Female Labor Supply Response to Alimony: Evidence from Massachusetts*

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Abstract

This paper studies the labor supply response of women to changes in expected alimony. Using an alimony law change in the US that significantly reduced the post-divorce alimony support among women, we show that the policy led to an increase in divorce probability. Subsequently, it led an increase in the female labor force participation (FLFP) and female wage income. We show that most of the FLFP increase was concentrated in part-time employment, income from which were not sufficient to compensate for the expected decline in alimony, resulting in a net loss of $40,621 in PDV of lifetime income for women.

JEL classification: J08, J12, J21, J16
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I. Introduction

Marriage can reinforce traditional gender norms in the household division of labor where women often take care of housework and childcare, while men engage in market work. This limits career opportunities for women, both within and beyond marriage, leaving them financially dependent on their husbands (Ciciolla and Luthar, 2019; Grossbard-Shechtman and Neuman, 1988; Silles, 2016).[1] As a consequence, when marriages end, women struggle disproportionately with financial challenges as compared to men (Leopold, 2018) — in 2012, women in the United States experienced a drastic 41 percent decline in their household income on average after divorce, almost twice the size of the decline experienced by men (23 percent) GAO (2012).

Taking this into consideration, policymakers have long used alimony payments as a means to protect spouses who invested in housework or childcare during the marriage from an economic fallout after the divorce (Amato, 2000; Biscardi, 2014; Diedrick, 1991).[2] However, since women are the primary recipients of alimony (for example, almost 97% of alimony recipients in the US[3] are women), alimony laws are often criticized as being outdated and gender-biased, creating a demand for reforms to reduce the provision of alimony. Proponents of alimony reforms argue that the law unfairly favors women, with most of the burden often falling on men. On the other hand, opponents of alimony reform argue that the gender-gap in labor and gender-roles in household work continue to exist, making it difficult for women to fairly compete in the labor market during marriage. Therefore, a reduction in alimony would further widen the already existing post-divorce gender gap in economic well-being. However, the empirical evidence on the role of alimony in determining women's economic outcomes is both scant and weak, making it difficult to properly internalize these trade-offs

[1] See Waldfogel (1998) for a discussion of the family gap in pay for women. Figure A.2a shows the empirical association between women's marital status and their labor force participation for 107 different countries. Married women in most countries participate less than their divorced or unmarried counterparts, whereas the opposite is true for men; who experience the peak of their labor supply when married.

[2] Alimony is a legal obligation to provide financial support to the lower-earning spouse after marital separation or divorce to alleviate some of the post-divorce disadvantages. It is typically based on some measure based on the difference in earnings of men and women during the marriage and the potential of the lower earning to sustain his/her standard of living. An alternate perspective can be that alimony allows specialization within marriage by protecting the non-working spouse from future financial risks.

[3] Source: US Census Data.

into alimony related policy considerations.

In this paper, we explore the labor supply response of women to changes in expected alimony income and its implication for their economic well-being. To study this, we exploit the Massachusetts' Alimony Reform Act (ARA) of 2011 that led to the dissolution of lifetime alimony provision in Massachusetts (MA). [4] The law ended the long-debated provision of lifetime alimony and made the length of alimony contingent on the length of the marriage. This meant that women were now entitled to a shorter duration of income support after their divorce compared to the lifelong provision of alimony before the policy. Importantly, the law applied not only to all future divorces, but extended retroactively to all past divorces as well, thus creating a sudden drop in alimony income for the latter group.

The key empirical strategy used for the analysis is a difference-in-difference (DD) strategy that compares outcomes for women in MA with outcomes of women in the rest of the US states (non-MA), before and after the ARA. The primary data set used for the analysis is the yearly data from the Current Population Survey (CPS) between 2000 to 2019 that allows me to explore 11 years of pre-period data and 9 years of post-period data. Since only one state is treated in my sample, this can potentially lead to an underestimation of the standard errors (MacKinnon and Webb, 2018). To address this concern, we test the robustness of my estimates using the Synthetic Control Method (SCM) that is well-suited for studies with one treated unit (Abadie, Diamond and Hainmueller, 2010; Cunningham and Shah, 2018).

While a reduction in expected lifetime alimony can increase the cost of divorce for women by lowering the value of their outside options, it can reduce the cost of divorce for men in alimony payments. As a result, it makes divorce a less lucrative option for women, but more lucrative for men. Thus, to begin with, it is not obvious whether the ARA would lead to an increase or a decrease in the separation rates.[5] We test this empirically by estimating the impact of alimony reform on separation rates, and find that alimony reform led to a

[4] This relates to the recent growing movement in the US to reform the alimony laws. A number of states across the US are considering bills to revamp their alimony reform laws and do away with the concept of lifetime or permanent alimony.

[5] Becker-Coase argument, as it applied to couples and intra-household allocation, says that changes in divorce laws should not affect divorce rates under the assumptions of transferable utility within marriage and upon divorce. However, if this assumption doesn't hold, it can lead to an increase in separation rates. In fact, (Chiappori, Iyigun and Weiss, 2007) argues that in general, divorce laws will influence the divorce rate, although the impact of the law change can go in either direction.

4.5 percent (.5 pp) increase in divorce and separation probabilities. In addition, using the court data on published case opinion files for alimony cases in MA between 1980-2019, we show that the reform also led to a substantial increase in alimony termination cases filed by men.[6] These two facts together illustrate that the ARA of 2011 in MA increased the likelihood of separation among married women and increased the likelihood of alimony termination among divorced women.

Using a Difference in Differences (DD) empirical strategy, we show that the policy led to an increase in the female labor force participation (LFP) after the reform. We explore heterogeneity along two main dimensions: marital status (ever-married vs never-married) and education status (more educated vs less educated). Heterogeneity results show that there was a larger impact among the ever-married sample, and among the more educated sample of women, i.e., those who are more likely to be affected by the policy, and those with higher human capital and skill to flexibly adjust their labor supply.

DD results on the type of employment shows that most of the increases in female LFP is almost exclusively concentrated in part-time employment. There was an 8 percent (0.015 pp) increase in part-time employment after the reform, with small and insignificant change in the full-time employment of women. Thus, while women increased their labor supply due to the reform, results on the type of employment can mean it may not be sufficient to compensate for the loss in alimony income as most of the employment was concentrated in low-paid part-time jobs.

A simple back-of-the-envelope calculation that compares the expected loss in lifetime alimony-income with the expected gains in the lifetime wage-income shows an estimated net expected loss of $40,621 in present discounted value of lifetime income for women in MA due to the reform. This implies that the reform can further accentuate the post-divorce gender gap in economic well-being.

Next, to infer the robustness of the results, we apply the Synthetic Control Method and test the statistical significance of SCM results using a test static based on the ratio of post-

[6] This is so because for past divorces, the law did not automatically end alimony. Instead, the provider needed to appeal for terminating the alimony provision. Since in the majority of cases men are the provider of alimony and women are the recipients, it means that we should see an increase in the alimony-termination cases filed by men after the reform.

treatment versus pre-treatment root mean squared predicted error (RMSPE), as proposed by Abadie, Diamond and Hainmueller (2010). Similar to DD results, SCM analysis shows a statistically significant increase in LFP, annual wage-income, and participation in part-time employment after the reform. Additionally, we implement an inference technique similar to Fisher's permutation or randomization test (Fisher, 1935)[7] and show the robustness of the impact on female LFP under this method as well.

The paper makes three main contributions to the literature. First, this is one of the first papers to provide reduced form causal evidence that a reduction in expected alimony duration leads to an increase in the female labor force participation. Consistent with the theoretical predictions of labor supply and household bargaining models, we find that reduction in alimony duration has a strong positive (increasing) effect on the female labor force participation rates in MA. A number of past studies have established the relationship between divorce and female labor supply (Chiappori, Fortin and Lacroix, 2002; Johnson and Skinner, 1986, 1988; Loew, 1995; Olivetti and Rotz, 2016; Voena, 2015), however, rigorous evidence on the impact of alimony duration on female labor supply is both scant and weak.[8] Exceptions to this are Rangel (2006) and Chiappori et al. (2017), who study the introduction of alimony rights for *cohabiting couples* in Brazil and Canada, respectively. While both the papers show a decrease in hours of work for women due to alimony law change, our paper has notable differences from each of them – Rangel (2006) study cohabiting households and finds a decrease in female hours of work among existing unions only. Chiappori et al. (2017) adds to this by studying a cohabitation-alimony law change and show effects on existing unions as well as on to-be formed unions. However, both these papers show effects of reforms that primarily affect labor supply of cohabiting couples only. In contrast, we show evidence from alimony reform in MA that applied to all past and future divorces , and thus provides a more generalizable result as well as a stronger external validity. Second, both these papers show effect on female hours of work (intensive margin) only. In contrast, ours is the first paper to show evidence for large significant effects on female labor force participation, the extensive margin of labor

[7] This method has been used for similar settings with single treated unit, see Cunningham and Shah (2018).

[8] (Foerster et al., 2020) develops a dynamic model of family labor supply with divorce rates using data from Denmark. Using the estimated structural model on a counterfactual economy with reduced alimony, the author shows a positive impact of alimony reduction on labor supply.

supply. Labor force participation is an important measure of labor market attachment and shows a change in the labor status of an individual. Hence, our results present an important and new finding over and above the existing evidence in the literature. Lastly, Bredtmann and Vonnahme (2019) explores alimony law change in Germany but does not find any effects on the labor supply. They attribute the lack of effects on labor supply to the potential low level of awareness about the policy and lower adjustment options for treatment groups. In contrast, our setting is suitable for this analysis due to the high prevalence to divorce in the US, as well as sufficient awareness about the policy.[9] Thus, the nature of the reform and the setting allows us to credibly identify the treatment effects which shows large significant impact of alimony reform on female labor force participation rates.

Second, this paper contributes to the evidence on the impact of alimony on marital instability and women's financial well-being. Marital separation or divorce can have severe financial consequences, especially for women (Elliott and Simmons, 2011). However, ex-ante, the relationship between alimony and marital dissolution is not obvious. On one hand, a reduction in alimony duration reduces the value of the outside options for women, thereby reducing their bargaining power within marriage. At the same time, it also lowers the cost of divorce for men. Empirically, we find that the law led to a 4.5 percent increase in the divorce probability. Additionally, this paper adds to the evidence by using case-level data from MA's to show that alimony reform led to an increase in the percentage of alimony-termination cases filed by men in MA.

Third, this paper contributes to the literature on the intersection of welfare programs and labor supply responses. A number of studies show a negative relationship between welfare programs and labor supply i.e. provision of welfare benefits leads to a reduction in labor supply (Blau and Robins, 1986; Cullen and Gruber, 2000; Grossman, 1989; Schmieder and Trenkle, 2016). However, understanding the implications of alimony separate from these other welfare programs is important as it mainly impacts women, and has very different incentives, trade-offs, and implications. Women often make career compromises in marriage

[9] The US has the 4th highest divorce rate among OECD countries with almost fifty percent of marriages ending in divorce or separation. Secondly, we show evidence on policy awareness using the google search trends (see Fig A.1) and through the court case data (see Fig: A.4a and A.4b).

to take care of children and the household compared to men. If an increase in wage income is unable to compensate for the lost alimony income, this can further widen the gender-gap in post-marital economic well-being.

Over the last decade, alimony reforms have gained substantial attention across countries which make the findings from this paper particularly relevant in the current scenario.

II. Policy Background: Massachusetts' Alimony Reform Act

In September 2011, the Massachusetts Governor passed new limits on alimony duration in MA, known as the "Alimony Reform Act (ARA)", which sharply curbed lifetime alimony payments.

Before 2011, the alimony laws in MA allowed the judges to order lifelong alimony for all types of divorce cases. In contrast, "General Term Alimony" that was introduced after the reform, ended the concept of lifetime alimony and capped the number of alimony-eligible years based on the duration for which the couple remained married. For a marriage that lasted between 0-5 years, alimony can now be granted for at most 50 percent of the marriage length — this meant, as compared to lifetime eligibility for alimony before the law, women under this category would now be eligible for a maximum of 2.5 years of alimony. Similarly, for marriages of duration 6-10 years, it was capped at 60 percent of the duration; for marriages between 11-15 years, capped at 70 percent of the duration; and for marriages of 16-20 years, capped at 80 percent of the marriage-length. For divorces that correspond to 20 or more years of marriage duration, the court would still have discretion over the alimony duration.

One distinct feature of this law was that the durational limits applied not only for future divorces but also to past divorces. This meant that among divorced groups of women, this can lead to a sudden termination in alimony income flow. Whereas, if the law was to apply only to future divorces, women would be able to internalize the law and make adjustments in other intermediate outcomes like education, children etc. This can make it hard to separate out the effects when the law applies only to future divorces. Moreover, laws that affect individuals only in the future, are also more likely to take longer to translate into sizable effects. For these reasons, the policy change in MA provides an ideal setup to study the impacts of

the alimony reform.

Intermediate and Post-Implementation Periods:— Alimony Reform Act did not automatically terminate alimony for the existing contracts. Instead, it required the payors of alimony to file a complaint about modification under the timeline specified in the law, if eligible. The earliest month for any such modification requests was announced to be March, 2013. Only in cases when a couple have been married for less than five years, or where the payor of alimony would reach retirement age before March, 2015, could file for a case in 2013. For marriages with longer duration, they would need to wait till March 2014 (for cases with 5-10 year of marriage) or March 2015 (for cases with 10-15 years of marriage) to file for a modification. Hence, the law was not fully implemented up until September 2015. For this reason, I denote 2011-2014 as the *intermediate period*, i.e. period when the bill had passed but the law was still not fully into effect, and years from 2015 onwards as the *post-implementation period*, i.e., the period after the full implementation of the law.

Awareness about the Reform:— Policy awareness plays a key role for individuals to internalize and respond to a policy change. To provide evidence that there was sufficient awareness about this ARA of 2011 in MA, I use data on google search trends for alimony-related terms in MA and for the rest of the US. Google search trend plots in Figure A.1 shows that there was a significant spike in 'alimony' related google searches in MA around the same time when Alimony Reform Act was passed in MA. However, we do not see any such jump in google search trends for the rest of the United States. We also do not see any other spike of this magnitude for MA or for the rest of the US in other years. This indicates that the policy had gained traction and hence, there was a good amount of awareness about the law in MA.

II.A Suggestive Evidence from Published Court Opinion Files

ARA of 2011 in MA eliminated the provision of lifetime alimony and made the duration of alimony contingent on the length of the marriage. While the law applied to both future and past divorces, it did not automatically reduce alimony but instead required the alimony provider to file an appeal for its reduction. Since the law didn't automatically terminate alimony, it is essential that we understand to what extent did the law create an actual movement in alimony-termination appeals for retroactive divorces.

To provide supporting evidence for this, we utilize publicly available published court opinion files for alimony cases in MA between 1980 to 2019. Published court opinions are case files that are ordered to be published in the official reports, and are usually cited or relied on by other courts and parties that involve a similar scenario. While not all cases are published, the set of published opinions establish a precedent that must be followed by all appellate and superior courts, and hence, serves as a good proxy for decisions in the majority of the other similar cases. Using 76 such publicly available published court opinion files from MA, we extract case-level information on the gender of plaintiffs and defendants, year of marriage and divorce, year in which the case was filed, the amount of alimony granted, and the case appeal.[10] Table A.1 provides summary statistics from the published court opinions in the sample. There are three important things to note from this table: 1) Similar to the national estimates, 97 percent of the alimony payers in this sample are men, 2) the majority of alimony that is granted in MA is lifetime alimony (73 percent), and 3) the average annual alimony payment in the sample is approximately 41,156 USD, thereby highlighting that termination of alimony is likely to create a substantial financial constraint on women who are largely dependent on alimony for their sustenance.

In Figure A.4a, we present evidence on the type of alimony cases filed in MA before and after the reform. We divide the sample into 4 decades: 1980-1990, 1991-2000, 2001-2010, and 2011-2019. The first 3 are pre-ARA decades and the last one is the post-ARA decade. For each time period, I plot a) the percentage of cases that appealed for an increase or continuation of alimony and b) the percentage of cases that appealed for a decrease or termination of alimony. Between 1980-2010, only 18 to 35 percent of cases appealed for a reduction in alimony and most of the cases asked for an increase or continuation of alimony. However, for 2011-2019 i.e., after the passage of the ARA in 2011, there was a reversal in trend, with almost 60 percent of the alimony cases in MA demanding a decrease or termination of alimony. Since alimony payers are typically men whereas alimony receivers are typically women, most cases for alimony reduction or termination should be filed by men. To verify this, in Figure A.4b we

[10] We focus on alimony-related cases as all the couples in these cases are already divorced and hence report the terms of alimony. This also allows me to look at the behavioral response at the retrospective application of the law, which would have the most immediate consequence. Finally, already-divorce women are most directly impacted by the policy as it comes as an unexpected income shock for them.

plot the percentage of cases with men as plaintiffs in each time period. The figure shows that the increase in alimony termination cases in MA after the reform goes hand in hand with the increase in the percentage of cases where men are plaintiffs. This is not surprising as the gender of the plaintiff is typically correlated with the type of alimony cases - women generally appeal for an increase or continuation of alimony, whereas men for a decrease or termination of alimony. Thus, the court opinion files indicate that the policy induced an actual movement towards reduction/termination of alimony in MA.

III. Empirical Framework

III.A Data

The main data set used for the analysis is the March supplement of the Census Population Survey (CPS) between 2000 to 2019, accessed via the Integrated Public Use Microdata Series (IPUMS) database (Flood et al., IPUMS, 2020). This widely used data set, also known as CPS-ASEC, is representative at both national and state level and is conducted by the Census Bureau for the Bureau of Labor Statistics. CPS provides a comprehensive list of variables on labor supply - labor force participation, employment, hours of work, earnings; as well as a number of demographic characteristics, including age, gender, education, and current marital status. CPS is conducted every year and thus, provides a long and consistent array of yearly data for 20 years in my sample - 11 years of pre-periods and 9 years of post-period data for the analysis. This is particularly helpful when using techniques such as the Synthetic Control Method (SCM) that requires a long pre-period to create reliable counterfactuals.[11] In addition, another advantage of using CPS data is that it is less sensitive to the business cycle, which is important in settings like mine that exploits the timing of a policy change (Kleven, 2019).

Sample:—The main analysis sample consists of all women *eligible* to participate in the labor force.[12] For DD analysis, the treatment sample consists of women in MA and the control

[11] See Section V.A.1 for a detailed discussion on SCM

[12] In CPS, only women of age 16 and above are eligible to be part of the labor force. One of the key benefits of working with all-women sample as the main analysis sample is that it eliminates any concern related to the changes in the group

sample consists of women in the rest of the US states. For SCM analysis, the control sample consists of women from the rest of the US states that receive a positive SCM weight.

Key outcomes:—The main outcomes of interest for this study are labor force participation (LFP), annual wage income, and type of employment. LFP takes a value of 1 if a woman is currently employed or in search of a job, and 0 if she is unemployed or out of the labor force. Female LFP is an important indicator for the growth and development of any country and is an important outcome variable at the individual level too. Wage income variable measures the total annual income earned by females from wages and salaries, including 0. Lastly, type of employment consists of two variables: part-time employment and full-time employment. The outcome variable 'part-time' takes value 1 if women are employed in a part-time job and 0 otherwise. Similarly, the variable 'full-time' takes value 1 if women is employed in a full-time job, else 0.

Timeline:—Figure A.8 describes the timeline of the treatment and the set of years from CPS data used for the analysis. For all the analyses, 2011 serves as the intervention year, 2000-2010 serves as the pre-reform period, and 2011-2019 as the post-reform period. Further, the post-reform period is divided into two periods - 1) 2011-2014 that serves as the intermediate period, and 2) 2015-2019 that serves as the post-implementation period.

III.B Empirical Strategy: Difference in Differences

We utilize a cross-state difference in difference (DD) strategy, and compare the trends in labor force participation of women in MA with the rest of the US, before and after the Alimony Reform. DD strategy eliminates the common time trends as well as state fixed effects that may affect the outcome, and hence, helps in estimating only those effects that arise from the state-year variations. In particular, we use the following estimating equation to analyze the outcomes:

$$Y_{ist} = \alpha_s + \gamma_t + \beta_{post} \times \mathbb{1}[s = MA] \times \mathbb{1}[t \geq 2011] + \epsilon_{ist} \tag{1}$$

composition that can arise in the cross-sectional data if we restrict the sample by any characteristics that can change over time.

Here, Y_{ist} represents the outcome variable for women i, in state s and year t. MA is the state dummy, which takes a value of 1 if the state is MA, and 0 if non-MA. α_s controls for time-invariant state fixed effects and γ_t controls for the year fixed effects common across the states. The coefficient of interest β_{post} is the difference-in-difference (DD) estimate for the treatment impact, and represents the intent-to-treat (ITT) effects. Standard errors are clustered at the state level i.e. at the level of treatment variation.

To separate the impacts of the reform in the intermediate period from those in the post-implementation period, we also estimate a variation of the base DD specification in equation 1, given by:

$$\begin{aligned} Y_{ist} = \alpha_s + \gamma_t + \beta_{intermed} \times \mathbb{1}[s = MA] \times \mathbb{1}[2011 \leq t \leq 2014] \quad + \\ \beta_{post-implement} \times \mathbb{1}[s = MA] \times \mathbb{1}[t \geq 2015] + \epsilon_{ist} \end{aligned} \tag{2}$$

$\beta_{intermed}$ captures the impact of the policy in the intermediate period, whereas $\beta_{post-implement}$ represents the treatment effect in the post-implementation period. In addition, we include controls for age (linear as well as five-year age bins FE) and educational attainment in the most comprehensive specification. The key identifying assumption for causal estimation in equation 1 and 2 is the common trends assumption, i.e., the outcome in MA would not have evolved differently to other states in the U.S. in the absence of the Alimony Reform Act.

Table 1 summarizes the mean and the standard deviation for key demographic and labor supply variables in the sample. Column (1) provides the summary statistics for women in MA whereas column (2) corresponds to the non-MA states. The table summarizes values using only the pre-reform sample years i.e., 2000 to 2010, to show the average characteristics of the two groups before the reform. In terms of the composition and average characteristics, MA was more or less comparable to the non-MA states before the reform.

IV. Impact on Marital Dissolution

Theoretical prediction for the impact of the reform on women's labor supply in section depends on the direction of the impact on divorce rates.[13] Hence, before moving on to the main results on labor supply outcomes, we first analyze the impact of the reform on separations and divorce probabilities. To begin with, it is not obvious whether alimony reform would lead to an increase or a decrease in the divorce rate among couples. While on one hand, alimony reform decreases the value of the outside options for women, it also significantly reduces the cost of divorce for men by reducing the duration of the alimony obligation. This is especially true for shorter-length marriages, where the monetary gains for men from an early divorce can be substantial. Evidence from court data analysis showed that alimony reform led to a significant spike in alimony-termination cases. Becker-Coase theorem suggests that when utility is transferable and bargaining costs are low, change in the alimony law should not affect the probability to separate i.e., a transfer of leisure from women to men can balance the altered value of outside option in marriage. In such scenarios, the decision to divorce would not be affected.[14] However, if the assumptions of transferable utility and low-cost bargaining does not hold, it could have an effect on the separation rates. In fact, Chiappori, Iyigun and Weiss (2007) argues that divorce related policies are likely to have an impact on the divorce rate, although the direction of the impact can go in either direction.

Using equations 1 and 2, we estimate the impact of reform on the probability of divorce among women in MA. Table 2 summarize the results. Columns (1)-(4) show the impact of reform on the probability of women being divorced, whereas columns (5)-(8) show the impact on the union of being divorced or separated. For both the outcomes, the table provides separate estimates for 'all-women' sample and for 'ever-married women' sample. ARA led to an increase in the probability of being divorced or separated by 4.5 - 5.5 percent (.5 pp - .7 pp) in the post-period. Period-wise analysis of impact on divorce probabilities suggest that the effects were concentrated mainly in the post-implementation period (columns (2) and (4)), however, for the combined status of divorce and separation, there is a small increase in mari-

[13] See, Appendix section IX. for a basic two period theoretical model

[14] The (Becker, 1993) model is a special case of the Coase Theorem in (Coase, 1960)

tal separation in the intermediate period as well. These results are consistent with Bredtmann and Vonnahme (2019), where they find that a reduction in post-marital alimony support in Germany led to an increase in the separation probabilities after the law. Hence, these results show that the alimony reform act increased the separated or divorce probabilities, and thus led to an overall increase in the marital instability.

Given that ARA led to an increase in the divorce probability, the theoretical model now *unambiguously* predicts that the law should lead to an increase in the female labor supply after the reform (see model prediction P.1). In the next section, we test this empirically by analyzing the impact of alimony reform on female labor force participation rates.

V. Impact on Female Labor Market Outcomes

V.A Labor Force Participation (LFP)

Table 3 presents the main result for the impact of alimony reform on female labor force participation rates in MA. Column (1) shows the treatment effect averaged over the entire post-reform period. In column (2), I break down this effect by phases i.e., treatment effect in the intermediate phase (2011-2014) and treatment effect in the post-implementation period (2015-2019). This will help in separating the effects that may exist due to the passage of the bill from the effects due to full implementation of the law as individuals may respond less intensely to a bill that is not yet implemented. The main result shows that the reform led to an increase in the female LFP rates for the all-women sample. We find there was an average 1.8 pp (approx. 3 percent) increase in the LFP rate of women in MA after the reform, with the breakdown of approximately 0.9 pp (approx. 1.5 percent) in the intermediate period and 2.8 pp (approx. 4.7 percent) in the post-implementation period (Table 3 columns 1 and 2). In terms of the total female population in MA who are eligible to be in the labor force, this corresponds to approximately 74,000 - 116,000 additional women entering the labor force due to the law.[15] The results are consistent with the testable predictions of the model (P.1.) in section IX., ac-

[15] We use population figures from Census, 2010 to extract the total numbers of women in MA corresponding to my sample. This corresponds to a total of 2,468,130 women in MA.

cording to which if a reduction expected alimony income increases the divorce probability, this should lead to an unambiguous increase in the labor supplied by women.[16] Thus, the empirical findings for the impact on female LFP are consistent with the theoretical prediction of the intertemporal labor supply model presented earlier.

While the reduction in alimony duration has a direct impact on female LFP, there can be a differential effect on one subset of women compared to others. However, it is important to note that subgroup estimates can be biased due to the compositional changes in the group that can occur after the reform. Since CPS is a cross-sectional data, we cannot restrict samples based on their baseline values. Keeping this caveat in mind, we investigate the heterogeneity in treatment effect on female LFP along two main dimensions - 1) marital status and 2) education level. Ever-married women (those currently or previously married) are more likely to be affected by any post-divorce law change as compared to never-married women.[17] Hence, we expect there to be a larger increase in labor supplied by ever-married samples as a way to safeguard themselves from the drop in expected alimony income flow after the reform. Table A.3, column (1) shows heterogeneity in the treatment effect by the ever-married status. The table shows that ever-married women have around 3.2 pp higher impact on labor force participation rates as compared to never-married women. Next, we look at heterogeneity by women's education level. Education serves as a good proxy for women's skill-level and how employable they are. To understand the heterogeneity in the treatment effect along this dimension, we divide the sample of women into two groups - those with a higher level of education (with education above high school degree[18]) and those with lower levels of education (with highest education of high school or below[19]). Table A.3, column (2) shows heterogeneity in the treatment effect, by education status. Women with high education in MA have a 3.4 pp larger increase in labor force participation rates compared to low educated women. In fact, for low-educated women, we see a decline in the LFP rates. There are sev-

[16] One might argue that increase in female LFP can lead to an increase in the divorce rates. While this is possible, Johnson and Skinner (1986) showed that when women increase their labor supply in response to increasing divorce probabilities, working has an insignificant effect on divorce.

[17] This holds under the assumption that a married woman is assigning at least some positive probability to the state of being divorced in the future.

[18] Includes diploma, some college, associate's degree, bachelor's degree, master's, professional schools, doctorate

[19] Includes no education or any grades up to 12th grade, but no diploma

eral explanations why this might be the case — one, women with higher levels of education have better labor market opportunities compared to their less-educated counterparts. Therefore, it is easier for them to flexibly adjust their labor supply in response to the reform. If the supply of highly skilled women increases without any change in the demand, this may push some of the low-skilled women out of the labor force. Second, Goldin (1994) suggests that among women with poor human capital, stigma can add resistance to their labor market attachment. If this is inbuilt in women's preference structure, lower educated women may prefer to shift away from market labor and devote more time to the household in an attempt to secure their marriage after the reform. Whereas among educated women, this stigma is weaker, and hence less likely to inhibit them from increasing labor participation rates after the program. [20]

V.B Wage Income

An increase in female income has been associated with improvement in a number of different outcomes such as women's health, household food purchases, autonomy and empowerment of women, mobility, nutrition and education of children, etc. (Haddad, 1999; Hoddinott and Haddad, 1995; Luke and Munshi, 2011; Pankaj and Tankha, 2010). However, in the context of alimony reform, an increase in female wage income is also important as it compensates some losses in expected alimony income. Thus, it can help in regaining financial security and independence after divorce. The magnitude of impact on wage income also informs us about the financial burden of the policy on state — if gains in wage income are unable to provide self-sufficiency to women, in the long run, states would need to compensate a part of the reduced alimony payments in terms of unemployment benefits or social welfare. Thus, identifying the effects on wage income is pertinent to understanding the long-term consequences of these reforms.

To quantify the impact of reform on income earned by females, we re-estimate equations 1 and 2 by replacing the outcome variable with annual wage income for women (including zeros). Table 4, columns (1)-(2) show the impact on wage income corresponding to the DD

[20] The impact of the reform on the intensive margin of LFP is unclear as the law led to a change in the composition of the labor force in itself. Hence, the paper only focuses on the extensive margin i.e., LFP rates of women.

analysis. The table shows that the reform led to an increase in wage income for women in MA by 9 percent or $1617 (corresponding to an average wage income of $17306 per year per woman in MA). Thus, we see that increase in labor force participation among women led to an increase in the average female income after the reform.

V.C Part-time versus Full-time Employment

Termination or reduction of alimony duration can have a substantial impact on the income support received by women. In such a scenario, increasing labor supply serves as a way to attain financial security and independence. However, there are various reasons why the reform may have led to a disproportionate increase in LFP in part-time jobs. One, lack of training or obsolete skill; having a dependent child; age and health can severely limit the employment options for women. This may result in women opting for part-time jobs which are relatively easier to enter and more flexible. Second, women may prefer part-time jobs to be able to devote more time to family and household due to the increased propensity of divorce after the reform. Hence, to understand the implications of the increase in LFP, we investigate the impact on the type of employment – whether the increase in LFP was concentrated in part-time or full-time jobs. Tables 5 Panel A and Panel B show the impact on female LFP in part-time employment and full-time employment, respectively. Results show that there was a disproportionate increase in female labor participation in part time jobs after the reform — there was a 7.5-8.4 percent (1.3 pp - 1.5 pp) increase in part-time jobs among women in MA, whereas the increase in full-time jobs was relatively small as well as statistically insignificant.

Increased participation in part-time jobs can have several implications - 1) In general, part-time workers earn lower income annually compared to those in full-time employment, which can hinder financial independence for women. Figure A.11 shows that the distribution of the average annual wage in part-time jobs is stochastically dominated by the distribution of average annual wage in full-time jobs. Owen (1978) shows that part-time workers are highly concentrated in poorly paid sectors. This implies that gain in annual wage-income may not be enough to provide financial independence to women; 2) In most part-time jobs, workers do not qualify for a majority of employment benefits that a full-time worker can avail such as

health insurance, sick leave, paid-holiday, etc. On top, break from work for any reason would also mean discontinuation of income flow. Moreover, in times of bad economic conditions, part-time workers are more likely to be laid off as they have loosely defined work contracts. In short, part-time jobs do not serve as a reliable and stable source of income.

VI. Inference: Synthetic Control Method

DD analysis exploiting policy variation across states is likely to suffer from serial correlations within a state (Bertrand, Duflo and Mullainathan, 2004). Hence, across all analyses, I cluster standard errors at the state level. However, when there is one treated cluster, the standard assumptions does not apply and can lead to an underestimation of the standards errors even when standard errors are clustered at the state level (MacKinnon and Webb, 2018).[21] Therefore, to make robust causal claims about the results, in addition to the DD analysis, we use the Synthetic Control Method (SCM) that is suitable for analyses using one treated unit.

SCM was formalized by Abadie, Diamond and Hainmueller (2010), and is commonly used in cases when there is only one treatment unit i.e. events or interventions that take place at an aggregate level (for example, Cunningham and Shah (2018)). Conceptually, SCM differs from the traditional regression methods by creating a synthetic control that can serve as a close counterfactual for the treated unit. This also helps in eliminating any concerns related to pre-trends that may arise in the DD analysis. The control group in this case is constructed by a weighted average of untreated units rather than being inferred from an underlying estimated model. Predictor variables that affect the outcome and the outcome variable itself before the policy, together determine the selection of control units and their respective weights. Thus, SCM provides a data-driven approach to re-weight the control units in a way that increases its similarities with the treated observations.[22]

Using this method, we create a synthetic MA by using data on the rest of the US states and

[21] Comparing a single treated state with the rest of the states can creates a larger sampling variance (Donald and Lang, 2007);(MacKinnon and Webb, 2018).

[22] (Heckman, Ichimura and Todd, 1998) argues that one of the issues with non-experimental econometric techniques is that the empirical distributions of the treated and untreated samples often do not have common support. Even where their supports do overlap, their mass may lie in substantially different regions of the distribution.

compare the evolution of female labor market outcomes for MA with those in synthetic MA, before and after the reform. Table A.2 shows the balance table for the predictor variables, for MA and for synthetic MA. In figure 1 (top), we plot the trends in female LFP for MA and synthetic MA. The figure shows that female LFP in MA and synthetic MA are a close fit over the entire pre-period, establishing strong comparability of synthetic control to the treated unit.[23] Figure shows that female LFP in MA starts to depart away from synthetic MA after 2013, with the difference widening sharply after the full implementation of the law in 2015. The difference in the trend mainly arises from increase in female LFP in MA during post-implementation period, whereas the trend for synthetic MA is almost flat in this period. Figure 1 (bottom) illustrates the treatment effect by plotting the difference in female LFP between MA and synthetic MA.

Abadie, Diamond and Hainmueller (2010) provides a mode of inference that is based on permutation methods. Under this method, we estimate the effect on the reform separately for each of the states in the sample. This is done by iteratively assigning placebo treatments to each state in the placebo sample and estimating 'placebo effects'. Then, we combine all placebo treatment effects and the actual treatment effect to construct a permutation distribution. The actual treatment effect is considered to be meaningfully significant when size is sufficiently large relative to the size of effect for the overall permutation distribution (Abadie, 2019). However, a limitation of this method is that, if some placebo units in the donor sample cannot find a synthetic control that closely matches it in the pre-period, then the magnitude of difference in the post-period is not very uninformative on its own. For this reason, (Abadie, Diamond and Hainmueller, 2010) proposes a test statistic that measures the ratio of post-intervention fit relative to pre-intervention fit based on the ratio of their root mean square predicted errors (RMSPE).

For each state, we generate a ratio of the post-treatment RMSPE over pre-treatment RMSPE. A large ratio for MA suggests that the control trend is a close fit to MA in the pre-treatment, but is very different from MA in the post-treatment period. We generate RMSPE

[23] Synthetic Controls by construction will be more or less similar to the treated unit. However, the degree of fit over the entire pre-period can vary. Moreover, to understand if it's a good control or not, we will also look at the root mean squared predicted errors (RMSPE) in the pre periods - the smaller is the RMSPE in the pre-period, the closer is the fit.

for MA as well as the other fifty states and rank them from highest to lowest. This allows me to examine whether the impact of alimony reform was significantly different for MA to the distribution of the placebo effects. The rank order of MA in this distribution divided by the number of units gives the probability with which MA estimates are as good as random and can serve as the p-values for SCM estimates. We present the distribution of the ratios in Figure 2, where 'MA' labels the ratio for MA. Non-labeled bars show the distribution of RMSPE for the placebo states. MA has the highest ratio of post/pre RMSPE and is substantially greater than any ratio for the placebo units. This implies that the probability of obtaining a post/pre RMSPE ratio as large as MA is 0.019 i.e. statistically significant at 5 percent. Note that this is statistically a very demanding test to get significance at the conventional levels, and hence, provides strong evidence for the robustness of the results.

Next, we plot the trends in LFP in MA and synthetic MA for each subsample of women — ever-married, never-married, high educated, low educated. Similar to the findings from the DD strategy, we find a higher increase in female LFP among the ever-married group (figure A.5a), with little to no effect on the never-married group of women (figure A.5b). Figures A.5c and A.5d presents the SCM analysis for women with high and low levels of education. Women with high education see a larger increase in labor participation post the policy implementation compared to women with low education. In figure A.6, we plot the distribution of the ratio of post over pre-RMPSE for MA and placebo units, for each of the above subsamples. In each sub-figures, points on the right of the dashed vertical line show points for which the p-value is less than 10 percent. Statistical significance of MA is determined if it lies on the right of this line. Like before, A.6 shows that the impact on female LFP is large and statistically significant for ever-married and high-educated women, but insignificant for never-married women and low-educated women. Figure 3 and 4 repeats this exercise for the annual wage-income and part-time employment, and shows a similar conclusion as from the DD analysis.

To draw a comparison of the point estimates from DD analysis with those from the SCM analysis, we conduct a DD analysis by reproducing the synthetic MA using SCM assigned weights for the control states. We refer to these as DD-SCM estimates. Table A.4 shows DD-SCM results for all the labor market outcomes - labor participation, wage income, and the

type of employment - using this method. Results show that alimony reform led to a 6 percent increase in female LFP compared to 4 percent effect from the main DD analysis. For annual wage income, while the point estimates are larger, the percent effect is the same (5 percent) across both the estimates. For type of employment, the impact is slightly larger for DD-SCM estimates compared to those from main DD estimates - 12 percent for part-time jobs and 4.5 percent for full-time jobs compared to 9.6 and 1.7 percent respectively for the DD estimates. Thus, DD-SCM estimates show that not only are the DD results robust, the size of the effects are also in the ballpark of our earlier findings.

These results show that our findings are consistent across the two methods and are not affected by the choice of the empirical strategy, thus providing strength to the main findings.

VII. Back of the Envelope Calculation: Net Expected Change in Lifetime Income of Women

The net welfare effects of alimony reform on women are not obvious to begin with. On one hand, the policy can leave women worse off due to reduced alimony duration, at the same time, it can improve female wage income by inducing a higher labor supply. While a full welfare analysis is out of the scope of this paper, in this part, We provide a simple back-of-the-envelope calculation to compare the loss in expected lifetime alimony income with the gains in expected lifetime wage income induced by the reform.[24]

To estimate the net change in the expected lifetime income, we calculate the A) lifetime alimony income before the law change, B) lifetime alimony income after law change and C) increase in wage income after the policy change. We separately estimate the lifetime alimony received by women before and the lifetime alimony income after the reform, and then deduct the latter from the former to estimate the expected change in lifetime alimony income due to the reform. For wage income, We will use the DD estimates on the average impact of reform on wage income and estimate the expected increase in the lifetime wage income of women.

[24] The exercise shows the calculation for an average woman in MA because We do not observe the distribution of alimony granted among various subsets of women.

Table C.1 of Appendix section C lays out the details of the calculation.

Back of the envelope calculation shows that alimony reform led to a loss of $306,922 in expected lifetime alimony income and a gain of $158,062 in expected lifetime wage income, resulting in a net loss of $148,830 in expected lifetime income for women in MA. Considering that an average woman in MA will live for 42 more years (i.e. difference between the mean expectancy (83) and mean age (41) for women in MA), at an inflation rate of 3.14, this amounts to a loss of $40,621 in presented discounted terms.[25] While the calculation is based on several assumptions about the demographic composition, these numbers should be treated as a ballpark estimate that provides some understanding about the direction and the net effects of the reform on women's financial well-being.

Thus, estimates from the back-of-the-envelope calculation suggest that alimony reforms that reduce or terminate alimony, can leave women financially worse-off and further accentuate the already existing post-divorce gender-gap in economic well-being.

VIII. Robustness Tests

Alternative Indicators of Labor Supply.– As an additional check for the consistency of the results on female labor supply outcome, we estimate the impact on two other indicators of labor supply that serve as a good proxy for labor force participation. In particular, we analyze the impact of ARA on 1) employment rate and 2) annual hours of work. Table A.5 summarizes the results corresponding to these outcomes and shows a similar pattern as for the LFP. Hence, the impact on female labor supply is fairly similar irrespective of the choice of labor supply indicator, showing the robustness and consistency of the finding.

Common trends assumption.– Causal inference from DD inference relies on the parallel pre-trends assumption. To test this, we use the event-study equation as described below and

[25] There are a few caveats to this calculation that should be kept in mind while interpreting these estimates. One, a change in alimony duration can also result in a change in the amount of alimony that is negotiated at the time of the divorce. If that is the case, then this would lead to a smaller decline in the lifetime alimony income as compared to the current estimates. Second, the policy can change the divorce or marriage rates in the long run, which can in turn increase or decrease the alimony amounts received by average women. Third, if the labor supply changes mainly happened as a response to the sudden unexpected decline in income support brought upon by the policy, then it is possible that some of these impacts may subside in the long-run, once the policy has been fully internalized. All these factors, and more, can affect the estimated costs and benefits to sway in one or the other direction.

compare the trends in labor participation for women MA with those in the rest of the US.

$$Y_{ist} = \alpha_s + \gamma_t + \sum_{T=2000}^{2019} \beta_t \times \mathbb{1}[s = MA] \times \mathbb{1}[t = T, t \neq 2010] + \epsilon_{ist} \tag{3}$$

All variables defined above are similar to the main estimating equation 1 except for β_t, which here is a vector that takes a unique value for each year between 2000-2019. The omitted year category is 2010 i.e., the year just before ARA came into place. Figure 5 and 6 plots the coefficients β_t on MA-specific year effects for the outcome variable generated from equation 2. The dashed and the solid vertical lines indicate the passing and the implementation of the bill, respectively. The coefficient plot shows that there was not any distinct upward or downward trend in female LFP in the pre-period (2000-2011), thus providing supportive evidence for the common trend assumption.

While the pre-trends for labor outcomes in DD event study analysis are almost flat, there is minor cyclicality in the pre-trend for female LFP. This is possible if certain economic factors affect MA differently over time. However, we cannot include state-by-year fixed effects to absorb this as this is also the level of treatment variation. Hence, to try and control for this, we estimate an alternate specification that includes interactions for property tax (interchangeably referred as PropTax) as a proxy for differential effect of economic development in a region. Dye, McGuire and Merriman (2001) finds evidence that shows that property tax contributes to differential rates of economic growth. However, studies show that magnitude and direction of effects of the taxation on a state's economy depend crucially on the use to which the revenues are put. Hence, the same amount of local tax revenue can have a differential effect by state or over time, depending on its use (Helms, 1985). To take this into account, we allow for the differential effect of property tax across states and over time by including interactions of property tax by-year and by-state separately. This will help in eliminating some of the differential effects of business cycle and economic development across states and over time. Event study corresponding to this alternate specification (see figure A.8 and A.9) eliminates most of the cyclical trends in the pre-period and still preserves the main impacts i.e. increase in LFP, wage income, and part-time employment among women in post period. In Table A.6, we re-estimate the DD treatment effect using this alternative specification. Results

show that the point estimates are slightly larger than the main DD estimates similar to those estimated from the SCM-DD specification. This seems consistent with the fact that both these methods i.e. DD-SCM method and DD with alternate-specification, have better and more comparable pre-trends. Thus, the event-study analysis shows that the control group serves as a good counterfactual for MA (treatment group) in the absence of the reform, and hence the treatment effects from DD analysis can be interpreted as being causal estimates.

DD Permutation Test.– Following Cunningham and Shah (2018), we implement a difference-in-difference permutation or randomization inference test described by Buchmueller, DiNardo and Valletta (2011) to check for the robustness of the main DD estimates.[26] To conduct this test, we estimate equation 1 an additional fifty times by replacing MA with an indicator for one of the other fifty states which serve as placebo states. Similar to the RMSPE test for SCM, this is also a statistically demanding test and hence, requires strong effects to get significance at the conventional levels.

In Figure A.10, capped vertical lines represent the sampling distributions for placebo estimates from the 99th percentile for each year, while the circles denote the DD point estimate corresponding to MA for each year. Comparing the point estimates for MA against the distribution of placebo estimates shows that before the reform, point estimates for MA are close to the placebo estimates - showing similarity of labor participation differences for MA and for placebo states. However, after the implementation of the law, point estimates for MA are significantly more than the highest estimate in the placebo distribution for each year in this period. In some respects, this is similar to the DD event study analysis, but with a significantly stronger condition, and hence provides further evidence for the robustness of the findings.

Exclusion of States with Alimony Related Changes.– Following the Alimony Reform Act of 2011 in MA, a few other U.S. states also passed different alimony-related bills in this time period. However, most of these reforms were of considerably smaller magnitude or were focused on only one subset of the population.While these reforms are unlikely to create significant impacts independently, they might influence the estimates when included in the anal-

[26] Buchmueller, DiNardo and Valletta (2011) describes this method as a variant of Fisher's permutation or randomization test (Fisher, 1935)

ysis. Hence, to get a clean estimate, in Table A.7, we re-estimate the treatment effects by excluding states that had any alimony related changes in this time frame from the analysis. I find that eliminating these states' does not have any substantial impact on the treatment effects.[27]

IX. Conclusion

Findings from this paper present evidence on the labor supply response of women to changes in expected alimony income. MA passed the Alimony Reform Act in 2011 which terminated lifetime alimony and made the duration of alimony receipts contingent on the length of the marriage. We show that this led to an increase in the alimony termination cases filed by men as well as increased separation rates after the law. Women increased their LFP in response to the law, thereby increasing female wage-income among women in MA. However, since most of the increase in female labor participation was concentrated in part-time jobs - which are generally low-paying and have poor job security, it may not be enough to compensate for the loss in alimony income. In fact, a simple back-of-the-envelope calculation suggests an estimated net loss of $40,621 in present discounted income for women in MA due to the reform. An unexpected decline in income can significantly reduce women's well-being in the short run, especially those who are constrained by their previous investment in education and career choices, thus having limited labor market opportunities.[28]In summary, these results show that a reduction or termination of alimony can further widen the already existing post-divorce gender gap in economic outcomes, and hence needs to be properly internalized in alimony-related policies.

Over the past decade, there has been a rising movement across countries to reform al-

[27] SCM analysis corresponding to this in A.12 establishes the robustness of these findings, thus showing that the estimates are robust to inclusion or exclusion of these states in the analysis.

[28] Anecdotal evidence (quoted below) highlights that even among women with ability to increase their labor supply, they may not be able to do so if they are limited by factors such an dependents requiring intensive care, or by obsolete skill set from staying out of the labor force in the past.
"I just received a complaint about modification from my ex looking to end alimony. He says because of the new alimony laws, he reached the time limit on his obligation.... I depend on that alimony and have structured my life so that I can meet my expenses, but I don't have savings. I just have a modest house and will be able to collect on my teacher's pension in a few years but I haven't worked full time since our kids were born - I have a job share with another teacher. Our daughter had special needs and I had to be available. When she passed away two years ago, I didn't have a real reason to change the job I've had for over a decade. Can he just end alimony?" —- anonymous women from Massachusetts [Boston Herald, July 2020]

imony laws [29] which makes the findings from this paper particularly relevant for policy considerations in the present context.

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[29] FigureA.3 shows the wide media coverage in the context of the recent alimony reform movement in the US.

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Main Tables and Figures

Table 1: SUMMARY STATISTICS

	(1) Massachusetts		(2) Rest of the US States	
	Mean	Std. Dev.	Mean	Std. Dev.
Demographics				
Age (mean)	43.92	18.06	43.26	18.03
Married (%)	0.48	0.50	0.51	0.50
Divorced (%)	0.10	0.29	0.11	0.31
Ever married (%)	0.71	0.45	0.74	0.44
Education				
Upto 12th grade (%)	0.17	0.37	0.19	0.39
Some degree but no college (%)	0.52	0.50	0.58	0.49
Bachelor degree or above (%)	0.32	0.47	0.23	0.42
Labor and Wages				
Looking for Work (%)	0.04	0.20	0.05	0.22
Retired (%)	0.21	0.40	0.21	0.41
Labor force participation (%)	0.62	0.49	0.60	0.49
Employment rate (%)	0.59	0.49	0.57	0.49
Employed in parttime job (%)	0.22	0.41	0.18	0.39
Employed in parttime job (%)	0.35	0.48	0.37	0.48
Annual Wage Income (USD)	18808	27903	15459	23270
Annual Hours of Work	990	1002	999	1033
N	15116		869553	

Notes: Table 1 shows the summary statistics of various demographic characteristics and labor supply characteristics for women. Columns (1)-(2) shows the mean and standard deviation for women in Massachusetts, whereas columns (3)-(4) shows the characteristics for women in the control group i.e., the rest of the US. *Source*: Author's calculation using CPS-ASEC (2000-2010)

Table 2: IMPACT OF ALIMONY REFORM ON DIVORCE/SEPARATION RATES

Outcome:	Divorce				Divorce + Separation			
Sample:	All		Ever-married		All		Ever-married	
	(1) TE	(2) TE by Phases	(3) TE	(4) TE by Phases	(5) TE	(6) TE by Phases	(7) TE	(8) TE by Phases
MA × Post	0.005***		0.009***		0.007***		0.012***	
	(0.001)		(0.002)		(0.002)		(0.002)	
MA × Intermediate Period		0.001		0.001		0.004**		0.006***
		(0.001)		(0.002)		(0.002)		(0.002)
MA × Post Implementation		0.010***		0.016***		0.010***		0.017***
		(0.001)		(0.002)		(0.002)		(0.002)
Mean Dep. Var.	0.11	0.11	0.15	0.15	0.13	0.13	0.18	0.18
N Clusters	51	51	51	51	51	51	51	51
Observations	1586364	1586364	1154134	1154134	1586364	1586364	1154134	1154134

Notes: Table 2 shows the impact of alimony reform in MA on the divorce and separation probabilities for women in the main analysis sample. Columns (1)-(4) show results corresponding to divorce, whereas columns (5)-(8) show results for a joint indicator of divorce or separation. For each type of outcome, I present results from two different types of sample - all women sample and only ever-married women sample. Columns (1)-(2) and (5)-(6) show results for all women samples, whereas columns (3)-(4) and (7)-(8) correspond to the ever-married sample of women. For each outcome and each sample, Column header 'TE' in (1), (3), (5) & (7) show the treatment effects corresponding to entire post period i.e. 2011-2019, whereas and column header 'TE by phases' in (2), (4), (6) & (8) shows the breakdown of treatment in each group by phases i.e. in the intermediate phase (2011-2014) and in the post-implementation phase (2015-2019). Each column shows results from a separate regression. The standard errors (in parenthesis) are clustered at the state level. *Source*: Author's calculation using CPS-ASEC 2000-2019. *p $\leq$ 0.10, **p $\leq$ 0.05, ***p $\leq$0.01

Table 3: MAIN RESULT: TREATMENT EFFECT ON FEMALE LFP

	Outcome: Female Labor Force Participation Rates					
	(1) TE	(2) TE by Phases	(3) TE	(4) TE by Phases	(5) TE	(6) TE by Phases
MA × Post	0.0188***		0.0187***		0.0171***	
	(0.002)		(0.002)		(0.002)	
MA × Intermediate Period		0.0089***		0.0088***		0.0137***
		(0.002)		(0.002)		(0.002)
MA × Post Implementation		0.0284***		0.0282***		0.0204***
		(0.002)		(0.002)		(0.002)
Treatment and Time Dummy	✓	✓				
State and Year FEs			✓	✓	✓	✓
Individual Controls and FEs					✓	✓
Mean Dep. Var.	0.59	0.59	0.59	0.59	0.59	0.59
N Clusters	51	51	51	51	51	51
Observations	1586364	1586364	1586364	1586364	1488142	1488142

Notes: Table 3 shows the main result i.e., treatment effect of alimony reform in MA on the female labor force participation rates. Columns (1) & (2) shows the most basic DD estimates with a dummy each for MA and post-period, columns (3) & (4) replaces MA and post-period dummies with State and Year FEs, and Columns (5) & (6) adds individual controls for age, education (a dummy for higher education), and 5 year age-bins FE. Column header 'TE' in (1), (3) & (5) show the treatment effects corresponding to entire post period i.e. 2011-2019, whereas and column header 'TE by phases' in (2), (4) & (6) shows the breakdown of treatment in each group by phases i.e. in the intermediate phase (2011-2014) and in the post-implementation phase (2015-2019). Each column shows results from a separate regression. The standard errors (in parenthesis) are clustered at the state level. *Source*: Author's calculation using CPS-ASEC 2000-2019. *p $\leq$ 0.10, **p $\leq$ 0.05, ***p $\leq$0.01

Table 4: IMPACT ON FEMALE WAGE INCOME

	Outcome: Annual Wage Income (USD)					
	(1) TE	(2) TE by Phases	(3) TE	(4) TE by Phases	(5) TE	(6) TE by Phases
MA × Post	1617.8833***		1573.3349***		1697.6094***	
	(160.992)		(165.079)		(187.371)	
MA × Intermediate Period		451.0538***		408.9777**		783.6804***
		(162.488)		(166.267)		(170.913)
MA × Post Implementation		2754.0199***		2699.6168***		2566.6566***
		(195.608)		(195.451)		(222.232)
Treatment and Time Dummy	✓	✓				
State and Year FEs			✓	✓	✓	✓
Individual Controls and FEs					✓	✓
Mean Dep. Var.	17306.00	17306.00	17306.00	17306.00	17306.00	17306.00
N Clusters	51	51	51	51	51	51
Observations	1586364	1586364	1586364	1586364	1488142	1488142

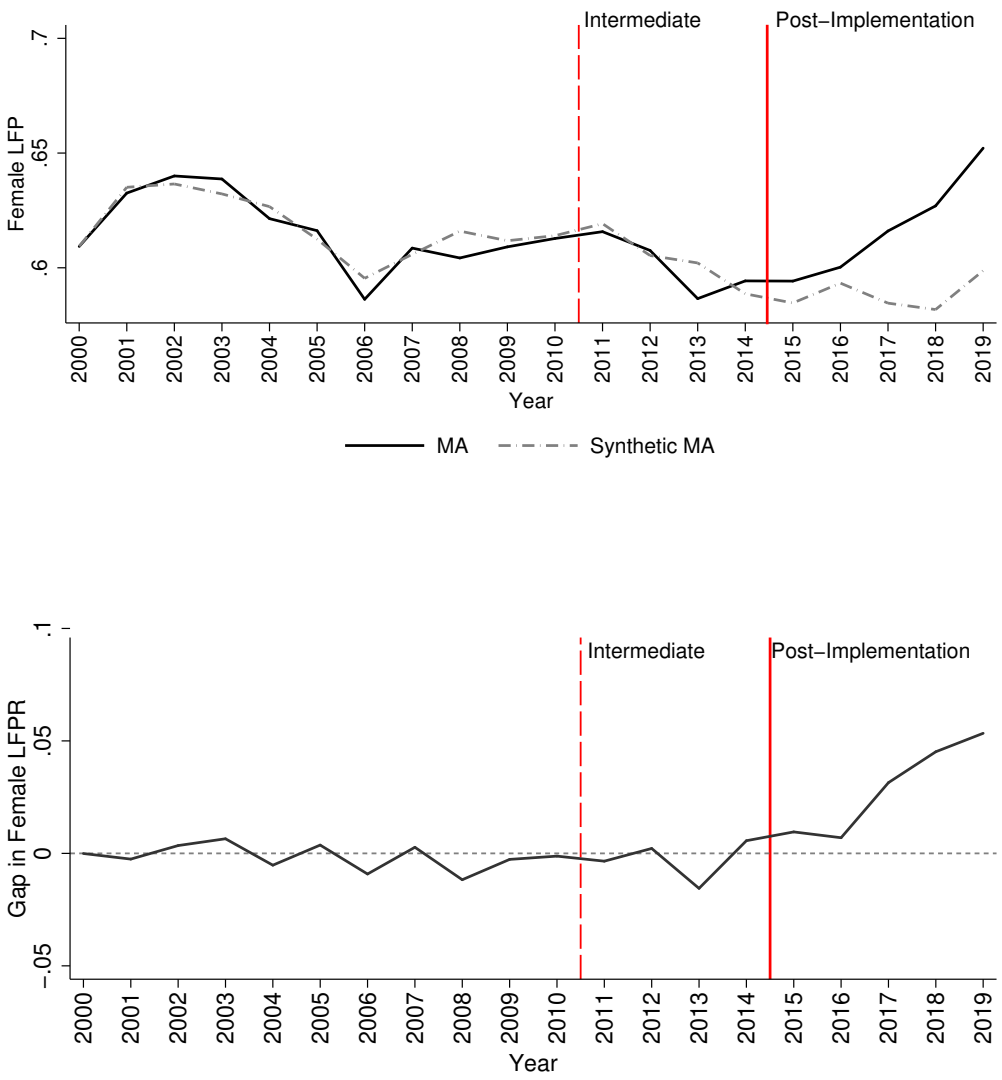
Notes: Table 4 shows the effect of alimony reform law on female annual wage income (including 0). Columns (1) & (2) shows the most basic DD estimates with a dummy each for MA and post-period, columns (3) & (4) replaces MA and post-period dummies with State and Year FEs, and Columns (5) & (6) adds individual controls for age, education (a dummy for higher education), and 5 year age-bins FE. Column header 'TE' in (1), (3) & (5) show the treatment effects corresponding to entire post period i.e. 2011-2019, whereas and column header 'TE by phases' in (2), (4) & (6) shows the breakdown of treatment in each group by phases i.e. in the intermediate phase (2011-2014) and in the post-implementation phase (2015-2019). Each column shows results from a separate regression. The standard errors (in parenthesis) are clustered at the state level. *Source*: Author's calculation using CPS-ASEC 2000-2019. *p $\leq$ 0.10, **p $\leq$ 0.05, ***p $\leq$0.01

Table 5: IMPACT ON PART-TIME JOB

	(1) TE	(2) TE by Phases	(3) TE	(4) TE by Phases	(5) TE	(6) TE by Phases
	Panel A: Part-time Employment					
MA × Post	0.0149***		0.0144***		0.0135***	
	(0.001)		(0.001)		(0.001)	
MA × Intermediate Period		0.0121***		0.0117***		0.0118***
		(0.001)		(0.001)		(0.001)
MA × Post Implementation		0.0175***		0.0169***		0.0152***
		(0.001)		(0.001)		(0.001)
Mean Dep. Var.	0.18	0.18	0.18	0.18	0.18	0.18
	Panel B: Full-time Employment					
MA × Post	0.0001		0.0004		0.0004	
	(0.002)		(0.002)		(0.002)	
MA × Intermediate Period		-0.0028		-0.0026		0.0026
		(0.003)		(0.003)		(0.002)
MA × Post Implementation		0.0030*		0.0034*		-0.0017
		(0.002)		(0.002)		(0.002)
Mean Dep. Var.	0.36	0.36	0.36	0.36	0.36	0.36
Treatment and Time Dummy	✓	✓				
State and Year FEs			✓	✓	✓	✓
Individual Controls and FEs					✓	✓
N Clusters	51	51	51	51	51	51
Observations	1586364	1586364	1586364	1586364	1488142	1488142

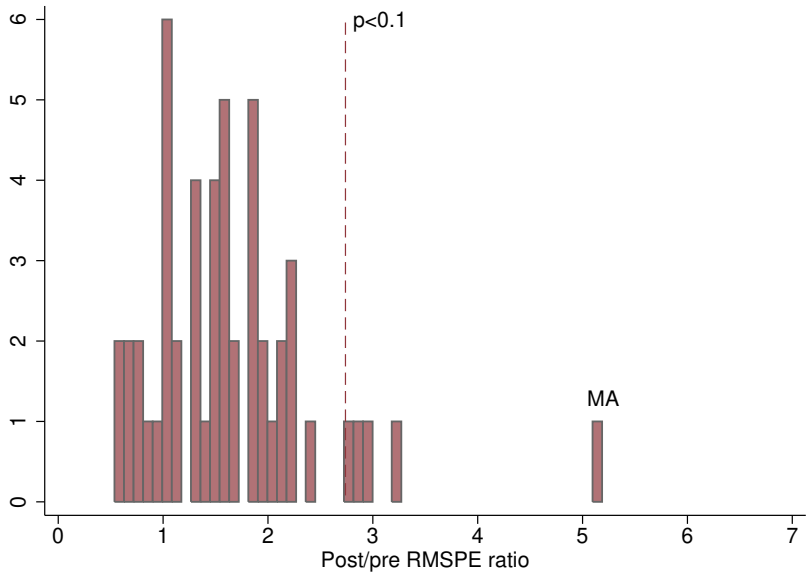
Notes: Table 5 shows the in treatment effect of alimony reform law on part-time employment (panel A) and full-time employment (panel B). Outcome variable part-time (full-time) takes a value of 1 if women are employed in part-time (full-time) jobs, else 0. Columns (1) & (2) shows the most basic DD estimates with a dummy each for MA and post-period, columns (3) & (4) replaces MA and post-period dummies with State and Year FEs, and Columns (5) & (6) adds individual controls for age, education (a dummy for higher education), and 5 year age-bins FE. Column header 'TE' in (1), (3) & (5) show the treatment effects corresponding to entire post period i.e. 2011-2019, whereas and column header 'TE by phases' in (2), (4) & (6) shows the breakdown of treatment in each group by phases i.e. in the intermediate phase (2011-2014) and in the post-implementation phase (2015-2019). Each column shows results from a separate regression. The standard errors (in parenthesis) are clustered at the state level. *Source*: Author's calculation using CPS-ASEC 2000-2019. *p $\leq$ 0.10, **p $\leq$ 0.05, ***p $\leq$0.01

Figure 1: SCM PLOT: FEMALE LFP IN MA AND SYNTHETIC MA



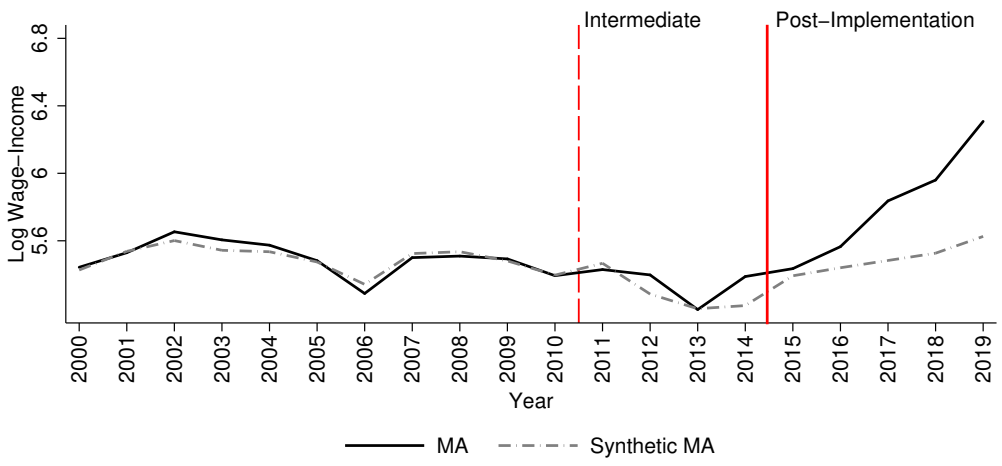
Notes: Figure 1 (Top) plots the trends in labor force participation rates of women in MA and synthetic MA between 2000 and 2019. The solid black plot shows the trend for the treatment state MA, whereas the dashed gray plot shows the trend corresponding to synthetic MA. Figure 1 (Bottom) shows the treatment effect on female labor participation rates by plotting the difference in trends for MA and synthetic MA between 2000 to 2019.
For both the figures, the dashed vertical line represents the period after which the Alimony Reform Act bill was passed in MA, whereas the solid vertical line marks the time for full implementation of the law. The period between 2011 to 2014 is the intermediate bill i.e. when the bill had passed but the law was not fully implemented, whereas 2015-2019 serves as the post-implementation period. *Source*: Author's calculation using CPS-ASEC 2000-2019.

Figure 2: SCM ROBUSTNESS TEST: DISTRIBUTION OF POST/PRE RMSPE IN FEMALE LFP



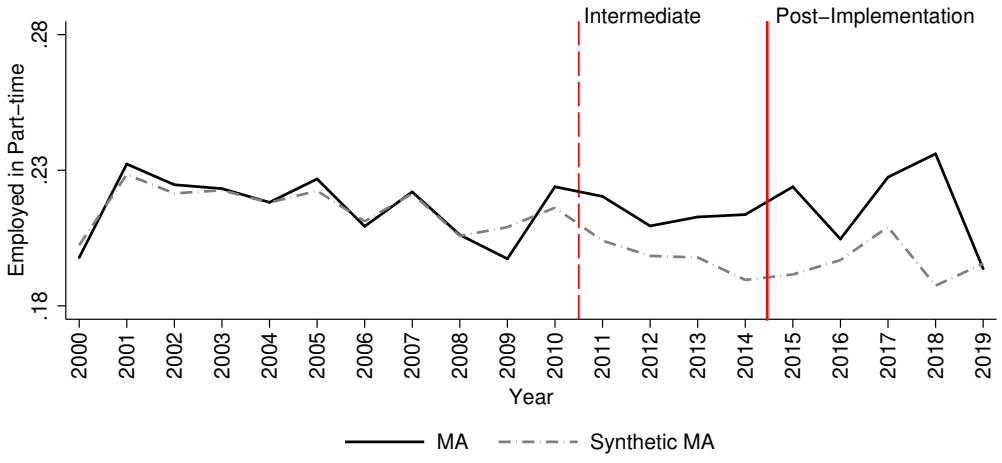
Notes: Figure 2, presents a test statistic for measuring significance of the impact on female LFP using SCM. This method, which was proposed by Abadie, Diamond and Hainmueller (2010), measures the ratio of the post-intervention fit relative to the pre-intervention fit based on the ratio of post versus pre root mean square predicted errors (RMSPE). For each state, a ratio of the post-treatment over pre-treatment RMSPE is generated. A large ratio for MA suggests that the control trend is a close fit to MA in the pre-treatment, but is very different from MA in the post-treatment period. I generate RMSPE for MA as well as the other 50 states and then rank them from highest to lowest. This allows me to examine whether the impact of alimony reform is significantly different for MA compared to the distribution of the placebo effects. The rank order of MA in this distribution divided by the number of units gives the probability with which MA estimates are as good as random and can serve as the p values for SCM estimates. The table presents the distribution of this ratio, where 'MA' labels the bar for MA. Non-labeled bars show the distribution of RMSPE for the placebo states. The dashed vertical line shows the cutoff point for p-values such that all points on the right of the line have a p-value of less than 0.1 and hence, statistically significant at 10 percent. The bar on the rightmost end of the figure shows the estimate for MA i.e. MA has the highest ratio implying that the probability of obtaining a post/pre RMSPE ratio as large as MA is 0.019. *Source*: Author's calculation using CPS-ASEC 2000-2019.

Figure 3: SCM TREND PLOT: IMPACT ON FEMALE WAGE INCOME



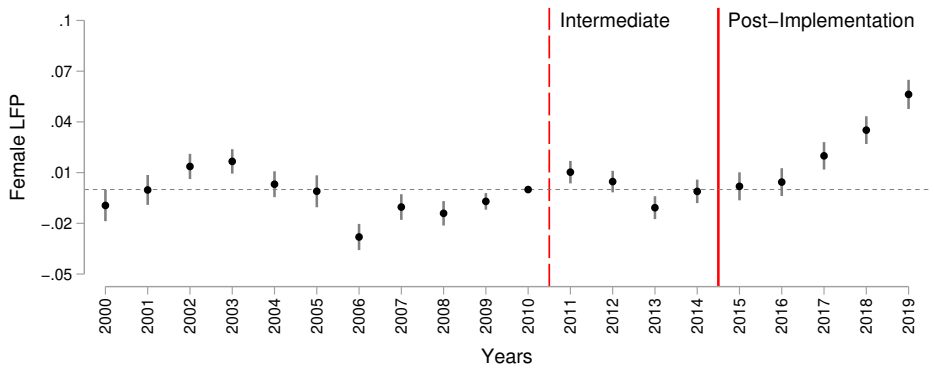
Notes: Figure 3 plots the trends in log of wage-income for women in MA and synthetic MA between 2000-2019. The solid black line shows the trend for MA, whereas the dashed gray line shows the trend corresponding to synthetic MA. The dashed vertical line represents the period after which the Alimony Reform Act bill was passed in MA, whereas the solid vertical line marks the time for full implementation of the law. The period between 2011 to 2014 is the intermediate bill i.e. when the bill had passed but the law was not fully implemented, whereas 2015-2019 serves as the post-implementation period. The standard errors are clustered at the state level. *Source*: Author's calculation using CPS-ASEC 2000-2019.

Figure 4: SCM TREND PLOT: IMPACT ON PART-TIME EMPLOYMENT



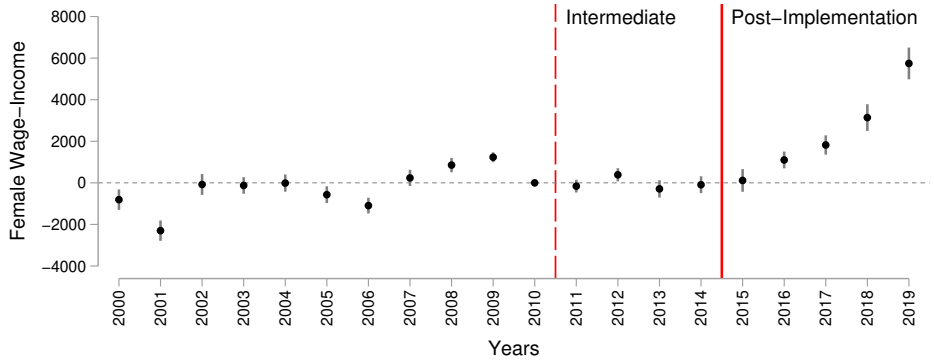
Notes: Figure 4 plots the trends in part-time employment for women in MA and synthetic MA between 2000-2019. The solid black line shows the trend for the treatment state MA, whereas the dashed gray line shows the trend corresponding to synthetic MA. The dashed vertical line represents the period after which the Alimony Reform Act bill was passed in MA, whereas the solid vertical line marks the time for full implementation of the law. The period between 2011 to 2014 is the intermediate bill i.e. when the bill had passed but the law was not fully implemented, whereas 2015-2019 serves as the post-implementation period. The standard errors are clustered at the state level. *Source*: Author's calculation using CPS-ASEC 2000-2019.

Figure 5: EVENT-STUDY PLOT: IMPACT ON FEMALE LFP



Notes: Figure 5, shows the event-study plot of the impact of the Alimony Reform Act on the labor force participation rates of women. Each point represents a year-specific coefficient β_t from equation 1 and shows the treatment effect of the reform relative to the year 2010 i.e. the year before the reform came into place. The dashed vertical line represents the period after which the Alimony Reform Act bill was passed in MA, whereas the solid vertical line marks the time for full implementation of the law. The period between 2011 to 2014 is the intermediate bill i.e. when the bill had passed but the law was not fully implemented, whereas 2015-2019 serves as the post-implementation period. The standard errors are clustered at the state level. *Source*: Author's calculation using CPS-ASEC 2000-2019.

Figure 6: EVENT-STUDY PLOT: IMPACT ON FEMALE ANNUAL WAGE-INCOME



Notes: Figure 6, shows the event-study plot of the impact of the Alimony Reform Act on the annual wage-income for women (in USD). Each point represents a year-specific coefficient β_t from equation 1 and shows the treatment effect of the reform relative to the year 2010 i.e. the year before the reform came into place. The dashed vertical line represents the period after which the Alimony Reform Act bill was passed in MA, whereas the solid vertical line marks the time for full implementation of the law. The period between 2011 to 2014 is the intermediate bill i.e. when the bill had passed but the law was not fully implemented, whereas 2015-2019 serves as the post-implementation period. The standard errors are clustered at the state level. *Source*: Author's calculation using CPS-ASEC 2000-2019.

ONLINE APPENDIX

”Female Labor Supply Response to Alimony: Evidence From Massachusetts”

Anjali P. Verma

A Appendix Tables and Figures

Table A.1: SUMMARY STATISTICS FROM MA'S PUBLISHED COURT OPINIONS

	(1) Courtdata Sample	
	Mean	Std. Dev
Male Plaintiff (%)	0.38	(0.49)
Alimony paid by Male (%)	0.96	(0.20)
Lifetime Alimony (%)	0.73	(0.45)
Length for which couple was married	18.72	(8.00)
Number of children from marriage	2.11	(1.11)
Case involved ARA 2011 (%)	0.29	(0.46)
Number of employed married-women	33.00	(0.00)
Number of employed married-men	56.00	(0.00)
Annual amount of Alimony	41156.62	(59794.74)
N	76	

Notes: Table A.1 presents the summary statistics for alimony related published case opinion files in MA between 1980-2019. The summary is based on the all the publicly available published alimony case opinions available at mass.gov *Source*: Author's calculation using published court opinions for alimony cases in MA.

Table A.2: SCM BALANCE TABLE FOR FEMALE LFP (MA VS SYNTHETIC-MA)

Variable	MA	Synthetic MA
Age	43.82	43.86
White	.87	.86
Black	.07	.07
Asian	.04	.03
High Education	.82	.80
Ever Married	.71	.74
Married	.49	.52
Log HH Inc	6.47	6.46

Notes: Table A.2 shows the balance table on the predictor variables for MA and synthetic MA corresponding to the outcome female LFP. The synthetic control group is constructed by a weighted average of untreated units in the pre-period that gives a close counterfactual for MA. Predictor variables that affect the outcome and the outcome variable itself before the policy together determine the selection of control regions and their respective weights. The table shows that the synthetic control looks very similar to MA in terms of socio-demographic characteristics that predict LFP of women for synthetic MA. *Source*: Author's calculation using CPS-ASEC 2000-2019.

Table A.3: HETEROGENEITY IN THE IMPACT ON FEMALE LFP

	TE	TE by Phases	TE	TE by Phases
	(1)	(2)	(3)	(4)
MA × Post	-0.003		-0.010***	
	(0.002)		(0.003)	
MA × Post × EverMarried	0.032***			
	(0.003)			
MA × Intermediate Period		-0.016***		-0.020***
		(0.003)		(0.004)
MA × Post Implementation		0.009***		0.003
		(0.003)		(0.003)
MA × Intermediate Period × EverMarried		0.038***		
		(0.004)		
MA × Post Implementation × EverMarried		0.027***		
		(0.003)		
MA × Post × HighEduc			0.034***	
			(0.003)	
MA × Intermediate Period × HighEduc				0.039***
				(0.004)
MA × Post Implementation × HighEduc				0.027***
				(0.003)
Mean Dep. Var.	0.59	0.59	0.59	0.59
Observations	1586364	1586364	1586364	1586364

Notes: Table A.3 shows heterogeneity in the impact of alimony reform in MA on female labor force participation rates, by their marital status and education level. EverMarried dummy takes a value 1 if a woman is currently or was previously married, else 0. HighEduc dummy takes a value 1 if a woman has an education degree higher than high school, and 0 if they have a high school or lower degree. Columns (1) and (3) shows heterogeneous treatment effect over the entire post period (2011-2019), whereas column (2) and (4) divides the heterogeneous treatment effect by phases - intermediate period(2011-14) and post-implementation period (2015-2019). Each column shows results from a separate regression and controls for age, individual characteristics, state FE, and year FE. The standard errors (in parenthesis) are clustered at the state level. *Source*: Author's calculation using CPS-ASEC 2000-2019. *p $<$ 0.10, **p $<$ 0.05, ***p $<$0.01.

Table A.4: DD ESTIMATES USING SCM CONTROL GROUP

	Labor Force Participation		Annual Wage Income		Part-time Employment		Full-time Employment	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
MA × Post	0.020***		1688.922***		0.022***		0.002***	
	(0.000)		(0.000)		(0.000)		(0.000)	
MA × Intermediate Period		0.001***		453.129***		0.021***		0.001***
		(0.000)		(0.000)		(0.000)		(0.000)
MA × Post Implementation		0.035***		2677.556***		0.023***		0.002***
		(0.000)		(0.000)		(0.000)		(0.000)
Mean Dep. Var.	0.60	0.60	19511.36	19511.36	0.20	0.20	0.35	0.35
N Clusters	51	51	51	51	51	51	51	51
Observations	40	40	40	40	40	40	40	40

Notes: Table A.4 shows the DD estimates for treatment effect of ARA on female labor market outcomes using a control group that is created by the SCM assigned state weights for each outcome. Columns (1) & (2) show the DD-SCM estimates for female LFP, columns (3) & (4) for annual wage income, columns (5) & (6) for part-time employment and columns (7) & (8) for full-time employment. For each outcome, Column header 'TE' show the treatment effects corresponding to entire post period i.e. 2011-2019, whereas and column header 'TE by phases' shows the breakdown of treatment in each group by phases i.e. in the intermediate phase (2011-2014) and in the post-implementation phase (2015-2019). Each column shows results from a separate regression. The standard errors (in parenthesis) are clustered at the state level. *Source*: Author's calculation using CPS-ASEC 2000-2019. *p $\leq$ 0.10, **p $\leq$ 0.05, ***p $\leq$0.01.

Table A.5: TREATMENT EFFECT ON ALTERNATE INDICATORS OF LABOR SUPPLY

	Employment		Annual Weeks of Work	
	(1) TE	(2) TE by Phases	(3) TE	(4) TE by Phases
MA × Post	0.0137***		0.5136***	
	(0.002)		(0.078)	
MA × Intermediate Period		0.0085***		0.1826*
		(0.002)		(0.098)
MA × Post Implementation		0.0188***		0.8338***
		(0.002)		(0.106)
Mean Dep. Var.	0.56	0.56	27.94	27.94
N Clusters	51	51	51	51
Observations	1586364	1586364	1586364	1586364

Notes: Table A.5 shows the treatment effect of alimony reform law in MA on alternate indicators of female labor supply - female employment rate and annual hours of work. Columns (1) & (3) show the average effects over the entire post period (2011-2019), whereas columns (3) & (4) show the breakdown of treatment by phases i.e. in the intermediate phase (2011-2014) and in the post-implementation phase (2015-2019). Each column shows results from a separate regression and controls for age, individual characteristics, state FE, and year FE. The standard errors (in parenthesis) are clustered at the state level. *Source*: Author's calculation using CPS-ASEC 2000-2019. *p $<$ 0.10, **p $<$ 0.05, ***p $<$0.01.

Table A.6: DD ESTIMATES WITH ALTERNATE SPECIFICATION INCLUDING PROPERTY TAX CONTROLS

	Labor Force Participation		Annual Wage Income		Part-time Employment		Full-time Employment	
	(1) TE	(2) TE by Phases	(3) TE	(4) TE by Phases	(5) TE	(6) TE by Phases	(7) TE	(8) TE by Phases
MA × Post	0.0269***		434.2569*		0.0173***		0.0041	
	(0.003)		(225.019)		(0.003)		(0.003)	
MA × Intermediate Period		0.0190***		-253.1969		0.0153***		0.0021
		(0.003)		(184.904)		(0.003)		(0.003)
MA × Post Implementation		0.0370***		1300.9323***		0.0197***		0.0066
		(0.004)		(313.537)		(0.003)		(0.004)
Mean Dep. Var.	0.59	0.59	15487.18	15487.18	0.18	0.18	0.36	0.36
N Clusters	51	51	51	51	51	51	51	51
Observations	1020	1020	1020	1020	1020	1020	1020	1020

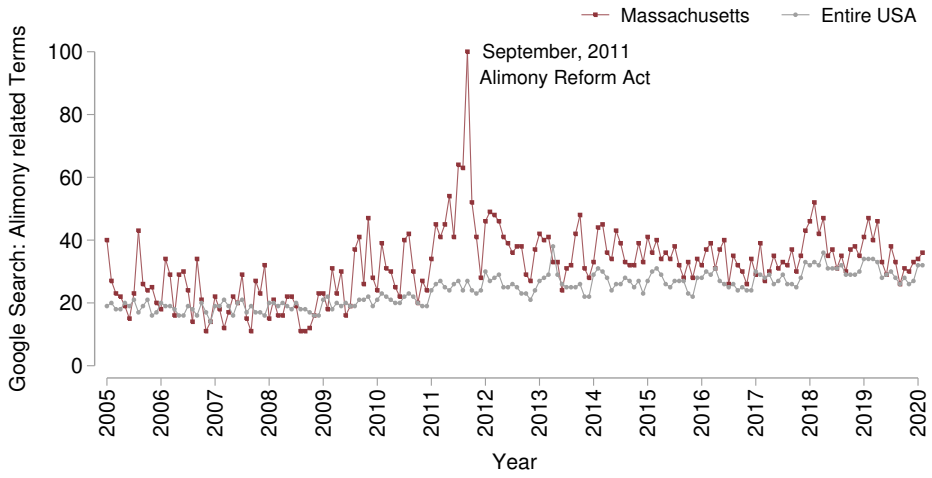
Notes: Table A.4 shows the DD estimates from an alternate specification that includes controls for differential effect of property tax by state and by time, over and above the covariates in the main DD specification 1 Columns (1) & (2) show the DD-SCM estimates for female LFP, columns (3) & (4) for annual wage income, columns (5) & (6) for part-time employment and columns (7) & (8) for full-time employment. For each outcome, Column header 'TE' show the treatment effects corresponding to entire post period i.e. 2011-2019, whereas and column header 'TE by phases' shows the breakdown of treatment in each group by phases i.e. in the intermediate phase (2011-2014) and in the post-implementation phase (2015-2019). Each column shows results from a separate regression. The standard errors (in parenthesis) are clustered at the state level. *Source*: Author's calculation using CPS-ASEC 2000-2019. *p $\leq$ 0.10, **p $\leq$ 0.05, ***p $\leq$0.01.

Table A.7: IMPACT ON FEMALE LFP: EXCLUDING STATES WITH ALIMONY LAW CHANGES

	Outcome: Female Labor Force Participation Rates					
	(1) TE	(2) TE by Phases	(3) TE	(4) TE by Phases	(5) TE	(6) TE by Phases
MA × Post	0.0198***		0.0197***		0.0185***	
	(0.002)		(0.002)		(0.001)	
MA × Intermediate Period		0.0103***		0.0102***		0.0153***
		(0.003)		(0.003)		(0.002)
MA × Post Implementation		0.0291***		0.0289***		0.0215***
		(0.002)		(0.002)		(0.002)
Treatment and Time Dummy	✓	✓				
State and Year FEs			✓	✓	✓	✓
Individual Controls and FEs					✓	✓
Mean Dep. Var.	0.59	0.59	0.59	0.59	0.59	0.59
N Clusters	51	51	51	51	51	51
Observations	1423255	1423255	1423255	1423255	1335048	1335048

Notes: Table A.7 shows the treatment effect of Alimony Reform in MA on the Labor Force Participation Rates of Women using only sample of states which did not pass any major alimony related law changes in the sample period. Columns (1) & (2) shows the most basic DD estimates with a dummy each for MA and post-period, columns (3) & (4) replaces MA and post-period dummies with State and Year FEs, and Columns (5) & (6) adds individual controls for age, education (a dummy for higher education), and 5 year age-bins FE. Column header 'TE' in (1), (3) & (5) show the treatment effects corresponding to entire post period i.e. 2011-2019, whereas and column header 'TE by phases' in (2), (4) & (6) shows the breakdown of treatment in each group by phases i.e. in the intermediate phase (2011-2014) and in the post-implementation phase (2015-2019). Each column shows results from a separate regression. The standard errors (in parenthesis) are clustered at the state level. *Source*: Author's calculation using CPS-ASEC 2000-2019. *p $\leq$ 0.10, **p $\leq$ 0.05, ***p $\leq$0.01

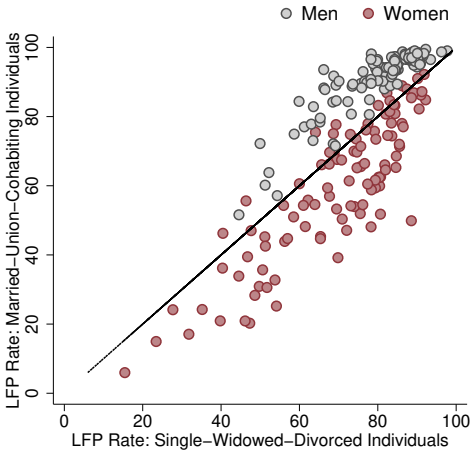
Figure A.1: Awareness About the Alimony Reform: Google Search Trend



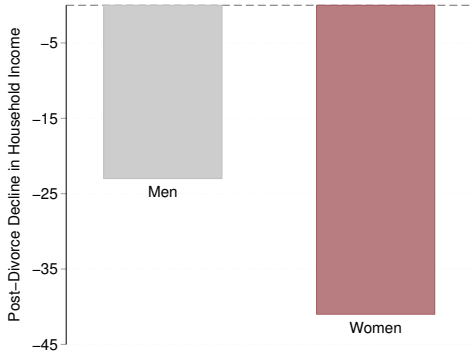
Notes: Figure A.1 plots the monthly google search trends for alimony-related terms in MA and in the entire US between 2005 to 2019. The figure shows a huge spike in the Alimony-related searches in MA around the same period when the Alimony Reform Bill passed i.e. in September 2011, thus suggesting that there was sufficient awareness about the policy among the residents in MA. We do not see any such jump in aggregate national level google searches or for MA in any other year. *Source:* Author's calculation using Google Search Trends Data

Figure A.2: Relationship between Marital Status, LFP, and Post-Divorce Well-being

(a) Labor Force Participation Rates



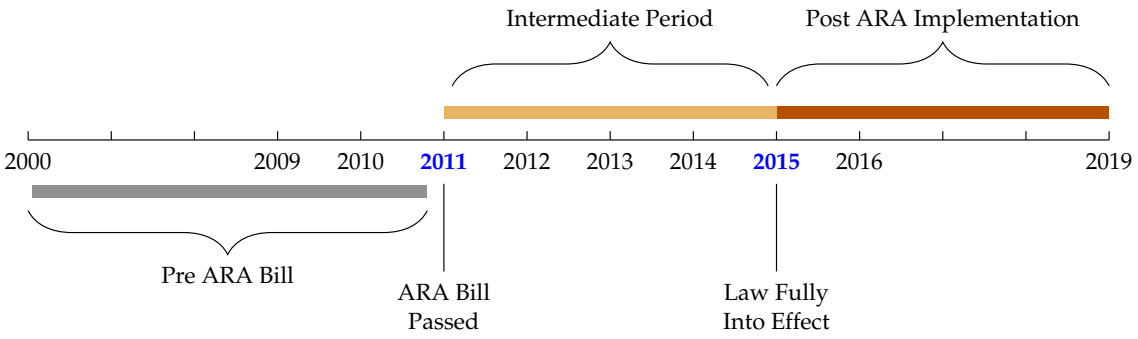
(b) Post-Divorce Household Income



Notes: Figure shows the relationship of gender and marital status with labor participation and changes in household income. Figure A.2a uses data from 107 different countries and plots LFP by marital status (represented by each axis) and by gender (represented by color). Figure shows that married women in most countries have lower labor participation than single or divorced women , while married men have higher participation than their unmarried counterparts. The 45 degree diagonal line shows those points where LFP rates of married and unmarried groups are equal. Figure A.2b uses data from the US and further shows that women face a significantly higher drop in household income post divorce as compared to men. *Source* Author's compilation using (A.2a): ILOSTAT data for 107 countries and (A.2b): US GAO-2012 data.

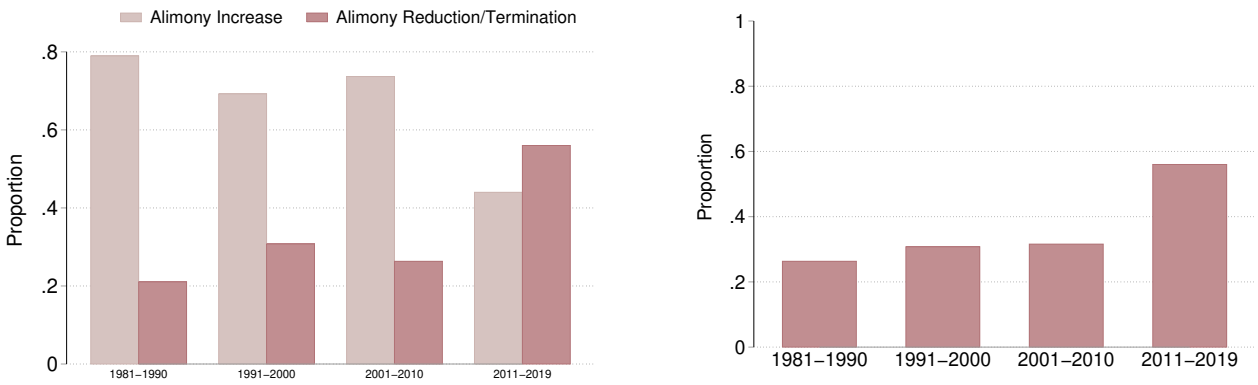
Figure A.3: NEWSPAPER CLIPS SHOWING THE RECENT MOVEMENT IN THE US FOR REFORMING ALIMONY LAWS

Table A.8: TIMELINE OF POLICY IN MAIN ANALYSIS SAMPLE



Notes: This shows the timeline of the policy along with the timeline for the data used for the analysis. The Alimony Reform Act (ARA) bill was passed in 2011, hence, 2000-2010 serves as the pre-reform period. The entire period from 2011-2019 is the post-reform period. 2011-2014 serves as the intermediate period i.e. when the bill had passed but the law was not fully into effect, and 2015-2019 serves as the post-implementation i.e. the period in which the law was fully into effect.

Figure A.4: IMPACT OF REFORM ON ALIMONY CASES: EVIDENCE FROM MASSACHUSETTS' PUBLISHED COURT OPINIONS



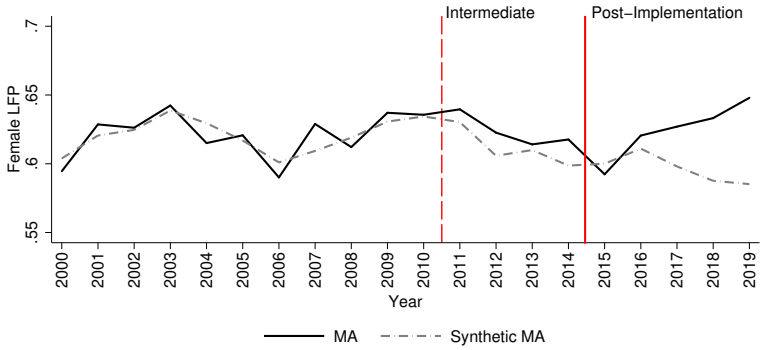
(a) TYPE OF ALIMONY CASE

(b) PERCENT CASES WITH MALE PLAINTIFF

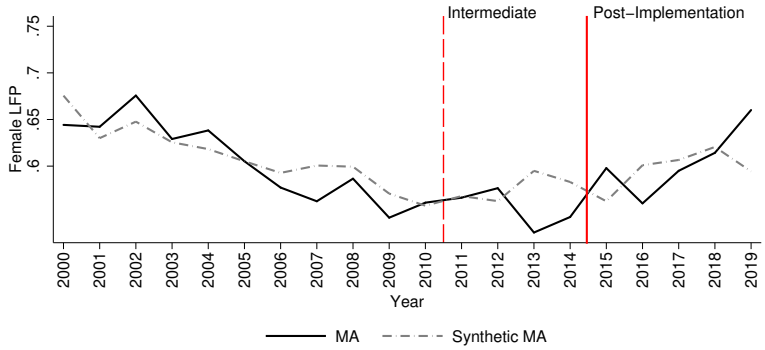
Notes: Figure A.4a presents evidence for the rise in alimony termination cases in MA after the Alimony Reform of 2011. Each alimony case in this figure is categorized as one of the two types, 1) Alimony Increase - Cases where plaintiff appealed for an increase in alimony, and 2) Alimony Reduction/Termination - Cases where the plaintiff appealed for a reduction or termination of alimony. Figure plots the percentage of each type of alimony cases in MA, for each decade between 1980-2019. Figure A.4b shows the percentage of alimony cases in MA where the plaintiff was male, by each decade between 1980-2019. This shows that there was a significant increase in the number of alimony cases filed by men in MA after the Alimony Reform Act of 2011. *Source:* Author's calculation using published court opinion files for alimony cases in MA.

Figure A.5: SCM PLOT: IMPACT ON FEMALE LABOR PARTICIPATION, BY SUBSAMPLES

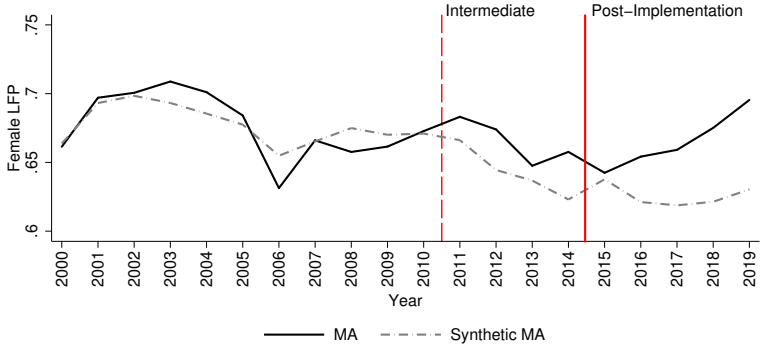
(a) EVER-MARRIED



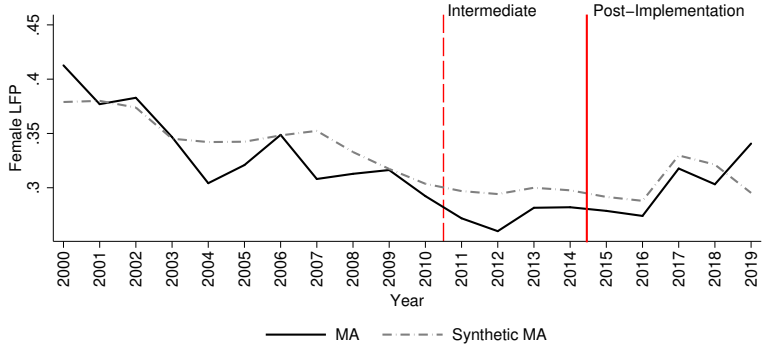
(b) NEVER-MARRIED



(c) HIGH EDUCATION



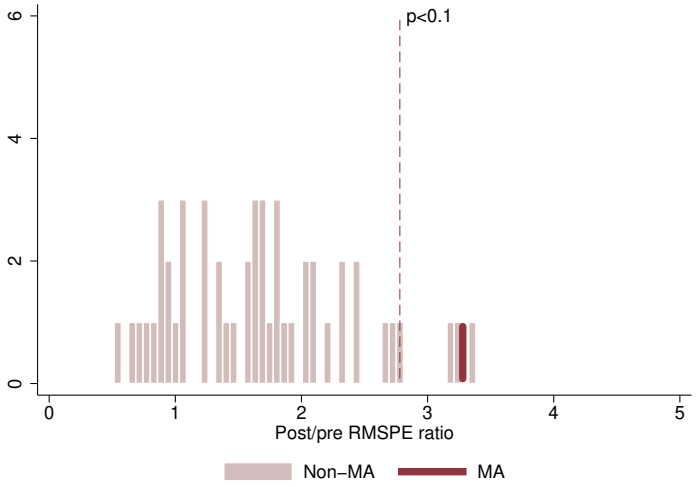
(d) LOW EDUCATION



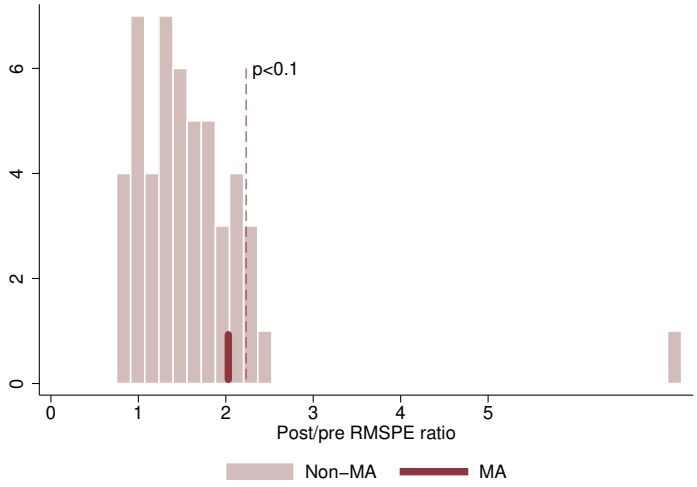
Notes: Figure A.5 plots the trends in labor force participation rates of women in MA and synthetic MA, by sub-samples of women. Figure A.5a and A.5b show the trends for ever-married and never-married women, where A.5c and A.5d show the trends among women with high education and women with low education. The dashed vertical line represents the period after which the Alimony Reform Act bill was passed in MA, whereas the solid vertical line marks the time for full implementation of the law. The period between 2011 to 2014 is the intermediate bill i.e. when the bill had passed but the law was not fully implemented, whereas 2015-2019 serves as the post-implementation period. *Source*: Author's calculation using CPS-ASEC.

Figure A.6: SCM Plot: Female LFP - Distribution of RMSPE, by Subsamples

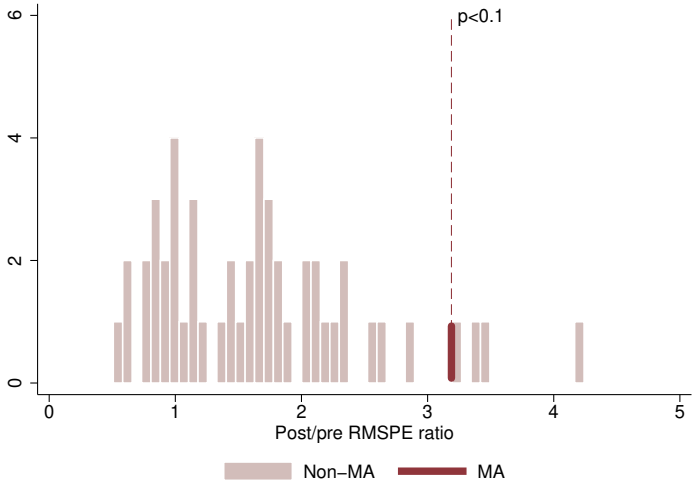
(a) Ever Married



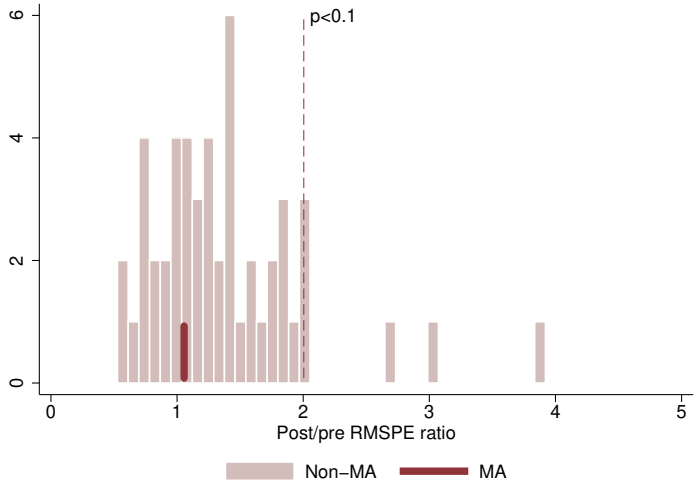
(b) Never Married



(c) High Education



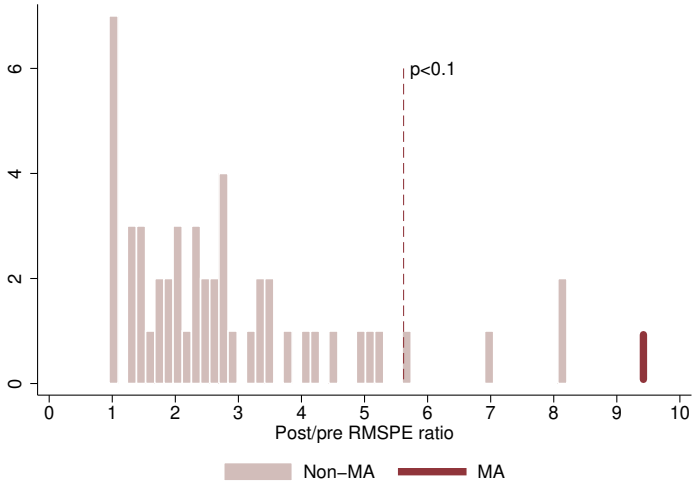
(d) Low Education



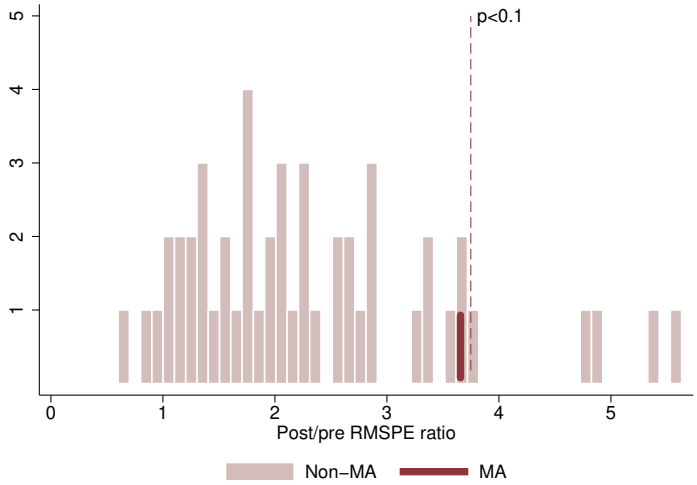
Notes: Figure A.6 plots the distribution of the ratio of post versus pre root mean square predicted errors (RMSPE) MA and placebo states corresponding to the outcome 'female LFP', by sub-samples. Figure A.6a and A.6b show the trends among ever-married and never married women, where A.6c and A.6d show the trends for women with high education (higher than high school) and women with low education (high school or lower). In each figure, the dark bar shows the ratio for MA, whereas light bars show the ratio among the placebo states. The dashed vertical line shows the cutoff point for p-values such that all points on the right of the line have p-value of less than 0.1 and hence, statistically significant at 10 percent. *Source*: Author's calculation using CPS-ASEC.

Figure A.7: SCM Robustness Test: Distribution of Post/Pre RMSPE

(a) Wage Income

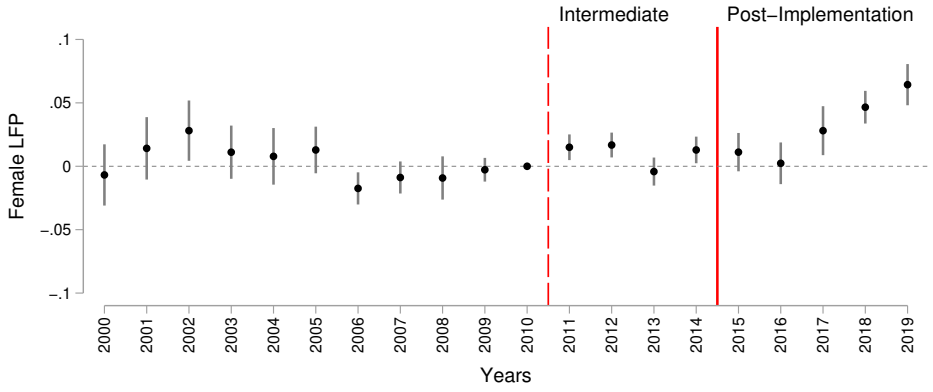


(b) Part-time Employment



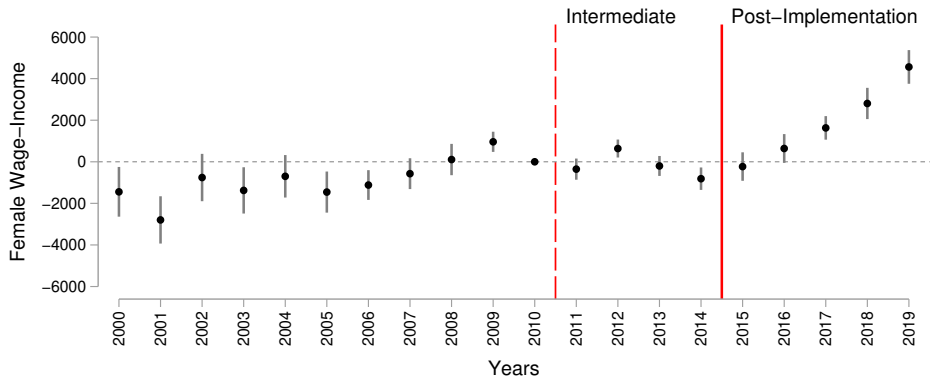
Notes: Figure A.7 plots the distribution of the ratio of post versus pre root mean square predicted errors (RMSPE) MA and placebo states. Figure A.7a and A.7b show the trends for wage-income and for part-time employment respectively.In each figure, the darker bar shows the ratio for MA, whereas light bars show the ratio among the placebo states. The dashed vertical line shows the cutoff point for p-values such that all points on the right of the line have p-value of less than 0.1 and hence, statistically significant at 10 percent. *Source*: Author's calculation using CPS-ASEC 2000-2019.

Figure A.8: ALTERNATE SPECIFICATION EVENT-STUDY: IMPACT ON FEMALE LFP



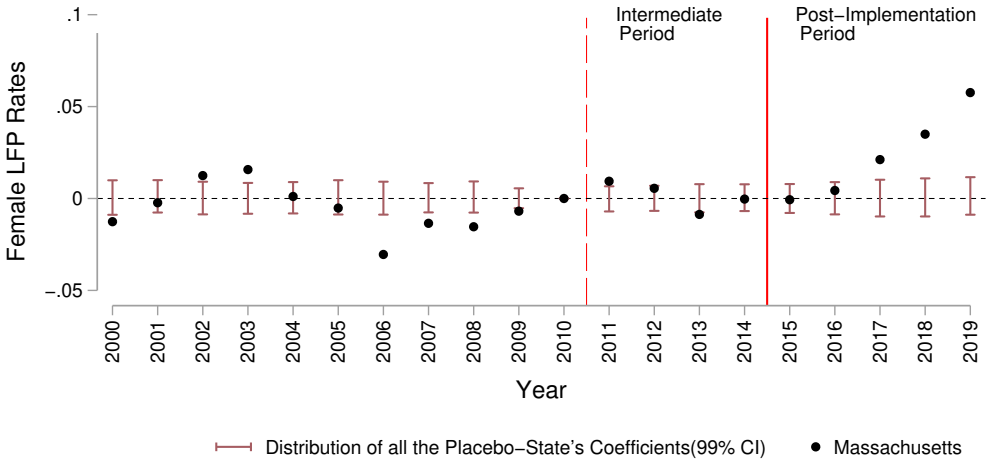
Notes: Figure A.8, shows the event-study plot of the impact of the Alimony Reform Act on the labor force participation rates of women. Each point in the graph represents a year-specific coefficient β_t from the regression equation that includes state and Year interactions of property tax in addition to the covariates in equation 1. Each regression shows the treatment effect of the reform relative to the omitted year 2010 i.e. the year before the reform came into place. The dashed vertical line represents the period after which the Alimony Reform Act bill was passed in MA, whereas the solid vertical line marks the time for full implementation of the law. The period between 2011 to 2014 is the intermediate bill i.e. when the bill had passed but the law was not fully implemented, whereas 2015-2019 serves as the post-implementation period. The standard errors are clustered at the state level. *Source*: Author's calculation using CPS-ASEC 2000-2019.

Figure A.9: ALTERNATE SPECIFICATION EVENT-STUDY: IMPACT ON FEMALE WAGE-INCOME



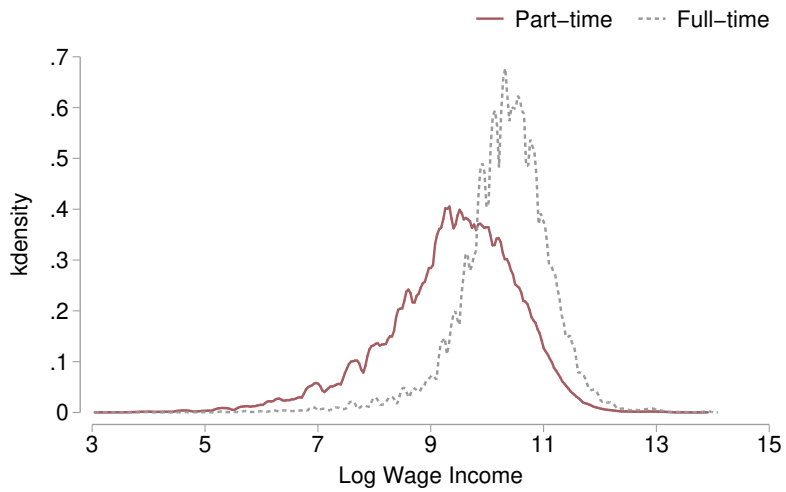
Notes: Figure A.9, shows the event-study plot of the impact of the Alimony Reform Act on annual wage-income for women (in USD). Each point in the graph represents a year-specific coefficient β_t from the regression equation that includes state and Year interactions of property tax in addition to the covariates in equation 1. Each regression shows the treatment effect of the reform relative to the omitted year 2010 i.e. the year before the reform came into place. The dashed vertical line represents the period after which the Alimony Reform Act bill was passed in MA, whereas the solid vertical line marks the time for full implementation of the law. The period between 2011 to 2014 is the intermediate bill i.e. when the bill had passed but the law was not fully implemented, whereas 2015-2019 serves as the post-implementation period. The standard errors are clustered at the state level. *Source*: Author's calculation using CPS-ASEC 2000-2019.

Figure A.10: RANDOMIZATION INFERENCE (SAMPLING DISTRIBUTION FOR PLACEBO ESTIMATES)



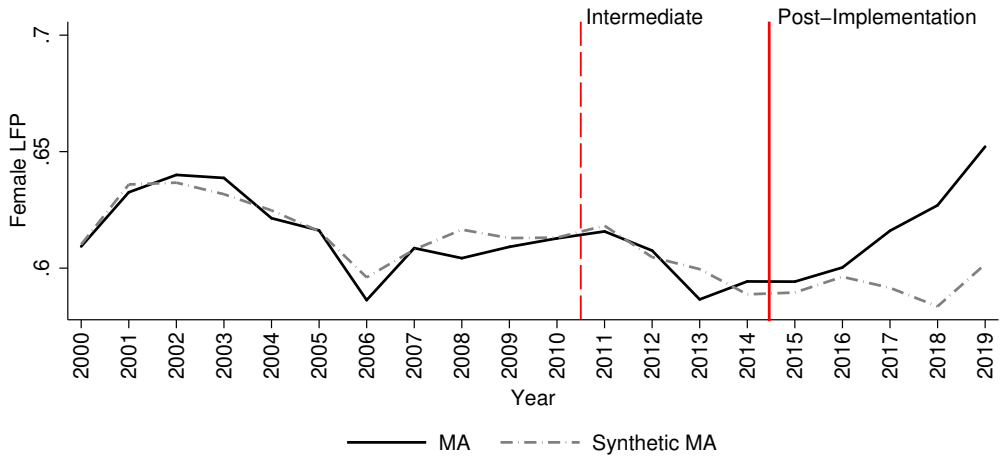
Notes: Figure A.10 shows the event study plot for the randomization inference of the DD treatment effect on Female LFP. For each year, equation 1 is estimated 50 additional times by replacing MA with an indicator for one of the other fifty states which serve as placebo states. Confidence interval corresponding to each year represents the sampling distribution for placebo estimates from the 99th percentile for each year, and solid circles show the DD point estimate corresponding to MA for each year. The dashed vertical line represents the period after which the Alimony Reform Act bill was passed in MA, whereas the solid vertical line marks the time for full implementation of the law. The period between 2011 to 2014 is the intermediate bill i.e. when the bill had passed but the law was not fully implemented, whereas 2015-2019 serves as the post-implementation period. The figure shows the point estimates for MA are similar to the placebo estimates - showing similarity in the pre-reform treatment coefficients for MA and for placebo states. However, after the implementation of the law, point estimates for MA are significantly higher than the placebo distributions in all post-implementation years, increasing over time - thus provides robustness to the treatment effects *Source*: Author's calculation using CPS-ASEC 2000-2019.

Figure A.11: DISTRIBUTION OF LOG WAGE INCOME: PART-TIME AND FULL-TIME JOBS



Notes: Figure shows the distribution of log-wages for women in part-time jobs versus those in full-time jobs. Figure shows that part-time workers are associated with lower wages compared to full-time workers. *Source*: Author's calculation using CPS-ASEC 2000-2019.

Figure A.12: SCM PLOT: FEMALE LFP
(SAMPLE: EXCLUDING OTHER STATES WITH ALIMONY LAW CHANGES)



Notes: Figure A.12 plots the trends in labor force participation rates of women in MA and synthetic MA between 2000 and 2019, using only those states that did not pass any major alimony related law changes in this time period. The dashed vertical line indicates the year of the Alimony Reform Bill in MA, whereas the solid vertical line indicates the year for full implementation of the law. The period between 2011 to 2014 is the intermediate bill i.e. when the bill had passed but the law was not fully implemented, whereas 2015-2019 serves as the post-implementation period. The standard errors (in parenthesis) are clustered at the state level. *Source*: Author's calculation using CPS-ASEC 2000-2019.

B Details of the Model

Theoretical Framework

This section provides a simple two-period model of labor supply and consumption in presence of divorce and alimony payments, and generates testable model predictions for the impact of ARA on women's labor supply under different scenarios.

B.1 Setup:

Consider a simplified lifetime utility model of a married women with two time periods, denoted by $t \in 1, 2$. She has preference over consumption c_t and hours of labor supplied, h_t, of the following functional form:

$$U = log(c_1) + \varphi log(1 - h_1) + \beta[log(c_2) + \varphi log(1\text{-}h_2)]$$

The real wage is w_1 in period 1 and w_2 in period 2. In period 1, women are married and receive a non-wage income e (for example, e can be some fixed amount from husband's income). In period 2, she can be divorced with some probability θ or can remain married with probability $(1 - \theta)$. If she is married in period 2, she continues to receive the non-wage income e. However, if she is divorced in period 2, she receives the same non-wage income e in the form of alimony but only with some probability p. Alimony Reform Act can be thought of as an exogenous change that reduces the probability p of receiving this alimony income, e. There are no bequest motives and hence no savings in period 2. The lifetime budget constraint allows women to transfer income between the two periods at the exogenous interest rate r. The lifetime budget constraint, in this case, is given by:

$$c_1 + \frac{c_2}{1+r} = h_1 w_1 + \frac{h_2 w_2}{1+r} + e + \frac{\theta p e + (1-\theta)e}{1+r}$$

Women maximize their overall utility subject to the lifetime budget constraint. For full details of the model, see Appendix B.

B.2 Comparative statics:

ARA of 2011 eliminated the provision of lifetime alimony, and thus reduced the probability p of receiving alimony income after a divorce. Using comparative statics of women's labor supply w.r.t to p, we generate model predictions and later test them empirically.

Case I: When divorce rate is exogenous and given.

Comparative statics of optimal labor supplied in period 1 and period 2 w.r.t p, when (θ) is exogenous and is not affected by the probability of receiving alimony income (p) is given by:

$$\frac{\partial h_t^*}{\partial p} = -\frac{\beta\theta e}{w_t(1+\beta)(1+\varphi^{-1})} < 0 \tag{B.1}$$

In this case, the model unambiguously predicts that a decline in the probability of receiving alimony income (p) after divorce, will lead to an increase in the labor supply of women (h_t) in both time periods.

Case II: When divorce rate (θ) depends on the probability of receiving alimony income (p).
So far, the model assumes that θ i.e., the probability of a woman being divorced in period 2, is exogenously given and unaffected by changes in the probability of receiving alimony income, p. Here, I relax this assumption and allow θ to be a function of p i.e., $\theta = \theta(p)$. This will help in generating model predictions for the impact of alimony reform on labor supply when divorce rates are allowed to vary with the expected alimony payments.

Comparative statics of optimal labor supply in period 1 and 2 w.r.t p when $\theta = \theta(p)$, is given by:

$$\frac{\partial h_t^*}{\partial p} = -\frac{(\beta\theta e - (1-p)\beta e\frac{\partial \theta}{\partial p})}{w_t(1+\beta)(1+\varphi^{-1})} \tag{B.2}$$

In this case, the direction of impact on labor supply depends on the sign of $\frac{\partial \theta}{\partial p}$ and on the relative values of θ and p. Appendix B lays out all the different scenarios and the corresponding model predictions under this case.

B.2.1 Testable model predictions:

Conditional on the sign of $\frac{\partial \theta}{\partial p}$ in equation (2), I derive following testable model predictions:
P.1.– *If a decline in the probability of receiving alimony income leads to an increase or no change in the probability of divorce, then the model unambiguously predicts an increase in the labor supply of women in both period 1 (when she is married) and period 2 (when she can be divorced with some probability θ).*
P.2.– *If a decline in the probability of receiving alimony income leads to a decline in the probability of divorce, then the direction of impact on the labor supply of women is ambiguous and depends on the relative values of θ and p*

Alimony Reform Act of 2011 in MA eliminated the provision of lifetime alimony and thus reduced the expected alimony income from a divorce. The model shows that while this has a direct income effect in period 2, it also affects optimal choices in period 1 by reducing the expected lifetime income overall. Hence, under lifetime utility maximization, this translates into an increase in labor supplied by women in both the periods - period 1 (when she is married) and period 2 (when she can be divorced with some probability θ). Moreover, when divorce rate increases after the law, it adds to the income effect by further reducing the expected alimony income. In this case, both the effects — alimony reduction and increase in the divorce rate — work in the same direction and lead to an increase in the optimal labor supplied by women (i.e., model prediction P.1). However, if the divorce rate decreases after the reform, this would go in the opposite direction to the effect from reduction in alimony income. Hence, in this case, the effect on female labor supply depends on the relative dominance of one effect over the other (i.e., model prediction P.2).

Details of the Optimization Exercise:

$$\text{Maximize} \qquad [log(c_1) + \varphi log(1-h_1)] + \beta[log(c_2) + \varphi log(1-h_2)] \qquad \text{s.t.}$$

$$c_1 + \frac{c_2}{1+r} = h_1 w_1 + \frac{h_2 w_2}{1+r} + e + \frac{\theta p e + (1-\theta)e}{1+r}$$

First order conditions:

$$\varphi(1-h_t)^{-1} = c_t^{-1} w_t, \qquad t \in 1,2 \tag{B.3}$$

$$c_2 = \beta(1+r)c_1 \tag{B.4}$$

$$\frac{(1-h_2)}{(1-h_1)} = \beta(1+r)\frac{w_1}{w_2} \tag{B.5}$$

$$c_1 + \frac{c_2}{1+r} = h_1 w_1 + \frac{h_2 w_2}{1+r} + e + \frac{\theta p e + (1-\theta)e}{1+r} \tag{B.6}$$

Solving (1), (2), (3), (4) simultaneously and using using $\beta = \frac{1}{1+r}$, optimal labor supply in period 1 and period 2 is given by:

$$h_1^* = \frac{1}{1+\varphi} + \frac{\beta(w_1 - w_2)}{w_1(1+\beta)(1+\varphi^{-1})} - \frac{(1+\beta)e - \theta\beta e(1-p)}{w_1(1+\beta)(1+\varphi^{-1})} \tag{B.7}$$

$$h_2^* = \frac{w_2 - w_1}{w_2} + \frac{w_1}{w_2}\left[\frac{1}{1+\varphi} + \frac{\beta(w_1 - w_2)}{w_1(1+\beta)(1+\varphi^{-1})} - \frac{(1+\beta)e - \theta\beta e(1-p)}{w_1(1+\beta)(1+\varphi^{-1})}\right] \tag{B.8}$$

Comparative Statics:

First order derivatives of h_1 and h_2 in equations 11 and 12 w.r.t p yeilds the required comparartive statics.
Comparative statics of optimal labor supplied in period t w.r.t p is given by:-

$$\frac{\partial h_t^*}{\partial p} = -\frac{\beta\theta e}{w_t(1+\beta)(1+\varphi^{-1})} < 0 \tag{B.9}$$

Comparative statics of optimal labor supplied w.r.t p when $\theta = \theta(p)$, is given by:-

$$\frac{\partial h_t^*}{\partial p} = -\frac{(\beta\theta e - (1-p)\beta e\frac{\partial\theta}{\partial p})}{w_t(1+\beta)(1+\varphi^{-1})} \tag{B.10}$$

Possible cases corresponding to comparative statics in C.8:

I. $\frac{\partial\theta}{\partial p} < 0$ *i.e. a decline in the probability of receiving alimony leads to an increase in the probability of divorce.*

$$\frac{\partial\theta}{\partial p} < 0 \implies (\beta\theta e - (1-p)\beta e\frac{\partial\theta}{\partial p}) > 0 \implies \frac{\partial h_t^*}{\partial p} < 0$$

II. $\frac{\partial\theta}{\partial p} = 0$ *i.e. the probability of receiving alimony has no impact on the probability of divorce. In this case, we are back to the original model where θ was exogenous to p*

$$\frac{\partial\theta}{\partial p} = 0 \implies (\beta\theta e - (1-p)\beta e\frac{\partial\theta}{\partial p}) = \beta\theta e > 0 \implies \frac{\partial h_t^*}{\partial p} < 0$$

III. $\frac{\partial\theta}{\partial p} > 0$ *i.e. a decline in the probability of receiving alimony leads to a decline in the probability of divorce.*

a.) *If* $\frac{\theta}{1-p} > \frac{\partial\theta}{\partial p} \implies (\beta\theta e - (1-p)\beta e\frac{\partial\theta}{\partial p}) > 0 \implies \frac{\partial h_t^*}{\partial p} < 0$

b.) *If* $\frac{\theta}{1-p} < \frac{\partial\theta}{\partial p} \implies (\beta\theta e - (1-p)\beta e\frac{\partial\theta}{\partial p}) < 0 \implies \frac{\partial h_t^*}{\partial p} > 0$

c.) *If* $\frac{\theta}{1-p} = \frac{\partial\theta}{\partial p} \implies (\beta\theta e - (1-p)\beta e\frac{\partial\theta}{\partial p}) = 0 \implies \frac{\partial h_t^*}{\partial p} = 0$

Testable Predictions of the model:

P1. *If a decline in the probability of receiving alimony income leads to an increase or no change in the probability of divorce, then there should be an increase in the labor supply of women (I or II). Note that scenario II is similar to the case where the divorce rate is exogenously given and does not depend on the alimony income. Hence, it is not shown separately here.*

P3. *If a decline in the probability of receiving alimony income leads to a decline in the probability of divorce, then the direction of impact on the labor supply of women depends on the relative values of θ and p. It will lead to an increase in labor supply if III (a) holds true, a decrease in labor supply if III (b) holds true, and no change if III(c) holds true.*

C Expected Change in Lifetime Income

Back of the Envelope Calculation

C.1 Lifetime Alimony Income Before the Reform

In order to calculate the lifetime alimony before the reform, I take into account the composition of women who have been ever married, the age at which they were first married, as well as the average duration of marriage before they were divorced.

Women in Massachusetts are married on an average at the age of 26 years (Census, 2010) and have a life expectancy of 83 years (Massachusetts-State-Report, 2017). Out of all ever-married women (which constitutes 73 percent of the entire sample), 9.4 percent of them get divorced under 5 years of marriage, 15.3 percent between 6-10 years, 10.1 percent between 11-15 years, 5.1 percent between 16-20 percent, and remaining were either never divorced or divorced after more than 20 years of marriage.[30] Alimony Reform Act defined the new alimony reform laws based on these categories of marriage length. Hence, for easy comparability with post-reform alimony changes, I provide estimates for each of the first 4 categories separately. For marriages of length greater than 20 years, they were still eligible for lifetime alimony at the discretion of the judge, as before. Hence, for estimation purposes, I assume that women in the last category are unaffected by the reform and have no net change in alimony income.

For each of the four categories of divorce brackets that were impacted by the reform i.e., 1-5 years, 6-10 years, 11-15 years, and 16-20 year, average marriage length is given by 3, 8, 13, and 18 years, respectively. First, I calculate the average age at divorce by adding the average marriage length to the average age at marriage. Second, I calculate the number of years remaining after the divorce by deducting the age at divorce from the average life expectancy of 83 for women in MA. Next, multiplying years remaining in the lifetime with annual alimony income of $41,156, gives us the total lifetime alimony in each category for divorced women.[31] However, not all divorces necessarily end with alimony. Hence, I multiply it with the average proportion of divorces that end with an alimony i.e., 0.62 divorces (Garrison, 1995). Finally, to arrive at the estimate for average women in each category, I multiply the estimates with the average proportion of women divorced out of the ever-married sample, as well as the average proportion of women ever-married out of all women samples. The estimates generated from this calculation gives us the average expected lifetime income from alimony before the reform. I refer to this value as A_{BEFORE}.

C.2 Lifetime Alimony Income After the Reform

The Alimony Reform Act terminated lifetime alimony and made the alimony duration a function of the length of the marriage. For marriages of duration fewer than 5 years, individuals were now eligible to receive alimony for at most 50 percent of the marriage length; for marriage duration between 6-10 years, at most 60 percent of marriage length; for marriages between 11-15 years, at most 70 percent of marriage length; and for marriages between 16-20 years, at most 80 percent of marriage length. There

[30] Data source for percent of women in each divorce category: (Elliott and Simmons, 2011)

[31] Due to lack of alimony data in the census, I use the average yearly alimony data from the published court opinion data in section 2, which is about $ 41,156.

was no duration limit for marriages of length greater than 20 years, who were still eligible for lifetime alimony.

In order to calculate lifetime alimony income after the reform, I first calculate the average number of years for which the woman is now eligible to receive alimony within each category of marriage length. For example, women who were married for 6-10 years, are now eligible for alimony for at most 60 percent of marriage duration. Hence, for an average marriage length of 8 years in the 6-10 group, the number of alimony eligible years = 8 $\times$ .6 = 4.8 years. Similarly, calculate the average alimony duration for the rest of the three categories. Next, I estimate the total alimony over the remaining lifetime in each category by multiplying the alimony-eligible duration with the average yearly alimony amount. Due to lack of alimony data in the census, I use the average alimony amount derived from the published court opinion files for alimony cases in MA, i.e., \$41,156 annually. Similar to before, I then calculate the lifetime alimony for women in each category by multiplying the total lifetime alimony with the proportion of divorces that end with alimony, the proportion of women divorced out of the ever-married pool in each category, and the proportion of women ever-married out of all women in the sample. This gives me average expected lifetime income from alimony after the reform. I refer to this value as A_{AFTER}.

To measure the net change in alimony income due to the reform, I then calculate the value of A_{AFTER} - A_{BEFORE} for each of the categories and then add them up to arrive at an average estimate for women in MA. Calculation shows that the alimony reform act, by significantly curtailing the alimony duration, led to a net loss of \$306,922 in expected lifetime alimony income for an average woman in MA.

C.3 Increase in Lifetime Wage Income After the Reform

DD estimates in Table 4 show that the reform led to an increase in the average annual wage income of women in MA by \$2566 in the post-implementation period. To arrive at the net change in expected lifetime wage income of women in MA, first, I calculate the average age of women for each of the four age groups: 18-25 years, 36-50 yrs, 51-65 years, and 66-80 years. Next, I derive the average number of years (N) left in the lifetime of women within each category by deducting the average category age from the average life expectancy of women in MA. Unlike alimony income which in most cases is decided at the time of the divorce and stays the same over time, wages grow over time.

Table C.1: BACK OF THE ENVELOPE CALCULATION: CHANGE IN THE EXPECTED LIFETIME INCOME DUE TO THE REFORM

	(1)	(2)	(3)	(4)	Total (in USD)
I. ALIMONY INCOME					
Category: Length of the marriage (in years)	1-5	6-10	11-15	16-20	
Average marriage duration, MD (in years)	3	8	13	18	
Mean age of marriage, Age_{marr} (in years)	26	26	26	26	
Age when divorced (Age_{div}) = $Age_{marr} + MD_{min}$	29	34	39	44	
Avg Life Expectancy, LE (in years)	83	83	83	83	
Lifetime Alimony BEFORE Reform =					
Years ahead of divorce (LE - Age_{div})	54	49	44	39	
× Avg Annual alimony (USD)	41,156	41,156	41,156	41,156	
× Proportion of divorces that pay alimony	.62	.62	.62	.62	
× Proportion divorced out of ever-married sample of women	0.094	0.153	0.101	0.051	
× Proportion ever-married out of entire sample of women	.73	.73	.73	.73	
Lifetime Alimony before ARA, A_{BEFORE}	94,552	139,648	82,779	37,050	
Lifetime Alimony AFTER Reform =					
Average marriage duration, MD (in years)	3	8	13	18	
× Proportion of marriage duration eligible for alimony	0.5	0.6	0.7	0.9	
× Avg Annual alimony (USD)	41,156	41,156	41,156	41,156	
× Proportion of divorces that pay alimony	.62	.62	.62	.62	
× Proportion divorced out of ever-married sample of women	0.094	0.153	0.101	0.051	
× Proportion ever-married out of entire sample of women	.73	.73	.73	.73	
Lifetime Alimony after ARA, A_{AFTER}	2,626	13,680	17,120	13,680	
Change in Alimony Income = A_{AFTER} - A_{BEFORE}	- 91,925	- 125,968	- 65,659	- 13,680	
Total Change in Lifetime Alimony Income, $\triangle A = \sum (A_{AFTER_i} - A_{BEFORE_i})$	**-[91,925**	**+ 125,968**	**+ 65,659**	**+ 13,680]**	**= - 306,922**
II. WAGE INCOME					
Category: Age Groups	18-35	36-50	51-65	66-80	
Mean age for each group, (Age_{mean})	26.5	43	58	73	
Avg number of years left = LE- Age_{mean}, (N)	56.5	40	25	10	
Avg increase in yearly wage income after ARA (14%) (P)	2566	2566	2566	2566	
Avg wage growth rate (r)	0.02	0.02	0.02	0.02	
Sum of Income flow (P) over the time-period (N) with growth rate (r) is given by:	$P \times \frac{(1+r)^N - 1}{(1+r) - 1}$				
Increase in Lifetime Wage Income AFTER Reform =					
Increase in Lifetime Wage Income:	264,468	154,991	82,190	28,097	
× Proportion of women in each category	.3284	.3165	.2257	.1294	
Gain in Lifetime Wage Income, w	86,851	49,055	18,550	3,636	
Total Change in Lifetime Wage Income, $\triangle W = \sum w_i$	**86,851**	**49,055**	**18,550**	**3,636**	**= 158,092**
Net Expected Change in Lifetime Income: $\triangle A + \triangle W$					= -148,830
PDV of Net Expected Change in Lifetime Income of women in MA (using Mean Age 41, LE 83, IR 3.14)					= **- 40,621 USD**

Hence, I also include an inflation rate of 2 percent to adjust for growth in average wage income over time. Using the wage growth rate (r), and the number of years remaining in the lifetime (N), I calculate the geometric sum of increase in wage income, growing at a rate, r, over the next N periods – and estimate the lifetime increase in wage income due to the policy. Lastly, I multiply this number by the proportion of women in each age group and add them to generate the expected increase in the lifetime wage of a woman in MA due to the policy. This gives me an estimated gain of $158,092 in wage income over the lifetime for women in MA.