DIVORCE RATES AND WOMEN'S LABOR SUPPLY: A CAUSATION EXPLORATION

by

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B.A., Western Washington University 2004

PROJECT SUBMITTED IN PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR THE DEGREE OF

MASTER OF ARTS

In the
Department
of
Economics

SIMON FRASER UNIVERSITY

Fall 2006

APPROVAL

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Degree:	**Master of Arts**
Title of Project:	**Divorce Rates and Women's Labor Supply: A Causation Exploration**

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ABSTRACT

Both Granger causality and three-stage least squares tests with state level panel data suggest that after 1976 divorce does not precede women's labor force participation. Also, Granger causality tests indicate that increases in women's labor force participation precede marginal decreases in divorce rates. The results support the theory that women do not change their labor force participation in response to changes in the divorce rates. Secondly, changes in incentives and roles in the marital relationship may lead to a decline in divorce rates in response to an increasing women's labor force participation rate.

Keywords: divorce rate; women; labor force participation; Granger causality

To my Mum and Pop

ACKNOWLEDGEMENTS

Thank you to those who have encouraged and supported me. Specifically thank you to Doug Allen for suffering through my drafts, John Krieg for the idea and comments, and Simon Woodcock for adding dimension to my work. Also, thank you to Suzanne Lamoureux for the extra vowel.

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1 INTRODUCTION

From 1950 to 1976 divorce rates in the US rose from 3.7 to 5.5 per 1,000 individuals. Meanwhile from 1960 to 1976, women's labor force participation rates rose steadily from 328 to 453 per 1000 women. When scholars began to notice the simultaneous increase in these two rates, journals became populated with papers exploring the relationship.[1] If a relationship exists between divorce rates and women's labor supply, understanding it may be important for analyzing divorce law or other policies which influence incentives for divorce. Changes in divorce law may influence both a woman's decision to work and also her decision to divorce.

While divorce rates increase over the period prior to 1976, they begin to decrease again by the early 1980's. Previous papers study the relationship between divorce and women's labor supply before the divorce rate begins to decline, however, here the period after 1976 is examined. I use two methods to examine "causality" between divorce rates and women's labor supply. The first is a Granger causality test on state-level panel data.[2] The second is a three-stage least squares approach using instrumental variables for the endogenous divorce rate and women's labor force participation rate. The question addressed with these methods is whether divorce causes women's labor supply, and/or if women's labor supply causes divorce.[3] The results show, counter to previous papers, high divorce rates do not precede increases women's labor force participation. It appears that increases in women's labor supply Granger cause a decrease in the divorce rate.

Previous empirical papers test two theories that relate divorce and women's labor supply decisions. The first theory is the "insurance theory." Basically, women respond to increasing divorce rates by working more. The idea is that women insure themselves and their children against a dramatic income change in case of divorce. Johnson and Skinner (1986) find that women respond to increases in divorce rates by working more

[1] See Seitz (1999) for a review literature that complements the literature presented here.
[2] Previously, Granger causality tests with *panel* data have not been applied to the divorce/women's labor supply question.
[3] Granger causality does not test causality, rather it tests if one variable precedes another.

hours. Michael (1985) and Bremmer and Kesselring (1999) find that divorce Granger causes women's labor force participation. Accordingly, Parkman (1992) finds that certain types of women increase their labor force participation in response to divorce laws that are not in their favor. These women are those whom lose substantial returns to their human capital by not working.

The second theory tested in previous papers is the "specialization theory." When both spouses work, there is a loss of specialization as the couple does not exploit their respective comparative advantage. Ignoring the gains from specialization decreases the value of the marriage from a situation where only one spouse works and the other invests in the home. With a decrease in value, the marriage is more vulnerable to shocks, and one would expect divorce rates to increase.[4] However, Michael (1985) does not find that women's labor supply Granger causes divorce. In their 1999 paper, Bremmer and Kesselring support Michael's findings. Likewise, Johnson and Skinner (1986) find that women working more have a positive but insignificant effect on divorce.

2 DIVORCE DECISIONS

The decision to divorce is based on the relative values of each spouse in and out of marriage. When a woman can support herself, her alternative to marriage becomes more attractive. Because women's labor supply affects the relative values she places on marriage and divorce, changes in labor supply may affect the divorce rate. Specifically, if a woman can support herself, she may be more likely to leave a marriage. This next section explains the theory behind divorce decisions.

Allen (2002) presents a simple model to explain the divorce decision. Simply, if the expected total utility of a couple is larger in marriage than separated, then the couple will choose to stay married. However, if the expected total utility is larger in separation, then the couple will choose to dissolve the union (Becker 1974) Total value, or utility, is

[4] Bremmer and Kesselring (2004) use a similar theory they call the "independent effect." They hypothesize that female labor participation increases income, financial independence, and therefore the probability of divorce.

important because when total value is maximized, each spouse is better off since their individual values are maximized. In order to achieve the efficient outcomes, payments may be necessary between married couples. Table 1 shows an example where preserving the marriage is the efficient decision. This example assumes no transaction costs.

Table 1 **Sample Payoffs in an efficient marriage ($)**

	Husband	Wife	Total
Married	50	50	100
Divorced	60	30	90

The above example from Allen (2002) indicates that the husband values divorce $10 more than he values marriage, but the wife loses $20 in divorce. The wife is willing to pay $20 to stay in the marriage and the husband is willing to accept anything more than $10. Therefore, the wife can pay $10.01 to her husband to keep the marriage together. In this case, the marriage will be salvaged. Likewise, if the Married and Divorced labels are interchanged, the wife will want to divorce since she values the marriage at only $30 and the divorce at $50. She is again willing to pay her husband $20 (this time for a divorce) which is more than he requires for consent.

This example is an application of the Coase theorem which states that when bargaining takes place, like in the above example, the efficient outcome is attained.[5] However, the for the Coase theorem to work, transaction costs must be low or, ideally, zero. Transaction costs complicate the bargaining and may result in an outcome that is inefficient. When it comes to divorce decisions, transaction costs may be high. Specifically transaction costs may higher if state law requires a period of separation before the divorce is allowed. The next section discusses divorce and property division laws and how these legal issues may lead to inefficient outcomes.

[5] Efficient bargaining also requires property rights.

3 DIVORCE LAW

Prior to 1969 all states had mutual consent (fault-based) laws for divorce. Both spouses had to agree on the divorce in order to legally separate. However, upon agreeing to divorce, one spouse needed to be at fault for reasons like adultery, insanity, or abuse. Because most marriages do not end for reasons specified by law, couples would commonly agree upon a fault to divorce (Allen 2002).[6] However, not all couples agree without some substantial transfer between them. "Essentially, a fault-based law assigns the property right, or power of the divorce, to the spouse *least wanting to divorce*" (Allen 2002). The property right is important since a woman who does not work in marriage, may exercise her "power of divorce" to obtain a large portion of the marital property. Since the woman's consent is needed, her marital property is protected and her incentive to work diminished.

Beginning with California in 1969, states began to adopt no-fault divorce laws. No-fault, or unilateral, divorce laws allowed divorce on grounds like "irreconcilable differences." The critical feature of such grounds is that they do not require mutual consent. Without mutual consent requirements, the property right shifts to the person most wanting the divorce.

No-fault divorce legislation is not the only law that influences the incentives for divorce. Property division laws are also important since they too affect the incentives for divorce and also labor force participation decisions. During the same time no-fault legislation came about, states changed their property division laws as well. Some states were "equal" distribution states where marital property is divided 50:50 regardless of spousal contribution during marriage. A 50:50 split may allow for the opportunity for one spouse to take advantage of another (Gray 1998). On the other hand, some states allow for "equitable" distribution of property, which considers each spouse's contribution to the marriage. Though this second type of property division law protects better the spouse with higher contributions, there still may be imperfect definitions of property allowing for exploitation (Allen 2002). For instance, if one spouse chooses not to work or invest in his or her human capital the lost investment was not always compensated for.

[6] The most common fault agreed upon was cruelty (Allen 2002).

Except recently, this opportunity cost was not considered a contribution to the marriage.[7] Thus, a housewife and mother will not be compensated for her investments in the home and children.

3.1 Effects of Divorce Law Changes

With the introduction of no-fault legislation, the age at which women first marry increased and consequently affected the level of education women attain and their labor force participation. According to Allen, Pendakur, and Suen (2006), women are waiting longer before entering into marriage.[8] This increase in age at first marriage is a combination of two factors. First, a woman may wish to support herself and so invest more in her education. With higher levels of educational attainment, the age at which women marry is pushed back. Secondly, higher probability of divorce after no-fault legislation may induce people to choose their spouses more carefully.[9] Longer search time is consistent with the marriage age increase. Stevenson and Wolfers (2006) find that pre-marital cohabitation increases the ages of both men and women at first marriage.[10]

The changes in divorce law may make it more risky for a married woman who is not working (investing in her human capital) to remain out of the labor force. With the introduction of no-fault divorce laws, men now have the opportunity to divorce their wives without their consent and without having to transfer as much wealth as before. Because women were faced with more risk, they may choose to work as a hedge for divorce. There are several papers that look at the relationship between divorce rates and women's labor force participation rates. Peters (1986) and Parkman (1992) contend that women work more when faced with higher divorce probabilities because losing their human capital investment during their married years jeopardizes future stability.

[7] Courts now often recognize opportunity cost as investments in marriage. Also, courts will consider human capital investments like a degree as part of the marital property.
[8] Allen, Pendakur, and Suen (2006) find that the mean age at first marriage increases by one to six months. Also, the standard deviation of age at first marriage fell by 1-13% indicating that search times for people with different preferences converged after the introduction of no-fault divorce laws.
[9] Recently, studies observe negative assortive matching where one spouse's labor income is negatively correlated with the other spouse's income (Stevenson and Wolfers 2006).
[10] Stevenson and Wolfers (2006) find that the majority of cohabitating 25-44 year olds describe the chance of marrying their cohabitating partners as 50% or more.

However, not all women will invest equally when faced with higher divorce probabilities. A woman's decision to invest in herself depends on the type of education and skills she posses before marriage. For instance, a professional woman would be less willing to give up work to be at home with the kids if it also meant that she gave up skills that may depreciate quickly once she is out of the labor force.[11] On the other hand, women in low skilled occupations are not as penalized as skilled women when they invest in the home rather than in the market. Low-skilled women do not expect returns from investments through on-the-job training nor are they able to make high return investments in themselves (Parkman 1992). Even if a woman with low level market skills were to divorce, she could re-enter the labor market with similar skills to the ones she had upon leaving it.

While there is a clear movement toward no-fault divorce law, not all no-fault laws are the same across states. Most states allow one person to dissolve the marriage; however, separation periods are often required before one spouse can divorce. These separation periods range from short periods like a few months to two years. Because separation periods are required in some states, there may be higher transaction costs to divorce in those states. The transaction costs may be high enough that the Coase theorem breaks down and inefficient marriages and divorces are observed. For example, if transaction costs are high enough, an efficient divorce may not occur. In Allen's example, if transaction costs of divorce decrease the value of divorce for each spouse, then the inefficient marriage will be preserved. In Table 2, assume transaction costs for each spouse for divorce is $15. The payoff for the husband for divorce is now only $45 and the payoff for the wife is $40. Therefore, even when divorce is efficient, the transaction costs prevent its occurrence.

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[11] A woman can also invest in her human capital through formal education (Parkman 1992).

Table 2 Sample Payoffs in an efficient divorce with transaction costs ($)

	Husband	Wife	Total
Married	50	50	100
Divorced	60	55	115

3.2 Implications of No-Fault Divorce Law

Since transaction costs partially originate from divorce law, changes in divorce law like the movement to no-fault grounds affects costs of divorce. It is necessary to include variables for no-fault states in analyses concerning divorce rates. Peters (1986) does not find that no-fault divorce laws increase the divorce rate; however, in later research Allen (1992) finds that simply reclassifying the no-fault states according to both separation and property division laws[12] changes Peters' result. Meanwhile, Parkman (1992) and Gray (1998) find that increases in a women's labor supply are correlated to the type of no-fault law in her state of residence.[13]

Both the no-fault divorce laws and no-fault property division laws change incentives for divorce and for labor force participation. Allen (2005) states that "unilateral divorce, by itself, is unlikely to have a significant effect [with respect to divorce rates] on its own since it only allows the *opportunity* to leave without mutual agreement." Gray (1998) adds that excluding state property division laws in his model resulted in finding no effect on women's labor supply when divorce laws changed to no-fault laws in a state. Since no-fault laws appear to increase divorce rates (at least soon after their introduction), it is important to include them as control variables in my equations, since I am interested in the direction of causality between divorce rates and women's labor force participation rates.

[12] No-fault property division laws refer to how marital property is allocated after a divorce and implies that neither spouse is penalized for being "at fault" in the marriage.
[13] Allen (1999) provides more information on the debate over the effect of no-fault divorce laws on the divorce rate. Earlier studies generally find no effect between no-fault laws and the divorce rate, however, later studies re-classify no-fault states more carefully and generally find that the introduction of no-fault laws raised the divorce rate (Allen, Pendakur, and Suen 2006).

No-fault laws are correlated with divorce rates but also they are correlated with women's labor force participation rates. This second correlation may be due to voting patterns of women who work more. Specifically, if women work more, they may be more likely to vote on laws that promote autonomy like no-fault divorce property division laws. Therefore, it is important to include no-fault divorce laws in the models I estimate. The next section discusses the data I use to test for Granger causality between divorce and women's labor force participation rates.

4 DATA

The demographic, education, divorce rate, and marriage rate data collected for this paper is from *Statistical Abstract of the US* provided by the US Census Bureau. The women's labor force participation rates and minimum wage data are from the Bureau of Labor Statistics (Current Population Survey). The definitions of no-fault states are from Allen, Pendakur, and Suen (2006) who take their definitions from Friedberg (1998), and Brinig and Buckley (1998).

Lastly the property division laws are taken from Mechoulan (2005). The time period, as noted before, is from 1976 through 2004. The data includes all fifty states plus the District of Columbia. Control variables included in regressions are the following: population density, percent of high school graduates, percent of population reported as black or African American, percent of population reported as white, percent of Christian church adherents, marriage rate, dummies for states with no-fault property division laws, and dummies for states with unilateral divorce laws. The definitions and the means of these variables are given in Table 3.

Due to differences across states in their no-fault laws, I use three different types of no-fault definitions. The first no-fault definition is the weakest and classifies a state as No-Fault (NF1) if it has some clause that allows for one person to dissolve the marriage. Property division laws in NF1 states may award a larger share of marital property to the spouse that files for divorce. Second, the NF2 definition does not allow for fault to enter in property division settlements. In other words, it does not matter in property division who files for divorce. Lastly in the NF3 definition, in addition to a no-fault clause in property division laws, fault is also not considered in awards of alimony (Allen, Pendakur, and Suen 2006).

The presence of no-fault property laws in a no-fault state should have a different effect on divorce rates than other combinations of the two variables. Therefore, I include an interaction term between no-fault divorce laws and no-fault property division laws. As mentioned above Allen (2005) and Grey (1998) find that the classification of no-fault states according to no-fault property laws is necessary since together the variables are significant.

In fact, one of the advantages of state-level panel data is that the no-fault variables change over time and across states. With panel data, changes in no-fault variables can be controlled for unlike earlier studies like Michael (1985) and Bremmer and Kesselring (2004) where national data was used.

Another thing to note about the data for this time period is that divorce rates decrease and women's labor supply increase. This change in the divorce rate trend is important since previous studies focus on a time period where divorce rates increase. Also, this trend change suggests that the two theories mentioned before, the "insurance theory" and the "specialization theory," no longer hold. National divorce rates (DIV) from 1950-2004 are shown in Figure 1. Divorce rates increase until the late 1970s when they start to fall. The transition period is where my data start. Figure 3 shows that when divorce rates are adjusted for decreasing marriage rates, divorce rates increase and then decrease during the period 1976-2004. National women's labor force participation rates (WLFPR) are shown in Figure 4.

5 METHOD

I use a Granger causality test to show that neither the "insurance theory" nor the "specialization theory" hold. The term "causality," however, should be used carefully here as it is understood that causality cannot be tested. What the Granger causality tells us is whether a lagged variable X holds information that better predicts another variable Y that lagged values of Y cannot predict as well alone. In other words, Granger causality is a test to see if changes in one variable, X, precede changes in another variable, Y, and vice versa.

A Granger causality test is simply an F test of the following equations. The unrestricted equations are those that contain both lagged divorce rates and lagged women's labor force participation. The restricted equations are that exclude the lagged value of the variable not on the right-hand side (RHS). In the divorce (DIV) equation, lagged women's labor force participation rate is excluded. In the women's labor force participation rate (WLFPR) equation, lagged divorce rate is excluded. The matrices **U** and **W** are composed of control variables, state effects, and year effects. After running each regression set, an F-test is applied to test for significance of the dropped variable in the restricted equation. If the F-statistic is significant, then the dropped lagged terms belong in the equation and we can say that X Granger causes Y.

$$DIV_{it}= \beta_0 + \sum_{k=1}^{m} \beta_m DIV_{it-k} + \sum_{k=1}^{n} \beta_n WLFPR_{it-k} + \boldsymbol{\beta}\mathbf{U} + v_{it} \qquad \textit{unrestricted}$$

$$DIV_{it}= \beta_0 + \sum_{k=1}^{m} \beta_m DIV_{it-k} + \boldsymbol{\beta}\mathbf{U} + \mu_{it} \qquad \textit{restricted}$$

$$WLFPR_{it}= \alpha_0 + \sum_{k=1}^{m} \alpha_m WLFPR_{it-k} + \sum_{k=1}^{n} \alpha_n DIV_{it-k} + \boldsymbol{\alpha}\mathbf{W} + \eta_{it} \qquad \textit{unrestricted}$$

$$WLFPR_{it}= \alpha_0 + \sum_{k=1}^{m} \alpha_m WLFPR_{it-k} + + \boldsymbol{\alpha}\mathbf{W} + \varepsilon_{it} \qquad \textit{restricted}$$

In his Granger causality test, Michael (1985) does not include control variables in his test equations. Excluding control variables could lead to omitted variable bias and possibly either obscure or create significance of included variables. For instance, if religion were left out of the divorce equation, then the lagged women's labor force participation coefficient may be insignificant when really lagged women's labor force participation is in the true model. This specific omitted variable bias could lead to falsely accepting that women's labor force participation does not Granger cause divorce rates.

Another issue influencing causality is that the number of lags used in the RHS of the equation changes the significance of the F-test. As the number of lags increases in the model, their joint significance decreases. Due to mulitcollinearity, joint significance decreases since adding more lags causes significant lags to become insignificant. Therefore, using too many lags may cause inappropriate acceptance of non-causality. In their paper using panel data to test for Granger causality between crime rates and police levels, Marvell and Moody (1996) determine the number of lags by starting with three lags and then dropping insignificant lags one at a time. Marvell and Moody do not mention model selection criteria like Akaike or Schwarz.[14] Also, in a previous model with divorce and women's labor supply, Michael (1985) uses only one lag in each of his regressions. Michael does not note his method for choosing a bivariate autoregressive model.

Before determining the number of lags in my model, I tested for non-stationarity using the augmented Dickey-Fuller test. I find that both divorce rates and women's labor force participation rates are non-stationary series. I then take first differences and find that in differences, the variables are stationary. Finally, I determine the number of lags in my model by using the same method as Marvell and Moody except that I evaluate autocorrelation functions. The autocorrelation functions of the differenced data show that correlations die off after no more than five lags meaning that there should be no lags included beyond t-5. Also I used Akaike and Schwarz criteria to validate the appropriate number of lags. I find that just one lag of the divorce variable and five lags for the labor participation variable are appropriate in the women's labor force participation equation. For the divorce equation, divorce rates are lagged by five years and women's participation rates are lagged by one year.

[14] However, nearly every forecasting book recommends using AIC or SIC for model selection.

6 MODEL

The following unrestricted models are estimated where the variables in the matrices, **U** and **W,** are described in Table 3. The term θ_i is the state effect while the term ϕ_t is the year effect.

$$\Delta DIV_{it}=\beta_0+\beta_1\Delta DIV_{it-1}+\beta_2\Delta DIV_{it-2}+\beta_3\Delta DIV_{it-3}+\beta_4\Delta DIV_{it-4}+\beta_5\Delta DIV_{it-5}+ \beta_6\Delta WLFPR_{it-1}+\boldsymbol{\beta}\mathbf{U}+\theta_i+\phi_t+\eta_{it}$$

$$\Delta WLFPR_{it}=\alpha_0+\alpha_1\Delta WLFPR_{it-1}+\alpha_2\Delta WLFPR_{it-2}+\alpha_3\Delta WLFPR_{it-3}+\alpha_4\Delta WLFPR_{it-4}+ \alpha_5\Delta WLFPR_{it-5}+\alpha_6\Delta DIV_{it-1}+\boldsymbol{\alpha}\mathbf{W}+\theta_i+\phi_t+\mu_{it}$$

I use a Hausman test to determine whether to specify the state and year effects as fixed or random. Under the null hypothesis (random effects), the random effects estimator is consistent and efficient, and the fixed effects estimator is consistent but inefficient. Under the alternative hypothesis, the random effect estimator is inconsistent, but the fixed effect estimator remains consistent. We reject the null hypothesis for both the divorce and labor force participation equations. For reference, I include random effects estimation results, in Table 9 of the appendix.

7 RESULTS

The first Granger causality tests I perform are fixed effects estimations of the differenced variables on all controls and state effects. The three regressions for each dependent variable each have a different definition for no-fault state laws. As before, the NF1 variable is the lowest standard for considering a state a no-fault state. From Table 4, it is clear that the F-statistics have little variability when the No-Fault variable is changed. This result makes sense since all of the No-Fault dummies are insignificant in turn. For the remainder of the paper, the NF3 variable is the no-fault variable for regressions that include control variables. This variable has the strictest definition of no-fault divorce, and since the no-fault variables are insignificant, any of these definitions would suffice.

Table 4 also shows that divorce rates do not Granger cause women's labor force participation. The F statistics are insignificant indicating that lagged divorce rates do not belong in the women's labor force participation equation. However, women's labor supply Granger causes divorce rates at a 95% level of confidence. The interesting thing about the Granger causality in the divorce equation is that the coefficient on women's labor force participation rates is negative and significant. Therefore an increase in women's labor force participation Granger causes a decrease in the divorce rate. The coefficient on women's labor participation is quite small however.

Since these results are quite different from Michael (1985), I test for Granger causality with a truncated data set. I use data from 1976 to 1980 (the overlap with Michael (1985) data. The results in Table 5 show that there is no Granger causality between divorce rates and women's labor force participation in either direction. Therefore, the shortened time period could reflect at time of transition between Michael (1985) and the results in this paper.

8 THREE-STAGE LEAST SQUARES

As a second method to verify the Granger test results, I use a three-stage least squares (3SLS) regression to determine direction of causality between divorce rates and women's labor force participation rates. The following equations are estimated simultaneously. The matrices **X**, $\mathbf{Z_1}$, and $\mathbf{Z_2}$ are defined in Table 6.

$$\Delta WLFPR_{it}=\lambda_1+\lambda_2\Delta DIV_{it}+\boldsymbol{\lambda_3}\mathbf{X}+\boldsymbol{\lambda_4}\mathbf{Z_1}+\epsilon_{it}$$

$$\Delta DIV_{it}=\alpha_1+\alpha_2\,\Delta WLFPR_{it}+\boldsymbol{\alpha_3}\mathbf{X}+\boldsymbol{\alpha_4}\mathbf{Z_2}+\mu_{it}$$

8.1 Instruments

Since both divorce rates and women's labor force participation rates are endogenous in theory, I instrument for these variables. For women's labor force participation rates I use the minimum wage, percent of employment in various industries (defined in Table 6), percent of women who voted in the 1984 presidential election, right to work state dummy, and percent of employees covered by labor unions. To instrument for the divorce rate, I use religion and a proxy for percent of liberal voters in a state.

Arguably, religion will not affect a woman's decision to work since women of all religions participate in the labor force. Also, if religion is included in the women's labor force participation equation, the coefficient is insignificant. Religion is a good instrument for divorce, since many religions do not condone divorce. Also, the percent of liberal voters may also help describe divorce rates since people with more liberal views may not value the institution of marriage as much as someone with more conservative views. Therefore, more liberal states likely have higher divorce rates, and indeed the coefficient on the liberal variable is positive.

Instruments for women's labor force participation rates are more elusive. Any law or characteristic that promotes the financial independence of women will likely be correlated with the divorce rate. Under these circumstances, the instruments I use may not be appropriate, but they are what is available. The minimum wage is unlikely to influence directly costs and benefits of dissolving a marriage and thus will not be highly correlated with the divorce rate. In general, low-skilled, married women would not want a divorce since their expected income out of wedlock is low with their set of marketable skills. These women would not choose to divorce based on a difference in the minimum wage. On the other hand, the minimum wage is a good indicator of potential income a woman faces. Therefore it's expected that the minimum wage is correlated with women's labor force participation rates.

Likewise, the percent of employees protected under labor unions will raise the average potential income in a state. More labor unions will likely have higher female labor force participation rates. I acknowledge that this variable is possibly correlated with divorce rates as well. The right to work state laws generally allow employees to choose whether they want to join or financially support labor unions. With choice, people don't have to join unions and so unions may lose bargaining power. Therefore, right to work states may have average incomes and lower labor force participation rates.

The percent of women who voted in the 1984 presidential election may be a good indicator of what percent of women participate in the labor force. More educated, employed women are more likely to vote and work. I use the presidential election since, voting in the presidential election is unlike voting for state issues, and governors etc. where state laws (like no-fault divorce laws) are directly affected.

Lastly, percent of employees in broad industry classifications may also be correlated with women's labor force participation rates. Women self-select in to industries suited for their skills, which mostly includes service industries. Women rarely work in industries like mining, manufacturing, and construction. Therefore, when these industries are large, women's labor force participation rates may be lower. It is unlikely that variation in industry employment will have a direct effect on divorce rates.

I test the strength of my instruments using an F-test and find that the joint significance of my instruments is low with an F-statistic of 0.45 and corresponding p-value of 0.96. I conclude that my instruments are weak. Due to lack of better available instruments, I proceed with a test for endogeneity of WLFPR and DIV. I use a Durbin-Wu-Hausman test which tests the null hypothesis that ordinary least squares estimation is inconsistent, or WLFPR and DIV are simultaneously determined. I do not reject the hypothesis of simultaneity; therefore, 3SLS is an appropriate estimator.

8.2 3SLS Results

I use 3SLS estimation to determine the direction of causality between WLFPR and DIV. The results of the 3SLS regression support the Granger causality results in that the coefficient on divorce rates in the women's labor force participation equation is insignificant. Alternatively, the coefficient on women's labor force participation in the divorce equation is insignificant and positive. This result does not support the Granger causality test, but this could simply be from model specification problems such as weak or inappropriate instruments. Table 7 shows results from the 3SLS estimation. Table 8 shows results from 3SLS estimation that includes state effects. The coefficients and significance of WLFPR in the DIV equation differ in the estimator with state effects in that the coefficient on WLFPR is positive and significant at the 5% level.

9 DISCUSSION

The result that divorce does not Granger cause women's work force participation may appear odd at first. Even though this relationship may have existed prior to 1980, it makes sense that the relationship no longer holds. Why? Strictly looking at the data, after 1976 women's labor force participation rates have increased in each state while divorce rates have actually fallen in most states. Interestingly, the divorce rate increases until the late seventies and then decreases. As mentioned before, the trend changes during the time period where Michael's (1985) data overlaps with the data in this paper. It is apparent that the trend has changed hence these up to date results differ from Michael's (1985) results.

The data shows that the "insurance theory" no longer holds since it appears as though women are not changing their labor force participation in response to divorce rate trends. If the insurance theory were to hold still, we would see decreases in women's labor force participation during the time divorce rates decrease. Instead, women's labor force participation rates are increasing due to women's desire to support themselves regardless of their marital status. While it's plausible that women working more causes more divorces, their labor participation may be unexpected, which is no longer the case. More likely, women's participation in the labor force is not unexpected given their level of education.[15] For instance, if a woman with a college degree marries, her husband will expect that she will work. In this case, divorce will not result from an unexpected change in the wife's labor force participation.

The second result (increases in women's labor force participation rates precede decreases in the divorce rate) could be explained by changes in the incentives to remain married. While a woman working in the labor force gives her greater incentive to

[15] Women's educational attainment is increasing over time.

divorce, it also gives her husband less incentive. Men enjoy more value from marriage when their wives work since they now are required to work less. This incentive scheme is consistent with the decreasing men's labor force participation rates we observe.

Another explanation for women working more causing lower divorce rates is the type of interaction between husband and wife. If both spouses work, there arises less opportunity for disagreement since both partners are away from each other more often. Specifically, if a young, married couple has small children, they may take turns working and staying at home with the children since childcare is expensive. In this case, the husband and wife have quite a lot less interaction with each other since during the week they see each other mostly just in passing. The reduced amount of time with one another may also lead to higher values placed on spousal interaction due to diminishing marginal utility.

In addition, the types as well as frequency of disagreement between spouses may change as well. For instance, with two incomes there may be fewer arguments over household expenditures. Each spouse has his or her own income to spend on both personal and family items. The infamous money arguments that lead to divorce are diminished when there are two income-earners.

A counter argument to women's increased labor force participation rate causing decreased divorce rates is one of lost comparative advantage. When a woman chooses to work, she strains the marriage if she does not maintain the expected level of household quality. The comparative advantage between men and women is lost when both spouses are working in the labor force and spend less time maintaining the quality of the home. However, comparative advantage is not forgotten completely since household income allows the couple to hire labor for maintaining the expected level of home quality. Furthermore, Stevenson and Wolfers (2006) find that with new home technology, there are lower returns from specialization in home production. Specifically they find that there is a 50% reduction in food preparation in the period 1965 to 1990. Recently, households pool risk according to negative correlations in labor income (Stevenson and Wolfers 2006). Whereas before, people followed negative assortive matching according to comparative advantages in labor market participation and household production.

10 CONCLUSION

Through two different techniques for determining causality, I find that first a woman's decision to work is independent of her marital status, and second that women's increased labor force participation rates change incentives and interactions between spouses. These changes in the marital relationship and incentives cause divorce rates to decrease. Prior to the 1970's, societal views were such that women were not expected to work after they married. When divorce legislation placed women at risk of divorce without consent, women began to work to insure themselves against the repercussions of the no-fault law. It is possible that the unexpected increase in women's labor force participation led to the increasing divorce rates after the no-fault laws were in place.

After the late 1970's women were taking time before marriage to both invest in their education and take more time to choose a better match for marriage. The marriage age increased as a result. It was not unusual for all women to work alongside their investments in the home. It appears as though the stereotypical roles men and women played in marriage are blurring. Women are now working, even in marriage, and their husbands enjoy less demand from income and an increase in domestic responsibility.

APPENDIX

Figure 1 Divorce Rate 1950-2004

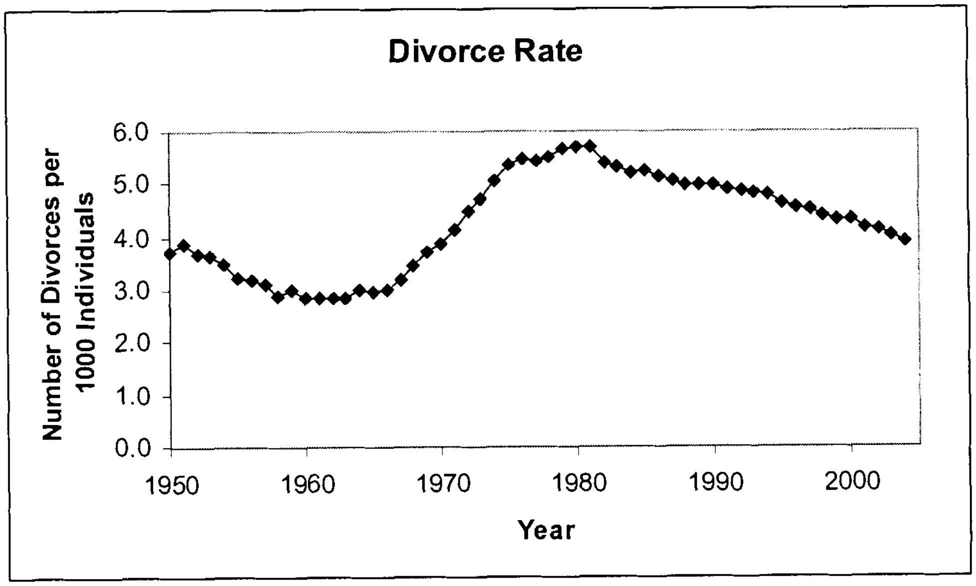

Figure 2 Marriage Rate 1976-2004

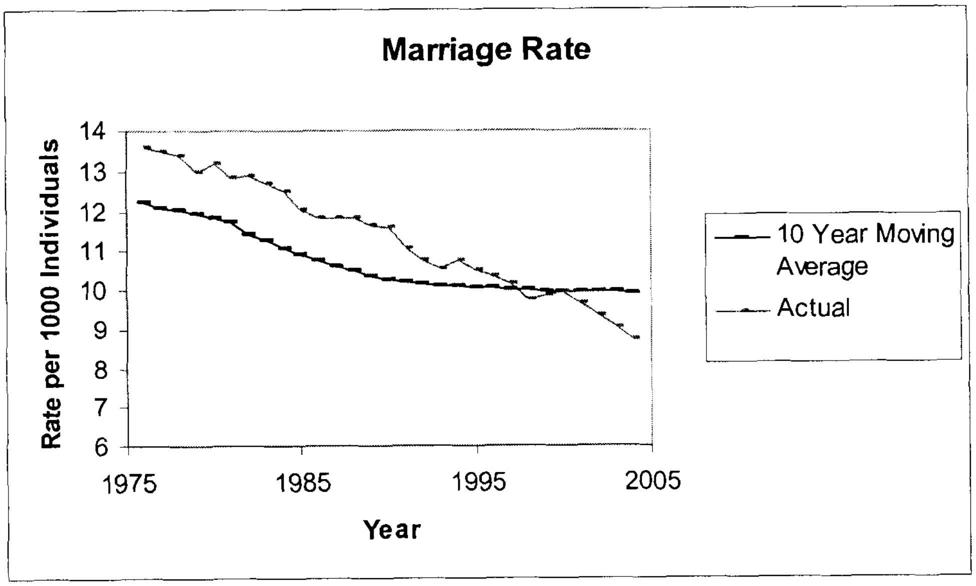

Figure 3 Divorce Rate Adjusted for Marriage Rate

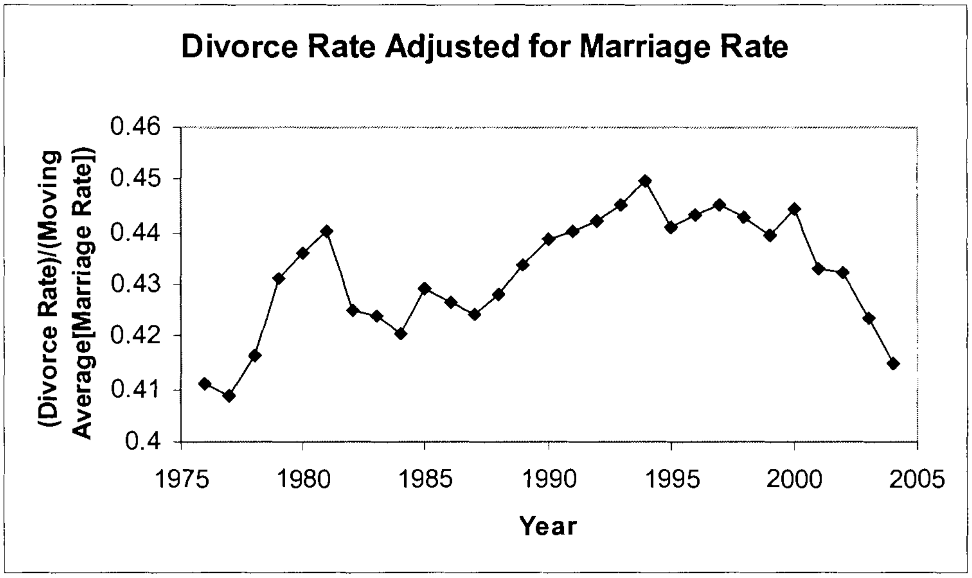

Figure 4 Women's Labor Force Participation Rate 1976-2004

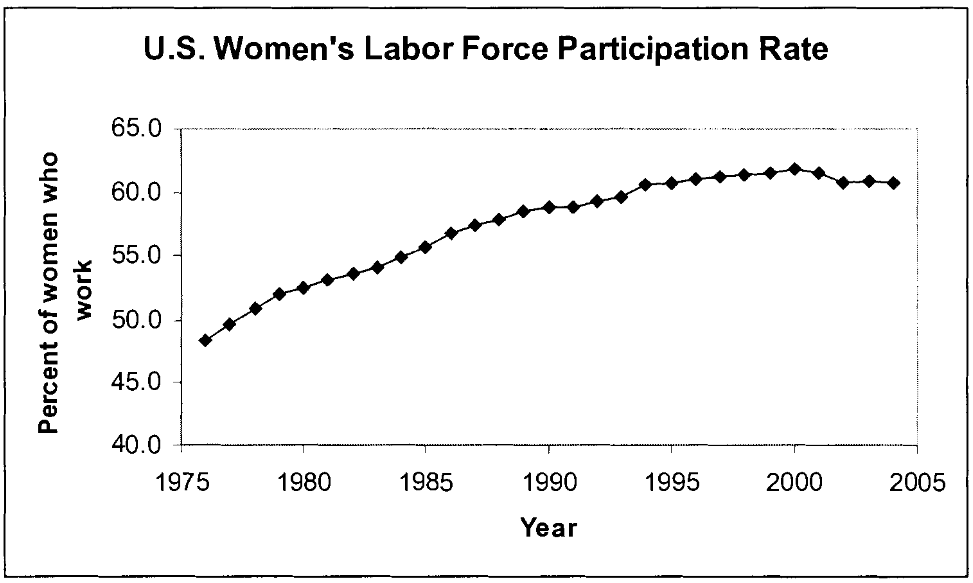

Table 3 Variable List

Variable	Definition	Mean
Variables included in both **U** and **W**		
Population Density	population per square mile	355.8
White	percent white, includes those reported as Hispanic	78.8
Black	percent black or African American	10.6
Property Division	1 if state has no-fault property division laws as defined in Mechoulan (2005)	0.43
NF1*	1 if state has no-fault divorce laws as defined by Allen 1988	0.67
NF2*	1 if state has no-fault divorce laws as defined by Friedberg 1998	0.38
NF3*	1 if state has no-fault divorce laws as defined by Brinig and Buckley 1998	0.32
pdiv*NF3	interaction term between prop division and NF3	
Marriage Rate	number of marriages per 1000 individuals	11.3
Variables included in only **U**		
Religion	percent of Christian church adherents: "all members, including full members, their children and the estimated number of other regular participants who are not considered as communicant, confirmed or full members"	51.57
Variables included in only **W**		
Min Wage	real minimum wage	3.22
Unit and Time Effects		
State	50 of the United States plus District of Columbia	
Year	1976-2004	
Dependent Variables		
DIV	number of divorces per 1000 individuals	4.9
WLFPR	women's labor force participation rate (percent)	57.4
Sample size:		1,428

*variable not included with other no-fault variables

Sources: US Bureau of Labor Statistics and US Census Bureau

Table 4 Granger Causality Test with Varied No-Fault Definition

dependent variable	no-fault variable	F	p-value	$\Delta WLFPR_{t-1}$ coefficient
ΔDIV_t	NF1	4.01	0.05	-0.014
				(-2.00)
	NF2	3.83	0.05	-0.014
				(-1.96)
	NF3	4.07	0.04	-0.008
				(-1.13)
				ΔDIV_{t-1} coefficient
$\Delta WLFPR_t$	NF1	0.13	0.72	0.037
				(0.36)
	NF2	0.14	0.71	0.039
				(0.037)
	NF3	0.14	0.71	0.05
				(0.48)

t statistic in parentheses

Table 5 Granger Causality Tests for Time Period: 1976-1980

dependent variable	F	p-value	coefficient of dropped variable
ΔDIV_t	0.31	0.58	0.28
			(0.09)
$\Delta WLFPR_t$	0.88	0.37	-0.0146
			(-0.55)
Sample size			203

Table 6 3SLS Variable Definitions

variables in **X**	definition
education	percent of high school graduates
marriage rate	number of marriages per 1000 individuals
population density	number of people per square mile
black	percent of African American population
white	percent of white population
NF3	1 if state is a no-fault state as defined by Brinig and Buckely (1998)
property division	1 if state has no-fault property division laws from Mechoulan (2005)
*propdiv*NF3*	interaction term between property division and NF3
variables in $\mathbf{Z_1}$	
labor union	percent of employees covered by labor unions
right to work	1 if state has right to work law
minimum wage	max{state minimum wage, federal minimum wage}
minimum wage2	square of minimum wage
minimum wage3	cube of minimum wage
female voters 1984	percent or women who claimed they voted in the 1984 presidential election. Source: Current Population Survey
*Industry Employment:**	employed civilians by occupation: 2003. industry codes are SIC
Management	
Sales	
Service	
fish, farm, forestry	
Transportation	
Production	
Manufacturing	
Office administration	
**omitted variables: professional and construction occupations*	
variables in $\mathbf{Z_2}$	
religion	percent of Christian Church Adherents
liberal[16]	percent of liberal voters in state governor elections

[16] Equals percent voting for democrat governor. Due to only winners reported in data, adjustments were made to percentages. If winning governor is republican and votes for republican is less than 50% then the percent for republican was given to democrats. If winning republican received more than 50% of the vote, then the democrats were given 100-%voting for republican. If democrat wins but received less than 50% of the vote (due to 3rd parties) then 50% was assigned to democrat. If democrat wins with more than 50% of the vote, then that percentage was assigned to democrat. Independent winners are treated the same as democrat winners.

Table 7 3SLS Estimates

$\Delta WLFPR_{it}$		ΔDIV_{it}	
independent variable		independent variable	
ΔDIV_{it}	2.20	$\Delta WLFPR_{it}$	0.17
	(0.78)		(1.61)
education	-0.199		-0.003
	(-6.91)		(-1.33)
marriage rate	0.002		-0.002***
	(0.33)		(-2.62)
population density	-0.00002		0.00
	(-0.48)		(0.11)
black	0.007		-0.002
	(1.07)		(-0.93)
white	0.01**		-0.002
	(2.02)		(-1.27)
NF3	0.03		-0.01
	(0.15)		(-0.17)
property division	0.02		(0.02)
	(0.14)		(0.55)
*propdiv*NF3*	-0.014		0.013
	(-0.05)		(0.19)
time	-0.45***		0.007
	(-4.02)		(1.10)
minimum wage	6.21	*religion*	0.0007
	(0.96)		(0.76)
minimum wage^2	-2.10	*liberal*	.0004
	(-0.94)		(0.42)
minimum wage^3	0.23		
	(0.91)		
female voters 1984	0.003		
	(0.26)		
right to work	-0.03		
	(-0.33)		
labor unions	-0.002		
	(-0.41)		
management	0.019		
	(0.46)		
sales	-0.008		
	(-0.23)		

	$\Delta WLFPR_{it}$	ΔDIV_{it}
service	0.024	
	(0.9)	
office admin	0.012	
	(0.29)	
fish, farm, forestry	-0.02	
	(-0.48)	
manufacturing	0.03	
	(0.28)	
production	0.0007	
	(0.02)	
transportation	0.004	
	(0.07)	
R^2	-0.19	-0.26
Sample Size		1172

Z-statistics in brackets. ***, **, * implies that the coefficient is significantly different from zero at the 1, 5, and 10% level

Table 8 3SLS Estimator with State Effects

independent variable	$\Delta WLFPR_{it}$	independent variable	ΔDIV_{it}
ΔDIV_{it}	1.53	$\Delta WLFPR_{it}$	0.37**
	(1.06)		(2.06)
education	0.02*		-0.01
	(1.71)		(-1.49)
marriage rate	-0.003		0.001
	(-0.39)		(0.37)
population density	-0.0003		0.0001
	(-0.78)		(1.03)
black	-0.03		0.01
	(-0.69)		(0.49)
white	0.03*		-0.02**
	(1.90)		(-2.09)
NF3	0.17		-0.04
	(0.41)		(-0.21)
property division	-0.003		(0.00)
	(-0.01)		(-0.03)

	ΔWLFPR$_{it}$		ΔDIV$_{it}$
*propdiv*NF3*	0.07		-0.03
	(0.15)		(-0.14)
time	-0.5		0.02
	(-4.52)		(1.63)
minimum wage	3.26	*religion*	0.002
	(0.64)		(0.46)
minimum wage^2	-1.11	*liberal*	0.0003
	(-0.67)		(0.36)
minimum wage^3	0.12		
	(0.69)		
female voters 1984	-0.05		
	(-0.42)		
right to work	1.54		
	(0.97)		
labor unions	-0.005		
	(-0.57)		
management	0.06		
	(0.34)		
service	0.01		
	(0.09)		
office admin	0.44		
	(1.54)		
sales	-0.66**		
	(-2.11)		
fish, farm, forestry	-0.15		
	(0.30)		
manufacturing	-0.92*		
	(-1.65)		
production	-0.03		
	(-0.15)		
transportation	0.03		
	(0.11)		
R^2	-0.02		-1.48
Sample Size			1425

Z-statistics in brackets. ***, **, * implies that the coefficient is significantly different from zero at the 1, 5, and 10% level

Table 9 Granger Causality Results with different Models and Estimators

	dependent variable	F	p-value	coefficient on excluded term
Model includes state effects, year effects, and control variables	$\Delta WLFPR_{it}$	0.23	0.61	0.052 (0.48)
	ΔDIV_{it}	1.27	0.26	-0.008 (-1.13)
Model includes year effects and control variables	$\Delta WLFPR_{it}$	0.39	0.53	0.065 (0.62)
	ΔDIV_{it}	1.94	0.16	-0.012 (-1.39)
Model includes state effects, and control variables*	$\Delta WLFPR_{it}$	0.14	0.71	0.039 (0.37)
	ΔDIV_{it}	4.07	0.04	-0.015 (-2.02)
Model includes control variables*	$\Delta WLFPR_{it}$	0.24	0.62	0.051 (0.49)
	ΔDIV_{it}	4.4	0.04	-0.016 (-2.10)
Model includes no control variables*	$\Delta WLFPR_{it}$	0.83	0.36	0.093 (0.91)
	ΔDIV_{it}	3.81	0.05	-0.015 (-1.95)
Sample Size				1172

t-statistic in brackets

*includes *time* and ln(*time*) variables

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