The Rise of Cohabitation and Women's Power: the role of Unilateral Divorce*

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May 15, 2020

Abstract

Marriage differs from informal cohabitation for its higher cost of breaking up. Moving from a mutual to a unilateral divorce regime drastically increases the risk of dissolution. We explore how this change affects partnership choice and the relative power within the couple. Exploiting the staggered introduction of unilateral divorce across the US states, we show that after the reform newly formed relationships are significantly more likely to be cohabitations instead of marriages, and that cohabitation spells last longer. To understand the drivers of these changes, we build and estimate a structural life cycle model with partnership choice, female labor supply and savings decisions, where the gains of marriage with respect to cohabitation come from a better risk sharing and specialization within the household, enforced through a costly divorce. In the model, the reform increases the risk of divorce, making cohabitation preferred by couples that would have had the highest risk of divorce under the mutual consent regime. Since the match quality of cohabitations is on average lower than that of marriages, the reform increases their length: we estimate that time spent cohabiting would have been four times lower if the law had never changed. In states where assets upon divorce are split equally, men would lose most of their wealth upon divorce: at equilibrium, many women accept to cohabit in exchange for a higher bargaining power.

JEL-Codes: D83 - J12

*The authors wish to thank David de la Croix, Matthias Doepke, Fabio Mariani, Alessandra Voena and the Norhtwestern Macro group for their useful comments. Blasutto acknowledges financial support from the French speaking community of Belgium (ARC project 15/19-063 on *family transformations* and *mandat d' aspirant* FC 23613).

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1 Introduction

Informal cohabitation is on the rise: the share of women that ever cohabited in the United States moved from 33% in 1987 to 60% in 2010 (Manning, 2013). Since cohabiting couples display different outcomes than married ones, this rise definitely contributes to the overall changes in the structure and behavior of the American family. For example, Bumpass and Lu (2000) claim that the higher instability of cohabitation is responsible for the rise in the number of single mothers, which is linked to worse children's outcomes (Chetty and Hendren, 2018). The first step to find out why cohabitation is surging and why its outcomes differs from marriage is to better understand partnership choice, selection and cohabiting couples behavior.

Since the seminal work of Becker (1981), economists studied the incentives behind the decision to marry, among which the sharing of public goods, the division of labor to exploit comparative advantages (Chiappori, 1997), and risk sharing (Voena, 2015 and Oikonomou and Siegel, 2015). These reasons tell us why couples live together, while they are actually silent about the choice between marriage and informal cohabitation. Those two partnerships can be viewed as contracts subject to different rules, which in particular regulate costs and rights to end these agreements. While the cost of divorce is higher than the one of just breaking up[1], the introduction of unilateral divorce during the 1970s shifted the property rights from the spouse who wished to stay married to the one who wished to divorce. Hence, the switch from mutual consent to unilateral divorce represents a unique opportunity to learn how people choose between marriage and cohabitation. In particular, unilateral divorce might have eroded the gains from marriage, both increasing the likelihood of a costly divorce and hampering couples' ability to commit, thus making some couples willing to cohabit instead of marrying. In addition, shifting to a less committed relationship hampers couples'

[1] Henceforth we will refer to the separation from cohabitation as breakup to avoid confusion with the legal separation.

ability to specialize and it might affect the relative bargaining power of partners.

In this paper, we study the role of unilateral divorce on the rise of cohabitation. Our main contribution is to show that the rate of cohabitation surged after the changes in the US law because the increased risk of divorce made marriage less attractive. In particular, cohabitation becomes the preferred choice to couples that would have experienced the highest risk of divorce. As a consequence, the average match quality of cohabiting couples increases, which cause cohabitation spells to last longer. Interestingly, men are those who wish to cohabit the most after the reform because they would lose a relatively higher share of their wealth upon divorce. This increases the bargaining power of women entering cohabitation.

We first use data from the National Survey of Family and the Household and from the National Survey of Family Growth to build a sample of first and second relationships[2]. Then, exploiting the exogenous variation coming from the staggered introduction of unilateral divorce over time across the US states, we show that cohabitation becomes around 5% more likely to be chosen compared to the pre-reform period. Interestingly, the effect's size depends on how property is divided upon divorce, being strongest in states where each spouse gets half of the wealth. This suggests that the result cannot be entirely driven by divorce being a less binding commitment technology[3], since the egalitarian property division rule can act as a substitute for the mutual consent regime. Moreover, we analyze how unilateral divorce affected the duration of newly formed cohabitation spells, showing that they last longer both because of a reduced risk of marriage and breakup.

To understand the mechanisms underlying these changes we build a dynamic model of intrahousehold decision making, where cohabitation and marriage differ in their splitting cost as well as in the way property is divided. In the case of breakup assets always split as an

[2] A relationship is defined as an interruption of the state of singleness, which can either be marriage or cohabitation.

[3] This mechanism is highlighted by Lafortune and Low (2019), where the equal division of assets within marriage makes it possible to efficiently invest in children even after the rise of unilateral divorce.

agreement between spouses, while in the case of divorce[4] they are split in half. Moreover, breakup can be initiated unilaterally, as opposed to divorce, that would need the consensus of both partners under a mutual divorce regime. Individuals are initially single, and with some probability in each period they meet a potential partner, which they can decide to marry or start cohabiting with. Couples make decisions about consumption, savings and female labor supply and they are subject to idiosyncratic income shocks. Couples also receive time varying match quality shocks, which might drive the couple to change their partnership status (i.e. from cohabitation to marriage) or to separate. We model the decision making in the couple building on the literature of limited commitment (see for example Kocherlakota (1996), Ligon et al. (2002), Marcet and Marimon (2019) and Pavoni et al. (2018)), which has been applied to dynamic collective models in the household by Voena (2015), Mazzocco (2007), Foerster (2019) and Lise and Yamada (2018) among others. In this framework, when one member of the couple wishes to split, the couple rebargains[5] such that the binding member is made indifferent between breakup and staying in a couple. The gains of marriage with respect to cohabitation come from a better risk sharing and a more efficient specialization in the production of a public good[6], which arise from a better commitment within the couple, enforced by the threat of a costly divorce. On the other hand, couples that would face a high risk of divorce if married (i.e. because of a low match quality draw) are more likely to choose cohabitation instead, since it implies a lower cost of breakup while allowing them to enjoy the gains from being in a couple.

We then estimate the model by indirect inference to learn about the size of our main mechanism, using survey data of community property states. We use as targets regression

[4] This assumption makes sense since we use survey from community property states only to estimate the structural model.

[5] For particularly bad draws in the match quality or productivity shock this might not be possible and hence the couple would split.

[6] We assume that a public good is produced with money and female time. When women stop working for producing such a good their potential productivity in the labor market decreases.

results from our empirical analysis and mating market moments from the NSFH, while we use the PSID for female labor supply data. In the model, a switch from mutual consent to unilateral divorce causes couples to start cohabiting more, since the higher risk of divorce makes the expected value of marriage with respect to cohabitation lower. This mechanism implies that couples that would have married under the old regime, are cohabiting instead. Since those have a higher match quality than the average cohabiting couples, this selection drives down the risk of breakup for cohabiting couples. The magnitudes of these effects is large: we estimate that if unilateral divorced was never introduced, people on average would have spent 0.25 years cohabiting instead of 1.06, while only 21.8% of people would have ever cohabited instead of 39.8%. To further deepen our understanding of the mechanisms, we analyze the changes in intrahousehold bargaining that followed the policy change in the model. We find that the average pareto weight of cohabiting females increases by 5%, which is consistent with the story that men, fearing to lose most of their assets because of divorce, convince women to cohabit in exchange for more power in the couple. The possibility to cohabit limits the welfare losses of unilateral divorce for men, while women suffers more because, being poorer on average, the increased risk of divorce hits harder on them.
We then run a series of counterfactual experiments to gain intuition about forces that might have contributed to the rise of cohabitation in the last decades. We find that a 20% increase in women wages and a 20% drop in market prices of goods increase respectively by 1% and 2% the share of people that ever cohabited at age 45. Both effects are driven by a reduced scope for labor specialization in the household, which can be enforced through a costly divorce acting as a commitment technology.

The contribution of this paper is threefold. First, we document and explain how divorce laws affected the choice between marriage and cohabitation. This adds to the existing literature that documents the effects of these laws on the rate of divorce (Friedberg, 1998, Wolfers, 2006), female labor supply (Stevenson, 2008, Voena, 2015), savings (Voena, 2015), assortative mating (Reynoso, 2019) and prostitution (Ciacci, 2017) among the others. As in

Reynoso (2019), we study not only the effect of unilateral divorce on married couples, but also on partnership choice. While her focus is on who marries whom and concludes that unilateral divorce raised the share of singles, we abstract from modeling the mating market and we focus on partnership choice, which allows us to conclude that the rate of singleness declined less than previously thought, since some people that were believed not to be in a couple were actually cohabiting. Our paper builds on Voena (2015), that studies how the interaction of unilateral divorce with property rights upon divorce affected household behavior of married couples. We extend her work both considering cohabitation as an alternative relationship and in analyzing partnership choice.

Second, our paper expands the literature on cohabitation, showing how the risk of divorce is essential for understanding partnership choices. Different papers in the literature highlighted various gains of marriage with respect cohabitation: commitment (Matouschek and Rasul, 2008), labor specialization within the couple (Gemici and Laufer, 2014), learning about match quality (Brien et al., 2006), the interaction between the cost of divorce and learning (Blasutto, 2020) and investment in children (Lafortune and Low, 2019). A paper close to ours is Lafortune and Low (2019), who highlight the role of assets as a collateral that enforces commitment and hence allows for optimal investment in children. While we think that their mechanism is important, it cannot be the whole story since we observe that the switch towards cohabitation is the strongest in states where assets are divided more equally. Instead, their model would predict that in those states the effect would be the weakest. In this paper, we quantify how much of the shift is due to the erosion of marriage's collateral versus the role of the increased risk of divorce. We extend the work of Gemici and Laufer (2014) and Blasutto (2020), who develop collective dynamic models with limited commitment, introducing asset accumulation decisions, which are shown to play an important role for commitment and hence for partnership choice, especially when interacted with property rights upon divorce.

Third, our paper speaks to the literature studying changes of the family in the last decades. Recent work has investigated various channels through which the structure of families might have changed over time. Albanesi and Olivetti (2016) show the role of improved maternal health in the rise of female labor force participation. Additionally, Greenwood et al. (2016) study the role that technology and the wage structure played in the rise of assortative mating, female labor force participation, the share of divorced and the increase in the share of singles. Our paper extends this work, studying the effect of wage structure, gender wage gap and changes in the home production technology on the rise of cohabitation. Through a series of counterfactual experiments, we are able to inspect which were the main forces behind the rise in cohabitation. Intuitively, as wages grow and the price of home appliances decreases, households can buy on the market goods that were once produced at home. One of the gains of marriage with respect to cohabitation lies in the better specialization of production within the household, enforced through a costly divorce. Hence, we might expect that those forces imply a reduction in the share of couples choosing marriage over cohabitation.

The paper is organized as follows: section 2 offers an overview of US divorce laws, section 3 presents the empirical results, while section 4 describes in detail the theoretical model. Section 5 explains the procedure used for the estimation as well as the results. Section 6 reports the results from a welfare analysis and discusses model's mechanics, while section 7 performs a series of counterfactual experiments. Section 8 draws the conclusions of the paper.

2 US Divorce Laws: an Overview

Between late 1960s and early 1980s most U.S. states experienced fundamental changes in the divorce law, both regarding the right to initiate a divorce without the consent of the other spouse and about the laws that govern the division of assets upon divorce.

Before the 1960s the vast majority of US states had a mutual consent divorce regime[7], where the agreement of both spouses was needed to obtain a divorce for mundane reasons (i.e. without misconduct by any spouse). Moreover, divorce was permitted for grounds showing guilt of misconduct[8] by any of the two spouses: for those cases the agreement of the innocent party alone was enough for having a divorce granted. From the late 1960s and early 1980s most U.S. states[9] switched to a unilateral divorce regime. Under this regime divorce can be filed by one spouse without the consent of the other.

Another dimension along which divorce laws differs across states and over time is the one about property division regimes. In the United States there are three types of those:

1. *Community Property.* Under this regime the couple are jointly owning family wealth, both that obtained during marriage and before. This implies that when divorce occurs, each spouse gets exactly half of the total family wealth.

2. *Equitable distribution.* Under this regime, it is the court that decides how to split family wealth between the two spouses. This decision is driven by the principle of equity, which is ambiguous: in some cases the wealth is divided exactly in half, while in others a larger share reserved to the party that contributed the most to its accumulation.

3. *Title Based Regime.* Under this regime wealth is split according to the title of ownership.

The comparison between marriage and cohabitation is worth a final remark. Separation can be initiated unilaterally and it falls under the title based property. Another importance difference is that while divorce requires the couple to undergo a legal process, which implies

[7] All the states apart from New Mexico, Oklahoma and Alaska.

[8] Examples of guilt or misconduct are adultery or abandonment.

[9] A list of the years at which unilateral divorce was introduced in different states can be found in table 1 of Ciacci (2017).

monetary and time costs, breakup from cohabitation just requires one member of the couple to leave.

3 Data and Empirical Evidence

3.1 The Dataset

We begin by describing our data. We use the the National Survey of Family and the Household (NSFH) wave I, and the National survey of Family Growth, 1988 wave. Both surveys were designed to study the causes and consequences of changes happening in families and households within the United States. This is reflected in detailed questions regarding the retrospective family history of respondents, including information both about marriage and cohabitation. Moreover, primary respondents[10] are asked a large set of questions regarding their socio economic background and the demographics of the household. While the NSFH I is the first of three longitudinal waves, NSFG is made of several repeated cross sectional[11] samples. A drawback of using this data[12] is that we know the state of residence of the respondents only at age 16 for the NSFH and at birth for the NSFG. Since we also know whether people lived all their life in the same State, we are able to overcome it and perform our empirical analysis both on the universe and of the subsample of never movers. We will show that point estimates turn out to be statistically not distinguishable between the two samples. Further details regarding those two surveys can be found in Bumpass et al. (2017)

[10] One adult per household was randomly selected as the primary respondent, while in the NSFG respondents are all women of 15-44 years of age.

[11] We decided not to use the other two other waves of the NSFH because in the second wave all currently cohabiting households were dropped from the survey. Moreover, the 1988 wave of NSFG is the only one with publicly available information about the residence of the respondents, which is crucial to identify the divorce regime that applies to the respondent.

[12] We do not have the choice of using other surveys for our analysis, since they either lack the State of residence variable, or they miss information about cohabitation history, or they do not cover people that were in a relationship age at the time the law changed.

and Mosher and Bachrach (1996). We use this dataset to build two samples, the one of *first and second relationships* and the one of *first cohabitations*, that are described below.

First and Second Relationships Sample

We build a sample to analyze the type of relationship[13] that respondents decided to have, which can be either marriage or cohabitation. The sample is made of first and second relationships. One first relationship is defined observing the first time (if ever) a certain person started cohabiting or married. This observation is associated to the date at which the relationship starts, to the characteristics of the respondent member of the formed couple, and with a *type*, which can either marriage or cohabitation. Note the type of couples that cohabited before marriage is "cohabitation": the transition from cohabitation to marriage is analyzed using the sample of *first cohabitations.* Second relationships are defined in a similar fashion, but they include only respondents that ended the relationship with their first partner and started a new one with a different person. The way this sample is built implies that for some respondents we will have zero corresponding observations in this sample, while for others we will have one, and for others we will have two. We did not consider third or higher order relationships for our analysis since these individuals would be further away from the age at which we knew their state of residence. Finally, we consider only relationships that started when the respondent was 20 years old or older. In table 1 we report the descriptive statistics of this sample.

[13] Dating is not considered, since we cannot observe this state. Hence, people dating will fall under the category of singles.

Table 1
Descriptive Statistics, Cohabitation Sample

Statistic	N	Mean	Median	St. Dev.
Unilateral Divorce	13,627	0.279	0	0.449
Age Relationship Starts	13,627	25.400	23	6.833
Married	13,627	0.700	1	0.458
College	13,627	0.226	0	0.418
Female	13,627	0.630	1	0.483
Birth year	13,627	1,944	1,949	15.819
NSFH	13,627	0.795	1	0.404

First Cohabitation Sample

This sample is built to analyze the decisions of cohabiting couples to separate or to marry. It is composed of the first non marital cohabitation experienced by respondents. This sample includes couples that cohabited before marriage, but it also includes cohabitations experienced by people with the following marital history: marriage without premarital cohabitation, divorce, cohabitation with a different person. Each observation of this sample is associated with a starting date, a possible ending date, and an outcome, which can be: still cohabiting, married or separated. In table 2 we report the descriptive statistics of this sample.

TABLE 2
Descriptive Statistics, Relationship Sample

Statistic	N	Mean	Median	St. Dev.
Unilateral Divorce	5,675	0.454	0	0.498
Age Cohabitation Starts	5,675	23.701	22	6.976
Year Cohabitation Starts	5,675	1,978	1,980	7.160
College	5,675	0.162	0	0.368
Female	5,675	0.758	1	0.428
Cohabitation Duration	5,675	24.170	13	29.513
Year of birth	5,675	1,954	1,956	13.790
NSFH	5,675	0.562	1	0.496
Censored	5,675	0.102	0	0.303
Married	5,675	0.490	0	0.500
Separated	5,675	0.408	0	0.491

3.2 Empirical Evidence

Does unilateral divorce affects the partnership choice of couples? We exploit the timing[14] in the adoption of unilateral divorce as a source of exogenous variation in the right to divorce. This strategy has already been used several times by the literature[15] to study the non-neutrality of the rights to divorce on various economic and demographic outcomes. According to Gruber (2004), who reviews the legal literature about the topic, the introduction of unilateral divorce was not view as a tool of social policy, but rather a way to reduce the legal burden of divorce processes. This reasoning is consistent with the fact that this change was not initiated by the most liberal states: New York was the last state to introduce unilateral divorce in October 2010, almost 40 years later than Kentucky. Moreover, Reynoso (2019) shows that there is no geographic correlation in adoption.

[14] See table 1 in Ciacci (2017) for the timing of adoption of unilateral divorce.

[15] Among the others, see Wolfers (2006), Stevenson (2008), Voena (2015), Reynoso (2019) and Ciacci (2017).

Relationship Choice

What is the effect of unilateral divorce on the partnerships that couples choose? To answer this question we estimate equation 1, where i are the newly formed couples, t is the calendar time, and s is the state:

$$\text{married}_{i,t,s} = \beta_0 + \beta_1 * \text{Unilatearal}_{t,s} + \gamma' \mathbf{X}_i + \delta_s + \nu_t + \epsilon_{i,t,s}. \tag{1}$$

The dependent variable is a dummy take takes value 1 if the couple i, started at time t if state s is a marriage, and 0 if it is cohabitation. The vector $\mathbf{X}_i$ instead includes a set of socio demographic controls, while δ_s are the state fixed effects and ν_t are the time fixed effects. The variable $\text{Unilateral}_{t,s}$ instead is a dummy that takes value 1 if unilateral divorce wave in place in state s at time t: β_1 instead is the coefficient that is informative about the effect of unilateral divorce on partnership choice. The results of the estimation are reported in table 3 for different samples. Column (1) reports the results for the full sample described in section 3.1, while column (2) is restricted to observations for which we know that the person lived all its life in the reported states, ensuring that they did not migrate. Finally, columns (3) and (4) restrict the sample to respectively the NSFH and NSFG surveys only.

TABLE 3

OLS Regression. Observation: first and second relationships

	Dependent variable:			
	Married (0/1)			
	Full Sample	Resident	NSFH	NSFG
	(1)	(2)	(3)	(4)
Unilateral Divorce	−0.057***	−0.066***	−0.067***	−0.054
	(0.013)	(0.016)	(0.015)	(0.034)
State Fixed effects	Yes	Yes	Yes	Yes
Age Polynomials	Yes	Yes	Yes	Yes
Year started Fixed Effect	Yes	Yes	Yes	Yes
Demographic Controls	Yes	Yes	Yes	Yes
Observations	13,627	8,357	10,830	2,797
R^2	0.203	0.220	0.224	0.140

NOTES: standard errors are clustered at the state level. Coefficients that are significantly different from zero are denoted by the following system: *10%, **5% and ***1%.

The results reported in table 3 suggest that unilateral divorce decreased the share of couples that are married by $-5\%(6\%)$ depending on the specification. These results are robust to an alternative specification that includes state specific linear trends, whose results are reported in table C.1, and to the use of a logistic regression, reported in table C.3.

We then move on to better understand the heterogeneity hidden behind the effect of unilateral divorce. While in some states assets are split in the same way in both breakup and divorce, which is the case of *title based regime* states, in others this rule is different, which is the case of *community property* and *equitable distribution* states. Analyzing this heterogeneity is then interesting to understand how much the asset sharing rule is important for understanding relationship choices. We hence estimate equation 2

$$
\begin{aligned}
\text{married}_{i,t,s} = \beta_0 + & \beta_1 * \text{Unilatearal*No Title Based}_{t,s} \\
& + \beta_2 * \text{Unilatearal*Title Based}_{t,s} + \\
& \beta_3 * \text{Title Based}_{t,s} + \gamma' \mathbf{X_i} + \delta_s + \nu_t + \epsilon_{i,t,s},
\end{aligned}
\tag{2}
$$

whose indexes and controls are the same of equation 1, with the difference that now we capture the interaction of unilateral divorce with asset division regimes interacting $\text{Unilateral}_{t,s}$ with $\text{Title Based}_{t,s}$ and $\text{No Title Based}_{t,s}$, which indicates whether state s at time t had or not a title based regime. In table 4 we report the results of the estimation of equation 2. Similarly to table 3, column (1) reports the results for the full sample described in section 3.1, while column (2) is restricted to the observations for which we know that the person lived all its life in the reported states, which ensures that they did not migrate. Finally, columns (3) and (4) restrict the sample to respectively the NSFH and NSFG surveys only.

Table 4
OLS Regression. Observation: first and second relationships

	Dependent variable:			
	Married (0/1)			
	Full Sample	Resident	NSFH	NSFG
	(1)	(2)	(3)	(4)
UnDiv*NoTit	−0.065***	−0.073***	−0.079***	−0.049
	(0.014)	(0.018)	(0.016)	(0.037)
UnDiv*Tit	−0.012	−0.018	−0.005	−0.053
	(0.028)	(0.037)	(0.033)	(0.063)
Tit	0.004	0.001	0.012	−0.024
	(0.016)	(0.020)	(0.018)	(0.034)
State Fixed effects	Yes	Yes	Yes	Yes
Age Polynomials	Yes	Yes	Yes	Yes
Year started Fixed Effect	Yes	Yes	Yes	Yes
Demographic Controls	Yes	Yes	Yes	Yes
Observations	13,627	8,357	10,830	2,797
R^2	0.204	0.220	0.224	0.140

Notes: standard errors are clustered at the state level. Coefficients that are significantly different from zero are denoted by the following system: *10%, **5% and ***1%.

The results show that the effect of unilateral divorce on the likelihood that a couples chooses marriage over cohabitation in non title based states is significant with a magnitude of $-6\%(-7\%)$ depending on specification, while it is non significant and much smaller in title based states. These results suggest that having a sharing rule decided by the law is not enough to replace the mutual consent regime as an alternative commitment technology. Instead, these results are consistent with the view that the richest partner starts disliking marriage when divorce becomes unilateral, since she would risk losing most of her wealth upon divorce. This was not happening in mutual consent regime, since she could have exercised her right to veto divorce. In title based state this threat for the richest member of the couple does not exist, hence marriage surplus with respect to cohabitation does not vary significantly. Table C.2 shows that results are robust to the inclusion of state specific linear trends.

Cohabitation Duration

What is the effect of unilateral divorce on cohabitation duration? How much of the change is due to a variation in the risk of breakup versus the risk of marriage? In order to answer this question, we construct a model of cohabitation duration with multiple risks, namely breakup and marriage. Our model builds on Jenkins (1995), who shows how that a logistic regression can be used for studying duration of events, expanding the dataset of relevant spells to make unit of time per spells observations, where the dependent variable takes value 1 whenever the event of interest occurs. The natural extension of this model to a multiple risk environment would be to use a multinomial logit. However, the problem with this model is that it assumes independence of irrelevant alternatives, which is particularly unappealing for our problem, since it would imply that the relative probability of choosing marriage over breakup stays the same after cohabitation is no longer an option. Hence, we chose to model cohabitation duration with a multinomial probit, where the independence of irrelevant alternatives does not need to be satisfied. We then study the choice of cohabiting couple i, at calendar time t in state s and at duration d estimating the following model:

$$\begin{aligned}
Y_{i,s,t,d}^{\text{Marry}} &= \beta^{\text{Marry}} * \text{Unilatearal}_{s,t} + \gamma^{\text{Marry'}}\mathbf{X_i} + \alpha_d + \delta_s + \nu_t + \epsilon_{i,s,t,d}^{\text{Marry}}, \\
Y_{i,s,t,d}^{\text{Cohabit}} &= \beta^{\text{Cohabit}} * \text{Unilatearal}_{s,t} + \gamma^{\text{Cohabit'}}\mathbf{X_i} + \alpha_d + \delta_s + \nu_t + \epsilon_{i,s,t,d}^{\text{Cohabit}}, \\
Y_{i,s,t,d}^{\text{Separate}} &= \beta^{\text{Separate}} * \text{Unilatearal}_{s,t} + \gamma^{\text{Separate'}}\mathbf{X_i} + \alpha_d + \delta_s + \nu_t + \epsilon_{i,s,t,d}^{\text{Separate}},
\end{aligned} \tag{3}$$

where

$$\begin{pmatrix} \epsilon_{i,s,t,d}^{\text{Marry}} \\ \epsilon_{i,s,t,d}^{\text{Cohabit}} \\ \epsilon_{i,s,t,d}^{\text{Separate}} \end{pmatrix} \sim \mathcal{N}(\mathbf{0}, \mathbf{\Sigma}), \tag{4}$$

and

$$Y_{i,s,t,d} = \begin{cases} \text{Marry} & \text{if} \quad Y^{\text{Marry}}_{i,s,t,d} > Y^{\text{Cohabit}}_{i,s,t,d} \text{ and } \quad Y^{\text{Marry}}_{i,s,t,d} > Y^{\text{Separate}}_{i,s,t,d} \\ \text{Cohabit} & \text{if} \quad Y^{\text{Cohabit}}_{i,s,t,d} > Y^{\text{Marry}}_{i,s,t,d} \text{ and } \quad Y^{\text{Cohabit}}_{i,s,t,d} > Y^{\text{Separate}}_{i,s,t,d} \\ \text{Separate} & \text{otherwise.} \end{cases} \tag{5}$$

The model described above is estimated with bayesian techniques via Markov chain Monte Carlo following the procedure of Imai and Van Dyk (2005), which is implemented using the standard options provided by the *R* package *MNP* developed by Imai et al. (2005). In table 5 we report results from the full sample in column (1), from the resident only sample in column (2) and from the observations coming from the NSFH and NSFG surveys alone respectively in column (3) and (4). Note that to gain intuition about the size of the results, in table 5 we computed the average risk of the event of interest relatively of continue cohabiting. The results shows that unilateral divorce caused an increase in the duration of cohabitation, which comes from both a reduced hazard of marriage and of breakup. While the result about the risk of marriage is not unexpected in light of the estimation results described above, the reduced risk of breakup brings new insights about the possible mechanisms underlying partnership choices. In fact, the decrease in the risk of breakup is consistent with a selection effect: some cohabiting couples would have married if mutual consent divorce was still in place. If the match quality of cohabitations is lower than the one of marriages[16], unilateral divorce drives down the risk of breakup because of a selection effect.

[16] This seems plausible in light of the fact that the risk of divorce is much lower than the risk of breakup.

TABLE 5

Multinomial Probit. Observation: person-month of cohabitation

	Full Sample	Resident	NSFH	NSFG
	(1)	(2)	(3)	(4)
	Risk of Marriage relative to Cohabitation			
Unilateral Divorce	-0.24^{***}	-0.25^{***}	-0.28^{***}	-0.28^{***}
	(0.06)	(0.08)	(0.09)	(0.09)
Average Relative Risk	0.64	0.63	0.59	0.6
	Risk of Breakup relative to Cohabitation			
Unilateral Divorce	-0.19^{***}	-0.16^{***}	-0.08	-0.24^{*}
	(0.07)	(0.06)	(0.05)	(0.14)
Average Relative Risk	0.67	0.71	0.83	0.62
State Fixed effects	Yes	Yes	Yes	Yes
Year Fixed effects	Yes	Yes	Yes	Yes
Age Polynomial	Yes	Yes	Yes	Yes
Picewise Duration	Yes	Yes	Yes	Yes
Observations	138012	81920	77826	60186
Censored spells(%)	10.18	10.98	11.6	8.38

NOTES: standard errors are obtained through the distribution of parameter obtained using the markov chain monte carlo estimation descibed by Imai and Van Dyk (2005). Coefficients that are significantly different from zero are denoted by the following system: *10%, **5% and ***1%.

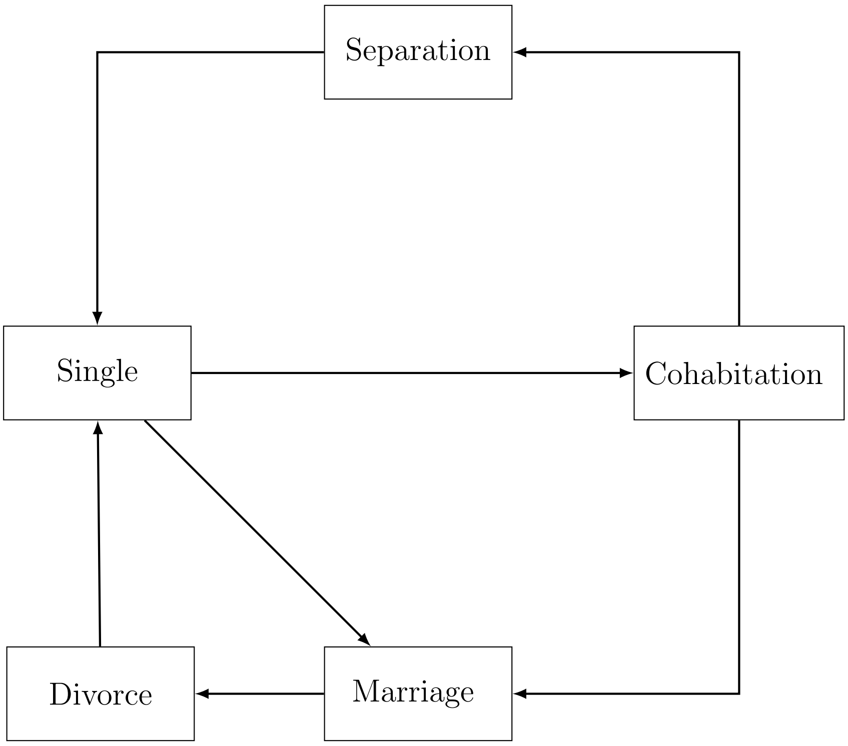
4 The Model

This section describes a dynamic life cycle structural model of partnership formation, savings, female labor supply and home production. Couples act cooperatively subject to limited commitment, which means that rebargaining might happen in response to changes in the outside options, which are assumed to be divorce or breakup.

In the model time is discrete, and in each period men and women draw their productivities. If single, with some probability they meet a potential partner: after drawing a match quality shock they decide whether to marry, cohabit or to stay single. Couples observe realization of the match quality shock as well as of their productivity, and according to those they decide whether to stay together or to split. Both singles and couples make consumption and savings decisions, using their money for private or public good expenditure. Couples also make female labor supply decisions[17] and female time can be used to produce the public good, but this comes at the cost of a loss in productivity. The gains of being in a couple come from love, risk sharing and labor market specialization. Instead, the gains of marriage with respect to cohabitation comes from a more functioning risk sharing and a better specialization in time use, which derives from the high cost of divorce serving as a commitment device. These gains of marriage deteriorate when the love shock is low enough to cause a high risk of divorce and frequent renegotiations: in this case cohabitation might be the better option, since we assume that the cost of breakup will be lower than the cost of marriage.

[17] We assume that single females and all men work full time.

FIGURE 1



4.1 Preferences

Women f and men m derive utility consuming a private good c and a household public good Q. The public good can be interpreted in terms of both the quantity and quality of children, as well as the goods and services produced within the household, as washing clothes or home cooked meals. Preferences are separable in the two goods and across time. Agents derives utility from a couple specific love shock ψ which evolves over time and it can be interpreted as can be interpreted as the value of love and companionship in a couples. The intra period utility of a single agent $s \in (f, m)$ is:

$$u(c_t^s, Q_t^s) = \frac{c_t^{s\,1-\sigma}}{1-\sigma} + \alpha \frac{Q_t^{s\,1-\xi}}{1-\xi},$$

where the superscript s on Q accounts for the fact that there is no partner to share the public good. Instead, the utility for agent $s \in (f, m)$ in a couple is:

$$u^C(c_t^s, Q_t) = \frac{c_t^{s\,1-\sigma}}{1-\sigma} + \alpha\frac{Q_t^{1-\xi}}{1-\xi} + \psi_t,$$

where the match quality evolves over time according to the following law of motion:

$$\psi_t = \psi_{t-1} + \epsilon_t, \text{ where } \epsilon_t \sim \mathcal{N}(0, \sigma_\psi^2),$$

while the love shock at first meeting is allowed to have a different variance $\sigma_{\psi,I}^2$. Note that if the couple is cohabiting, the utility of the two partners is decreased by γ, which captures the stigma associated with premarital sex and premarital cohabitation. We think that this assumption fits the fact that we will estimate our model on the behavior of 1940-1955 birth cohorts.

4.2 Home Production

In our model each agent is embodied with one unit of time. We assume singles and married men are assumed to supply inelastically one unit of market labor. Instead, women in a couple can be out of the labor force to devote their time producing the home good Q, in line with the gender roles typically observed in the period under analysis. The public good can be produced buying d goods in the market. Following Greenwood et al. (2016) we define the production function of home good as:

$$Q_t = [d_t^\nu + \kappa(1 - P_t^f)^\nu]^{\frac{1}{\nu}}, \text{ where } 0 < \nu < 1. \tag{6}$$

The parameter ν captures the degree of substitutability between female time and the use of durables in the production of the home good. This structure implies that when the relative price of durables decreases and when wages goes up, households will use less female time for its production, and hence female employment will increase. The variable P_t^f is a dummy variable that that takes value 1 when the women is participating in the labor market.

4.3 Wages

The labor income for agents $s \in \{f, m\}$ depends on their age t and on a permanent income component z_t^s:

$$\ln(w_t^s) = f_t^s + z_t^s,$$

where f_t^s is a gender specific function that captures the evolution of productivity over age. The permanent income component z_t^s evolves over time as:

$$z_t^s = z_{t-1}^s - (1 - P_t^s)\mu + \zeta_t^s, \text{ where } \zeta_t^s \sim^{iid} \mathcal{N}(0, \sigma_{\zeta}^{2_s}), \text{ and } \zeta_1^s = z_1^s. \tag{7}$$

Note that μ is the loss in productivity that affects women[18] that are not participating in the labor market. It can be interpreted as a reduced form way of capturing both the missed opportunity to accumulate human capital while working as wells as the skill atrophy deriving from interruptions, a phenomenon described by Adda et al. (2017). Modeling the loss in productivity for not working is an important feature of our model as it creates an incentive to join the labor force for women that expect to divorce or separate soon.

4.4 Budget Constraints

The budget constraint of single agents $s \in \{f, m\}$ is:

$$a_{t+1}^s = Ra_t^s + w_t^s - c_t^s - d_t^s, \text{ with } a_{t+1}^s \geq 0, \tag{8}$$

[18] As we anticipated men always participate in the labor market, hence $P_t^m = 1 \; \forall \; t$.

where a^s are agent's savings, w^s is the wage and c^s and d^s are consumption in the private good and the expenditure used to produce the public good. The budget constraint for a couple instead is:

$$a_{t+1} = Ra_t + w_t^m + P_t^f w_t^f - c_t^f - c_t^m - d_t, \text{ with } a_{t+1} \geq 0, \tag{9}$$

where P_t^F is a dummy of female labor force participation. When a couple divorces in t, we assume

$$a_t^m + a_t^f = \delta a_t,$$

where δ is the fraction of total assets a_t left[19] after divorce. Separation instead comes with no monetary costs[20]. An important feature of our model is the role of property rights upon divorce, which define how assets are divided. We distinguish three cases which define the share of assets χ going to the women:

1. *Community Property.* Assets are split exactly in half: $\chi = 0.5$
2. *Title Based Regime.* χ equals the share of private consumption under pareto weight θ.

$$\chi = F(\theta_t^m, \theta_t^f).$$

It is worth noting that we depart from Voena (2015) in the way title based regime is modeled: she assumes that assets are split following a couple decision, while for us the sharing rule depends only on z^F and z^M. Since in our model relative productivities are the only source of disagreement. If we took the modeling assumption of Voena (2015) we would still get

[19] The assumption that divorce erodes a fraction of wealth is common to Cubeddu and Ríos-Rull (2003).

[20] In reality the monetary cost of breakup is likely to be positive. We assumed it to be zero because of the difficulties that arises when it comes to identify it. In fact, the gap in divorce and breakup cost is what is actually needed to match the data.

that the sharing rule is mainly determined by productivities[21]. Moreover, if the sharing rule was endogenous, couples would always choose cohabitation over community property or equitable distribution marriage,[22] which would make matching the data impossible.

4.5 Problem of the Singles

We start by describing the problem for a single agent $i \in \{f, m\}$ in t. The agent makes consumption and saving decisions, and she is also determining expenditures d_t^i. In $t+1$ she meets a potential partner j of the opposite sex with probability λ_{t+1} and she can decide to enter a partnership, which also depend on whether the potential partner will agree. If the two decides to marry, the variable MA_{t+1} will take value 1, while $CO_{t+1} = 1$ if the couple decides to cohabit. Otherwise, MA_{t+1} and CO_{t+1} will be equal to 0. Note we assume singles to always participate in the labor market. The state variable of a single then is $\omega_t^i = \{a_t^i, z_t^i\}$, while her choices are represented by the vector $\mathbf{q}_t^i = \{a_{t+1}^i, c_t^i, d_t^i\}$. We denote by $V_t^{i,S}(\Omega_t^i)$ the value function of agent s, which we define as

$$\begin{aligned} V_t^{iS}(\omega_t^i) = &\max_{\mathbf{q}_t^i} u(c_t^i, Q_t^i) + \beta E_t \Big\{ (1-\lambda_t) V_{t+1}^{iS}(\omega_{t+1}^i) + \\ &\lambda_t \big\{ (1 - MA_{t+1})(1 - CO_{t+1}) V_{t+1}^{i,S}(\omega_{t+1}) + \\ &MA_{t+1} V_{t+1}^{i,M}(\Omega_{t+1}) + CO_{t+1} V_{t+1}^{i,C}(\Omega_{t+1}) \big\} \Big\}, \\ &\text{s.t. (8) and (6).} \end{aligned} \tag{10}$$

[21] If we had individual specific love shocks, our reduced form modeling assumption would give different results instead.

[22] This would happen because breackup would have more degrees of freedom than divorce, where it is the court that decides the sharing rule.

4.6 Household Planning Problem

The problem of the couple depends both on the type of relationship, cohabitation or marriage, and on the divorce regime, which can be either *mutual consent* or *unilateral*. Separation is always unilateral. Under the unilateral regime, one partner can initiate the breakup/divorce process alone, while under mutual consent the agreement of both is needed.

Mutual Consent Regime

Under mutual consent marriage $\hat{M}$, couples solve a Pareto problem where the weight[23] of the wife is θ^f, while the one of the husband is $1-\theta^f$. The state vector is $\Omega_t^{\hat{M}} = \{a_t, z_t^f, z_t^m, \psi_t, \theta^f\}$, while the variables over which the couple maximize are summarized by the vector $\mathbf{q}_t^M = \{a_{t+1}, d_t, c_t^m, c_t^f, P_t^f, D_t\}$, where D_t is a dummy variable that takes value 1 is divorce happens and 0 otherwise. The formal problem that a couple married is t solve is:

$$
\begin{aligned}
V_t^{\hat{M}}(\Omega_t^{\hat{M}}) = \max_{\mathbf{q}_t^M} & (1-D_t)\{\theta^f u(c_t^f, Q_t) + (1-\theta^f)u(c_t^m, Q_t) + \psi_t + \beta E_t V_{t+1}^{\hat{M}}(\Omega_{t+1}^{\hat{M}})\} \\
& + D_t\{\theta^f V_t^{fS}(\omega_{t+1}^f) + (1-\theta^f)V_t^{mS}(\omega_t^m))\} \\
\text{if } D_t = 0: \quad & \text{s.t. (9) and (6)} \\
\text{if } D_t = 1: \quad & \text{s.t. (8), (6) for } i \in \{f, m\}, \\
& a_t^m + a_t^f = \delta a_t, \\
& a_t^m, a_t^f \text{ determined according to property right regime}, \\
& V_t^{fS}(\omega_t^f) > W_t^{f\hat{M}}(\Omega_t^{\hat{M}}), \\
& V_t^{mS}(\omega_t^m) > W_t^{m\hat{M}}(\Omega_t^{\hat{M}}).
\end{aligned}
\tag{11}
$$

[23] Refer to subsection 4.7 for a description about how pareto weight are initially set.

The individual value of marriage conditional on $D_t = 0$ is $W_t^{i\hat{M}}$ for $i \in \{F, M\}$, and it is defined as

$$W_t^{i\hat{M}} = u(\tilde{c}_t^i, \tilde{Q}_t) + \psi_t + \beta E_t V_t^{i\hat{M}}(\Omega_{t+1}^{\hat{M}}), \tag{12}$$

where $\tilde{\mathbf{q}}_t^{\hat{M}} = \{\tilde{a}_{t+1}, \tilde{d}_t, \tilde{c}_t^m, \tilde{c}_t^f, \tilde{P}_t^f\}$ is the arg max of problem (11) conditionally on having chosen $D_t = 0$. $V_{t+1}^{i\hat{M}}(\Omega_{t+1}^{\hat{M}})$ instead can be obtained by the expectation of the sum of the time utilities that the agent get from $t + 1$ to T, where the variables entering the utility function derive from the pareto problem if the agent is in a relationship, otherwise they are the solution of (10). Under mutual consent regime the pareto weight is never rebargained, which makes risk sharing efficient. It also makes harder a divorce to happen, since the member that after a shock is relatively worse off can exercise her veto power to avoid a divorce: this feature makes labor specialization easier.

Unilateral Divorce Regime

Under the unilateral divorce regime, denoted by $\overline{M}$, couples solve a Pareto problem where the weight of the wife is θ_t^f and the one of the husband is θ_t^m. Note that, in opposition to the mutual consent regime, now pareto weights are allowed to vary over time. This happens whenever a member of the couple is better off divorcing: the other member will try to convince her not to split offering her a larger share of resources. The state vector of this problem is $\Omega_t^{\overline{M}} = \{a_t, z_t^f, z_t^m, \psi_t, \theta_t^f, \theta_t^m\}$, while the variables over which the couple maximize are summarized by the vector $\mathbf{q}_t^M$. The formal problem that a couple married at t solves is:

$$
\begin{aligned}
V_t^{\overline{M}}(\Omega_t^{\overline{M}}) = & \max_{\mathbf{q}_t^M}(1-D_t)\{\theta_{t+1}^f u(c_t^f, Q_t) + \theta_{t+1}^m u(c_t^m, Q_t) + \psi_t + \beta E_t V_{t+1}^{\overline{M}}(\Omega_{t+1}^{\overline{M}})\} \\
& + D_t\{\theta_t^f V_t^{fS}(\omega_{t+1}^f) + \theta_t^m V_t^{mS}(\omega_t^m))\} \\
\text{if } D_t = 0: \quad & \text{s.t. (9) and (6)}, \\
& \theta_{t+1}^f = \theta_t^f + \mu_t^f, \\
& \theta_{t+1}^m = \theta_t^m + \mu_t^m, \\
\text{if } D_t = 1: \quad & \text{s.t. (8), (6) for } i \in \{f, m\}, \\
& a_t^m + a_t^f = \delta a_t, \\
& a_t^m, a_t^f \text{ determined according to property right regime},
\end{aligned}
\tag{13}
$$

where θ_{t+1}^f and θ_{t+1}^m adjust such that the following participation constraints are satisfied:

$$
\begin{aligned}
W_t^{f\overline{M}}(\Omega_t^{\overline{M}}) &\geq V_t^{fS}(\omega_t^f), \\
W_t^{m\overline{M}}(\Omega_t^{\overline{M}}) &\geq V_t^{mS}(\omega_t^m).
\end{aligned}
\tag{14}
$$

Note that μ_t^i are the Lagrange multipliers associated with spouses' participation constraints. Similarly to mutual consent regime, the individual value of marriage conditional on $D_t = 0$ is $W_t^{i\overline{M}}$ for $i \in \{f, m\}$, and it is defined as

$$
W_t^{i\overline{M}} = u(\tilde{c}_t^i, \tilde{Q}_t) + \psi + \beta E_t V_{t+1}^{i\overline{M}}(\Omega_{t+1}^{\overline{M}}), \tag{15}
$$

where $\tilde{\mathbf{q}}_t^{\overline{M}} = \{\tilde{a}_{t+1}, \tilde{d}_t, \tilde{c}_t^m, \tilde{c}_t^f, \tilde{P}_t^f\}$ is the arg max of problem (11) conditionally on having chosen $D_t = 0$. $V_{t+1}^{i\hat{M}}(\Omega_{t+1}^{\overline{M}})$ instead can be obtained by the expectation of the sum of the time utilities that the agent gets from $t+1$ to T, where the variables entering the utility function derive from the pareto problem if the agent is in a relationship, otherwise they are the solution of (10). Note that we follow the literature assuming that the planner evaluates the welfare of the two members of the couple if a divorce happens with the current Pareto weights. Under the unilateral divorce regime pareto weights varies every time one participation constraint is binding, which makes risk sharing worse than in the mutual divorce regime. Labor market specialization is also less functioning, since the higher risk of divorce makes women willing to insure against this event through labor market participation. Property rights upon divorce plays a significative role when splitting is unilateral: for example under community properly the least wealthy member can bargain a higher share of resources since the threat of divorce is real. This could not happen under a title based regime.

Cohabitation

Cohabiting couples, denoted by C, solve a pareto problem where the weight of the wife is θ_t^f and the one of the husband is θ_t^m.The state vector is $\Omega_t^C = \{a_t, z_t^f, z_t^m, \psi_t, \theta_t^f, \theta_t^m\}$, while the variables over which the couple maximize are summarized by the vector $\mathbf{q}_t^C = \{a_{t+1}, d_t, c_t^m, c_t^f, P_t^f, S_t, MA_t\}$. S_t and MA_t are dummy variable that take value 1 is the couple respectively breackup or marry[24] and 0 otherwise. The formal problem that a cohabiting

[24] We denote marriage by M, which might be fall under unilateral divorce regime $\overline{M}$ or mutual consent $\hat{M}$.

couple at t solves is:

$$
\begin{aligned}
V_t^C(\Omega_t^C) = \max_{\mathbf{q}_t^C} & (1-S_t)\{\theta_{t+1}^f u(c_t^f, Q_t) + \theta_{t+1}^m u(c_t^m, Q_t) + \psi_t - \gamma + \beta E_t V_{t+1}^C(\Omega_{t+1}^C)\} \\
& + MA_t\{\theta_{t+1}^f u(c_t^f, Q_t) + \theta_{t+1}^m u(c_t^m, Q_t) + \psi_t + \beta E_t V_{t+1}^M(\Omega_{t+1}^M)\} \\
& + S_t\{\theta_t^f V_t^{fS}(\omega_{t+1}^f) + \theta_t^m V_t^{mS}(\omega_t^m))\} \\
\text{if } S_t = 0: \quad & \text{s.t. (9) and (6),} \\
& \theta_{t+1}^f = \theta_t^f + \mu_t^f, \\
& \theta_{t+1}^m = \theta_t^m + \mu_t^m, \\
\text{if } S_t = 1: \quad & \text{s.t. (8), (6) for } i \in \{f, m\}, \\
& a_t^m + a_t^f = a_t, \\
& a_t^m, a_t^f \text{ determined as in the title based regime,}
\end{aligned}
\tag{16}
$$

where θ_{t+1}^f and θ_{t+1}^m adjust such that the following participation constraints are satisfied:

$$
\begin{aligned}
W_t^{fC}(\Omega_t^C) &\geq V_t^{fS}(\omega_t^f), \\
W_t^{mC}(\Omega_t^C) &\geq V_t^{mS}(\omega_t^m).
\end{aligned}
\tag{17}
$$

Note that μ_t^i are the Lagrange multipliers associated with spouses' participation constraints. The individual value of cohabitation conditional on $S_t =$ is W_t^{iC} for $i \in \{f, m\}$, and it is defined as

$$W_t^{iC} = u(\tilde{c}_t^i, \tilde{Q}_t^i) + \psi_t - \gamma + \beta E_t V_{t+1}^{iC}(\Omega_{t+1}^C), \tag{18}$$

where $\tilde{\mathbf{q}}_t^C = \{\tilde{a}_{t+1}, \tilde{d}_t, \tilde{c}_t^m, \tilde{c}_t^f, \tilde{P}_t^f\}$ is the arg max of problem (11) conditionally on having chosen $S_t = 0$. $V_{t+1}^{iC}(\Omega_{t+1}^C)$ instead can be obtained by the expectation of the sum of the time utilities that the agent get from $t+1$ to T, where the variables entering the utility function derive from the pareto problem if the agent is in a relationship, otherwise they are the solution of (10). Similarly to the unilateral divorce regime, we assume that the planner evaluates the welfare of the two members of the couple if a breakup happens with the current Pareto weights.

The cohabitation problem is similar to the one of marriage under the unilateral divorce regime, but two main features are different. First, the way assets are split within cohabitation might not be the same, and total assets are not eroded when breakup happens. On the one hand this makes risk sharing and cooperation less functioning than in marriage with unilateral divorce, since the couple is left without a commitment-enhancing technology. On the other hand, assuming no cost of breakup makes cohabitation more appealing to couples with a low surplus of being in a couple. Since for them splitting if very likely, they prefer the relationship that allows them to do it in a cheaper way.

4.7 Partnership Choice and the Mating Market

In each period t singles have a probability λ_t to meet a potential partner of their same age and with a productivity and wealth that depends on their productivity z_t and assets a_t. Formally:

$$\ln(a_t^p) = \alpha_t^s + \ln(a_t) + \hat{\epsilon}, \text{ where } \hat{\epsilon} \sim \mathcal{N}(0, \sigma_{\hat{p}}^2), \tag{19}$$

$$\ln(w_t^p) = \alpha \ln(w_t + (1-\alpha)\ln(\overline{w}_t^s)) + \tilde{\epsilon}, \text{ where } \tilde{\epsilon} \sim \mathcal{N}(0, \sigma_{\tilde{p}}^2). \tag{20}$$

where s is the gender of the partner p, $\overline{w}_t^s$ indicates the average potential wage[25] by gender across the population and α_t^s is a constant that differs by gender. These assumptions capture in a reduced from fashion that people are mating assortatively[26] both within marriage and cohabitation, as Gemici and Laufer (2014) point out. Once the meeting happened, agents have to decide whether to stay in a couple and eventually decide which partnership contract to choose. Note that for the rest of this section we will refer to marriage as M, but depending

[25] If that person does not participate in the labor market her productivity potentials are not realized.

[26] In the life cycle models featured in Ciscato (2019), Shephard (2019) and Reynoso (2019) assortative mating arise in marriage markets through the interactions of preferences, incentives, supply and demand forces.

on property rights upon divorce we have $M \in \{\hat{M}, \overline{M}\}$. We model their choices in three steps.

1. The couple considers marriage M (cohabitation C) as a viable alternative if the set of pareto weights[27] θ^f such that the couple prefers to marry (cohabit) is non-empty. Formally, for relationship $J \in \{M, C\}$ the set is

$$\Theta_t^J(\Omega_t^J, \omega_t^f, \omega_t^m) = \big\{\theta_t : V_t^{fJ}(\Omega_t^J) \geq V_t^{fS}(\omega_t^f), V_t^{mJ}(\Omega_t^J) \geq V_t^{mS}(\omega_t^m)\big\}. \tag{21}$$

2. If the set for marriage (cohabitation) is non-empty, the pareto weight for the potential marriage $\theta^{m,f}$ (cohabitation $\theta^{c,f}$) is set through symmetric Nash Bargaining.[28] Formally[29], for $J \in \{M, C\}$ $\theta^{J,f}$ is set to :

$$\theta_t^{J,f} = \underset{\theta_t^f \in \Theta_t^J}{\arg\max}\, \Upsilon^J(\theta_t^f, \Omega_t^{J,-1}, \omega_t^f, \omega_t^m), \tag{22}$$

where

$$\Upsilon^J(\theta_t^f, \Omega_t^{J,-1}, \omega_t^f, \omega_t^m) = \big[V_t^{fJ}(\Omega_t^{J,-1}) - V_t^{fS}(\omega_t^f)\big] \times \big[V_t^{mJ}(\Omega_t^{J,-1}) - V_t^{mS}(\omega_t^m)\big]. \tag{23}$$

3. Four possible situations can arise:

   - $\Theta_t^M = \emptyset$ and $\Theta_t^C = \emptyset \Rightarrow$ stay single.
   - $\Theta_t^M \neq \emptyset$ and $\Theta_t^C = \emptyset \Rightarrow$ marry.
   - $\Theta_t^M = \emptyset$ and $\Theta_t^C \neq \emptyset \Rightarrow$ cohabit.

[27] Without loss of generality, we impose $\theta^f + \theta^m = 1$ at first meeting.

[28] The assumption that the initial pareto weight is pinned down by Nash Bargaining can be found in Low et al. (2018).

[29] For consistency with the rest of the paper we define $\Omega_t^{J,-1}$ as the state vector for the couple excluding pareto weights.

- $\Theta_t^M \neq \emptyset$ and $\Theta_t^C \neq \emptyset \Rightarrow$ The couple chooses the partnership that gives the largest Nash product. Formally, if $\Upsilon^M(\Omega_t^M, \omega_t^f, \omega_t^m) \geq \Upsilon^C(\Omega_t^C, \omega_t^f, \omega_t^m)$, otherwise cohabit.

This framework is a natural extension of the nash bargaining problem[30] to discrete choices.

5 Estimation

We estimate our model following a two step procedure. In a first step, we set some parameters outside the model. This can be done for parameters that can be directly linked to the data and for parameters that our data does not directly identifies: those are fixed according to findings coming from the existing literature. Moreover, we also estimate the labor income processes of men and women outside the model: this procedure is common in the literature[31] and it has been used to reduce the burden of structural estimation. In the second step we use indirect inference to estimate the deep parameters of the model. In this section we describe in detailed every step of the estimation and we discuss the identification of the structural parameters as well as the results.

5.1 Income Processes

For both men and women we model the hourly wage rate using PSID, dividing the annual labor income by the number of yearly working hours supplied. In this way we avoid consid-

[30] Note that we could have chosen a different protocol for determining the choice between marriage and cohabitation. For example, we could have decided to impose a sequential structure to the problem, assuming that first agents compare cohabitation to singleness, obtaining the envelop of the two, where the pareto weight is set as above. Then, the agents make their final choice solving a pareto problem where the outside option is the outcome of the first step. We tried applying this methodology: results were indistinguishable from our main strategy.

[31] See for example Voena (2015), Reynoso (2019) and Gourinchas and Parker (2002).

ering a variation in working hours as a productivity shock. This correction is particularly relevant for the estimation of women's income process, as the variance of hours worked per year is considerably higher than for men. For our estimation we consider the 1968-1993 waves of the PSID, including men and women between age 20 and 65.

For the estimation of men's processes we proceed estimating the following model for man i, of age t, from state s in survey year sur:

$$\ln(w^m_{i,t,s,sur}) = \iota^m_0 + \iota^m_1 * t + \iota^m_2 * t^2 + \delta_s + \nu_{sur} + u^m_{i,t,s,sur}, \tag{24}$$

where $u^m_{i,t,s,sur} = z^m_t + e^m_{i,t,s,sur}$. z^m_t follows equation 7, while $e^m_{i,t,s,sur}$ is the measurement error. Instead, δ_s are state fixed effects and ν_{sur} are year of the survey fixed effects. We then estimate equation 24, whose results are reported in table B.1: this allow us to obtain the residuals $\hat{u}^m_t$. We then use the regression residuals to estimate through GMM the variance of the permanent component of income σ^{2m}_ζ and the one of the measurement error σ^{2m}_e using the following conditions:

$$\begin{aligned} E(\Delta(\hat{u}^m_t)^2) &= \sigma^{2m}_\zeta + 2\sigma^{2m}_e \\ E(\Delta\hat{u}^m_t \Delta\hat{u}^m_{t-1}) &= -\sigma^{2m}_e \end{aligned} \tag{25}$$

Results are reported in table 6.

The estimation of female's labor earning differs from the men's one since we need to take into account the endogeneity of female labor participation. We do so using a Heckman selection correction procedure. Female labor earnings of female i, of age t, from state s in survey year sur:

$$\ln(w^f_{i,t,s,sur}) = \iota^f_0 + \iota^f_1 * t + \iota^f_2 * t^2 + \delta_s + \nu_{sur} + u^f_{i,t,s,sur}, \tag{26}$$

where $u^f_{i,t,s,sur} = z^f_t + e^f_{i,t,s,sur}$. z^f_t follows equation 7, while $e^f_{i,t,s,sur}$ is the measurement error.

Instead, δ_s are state fixed effects and ν_{sur} are year of the survey fixed effects. We observe female wages only if

$$\gamma' \mathbf{Z}_{i,t,s,sur} + \pi_{i,t,s,sur} > 0, \tag{27}$$

where $\mathbf{Z}_{i,t,s,sur}$ includes all the regressors in equation 26 plus the interaction of unilateral divorce[32] with property rights regimes upon divorce. Instead, $\pi_{i,t,s,sur}$ includes measurement error and the permanent component of income. The estimation results of the two steps are reported in tables B.3 and B.2. Finally, we use the regression residuals from the second step $\hat{u}_t^m$ to estimate through GMM the variance of the permanent component of income $\sigma_\zeta^{2_f}$ and the one of the measurement error $\sigma_e^{2_f}$ using the following[33] conditions:

$$\begin{aligned} E(\Delta \hat{u}_t^f | P_t^f = 1, P_{t-1}^f = 1) &= \sigma_\pi^f \frac{\phi(\tau_t)}{1-\Phi(\tau_t)}, \\ E(\Delta (\hat{u}_t^f)^2 | P_t^f = 1, P_{t-1}^f = 1) &= \sigma_\zeta^{2_f} + \sigma_\pi^{2_f} + 2\sigma_e^{2_f} + \tau_t \frac{\phi(\tau_t)}{1-\Phi(\tau_t)}, \\ E(\Delta \hat{u}_t^f \Delta \hat{u}_{t-1}^f | P_t^f = 1, P_{t-1}^f = 1, P_{t-2}^f = 1)) &= -\sigma_e^{2_f}. \end{aligned} \tag{28}$$

Results are displayed in table 6.

[32] This strategy has been used by Voena (2015) and Reynoso (2019)

[33] The conditions are those used by Low et al. (2018).

Table 6
Parameters of the Income Processes

Parameter	Symbol	Value	Standard Error
f's age return (constant)	ι_0^f	-0.383	(0.012)
f's age return (linear component)	ι_1^f	0.0244	(0.002)
f's age return (squared component)	ι_2^f	-0.0005	(0.000)
Variance of f's permanent income shock	σ_ζ^{2f}	0.0399	(0.004)
m's age return (constant)	ι_0^m	-0.342	(0.014)
m's age return (linear component)	ι_1^m	0.0495	(0.002)
m's age return (squared component)	ι_2^m	-0.0009	(0.000)
Variance of m's permanent income shock	σ_ζ^{2m}	0.0417	(0.005)

Notes: The parameters are estimated using nonlinear least squares using single, cohabiting and married males and females from the PSID. Standard errors are computed by bootstrap.

5.2 Preset Parameters

This section describes how we choose the parameters that are set externally from the model. In the model we assume agents to start making decisions at age 20, while they retire at 65 and die with probability 1 at age 82. Each period in the model lasts 1 year: we chose this length balancing the benefits of having a short period, which fits the fact that cohabitation spells are particularly short, and the computational burden associated with having too many periods. We chose the relative risk aversion γ of private goods and the discount factor β to be those in Attanasio et al. (2008). Instead, the parameters relative to the production of public goods, ν and κ are those in McGrattan et al. (1997). The annual interest rate is set to 2%. The pension scheme is taken from Heathcote et al. (2010), while wages are normalized such that average log wages of male at age 30 is 0. The unexplained variance of male and female's earnings at age 20 $\sigma_{\zeta,1}^{2m}$ and $\sigma_{\zeta,1}^{2f}$ are taken directly from the PSID data. The parameters regarding the mating market, contained in equations 19 and 20, are pinned down to obtain a realistic degree of assortative mating with respect to assets and wages.

In particular, we target correlation in wages in the PSID and the share of households with family income above the median whose welath is also above the median. Moreover, we pay attention to get symmetry with respect to those variables: for example, married men at age t should have on average the same wage and wealth regardless of the fact of simulated though their life cycle or of appearing in the simulated sample as partners. Clearly, since we set these parameters before the structural estimation takes place, we cannot perfectly match the degree of assortativeness, even tought we are close: the correlation in log wages of couples in the PISD is 0.58 versus 0.62 in the simulated sample[34], while the share of people that have a wealth above the median, conditionally on having a family income above the median, is 0.76 in the Survey of Consumer Finances and 0.82 in the model. The results regarding symmetry are reported in D.6.

[34] We get this value simulating the behavior of agents under the parametrization of deep parameters described later in this section.

TABLE 7
Preset Parameters

Estimated Parameters	Symbol	Value	Source
Initial age		20	
Retirement age	T_R	65	
Age at death	T	82	
Years per period		1	
Interest rate	$R-1$	0.02	
m's average earnings at 30		1	Normalization
Mating market—productivities			PSID
Mating market—assets			SCF
m's average earnings		1	Normalization
Pensions at $t=30$			Heathcote et al. (2010)
Var. f's productivity in $t=1$	$\sigma^{2_f}_{\zeta,1}$	0.54	PSID
Var. m's productivity $t=1$	$\sigma^{2_m}_{\zeta,1}$	0.54	PSID
Relarive Risk Aversion private good	γ	1.5	Attanasio et al. (2008)
Discount factor	β	0.98	Attanasio et al. (2008)

Function	Symbol	Value	Source
$Q_t = [d_t^\nu + \kappa(1-P_t^f)^\nu]^{\frac{1}{\nu}}$	κ	3.76	McGrattan et al. (1997)
	ν	0.19	McGrattan et al. (1997)

5.3 Indirect Inference

We use the method of indirect inference (Gourieroux et al., 1993) to pin down the vector $\vartheta = (\alpha, \lambda, \sigma_\psi, \sigma_{\psi,I}, \delta, \mu, \xi, \gamma)$ of the 8 remaining parameters of the model. We use 32 moments and regression coefficients for the structural estimation, which capture the process of marriage and cohabitation creation and dissolution, as well the female labor force participation. More precisely, we include as targets the coefficient of unilateral divorce estimated through equation 1, the hazard of divorce (6), the hazard of breakup (3), the hazard of marriage (3), the share of people ever married over time (6), the share of people that ever cohabited over time (6), female labor force participation (1), differences in female labor force participation between marriage and cohabitation (4), ratio of the rate of divorce between households with male wage above and below the median (1) and differences in log wages between married and cohabiting men (1). We use the retrospective marital history data from the NSFH wave III to construct[35] moments linked to partnership choice, while we all the others are computed using the PSID. We include in the sample for the data moment construction men and women born in 1940-1955 in community property states, which allow us to follow them unitil a late age, and also to observe how their behavior reacts to changes in divorce laws. The first step for the estimation is to solve the model for a vector of parameters ϑ, then simulating income, love shocks and unexpected policy changes to obtain the simulated behavior for the given parametrization. This allows us to compare[36] the simulated and the data moments: the objective is to obtain ϑ such that this difference is the smallest possible. Formally, the problem that we solve is

$$\hat{\vartheta} = \arg\min_{\theta} \qquad (\mathbf{m} - \mathbf{m}_{\vartheta})'\mathbf{W}(\mathbf{m} - \mathbf{m}_{\vartheta}), \tag{29}$$

where $\mathbf{m}$ is the vector of empirical moments, as described in the section about target moments, while $\mathbf{m}_{\vartheta}$ is the vector of the moments simulated by the model parametrized with ϑ. $\mathbf{W}$ is a matrix where the diagonal contains the inverse of the variance of the data moments, while all the other entries are zeros. The minimization of this object function is performed using a global minimization algorithm called TikTak, which is described in detail in appendix A.

[35] NSFH wave III is conducted in 2001/2003 following the original respondents of wave 1. This sample does not include respondents under age 45 as of January 2000 unless some particular conditions are met, but this is not an issue for us since the youngest person in our estimating sample was 44 in 2000. One possible issue with this data is that by mistake during NSFH wave II all cohabiting couples were dropped by the sample. We can circumvent this issue simulating the same "mistake" dropping some observation from the fictional samples.

[36] Moments are actually build performing a stratified sampling on simulated data such that its distribution over an array of relevant characteristics is the same as the one in the real data.

5.4 Identification

This section provides a description of how, heuristically, the structural parameters of the model are identified. The parameter α is identified by total female labor force participation: when this parameter is large the household want to produce more of public good which requires female time. Instead μ affects the gap in female labor force participation for married and cohabiting couples: when this parameter is large, specialization within cohabitation becomes harder, which increases the gap. λ is intuitively identified by the share of people in a relationship. Instead, δ and γ are informative about the gains of marriage with respect to cohabitation: they are henced identified by the share of people married and cohabiting as well as the coefficient of unilateral divorce of regression 1. The parameter $\sigma_{\psi,I}$ is identified by the hazard of breakup and marriage: when this parameter is small compared to the variance of the transitory shocks, agents are not *picky* about sorting into cohabitation, but they move fast to a new relationship or they separate within the first periods of the relationship. ξ influences the surplus of marriage and cohabitation by income: hence it is identified by the difference in log wages of married and cohabiting men and by the ratio of the rate of divorce between the reletively richer and poorer. Finally, σ_{ψ} identifies the hazard of divorce: the larger the variance in the shocks, the higher would be the likelihood that marriage surplus becomes negative.

5.5 Model Fit

Table 8 reports the results of the structural estimation. The estimated standard σ_{psi} deviation of the transitory match quality shock is 0.52, while standard deviation $\sigma_{psi,I}$ of the love shock at first meeting is higher with a value of 0.88. Instead, the probability of meeting a partner λ is 0.34, while the share of assets left after divorce is 0.34. Thehe weight on the public good α is 0.57, while the loss in productivity parameter μ is 0.12. Finally, the penalty of cohabiting is γ, while the coefficient of reltive risk aversion for the public good ξ is 1.14.

The fit of the model is reported in table 9. The model matches well the hazard of marriage, breakup and divorce over time: model moments rarely lie outside the 95% confidence interval of data moments. Also the share of people that ever cohabited and married over time is well matched, even though people start marry too early in the model. The data about female labor force participation implies a slightly higher participation in the model, while the differences in divore by wage and the differences in log wages for married and cohabiting men are well matched. Finally, the coefficient of unilateral divorce estimated through equation 1 is too large with respect to the data: further work is needed to improve the fir of this crucial moment.

The model is validated according to its ability to reproduce the effects of unilateral divorce on cohabitation duration, women wages over time and the share of income earned by women. We run the same econometric models of section 3.2 for cohabitation duration, both with the real data sample and with a the simulated sample. The results, reported in table 9, show that the direction of the effects is correct, while being quantitatively too large in model for the hazard of marriage. Instead, women wages are a slightly too low in the simulation, as figure D.3 suggest: this can be due to the fact that female labor force participation is too low in the first place, which comes with a weaker selection. Instead, the share of income earned by women is in line with data.

Table 8
Estimated Structural Parameters

Estimated Parameters		Value
Standard deviation of match quality shock	σ_ψ	0.52
Standard deviation of initial match quality shock	$\sigma_{\psi,I}$	0.88
Probability of meeting a partner	λ	0.34
Assets left upon divorce	δ	0.34
Weight of public good	α	0.57
Loss in productivity while not working	μ	0.12
Relarive Risk Aversion public good	ξ	1.14
Penalty of Cohabiting	γ	0.024

Notes: The parameters in the table are estimated by Indirect infrerence.

Table 9
Model fit and Validation

Estimated Moments	Model	Data	95% CI
Hazards over Time	fig. D.1	fig. D.1	fig. D.1
Share Ever Cohabited and Married	fig. D.2	fig. D.2	fig. D.2
FLFP in a Couple	0.66	0.51	[0.52,0.53]
FLFP if Married/ FLFP if Cohabiting (<35 yrs)	0.95	0.86	[0.77,0.95]
FLFP if Married/ FLFP if Cohabiting (≥35 yrs)	0.95	1.00	[0.88,1.12]
Log wages Marraige-Log wages Cohabitation	0.14	0.12	[0.11,0.13]
Divorce Rate Rich/Divorce Rate Poor	0.78	0.79	[0.71,0.87]
Unilateral Divorce coefficient equation 1	-0.23	-0.065	[-0.16,+0.1]
External Moments	**Model**	**Data**	**95% CI**
Unilateral Divorce on the relative Risk of Marriage	0.37	0.73	[0.60,0.86]
Unilateral Divorce on the relative Risk of Separation	0.81	0.82	[0.75,0.89]
Women wages by age	fig. D.3	fig. D.3	fig. D.3
Share household income earned by women	0.37%	0.35%	[0.36-0.38]

Notes: Confidence intervals are obtained by bootstrapping. The coefficients and the relative hazard ratios in the table differs from those obtained with the same econometric model in section 3.2. The reason is that the sample used for the empirical part is different from the one used for structural estimation as explained in the section.

6 Mechanisms and Welfare

Having estimated the structural model, paying particular attention to obtain a realistic response to the introduction of unilateral divorce, we can now examine more in depth the mechanisms that led the behavioral changes as well as the effects of such reform on the welfare of men and women.

Mechanisms

To better understand the mechanisms we start by analyzing how selection and intra-household bargaining changes such as a result of the reform. Using a structural model allow us to analyze the variation of non observable variables, as the match quality ψ and women pareto weight θ, as well as variables that are not available conditionally on relationship status, such as female labor force participation.

We analyze the behavior of our variable of interest ψ, θ and female labor force participation using a standard event study on our simulated data. Specifically, we estimate the following regression model

$$\text{Variable of Interest}_{i,a,t} = \sum_{j=-5}^{5} \beta_j^{Uni} \cdot \mathcal{I}(t=j) + \alpha_0 + \alpha_a + \epsilon_{i,t} \tag{30}$$

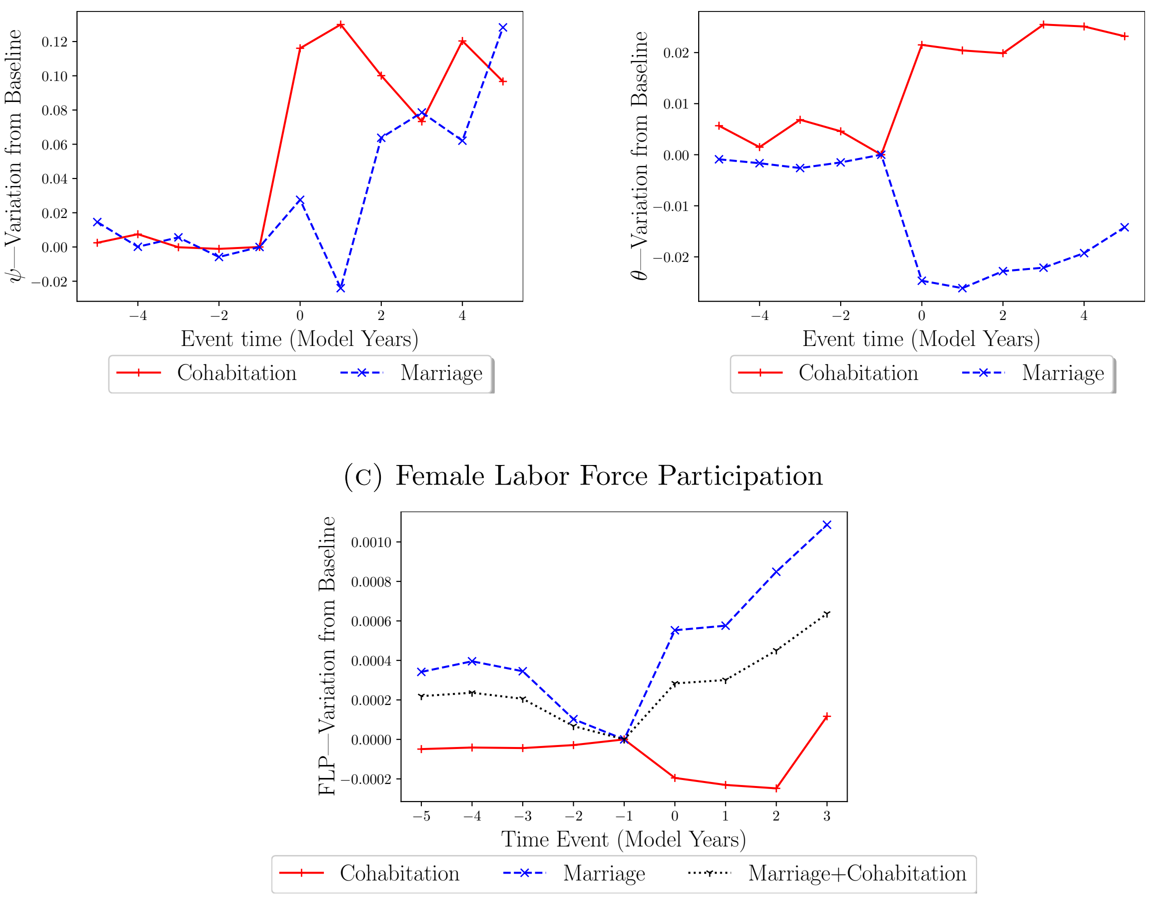
where a is age, t if the year relative to switching to unilateral divorce ($t = -1$ is omitted) and i is a couple. For variables θ and ψ we consider (separately) cohabiting and married couples in the period they met, while for female labor force participation we keep all the years the couples have been staying together. Figure 2 reports the results. As we can see from panel (a), the match quality at meeting for cohabitation increases by a value that is around 10% percent of its structural standard deviation. This is consistent with selection of relatively high quality couples into cohabitation after the reform. This can explain why the hazard of breakup of newly formed cohabiting couples decreases after the reform. We can also see that the match quality at meeting for marriage goes up, which is consistent with a positive selection induced by the increased risk of divorce. The fact that the group of people deciding to marry after the reform has an average match quality which is lower than the average married couple, but higher than the average cohabiting couple, is due to the strong selection[37] on partnership with respect to ψ. This effect is generated by the different cost of divorce/break up.

Panel (b) instead depicts the evolution of the women bargaining power θ for cohabitation and marriage around unilateral divorce. As we can see θ increases with respect to baseline for cohabitation, while the opposite happens for marriage. Since before the reform female pareto weight in marriage was 0.45 and 0.41 in cohabitation, the reform eliminates the differences in average θ that preceded the reform. Under Mutual consent, marriage was protecting women from ending up divorced and poor, while cohabitation was chosen only by couples with large differences in productivities, where women could access only a fraction on the wealth of their partner. After the reform, men prefer cohabitation over marriage because it avoids splitting assets upon divorce, but they have to promise a higher initial θ to women to convince them. On the other hand, θ of married couples decreases because the increased risk of divorce makes the bargaining power of women weaker, since divorce would be more painful for them as they are poorer on average.

Lastly, panel (c) shows the evolution of female labor force participation around the reform. Consistently with Fernández and Wong (2014) we find that female labor force participation increases after the reform, as women seek to have higher productivities through experience and accumulate more wealth to smooth out consumption under the increased possibility of a divorce. Note that this effect is weaker within cohabiting couples, as their baseline participation in the labor market is already high.

[37] Indeed figure D.4 shows that the distribution of ψ at meeting for marriage dominates that of cohabitation.

Figure 2
Event Studies Around the introduction of Unilateral Divorce–Simulated Data



(a) Love Shock ψ at meeting

(b) Women Pareto Weight θ at meeting

(c) Female Labor Force Participation

Notes The figures display the evolution of the love shock ψ, the female pareto weight θ and female labor force participation for simulated data around the introduction on Unilateral Divorce with respect to the reference time -1. The graphs about ψ and θ are relative to couples that started a relationship at the event time while the graph about female labor force participation pools all the couple at the event date. The values displayed in the figures are the estimated coefficients β_t in equation 30 using simulated data.

Welfare

The literature already studied the welfare effects of the introduction of unilateral divorce: both Reynoso (2019) and Fernández and Wong (2017) find that the introduction of unilateral divorce decreases welfare for both genders, but more so for women. While we find a similar result, we claim that accounting for cohabitation gives an effect which is even more polarized by gender. To study the welfare consequences of the two divorce regimes we perform an *ex-ante* welfare comparison, where for each gender we compute the expected value of spending the whole life cycle under a certain regime, before any productivity or love shocks is realized. The results, reported in 10, show that welfare under a unilateral divorce regime is lower than the one under a mutual consent for both men and women. The difference is much stronger for women, which would need to be given almost 14,000$ in assets at age 20 to be indifferent between the two regimes, while would need just $63 to be indifferent. We then performed again the same exercise without allowing cohabitation to be a choice. The results show that for women the welfare difference between the two regimes is very close to the case where cohabitation is a choice, while men now need more than $6,000 to be indifferent between the two divorce regimes. This result suggests that models not accounting for cohabitation overestimate the welfare losses for men when unilateral divorce is introduced. The intuition behind this difference is linked to one of the mechanisms explained above in this section: men start preferring cohabitation after the reform to avoid the possibility of losing most of their assets upon divorce.

Table 10
Welfare by gender and divorce regime

Female		**Male**	
Mutual Consent	Unilateral Divorce	Mutual Consent	Unilateral Divorce
Life-Time utilities in $t = 0$			
-102.06	-105.77	-90.75	-91.62
Welfare Losses with Unilateral Divorce			
13980.85 $		62.75 $	
Life-Time utilities in $t = 0$ when cohabitation is not a choice			
-102.2	-105.73	-90.87	-92.19
Welfare Losses with Unilateral Divorce when cohabitation is not a choice			
			
13990.74 $		6662.11 $	

Welfare losses are obtained computing the amount of wealth that has to be transferred to men and women in $t = 0$ such that their life time utility under the unilateral divorce regime equals the one under mutual consent. The wealth is measured in 1990 dollars.

7 Counterfactual Experiments

In this section we use the estimated model to perform a series of counterfactual experiments to learn about the forces that contributed to the surge in cohabitation during the last decades. The first candidate to the rise in cohabitation is the introduction of unilateral divorce: its qualitative impact on the choice between marriage and cohabitation has been largely discussed throughout this paper. Table 11 reports the share of people that cohabited at 45 and the average years spent cohabiting[38] under the baseline scenario and a counterfactual one where unilateral divorce was never introduced. The results show that under the counterfactual less than half the people would have cohabited by the age of 45, while the years spent into cohabitation would have moved from 1.06 to 0.25: this last effect is the strongest because it captures both changes in partnership choices of singles and partnership duration.

Table 11 reports the results of another scenario where the gender wage gap is reduced, increasing women potential[39] wages by 20%: the share of people that ever cohabited increases from 39.8% to 42.1%, while the number of years spent cohabiting move from 1.06 to 1.15. This happens because there is less room from specialization in the couple when the two partner's wages are more similar and also the opportunity cost of not working for women rises. Under those new incentives couples' need for commitment decreases: cohabitation becomes relatively more interesting as it comes with a lower cost of break up.

Finally, table 11 explores the effects of reducing by 20% the relative price of good d, used to produce the public good Q. This change has to be interpreted in the literature as a results of the improvement in home production technologies, such as the dish washer or the washing machine, which freed up women's time. Several papers already showed the impact of those

[38] We consider the number of years spent cohabiting between the age of 20 to the age of 55.

[39] The increase is in female productivity, which might not be realized if women decide not to participate in the labor market.

changes of female labor supply (Greenwood et al., 2005), the decline in marriage, the rise in divorce and assortative mating (Greenwood et al., 2016). The counterfactual experiment shows that the share of people that ever cohabited increases by moved from 39.8% to 41%, while the years spent cohabiting stays almost identical. Similarly to a reduction in the gender wage gap, improvements in the technology of home production decrease the need for labor specialization within the household and for a commitment technology to enforce it. Hence, improvements in the technology of home production not only caused a decline of marriage with respect to singleness, as Greenwood et al. (2016) claim, but also a change in the relative convenience of partnership contracts.

TABLE 11
Counterfactual Experiments

Scenario	Share people ever cohabited	Years spent cohabiting
Baseline	39.8	1.06
No Unilateral Divorce	21.8	0.25
$\downarrow$ wage gap	42.1	1.15
$\downarrow$ Price of "durable" good d	41.0	1.02

NOTES. The Baseline scenario reports the model output with the parameters reported in the previous section. The scenario "No Unilateral divorce" assumes that all the agents live under a Mutual consent regime during all their life, while in the lower gender gap scenario women wages are increased by 20%. Instead, under the lower price of public good scenario the relative price between goods d, used to produce the public good, and private consumption c is reduced by 20%. The share of people that ever cohabited is measured at the simulated age of 45, while years spent cohabiting are coumputed between ages 20 and 55.

8 Conclusion

In this paper, we show that partnership choices are influenced by the rights to end them: the introduction of unilateral divorce in most US states influenced selection into marriage and cohabitation as well as the duration of these relationships and women's bargaining power. In particular, using NSFH and NSFG data, we show that the introduction of unilateral divorce is responsible for a 5% increase in the likelihood that singles choose cohabitation over marriage, and that newly formed cohabitation last longer. To understand the mechanisms that underlie those changes, as well its welfare effect for the two genders, we build a dynamic structural model where agents can choose to marry, cohabit and when to end those relationships. We use regression results from survey data as well as moments concerning the mating market and female labor supply to estimate our model by indirect inference. The structural estimation shows that couples choosing cohabitation instead of marriage are those that would have had the highest risk of divorce. Since cohabiting couples had on average a lower match quality than married ones, this selection effect drives up the duration of newly formed cohabitations. Moreover, in the US states where assets are split equally, men are those who wish to cohabit after the reform, since they would lose relatively more of their assets upon divorce: women are convinced to enter this relationship in exchange for a higher bargaining power, even though this makes them worse off if the couple subsequently breaks up. The possibility to switch to cohabitation makes the welfare of men under the two divorce regimes similar, while for women the welfare under unilateral divorce is much lower because, being poorer, divorce hits harder on their utility. Finally, we show that the magnitude of the overall effect of unilateral divorce on cohabitation is large: a counterfactual experiment shows that if the law never changed, time spent into cohabitation for the birth cohorts used in our estimation would have been 0.25 years instead of 1.06, while the share of people that eve cohabited would have moved from 39.8% to 21.8%.

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Appendix

A Computational Appendix

Research by Arnoud et al. (2019) compares an array of local and global optimizers, which are given the task of finding the global optimum of non well-behaved functions. They find that a multistart algorithm that they propose, called TikTak, outperforms the others regarding in terms of time required to reach the solution and the probability that the algorithm actually find the right point. In light of these findings, we decided to use TikTak for solving problem 29. While the core of the original algorithm is the same as in Arnoud et al. (2019), we adapted it to accommodate parallelization in conjunction with GPU computing, which is used for solving efficiently the model by backward induction. TikTak is implemented following the following steps:

1. Draw and evaluate N Sobol points
2. Sort the N Sobol points (s_1 ,..., s_N), with $f(s_1) \leq \cdots \leq f(s_N)$ and keep the first N^* with $N^* < N$. Note that $f()$ is the objective function. We set those numbers such that $N^*/N = 0.15$.
3. Then run local searcehs ($\hat{s}_1$,..., $\hat{s}_N$). Call z_j^* the point resulting from the local mini-

mization[40] starting from $\hat{s}_j$. Then, the next starting point will be a convex combination between $\hat{s}_{j+1}$ and the most fit point that arised so far through local minimizations Z_j^*, defined as $Z_j^* = \min\{z_1^*, ..., z_j^*\}$. Formally:

$$\hat{s}_{j+1} = (1 - \theta_j) + \theta_j Z_j^*,$$

where

$$\theta_j = \min \big[\max[0, 1, (j/N^*)^{\frac{1}{2}}], 0.995 \big].$$

4. The global minimum is $Z_{N^*}^*$.

B Estimation of Income Processes

Table B.1
OLS Regression. Observation: Males in Year t.

	(1)
Dep. Variable: Male Log Earnings	
ι_1^m	0.05
ι_2^m	-0.00
ι_0^m	-0.34
Survey Year Fixed Effects	✓
State Fixed Effects	✓
Observations	98118
R^2	0.152

Notes: Standard errors are obtained through bootstrapping and they are reported in summary table 6.

[40] We use the local minimization algorithm provided by Cartis et al. (2019), which is a derivative-free optimization (DFO) for nonlinear Least-Squares (LS) problems. This algorithm is robust to noise, which might arise because of the errors coming from the approximation of continuous problems on a discrete grid.

Table B.2
OLS Regression. Observation: Females in Year t.

	(1)
Dep. Variable: Female Labor Earnings	
ι_1^f	0.02
ι_2^f	-0.00
ι_0^f	-0.38
Survey Year Fixed Effects	✓
State Fixed Effects	✓
Observations	86891
R^2	0.085

Notes: Standard errors are obtained through bootstrapping and they are reported in summary table 6.

Table B.3
Probit Regression. Observation: Females in Year t.

	(1)
Dep. Variable: Female Labor Force Participation	
Unilateral Divorce∗Community Property	-0.18***
Unilateral Divorce∗Title Based	-0.08
Unilateral Divorce∗Equitable Distribution	-0.06
Equitable Distribution	-0.00
ι_1^f	0.01***
ι_2^f	-0.00***
ι_0^f	1.95
Survey Year Fixed Effects	✓
State Fixed Effects	✓
Observations	127728

Notes: standard errors are clustered at the state level. Coefficients that are significantly different from zero are denoted by the following system: *10%, **5% and ***1%. 6.

C Robustness Checks - Empircal Analysis

Relationship Choice - Linear State Trends

Table C.1
OLS Regression. Observation: first and second relationships

	Dependent variable:			
	Married (0/1)			
	Full Sample	Resident	NSFH	NSFG
	(1)	(2)	(3)	(4)
Unilateral Divorce	-0.060^{***}	-0.071^{***}	-0.071^{***}	0.005
	(0.020)	(0.024)	(0.022)	(0.053)
State Fixed effects	Yes	Yes	Yes	Yes
Age Polynomials	Yes	Yes	Yes	Yes
Year started Fixed Effect	Yes	Yes	Yes	Yes
Linear trend by State	Yes	Yes	Yes	Yes
Demographic Controls	Yes	Yes	Yes	Yes
Observations	13,627	8,357	10,830	2,797
R^2	0.208	0.227	0.232	0.152

Notes: standard errors are clustered at the state level. Coefficients that are significantly different from zero are denoted by the following system: *10%, **5% and ***1%.

Relationship Choice - Heterogeneity by Propoerty regime and linear state trends

Table C.2
OLS Regression. Observation: first and second relationships

	Dependent variable:			
	Married (0/1)			
	Full Sample	Resident	NSFH	NSFG
	(1)	(2)	(3)	(4)
UnDiv*NoTit	-0.062^{***}	-0.074^{***}	-0.072^{***}	0.004
	(0.021)	(0.025)	(0.022)	(0.056)
UnDiv*Tit	-0.015	-0.045	-0.023	0.012
	(0.026)	(0.046)	(0.040)	(0.051)
Tit	-0.034^{**}	-0.036	-0.030^{*}	-0.054
	(0.017)	(0.024)	(0.017)	(0.049)
State Fixed effects	Yes	Yes	Yes	Yes
Age Polynomials	Yes	Yes	Yes	Yes
Year started Fixed Effect	Yes	Yes	Yes	Yes
Linear trend by State	Yes	Yes	Yes	Yes
Demographic Controls	Yes	Yes	Yes	Yes
Observations	13,627	8,357	10,830	2,797
R^2	0.192	0.227	0.209	0.128

Notes: standard errors are clustered at the state level. Coefficients that are significantly different from zero are denoted by the following system: *10%, **5% and ***1%.

Relationship Choice - Logit

Table C.3
Logitstic regression. Observation: first and second relationships

	Dependent variable:			
	Married (0/1)			
	Full Sample	Resident	NSFH	NSFG
	(1)	(2)	(3)	(4)
Unilateral Divorce	-0.307^{***}	-0.387^{***}	-0.354^{***}	-0.317
	(0.095)	(0.127)	(0.107)	(0.229)
State Fixed effects	Yes	Yes	Yes	Yes
Age Polynomials	Yes	Yes	Yes	Yes
Year started Fixed Effect	Yes	Yes	Yes	Yes
Demographic Controls	Yes	Yes	Yes	Yes
Average Marginal Effects	-0.051	-0.062	-0.051	-0.062
Observations	13,627	8,357	10,830	2,797

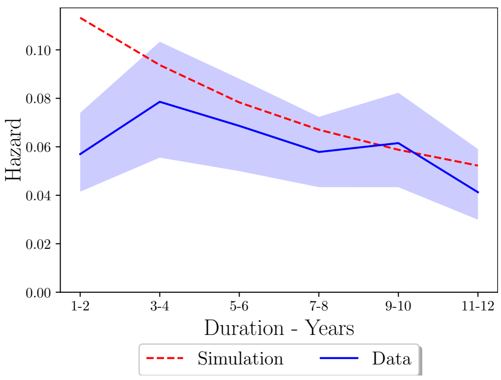
Notes: standard errors are clustered at the state level. Coefficients that are significantly different from zero are denoted by the following system: *10%, **5% and ***1%.

D Figures

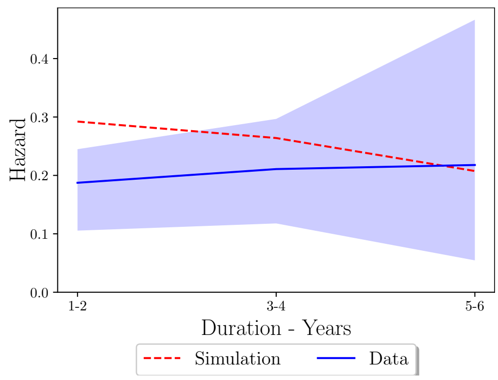
D.1 Model Fit

Figure D.1
Hazards by Duration of Spells: Data and Simulations

(A) Hazard of Divorce



(B) Hazard of Separation



(C) Hazard of Marriage

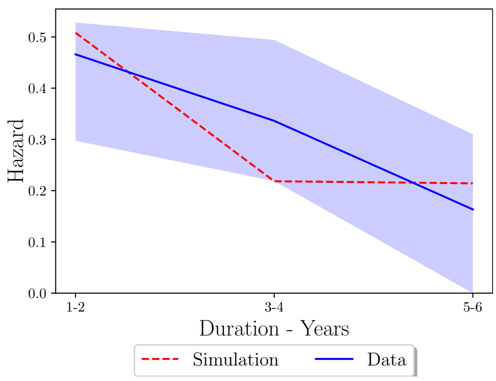


FIGURE D.2
Share ever cohabited and married: Data and Simulations

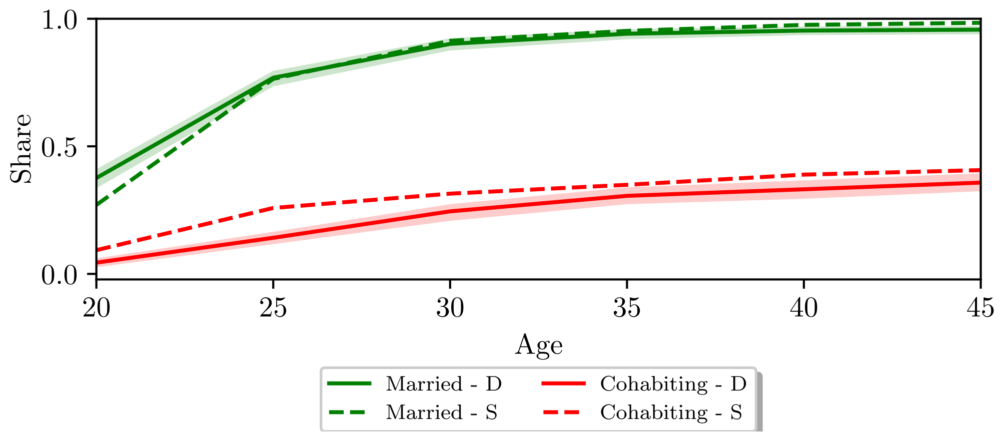
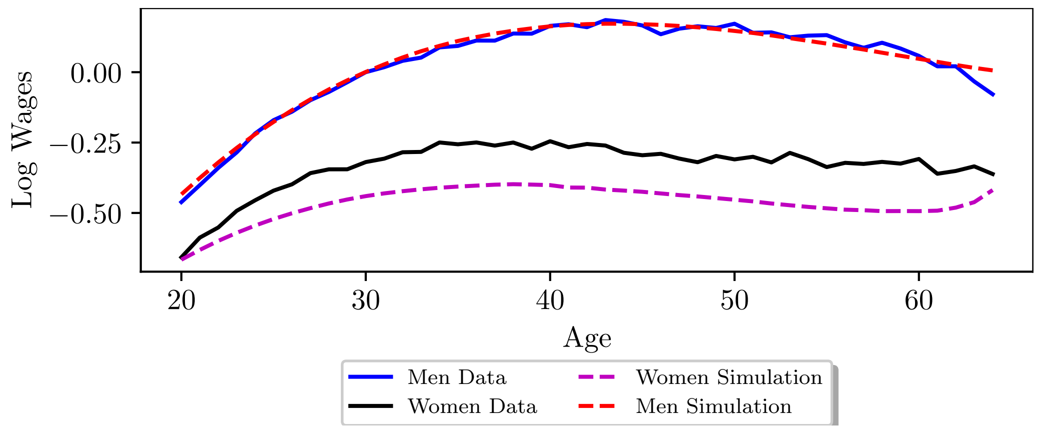


FIGURE D.3
Log Wages: Data and Simulations



NOTES. The figure display log wages as in the PSID and with simulated data. Wages are normalized such that log wages of men at age 30 equals 0.

D.2 Mechanisms

FIGURE D.4
Cumulative Distribution of Love shock ψ at meeting

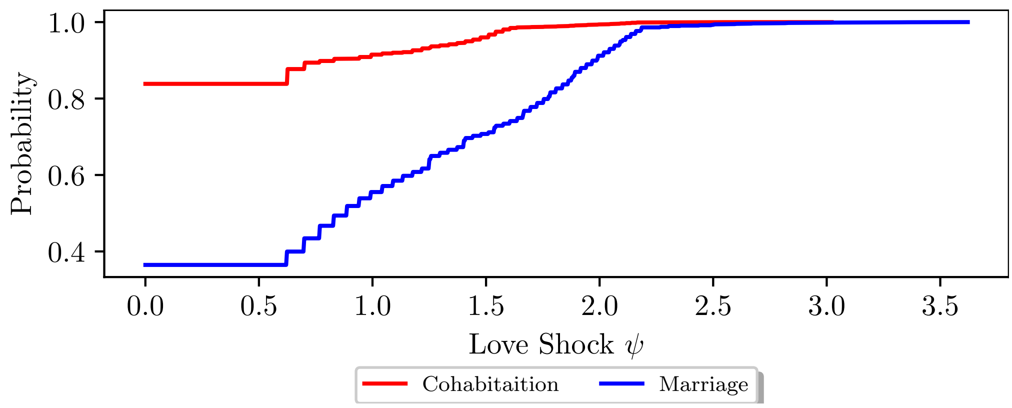
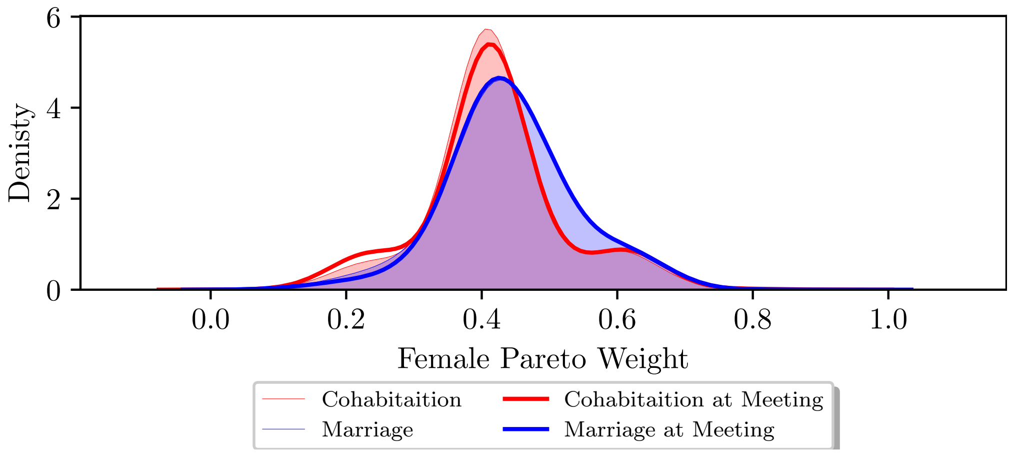


FIGURE D.5
Distribution of Women Pareto weight θ—Marriage and Cohabitation



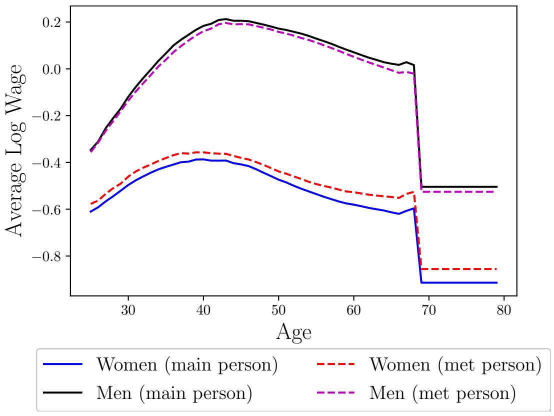
NOTES. This figure depicts the distribution women pareto weight for married and cohabiting couples. The thick solid lines represent the distribution of this variable in the period the couple decides to get together, while the lighter areas depict the distribution of θ considering every relationship duration.

D.3 Simulations-Symmetry

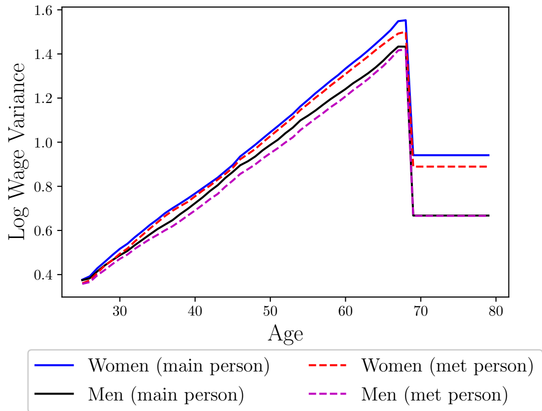
Figure D.6

Log Income and Assets mean and Variances by Age—Simulated Data

(A) Average Log Wages

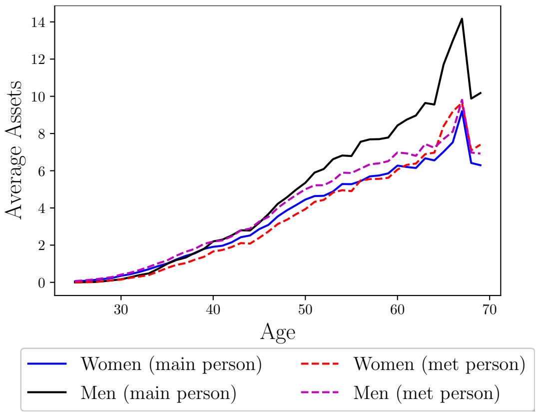


(B) Variance Log Wages

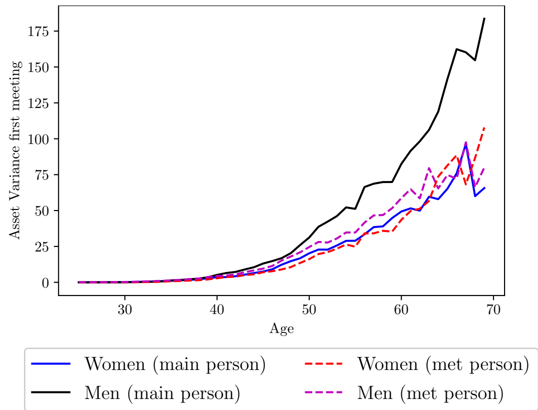


S

(C) Average Assets



(D) Variance Assets



Notes. The figures display mean and variances of simulated log wages and assets of men and women in a couple over their age. We label as "main person" the variables that are computed from agents that are simulated and followed through their whole life-cycle, while we label as "met person" the variables constructed using the partners met by the people whose behavior is simulated for their whole life-cycle. Wage variables are constructed using couples at any point of their relationship, while for assets we use only the period the couple met, where we can still distinguish the title of ownership of assets.