce. I construct a measure of marriage and divorce rates by matching individuals across a pair of year in CPS from March 1988 to 2002. I also introduce a new matching procedure called "converse matching". This matching allows me to also match women who appear only one time by matching through their newly wed husbands (marriage rate) or newly divorced ex-husbands (divorce rate). I find that welfare reform has a significant negative effect on the marriage rate and an insignificant negative effect on the divorce rate. The Difference-in-Difference estimates also yield a consistent result with the probit model. By decomposing the components of welfare reform, e.g. time limits, work sanctions, earning disregards, and maximum cash benefits, I find that a negative effect of welfare reform comes from self sufficiency in work incentives. However, least attractive welfare policies increase marriage which suggesting that women consider marriage as an alternative financial support when government aids become uncharitable.

CHAPTER II

THE EFFECT OF WELFARE REFORM ON CHILDBIRTH

A. Introduction

During the 1980s and 1990s, increasing trends in teenage motherhood, out-of-wedlock births, and female headship were well recognized and became the main targets of the welfare reform. Previous studies have found mixed evidence on whether the Aid to Families with Dependent Children (AFDC) program was responsible for these trends. The estimated effect of AFDC on the U.S. family structure is inconclusive. Yet, the program was reformed in 1996. All the states completely replaced AFDC by the Temporary Assistance for Needy Families (TANF) program between 1996 to 1998. Before the implementation of TANF, some states were granted permission to experiment with some of the TANF provisions such as time limits, family caps, work requirement, etc. These were called "waivers" and were considered as a first step towards the welfare reform.

It has been more than a decade since the welfare program underwent a major overhaul in order to address these social problems along with a large fiscal deficit. The welfare reform and its results were acknowledged as great achievements. By imposing many restrictive rules that emphasize self reliance through work promotion, welfare caseloads dropped dramatically. Unfortunately, the channels leading to such results are unclear. Even though caseload reduction was mainly a result of welfare recipients' inability to comply with the new restrictive welfare policies, it is also worthwhile to investigate any simultaneous change in family composition during the same period that might have made them immediately unqualified or less in need of welfare support.

As the welfare program after the reform became less generous, disadvantaged

women had fewer incentives to give birth in order to qualify and participate in the welfare system. Families without children are ineligible to recieve welfare benefits. If fertility, birth rates, or number of children per family decrease, the proportion of welfare-qualified families would decrease as well. As a result, it is not surprising to witness a sharp reduction in welfare caseloads after the reform.

The main objective of this paper is to analyze the effect of welfare reform on birth rates among adults and teenagers by introducing a multinomial logit model. This model is unique for this type of research question as it allows for the fertility comparison between non-marital, marital child births, and no childbirth. It provides a suitable econometric framework to understand fertility behavior, specifically when the fertility is jointly determined with marriage decisions. I find that the welfare reform increases marital birth rates but it does not affect out-of-wedlock birth rates when compared to a choice of having no birth. Teen birth rates are not significantly affected by the welfare reform.

To complete the analysis, this paper also studies the effect of family caps on fertility rates using "birth order" as an instrument. Among many other new policies introduced in the reform, family caps is the policy targeting most directly the birth rates of welfare recipients. This policy imposes a reduction or zero welfare benefit offered for each additional child. Women living in a state with an effective family cap policy would be more reluctant to bear higher-order children because the welfare benefits are capped for additional children born while collecting benefits. Using a semi-natural experiment, I compare the birth rate of women who already have a second or higher order birth (treatment group) to women who have one child (comparison group), between states with family caps and states without family caps. The difference-in-difference estimates reveal a strictly negative effect of family caps on the higher order birth rate as expected.

The validity of the difference-in-difference methodology requires that the fertility trend between treatment and control groups is parallel during the non-family cap period. Determining treatment and control groups effectively is a real challenge. Both groups should posses similar characteristics leading to similar outcomes when the family cap policy has not yet been implemented. Yet a treatment group is a group at high risk and a control group is a group at low-risk to be affected by the policy.

B.   Literature Review

Many previous papers study the effect of pre-reform welfare benefits on social outcomes including welfare participation rates, poverty rates, family formation, among others. Previous studies have found mixed evidence on whether the Aid to Families with Dependent Children (AFDC) program was responsible for these trends. Danziger et al. (1982), Ellwood and Bane (1985), Duncan and Hoffman (1990), Fossett and Kiecolt (1993), and Lundberg and Plotnick (1995) concluded that AFDC led to an undesirable family structure in the U.S. Acs (1996), An, Haveman, and Wolfe (1993), Darity and Myers (1983), Lichter et al. (1992), Plotnick (1990), and Robins and Fronstin (1996) found an insignificant effect of AFDC on these problems. The rest of the studies (see Freshnock and Cutright (1979); Hoynes (1995); Janowitz (1976); Lundberg and Plotnick (1990); Moffitt (1990); Moffitt (1994); Moore and Caldwell (1977); Rank (1989); Rosenzweig and Wolpin (1994); Schultz (1994)) found mixed or converse results. Most studies also found a stronger and/or more significant effect of AFDC on whites than blacks–who are common welfare recipients.

The government welfare program and its effect on family formation and fertility decisions among disadvantaged women have captured increasing attention over the years. Using cross-state variation in benefit levels is the most common method of

identifying the effect of AFDC on fertility. However, if fertility systematically varies across states with different levels of welfare benefits due to other reasons, such as social norms, the results obtained through this identification method can be spurious. As a result, cross-state variation in benefit changes, also known as the *state-fixed effects model*, has become increasingly utilized. Changes over time in benefit levels across states are used to explain changes over time in several social outcomes such as fertility, marriage, divorce and others.

Many studies examine the effect of welfare reform by exploiting cross-state variation in the set of outcomes observed in either state- or individual-level data. Lopoo and DeLeire (2006) used natality data from the National Center for Health Statistics and found that the fertility rate of minor parents aged 15–17 declined more than in the control group of 18-year-olds. Even though the state-level data, for example, fertility and marriage rates from the Vital Statistics, virtually collects all occurrence in a particular state, it lacks detail for a more in-depth analysis. Individual-level data, instead, allows for the difference-in-difference strategy since welfare reform should have a greater impact on disadvantaged women who are at high risk of welfare dependency. Kaestner, Korenman, and O'Neill (2003) and Offner (2005) therefore applied this method to the National Longitudinal Survey of Youth (NLSY79 and NLSY97) and the Current Population Survey March Supplement (CPS 1989–2001), respectively, to investigate the outcomes among female teenagers. The results from both studies supported the findings of Lopoo and DeLeire (2006) who used state-level aggregate data.

There is no consensus on whether to perform race-specific or race-inclusive analysis. Due to data limitations, some studies cannot analyze the impact of welfare across race. However, most papers find a stronger and more significant effect of welfare reform on outcome for whites than blacks (for a summary, see Moffitt (1998)).

This suggests that there exist racial differences in the responses to the changes in the welfare program and therefore each race should be analyzed separately. This type of study imposes the assumption that the classical error terms are race-specific. For example, out-of-wedlock births accounted for 26 percent of fertility among whites and 69 percent among blacks. Willis (1999) captured the differences between whites and blacks in fertility choices by constructing an out-of-wedlock model considering women and men as separate decision units. He found that a marriage market equilibrium may exist in which children are born within marriages of high-income parents, whereas in low-income groups men father children from multiple partners outside of marriage. In this paper, I examine the effect of welfare reform on the pooled sample and separating blacks and whites.

Prior to TANF implementation, many states adopted waivers to test a variety of new welfare policies by randomly assigning welfare participants into experiment and control groups. The experiment groups were subjected to new rules while control groups remained in the AFDC regime. These experiments were designed for studying different reform policies such as family caps, time limits, work sanctions, and many others. Yet the results are state-specific and may not be externally validated at a national level. Jagannathan, Camasso, and Killingsworth (2004) studied the impact of the family cap policy on the fertility behavior of welfare recipients in New Jersey by exploiting the results from the experiment group[1]. They found that family caps reduced births among blacks. Dyer and Fairlie (2005b) applied a difference-in-difference-in-difference approach to the Current Population Survey data from 1989 to 1999 and found that the family cap policies did not reduce the incidence of out-of-wedlock births among single less-educated women with children.

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[1]NJ is the first state that implemented family caps.

C.   Contribution

All of the previous studies use either logistic or probit regressions to identify the effect of welfare on fertility. The fertility decisions of interest, however, are more focused on non-marital or out-of-wedlock childbearing. It is important to distinguish the births between within and outside marriages as both fertility and marriage are jointly determined and they can be affected differently by the welfare reform. In this paper, I do not consider the timing of fertility and marriage decisions, for example, conception followed by marriage or vice versa, because this cannot be captured in my data. I apply a multinomial logit model to segragate the un-ordered fertility choices between non-marital childbirth, marital childbirth, and no childbirth. I do not consider a multinomial logit model of four choices, i.e., no childbirth and not being married, no childbirth and being married, marital childbirth, and non-marital childbirth because it will yield more imprecise estimates while offering no real advantages for this type of analysis.

The main advantage of using multinomial logit model, in comparison to logit or probit, is that it allows a comparison analysis of multiple relevant choices of fertility and marriage at the same time. This is particularly important since the welfare reform also negatively affect marriage rate (see Bitler et al. (2004) and Pakdeethai (2008)).

Even though policy makers aim to reduce the out-of-wedlock birthrate, marital births may also decrease if the policy of welfare reform negatively affect birthrates as a whole. Welfare reform may, in turn, cause a relatively increase in marital birth by attracting those women who otherwise would have borne children outside marriage. These phenomena cannot be captured by a simple logit (or probit) regression.

I focus on three choices: no birth, out-of-wedlock birth, and marital birth. I do not disaggregate "no birth" choice based on marital status, i.e., single without birth

and married without birth because this paper aims to study birth rates in which the appropriate reference choice is no birth (regardless a marital status). Including marital status as an additional choice of no birth decision unnecessarily complicate the analysis. Estimates obtained from a multinomial logit model must be interpreted relatively to a reference choice. If a reference choice is "single and no birth" (or "married and no birth") instead of "no birth", the estimates on out-of-wedlock or marital birth rates cannot be measured properly.

Since family caps is the most direct policy introduced in the welfare reform targeting fertility decisions, it is worthwhile to study the effect of family caps on birth rates. Even though there are a handful of papers studying this policy on fertility decisions, most of them apply the difference-in-difference-in-difference model between control and treatment groups during the pre- and post-family caps periods within family cap states. The typical control groups are disadvantaged women with children and the treatment groups are non-disadvantaged women with children (For example, see Dyer and Fairlie (2005a).). However, the family cap policy, which reduces the financial incentives for additional fertility, should affect disadvantaged women to a different degree according to their number of pre-existing children. In this paper, I apply the difference-in-difference model to the analysis of family caps. I use the "birth order" as an instrument to identify the treatment and control groups. I compare the birth rates of disadvantaged women at the second or higher order (control group) with that of the first order (comparison group) between states with and without family caps.

D.   Theory

The AFDC program was designed primarily to aid single women with children. The implication is that the availability of welfare lowers the cost of childbearing to unwed mothers relative to not having a child or having a marital childbearing. The welfare reform introduced many new policies that made welfare support less attractive to potential welfare recipients. By offering a smaller cash benefit, it would theoretically increase the private cost of out-of-wedlock childbearing, and other fertility options, such as marital childbearing and no childbearing would become relatively more appealing. If a woman decides to bear a child, an increase in the cost of childbearing can be partially alleviated by the presence of the spouse. Work requirement is one of the new additions to the welfare program. It improves the women's employment opportunity and helps them gain self sufficiency. The theory of childbearing suggests that a change in wage rates ambiguously affects the fertility rate.

In special cases, a small number of married parents were eligible and received welfare from the AFDC-UP program. By eliminating differences in eligibility[2] for two-parent versus one-parent families, any disincentive toward marital fertility associated with welfare eligibility rules should be mechanically removed and lead to a lower rate of non-marital childbearing.

Family caps is the policy designed to directly target fertility decisions among welfare recipients. Even though it is not mandatory for states to adopt family caps, many states imposed and maintain the policy. Other states either never implemented it or opted out of it in later years. Women receiving welfare under a family caps regime will receive lower or no additional benefit for an extra child born. As a result, family cap policy provides a financial disincentive for higher-order fertility.

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[2]They are known as the "100-hour rule" and work history requirement.

Grogger, Karoly, and Klerman (2002) suggest that any policy change that makes welfare relatively more attractive (e.g., higher benefit levels, more financial work incentives, no time limits, or lenient work sanction) will raise fertility (and especially non-marital fertility) and decrease marriage. Conversely, any policy change that makes welfare relatively less attractive will lower fertility (and non-marital fertility) and increase marriage. These theoretical predictions are consistent with the findings of Pakdeethai (2008) in which she examined and estimated the effect of welfare attractiveness on marriage decisions.

The number of teenage pregnancies climbed during 1980's. The policy makers addressed this critical problem by requiring minors with children to reside with their parents or relatives. The policy would make teenage pregnancies much less beneficial to those who perceived that a pregnancy can be used as a quick fix to avoid living with parents. As a result, the welfare reform should reduce teenage childbearing.

I hypothesize that welfare reform reduces out-of-wedlock birth rates and increased the marital birth rates among adults and teenagers. As financial incentives to have additional children are removed under the family caps regime, disadvantaged women with higher completed fertility are hypothesized to bear fewer children than do disadvantaged women with lower completed fertility.

E.   Econometric Framework

Previous studies use either logistic or probit regressions to identify the effect of welfare on fertility. The fertility decisions of interest, however, are more focused on non-marital or out-of-wedlock childbearing. It is important to distinguish the births between within and outside marriages as both fertility and marriage are jointly determined and they can be affected differently by the welfare reform. In this study I

analyze 3 choices: non-marital childbirth, marital childbirth, and no childbirth using a multinomial logit estimation. The model

$$Pr(y_i = j) = \frac{exp(X_i\beta_j)}{1 + \sum_j^J exp(X_i\beta_j)} \tag{2.1}$$

$$Pr(y_i = 0) = \frac{1}{1 + \sum_j^J exp(X_i\beta_j)} \tag{2.2}$$

where

$y_i = j$	Fertility choice j (out-of-wedlock birth or marital birth) of observation i
$y_i = 0$	Fertility reference choice (no birth) of observation i
X_i	Explanatory variables associated to observation i
β_j	Coefficients associated to fertility choice j
$Pr(y_i = j)$	Probability of choice j being chosen

For an analysis of the effect of family caps on fertility , I use a difference-in-difference model by identifying the treatment and control groups in probit model[3]. Therefore, the sample of interest consists of women with at least one child before the interviewing year. I do not include women who have not yet had children because they are not eligible for welfare benefits and their childbearing decisions are potentially different from the ones who already have them. Disadvantaged women who already have at least two children [4] besides the child born in the interviewing year are in the treatment group. I use three different control groups. The control groups consist of disadvantaged women who already have one child [4] , non-disadvantaged women who already have at least two children [4] , and non-disadvantaged women who already

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[3]Different from a multinomial logit, the decision choices are only live birth and no birth.

[4]Exclude any child born in the interviewing year.

have one child. These control groups are valid under assumption that the family cap policy did not alter poverty rate and fertility decisions among control groups.

Since the explained variable, child birth and no child birth, is a restricted value between zero and one, the difference-in-difference model can be estimated from a probit model in a non-traditional way (see Puhani (2008)). Let a linear regression to estimate a treatment effect be defined as follow:

$$y_i = X_i\theta + \alpha + \beta Treat + \gamma FamCaps + \tau TreatxFamCaps \qquad (2.3)$$

where

y_i	is a continuous outcome of interest.
X_i	is a set of covariates.
θ	is a set of parameters associated to their covariates.
Treat	is an indicator of treatment group.
FamCaps	is an indicator of family cap policy.
TreatxFamCaps	is an interaction term.

The treatment effect on the treated at the time of treatment is:

$$\tau(T = 1, F = 1) = E[y^1|T = 1, F = 1, X] - E[y^0|T = 1, F = 1, X] \qquad (2.4)$$

Where y^1 is an outcome of treated group and y^0 is an outcome of untreated group. The expected counterfactual potential outcome of untreated group, y^0, conditional on the policy F (Family Caps), the group T (Treatment), and attributes X is specified as

$$E[y^0|T = 1, F = 1, X] = \alpha + \beta + \gamma + X_i\theta \qquad (2.5)$$

The potential outcome under treatment for a treated group is

$$E[y^1|T = 1, F = 1, X] = \alpha + \beta + \gamma + \tau + X_i\theta \qquad (2.6)$$

Equation 2.4 is derived from equation 2.5 and 2.6. The treatment effect on the treated during the time of treatment, τ, is simply identified by an interaction effect in a linear model 2.3. Nevertheless, the probit estimation is a non-linear function and the treatment effect on the treated group cannot be simply identified like the one in 2.3. A probit model is defined as follow:

$$Pr[Y_i = 1|X_i] = \Phi(X_i\theta + \alpha + \beta Treat + \gamma FamCaps + \tau TreatxFamCaps) \qquad (2.7)$$

or

$$E[Y|T, F, X] = \Phi(X_i\theta + \alpha + \beta Treat + \gamma FamCaps + \tau TreatxFamCaps) \qquad (2.8)$$

where

$\Phi(\cdot)$ is the standard normal distribution function $\in [0, 1]$.

Y_i is a childbearing decision of woman i.

     It equals one if she has an infant and equals zero otherwise.

X_i is a set of covariates.

θ is a set of parameters associated to their covariates.

Unlike the linear difference-in-difference model, the treatment effect from the non-linear difference-in-difference model cannot be achieved directly from the estimated parameter of the interactive term, τ, because group and policy differences in the conditional expectation of the bounded outcome Y are not constant and therefore α, β, and γ are not canceled out. According to equations 2.4 and 2.8, Puhani (2008) shows that the treatment effect in probit "difference-in-difference" model equals to

the difference in two cross differences as follow:

$$\tau(T = 1, F = 1, X) = \Phi(\alpha_0 + \alpha_1 + \alpha_2 + \alpha_3 + X\beta) - \Phi(\alpha_0 + \alpha_1 + \alpha_2 + X\beta) \quad (2.9)$$

The set of individual control variables X includes race[5], age, Marriageable Men Pool Index (MMPI), Metropolitan Statistical Area (MSA), motherhood status, participation in labor force, and wage rate. I also include a set of state-level variables such as covenant marriage laws, unilateral divorce laws, and unemployment rate[6].

It is common that women who anticipate childbearing, for instance, women during their last tri-semester of pregnancy until a born child are few-months matured, may self-select to drop out of the labor force and therefore their wage rates are censored. To account for any selection bias, I use the Heckman two-step selection model. The first stage is the specification of the selection decision to participate in the labor force in the format of cumulative distribution function of the standard normal distribution (Φ) with a vector of explanatory variables (Z) and a vector of unknown parameters (θ).

$$Pr(LFPR = 1 | Z) = \Phi(Z\theta + u_1) \quad (2.10)$$

where

LFPR   is a labor force participation rate. It equals one if a wage rate is observable.

Z is a set of covariates affecting a decision to join a labor force.

u_1 is a disturbance term with zero mean and unit variance.

Z in a selection model includes marital status, education attainment,age, age squared, race, presence of pre-school children, number of children, unemployment

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[5]Black, white, and hispanic.

[6]It is constructed by state and year from CPS data.

rate, EITC expansion, and welfare reform[7]. The wage equation is introduced in the second stage to correct for self-selection by incorporating a transformation of the predicted probability obtained from the first stage as an additional explanatory variable. The observed wage equation is identified as follows.

$$w^* = R\beta + u_2 \tag{2.11}$$

w^* denotes the observed wage rate deflated by the Consumer Price Index (CPI) if the selection equation 2.10 is greater than zero. R is a set of covariates affecting a wage rate. It includes education attainment, race, age, age squared, MSA, and median of female wage rate[8]. I use a median of female wage rate to capture the wage environment for women in each particular state and year. Ideally, occupation is a more precise variable to predict wage rates. However, occupations for women who are not in a labor force are unobservable and therefore wage rates estimated on occupation cannot be predicted for them. The Heckman two-step selection model also assumes the errors are jointly normal:

$$\begin{pmatrix} u_{1i} \\ u_{2i} \end{pmatrix} \sim N\left(\begin{pmatrix} 0 \\ 0 \end{pmatrix}, \begin{pmatrix} 1 & \rho \\ \rho & \sigma_u^2 \end{pmatrix} \right) \tag{2.12}$$

The conditional expectation of wages given the person works is then

$$E[w|X, Participate = 1] = X\beta + E[u|X, Participate = 1]$$

$$E[w|X, Participate = 1] = X\beta + \rho\sigma_u\lambda(Z\theta) \tag{2.13}$$

Equation 2.13 is a standard-form of heckman sample selection model where ρ

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[7]Both EITC expansion and welfare reform stimulate more labor force among the poor.

[8]I obtained a median of female wage rates by year and state from CPS data.

is the correlation between unobserved determinants of propensity to work, σ_u is the standard deviation of u, and λ is the inverse Mills ratio evaluated at $Z\theta$. When the same covariates appear in the selection equation and the equation of interest, the identification of the selection equation based on the normality assumption.

I then include the *estimated* probability of individual participation rate and the *estimated* wage rate obtained from the heckman two-step model into the set of control variables for the logit estimation of childbearing choices.

F.   Data

I use the March Current Population Survey (CPS) 1988–2002 (The Bureau of Labor Statistics and the Census Bureau (2005)). The data covers the periods of pre- and post-welfare reform. The monthly survey includes 50,000 households or approximately 120,000 individuals. I restrict my sample to women aged 15 to 44. The teenagers are women aged 15 to 19 and adults are women aged 20 to 44. I examine the effect of welfare reform among teenagers and adults separately.

I computed the live birth rate for women whose child is under 12 months old by March of each particular year of survey. The infant is an indicator for natality in each year. The fertility and live birth rates are different. Giving birth involves many decisions, beginning with sexual activity and contraceptive methods which might lead to a conception. After becoming pregnant, a woman decides either to interrupt [9] or carry her pregnancy to full-term. In order to give birth to a live infant, a woman must make these decisions in a particular set of choices.

Due to data limitations, I cannot obtain woman's history of sexual activity, contraceptive method, and abortion. However, the analysis of live births remain

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[9]I assume that miscarriages are exogenous.

important because it captures the end result of the effect of welfare reform. For policy makers it is also worthwhile to understand the effect of welfare reform on each particular stage which is not included in this study.

The live birth rate can be categorized into 2 types, i.e, non-marital (out-of-wedlock) and marital births. Women who do not have any infant will not contribute to a live birth rate.

For the analysis of the family cap policy on live birth rate, I constructed treatment and control groups by the order of births. The treatment group contains disadvantaged women who have at least two children prior to the interviewing year. I consider women whose family incomes fall below 10 percentile among women in each particular year and state as the disadvantaged group. I define 3 different control groups to ensure the quality of the estimated results. The control groups are defined as follows:

1. Control group 1: Disadvantaged women with one child prior to the interviewing year.

2. Control group 2: Non-disadvantaged women with at least two children prior to the interviewing year.

3. Control group 3: Non-disadvantaged women with one child prior to the interviewing year.

Welfare policy data on the timing and details of the welfare reform in each states were collected from the green book series (The Committee on Ways and Means of the U.S. House of Representatives (1996)) and the State Policy Documentation Project (SPDP) web site (The State Policy Documentation Project (2007)), from the pre- and post-reform[10]. The cash welfare value used in this study is a logarithm of deflated

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[10]For additional details, see Pakdeethai (2008).

maximum cash benefit for a family of three varied across states and years.

During the period under analysis, there was an expansion of the Earned Income Tax Credit (EITC) program introduced in 1975. EITC was modified in 1986, 1990 and 1993[11], and became the largest government cash-transfer program. The tax reforms increased EITC only for families with positive incomes. Even though the primary purpose of EITC is to encourage the working poor to work more, the tax credit schedule, that differentiates families by numbers of children has an impact fertility decisions. Families without children were not eligible for EITC until 1993 whereas families with children were eligible for EITC[12]. Since the 1990 reform, however, families with at least two children qualify for the larger credits than do families with only one child. As a result, prior to 1993, families with no children had an incentive to have children and the incentive disappeared after 1993. Families with only one child also have an incentive to conceive more children when EITC pays higher credits to families with two or more children after 1990. The EITC different incentives for childbearing depending on the number of children the families already have.

In addition, there are marriage-related laws that may affect the fertility choices (inside and outside wedlock). These laws include unilateral(no-fault) divorce laws and covenant marriage laws[13] enacted by different states at different points in time. Most states switched laws from mutual consent to unilateral or no-fault divorce between 1970-1985 prior to my analysis. Only twenty out of fifty-one states still have mutual divorce laws. Optional covenant marriage laws in which the marrying couple agree

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[11]The Omnibus Budget Reconciliation Acts(OBRA) of 1990 and 1993.

[12]The tax credit paid to any working-poor families with children were subjected to the same scheme regardless a number of children.

[13]It is more difficult for couples who have a legal covenant marriage to obtain a divorce. Cause for divorce is typically limited to abuse, a felony with jail time, or adultery.

to obtain pre-marital counseling and accept more limited grounds for divorce is legal in only 3 states; i.e, Louisiana(1997), Arizona(1998) and Arkansas(2001).

Summary statistics for the data used in this paper are reported in table I. The table is divided into two periods, before and after the welfare reform. The overall birth rate rose from 4.9 to 6 child births per 100 women[14] after the reform was implemented. Both increases in out-of-wedlock and marital births account for this trend. Attributes such as age, wage, and Men Marriageable Pool Index (MMPI) remain stable throughout the sampling period. However, there is a lower female unemployment rate during the mid 90's and women aged 20–44 seemed to participate less in the labor force during the same period of low unemployment rate. Unsurprisingly, the average welfare cash benefit dropped with the reform.

G.   Estimation Results

The labor force participation equation includes some variables that do not appear in the wage equation. They are marital status, number of children prior to the interviewing year, presence of pre-school children, unemployment rate, EITC expansion[15], and welfare reform[16]. Table II reports the estimated selection and wage equations using the Heckman Two-Step Selection Model. Married women self-select to not join the labor force. The omitted category of education variable is "less than 1st grade"[17] and

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[14]Aged 20–44.

[15]the Omnibus Budget Reconciliation Acts(OBRA) in 1990 and 1993. It is coded to one if a woman is childless between 1994 to 2004 or she has children between 1991 to 2004.

[16]It is a share of year that welfare reform is in effect (from March$_{t-1}$ to March$_t$) if a woman with children lives in a state where either the waivers or TANF are in effect; it is zero otherwise.

[17]Of all women in the sample, point three percents obtain education less than the first grade.

the estimates reported in the selection equation show the increasing likelihood of participating in the labor force as women acquire more education. Having any pre-school children also causes a negative effect on joining the labor force. The EITC expansion program (OBRA) also encouraged labor force participation among women with children; however it discouraged it among women without children. As expected, the welfare reform increases the probability of labor force participation for women with children. ρ is negative and strongly significant which can be interpreted as evidence that the unobserved characteristics sorting women to participate in the labor force are negatively correlated with the unobserved characteristics in wage rate.

Table III reports the Relative Risk Ratio (RRR) estimates from the multinomial logit model of women's childbirth choices controlling for individual characteristics. The base choice is "no childbirth" and other two choices are "out-of-wedlock birth" and "marital birth". Model (1) does not control for state or year fixed effects; model (2) accounts state fixed effects; and model (3) controls for year fixed effects. Due to the fact that I use cross-state variation in the times of welfare reform implementation as an identification method (see figure 1), I cannot control for both state and year fixed effects. However, I partially control state-year specific effects through several state-year variables of birth-related decision such as unemployment rate, covenant marriage law, unilateral divorce law, age and race composition, percentage of female, percentage of samples living in MSA, and percentage of high school dropouts.

EITC expansion in which the eligibility is contingent on child presence statistically increases the probability of both out-of-wedlock and marital births. The effect of welfare cash benefit is evaluated in a log form; however, it cannot be interpreted directly as a percentage change in welfare benefit because of the nonlinear estimation. There is sufficient evidence suggesting that welfare cash benefits raise the probability of having an out-of-wedlock birth but lower the probability of a marital birth. The

period during which welfare reform is in the effect shows a strong upward trend of both marital and non-marital births. From now on I will focus my analysis on year fixed effect model because birth rates impose a strong time trend that should be controlled for and majority of my control variables such as state unemployment rate, percentage of high-school dropouts, percentage of MSA, etc. is more state-specific and therefore state fixed effect would have been already partially controlled for.

There is evidence of racial response difference to the welfare program documented in the literature. I therefore analyze the effect of welfare separately for blacks and whites as reported in table IV. The first column in table IV is specification (3) in table III where year fixed effects are controlled for. The second column reports the estimates using only black women and the third column uses only whites. The effect of EITC is consistent across races; although the magnitudes are slightly different. For example, blacks are almost 4 times more likely to have an out-of-wedlock birth than having no birth compared to whites that are more than 6 times more likely. The welfare reform does not affect any out-of-wedlock birth for both blacks and whites. However, it increases a marital birth among whites by 18 percentage points when compared to no childbirth.

The welfare reform not only implemented many new policies but it also adjusted the existing policies. Welfare policies vary across states and times. The welfare program is composed of four main policies: cash benefits, time limits, earned income disregards, and work sanction. Each policy is categorized into three levels depending on their benefits and restrictions. The details are described in the appendix. Table V reports the effect of welfare policies on childbirth choices.

A high level of cash benefit insignificantly increases the likelihood of out-of-wedlock births by 15 percentage points and it insignificantly decreases the marital birth by 6 percent when compared to the likelihood of having no childbirth. The cash

benefits mainly provided to single mothers attracts women to bear children out-of-wedlock because the pecuniary cost of child rearing decreases and therefore the utility of having out-of-wedlock children increases. Relatively to a choice of no birth, the utility of having children inside the wedlock decreases because the alternative choice, i.e, out-of-wedlock birth, becomes more attractive when the government provides more transfer.

Time limits do not have any impact on either out-of-wedlock or marital births. Earning disregards significantly decreases the probability of marital births. Work sanction also significantly decreases birth rates in both statuses. I combine work sanction and earning disregards into the direct work incentives. The statistical result shows a strong and consistent evidence such that the strong work incentives suppress birth rates in both marital and non-marital scenarios suggesting that child bearing becomes less attractive when women are more exposed to working environment. Consistent with hypothesis of Grogger, Karoly, and Klerman (2002) I also find that the restrictive welfare rules increases marital birth probability by 15 percents whereas an out-of-wedlock birth is left unaffected.

Teenager behavior in childbearing is always treated with a great concern as these potentially young mothers are immature psychologically and financially. Majority of teen mothers drops out of school and are in poverty. The children born to teen mothers also suffer from adverse effects that carry out through their lifetimes (For example, see Hunt (2006)). The effect of welfare reform on teen's choices of childbirth by race is reported in table VI. There is no significant effect of welfare reform on teenage childbirth in neither the pooled samples of blacks and whites nor race-specific analysis.

Family caps is the major policy implemented during the welfare reform in an attempt to gain some control in fertility decision among the recipients. Table VII

reports the difference-in-difference estimates on birth rates using three different control groups. The treatment group is disadvantaged women who have at least 2 prior children before the interviewing year. The top panel reports the estimates without controlling for individual characteristics and the bottom panel reports the estimates with the characteristics control. The effect of family caps is very strong and robust across control groups and characteristics control. The family caps gain the expected decrease in birth rates for which it is designed. However, the results shown in table VII is inappropriate for magnitude interpretation due to the nonlinearity nature of the probit model. Table VIII accounts for this issue by following the method proposed by Puhani (2008). The last column in table VIII (Diff-in-Diff) is the effect of family caps in percentage points. The family caps reduce childbirth by 13 to 18 percentage points without controlling for the individual characteristics. When characteristics are accounted for, the negative effect of family caps on childbirth range between 0.12 and 5 percentage points.

H.   Conclusion

The welfare program was reformed in different degrees across states and times to account for the rising trends in teenage motherhood, out-of-wedlock birth, and female headship. This paper exploits the cross-state variation in welfare reform implementation during 1992 to 1998 to identify the effect of welfare reform on out-of-wedlock and marital child births. The welfare reform is identified as effective if states either adopt the welfare waivers or the TANF. I use the Current Population Survey (CPS), March supplement to set up the data set composed of unmarried women with infants, married women with infants, and women without infants. The infant is an indicator for natality in each particular year during the sampling period.

This study finds a positive overall effect of welfare reform on marital birth likelihood as compared to the likelihood of no childbirth. The out-of-wedlock birth in year fixed effect specification seems to decrease as a result of welfare reform as well, yet this effect is not significant. These results are consistent across different races.

Besides the overall effect of welfare reform, it is also interesting to policy makers to understand how each welfare components, such as cash benefits, time limits, earning disregards, and work sanctions, affect childbirth choice. I categorize each welfare policy into 3 levels according to the criteria proposed by Blank and Schmidt (2001) and adjusted by Pakdeethai (2008). I find that the strong work incentives, defined as a combination of strong work sanction or high earning disregards, have a strong negative effect on natality in both marital and non-marital statuses which suggests that additional child bearing becomes less attractive when women are more progressive in career. The restrictive welfare rules significantly increase marital birth. This result supports the hypotheses of Grogger, Karoly, and Klerman (2002).

Family cap policies are the only reforms directly aimed to reduce the childbirth rates among welfare recipients. I use the difference-in-difference estimation comparing the treatment group with 3 different comparison groups by birth order. As expected, the empirical results show a strong and consistent negative effect of family caps on additional child births.

I estimate childbirth choices made by teenagers separately from the adults due to the vast different nature of the subject. The overall effect of welfare reform do not statistically affect the teenage's child births. Nevertheless, there is evidence of race-specific response to the welfare reform. Unlike adults, the black teenagers seem to respond differently to the white counterparts in terms of magnitude and direction. For example, the probability of marital birth among black teenagers significantly decreased as a result of the welfare reform but the probability of marital birth among

whites increased, although insignificantly.

CHAPTER III

THE EFFECT OF WELFARE REFORM ON MARRIAGE AND DIVORCE

A. Introduction

The federal welfare program Assistance to Families with Dependent Children (AFDC) was the main financial support to single-parent families for many years. Poor single mothers with children were the most common beneficiaries of this program. Two-parent families who satisfied certain requirements were qualified for a separate welfare program entitled Assistance to Families with Dependent Children with Unemployed Parents (AFDC-UP). The objective of these programs was helping poor families overcome transitory economic hardship. Nevertheless, the opponents to these programs claimed that the AFDC regime discouraged marriage and eventually raised many social and family-related problems such as the increase in teen motherhood, out-of-wedlock birth, and others.

In 1996 the Personal Responsibility and Work Opportunity Reconciliation Act (PRWORA) replaced AFDC with the Temporary Aid to Needy Families (TANF) program. TANF introduced several new rules and policies which dramatically changed the incentives for potential welfare recipients. During 1992–1997, prior to the implementation of TANF, the Department of Health and Human Services (DHHS) granted several AFDC waivers to a number of states to test a variety of welfare reform strategies. Thirty-one out of fifty-one states were authorized to set up their own experimental programs with different welfare policies such as time limits, work requirements, increased earnings disregards, etc. After these experiments, some of the waivers were integrated into the official TANF which all states must comply with. A fundamental guideline of TANF is attempting to lead its beneficiaries to be economically self

sufficient. Block grant funding is allocated to each state in order to find the most suitable manner to help beneficiaries reach this objective given the circumstances of the state.

In principle, the changes in the welfare reform cause both mechanical and behavioral effects on individual decisions about family formation. For example, the implications of time limits and work requirements make TANF less attractive. The degree of *welfare aggressiveness*, i.e., lenient benefit generosity, strict time limits, high earnings disregards, or strict work requirements, varies across states and time as states set up their own programs. These restrictive welfare rules lead to a substantial reduction in welfare use. In response to the new welfare regime, individuals re-optimize their fertility, marriage, welfare-use, and work decisions mechanically and behaviorally. The mechanical effects refers to the eligibility restriction. There are two types of mechanical effects on the marriage and divorce decisions; i.e., AFDC-UP availability and time limits. Living in a state which does not provide AFDC-UP, a single mother is less likely to be married as she will lose her entitlement to the welfare benefit. Time limits allow an individual to receive welfare for at most 60 months. Welfare becomes unavailable to a recipient after she exhausts the time limits. Behavioral effects refer to the variations in individual decisions arising from the changes in the optimal choices in response to the new rules of the welfare programs.

While many papers attempt to assess the impact of the TANF regulations of each state on marriage, only a few studies (for example, Bitler et al. (2004)) have done this using post welfare-reform and nation-level data. There is a handful of papers either simulating the post-reform data to predict the effect of the reform on individual behavior (for example, Swann (2005)) or investigating the reform effect in specific state-wide programs (for example, Gennetian and Miller (2004)). Policy simulations of the AFDC in Swann (2005) suggest that the new elements of welfare reform such

as time limits and work requirements prolong the marriage spell. Gennetian and Miller (2004) found that the welfare experiment in Minnesota increased marriage rates among single parent long-term recipients and increased marital stability among two-parent recipient families. However, using state-level marriage and divorce rates from the Vital Statistics, Bitler et al. (2004) found that TANF and waivers decreased both marriage and divorce.

In this paper I use micro data to assess the effect of welfare reform on marriage and divorce among women. My results complement those found by Bitler et al. (2004)). Since Bitler et al. (2004) study is limited to only marriages and divorces of the whole population, it does not provide an analysis of the family formation decisions of disadvantaged women who are most likely to be affected by the reform. I provide a fairly simple static model of individual choice including welfare and family formation decisions in order to obtain a number of hypotheses which can be contrasted with the data. I measure marriage and divorce likelihood by using a flow into and out of marriage. I match individuals in the March Current Population Survey (CPS) from 1988 to 2002, covering the pre- and post-reform periods, and observe their changes in marital status. The different welfare policies adopted by the different states allow me to identify the effect of each major welfare policy. Similarly, I use cross-state variation in the timing that the welfare reform was adopted to identify the overall effect of welfare reform.

Using probit estimations, I find that the welfare reform decreased marriage; however, it had no effect on divorce. The result is driven by a strong negative effect of work incentives on family formation. The difference-in-difference models allow for an analysis of the impact of welfare reform on disadvantaged women. Among disadvantaged women, I find that the welfare reform had a negative effect on marriage but did not significantly affect divorce. The mechanical effect of AFDC-UP program

strongly impacts marriage and divorce as predicted. Interestingly, I find that the aggressiveness of welfare reform had a positive effect on marriage. Marriage becomes more attractive when the welfare is more intricate to obtain. The results are robust when control for the individual characteristics. These empirical observations are consistent with the predictions of the theoretical model described in this paper. Overall, these results provide a detailed explanation of the mechanisms behind the effect of the reform on marriage.

B. Literature Review

In the last decade, a number of papers have analyzed the impact of welfare reform on many different aspects: labor market, out-of-wedlock and teen births, the marriage rate, female headship, etc. In this section, I highlight the main contributions and show how the results in this paper contribute to this line of research.

Swann (2005) proposed a structural model to analyze the decisions related to the optimal duration of employment, welfare use, and mariage spells. Using the PSID dataset[1] in which all employment, welfare use, and marriage spells are observed, he can predict the changes in behavior and time spent in each state given a change in any component of the AFDC program; i.e., cash benefits, benefit reduction rates, time limits, and work trigger. His results suggest that marriage spells, regardless of employment status, increase due to the effect of time limits. Also, work trigger leads women to stay married longer. A decrease in benefit reduction rates, however, shortens marriage spells. These results suggest that womens marriage decision is affected by welfare policy changes.

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[1]His sample contains women when they finish school or establish their own household, and they leave the sample either when they leave the PSID through attrition or in 1992 prior to the welfare reform.

Blackburn (2000) hypothesizes that generous welfare benefits lead to fewer marriages and less work among single mothers. Therefore, the AFDC program would have lead to an increase in the percentage of families headed by unmarried women. Marriage is less likely when welfare benefits are high because receiving welfare income is contingent on being unmarried. Applying the hazard rate model on the NLSY79 data set, he found that higher welfare payments lower the probability of being married among non-black, never married mothers; whereas they are associated with a higher probability of being married for black, never married mothers.

Moffitt (1990) uses cross-sectional data to investigate the effect of the AFDC program on marital status of both men and women. The empirical results show weak correlations. However, the magnitude and significance have grown over time. In addition, correlations for men are stronger than those for women. Overall these results suggest that the generous benefits of the welfare program decrease the incentives to be married.

Klerman and Haider (2004) provide an alternative method to estimate the impact of economic conditions on welfare caseload by focusing in a flow measure of program beneficiaries. They study the data of California and find that an estimate is appreciably larger than that obtained from static stock measure. Bitler et al. (2004) apply a similar procedure by obtaining marriage rates at state-level from the Vital Statistics. They find that the welfare reform has led to lower divorce and marriage rates in relation to the whole population. However, a more meaningful measure of marriage rates should consider only the people who are potentially marriageable and not the whole population. A similar argument applies to the measure of divorce rates. In addition, as suggested by Moffitt (1990), men and women may respond differently to the change in the welfare reform. Since the Detailed Vital Statistics, which record all marriages and divorces by demographic variables, are available only until 1995,

this study cannot measure the effect of the reform for different groups of interest such as low-income women. The welfare reform should strongly affect low-income women with dependent children, therefore, it is worthwhile to focus on the effect of welfare reform on the groups which are most likely to be affected by it.

C. Contribution

By matching individuals across two consecutive years in the March CPS data, I obtain marriage rates from the change in the marital status of the matched sample. In addition to the traditional matching, I introduce a new procedure, namely *converse matching*, which allows me to identify women who change marital status and address at the same time. Women who change their address as they get married are not in the same household in two consecutive years; therefore, they cannot be matched. In order to take into account these women among those who change their marital status, I observe men who appear in two consecutive years whose marital status changes from "unmarried" in $t-1$ to "married" in t. If their newlywed wives just move into the sampled households in t, then I consider these women as a match whose marital status changes from "unmarried" in $t-1$ to "married" in t (see more details in section 1) and collect their information. I obtain divorce rates in a similar fashion.

The welfare reform is a change in government policy which affects the whole nation. However, the disadvantaged group such as low-income women is most likely to be affected by it. In contrast to state-level total marriage and divorce rates of the whole population used in Bitler et al. (2004), using a micro-level data set consisting of individual- and family-level characteristics allows for cross-group comparisons. Therefore the Difference-in-Difference approach is possible. The effect of the reform is identifiable from the cross-state variation in the time when the welfare reform, either

waiver or TANF, whichever comes first, was adopted.

TANF incorporates many new components; i.e., time limit, work requirement, and eligibility for two-parent family. These changes may affect marriage decision differently. In the section E I analyze a utility maximization model. Even though I do not assume a specific utility function, the model provides sharp predictions about the static response to changes in different welfare components.

One of the most important aspects of the welfare reform is work encouragement. Work incentives play an important role in marriage decision among women. Nevertheless, the sign of this effect may be ambiguous. If the *self-sufficiency* effect dominates the effect of increased marriageability in the mating market, then strong work incentives should have a negative impact on new marriages and vice versa. In order to identify the effect of work incentives, I use the index proposed by Blank and Schmidt (2001). This index has three categories, weak, mixed, and strong; and measures the degree of benefit generosity, earnings disregards, work sanction, and time limit across states and years. In addition to work incentives, I define the degree of welfare aggressiveness which measures the level of welfare generosity in terms of high cash benefit, lenient time limit, lenient work sanction, and high earned income disregard. More details are available in section 3.

D.   Objectives and Hypothesis

First, in this paper I investigate the overall effect of the welfare reform on the flow of women into and out of marriage. Second, I estimate the effect of welfare reform components on marriage and divorce decisions. The identification comes from cross-state variation in policy parameters. Due to the flexibility in implementing the welfare reform and the fact that each state could implement its own welfare program (within

some general restrictions), there are many differences in welfare policies across states and time. The welfare policy affects marriage decisions not only among women but also among men (Moffitt (1990)). In order to quantify the change in marriage decisions during 1989-2002, I construct a variable which measures marriage rates as a flow. These flow variables, marriage and divorce rates, are more appropriate than the proportion of marriage, for detecting an immediate impact of the welfare reform (Klerman and Haider (2004); Bitler et al. (2004)).

The overall effect of welfare reform on marriage and divorce decisions is ambigous as it operates through many channels:% through many channels.

1. Mechanical effect: The reformed AFDC-UP program, and its less restrictive rules for married couples, encouraged welfare recipients to combine welfare and marriage. This should have a positive effect on marriage rates.

2. Behavioral effect:

   - Work-incentive rules such as work requirement and the increase in earned income disregard may have an ambiguous effect on marriage. Once a woman works, a greater pool of potential mates is accessible through the workplace. The increase in supply of potential mates results in a higher probability of matching in the marriage market. However, a *self-sufficiency effect* may also occur when a working woman becomes financially independent. Blau and Kahn (2000) found that, as a result of the decline in the gender wage gap, the comparative advantage of wives at home has declined, driving an increased share of men into home production and reducing the value of specialization within marriage. The self sufficiency effect therefore has a negative (positive) impact on marriage (divorce) decisions.

   - Aggressiveness of the welfare policy such as low benefit levels, strict time

limits, and strong work-related rules may turn marriage into a more attractive alternative than it was before the reform. A woman with large disutility parameter from mandatory working and less generous benefits may find in marriage a more attractive alternative. It is also possible that the restrictive welfare program discourages potential welfare recipients from receiving welfare and encourages them to acquire more education and delay marriage.

I also construct a static model of individual maximization to identify the relationship between welfare parameters and marriage gain. The main objective is to make predictions which disentangle the effects of several family-formation related elements of the new welfare reform. The comparative static analysis described in the next section yields several testable hypotheses regarding the effects of each welfare component over the marriage gains. In particular (1) the maximum cash benefit has a negative effect; (2) earnings disregards has a negative effect; (3) work requirement has a positive effect; and (4) Earned Income Tax Credit (EITC) expansion has an ambiguous effect.

E. Theory

In this section I set up a model to examine the relationship between changes in different policy parameters and family formation decisions. The analysis focuses on the utility maximization problem solved by women who simultaneously make decisions about family formation and welfare use. Solving this problem aims to analyze the marriage gain in response to the changes in the major components of welfare reform. These changes relate to maximum benefit levels, earned income disregards, and work requirements among others. Any female eligible for welfare benefits solves

the following utility maximization problem.

$$MAX_{h_f,C,T,M}U(h_f,C,T,M) = U(h_f,C) - \delta T + \eta M$$

subject to

$$C = (1-M)w_f(1-\tau)h_f + M(1-\tau)(w_fh_f + w_mh_m)e^{-\gamma}$$

$$+ T(1-M)B^S + TMB^Me^{-\gamma} + N$$

$$B^S = G - (N + t(w_f(h_f + h^r) - E))$$

$$B^M = G - (N + t(w_f(h_f + h^r) + w_mh_m - E))$$

The Lagrangian can be written as

$$L = U(h_f,C) - \delta T + \eta M - \lambda[C - (1-M)w_f(1-\tau)h_f$$

$$- M(1-\tau)(w_fh_f + w_mh_m)e^{-\gamma} - N - T(1-M)B^S - TMB^Me^{-\gamma}]$$

All prices are normalized to P_c where

C is a consumption good

h_f is female's hours worked

h^r is additional hours worked required by welfare

M is marital status, $M = 1$ if married and $M = 0$ otherwise

T is welfare status, $T = 1$ if on welfare and $T = 0$ otherwise

δ is stigma effect.

η is a parameter measuring preference for marriage.

h_m is given male's hours worked.

w_f is female's wage rate.

w_m is male's hours worked.

τ is earned income tax rate or positive earned income tax credit(EITC)

$e^{-\gamma}$ is female's bargaining power on couple's earned income

N is non-labor income

B^S is the welfare benefit for single women

B^M is the welfare benefit for married couples

t is the benefit reduction rate (BRR) or negative income tax

G is the maximum welfare benefit

Four choice variables, hours worked (h_f), consumption good (C), marital status (M), and welfare receipt (T), are chosen. Hours worked and consumption are continuous variables whereas marital status and welfare use are binary variables. To solve this problem, I hold M and T constant and solve for the optimal solution of $\{h_f^*, C^*\}$ at each marital and welfare status. In sum, there are 4 states for consideration; i.e., single and no welfare use $(M = 0, T = 0)$, single and welfare use $(M = 0, T = 1)$, married and no welfare use $(M = 1, T = 0)$, and married and welfare use $(M = 1, T = 1)$. Then women choose the state at which her utility is maximized.

	T=0	T=1
M=0	$U^1(h_{00}^*, C_{00}^*)$	$U^2(h_{01}^*, C_{01}^*)$
M=1	$U^3(h_{10}^*, C_{10}^*)$	$U^4(h_{11}^*, C_{11}^*)$

For example, a woman will choose to be in the state 1 (single and no welfare use), and correspondingly $\{h_f^*, C^*\}$ if $U^1(h_{00}^*, C_{00}^*)$ is greater than $U^2(h_{01}^*, C_{01}^*)$, $U^3(h_{10}^*, C_{10}^*)$, and $U^4(h_{11}^*, C_{11}^*)$.

The first-order conditions impose the optimal choices of h_f^* and C^* to satisfy

$$\frac{-U_1}{U_2} = w_f[(1 - M) + M(1 + \frac{w_m}{w_f}h_m)e^{-\gamma} - T(1 - M)t_s - TMt_m].$$

Specifically, assuming an interior solution, I obtain

$$\frac{-U_1}{U_2} = w_f[1 - \tau]$$

$$\frac{-U_1}{U_2} = w_f[1 - \tau][(1 + \frac{w_m}{w_f}h_m)e^{-\gamma}]$$

$$\frac{-U_1}{U_2} = w_f[1 - t]$$

$$\frac{-U_1}{U_2} = w_f[1 - t][(1 + \frac{w_m}{w_f}h_m)e^{-\gamma} - t]$$

for $\{M, T\} = \{0, 0\}$, $\{M, T\} = \{1, 0\}$, $\{M, T\} = \{0, 1\}$, and $\{M, T\} = \{1, 1\}$ respectively. As a result, optimal solutions for h_f^*, C^*, M^*, T^* are functions of the exogenous variables, including welfare parameters:

$$C^* = d_c(w_f, w_m h_m, e^{-\gamma}, \delta, \eta, N, G, t, E, G, t)$$

$$h_f^* = s_h(w_f, w_m h_m, e^{-\gamma}, \delta, \eta, N, G, t, E, G, t)$$

$$M^* = d_M(w_f, w_m h_m, e^{-\gamma}, \delta, \eta, N, G, t, E, G, t)$$

$$T^* = d_T(w_f, w_m h_m, e^{-\gamma}, \delta, \eta, N, G, t, E, G, t).$$

Here d_c is the demand for the consumption good, s_h is the supply of labor, d_M is the demand for marriage, and d_T is the demand for welfare assistance. Let V_{MT} be the utility of a woman with marital status $M \in \{\text{single, married}\}$ and welfare status $T \in \{\text{off welfare, on welfare}\}$. The optimal utility functions for each state are given by

$$V_{00} = V_{00}(c_{00}, 1 - h_{00}, w_f[1 - \tau])$$

$$V_{10} = V_{10}(c_{10}, 1 - h_{10}, w_f[1 - \tau][(1 + \frac{w_m}{w_f}h_m)e^{-\gamma}], \eta)$$

$$V_{01} = V_{01}(c_{01}, 1 - h_{01}, w_f[1 - t], G, E, -\delta)$$

$$V_{11} = V_{11}(c_{11}, 1 - h_{11}, w_f[1 - t][(1 + \frac{w_m}{w_f}h_m)e^{-\gamma} - t], G, E, -\delta, \eta).$$

The expected utility gained by getting married, denoted by F, is given by the difference between the expected utility obtained from being married and the expected utility obtained from not being married. Therefore

$$F = E[V_{10}, V_{11}] - E[V_{00}, V_{01}]$$
$$= [pV_{10} - (1-p)V_{11}] - [qV_{00} + (1-q)V_{01}],$$

where p is the probability of receiving welfare conditional on being married and q is the probability of receiving welfare conditional on being single.

A standard comparative static exercise allows me to analyze the effects of changes in policy parameters on the expected gained from getting married. Let $V(z)$ be the indirect utility function of the maximization problem where z represents policy parameters:

$$V(z) = max_{C,h_f} U(C, h_f; z).$$

Using the Lagrange-Envelope theorem (for example, see Simon and Blume (1994)), the total derivative of the indirect utility is just the partial derivative of the Lagrangian with respect to the change in the corresponding policy parameter, i.e.,

$$\frac{d}{dz} V(C^*(z), h_f^*(z); z) = \frac{\partial L}{\partial z}(C^*(z), h_f^*(z), \lambda(z); z).$$

where L is the lagrangian function and $\lambda(z) \geq 0$ is the lagrange multiplier. In particular,

1. The effect of a change in the maximum benefit generosity, G, is given by

$$\begin{aligned}
\frac{dF}{dG} &= \frac{\partial([pV_{10} + (1-p)V_{11}] - [qV_{00} + (1-q)V_{01}])}{\partial G} \\
&= \frac{\partial(1-p)V_{11}}{\partial G} - \frac{\partial(1-q)V_{01}}{\partial G} \\
&= (1-p)\lambda e^{-\gamma} - (1-q)\lambda \\
&= \lambda[(1-p)e^{-\gamma} - (1-q)] \\
&< 0.
\end{aligned}$$
(3.1)

$\frac{dF}{dG}$ is negative because the proportion of welfare recipients who are married, $1-p$, is less than the proportion of welfare recipients who are single, $1-q^2$. In addition, $e^{-\gamma} \in [0,1]$; as a result, the change in the maximum benefit generosity, G, has a negative effect on the expected utility gained by getting married.

2. The effect of a change in the earned income disregard, E, is given by

$$\begin{aligned}
\frac{dF}{dE} &= \frac{\partial([pV_{10} + (1-p)V_{11}] - [qV_{00} + (1-q)V_{01}])}{\partial E} \\
&= \frac{\partial(1-p)V_{11}}{\partial E} - \frac{\partial(1-q)V_{01}}{\partial E} \\
&= (1-p)\lambda e^{-\gamma} - (1-q)\lambda \\
&= \lambda[(1-p)e^{-\gamma} - (1-q)] \\
&< 0.
\end{aligned}$$

Therefore, a change in the earnings disregards, E, has a negative effect on the expected utility gained by getting married.

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[2]Only 1.76 percents of all married women aged 15-44 is on welfare where as 8.84 percents of all single women aged 15-44 is on welfare (Source: March CPS 1988b-2002).

3. The effect of a change in the work requirement, h^r, is given by

$$
\begin{aligned}
\frac{dF}{dh^r} &= \frac{\partial([pV_{10} + (1-p)V_{11}] - [qV_{00} + (1-q)V_{01}])}{\partial h^r} \\
&= \frac{\partial(1-p)V_{11}}{\partial h^r} - \frac{\partial(1-q)V_{01}}{\partial h^r} \\
&= (1-p)\lambda(-tw_f)e^{-\gamma} - (1-q)\lambda(-tw_f) \\
&= -\lambda tw_f[(1-p)e^{-\gamma} - (1-q)] \\
&> 0
\end{aligned}
$$

A change in the work requirement, h^r, has a positive effect on the expected utility gained by getting married.

4. The effect of a change in the positive Earned Income Tax Credit, τ, is given by

$$
\begin{aligned}
\frac{dF}{d\tau} &= \frac{\partial([pV_{10} + (1-p)V_{11}] - [qV_{00} + (1-q)V_{01}])}{\partial \tau} \\
&= \frac{\partial[pV_{10} + (1-p)V_{11}]}{\partial \tau} - \frac{\partial[qV_{00} + (1-q)V_{01}]}{\partial \tau} \\
&= -p\lambda w_f h_f e^{-\gamma} - (1-p)\lambda w_f(h_f + h^r)e^{-\gamma} - q\lambda w_f h_f - (1-q)\lambda w_f(h_f + h^r) \\
&= \lambda w_f[(h_f + h^r e^{-\gamma}) + ph^r e^{-\gamma} - (h_f + h^r) + qh^r] \\
&= \lambda w_f h^r(e^{-\gamma}(1+p) + q - 1) \\
&> 0.
\end{aligned}
$$

For simplicity, I assume $e^{-\gamma} = 1$ which means all of husband income goes into the budget constraint as a non-labor income, then $\frac{dF}{dh^r} > 0$. As a result, the expansion in the Earned Income Tax Credit should raise the expected utility gained by getting married.

5. The effect of a change in the AFDC-UP availability, $1 - p$, is given by

$$\frac{dF}{dp} = \frac{\partial([pV_{10} + (1-p)V_{11}] - [qV_{00} + (1-q)V_{01}])}{\partial p}$$

$$= \frac{\partial pV_{10}}{\partial p} + \frac{\partial(1-p)V_{11}}{\partial p}$$

$$= V_{10} - V_{11}$$

$$< 0$$

$$\frac{dF}{d(1-p)} = \frac{dF}{dp} * \frac{dp}{d(1-p)}$$

$$> 0.$$

Assuming a utility if married and receive welfare (V_{11}) is greater than a utility if married and receive no welfare (V_{10}). As a result, the mechanical effect of AFDC-UP availability has a positive effect on the expected utility gained by getting married.

6. The effect of a change in the welfare restriction, (δ), is given by

$$\frac{dF}{d\delta} = \frac{\partial([pV_{10} + (1-p)V_{11}] - [qV_{00} + (1-q)V_{01}])}{\partial \delta}$$

$$= \frac{\partial(1-p)V_{11}}{\partial \delta} - \frac{\partial(1-q)V_{01}}{\partial \delta}$$

$$= -(1-p) + (1-q)$$

$$> 0.$$

An aggressive welfare rule with the strict time limits, low benefit generosity, strong work sanction, and low earned income disregard implies a stronger degree of stigma as denoted by an increase in δ. Theoretical comparative static analysis concludes that an aggressive welfare rule should increase the marriage gain.

These theoretical results yield testable hypotheses. Empirically, higher marriage

gains lead to a higher probability that a woman gets married. The following sections describe the data and empirical methodology used to test the aforementioned hypotheses.

F. Data

There are two sets of data required for this analysis, i.e., individual-level and welfare policy data.

1. Individual-level Data: March Current Population Survey

I construct a flow measure of marriage rate obtained from micro data. I match individuals from the cross-sectional March CPS 1988B-2002[3] across two consecutive years. The advantage of CPS data is that its sample size swamps all alternative sources of panel data and the rotating design guarantees continual refreshing. The alternative data sets such as PSID, NLSY, and SIPP embody individual fixed effect and are not nationally representative for each other year. Monthly, CPS interviews approximately 130,000-160,000 individuals. There are 8 rotation groups. Each rotation is interviewed for 4 consecutive months and discontinued for the next 8 months and re-interviewed again for the following 4 consecutive months before it is removed from the sample. Therefore in the CPS data, I can identify an individual who has been sampled in two consecutive years if he/she lives in the same housing unit in March of year $t - 1$ and March of year t[4]. The sample with month-in-survey 1-4 in

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[3]In 1989 the Census bureau changed the way data was processed, cleaned, and edited. Some variable definitions changed, new variables (census recodes) appeared, and others disappeared. Thus, the Census took the raw 1988 data, processed it using the 1989 techniques and released it as a Bridge file, 1988B.

[4]As in most of the literature, I choose March to match the individuals from one year to the next.

year $t-1$ is matched with the sample with month-in-survey 5-8 in year t, respectively.

An individual sample is recorded as a match if (s)he lives in the same household with the same line number, gender, race, and age (see Madrian and Lefgren (1999)). I allow some variations in person's age in this matching process[5]. I also record sample of women who did not appear in year $t-1$ but then appear as they move into the sampled households in year t due to new marriages to the matched men. I call this procedure converse matching. I record changes in marital status of matched men and then collect their spouse information even if she appears only in the second period. Her change in marital status is inferred from the matched spouse's. Similarly, I can observe matched men who get divorced. If their ex wives remained in the household in year $t-1$ prior to the divorce and move out in year t, then these women are recorded as a matched sample whose marital status changes from "married" to "divorce". This procedure yields a unique matched CPS data. Welch (1993) matched the March CPS from 1979 through 1991 files using two stages. The sampled was matched in the first stage according to a traditional matching. Those remaining unmatched were then matched without reference to the line number. I did not use Welch (1993) second step in matching, rather I matched more samples using the converse matching procedure. Though, my matching rate is similar and com- parable to Welch (1993).

The matching rates for whites and blacks by age are provided in figures 2 and 3. The matching rate shown is a combined matching rate in the first and second year in sample[6]. The matching rate for young female is relatively lower than the older

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[5]It is possible that a person ages 0-2 years from the interview in the previous March.

[6]For example, the matching rate in 1989 is a percentage of the matched sample in month-in-survey 1 to 4 in 1989 that were matched with the sample in month-in-survey 5 to 8 in 1990 *and* a matched sample in month-in-survey 5 to 8 in 1989 that were matched with the sample in month-in-survey 1 to 4 in 1988.

counterpart as their mobility is higher. Conditioning on the age, the matching rate for both blacks and whites are roughly constant throughout the sampling period. In addition, figure 4 illustrates the comparison in proportion of women who are married between full-sample March CPS and matched-sample March CPS. The proportion of married women from matched sample is slightly higher than that of full sample except for women aged 15-23. The pattern of proportion of married women is consistent between full sample and matched sample from March CPS in each age group. As a result, the selection bias in matching procedure does not arise.

One might argue that the sample from matching the March CPS left out many new marriages as women move out when they are married. Figure 5 compares the marriage rate of unmarried women aged 15-44 between the Vital Statistics[7] and the matched March CPS sample. The dot lines represent the standard error interval constructed from a binomial distribution. It shows that the marriage rates obtained from the Vital Statistics and the matched March CPS are similar. On average, the marriage rate per 1000 population from the matched March CPS is higher than that from the Vital Statistics as depicted in figure 5. This evidence suggests that the *unmatched sample* in the CPS are more concentrated on the ones who move out of the sampled households due to the non-marriage reason such as employment or education rather than being married. There are some explanations behind this findings. First, there is an increasing trend in pre-marital cohabitation (see Stevenson and Wolfers (2007)), therefore, people are unlikely to move out when they are married. Second, as the average age of the population getting married is high, they are more stable and settled down than the younger ones.

According to my unique method of matching the March CPS, the only new

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[7]The Detailed Vital Statistics are available until 1995, see Chadwick and Heaton (1999).

marriages that would be missing out are newlywed couples who both move out to the new residences. In addition, Stevenson and Wolfers (2007) found a strongly positive trend of cohabitation prior to the marriage. This stylized fact should cause the marriage-moving-out sample to become less concern. CPS data suggests that cohabitation rates among adults have risen from 2.9 percent in March 1995 to 4.7 percent in March 2005. Among those entering first marriages in the early 2000s, 59 percent had cohabited with their future spouse prior to marriage. The 2002 National Survey of Family Growth found that 50 percent of women aged 15 to 44 had cohabited at some point. Prior to marriage, couples were cohabiting and are likely to remain in the same household after marriage. As a result, the matched CPS sample is a proper micro-level data set for marriage and welfare reform analysis.

I construct the flow into marriage from each year (March to March) by observing a change in a marital status from *not married* it year $t-1$ to *married* in year t. I construct the flow out of marriage, or the flow into divorce, in a similar fashion. In terms of willingness to leave marriage, widowers are different from divorcees so the new widowers in year t are coded as being married.

2. Policy Data

The data of cross-state welfare policy and implementation year is collected from the State Policy Documentation Project (SPDP) and the green book. Figure 1 illustrates the time variation in welfare reform implementation year across states. California, Michigan, and New Jersey are the first pioneers that adopted waiver in 1992. Twenty-five states implemented TANF in 1996 calendar year. Other twenty-five states implemented TANF in the following year. California was the last and only state that implemented TANF in the early 1998.

In addition, there are other marriage-related laws such as unilateral(no-fault)

divorce laws and covenant marriage laws[8] enacted by different states at different points in time. Most states switched laws from mutual consent to unilateral or no-fault divorce between 1970-1985 prior to my analysis. Only twenty out of fifty-one states still have mutual divorce laws. Optional covenant marriage laws in which the marrying couple agree to obtain pre-marital counseling and accept more limited grounds for divorce is legal in only 3 states; i.e, Louisiana(1997), Arizona(1998) and Arkansas(2001).

Tables IX and X report the pre- and post-reform sample means of demographic as well as the welfare policies variables of unmarried women aged 15-44 from the matched March CPS 1988B-2002. In general, women's characteristics such as a proportion of women with children, a fertility rate, a proportion of blacks, and a mean of age are virtually similar before and after welfare reform implementation. The average age of women in the sample is 26 years old. The share of hispanics, however, significantly increases after the reform. The labor force participation rate (LFPR) is slightly higher. By comparison, the stylized fact shows a dramatically decrease in a proportion of welfare recipients and a maximum cash benefit after the reform. A flow into marriage significantly drops during the post reform. Of every 100 unmarried women aged 15-44, eight new marriages occurred prior to the reform and it decreased into only six new marriages after the reform.

A sample mean of the divorce shown in tables XI and XII reports a marginal increase during the post reform. A proportion of women with children, age of children, a proportion of blacks, and a mean of age are comparable the same before and after the welfare reform. The labor force participation among married women is higher

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[8]It is more difficult for couples who have a legal covenant marriage to obtain a divorce. Cause for divorce is typically limited to abuse, a felony with jail time, or adultery.

than unmarried women and it remains roughly constant over the course of 1988 to 2002.

Figure 6 represents the marriage rate of women aged 15-44 from the matched March CPS during 1989 to 2002 by redefining a traditional calendar year to the number of years since the welfare reform was implemented[9], that is, year "0" is the year that the welfare reform initially sets in, year "1" is one year after the reform-implementation year, year "-1" is one year prior to the welfare reform implementation and so on. Even though different states adopted waivers or TANF in different calendar years (as summarized in figure 1), this technique puts all states into the reform-implementation year dimension instead. Figure 6 and 7 illustrate the number of marriages and divorces per 1,000 at-risk women aged 15-44 from matched March CPS 1988B-2002 with time dimension redefined to years since the welfare reform was implemented. On average, the post-reform marriage rate is considerably lower than pre-reform. Figure 8 also shows the marriage rate by age group and by race. The different demographic groups may respond to the reform differently. There is no clear evidence from figure 8 suggesting that the welfare reform affect women's marriage differently according to their ages. White women, compared with other races, show a significant drop in marriage after the reform as illustrated in figure 9.

Another nationwide poverty-relief federal policy, the Earned Income Tax Credit (EITC), expanded during the sample period. The EITC began in 1975 to offset the social security payroll tax for working-poor families. It has been reformed three times in 1986, 1990 and 1993 and has grown to become the largest cash-transfer program. The EITC expansion in 1990 and 1993 was a result of the Omnibus Budget Reconciliation Acts(OBRA). The tax reform expanded EITC only to families with

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[9]When either a waiver or TANF is adopted, whichever comes first.

positive incomes. EITC transfers cash to the poor while also creating incentives to work (Eissa and Liebman (1996)) which may indirectly affect the marriage rate. Prior to 1994, only working families with children were eligible for the EITC. During 1983-1990, working families with two or more children had the same EITC parameters[10] as families with only one child. Since both the EITC expansion and the welfare reform occurred in the same period of analysis, I have to control for the EITC expansion effect. I construct an indicator of EITC expansion to capture the *average* OBRA effect. EITC expansion is in effect if families have either at least one child during 1991-2001 or no child during 1994-2001. The estimate of the EITC expansion can be interpreted as the average OBRA effect compared with the prior EITC program on woman's marriage decision.

G.   Econometric Framework

1.   Overall Welfare Reform Effect: Probit Model

The probit models of the flow into and out of marriage are given as following.

$$Pr(M_{i,s,t} = 0 \rightarrow M_{i,s,t+1} = 1)_t = \phi(X_{ist}, E_{ist}, WR_{st}, L_{st}, V_s, Y_t, \varepsilon_{ist}) \qquad (3.2)$$

$$Pr(M_{i,s,t} = 1 \rightarrow M_{i,s,t+1} = 0)_t = \phi(X_{ist}, E_{ist}, WR_{st}, L_{st}, V_s, Y_t, \epsilon_{ist}) \qquad (3.3)$$

where the regressand takes value 0 if the statement inside the parenthesis is false, or 1 if it is true for the at-risk women. For example, it equals one if an individual i lives in state s changes her marital status from not married in t to married in $t+1$ and equals zero if she is not married in t and remains unmarried in $t + 1$. Demographic covariates of individual i in state s and in year t is represented by X_{ist}. I also consider

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[10]These are marginal tax rates including phase-in and phase-out, maximum credit, etc.

EITC expansion during the sampling period and it is represented by dummy variable E_{ist}. E_{ist} is an average EITC expansion depending on the family-child structure. Families with any positive number of children were EITC qualified with the same rules before 1991. After 1991, the EITC rules applied to families with one child are different from the ones with two or more children. Families without any children began to be eligible for EITC in 1994. As a result, I define E_{ist} equals to 1 if a woman has either any dependent child during 1991-2002 or no child during 1994-2002. I also include state welfare benefit generosity which consists of AFDC/TANF cash benefit for a family of three, food stamp, and medicaid as well as state-level labor market variable; e.g, unemployment rate, lagged state unemployment in variable L_{st}. State and year fixed effects are denoted by V_s and Y_t respectively. The rest of unobservable determinants are captured in the error terms, ε_{ist} and ϵ_{ist}.

The key variable is the welfare reform indicator, WR_{st}. WR_{st} is the fraction of year t[11] that major AFDC waiver (or TANF) is effective in state s. If state s implements the AFDC waiver in year t, WR_{st} equals to a fraction of year t and becomes 1 thereafter. If state never implemented the AFDC waiver, then WR_{st} equals to a fraction of year t that such state adopts TANF. This dummy specification is derived from the assumption that the reform has an immediate impact on the marriage rate and its effect is constant over the post-reform period and across states. The welfare-reform coefficients, therefore, obtained from this estimation should be interpreted as an average of welfare reform effects for both waiver and TANF over the post-reform period. The welfare reform dummy, however, are defined differently from the ones specified in Bitler et al. (2004). Their waiver and TANF welfare dummies are fractions of the year that welfare reforms(waiver or TANF) were initially implemented.

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[11]year t starts from March in year t for consistency with March CPS data.

Then, those dummies turn back to zero in the subsequent years. In addition, they estimate waiver and TANF effects separately. Their model suggests that they assume welfare reform has an instantaneous effect on marriage rate only in the first year but not thereafter. My model allows welfare reform to have a roughly constant effect on the marriage rate throughout the post-welfare reform period available in my data.

2. Overall Welfare Reform Effect: Difference-in-Difference Model

If the marriage rate follows some welfare-unrelated within-state trend that coincides with the period of welfare reform, the welfare effect estimation will be inconclusive. In addition, welfare reform, theoretically, should impose a stronger effect on a target group of poor single women with children than its counterpart due to the fact that only wealth-qualified families with children are eligible for the welfare. Identifying any single women with dependent children as a treatment group is inappropriate because it also includes those who are unlikely to be affected by the reform. To address this potential problem, I use a Difference-in-Difference approach(DD). I use qualified children, education level, and family income to construct treatment and control groups. The proposed treatment and control groups are valid under the assumption that fertility is exogenous. The sample means of probability that a woman has an infant in tables IX and X are virtually equal. I perform a mean comparison test between pre- and post-reform fertility rate and I cannot reject that they have the same mean. This suggests that the fertility rate was not affected by the welfare reform and it was exogenous.

The Difference-in-Difference approach also controls for any contemporaneous shocks to the overall marriage market over time. It is worth noting that the DD estimation yields consistent estimates if (1) there are no contemporaneous shocks (other than welfare reform) to the relative marriage market outcome of both treat-

ment and control groups and (2) there are no underlying marriage trends that differ between the treatment and control groups. I define unmarried women aged 15-44 with less than 18 year-old dependent children as a treatment group. Two comparison groups are unmarried women aged 15-44 with no dependent child or with children aged 18 and over.

For further confidence in the DD estimation, I define 3 different treatment groups with their counterpart control groups. I propose 2 control groups associated with each treatment group to ensure that what I am estimating is the actual effect of welfare reform and not simply the effect of other contemporaneous changes or trend differences between the control and treatment groups. I categorize each woman, depending on her characteristics, into the groups below.

Group 1

Treatment Group	With child & High school dropout
Control Group 1	No child & High school dropout
Control Group 2	With child & High school degree or higher

Group 2

Treatment Group	With child & Family income $\leq$ 5 pct
Control Group 1	No child & Family income $\leq$ 5 pct
Control Group 2	With child & Family income $\geq$ 50 pct

Group 3

Treatment Group	With child & Family income $\leq$ 10 pct
Control Group 1	No child & Family income $\leq$ 10 pct
Control Group 2	With child & Family income $\geq$ 50 pct

The welfare reform effect is then estimable from a linear probability regression as expressed in the following equation.

$$1_{ist}(\hat{Married}) = \hat{\alpha_0} + \hat{\alpha_1}1_{ist}(Treat) + \hat{\alpha_2}1_{ist}(Control_1) + \hat{\alpha_3}Reform_{st}$$

$$+ \hat{\alpha_4}1_{ist}(Control_1) * Reform_{st} + \hat{\alpha_5}1_{ist}(Control_1) * Reform_{st} \quad (3.4)$$

where $1_{ist}(Married)$ is an indicator variable; it equals to one if a woman is not married in t and becomes married in $t + 1$, zero if a woman is not married in both t and $t + 1$. $1_{ist}(Treat)$ or $1_{ist}(Control_1)$ equals to one if a woman is categorized as a treatment group or control group 1 and zero otherwise. The Reform variable is a share of year that the welfare reform is in the effect.

The DD estimate for the divorce probability is modeled in the similar fashion by simply changing the dependent variable from *"being married"* to *"being divorce"*[12]. The estimates in table XXII, XXIII, XXIV, XXV, XXVI, and XXVII are derived from the linear combination of the coefficients estimated from equation 3.4 as illustrated in table XXVIII.

3.   The Effect of Welfare Reform Components

As the reform introduced many new features into the welfare program, it is worthwhile to assess the effect of the reform components on family structure. It is practical and useful for the policy makers to develop strategies based on the findings in this setup to achieve the prospective outcomes.

States are allowed to set up their own policies following TANF guidelines. They vary in terms of the degree of work incentive and welfare restriction. Source of identification for welfare-reform components comes from the fact that states differently applied and adjusted welfare component at different points in time. I model the wel-

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[12]Dependent variable takes value one if a woman is married in t and divorce in $t + 1$; zero if a women is married in both t and $t + 1$.

fare reform components effects on the probability of new marriage and new divorce as the following probit equations.

$$Pr(M_{i,s,t} = 0 \rightarrow M_{i,s,t+1} = 1)_t = \phi(X_{ist}, W_{st}, T_{st}, I_{st}, L_{st}, V_s, \omega_{ist})$$

$$Pr(M_{i,s,t} = 1 \rightarrow M_{i,s,t+1} = 0)_t = \phi(X_{ist}, W_{st}, T_{st}, I_{st}, L_{st}, V_s, \psi_{ist})$$

The notation is the same as in equations 3.2 and 3.3. The vector of the components of welfare reform is I_{st}. I assume a constant effect of the the components of welfare reform across states and throughout the period in which those components are effective. I adopt a methodology proposed by Blank and Schmidt (2001) to rank the degree for each component and work incentives. In addition, I apply similar concept to identify the degree of welfare aggressiveness. Construction methodologies are available in appendix.

4. Validity of Cross-State Variation in Welfare Reform

Since the estimation of the welfare reform effect in this paper is identifiable from the cross-state variation in time of welfare reform implementation, it is critical that timing of adopting reform does not correlate to the prior marriage and divorce rates. If timing of reform adoption systematically correlates to pre-reform marriage rate, then the results from cross-state variation method will not represent the welfare reform effect, instead, it illustrates the marriage pattern consistent with state marriage trend. As a result, I perform a validity test to check whether timing of reform adoption systematically correlates to the prior marriage rate.

I construct a variable representing timing of reform adoption as a number of years since September 1992 when New Jersey became the first state initiating welfare waiver or reform. In addition, I restrict the sample to only women aged 15-44 years old who reside in a pre-reform state. Then I regress time of reform adoption on

the marriage rate. The result shows that timing of reform adoption is not affected by prior marriage rate. As a result, cross-state variation method is valid and yields meaningful estimates of welfare reform effect.

H.   Statistical Results and Interpretation

The following subsections report the overall welfare reform effect from the probit and Difference-in-Difference models as well as the welfare-reform component effect on the marriage and divorce. Each welfare component is categorized into 3 discrete groups. I present the reduced-form estimates of the effect of welfare components on family formation as never been statistically approached before, as of my knowledge, in the literature[13] due to a complexity in welfare variables across time and across states. Tables XIII to XVII report the probit marginal effects of the welfare reform and the EITC expansion on a flow into the marriage. The Difference-in-Difference result for a probability of new marriage is reported in tables XXII to XXIV. The probit and DD estimated welfare reform effect on a flow into the divorce is illustrated in similar fashion in tables XIV to XXI and tables XXV to XXVII, respectively.

1.   The Overall Effect of Welfare Reform on the Likelihood of Marriage and Divorce

I estimate the overall effect of welfare reform using two different approaches: probit and difference-in-difference models.

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[13]Swann (2005) applied policy simulation such as a 10% decrease in BRR, benefit termination (a.k.a time limit), and work trigger (a.k.a work sanction) on lifetime structural-form behavioral model using data prior to welfare reform.

a.   Probit Estimates

Figure 6 illustrates a noticeable drop in the marriage rate after the welfare reform. As shown in table XIII, the simple probit models of a woman changing marital status from not being married to being married with different fixed effects are estimated. The state and year fixed-effect model are not estimated because controlling for both state and year left no independent variation in the welfare reform variable. Without controlling for individual characteristics, the probability that a woman, living in a state where the welfare reform is currently in effect, gets married in the next period decreases by 3.91 percentage points compared with a single woman living in a state where welfare reform has implemented yet. Estimate of welfare reform effect is stronger and consistent once state fixed effect is introduced in the model. A woman decreases a probability of getting married by 4.37 percentage points. However, the year fixed-effect model does not yield any significant welfare reform effect on marriage decision. EITC expansion consistently and significantly increases marriage by probability by 2.26-4.68 percentage points.

In table XV, I report the estimated results when I control for the individual characteristics and state-level measures. The magnitude and significant level of welfare reform effect drop yet it is consistent with the findings in table XIII. For example, the negative effect of welfare reform on flow into marriage shrinks by more than half from 3.91 to 1.42 percentage points in non fixed-effect model. I add variables such as pre-marital cohabitation, race, age, real weekly wage rate, MMPI, MSA, child presence, state unemployment rate, unilateral divorce laws and covenant marriage law. Cohabitation, race, age weekly wage rate, MSA and child presence consistently show the significant effects that do not sensitive to the model specifications. A woman who cohabited with her partner in the last period is approximately 3 percentage points

more likely to be married in the following year. Of all women in the sample, new marriages among blacks are 3.74 percents less likely than that of whites. Women aged between 25-29 are the most marriageable group as the estimate of this age group shows the highest positive marginal effect on the transition into marriage when compared with the rest. Women who participate in the labor force become a better match for marriage prospects as it raises the probability of being married by 0.80-0.85 percentage points. In addition, living in the Metropolitan Statistical Areas (MSA) significantly decreases woman's marriage probability. Interestingly, a woman with dependent child is more than 1.5 percentage points more likely to wed than a woman without children even though the shotgun marriage has already been controlled. I use an indicator variable for a woman with infant, a child aged less than 1 year old, to capture the possibility of shotgun marriage and I find a strongly positive magnitude of the shotgun marriages. Nearly 7 percents of new births among unmarried mothers follow by the marriage.

Theoretically, MMPI should yield a positive effect as an increase in the pool of marriageable men, when controlling for the number of women, induces more marriages. The results show a consistently positive and significant MMPI effect on marriage in table XV. Covenant marriage laws unambiguously decrease women's probability of marriage in all specifications as expected but none of them is statistically significant. Tables XV and XVIII suggest that the Unilateral divorce laws have a strong positive effect on the transition into and out of marriage. As the divorce is easier to obtain in the states that hold the unilateral divorce laws, so is the marriage. Women internalize the cost of divorce prior to the marriage. If it is effortless to get divorce, then the cost of marriage is small. In contrast to table XIII, EITC expansion turns out to have no effect on woman's marriage after controlling for the individual characteristics. AFDC-UP dummy variable is included in table XV to

capture the mechanical effect. The omitted AFDC-UP category is a group of states with no AFDC-UP. The presence of AFDC-UP should increase the marriage rate. The finding shows a weakly positive effect of AFDC-UP program on the marriage. Contradict to Moffitt (1990), I find that high welfare benefit generosity empirically increases incentive to be married as contrast to the prediction in equation 3.1. The effect of Log of real maximum cash assistance for a family of three is sensitive to the model specification. It has an insignificant negative effect on the marriage in the non fixed-effect and year fixed-effect models. Controlling for the state fixed effect, log of real cash assistance significantly increases the marriage by 3.16 percentage points. Even though it is sensitive to the specification, the positive cash benefit estimates in model (7) and (8) are insignificant. Controlling for the economic situation, state unemployment rate parameter yields a positive and significant effect on marriage. It can be interpreted that women are more likely to get married during the economic downturn. In addition, I use the median of male weekly wage by year and by state to account for the financial attractiveness of potential mates. The results consistently show a negative effect of financial attractiveness of potential mates in the marriage market.

Welfare reform seems to have no significant effect on the divorce rate as reported in table XIV. The EITC expansion increases the probability of divorce as well as marriage when there is no year fixed effect (see model (1D) and (2D) in table XIV). The negative estimate of AFDC-UP provide a consistent piece evidence of the mechanical effect in family structure. In addition to the marriage probit model results presented in table XV, I modify the divorce probit model as shown in table XVIII by dropping cohabitation and male median wage rate variables and including divorce-related variables such as separation, a relative wage rate to spouse's, and the youngest age of the child if there are any. Married women who do not have any independent child

are the omitted dummy variable. A woman's relative wage rate to spouse's variable is included in the divorce model as Gould and Paserman (2003) argue that the rising wage inequality has increased the returns to further search and thus increased the option value of remaining unmarried. Therefore, it should have a positive effect on a flow out of marriage.

There are mixed findings among Allen (1992); Friedberg (1998); Peters (1986); and Wolfers (2006) in search for the unilateral divorce law effect on a rise in the U.S. divorce rate. In my study, I find that the unilateral divorce laws significantly increases a flow into divorce by approximately 0.30 percentage points. The covenant marriage laws insignificantly decreases the divorce since it is more difficult to obtain it. A woman's labor force participation and a relative wage rate between wife and husband do not affect the divorce. Compared to having no child, Married women with children, especially the young ones, are less likely to obtain the divorce. The existence of AFDC-UP illustrates an insignificant 0.09 to 0.28 percentage-point reduction in the divorce likelihood. The effect of maximum cash benefit is very sensitive to the divorce model specification. It is strictly positive when state fixed effect is controlled for but then becomes weakly negative when no fixed effect or year fixed effect are controlled. Welfare reform does not illustrate any significant effect on a transition into the divorce.

b.   Differece-in-Difference Estimates

The probit estimates suggest that the overall welfare reform has a negative impact on single women's marriage decision. Divorce, however, seems not to be affected by any policy introduced in the welfare reform. I also estimate the Difference-in-Difference model and the results in tables XXII to XXIV and XXV to XXVII confirm the findings in the probit estimation. The effect of welfare reform on marriage and

divorce probabilities is estimated by the difference-in-difference model reported in the last column of tables XXII, XXIII, XXIV, XXV, XXVI, and XXVII. The second to last column represents the first difference effect of the welfare reform on the treatment group. Each table is split into 2 parts; the upper part reports the DD estimates without controlling for the individual characteristics and the lower one reports the DD results in which the characteristics are controlled for.

Supported by the probit estimation results, the welfare reform consistently and strictly decreases marriage among treatment or potential welfare recipient group as shown in the second-last column. There might be some other negative marriage-related trend during the sampling period, therefore I set up comparison groups to control for this concern. I define the first treatment group as high school dropout single women with children. The comparison groups are (1) high school dropout single women without children (2) single women with children and a high school degree or higher. In general, the result reported in table XXII suggests that welfare reform has a negative effect on new marriages among the potential welfare recipients (treatment group). The marriage response from the welfare reform effect among the treatment group is significantly lower than that of control group 1 by 1.45 percentage points. Using control group 2, I find that welfare reform decreases the marriage response among women in the treatment group by 0.45 percentage points, yet it is insignificant.

As a robustness check, I use fertility and family income to identify another treatment and corresponding control groups. Since the welfare caseload is approximately 3%-7%[14] during 1988-2002, I propose the second treatment group as a group of single women with children who have a family income less than 5 percentile within state and

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[14]This statistics comes from March CPS 1988b-2002, women sample aged 15-44 who report positive amount of welfare assistance.

year of residence[15]. The control groups are (1) single women without children whose family income is less than 5 percentile and (2) single women with children whose family income is at least 50 percentile. I disregard a sample whose family income is between 5 to 50 percentile in order to separate unambiguously the treatment from the control groups. The estimates are reported in table XXIII. There is no statistically significant effect of welfare reform if I omit to control for the individual characteristics. After the individual characteristics are controlled for, the DD estimate between treatment and control group 1 shows an extremely small positive welfare reform effect, yet it is not significant. When a group of women with children whose family income is less than 5 percentile is compared with the second comparison group which is middle-class or higher women with children, welfare reform significantly decreases the probability of marriage by 1.37 percentage points within 90 percent confident interval.

The third treatment group is introduced for another round of robustness check. It is defined as single women with children whose family income is less than 10 percentile. The control groups are (1) single women without children whose family income is less than 10 percentile and (2) single women with children whose family income is above 50 percentile. The estimates are reported in table XXIV. The evidence consistently shows a negative reform effect on the marriage in the treatment group. Women with children and family income less than 10 percentile tend to wed less than women with children and family income above 50 percentile by 1 percentage point. To conclude, the Difference-in-Difference estimation reveals the robust and negative welfare reform effect on marriage decision among potentially affected women.

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[15]National family income ranking is inappropriate for this estimation due to an income inequality in different states. For example, families with national family income less than 5 percentile are likely drawn from Mississippi.

Consistent with the probit estimates, Difference-in-Difference models in table XXV, XXVI, and XXVII suggest that there is no welfare reform effect on divorce probability. The divorce likelihood among women in treatment groups does not statistically change after the reform was implemented as shown in the ""difference" estimate column. Based on my findings, I conclude that welfare reform does not affect the divorce decision.

2.   The Effect of Welfare Reform Components on the Likelihood of Marriage and Divorce

It is well known that welfare has been completely changed after the reform. The change in each welfare components would theoretically affect marriage decision as explained earlier in section F. The estimates of the effect of welfare components are reported in tables XVI (without characteristics control) and XVII (with characteristics control). Model (7) represents the impact of welfare reform components in various categories such as cash generosity, time limits, earned income disregard, and work sanction. I redefine welfare cash benefit or earnings disregards into 3 categories, i.e., low, medium, and high. In addition, time limit is sorted into 3 levels; i.e., no time limits, moderate time limits, and strict time limits as described in section 3.

Specifically, work sanction categories include no work sanction, moderate work sanction, and strict work sanction. Consistent with the previous table, model (7) estimates a strictly positive impact of cash generosity on the marriage decision. An increase in the cash benefit induces more marriages. Also, time limit imposes a strong positive effect on women's marriages. Living in a state with moderate time limit constraint shall increase woman's marriage probability by 1.45 percentage points as compared with a state with no time limit. Earnings disregards and work sanction estimates illustrate a homogenous decreasing effect on women's marriages as direct

work incentive gets stronger[16]. For example, moderate and high earnings disregards decrease marriage probability by 0.43 and 1.02 percentage points, respectively, if compared with low earnings disregards. Similarly, moderate and strong work sanction significantly lessen marriage probability by 4.57 and 4.99 percentage points. As a result model (8) is developed from the interesting results of work incentive in model (7) by combining earned income disregard and work sanction into only 1 group named *direct work incentive.*

A state is said to emphasize on a strong direct work incentive if it imposes a high earned income disregard and some work sanctions *or* a strict work sanction and a moderate or high earned income disregard. A complement of a strong direct work incentive is a weak direct work incentive. The evidence shows that a strong direct work incentive indeed decreases the marriage likelihood by 2.63 percentage points. I draw a conclusion that the negative self-independence effect from working outweighs the positive marriageable effect from working.

In addition, other welfare components such as cash benefit and time limits should also influence marriage decision as discussed earlier. Different from earned income disregard and work sanction, the channels through which the marriage is affected from cash benefit and time limit are ambiguous since the work incentive is not directly impacted. I generalize work incentive category by combing all major 4 welfare components according to how each component should affect work incentive. A state s in year t is said to pose a strong work incentive if *at least* one of the welfare components enhances work incentive and the rest are not categorized in the work disincentive group. Components that comply with work incentive are (1) low cash generosity, (2) strict time limit, (3) high earnings disregards, and (4) strong work

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[16]A strong direct work incentive is defined if there is either high earnings disregards or strong work sanction.

sanction. Conversely, components that are categorized as work disincentive are (1) high cash generosity, (2) no time limit, (3) low earnings disregards, and (4) no work sanction.

I omit the estimates of work incentive from tables XVI and XVII. According to a generalized work incentive, a strong work incentive does not affect the marriage rate. Prior to welfare reform, previous study by Moffitt (1990) found that high benefit generosity decreases marriages which suggesting that marriage is more likely to be affected from other channels, rather than work incentive, that generate an opposite impact. If marriage is an an alternative, besides the welfare, for woman to leave poverty, she may choose marriage over the welfare. Therefore, the work incentive incorporated in welfare shall be muted for this particular case. The complex mechanism cannot be tracked down by applying a reduce-form estimation. If the marriage substitution dominates work incentive effect, then the overall strong work-incentive component effect on marriage decision is speculated to be positive as confirmed in the estimates of model (9).

I categorize the welfare aggressiveness into 3 degrees of restriction to capture the essence of attractiveness in outside option such as the marriage substitutability if welfare is too restrictive to comply with. Welfare rule is said to be *restrictive* if at least one of the following conditions holds; (1) low cash generosity with time limit, moderate or high earnings disregards, and moderate or strong work sanction, (2) strict time limit with moderate or high cash generosity, moderate or high earnings disregards, and moderate or strong work sanction, (3) low earnings disregards with moderate or high cash generosity, time limit, and moderate or strong work sanction, and (4) strong work sanction with moderate or high cash generosity, time limit, and moderate or high earnings disregards. The omitted variable in model (11) is a generous welfare rule which is defined as a complement of a restrictive welfare rule.

If some of the welfare components imposed by a state contradicts each other in terms of welfare rule generosity, then that state has a mixed welfare rule. As speculated, the restrictive welfare rule shows a significant positive overall effect on the marriage. Controlling for the individual attributes, a woman living in a state with the most aggressive welfare rule has higher marriage probability than her counterpart living in a state with the most generous welfare rule by 0.73 percentage points. The estimates are robust when individual characteristics are controlled for in model (12)

Unlike the marriage, it is unclear how welfare components affect the divorce decision. Tables XIX (without characteristics control) and XX (with characteristics control) show that high cash benefit generosity decreases the divorce likelihood. Almost all disaggregated welfare-reform policies, however, insignificantly affect the divorce decision. The divorce likelihood can not be explained by welfare policies such as time limit, earnings disregards, and work sanction. Nevertheless, a combination of welfare components toward the work incentive in model (8D) and (11D)suggests that a strong work incentive indeed strictly increases the divorce.

3. The Effect of Welfare Reform Lag on the Likelihood of Marriage and Divorce

It is possible that the marriage may not respond to welfare reform immediately due to many plausible reasons such as lack of knowledge in welfare changes. In addition, marriage requires mutual agreement from both parties in which it may not feasible overnight. As a result, I introduce the lags of welfare reform into model (4) to identify such effect. I started with 4 lags and test for a null hypothesis such that all lags of welfare reform equal to zero. If it is not rejected, I then remove 1 lag at a time and re-test it again. The procedure discontinues when the null hypothesis is rejected. However, I found that there is no evidence such that marriage is adjusted to any lags of welfare reform.Interestingly, welfare reform has a strongly negative lagged effect

on the divorce as reported in table XXI. A divorce probability significantly drops 4 years after the welfare reform was implemented.

I.   Conclusion

The welfare reform has dramatically changed the image of welfare programs in the eyes of the society. As welfare programs become less generous and require families who seek for public assistance to fulfill several requirements, women who lead a family have had to significantly reassess their choices of marriage, welfare, and work. This paper investigates the behavioral and mechanical effects of welfare reform on women's marriage and divorce decisions. I primarily focus on marriage decisions. Yet, considering divorce helps provide a more complete understanding of the effects of welfare reform on family composition.

I analyze a theoretical model and provide a comparative static analysis to understand the mechanisms which explain women's response in choices of family structure as policy parameter changes. The model attributes the changes in marriage decisions to the variations in the gains obtained from getting married as a consequence of changes in each of the welfare parameters affected by the reform.

In addition to a traditional matching of individuals between pairs of years from March CPS 1988B-2002, I introduce a *converse matching* procedure. This approach allows me to include women who are not matched but whose marital status change is detected by observing the marital status change of the matched spouses. I code the flow into marriage and divorce as a sampled woman moves from being single to being married and vice versa in the following year, respectively.

I use a measure of flow into and out of marriage to assess the impact of the welfare reform on marriage and divorce decisions in probit models. Nevertheless, the

welfare reform, which provides public assistance only to poor families with children, should affect women with different characteristics differently. For example, low income women with children, low income women without children, and relatively high income women with children may respond differently to the policy changes. The micro-level data allows for this cross-group analysis. I also estimate Difference-in-Difference models to disentangle the welfare reform effect between the comparison and treatment groups. Each treatment group is accompanied by two additional comparison groups for more efficient controlling.

Probit model estimates, without any control for demographic characteristics of the individuals, provide evidence that the welfare reform has an overall negative effect on the probability that an unmarried woman gets married. Yet, the estimates are sensitive to model specification. The results are robust to the inclusion of individual characteristics in the estimation, however, the magnitude of the effects drops by more than one half. As expected, the estimates show that the mechanical effects of the AFDC-UP program cause a significant increase in the likelihood of marriage and a decrease in the likelihood of divorce. In comparison with the estimation of the probit model of all unmarried women, the Difference-in-Difference estimates suggest that the welfare reform has a robust negative effect on marriages among the treatment women. Even though the results show that the welfare reform has a significant effect on the marriage decision; the divorce decision is not statistically affected.

In addition to the estimation of the effect of individual welfare components, I estimate the effect of work incentives and welfare aggressiveness on marriage and divorce decisions. Here I build on the methodology proposed by Blank and Schmidt (2001). In particular, I can rank the restrictiveness of each state welfare program and construct measures of work incentives and welfare aggressiveness.

I find that welfare policies which include direct work incentives decrease marriage.

I conclude that the self-sufficiency effect dominates the marriageably attractiveness from the job effect. Along with the government-funded welfare benefits, private marriage may be considered as an alternative for financial support that a woman can seek for. Theoretically, a highly aggressive welfare rule shall increase the attractiveness of an alternative option of financial support such as marriage. This hypothesis is supported by the empirical findings of this paper. To investigate this issue further, a structural model explicitly incorporating marriage as an alternative source for financial support shall be conducted.

CHAPTER IV

SUMMARY

Even though the U.S. government have been providing welfare programs to families with children for many decades, previous studies have found mixed evidence of its impact on social outcomes and have not yet reached to a consensus. In the two essays of this dissertation I have estimated the effect of welfare reform on childbirth, marriage, and divorce. I used flow measures of birth rates, marriage rates, and divorce rates instead of stock measures because flow measures can detect an immediate impact of welfare reform better.

Childbirth rates used in the first essay can be identified if a woman mothers an infant (less than 12-months-old) by an interviewing year. Marriage and divorce rates used in the second essay are identified through both traditional and converse matchings. By the survey construction of CPS data, the same "household" are repeatedly interviewed across two consecutive years. Therefore, it is plausible to match individuals and observe changes in their marital statuses if there is any.

This study finds a positive and significant overall effect of welfare reform on marital birth likelihood as compared to the likelihood of no childbirth. The out-of-wedlock birth seems to decrease as a result of welfare reform as well, yet this effect is not significant. The overall effect of welfare reform do not statistically affect the teenage's child births. Strong work incentives decrease both marital and non-marital births. However, the most aggressive welfare restriction increases marital birth rates suggesting that when government transfer (most likely to single mothers) is more difficult to obtain, the choice of bearing a child inside a wedlock becomes more attractive. The results also show a strong and consistent negative effect of family caps on additional child births.

The welfare reform had a negative effect on marriage but it did not affect divorce. I investigate that the work encouragement introduced in the welfare programs lead to a dominant effect of self sufficiency which results into a decrease in marriage. However, women get married more often if welfare benefits available to them are less attractive. This piece of evidence suggests that women consider marriage as an alternative choice of financial support.

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APPENDIX A

1. **Cohabitation**

Cohabitation becomes an increasingly important institution in the U.S. as most marriages are preceded by it. The 2002 National Survey of Family Growth found that 50 percent of women aged 15 to 44 had cohabited at some point in their lives (Stevenson and Wolfers (2007)). Even though CPS includes an "unmarried partner" category in the survey, it began in 1995, 7 years after 1988. Fitch, Goeken, and Ruggles (2005) propose the rules for cohabitate identification called "Persons (or Partners) of Opposite Sex Sharing Living Quarters (POSSLQ)". I apply those rules for designating adjusted POSSLQ household to identify household containing unmarried partner in CPS data set throughout the sampling period 1988-2001. The household is identified as an adjusted POSSLQ if it complies the following arguments.

(a) Household must have a householder aged 15 or more

(b) Household must include one other person aged 15 or more who is unrelated, not a foster child, and of the opposite sex as the householder

(c) Household cannot include any other persons aged 15 or more, except for relatives of the references person and persons listed as a child in an unrelated subfamily

2. **Men Marriageable Pool Index: MMPI**

To measure marriage market condition exposed to a representative woman, I introduce Male Marriageable Pool Index (MMPI) as proposed by Wilson and Neckerman (1987). Wilson and Neckerman (1987) assumed that marriageable

man needs to be employed and the men and women are matched by age and race, since most people marry within their own race and near their own age. Hence, $MMPI_{art}$ for woman raced r (White, Black, or Hispanic) aged a living in state s in year t is estimated as following

$$MMPI_{arst} = \frac{EmployedMen_{(a-2)to(a+2),rst}}{Women_{(a-2)to(a+2),rst}}$$

Where $EmployedMen_{(a-2)to(a+2),rst}$ is a total numbers of employed men of race r aged between 2 years younger and 2 years older than an observed woman who lives in the same state at the same year. The denominator is a number of marriage-competing women by race and age range.

3. **The Earned Income Tax Credit Expansion: EITC**

I construct the EITC index to represent the effect of the EITC expansion during the 1990's on the birth rate. It is indexed to one if the EITC expansion affects fertility decisions and it is zero otherwise. The EITC equals one as it created financial incentives to:

(a) a woman who does not have any children prior to 1993 to bear a child, and

(b) a woman who has only one child after 1990 to bear more children.

4. **The Aids to Families with Dependent Children for Unemployed Parent: AFDC-UP**

The passage of the Family Support Act (FSA) of 1988, effective October 1990, extended the previously state-optional AFDC-Unemployed Parent (AFDC-UP)

program to all states. Prior to October 1990, two-parent families were ineligible for cash and medical assistance in twenty-two states. Two-parent families seeking government assistance were subjected to special restrictions and treated differently from single-parent families and accounted for less than 10 percent of the total AFDC caseload. The standard AFDC-UP[1] program was available for two-parent families whose combined work between a couple is less than 100 hours per month (100-hour rule), the primary earner was working at least 6 of the last 13 quarters (work history test), and was unemployed or working fewer than 100 hours for 30 consecutive days (waiting period). The welfare reform allowed states to modify the restrictions on two-parent family applicants. Almost all states relaxed standard AFDC-UP restrictions in effort to promote marriage. However, North Dakota is the only state that does not provide benefits to non-disabled two-parent families starting in 1998. using an availability criteria, I categorize AFDC-UP into 2 groups, i.e., states that offer the AFDC-UP program in a given year and states that do not offer it.

5. **Cash Benefit Generosity**

Prior to the welfare reform, individuals who are eligible for AFDC program are also eligible for the medicaid and the food stamp benefit. The welfare benefit package including AFDC cash assistance, medicaid, and food stamp benefits, varies across states and over time. I collect AFDC/TANF cash assistance for a family of three by state during 1988-2002[2]. There are two dimensions of benefit generosities, i.e. benefit value and benefit level, that I apply into the

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[1]AFDC-Unemployed Parent

[2]Data is collected from green book and SPDP website

estimations. Benefit generosity is categorized into 3 levels:[3]

Low if	state's maximum benefit value < MEAN-S.D.
Moderate if	MEAN-S.D.$\leq$ state's maximum benefit value < MEAN+S.D.
High if	state's maximum benefit value $\geq$ MEAN+S.D.

Where MEAN is a sample mean of maximum benefit value by year and S.D. is its corresponding standard deviation.

6. **Time Limits**

TANF imposes time limit policies including benefit reduction, benefit termination, and work requirement. Once a TANF case reaches a time limit, the case must be granted an exception or exemption (permitted for up to 20 percent of the caseload) or cease to receive federally-funded TANF assistance. TANF time limit varies between 21-60 months. However, Michigan, Massachusetts, and Vermont practically do not have time limit constraint. Once welfare recipients exhaust federal TANF benefit subjected to the time limits, these three states will use state-funded TANF benefit to continue supporting the ongoing welfare recipients. Similar to the benefit generosity, I categorize the time limits into 3 levels, i.e., lenient, moderate, and strict. States with no time limit (prior to the reform) are lenient, states with 60-month time limit are moderate, and states with less than 60-month time limit are strict.

7. **Work Requirement and Work Sanction**

After having been receiving the welfare benefit for some time, all single and two-parent families who are not exempted[4] from JOBS work requirement must

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[3]Methodology is adopted from Blank and Schmidt (2001)

[4]JOBS work exemption criteria varies across states, mostly applied to teenage mothers and mothers with newborn babies.

participate in labor force or work-related activities for 30 and 35 hours a week, respectively, toward self-sufficiency. Recipients who do not comply with JOBS requirement will be subjected to benefit sanction such as partial benefit reduction, full benefit reduction for some periods, or full-lifetime benefit termination. However, states must continue the assistance for single, custodial parents who have a child under age 6 but who cannot obtain child care. States impose different severities of work sanction. The degree of work sanction is outlined in table XXIX.

8. **Earned Income Disregard Effect**

Welfare recipients are required to work according to JOBS work requirement in TANF policy and the benefit is reduced as their earned income increase. However, to promote work, they can keep some earnings and be exempted from benefit reduction calculation. This benefit-reduction exempted income is called earned income disregard. As a result, an increase in an earned income disregard creates a work incentive for individual to keep income from work and still be eligible for the same amount of welfare benefit. The AFDC program allowed working welfare recipients to keep the first earned $120 and 33 percents of the remaining income for income disregard purpose. Therefore, I use earned income disregard policy under AFDC as a reference group to determine whether the state poses more or less generosity in earning disregard effect. I, therefore, categorize earned income disregard policy into 3 groups depending on generosity degree; low if state has less than $90 earned income disregard, medium if $90 \le$ earned income disregard is at least $90 but not greater than $150, and high if earned income disregard is greater than $150.

Since states have different, mixed welfare policies to encourage work, for ex-

ample, low welfare benefit, high earning disregards, strong work sanction, and strict time limit, it is complicated to determine the degree to which the work is encouraged. Blank and Schmidt (2001) suggest that a state has a *strong* overall work incentive if state with at least one category has the strongest work incentives[5] and no other category has the weakest work incentives[6]. In addition, state has a *weak* overall work incentive if state with at least one category has the weakest work incentives and no other category has the strongest work incentives; otherwise, state has a *mixed* overall work incentive.

9. **Work Incentives**

   A state s in year t is said to create a strong work incentive if *at least* it either imposes high earning disregards and/ or strong work sanction. Conversely, components that are categorized as weak work incentive are low earning disregard and/ or no work sanction. Otherwise, I consider them as having mixed work incentives.

10. **Welfare Attractiveness**

    A state s in year t is said to pose an attractive welfare policy if at least one of the welfare components is in the most generous category and the rest are not categorized in the least generous category. Components that comply with the most attractive welfare policy are:

    (a) high cash generosity,

    (b) no time limit,

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[5]for example, low welfare benefit, high earning disregards, strong work sanction, or strict time limit.

[6]for example, high welfare benefit, low earning disregards, lenient work sanction, or lenient time limit.

(c) high earning disregard, and

(d) no work sanction.

A state s in year t is said to pose the least attractive welfare policy if at least one of the welfare components is in the least generous category and the rest are not categorized in the most generous category. Components that comply with this environment are:

(a) low cash generosity,

(b) strict time limit,

(c) low earning disregard, and

(d) strict work sanction.

If some of the welfare components are in the most generous categories and some others are in the least generous categories, then I consider that state impose a mixed welfare attractiveness.

APPENDIX B

Table I.: Summary Statistics

Variable	Before the Reform		After the Reform	
	Mean	(Std. Dev.)	Mean	(Std. Dev.)
Fertility	0.049	(0.22)	0.060	(0.24)
-Out of Wedlock Birth	0.007	(0.08)	0.010	(0.10)
-Marital Birth	0.043	(0.20)	0.050	(0.22)
Age	32.344	(6.91)	32.648	(7.08)
Log(wage)	4.732	(0.41)	4.830	(0.37)
MMPI	0.829	(0.10)	0.844	(0.11)
MSA	0.764	(0.43)	0.810	(0.39)
Unemploymen Rate	4.304	(1.70)	3.233	(1.71)
Labor Force Participation	0.919	(0.27)	0.764	(0.43)
Covenant Marriage	0.000	(0.00)	0.024	(0.15)
Unilateral Divorce	0.520	(0.50)	0.600	(0.49)
EITC	0.458	(0.50)	0.227	(0.42)
AFDC–UP	0.874	(0.33)	0.993	(0.08)
Log(real welfare benefits)	1.424	(0.42)	1.332	(0.40)
Poor	0.109	(0.27)	0.108	(0.31)
N	189,921		150,645	

Table II.: Heckman Two-step Selection Model

Selection Equation	γ	se	Wage Equation	β	se
Married	–0.1487***	(0.01)	Elementary 1–4	–1.4814	(5.15)
Elementary 1–4	0.5330***	(0.04)	Elementary 5–8	10.6295**	(4.55)
Elementary 5–8	0.3008***	(0.03)	HS Dropout	22.8894***	(4.44)
HS Dropout	0.5481***	(0.03)	HS Graduates	37.6950***	(4.43)
HS Graduate	1.0620***	(0.03)	Some College	51.3578***	(4.43)
Some College	1.2179***	(0.03)	B.A./B.S.	102.5088***	(4.44)
B.A./B.S.	1.2958***	(0.03)	Post-Graduates	156.1553***	(4.47)
Post-Graduate	1.4104***	(0.03)	Black	–6.2021***	(0.56)
Black	–0.1230***	(0.01)	Hispanic	–9.2472***	(0.54)
Hispanic	–0.1482***	(0.01)	Age	11.7638***	(0.19)
Have any child under 6	–0.3749***	(0.01)	Age Squared	–0.1358***	(0.00)
Number of children	–0.1522***	(0.00)	Median Wage	0.0028***	(0.00)
Age	0.2033***	(0.00)	MSA	21.0188***	(0.42)
Age squared	–0.0032***	(0.00)	Constant	–218.4316***	(5.29)
Unemployment Rate	–0.0403***	(0.00)			
OBRAxChild	0.0469***	(0.01)			
OBRAxNoChild	–0.1612***	(0.01)			
REFORM*Child	0.0628***	(0.01)			
Constant	–2.8671***	(0.05)			
Obs.	505880		Obs.	366078	
ρ	–0.12608**	(0.00)			
σ	100.8356***	(0.12)			
λ	–12.7045***	(0.45)			

*Significant at 90%; **Significant at 95%; ***Significant at 99%

Table III.: Multinomial Logit Estimates on Choices of Childbirth

Base Choice: No Childbirth	(1)	(2)	(3)
Out-Of-Wedlock Birth			
EITC	1.3976***	1.4279***	1.5296***
	(0.0620)	(0.0635)	(0.0709)
AFDC-UP	1.1010	1.0848	0.8934
	(0.1086)	(0.1152)	(0.1025)
Log (real welfare cash)	1.1114	0.5779*	1.2441***
	(0.0762)	(0.1839)	(0.0888)
Share of year that the reform is in effect	1.2590***	1.1491*	0.9626
	(0.0740)	(0.0933)	(0.0722)
Marital birth			
EITC	1.7644***	1.7659***	1.8237***
	(0.0327)	(0.0332)	(0.0359)
AFDC-UP	1.0761*	1.0512	0.9742
	(0.0403)	(0.0429)	(0.0423)
Log (real welfare cash)	0.9419**	0.7767*	0.9935
	(0.0265)	(0.1021)	(0.0302)
Share of year that the reform is in effect	1.1299***	1.0854**	1.1627***
	(0.0289)	(0.0374)	(0.0381)
Year fixed effect	No	No	Yes
State fixed effect	No	Yes	No
Obs.	340566	340566	340566
Pseudo R2	0.0904	0.0924	0.0915
Log-likelihood	−72108.03	−71944.46	−72021.61

The estimated parameters of individual characteristics are omitted from this table.

Reported results are relative risk ratios (RRR).

*Significant at 90%; **Significant at 95%; ***Significant at 99%.

Table IV.: Multinomial Logit Estimates on Choices of Childbirth by Race

Base Choice: No Childbirth	(All Race)	(Black)	(White)
Out-Of-Wedlock Birth			
EITC	1.5296***	1.3882***	1.6393***
	(0.0709)	(0.1142)	(0.0912)
AFDC-UP	0.8934	1.1526	0.8501
	(0.1025)	(0.2391)	(0.1194)
Log (real welfare cash)	1.2441***	0.8678	1.2548***
	(0.0888)	(0.1233)	(0.1106)
Share of year that the reform is in effect	0.9626	0.8087	1.0311
	(0.0722)	(0.1154)	(0.0935)
Marital birth			
EITC	1.8237***	1.5190***	1.8499***
	(0.0359)	(0.1181)	(0.0376)
AFDC-UP	0.9742	0.6443***	1.0109
	(0.0423)	(0.1037)	(0.0458)
Log (real welfare cash)	0.9935	0.9387	0.9858
	(0.0302)	(0.1244)	(0.0311)
Share of year that the reform is in effect	1.1627***	0.7855	1.1884***
	(0.0381)	(0.1281)	(0.0399)
Year fixed effect	Yes	Yes	Yes
State fixed effect	No	No	No
Obs.	340566	35631	304935
Pseudo R2	0.0915	0.0853	0.0848
Log-likelihood	−72021.61	−7547.38	−64354.47

The estimated parameters of individual characteristics are omitted from this table.

Reported results are relative risk ratios (RRR).

*Significant at 90%; **Significant at 95%; ***Significant at 99%.

Table V.: Multinomial Logit Estimates on Choices of Childbirth by Policies

Base Choice: No Childbirth	OWL^+ (4)	MB^{++} (4)	OWL^+ (5)	MB^{++} (5)	OWL^+ (6)	MB^{++} (6)
Cash level–Moderate	1.04 (0.08)	0.99 (0.04)	1.02 (0.08)	0.99 (0.04)		
Cash level–High	1.15 (0.11)	0.94 (0.04)	1.11 (0.10)	0.93* (0.04)		
Time Limit–Mod.	1.03 (0.08)	0.99 (0.03)	1.01 (0.08)	0.98 (0.03)		
Time Limit–Strict	0.87 (0.10)	1.07 (0.05)	0.89 (0.10)	1.09* (0.05)		
Earn. disregard–Mod.	0.83 (0.10)	0.86*** (0.05)				
Earn. disregard–High	0.83 (0.10)	0.84*** (0.05)				
Work sanction–Mod.	0.82** (0.06)	0.94* (0.03)				
Work sanction–Strict	0.91* (0.08)	0.94* (0.04)				
Work incentive–Mixed			0.66*** (0.09)	0.85** (0.06)		
Work incentive–Strong			0.75** (0.09)	0.85*** (0.05)		
Welfare rule–Mixed					1.09 (0.07)	1.08*** (0.03)
Welfare rule–Strict					1.08 (0.09)	1.15*** (0.04)
Year fixed effect	Yes		Yes		Yes	
State fixed effect	No		No		No	
Pseudo R2	0.0915		0.0912		0.0913	
Log-likelihood	−62159.13		−62176.45		−62169.81	

+Out–of–Wedlock Birth; ++Marital Birth

The estimated parameters of individual characteristics are omitted from this table.

Reported results are relative risk ratios (RRR).

*Significant at 90%; **Significant at 95%; ***Significant at 99%.

Table VI.: Multinomial Logit Estimates on Teen's Choices of Childbirth by Race

Base Choice: No Childbirth	(All Race)	(Black)	(White)
Out-Of-Wedlock Birth			
HEITC	2.3513***	1.9390***	2.7632***
	(0.3318)	(0.4865)	(0.4632)
AFDC-UP	0.7352	0.8088	0.8223
	(0.1804)	(0.3408)	(0.2530)
Log (real welfare cash)	0.8045*	0.4534***	0.9115
	(0.1015)	(0.1311)	(0.1395)
Share of year that the reform is in effect	1.0928	0.9907	1.0885
	(0.1356)	(0.2663)	(0.1556)
Marital birth			
EITC	3.2744***	0.4785	3.5982***
	(0.6254)	(0.6828)	(0.6844)
AFDC-UP	0.6665	0.0000***	0.7842
	(0.1724)	(0.0000)	(0.2085)
Log (real cash benefit)	0.5408***	0.1373	0.5465***
	(0.1002)	(0.2252)	(0.1047)
Share of year that the reform is in effect	1.0065	0.9954	0.9948
	(0.1919)	(1.5799)	(0.1916)
Year fixed effect	Yes	Yes	Yes
State fixed effect	No	No	No
Obs.	41991	4714	37277
Pseudo R2	0.0940	0.0755	0.0844
Log-likelihood	−5756.37	−889.87	−4852.84

The estimated parameters of individual characteristics are omitted from this table.

Reported results are relative risk ratios (RRR).

*Significant at 90%; **Significant at 95%; ***Significant at 99%.

Table VII.: Probit Estimates of the Effect of Family Caps on Childbirth

| | **Without Controling for Individual Characteristics** | | |
| | Control Group 1[+] | Control Group 2[++] | Control Group 3[+++] |
	mfx/se	mfx/se	mfx/se
Treatment Group	–0.1497***	0.3133***	–0.1029***
	(0.0239)	(0.0175)	(0.0176)
Family Caps	–0.0550	–0.0666***	–0.0341*
	(0.0483)	(0.0178)	(0.0179)
Treat x Family Caps	–0.1115	–0.0998*	–0.1324***
	(0.0681)	(0.0511)	(0.0512)
constant	–1.2211***	–1.6841***	–1.2680***
	(0.0175)	(0.0066)	(0.0068)
Obs.	24836	144464	89314
Pseudo R2	0.0044	0.0062	0.0012
Log-likelihood	–7690.09	–27974.62	–28676.34

| | **With Characteristics Control** | | |
| | Control Group 1[+] | Control Group 2[++] | Control Group 3[+++] |
	mfx/se	mfx/se	mfx/se
Treatment Group	–0.0091	0.0185	–0.2704***
	(0.0737)	(0.0256)	(0.0353)
Family Caps	0.0568	–0.0264	–0.0096
	(0.0574)	(0.0221)	(0.0225)
Treat x Family Caps	–0.1403*	–0.1007*	–0.1085*
	(0.0760)	(0.0561)	(0.0561)
constant	0.2663	–1.1197***	–2.2887***
	(0.5211)	(0.2679)	(0.2618)
Obs.	17294	119389	75519
Pseudo R2	0.0792	0.0911	0.1092
Log-likelihood	–4374.64	–18259.16	–19888.22

+Disadvantaged women with one child prior.

++Non-disadvantaged women with at least two children prior.

+ + +Non-disadvantaged women with one child prior.

Reported results are marginal effects.

*Significant at 90%; **Significant at 95%; ***Significant at 99%.

Table VIII.: Difference-in-Difference Estimates of the Family Caps on Childbirth

| | **Without Controling for Individual Characteristics** | | | |
	With Family Caps	Without Family Caps	Diff	Diff-in-Diff
Treatment Group	−1.5373*** (.0055)	−1.3709*** (.0025)	−0.0231*** (.0061)	
Control Group 1	−1.2761*** (.0079)	−1.2211*** (.0033)	−0.0101 (.0086)	−0.0149* (.0092)
Control Group 2	−1.7508*** (.0014)	−1.6841*** (.0006)	−0.0061*** (.0016)	−0.0132** (.0065)
Control Group 3	−1.3021*** (.0028)	−1.2680*** (.0012)	−0.0060** (.0031)	−0.0179*** (.0066)

| | **With Characteristics Control** | | | |
	With Family Caps	Without Family Caps	Diff	Diff-in-Diff
Treatment Group	0.2179*** (.1161)	0.3013*** (.1120)	−0.0322 (.0220)	
Control Group 1	0.3672*** (.1100)	0.3104*** (.1105)	0.0214 (.0216)	−0.0536* (.0293)
Control Group 2	−1.6984** (.0178)	−1.6720** (.0185)	−0.0025*** (.0022)	−0.0090*** (.0056)
Control Group 3	−2.3489** (.0044)	−2.3394** (.0045)	−0.0002 (.0006)	−0.0012 (.0008)

*Significant at 90%; **Significant at 95%; ***Significant at 99% according to the wald test.

Standard errors are in parenthesis.

Table IX.: Sample Means of Pre-Reform Marriage

Variable	Mean	(Std. Dev.)	Min.	Max.
Marriage probability	0.081	(0.273)	0	1
Cohabitate	0.071	(0.256)	0	1
Black	0.172	(0.378)	0	1
Hispanic	0.065	(0.247)	0	1
Age	26.34	(8.865)	15	44
LFPR	0.667	(0.471)	0	1
Real weekly wage	264.319	(314.484)	0	10759.372
Real male median wage	535.49	(72.573)	380.996	750.19
MMPI	0.65	(0.273)	0	4.732
State unemployment rate	6.103	(1.512)	2.3	11.3
MSA	0.595	(0.491)	0	1
Unilateral divorce law	0.477	(0.499)	0	1
Covenant marriage	0	0.000	0	0
Child presence	0.272	(0.445)	0	1
Infant	0.045	(0.208)	0	1
EITC expansion	0.247	(0.431)	0	1
Welfare recipient	0.11	(0.313)	0	1
AFDC-UP availability	0.853	(0.354)	0	1
Log(real max. cash benefit)	1.464	(0.410)	0.235	2.331
Moderate cash benefit	0.633	(0.482)	0	1
High cash benefit	0.229	(0.420)	0	1
Moderate time limits	0	(0.000)	0	0
Strong time limits	0	(0.000)	0	0
Moderate earning disregard	1	(0.000)	1	1
High earning disregard	0	(0.000)	0	0
Moderate work sanction	0	(0.000)	0	0
Strict work sanction	0	(0.000)	0	0
Obs.	32473			

Table X.: Sample Means of Post-Reform Marriage

Variable	Mean	(Std. Dev.)	Min.	Max.
Marriage probability	0.059	(0.236)	0	1
Cohabitate	0.101	(0.301)	0	1
Black	0.163	(0.369)	0	1
Hispanic	0.108	(0.310)	0	1
Age	26.658	(9.258)	15	44
LFPR	0.675	(0.469)	0	1
Real weekly wage	283.635	(386.593)	0	10065.184
Real male median wage	549.18	(64.636)	387.378	781.486
MMPI	0.659	(0.300)	0	6.027
State unemployment rate	4.933	(1.469)	2.3	9.5
MSA	0.657	(0.475)	0	1
Unilateral divorce law	0.538	(0.499)	0	1
Covenant marriage	0.021	(0.143)	0	1
Child presence	0.268	(0.443)	0	1
Infant	0.043	(0.204)	0	1
EITC expansion	0.956	(0.205)	0	1
Welfare recipient	0.067	(0.249)	0	1
AFDC-UP availability	0.992	(0.090)	0	1
Log(real max.cashbenefit)	1.325	(0.395)	0.14	2.196
Moderate cash benefit	0.631	(0.483)	0	1
High cash benefit	0.254	(0.435)	0	1
Moderate time limits	0.617	(0.486)	0	1
Strong time limits	0.11	(0.313)	0	1
Moderate earning disregard	0.529	(0.499)	0	1
High earning disregard	0.399	(0.490)	0	1
Moderate work sanction	0.401	(0.490)	0	1
Strict work sanction	0.498	(0.500)	0	1
Obs.	28014			

Table XI.: Sample Means of Pre-Reform Divorce

Variable	Mean	(Std. Dev.)	Min.	Max.
Divorce probability	0.035	(0.184)	0	1
Separate	0.04	(0.196)	0	1
Black	0.068	(0.253)	0	1
Hispanic	0.058	(0.234)	0	1
Age	34.174	(6.144)	7	44
LFPR	0.731	(0.443)	0	1
Relative wage to spouse's	0.768	(19.989)	0	3475.118
MMPI	0.852	(0.185)	0	7.85
State unemployment rate	6.04	(1.520)	2.3	11.3
MSA	0.524	(0.499)	0	1
Unilateral divorce laws	0.512	(0.500)	0	1
Covenant marriage	0	0.000	0	0
Child aged 0	0.082	(0.274)	0	1
EITC expansion	0.445	(0.497)	0	1
Welfare recipients	0.032	(0.176)	0	1
AFDC-UP availablity	0.83	(0.375)	0	1
Log(real max. cash benefit)	1.447	(0.407)	0.235	2.331
Moderate cash benefit	0.654	(0.476)	0	1
High cash benefit	0.201	(0.401)	0	1
Moderate time limits	0	0.000	0	0
Strong time limits	0	0.000	0	0
Moderate earning disregards	1	0.000	1	1
High earning disregards	0	0.000	0	0
Moderate work sanctions	0	0.000	0	1
Strict work sanctions	0	0.000	0	0
Obs.	43524			

Table XII.: Sample Means of Post-Reform Divorce

Variable	Mean	(Std. Dev.)	Min.	Max.
Divorce probability	0.038	(0.191)	0	1
Separate	0.039	(0.193)	0	1
Black	0.067	(0.250)	0	1
Hispanic	0.113	(0.316)	0	1
Age	34.997	(6.128)	15	44
LFPR	0.752	(0.432)	0	1
Relative wage to spouse's	1.944	(126.714)	0	16707.221
MMPI	0.865	(0.202)	0	5.642
State unemployment rate	4.876	(1.456)	2.3	9.5
MSA	0.614	(0.487)	0	1
Unilateral divorce	0.567	(0.495)	0	1
Covenant marriage	0.02	(0.139)	0	1
Child aged 0	0.08	(0.272)	0	1
EITC expansion	0.987	(0.112)	0	1
Welfare recipients	0.019	(0.138)	0	1
AFDC-UP availablity	0.992	(0.088)	0	1
Log(real max. cash benefit)	1.314	(0.399)	0.14	2.196
Moderate cash benefit	0.64	(0.480)	0	1
High cash benefit	0.239	(0.426)	0	1
Moderate time limits	0.614	(0.487)	0	1
Strong time limits	0.117	(0.321)	0	1
Moderate earning disregard	0.53	(0.499)	0	1
High earning disregard	0.389	(0.488)	0	1
Moderate work sanction	0.4	(0.490)	0	1
Strict work sanction	0.497	(0.500)	0	1
Obs.	33972			

Table XIII.: Probit Estimates on Marriage without Characteristics Control

	(1)		(2)		(3)	
	$dF/d\beta$	S.E.	$dF/d\beta$	S.E.	$dF/d\beta$	S.E.
EITC Expansion	0.0226***	(0.0028)	0.0242***	(0.0028)	0.0468***	(0.0039)
AFDC-UP	−0.0045	(0.0040)	−0.0007	(0.0044)	0.0010	(0.0042)
Welfare Reform+	−0.0391***	(0.0029)	−0.0437***	(0.0030)	0.0066	(0.0051)
Year fixed effect	No		No		Yes	
State fixed effect	No		Yes		No	
Obs.	60487		60487		60487	
Pseudo R2	0.0058		0.0124		0.0112	
Log-likelihood	−15430.06		−15326.67		−15345.08	

Reported results are marginal effect

+Share of year that welfare reform is in effect

*Significant at 90%; **Significant at 95%; ***Significant at 99%

Table XIV.: Probit Estimates on Divorce without Characteristics Control

	(1D)		(2D)		(3D)	
	$dF/d\beta$	S.E.	$dF/d\beta$	S.E.	$dF/d\beta$	S.E.
EITC Expansion	0.0056***	(0.0019)	0.0043**	(0.0019)	−0.0033	(0.0032)
AFDC-UP availability	−0.0075***	(0.0029)	−0.0038	(0.0031)	−0.0109***	(0.0032)
Welfare Reform+	0.0004	(0.0017)	0.0008	(0.0017)	−0.0047	(0.0036)
Year fixed effect	No		No		Yes	
State fixed effect	No		Yes		No	
Obs.	77496		77496		77496	
Pseudo R2	0.0006		0.0057		0.0026	
Log-likelihood	−12114.80		−12053.39		−12090.91	

Reported results are marginal effect

+Share of year that welfare reform is in effect

*Significant at 90%; **Significant at 95%; ***Significant at 99%

Table XV.: Probit Estimates on Marriage with Characteristics Control

	(4)		(5)		(6)	
	$dF/d\beta$	S.E.	$dF/d\beta$	S.E.	$dF/d\beta$	S.E.
Cohabitate	0.0292***	(0.0032)	0.0281***	(0.0032)	0.0295***	(0.0032)
Black	−0.0374***	(0.0016)	−0.0374***	(0.0016)	−0.0373***	(0.0016)
Hispanic	−0.0117***	(0.0024)	−0.0115***	(0.0025)	−0.0113***	(0.0024)
age 20–24	0.1331***	(0.0077)	0.1369***	(0.0078)	0.1334***	(0.0077)
age 25–29	0.2069***	(0.0106)	0.2132***	(0.0109)	0.2077***	(0.0107)
age 30–34	0.1715***	(0.0104)	0.1766***	(0.0107)	0.1719***	(0.0105)
age 35–39	0.1336***	(0.0096)	0.1381***	(0.0099)	0.1348***	(0.0097)
age 40–44	0.1012***	(0.0089)	0.1058***	(0.0091)	0.1028***	(0.0090)
LFPR	0.0085***	(0.0019)	0.0080***	(0.0019)	0.0085***	(0.0019)
Median of male wage	−0.0000**	(0.0000)	0.0000	(0.0000)	−0.0000*	(0.0000)
MMPI	0.0213***	(0.0042)	0.0178***	(0.0042)	0.0200***	(0.0042)
Unemployment rate	0.0013**	(0.0005)	0.0018**	(0.0008)	0.0005	(0.0006)
MSA	−0.0059***	(0.0017)	−0.0076***	(0.0020)	−0.0059***	(0.0017)
Unilateral divorce	0.0054***	(0.0018)	−0.0110	(0.0082)	0.0054***	(0.0017)
Covenant marriage	−0.0040	(0.0082)	−0.0100	(0.0083)	−0.0030	(0.0083)
Child presence	0.0175***	(0.0023)	0.0157***	(0.0023)	0.0169***	(0.0024)
Infant	0.0664***	(0.0063)	0.0657***	(0.0063)	0.0657***	(0.0063)
EITC expansion	−0.0015	(0.0024)	0.0021	(0.0026)	0.0003	(0.0035)
AFDC-UP	0.0030	(0.0029)	0.0054*	(0.0030)	0.0046	(0.0032)
Log(welfare cash)	−0.0008	(0.0023)	0.0316***	(0.0118)	−0.0029	(0.0024)
Welfare Reform+	−0.0142***	(0.0024)	−0.0119***	(0.0030)	0.0045	(0.0039)
Fixed effect?	None		State		Year	
Obs.	60486		60486		60486	
Pseudo R2	0.1234		0.1267		0.1261	
Log-likelihood	−13601.69		−13551.27		−13560.07	

Reported results are marginal effect

+Share of year that welfare reform is in effect

*Significant at 90%; **Significant at 95%; ***Significant at 99%

Table XVI.: Probit Estimates of the Effect of Welfare Components on Marriage without Characteristics Control

	(7)		(8)		(9)	
	$dF/d\beta$	S.E.	$dF/d\beta$	S.E.	$dF/d\beta$	S.E.
EITC expansion	0.0309***	(0.0028)	0.0152***	(0.0027)	0.0080***	(0.0025)
AFDC-UP	−0.0091**	(0.0043)	−0.0066	(0.0043)	−0.0128***	(0.0044)
Cash generosity–Mod	0.0114***	(0.0033)	0.0089***	(0.0033)		
Cash generosity–High	0.0122***	(0.0041)	0.0049	(0.0039)		
Time Limit–Mod	0.0145***	(0.0040)	−0.0084***	(0.0031)		
Time Limit–Strict	0.0107	(0.0068)	−0.0129**	(0.0050)		
Earning disregard–Mod	−0.0043	(0.0068)				
Earning disregard–High	−0.0102*	(0.0060)				
Work sanction–Mod	−0.0457***	(0.0029)				
Work sanction–Strong	−0.0499***	(0.0033)				
Work incentive–Mixed			−0.0150**	(0.0060)		
Work incentive–Strong			−0.0263***	(0.0029)		
Mixed welfare rule					0.0250***	(0.0025)
Restrictive welfare rule					0.0073*	(0.0042)
Year fixed effect	No		No		No	
State fixed effect	No		No		No	
Obs.	60486		60486		60486	
Pseudo R2	0.0103		0.0049		0.0033	
Log-likelihood	−15359.18		−15443.02		−15468.00	

The estimates are **not** controlled for individual characteristics

Reported results are marginal effect

*Significant at 90%; **Significant at 95%; ***Significant at 99%

Table XVII.: Probit Estimates of the Effect of Welfare Components on Marriage with Characteristics Control

	(10)		(11)		(12)	
	$dF/d\beta$	S.E.	$dF/d\beta$	S.E.	$dF/d\beta$	S.E.
EITC expansion	0.0036	(0.0024)	−0.0053**	(0.0022)	−0.0077***	(0.0020)
AFDC-UP	0.0019	(0.0030)	0.0032	(0.0029)	0.0014	(0.0030)
Cash generosity–Mod	−0.0003	(0.0027)	−0.0005	(0.0027)		
Cash generosity–High	−0.0011	(0.0031)	−0.0039	(0.0030)		
Time Limit–Mod	0.0142***	(0.0032)	0.0034	(0.0026)		
Time Limit–Strict	0.0125**	(0.0055)	0.0013	(0.0045)		
Earning disregard–Mod	0.0031	(0.0049)				
Earning disregard–High	−0.0021	(0.0048)				
Work sanction–Mod	−0.0244***	(0.0024)				
Work sanction–Strong	−0.0261***	(0.0028)				
Work incentive–Mixed			−0.0116***	(0.0044)		
Work incentive–Strong			−0.0149***	(0.0023)		
Mixed welfare rule					0.0076***	(0.0020)
Restrictive welfare rule					0.0051*	(0.0032)
Year fixed effect	No		No		No	
State fixed effect	No		No		No	
Obs.	60486		60486		60486	
Pseudo R2	0.1259		0.1237		0.1228	
Log-likelihood	−13563.22		−13597.59		−13612.02	

The estimates are controlled for individual characteristics as shown in table XV but are opted out from the table
Reported results are marginal effect
*Significant at 90%; **Significant at 95%; ***Significant at 99%

Table XVIII.: Probit Estimates on Divorces with Characteristics Control

	(4D)		(5D)		(6D)	
	$dF/d\beta$	S.E.	$dF/d\beta$	S.E.	$dF/d\beta$	S.E.
Separate	−0.0237***	(0.0011)	−0.0233***	(0.0011)	−0.0235***	(0.0011)
Black	−0.0035	(0.0023)	−0.0030	(0.0023)	−0.0034	(0.0023)
Hispanic	−0.0042**	(0.0019)	−0.0040**	(0.0020)	−0.0040**	(0.0019)
age 20–24	0.0048	(0.0096)	0.0048	(0.0095)	0.0045	(0.0095)
age 25–29	0.0015	(0.0086)	0.0015	(0.0085)	0.0010	(0.0084)
age 30–34	0.0017	(0.0085)	0.0018	(0.0084)	0.0013	(0.0084)
age 35–39	0.0018	(0.0085)	0.0020	(0.0085)	0.0014	(0.0084)
age 40–44	0.0008	(0.0084)	0.0012	(0.0084)	0.0005	(0.0083)
LFPR	−0.0007	(0.0013)	−0.0007	(0.0013)	−0.0008	(0.0013)
Relative wage	−0.0001	(0.0002)	−0.0001	(0.0001)	−0.0001	(0.0001)
MMPI	0.0003	(0.0032)	−0.0008	(0.0033)	0.0005	(0.0032)
Unemployment rate	−0.0004	(0.0004)	−0.0007	(0.0006)	−0.0006	(0.0005)
MSA	0.0012	(0.0011)	0.0021	(0.0013)	0.0013	(0.0011)
Unilateral divorce	0.0031***	(0.0011)	−0.0025	(0.0054)	0.0029**	(0.0011)
Covenant marriage	−0.0043	(0.0053)	−0.0033	(0.0065)	−0.0036	(0.0055)
Child aged 0	−0.0034	(0.0022)	−0.0039*	(0.0021)	−0.0020	(0.0023)
Child aged 1–2	0.0001	(0.0019)	−0.0005	(0.0019)	0.0019	(0.0021)
Child aged 3–5	−0.0023	(0.0018)	−0.0029	(0.0018)	−0.0008	(0.0020)
Child aged 6–8	−0.0006	(0.0020)	−0.0012	(0.0019)	0.0011	(0.0022)
Child aged 9–18	−0.0016	(0.0017)	−0.0024	(0.0017)	−0.0000	(0.0019)
EITC expansion	0.0044***	(0.0016)	0.0068***	(0.0018)	−0.0017	(0.0030)
AFDC-UP	−0.0009	(0.0023)	−0.0018	(0.0026)	−0.0028	(0.0026)
Log(cash benefits)	−0.0026*	(0.0015)	0.0230***	(0.0080)	−0.0023	(0.0015)
Welfare Reform+	−0.0016	(0.0016)	0.0010	(0.0021)	−0.0035	(0.0030)
Year fixed effect	No		No		Yes	
State fixed effect	No		Yes		No	
Obs.	77495		77495		77495	

Reported results are marginal effect

+Share of year that welfare reform is in effect

*Significant at 90%; **Significant at 95%; ***Significant at 99%

Table XIX.: Probit Estimates of the Effect of Welfare Components on Divorce without Characteristics Control

	(7D)		(8D)		(9D)	
	$dF/d\beta$	S.E.	$dF/d\beta$	S.E.	$dF/d\beta$	S.E.
EITC expansion	0.0040**	(0.0019)	0.0035*	(0.0018)	0.0034*	(0.0018)
AFDC-UP	−0.0052*	(0.0028)	−0.0066**	(0.0029)	−0.0060**	(0.0028)
Cash generosity–Mod	−0.0003	(0.0020)				
Cash generosity–High	−0.0084***	(0.0022)				
Time Limit–Mod	0.0021	(0.0025)				
Time Limit–Strict	0.0057	(0.0040)				
Earning disregard–Mod	−0.0011	(0.0039)				
Earning disregard–High	−0.0029	(0.0036)				
Work sanction–Mod	−0.0008	(0.0026)				
Work sanction–Strong	0.0017	(0.0030)				
Work incentive–Mixed			0.0031	(0.0019)		
Work incentive–Strong			0.0061***	(0.0019)		
Mixed welfare rule					−0.0041**	(0.0017)
Restrictive welfare rule					0.0040	(0.0025)
Year fixed effect	No		No		No	
State fixed effect	No		No		No	
Obs.	77495		77495		77495	
Pseudo R2	0.0021		0.0010		0.0012	
Log-likelihood	−12096.23		−12109.39		−12107.22	

The estimates are **not** controlled for individual characteristics

Reported results are marginal effect

*Significant at 90%; **Significant at 95%; ***Significant at 99%

Table XX.: Probit Estimates of the Effect of Welfare Components on Divorce with Characteristics Control

	(10D)		(11D)		(12D)	
	$dF/d\beta$	S.E.	$dF/d\beta$	S.E.	$dF/d\beta$	S.E.
EITC expansion	0.0046**	(0.0020)	0.0039**	(0.0018)	0.0037**	(0.0018)
AFDC-UP	−0.0044	(0.0028)	−0.0056*	(0.0029)	−0.0050*	(0.0029)
Cash generosity–Mod	0.0008	(0.0021)				
Cash generosity–High	−0.0072***	(0.0023)				
Time Limit–Mod	0.0022	(0.0024)				
Time Limit–Strict	0.0038	(0.0038)				
Earning disregard–Mod	0.0005	(0.0038)				
Earning disregard–High	−0.0024	(0.0036)				
Work sanction–Mod	−0.0021	(0.0026)				
Work sanction–Strong	0.0016	(0.0031)				
Work incentive–Mixed			0.0014	(0.0019)		
Work incentive–Strong			0.0046**	(0.0020)		
Mixed welfare rule					−0.0033*	(0.0017)
Restrictive welfare rule					0.0032	(0.0025)
Year fixed effect	No		No		No	
State fixed effect	No		No		No	
Obs.	77495		77495		77495	
Pseudo R2	0.0107		0.0096		0.0097	
Log-likelihood	−11989.12		−12002.38		−12001.01	

The estimates are controlled for individual characteristics as shown in table XVIII but are opted out from the table
Reported results are marginal effect
*Significant at 90%; **Significant at 95%; ***Significant at 99%

Table XXI.: Probit Estimates of the Effect of Welfare Reform Lags on Divorce

	(13D)		(14D)		(15D)	
	$dF/d\beta$	S.E.	$dF/d\beta$	S.E.	$dF/d\beta$	S.E.
EITC expansion	0.0060***	(0.0018)	0.0060***	(0.0018)	0.0059***	(0.0018)
AFDC-UP availability	−0.0032	(0.0026)	−0.0032	(0.0026)	−0.0031	(0.0026)
Welfare Reform+	0.0025	(0.0031)	0.0028	(0.0031)	0.0028	(0.0031)
Welfare Reform$_{t-1}$	−0.0051	(0.0043)	−0.0069	(0.0044)	−0.0065	(0.0044)
Welfare Reform$_{t-2}$	−0.0024	(0.0032)	0.0052	(0.0044)	0.0035	(0.0045)
Welfare Reform$_{t-3}$			−0.0080**	(0.0033)	−0.0008	(0.0044)
Welfare Reform$_{t-4}$					−0.0087**	(0.0036)
Year fixed effect	No		No		No	
State fixed effect	No		No		No	
Obs.	77071		77071		77071	
Pseudo R2	0.0117		0.0120		0.0122	
Log-likelihood	−10556.82		−10553.89		−10551.01	
$Prob > chi2$:						
All lagged WR=0	0.02		0.00		0.00	

The estimates are controlled for individual characteristics as shown in table XVIII but are opted out from the table

Reported results are marginal effect

+Share of year that welfare reform is in effect

*Significant at 90%; **Significant at 95%; ***Significant at 99%

Table XXII.: Diff-in-Diff Estimates of the Effect of Welfare Reform on Marriage Likelihood (Treatment Group: High School Dropout Women with Children)

	No control for individual characteristics			
	Pre-reform	Post-reform	Diff	Diff-in-Diff
Treatment Group				
HS dropout with child	.0423***	.0246***	−.0177***	
	(.0041)	(.0053)	(.0068)	
Control Groups				
(1) HS dropout without child	.0068***	.0061***	−.0008	−.0169**
	(.0019)	(.0021)	(.0028)	(.0074)
(2) HS degree or higher with child	.0455***	.0368***	−.0086***	−.0090
	(.0012)	(.0014)	(.0018)	(.0070)
	Controlled for individual characteristics			
	Pre-reform	Post-reform	Diff	Diff-in-Diff
Treatment Group				
HS dropout with child	.0082	−.0136	−.0216***	
	(.0108)	(.0114)	(.0068)	
Control Groups				
(1) HS dropout without child	.0064	.0068	.0004	−.0222***
	(.0098)	(.0100)	(.0035)	(.0073)
(2) HS degree or higher with child	.0157	.0034	−.0123***	−.0095
	(.0099)	(.0101)	(.0026)	(.0069)

*Statistically significant at 90%; **statistically significant at 95%; ***statistically significant at 99%

Table XXIII.: Diff-in-Diff Estimates of the Effect of Welfare Reform on Marriage Likelihood (Treatment Group: Women with Children and Family Income below 5 Percentile)

	No control for individual characteristics			
	Pre-reform	Post-reform	Diff	Diff-in-Diff
Treatment Group				
Income ≤ 5 pct with child	.0543***	.0378***	−.0165**	
	(.0043)	(.0055)	(.0070)	
Control Groups				
(1) Income ≤ 5 pct without child	.0665***	.0473***	−.0192**	.0027
	(.0056)	(.0056)	(.0081)	(.0107)
(2) Income ≥ 50 pct with child	.0325***	.0261***	−.0064***	−.0100
	(.0010)	(.0011)	(.0016)	(.0072)
	Controlled for individual characteristics			
	Pre-reform	Post-reform	Diff	Diff-in-Diff
Treatment Group				
Income ≤ 5 pct with child	.0219**	−.0004	−.0223***	
	(.0107)	(.0113)	(.0070)	
Control Groups				
1) Income ≤ 5 pct without child	.0213*	−.0010	−.0223***	.0000
	(.0111)	(.0113)	(.0081)	(.0105)
(2) Income ≥ 50 pct with child	.0111	.0023	−.0085***	−.0137*
	(.0097)	(.0099)	(.0024)	(.0071)

*Statistically significant at 90%; **statistically significant at 95%; ***statistically significant at 99%

Table XXIV.: Diff-in-Diff Estimates of the Effect of Welfare Reform on Marriage Likelihood (Treatment Group: Women with Children and Family Income below 10 Percentile)

	No control for individual characteristics			
	Pre-reform	Post-reform	Diff	Diff-in-Diff
Treatment Group				
Income ≤ 10 pct with child	.0485***	.0362***	−.0123**	
	(.0033)	(.0041)	(.0053)	
Control Groups				
(1) Income ≤ 10 pct without child	.0602***	.0468***	−.0133**	.0010
	(.0041)	(.0043)	(.0060)	(.0080)
(2) Income ≥ 50 pct with child	.0231***	.0159**	−.0072***	−.0091*
	(.0064)	(.0078)	(.0026)	(.0055)
	Controlled for individual characteristics			
	Pre-reform	Post-reform	Diff	Diff-in-Diff
Treatment Group				
Income ≤ 10 pct with child	.013	−.0052	−.0182***	
	(.0104)	(.0107)	(.0053)	
Control Groups				
(1) Income ≤ 10 pct without child	.0225**	.0046	−.0178***	−.0004
	(.0105)	(.0107)	(.0062)	(.0079)
(2) Income ≥ 50 pct with child	.0106	.0024	−.0083***	−.0100*
	(.0097)	(.0099)	(.0025)	(.0055)

*Statistically significant at 90%; **statistically significant at 95%; ***statistically significant at 99%

Table XXV.: Diff-in-Diff Estimates of the Effect of Welfare Reform on Divorce Likelihood (Treatment Group: High School Dropout Women with Children)

	No control for individual characteristics			
	Pre-reform	Post-reform	Diff	Diff-in-Diff
Treatment Group				
HS dropout with child	.0289***	.0317***	.0028	
	(.0029)	(.0037)	(.0047)	
Control Groups				
(1) HS dropout without child	.0036***	.0404***	.0045	−.0017
	(.0064)	(.0079)	(.0103)	(.0011)
(2) HS degree or higher with child	.0310***	.0325***	.0015	.0013
	(.0009)	(.0011)	(.0014)	(.0049)
	Controlled for individual characteristics			
	Pre-reform	Post-reform	Diff	Diff-in-Diff
Treatment Group				
HS dropout with child	.0246***	.0243***	−.0003	
	(.0091)	(.0093)	(.0045)	
Control Groups				
(1) HS dropout without child	.0302***	.0251**	−.0052	.0049
	(.00102)	(.0107)	(.0095)	(.0104)
(2) HS degree or higher with child	.0275***	.0248***	−.0027	.0024
	(.0088)	(.0087)	(.0017)	(.0045)

*Statistically significant at 90%; **statistically significant at 95%; ***statistically significant at 99%

Table XXVI.: Diff-in-Diff Estimates of the Effect of Welfare Reform on Divorce Likelihood (Treatment Group: Women with Children and Family Income below 5 Percentile)

	No control for individual characteristics			
	Pre-reform	Post-reform	Diff	Diff-in-Diff
Treatment Group				
Income ≤ 5 pct with child	.0294***	.0310***	.0017	
	(.0013	(.0017)	(.0022)	
Control Groups				
(1) Income ≤ 5 pct without child	.0300***	.0385***	.0085*	−.0069
	(.0027)	(.0036)	(.0045)	(.0050)
(2) Income ≥ 50 pct with child	.0324***	.0327***	.0003	.0014
	(.0012)	(.0013)	(.0018)	(.0028)

	Controlled for individual characteristics			
	Pre-reform	Post-reform	Diff	Diff-in-Diff
Treatment Group				
Income ≤ 5 pct with child	.0228***	.0206**	−.0023	
	(.0089)	(.0089)	(.0023)	
Control Groups				
1) Income ≤ 5 pct without child	.0280***	.0282***	.0001	−.0024
	(.0089)	(.0090)	(.0045)	(.0046)
(2) Income ≥ 50 pct with child	.0278***	.0247***	−.0031	.0009
	(.0089)	(.0088)	(.0020)	(.0026)

*Statistically significant at 90%; **statistically significant at 95%; ***statistically significant at 99%

Table XXVII.: Diff-in-Diff Estimates of the Effect of Welfare Reform on Divorce Likelihood (Treatment Group: Women with Children and Family Income below 10 Percentile)

	No control for individual characteristics			
	Pre-reform	Post-reform	Diff	Diff-in-Diff
Treatment Group				
Income ≤ 10 pct with child	.0291***	.0252***	−.0039	
	(.0049)	(.0063)	(.0081)	
Control Groups				
(1) Income ≤ 10 pct without child	.0271**	.0222*	−.0049	.0010
	(.0110	(.0118)	(.0163)	(.0182)
(2) Income ≥ 50 pct with child	.0310***	.0328***	.0019	−.0058
	(.0008)	(.0010)	(.0013)	(.0082)
	Controlled for individual characteristics			
	Pre-reform	Post-reform	Diff	Diff-in-Diff
Treatment Group				
Income ≤ 10 pct with child	.0212**	.0121	−.0091	
	(.0098)	(.0104)	(.0075)	
Control Groups				
(1) Income ≤ 10 pct without child	.0176	.0035	−.0140***	.0049
	(.0131)	(.0135)	(.0150)	(.0167)
(2) Income ≥ 50 pct with child	.0300***	.0277***	−.0023	−.0068
	(.0087)	(.0087)	(.0017)	(.0076)

*Statistically significant at 90%; **statistically significant at 95%; ***statistically significant at 99%

Table XXVIII.: Linear Combination of the Coefficients in Diff-in-Diff Model

	Pre-Reform	Post-Reform	Difference	Diff-in-Diff
Treatment Group	$\hat{\alpha_0} + \hat{\alpha_1}$	$\hat{\alpha_0} + \hat{\alpha_1} + \hat{\alpha_3} + \hat{\alpha_4}$	$\hat{\alpha_3} + \hat{\alpha_4}$	
Control Group 1	$\hat{\alpha_0} + \hat{\alpha_2}$	$\hat{\alpha_0} + \hat{\alpha_2} + \hat{\alpha_3} + \hat{\alpha_5}$	$\hat{\alpha_3} + \hat{\alpha_5}$	$\hat{\alpha_4} - \hat{\alpha_5}$
Control Group 2	$\hat{\alpha_0}$	$\hat{\alpha_0} + \hat{\alpha_3}$	$\hat{\alpha_3}$	$\hat{\alpha_4}$

Table XXIX.: Category of the Severity of State Work Sanction

	No sanction	Moderate	Strong
Sanction Period	No	Less than 1 year	More than 1 year
Benefit reduction	No	Partially	Partially or Full

APPENDIX C
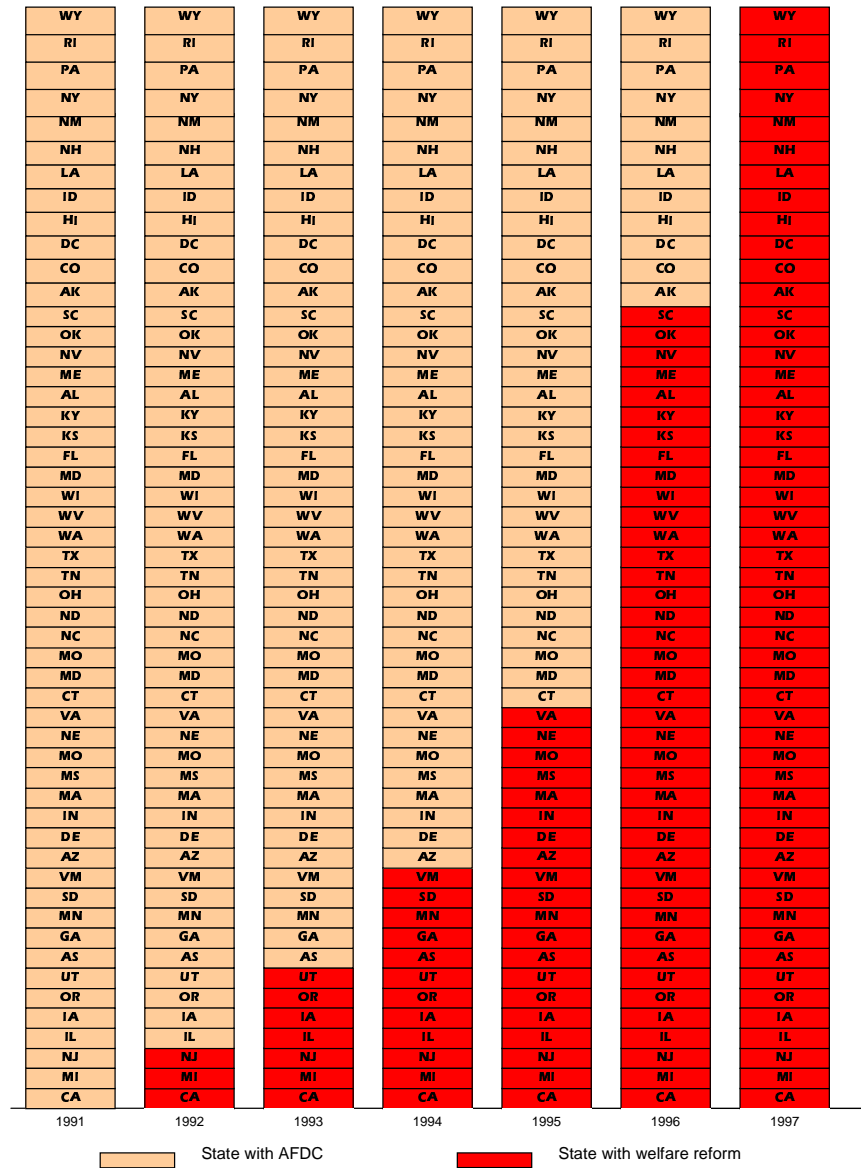
Fig. 1.: Cross-State Variation in Welfare Reform Implementation Year
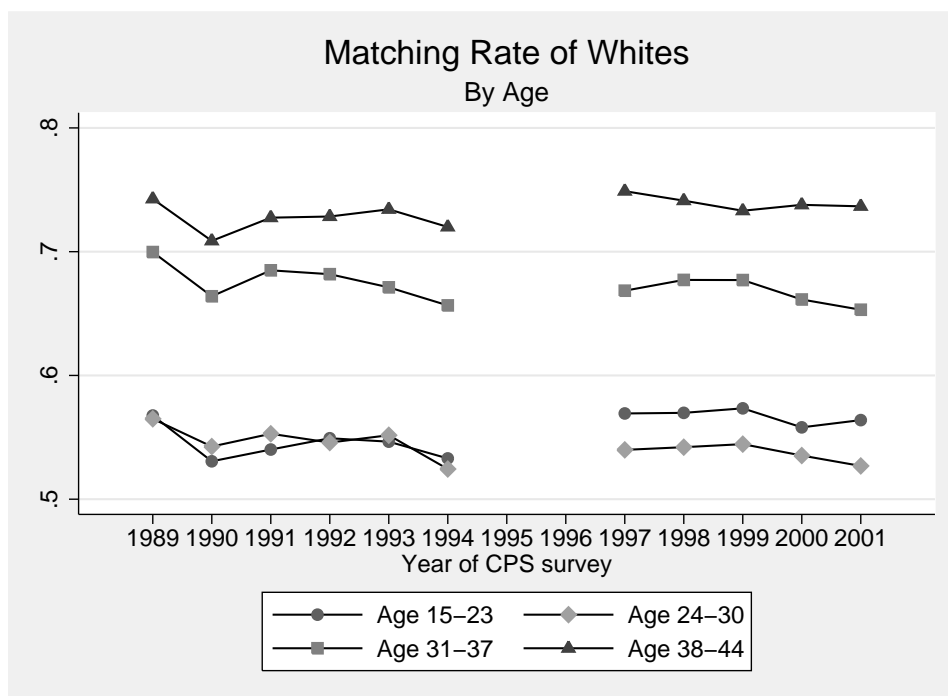
Fig. 2.: Matching Rate of White Women Aged 15–44 by Year and Age
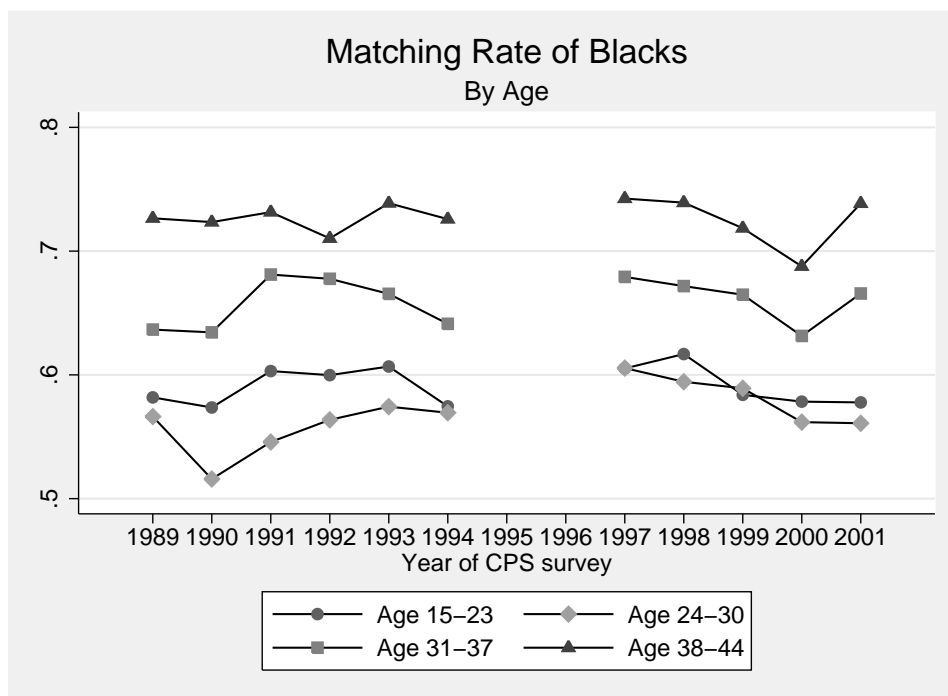
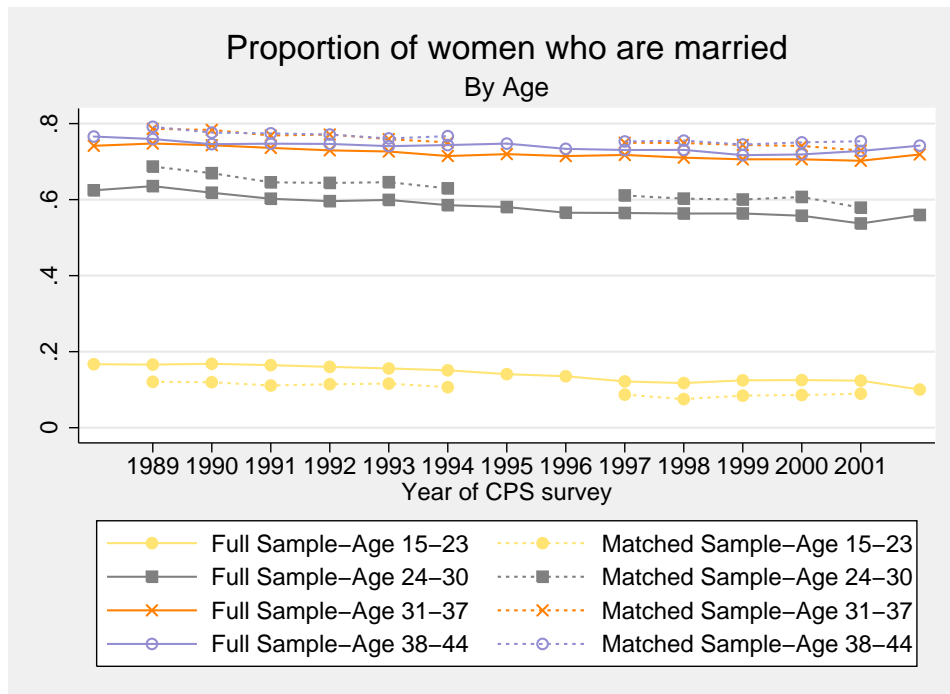Fig. 3.: Matching Rate of Black Women Aged 15-44 by Year and Age

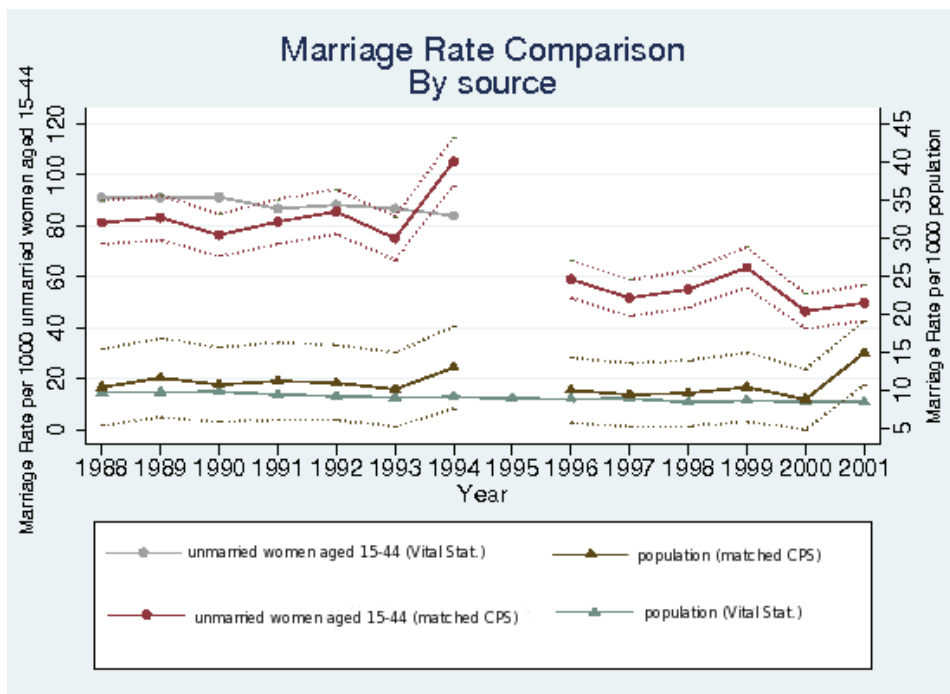Fig. 4.: Comparison of Proportion of Married Women by Age
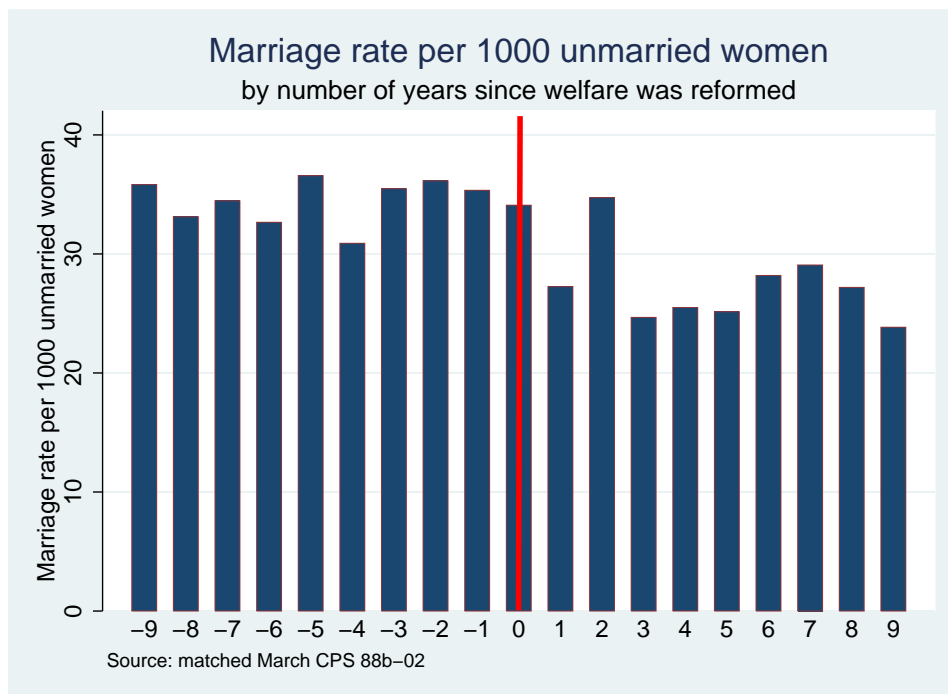

Fig. 5.: Marriage Rate Comparison
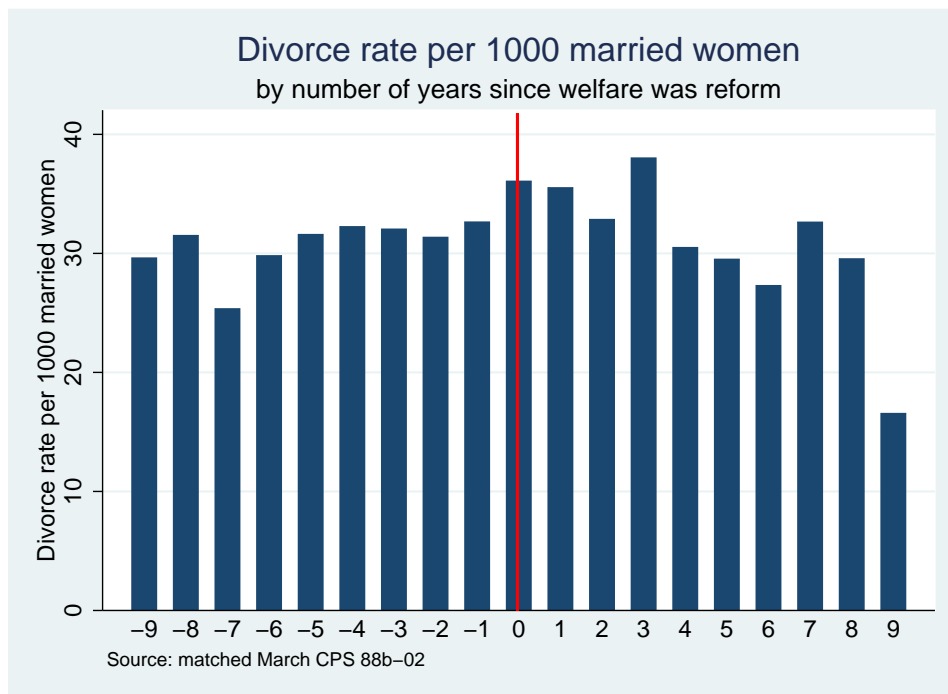
Fig. 6.: Marriage Rate of Women from Matched March CPS
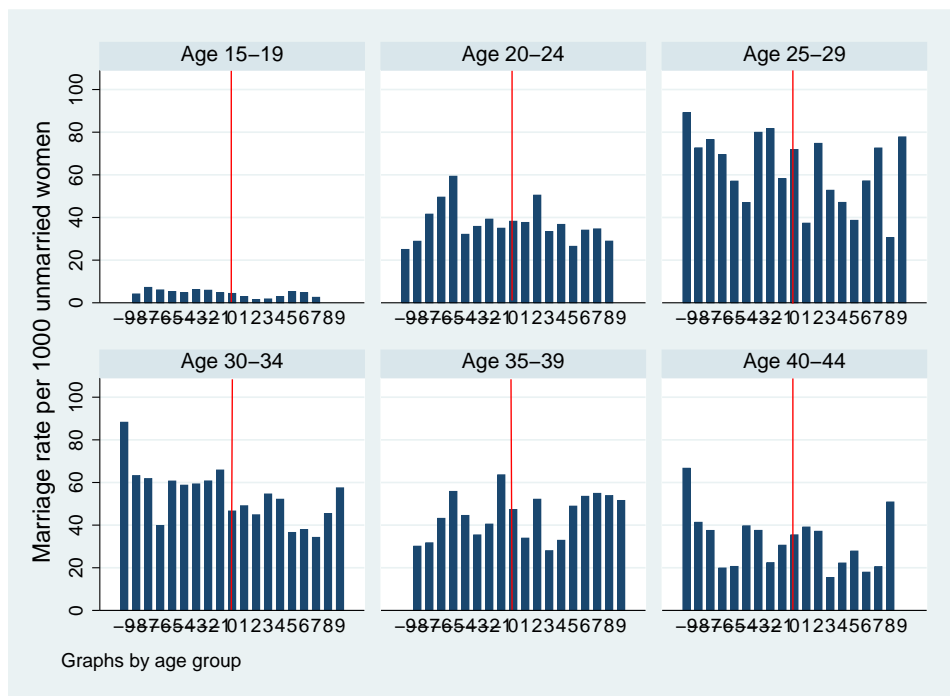

Fig. 7.: Divorce Rate of Women from Matched March CPS
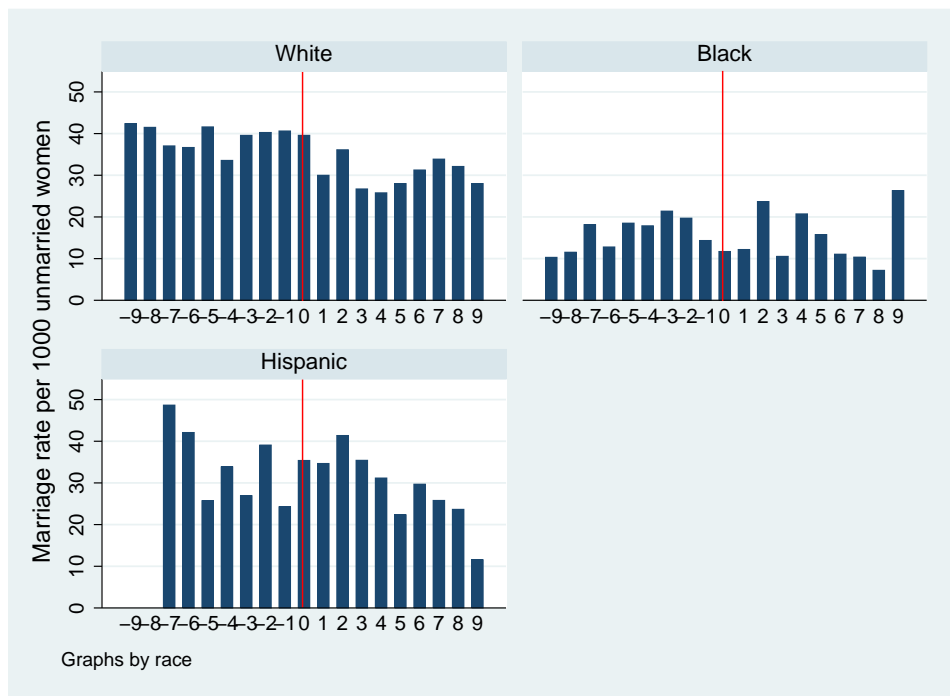
Fig. 8.: Marriage Rate of Women by Age Group

Fig. 9.: Marriage Rate of Women by Race

VITA

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