

# Differential Fecundity and Child Custody

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August 2011

## Abstract

Despite U.S. child custody laws favor gender neutrality since the mid-70s, fathers' involvement with their children after a divorce remains limited. Children spend about 80% of their time with their mothers and 20% with their fathers. The question is why divorced parents do not react to changes in the law. Men are capable of having children for a longer time span than women. Thus, if they divorce, they have a higher probability of having more children in comparison to women. This acts as an incentive for women to keep the children after a divorce. Understanding the mechanism behind the allocation of child custody is relevant for public policy as there is large evidence showing that children from divorced parents perform worse in terms of lower test scores and educational achievement than those from intact families. In this paper, I build a model of marriage, divorce and remarriage with fecundity differential between women and men. I use the model to explore how differences in fecundity between women and men affect child custody arrangements. I find that if it is more likely to have more children after a divorce, fathers' involvement in children's lives decreases.

JEL Classification: E10 J12 J13 J18

Keywords: Remarriage, Child Custody, Divorce

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<sup>\*</sup>I would like to thank my advisor, Nezhir Guner for all his help.

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# 1 Introduction

Most U.S. states abandoned the maternal presumption for custody by mid 1970s in favour of gender-neutral laws (best interest standard). Under this law, custody should be awarded on the basis of the child's best interest. This criterion includes the wishes of the child's parents, the child's wishes, the relationship of the child with parents as well as the child's adjustment to his /her home, school and community. Thus, there are several factors that can account for the decision to award custody. In the U.S., there are two types of custody arrangements: sole custody and joint custody. Sole custody assigns to one parent all legal rights over the child, and most often sole custody is assigned to the mother. Joint custody can be either legal or physical joint custody. Legal shared custody means having the rights and obligations to make decisions about the child's upbringing, while joint physical custody involves specific amounts of time spent with each parent. Most researchers have defined joint physical custody (or dual residence) as at least between 30 and 50 percent of time spent with one of the parents (Kelly 1994).

Child custody arrangements are not necessarily imposed on individuals, as there is room for private arrangement between spouses. In the U.S., about 50 % of parents make private decisions between themselves about custody and visitation rights and the rest of the cases are decided in courts (Kelly, 1994). In 1995, about 20 % of divorce cases involved joint physical custody (Halla, 2010). This does not mean that only 20% of children had any involvement with both parents as 85 % of divorced parents had agreements for joint (legal or physical) custody or visitation privileges. Overall, 5 in 6 custodial parents are mothers, i.e., either the mother has sole custody or parents have joint custody but children spend more time with their mother (Grall, 2007). As a result, most of the children of divorced parents spend most of their time with the divorced mothers. On average about 80 % of time is spent with mother and about 20% is spent with the father (Brown and Flinn, 2010). Hence, despite the recent changes in the law that allows for joint custody of children, fathers' involvement with their children after a divorce remains limited. The question is why. I propose fecundity differentials between women and men to account for the fact that child custody is normally allocated to the mother and the relatively small involvement of the father in his children's lives after a divorce.

It is important from a public policy perspective to know how granting of child support payments and allocation of child custody work. Divorce rates have increased in most OECD countries in the last decades. This has implications for the current living arrangements of children. In particular, 4 out of 10 children in the U.S. will experience the divorce of their parents (Kreider

and Fields, 2005). There is large evidence showing that children from divorced parents perform worse in terms of lower test scores and educational achievement than those from intact families (see McLanahan and Sandefur, 1994; Gruber, 2004; Cáceres-Delpiano and Giolito, 2011, among others). This poorer performance may come about through different channels. After divorce, the household experiences a loss of income and children tend to have less contact at least with one of the parents, typically the father. As it is commonly assumed in the literature (e.g. Weiss and Willis, 1985) if children are public goods during marriage and they become private goods upon divorce, then the father's child support payments will be less than optimal. Besides diminished resources upon divorce, lesser time spent with parents might also have an effect on the well being of the child.

In this paper, I build a model economy of marriage, divorce and remarriage in which parents decide whether to have joint or sole custody. I explicitly model differences in fecundity between women and men. The idea is that marriage is a fertility contract (see Buckle et al, 1994). Men can only have children if they marry. Men can have children for a longer time span than women, so they will want to marry a younger fertile woman. Upon divorce, they would prefer to marry to a woman who is able to have children. However, having children from the previous marriage is costly. Therefore, child custody arrangements will have an impact on remarriage. The aim of this paper is to explore the allocation of child custody and how biological differences account for the incidence of joint child custody without further differences between women and men.

## 1.1 Facts

I provide an overview of the empirical evidence on the relationship between marriage, child custody and fertility.

**Child custody.** Child custody laws changed in the 1970s in most U.S. states. Until then, sole custody was assigned to the mother by default. The law changed in favour of the child's best interests. The two most common child custody arrangements are: mother's sole custody and joint custody. However, it is hard to tell which arrangement is best for children. There is evidence supporting joint custody, in terms of behavioral and emotional adjustment (Bauserman, 2002), economic well-being (Seltzer, 1991; Del Boca and Ribero, 1998; Allen, Nunley and Seals, forthcoming), educational attainment (Teng Wah, 2006; Nunley and Seals, forthcoming) and parental involvement (Huang, Han and Garfinkel, 2003), among others. Opponents object that children under joint custody are exposed to ongoing parental conflict (Kuehl, 1989). The

following table shows the share of joint custody across some US states in 1995 (Halla, 2010)

Table I: Share of joint physical custody

State	Share of joint awards, 1995
AK	27.4
CT	47
IL	22.3
MI	14.1
MT	53
OR	23
PA	16

(1)

Micro- level divorce certificate data from NVSS, NCHS

(2)

Thus, even though, the share of joint custody awards differed across states, the incidence of joint custody was around 20 per cent. It is hard to get more recent estimates on the shares of joint custody as in surveys, the custodial parent is the one with whom the child spends more time. This can be misleading as it does not rule out some joint custody arrangement. However the average split of custody is 80 % of time is spent with mother and 20% is spent with the father, which implies that the mother is the one taking care of the child most of the time (Brown and Flinn, 2010). Therefore, the role of the mother as the main custodian of children after a divorce has not changed even though in the mid 70s child custody law moved towards a gender-neutral law.

**Non biological children are costly.** Having children from a previous marriage affects the marriage prospects of divorced individuals, especially of women. The remarriage rates of women are lower than those of men. The following table shows the marital status in 2001 of those ever

divorced by age and sex.

Table II: Marital Status of ever divorced by sex and age, 2001

Age	Men		Women	
	Divorced	Married	Divorced	Married
>25	41.7	54.8	46.6	44
25-29	62.4	35.9	62.1	35.5
30-34	45.5	52	49.9	45.8
35-39	54.5	44.1	48.7	47.1
40-44	42.6	55.3	48.2	47.1
45-49	42	55.4	46.7	49
>50	36.8	58.4	43.5	41(+13.3)

*Source* : Kreider, 2005, Current Population Reports

Women tend to remain unmarried more often than men (except at age 35-39) , especially as women age. Therefore, it looks like after the fertile years it is harder for a woman to remarry than for a man. There is evidence suggesting that the presence of former children reduce the likelihood of remarriage. Chiswick and Lehrer (1990) find that the presence of children reduce the mother’s likelihood of remarrying. Buckel et al (1996) find this pattern, too. However this does not seem to happen for men. Previous children do not matter for the remarriage probability of men. This might be explained by co-residence of children. Children normally remain with the mother after a divorce and this affects mother’s remarriage opportunities. Meanwhile, men do not live with children and thus, their remarriage chances are not affected. Having children present in the household reduces remarriage probability as new partners do not enjoy raising someone else’s child. There is an extensive literature in psychology, sociology and biology supporting this (White and Booth, 1985; Coleman and Ganong, 1990, Cherlin and Furstenberg, 1994, among others). Hence, the available evidence suggests that remarriage is affected by the presence of children in the household from previous relationship. This is especially true for the woman as she is normally the custodian of the child.

**Fertility after remarriage.** After a divorce, men are more likely to form new households than women. Fustenberg et al (1983) and Manning and Smock (2000) find evidence of men "swapping" families (their old one for their new family). Men who form new families reduce social and economic investment in non resident biological children in favour of the biological

children from the current relationship. Seltzer (1994) and Bergstrom (1996) argue that parent's interest in a child's well being diminishes in the presence of alternative offsprings.

There are several papers indicating that the possibility of remarriage affects the fertility decisions of individuals and that these are different for men and for women. Stewart (2002) indicates that stepchildren negatively affect childbearing intentions and childbearing risks. Intentions to have a child are weakened by one's own previous biological children and the previous biological children of one's current spouse or partner. This effect varies by the parenting configuration of the couple and gender of the respondent. Among couples with stepchildren, intentions remain high until each partner has had a biological child. Unlike women, men's previous biological children do not affect their intentions of having a child. Therefore, men actually have more children after a divorce consistent with the idea that men can let the ex-wife keep their children as he has the possibility of having more children. In fact, 38% of remarried man who had children with their current wife, had children from previous marriage (Male Respondent File of the National Survey of Family Growth, NSFG , 2006-2008). Moreover, men tend to remarry younger women than the first time around (Gelissen, 2004 and Shafer, 2009). The fact that men form new families replacing the older ones and they marry younger women provides some evidence supporting the idea that fertility is an important factor when considering remarriage.

## 1.2 Related literature

Literature on child custody arrangements is surprisingly small – see Del Boca (2003) for a review of the literature on the economic consequences of divorce for the welfare of children and parents. Weiss and Willis (1985) present a model of optimal marriage contracts in which couples decide on the allocation of resources within marriage and the terms of a settlement (transfers and child custody) in the event of divorce. They explain why custody and transfers go towards the same person. The parent that keeps the child depends on his/her income and his /her level of altruism. Rasul (2006) allows spouses to decide ex ante the allocation of the child in case of divorce. Parents differ in their valuation of children. His results point out that if couples valuation of children are relatively similar, then joint custody is optimal. Else, sole custody should go to the parent with highest valuation. Brown and Flinn (2011) explore the effect of different family law environments on the educational attainment of children, their welfare and parents welfare using data from the NLSY. They find that changes in family law have little effect on children's welfare, but they have larger effects on parents welfare. Women prefer to have sole custody and large child

support payments and men prefer shared custody and no payments. Chiappori and Weiss (2007) explore the effects of an increase in the aggregate divorce rate on children's education. They propose that higher probability of remarriage can trigger an equilibrium in which child support is more generous and children are better off under higher divorce rates. Halla (2010) studies the effects of joint child custody on marriage rates, divorce rates, fertility and female labor force participation. He exploits the time variation across U.S. states on the introduction of family laws favouring gender neutral (joint) child custody. He finds that joint custody leads to an increase in marriage rates and in fertility. In another paper, Halla and Holzl (2007) investigate how the option of joint custody affects divorce in a model of bargaining. Looking at Austrian divorce court records, they find that the introduction of joint custody has no impact on the odds that children are mainly living with their mother. There has not been any attempts, however, to model custody arrangements within an equilibrium model of marriage, divorce and remarriage. This is the gap that the current paper tries to fill.

There are several papers in economics that take into account fecundity differentials between women and men. Siow (1998) explores how differentials in fecundity interact with marriage, labor and financial markets to affect gender roles. He can account for several difference between women and men in labour participation, time rearing children and age of marriage among others. While previous literature has proposed women's comparative advantage in household production, he uses only biological difference to account for these facts. There are no other gains to marriage than having children. Thus individuals will only remarry if they can have more children within the new marriage. Thus the allocation of child custody is not an issue for the man. I consider other gains to marriage and the how the allocation of children after divorce will have effects on the remarriage of individuals. While Siow (1998) argues that fecund women are scarce and men compete to marry them, Diaz-Gimenez and Giolito (2010) argue that women become less picky when choosing a partner as their shorter biological clocks are ticking. Fecundity differentials are sufficient to account for the age distributions of ever and never married men and women, for the probabilities of marrying a younger bride and a younger groom, and for the age distributions of first births observed in the United States in the year 2000.

In the following section I introduce the model environment and the value functions and in section 3, the equilibrium is defined. In section 4, I perform simulations of the model to see how it does in terms of matching the US economy. Section 5 includes a discussion of mechanism behind the model and I include some robustness checks. Section 6 concludes.

## 2 Environment

The economy is populated by overlapping generations of individuals who live for two periods as children and two as adults. The only decisions that individuals make in this economy are marriage decisions and decisions on child custody arrangements. While children, they make no decisions. The two periods living as adults will be denoted by the young and the old period. There is mass one of women and men of each generation. Individuals are endowed with one unit of time. Individuals differ in their productivity (type). Let the productivity of women be denoted by  $x \in X = \{x_1, \dots, x_N\}$ , and that of men by  $z \in Z = \{z_1, \dots, z_N\}$ . The productivity in the second period depends on the productivity of the previous period in the following way

$$\Pr[x' = x_j \mid x = x_i] = \pi_x(x_j \mid x_i) \text{ and } \Pr[z' = z_j \mid z = z_i] = \pi_z(z_j \mid z_i).$$

**Fertility** Women are only fertile when they are young while men are fertile during young and old age. Men can have children only if they are married to a young woman. When a woman is fertile, she has 2 children who remain with her for all her lifetime. Therefore, only couples formed by a young man and a young woman and couples formed by an old man and a young woman can have children. Single women also have children, outside of any marriage.

**Marriage market** At the start of their adult lives, agents observe their productivity and they form households. A young individual meets another young individual with probability  $p$ . Upon their meeting individuals decide whether to form a household or remain single. Young singles who do not meet another young, fraction  $(1 - p)$  of the young, meet old single agents. Since the divorce rate will be smaller than 1 in equilibrium there will be a smaller number of old singles than the number of young singles. Hence some fraction of the  $(1 - p)$  of young singles will not meet anyone and they remain single for that period. Like young, old agents will meet another old with probability  $p$  and a young agent with probability  $(1 - p)$ . Unlike young agents, all old agents will meet someone, either young or old.

Potential couples draw a match quality  $\gamma \in G = \{\gamma_1, \dots, \gamma_M\}$  from the distribution  $\Gamma(\gamma)$ . If two young adults meet, they observe their types and match quality and they form a household if both agree to do so. Otherwise they remain single for that period. Individuals also observe whether there is any children associated with their partner. When a young agent matches with a young each of them have no children. However, if a young matches with an old agent, the old agent might have children associated with them from the previous period. Likewise, if an old agent matches with an old agent, both of them might have children associated with them.

At the end of their young lives, couples formed by two young individuals draw next period's productivities and a new match quality. They might divorce and there can be divorce couples who share custody and couples where the mother is the sole custodian of the children. Next period they will go to the marriage market as singles with either joint or sole custody. Those young individuals who married an old individual will enter next period as widows/widowers. Thus, at the beginning of the old period, the pool of old singles will be formed by never married old agents, widows and widowers and divorced agents.

**Decisions** As well as marriage decisions, the only other decision in the economy is about the allocation of child custody. This decision is only made in households formed by a young man and a young woman. Young couples decide on custody arrangements,  $a$  for their children in case they were to divorce. There are two possibilities: they can agree on sharing custody or on giving sole custody to the mother.<sup>1</sup> Custody is thought of as the time that the child spends with each parent. The chosen custody arrangement has implications for the utility that parents receive from having their children at home and for the education that children receive. The custody policy parameter,  $\tau_a$  determines how much time is allocated to the mother. Thus,  $\tau_a$  is the share of time the child spends with the mother, while  $(1 - \tau_a)$  is the father's share. If  $a = 1$ , then the mother is the sole custodian of the child, and  $\tau_1 = 1$ . This means that she is the only one enjoying the child and the father forgets about the child. If  $a = 2$ , parents will have joint custody. The share of time with the child allocated to the mother is  $\tau_2 < 1$ . We will set  $a = 0$ , for mothers who had their children outside of a marriage.

**Utility** Single women care about consumption and the quality and quantity of their children. Single men only enjoy consumption as they cannot have children if they remain single. Couples care about consumption, children and the match quality. Women marry to enjoy economies of scale in consumption and the match quality. Men marry not only to enjoy economies of scale in consumption and the match quality, but to have children. Parents receive utility from the number of children they have and the education that the children receive. However, they only get utility from their own biological children. An individual has to pay a fixed utility cost  $\varphi$  if there are children in the household who are not his/her own. Divorced mothers with sole custody get utility from their children, however divorced fathers who agreed to assign sole custody to the mother forget about their child and they get no utility from them. Parents who share custody get utility from their children, determined by the parameter  $\tau_2$ , since the mother will have the

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<sup>1</sup>I do not allow for the possibility of fathers having the sole custody of the child as this arrangement is rare in the data.

children for  $\tau_2$  of the time and the father will have the children the rest of the time. All agents have one unit of time and as they do not value leisure, their earnings are given by their types ( $x$  for females and  $z$  for males).

**Education** The quality (education) of children living in two parent households or in never married women households depends on the consumption level of the household. However, when the parents are divorced, a child's education depends on the custody arrangements. If parents have agreed on sole custody, the child lives with the mother and the father forgets about the children. Therefore, the education that the child receives under sole custody is determined by the consumption level of the mother's household.

Under joint custody, the education of the child depends on the level of consumption in the mothers' household and the level of consumption in the father's household. As divorced parents can remarry, the consumption on their households also depend on whether they have remarried and to whom they have remarried. This implies that couples agreeing on joint custody will need to keep track of the marital status of their ex-partners. The consumption level of a couple's household is the sum of the woman's income,  $x$  and the man's income,  $z$ . If a woman of type  $x$  shares custody with a man of type  $\tilde{z}$  and she remarries to a man of type  $z$ , her children's education will depend on her household's consumption ( $x + z$ ) and her ex-husband's consumption level. If the ex-husband has also remarried to a woman of type  $\tilde{x}$ , the ex-husband's consumption level is  $(\tilde{z} + \tilde{x})$ . Thus the value of remarrying for this woman will also depend on her ex-husband's type and his marital status. It is important to note that using consumption level as an approximation of the amount of investment parents make is a shortcut that avoids having an impossibly large state space. If one allows parents make an investment decision on children, one has to know not only the types of parent's new couples but also the complete marital connections of these new partners — see Laitner (1991) for a discussion. Note that there is no link between the education that children receive and their productivity levels when they become young adults. Education only provides utility to the parents.

When deciding whether to marry or not, young individuals need to form expectations about future marriage market conditions. If they remain single or they marry someone from the old cohort, thus entering next period as a widow/widower, they have to anticipate who will be in the single pool in the young generation(all start out as single) and in the old generation (there will be also divorcees). If they marry someone young, they also need to anticipate who would be a potential match for their ex in case of divorce, as the education of their children will depend on the consumption level of the ex-partner's household in case of shared custody. Thus they also

have to form expectations over the probability of their ex-partner remarrying.

## 2.1 Value functions

I introduce the value functions for the old and young individuals. First, I introduce the value of being a single old and a married couple consisting of two olds. Then, I introduce the value of being in a marriage between an old individual and a young individual and finally the value of being a single young and the value of a marriage among two young individuals.

## 2.2 Old Individuals

I start with the value of being non-married (single, divorced, or widowed) for an old woman. It depends on the type of the woman,  $x$  and the children,  $k$ . The value of being non-married for a divorced woman also depends on the custody arrangements,  $a$ . Widows and never married women have sole custody by default, therefore, the share of time their children spend with them is equal to one and  $a$  is set to 0.

If a divorced woman has sole custody,  $a$  is equal to 1 and her children spend all their time with her,  $\tau_1$  equals 1. However, if she has shared custody with the father, the education of her children depends on the ex-husband's type,  $\tilde{z}$  and if he has remarried, on the type of the new wife,  $\tilde{x}$ . Mothers care about the education that their children receive. The education production function depends on  $k$  and the education,  $e$ . Women also care about consumption,  $c$ . There are economies of scale in consumption in the sense that as a household grows, more resources are needed but the need is less than proportionate.

The value of being non-married when old for a woman is given by

$$G_2(x, a, k, (\tilde{x}, \tilde{z})) = \frac{1}{(1 - \sigma)} c^{1-\sigma} + \tau_a \phi \ln(E),$$

where consumption is

$$c = \frac{1}{(1 + \epsilon_1 k)^{\epsilon_2}} x, \quad 0 < \epsilon_1 < 1, \quad 0 < \epsilon_2 < 1,$$

and quality-quantity composite for children,  $E$ , is given by

$$E = e^\lambda k^{1-\lambda}.$$

Note that parameters  $\epsilon_1$  and  $\epsilon_2$  determine the economies of scale and the parameter  $\lambda$  is the weight of education (quality) in the quality-quantity composite for children. The education that

children receive is a weighted sum of the households' consumption levels where the children lives, and is given by,

$$e = (\tau_a x + (1 - \tau_a)(\tilde{x} + \tilde{z})\psi_a),$$

where  $\tau_a$  is the weight given to the mother's consumption and  $(1 - \tau_a)$  is the weight given to the father's consumption. These weights are taken to be the same as the share of time the child spends on each of the parents' households. The indicator function  $\psi_a$  takes the value of 1 if there is joint custody and so the father's consumption becomes of relevance, else it takes the value of zero and only the mother's consumption is important for the children education,

$$\psi_a = \begin{cases} 1 & \text{if } a = 2 \\ 0 & \text{if } a = 0, 1. \end{cases}$$

The value of being an old never married or widowed man depends on his type. He has no children from previous relationship so he only cares about consumption. However, if he is divorced, he will care about his children depending on the custody arrangements. If he agreed to giving sole custody to the mother, he will not care about the children. However, if he shares custody with his ex-wife he will care about his children. As the education of the children will also depend on the mother's household, both the type of the mother,  $\tilde{x}$  and the type of the potential new partner,  $\tilde{z}$  are state variables.

The value of being non-married (single, divorced, widower) for an old man is given by

$$B_2(z, a, k, (\tilde{x}, \tilde{z})) = \frac{1}{(1 - \sigma)} c^{1 - \sigma} + (1 - \tau_a)\psi_a \phi \ln(E)$$

where consumption is

$$c = \frac{1}{(1 + \epsilon_1 k)^{\epsilon_2}} z$$

and the education production function

$$E = e^\lambda k^{1 - \lambda}$$

where  $e$  is given by

$$e = ((1 - \tau_a)z\psi_a + \tau_a(\tilde{x} + \tilde{z})\psi_a).$$

The old man only cares about the children in case of joint custody. This is the case when the indicator function  $\psi_a$  takes the value of 1, i.e.

$$\psi_a = \begin{cases} 1 & \text{if } a = 2 \\ 0 & \text{if } a = 0, 1. \end{cases}$$

The value of being married when old depends on the age composition of the couple and on whether the couple is newly formed or not. Let  $M_{i,j}^n$  denote the value of a newly formed marriage among a woman of age  $i \in \{1, 2\}$  and a man of age  $j \in \{1, 2\}$ . Age 1 corresponds to being young and age 2 corresponds to being old. Let's also define the value of a newly formed marriage among a woman of age  $i$  and a man of age  $j$  for a woman be  $W_{i,j}^n$  and for a man  $H_{i,j}^n$ . Similarly let  $M_{i,j}^o$  denote the value of an old marriage among a woman of age  $i$  and a man of age  $j$  and  $W_{i,j}^o$  and  $H_{i,j}^o$  the value of the marriage for a woman and a man respectively.

I start with the value of a newly formed marriage among old individuals. The value of the couple depends on the type of the woman,  $x$  and the type of the man,  $z$  as well as the match quality they drew at the beginning of the period. It also depends on the children that the woman brings to the marriage,  $k_w$  and her child custody arrangements,  $a_w$ . It might also depend on the children of the husband,  $k_h$  and his child custody arrangements,  $a_h$ . If the woman has joint custody, the type of her ex-husband and his potential partner,  $(\tilde{x}_w, \tilde{z}_w)$  are of relevance. If the man has joint custody, the value of the new marriage will also depend on the type of his ex-wife and his potential partner,  $(\tilde{x}_h, \tilde{z}_h)$ . However, if he has sole custody, he forgets about his previous children and neither  $k_h$  nor the type of his ex-wife are important. Having non biological children in the household is costly for the non-biological parent. As all women come with two children, the man has to pay a cost  $\varphi$  and the woman will have to pay this same cost if the man has joint custody. The couple cares about consumption, their own children, the match quality,  $\gamma$  and they pay a fixed cost for their non-biological children.

The value of a newly formed marriage for an old woman is given by

$$W_{2,2}^n(x, z, a_w, a_h, k_w, k_h, (\tilde{x}_w, \tilde{z}_w), (\tilde{x}_h, \tilde{z}_h), \gamma) = \frac{1}{(1-\sigma)} c^{1-\sigma} \gamma + [\tau_{a_w} \phi \ln(E_w) - \varphi \psi_{a_h}]$$

and for an old man it is equal to

$$H_{2,2}^n(x, z, a_w, a_h, k_w, k_h, (\tilde{x}_w, \tilde{z}_w), (\tilde{x}_h, \tilde{z}_h), \gamma) = \frac{1}{(1-\sigma)} c^{1-\sigma} + \gamma + [(1 - \tau_{a_h}) \phi \ln(E_h) - \varphi \psi_{k_w}].$$

Consumption is given by

$$c = \frac{1}{(2 + \epsilon_1 k)^{\epsilon_2}} (x + z)$$

where the total number of children in the household,  $k$  is equal to the sum of the children brought

by the wife and the children brought by the husband,

$$k = k_w + \psi_{a_h} k_h.$$

The education production function of the woman's children is given by

$$E_w = e_w^\lambda k_w^{1-\lambda}$$

where the education that the woman's children get depends on the household's income,  $(x + z)$  and if she has joint custody, on the ex-husband's income  $(\tilde{x} + \tilde{z})$  according to the time the child spends on the mother's and the father's household,  $\tau_{a_w}$  and  $(1 - \tau_{a_w})$  respectively,

$$e_w = (\tau_{a_w} (x + z) + (1 - \tau_{a_w}) (\tilde{x}_w + \tilde{z}_w)) \psi_{a_w}.$$

Similarly for the education of the man's children,

$$E_h = e_h^\lambda k_h^{1-\lambda},$$

where the education that they receive depends on the father's household income  $(x + z)$  and the ex-wife's household,  $(\tilde{x} + \tilde{z})$ , if he has shared custody, where  $(1 - \tau_{a_h})$  is the share of the man's household income that affects his children education as well as the share of time they spend with him, i.e.

$$e_h = ((1 - \tau_{a_h}) (x + z) \psi_{a_h} + \tau_{a_h} (\tilde{x}_h + \tilde{z}_h) \psi_{a_h}).$$

Finally, the indicator function  $\psi_{a_w}$  takes the value of 1 if the woman has joint custody,

$$\psi_{a_w} = \begin{cases} 1 & \text{if } a_w = 2 \\ 0 & \text{if } a_w = 0, 1 \end{cases},$$

and the indicator function  $\psi_{a_h}$  takes the value of 1 if the man has joint custody, else, he will not care about his previous children,

$$\psi_{a_h} = \begin{cases} 1 & \text{if } a_h = 2 \\ 0 & \text{if } a_h = 0, 1. \end{cases}.$$

A woman and a man will only marry if they both agree to do so. An old woman will only agree to marry an old man if the value as a wife is at least as high and that of remaining single.

And the same goes for the old man. Let  $I_{2,2}^n$  and  $J_{2,2}^n$  be indicators functions for the woman and the man decisions, that take the value of 1 if they would prefer to marry. Therefore, for the woman

$$I_{2,2}^n = \begin{cases} 1 & \text{if } W_{2,2}^n(\cdot) \geq G_2(\cdot) \\ 0 & \text{otherwise,} \end{cases}$$

and for the man

$$J_{2,2}^n = \begin{cases} 1 & \text{if } H_{2,2}^n(\cdot) \geq B_2(\cdot) \\ 0 & \text{otherwise.} \end{cases}$$

If the couple married when both of them were young and they remain married when old, the value the couple enjoys is similar to that of a newly formed old couple, but all the children in the household are the biological children of the couple. Therefore, the education that children receive depends on the household's consumption level and there is no penalty for raising someone else's children. The value of a continuing couple for a woman is the following

$$W_{2,2}^o(x, z, k, \gamma) = \frac{1}{(1-\sigma)} c^{1-\sigma} + \gamma + \phi \ln(E),$$

and for the man

$$H_{2,2}^o(x, z, k, \gamma) = \frac{1}{(1-\sigma)} c^{1-\sigma} + \gamma + \phi \ln(E),$$

where consumption is given by

$$c = \frac{1}{(2 + \epsilon_1 k)^{\epsilon_2}} (x + z),$$

and the education production function is

$$E = e^\lambda k^{1-\lambda},$$

where the education of the children,  $e$  now only depends on the household's income

$$e = (x + z).$$

Both members of this couple were married to each other in the previous period. In order to decide whether they wanted to remain married to each other, they have to compare the value of remaining married to the expected value of divorcing. This expected value will be introduced later on in the problem of young individuals. Let  $I_{2,2}^o$  be an indicator function taking the value of 1 if an old woman's value of marriage,  $W_{2,2}^o(x, z, k, \gamma)$  is at least as high as her expected value of

divorce. For the man, the indicator function  $J_{2,2}^o$  equals 1 if his value as a husband  $H_{2,2}^o(x, z, k, \gamma)$  is at least as large as his expected value of divorce.

I continue by introducing the value of a marriage formed by individuals of different generations. First, I introduce the value of a marriage between an old woman and a young man. If a young man marries to an old woman, he cannot have children while he is young, so he gets no utility from children. Moreover, he has a utility cost for raising the children that his wife brings into the marriage. The value of the couple will depend on the custody arrangements of the woman,  $a_w$ . If she has joint custody, the type of her ex-husband and his potential partner's type,  $(\tilde{x}_w, \tilde{z}_w)$  affect the value of the couple through their effect on the education of the woman's children. The couple enjoys consumption and their match quality. The value of the marriage for a woman is

$$W_{2,1}^n(x, z, a_w, k_w, 0, (\tilde{x}_w, \tilde{z}_w), \gamma) = \frac{1}{(1-\sigma)} c^{1-\sigma} + \gamma + [\tau_{a_w} \phi \ln(E_w)]$$

while for a man it is given by

$$\begin{aligned} H_{2,1}^n(x, z, a_w, k_w, 0, (\tilde{x}_w, \tilde{z}_w), \gamma) &= \frac{1}{(1-\sigma)} c^{1-\sigma} + \gamma - \varphi \\ &+ \beta p \int_{z', \gamma', \Omega_2} [\max \{B_2(z'), H_{2,2}^n(x', z', a_w, k_w, 0, (\tilde{x}_w, \tilde{z}_w), I_{2,2}^n, \gamma') I_{2,2}^n\}] \\ &\quad d\pi^z(z'|z) d\Omega_2(x', a_w, k_w, (\tilde{x}_w, \tilde{z}_w)) d\Gamma(\gamma') + \\ &+ \beta(1-p) \int_{x', \gamma', \Omega_1} [\max \{B_2(z'), H_{1,2}^n(x', z', \gamma') I_{1,2}^n\}] d\pi^z(z'|z) d\Omega_1(x') d\Gamma(\gamma') \end{aligned}$$

where consumption is

$$c = \frac{1}{(2 + \epsilon_1 k_w)^{\epsilon_2}} (x + z)$$

and the education production function

$$E_w = (\tau_{a_w} (x + z) + (1 - \tau_{a_w}) (\tilde{x}_w + \tilde{z}_w) \psi_{a_w})^\lambda k_w^{1-\lambda}.$$

The indicator function  $\psi_{a_w}$  takes the value of 1 if the woman has joint custody,

$$\psi_{a_w} = \begin{cases} 1 & \text{if } a_w = 2 \\ 0 & \text{if } a_w = 0, 1. \end{cases}$$

An old woman will marry a young man if her value of being a wife,  $W_{2,1}^n(.,.)$  is greater or equal than her value of being single,  $G_2(.,.)$ . Let  $I_{2,1}^n$  equal 1 if this is the case. For the young man,  $J_{2,1}^n$  will take the value of 1 if the value of being a husband,  $H_{2,1}^n(.,.)$  is at least as large as the value of remaining single,  $B_1(.,.)$  which I introduce below.

Note that the young man will have a continuation value for the second period of his life. The old woman dies at the end of her old period and so the young man will enter next period as a widower. He forms expectations about the future marriage market. He will become of type  $z'$  with probability  $\pi^z(z'|z)$ . With probability  $p$ , he will meet an old woman from the distribution  $\Omega_2(x', a_w, k_w, (\tilde{x}_w, \tilde{z}_w))$ . This distribution of old non-married women consists of never married women, widows and divorced women. All the women have children with them,  $k_w$ . They draw a match quality  $\gamma'$  from the distribution  $\Gamma(\gamma)$  and she observes his type and he observes her type,  $x'$  and the child custody arrangements,  $a_w$ . If he matches with a divorced woman, she might share custody and he can also observe her ex-husband's household income  $(\tilde{x}_w, \tilde{z}_w)$ . If he matches with a divorced woman with sole custody, a widow or a never married woman, he only observes her type and her children. Then he has to decide whether he stays single for the last period of his life with a value  $B_2(z')$  or whether he marries and his utility would be  $H_{2,2}^n(x', z', a_w, k_w, 0, (\tilde{x}_w, \tilde{z}_w), \gamma')$ , both defined above. With probability  $(1 - p)$  he meets a young woman from the distribution of single young women  $\Omega_1(x')$ . The couple draws a match quality and observe each others' types. Then, he decides whether to stay single or marry. If he marries, he will get  $H_{1,2}^n(x', z', \gamma')$  which is defined below.

If an old man marries to a young woman, they will have children. The old man might bring children,  $k_h$  into the marriage as well if he shares the custody with his ex-wife. Then, the ex-wife's household income will affect the man's children education. In this case, the young woman has to pay a fixed cost for raising someone else's children. However, as both the young woman and the old man are fertile, they have more children and they will both get utility from the children they have in common, denoted by  $k_c$ . The value of this marriage for the young woman is

$$\begin{aligned}
W_{1,2}^n(x, z, a_h, 0, k_h, (\tilde{x}_h, \tilde{z}_h), \gamma) &= \frac{1}{(1-\sigma)} c^{1-\sigma} + \gamma + (\phi \ln(E) - \psi_{a_h} \varphi) \\
&+ \beta \int_{x', \gamma', \Theta_2} \max \{G_2(x', k), W_{2,2}^n(x', z', 0, a_h, k_c, k_h, (\tilde{x}'_h, \tilde{z}'_h), \gamma') J_{2,2}^n\} \\
&\times d\pi^x(x'|x) d\Theta_2(z', a_h, k_h, (\tilde{x}_h, \tilde{z}_h)) d\Gamma(\gamma') + \beta(1-p) \times \\
&\times \int_{x', \gamma', \Theta_1} \max \{G_2(x', k), W_{2,1}^n(x', z', 1, k_c, \gamma') J_{2,1}^n\} d\pi^x(x'|x) d\Gamma(\gamma') d\Theta_1(z')
\end{aligned}$$

and for the old man

$$\begin{aligned}
H_{1,2}^n(x, z, a_h, 0, k_h, (\tilde{x}_h, \tilde{z}_h), \gamma) &= \frac{1}{(1-\sigma)} c^{1-\sigma} + \gamma \\
&+ ((1 - \tau_{a_h}) \phi \ln(E_h) \psi_{a_h} + \phi \ln(E))
\end{aligned}$$

where the household's consumption is

$$c = \frac{1}{(2 + \epsilon_1 k)^{\epsilon_2}} (x + z)$$

and the total number of children in the household,  $k$  is equal to the number of children they have in common,  $k_c$  and the number of the husband's children if he has joint custody,  $k_h$

$$k = k_c + k_h.$$

The production function of common children and of the husband's children are given by

$$E = (x + z)^\lambda k_c^{1-\lambda},$$

and

$$E_h = ((1 - \tau_{a_h})(x + z) \psi_{a_h} + \tau_{a_h}(\tilde{x} + \tilde{z}) \psi_{a_h})^\lambda k_h^{1-\lambda},$$

respectively.

The young woman will marry the old man if the value of being single is smaller than the value of being a wife,  $W_{1,2}^n(\cdot, \cdot)$ . The indicator function  $I_{1,2}^n$  equals 1 if this happens. And for the old man, let the indicator function  $J_{1,2}^n$  equal 1 if the value of being a single old man,  $B_2(\cdot, \cdot)$  is smaller than the value of marrying a young woman,  $H_{1,2}^n(\cdot, \cdot)$ .

A young woman who married an old man will be a widow next period. She will be of type  $x'$  with probability  $\pi^x(x'|x)$  and she will match with a young man from the distribution  $\Theta_1(z)$

with probability  $(1 - p)$ . If she matches with a young man of type  $z'$  they will draw a match quality  $\gamma'$  from the distribution  $\Gamma(\gamma)$ . She will decide on whether to remain single and get utility  $G_2(x', k)$  or get married again and enjoy the value of a marrying,  $W_{2,1}^n(x', z', 1, k_c, \gamma')$ . She will match with an old man from the distribution  $\Theta_2(z, a_h, k_h, (\tilde{x}_h, \tilde{z}_h))$  with probability  $p$ . The distribution of old men depends on the type of the men,  $z$  and child custody arrangements,  $a_h$ . Never married and widowed men will not have children. However, divorced men might have children attached to them if they have joint custody,  $a_h = 2$ . Then, if the woman meets a divorced man with joint custody, she will observe his type, the children he has and the ex-wife's household income,  $(\tilde{x}_h, \tilde{z}_h)$ . Upon observing this and the match quality, she will decide on whether to stay single with the value of,  $G_2(x', k)$  or marry where she would enjoy the utility  $W_{2,2}^n(x', z', 0, a_h, k_c, k_h, (\tilde{x}_h, \tilde{z}_h), \gamma')$ .

### 2.3 Young Individuals

A young single woman will have 2 children. She will get utility from consumption, the number of children she has and the level of education they have. The value of being a single young woman is

$$\begin{aligned}
G_1(x) &= \frac{1}{(1 - \sigma)} c^{1-\sigma} + \phi \ln(E) + \\
&+ \beta p \int_{x', \gamma', \Theta_2} \{ [\max \{ G_2(x', k), W_{2,2}^n(x', z', 0, a_h, k, k_h, (\tilde{x}_h, \tilde{z}_h), \gamma') J_{2,2}^n \}] \} \\
&\times d\pi^x(x'|x) d\Theta_2(z', a_h, k_h, (\tilde{x}_h, \tilde{z}_h)) d\Gamma(\gamma') \\
&+ \beta(1 - p) \int_{x', \gamma', \Theta_1} [\max \{ G_2(x', k), W_{2,1}^n(x', z', 0, k, \gamma') J_{2,1}^n \}] \times \\
&\times d\pi^x(x'|x) d\Theta_1(z') d\Gamma(\gamma')
\end{aligned}$$

where her household consumes all of her income  $x$

$$c = \frac{1}{(1 + \epsilon_1 k)^{\epsilon_2}} x$$

and the children's production function depends on the number of children and the education they receive, being  $\lambda$  the share of education in the education production function,

$$E = x^\lambda k^{1-\lambda}.$$

where the education  $e$  is equal to her income,  $x$ .

Next period, with probability  $p$ , the young woman will be matched to someone from her generation and with probability  $(1 - p)$ , she will match with a young man. The distribution of non-married old men (never married, divorced and widowers) is denoted by  $\Theta_2(z', a_h, k_h, (\tilde{x}_h, \tilde{z}_h))$  with no custodial rights if  $a_h = 0, 1$  and with joint custody if  $a_h = 2$ . While the distribution of young single men is  $\Theta_1(z')$ . She will be of type  $x'$  with some probability and she will match with a man from the above distributions. They will draw a match quality,  $\gamma'$  and she will have to decide on whether to remain single and enjoy the value of being a single old woman,  $G_2(x', k)$  or she can get married and enjoy the value of being a married old woman married to an old man,  $W_{2,2}^n(x', z', 0, a_h, k, k_h, (\tilde{x}_h, \tilde{z}_h), \gamma')$  or if she matched with a young man her utility will be  $W_{2,1}^n(x', z', 0, k, \gamma')$ .

A single young man only enjoys consumption as he cannot have children. The value of being a single young man

$$\begin{aligned}
B_1(z) &= \frac{1}{(1 - \sigma)} c^{1-\sigma} + \beta p \int_{z', \gamma', \Omega_2} [\max \{B_2(z'), H_{2,2}^n(x', z', a_w, k_w, 0, (\tilde{x}_w, \tilde{z}_w), \gamma') I_{2,2}^n\}] \times \\
&\quad \times d\pi^z(z'|z) d\Gamma(\gamma') d\Omega_2(x', a_w, k_w, (\tilde{x}_w, \tilde{z}_w)) \\
&\quad + \beta p \int_{x', \gamma', \Omega_1} [\max \{B_2(z'), H_{1,2}^n(x', z', \gamma') I_{1,2}^n\}] \times d\pi^z(z'|z) d\Gamma(\gamma') d\Omega_1(x').
\end{aligned}$$

Next period his type will be  $z'$  according to the process  $\pi^z(z'|z)$  and he will enter the marriage market where he will match with an old woman with probability  $p$  from the distribution  $\Omega_2(x', a_w, k_w, (\tilde{x}_w, \tilde{z}_w))$  and with a young woman with probability  $(1 - p)$  from the distribution  $\Omega_1(x')$ . The couple will draw a match quality and then he has to decide whether to marry or remain single. If he matches with an old woman, the value of their marriage will depend on her type, the children she brings into the marriage and her child custody arrangements. If she has joint custody, the type of her ex-husband,  $\tilde{z}_w$  and his potential partner's type,  $\tilde{x}_w$  will also affect the value of the marriage through the education of the woman's children. If she has sole custody or she has never married or she is a widow, there are no links with the father of the child, thus his type and marital status are of no relevance.

Finally, I present the value of a married couple formed by a young woman and a young man. The couple decides on child custody arrangements,  $a$  in case of divorce. Child custody arrangements will affect the future utility of each individual and how much they care about their children. These arrangements will also affect the marriage market opportunities if they were to divorce. Bringing children into a new marriage is costly for the non biological parent and thus,

the options for remarriage are affected by this. The value of a young woman and a young man is given by

$$\begin{aligned}
M_{1,1}(x, z, \gamma) &= \max_a \left\{ \frac{1}{(1-\sigma)} c^{1-\sigma} + \phi \ln(E) + \gamma + \right. \\
&\quad + \int_{x', z', \gamma'} (\mu \beta [\max\{W_{2,2}^o(x', z', k, \gamma') J_{2,2}^o, W_2^d(x', a, k)\}] \\
&\quad + (1-\mu) \beta [\max\{H_{2,2}^o(x', z', k, \gamma') I_{2,2}^o, H_2^d(z', a, k)\}]) \times \\
&\quad \left. \times d\pi^x(x'|x) d\pi^z(z'|z) d\Gamma(\gamma') \right\}
\end{aligned}$$

subject to the budget constraint

$$c = \frac{1}{(2 + \epsilon_1 k)^{\epsilon_2}} (x + z)$$

and the education production function,

$$E = (x + z)^\lambda k^{1-\lambda}.$$

Given the optimal custody decisions,  $a^*(x, z, \gamma)$ , let the value of being married for a young female male be denoted by  $W_{1,1}^n(x, z, \gamma)$  and  $H_{1,1}^n(x, z, \gamma)$ . Young individuals will only get married if both agree to do so. The young woman will get marry if the value of being single,  $G_1(x)$  is smaller than the value of getting married,  $W_{1,1}^n(x, z, \gamma)$ . The indicator function  $I_{1,1}^n$  will equal 1 if the young woman wants to marry. For the young man,  $J_{1,1}^n$  will equal 1 when the value of being single,  $B_1(z)$  is smaller than  $H_{1,1}^n(x, z, \gamma)$ .

At the end of the first period of their lives, they receive a match quality shock and a productivity shock. They have to decide whether to remain married or divorce. If they were to remain married, the wife will get utility  $W_{2,2}^o(x', z', k, \gamma')$  and the man will get  $H_{2,2}^o(x', z', k, \gamma')$ . If they divorce, they enter the marriage market at the beginning of the next period and they have the possibility of remarrying. In order to decide whether to remain married or divorced they compare the expected value of staying married to the expected value of divorcing. The woman's expected value of divorcing,  $W_2^d(x', a, k)$  depends on the distribution of single old men,  $\Theta_2(z'', a_h, k_h, (\tilde{x}_h, \tilde{z}_h))$  she would match to with probability  $p$  and the distribution of single men  $\Theta_1(z'')$  that she will match to with probability  $(1-p)$ . She might match with an old man who has joint custody and so his children and the type of his ex-wife and her partner,  $(\tilde{x}_h'', \tilde{z}_h'')$  will affect the value of the marriage,  $W_{2,2}^n(x', z'', a, a_h, k, k_h, (\tilde{x}_w, z'), (\tilde{x}_h'', \tilde{z}_h''), \gamma'')$ . Her own custody arrangements,  $a$  will have an effect on the value of the marriage. If she has joint custody,

$a = 2$ , her ex-husband's type,  $z'$  and his new partner's if he remarries,  $\tilde{x}_w$  will be taken into account. Else, she can remain single and she will get utility  $G_2(x', a, k, (\tilde{x}'_w, z'))$ . This utility will also depend on the custody,  $a$ . If she matches with a young man, the problem is similar but the young man has no children attached to him, so the value of their marriage will be  $W_{2,1}^n(x', z'', a, k, (\tilde{x}'_w, z'), \gamma'')$ . The value of divorcing for a young wife is given by

$$\begin{aligned}
W_2^d(x', a, k) &= p \int_{\gamma'', \Theta_2} \max\{G_2(x', a, k, (\tilde{x}_w, z)), \\
&W_{2,2}^n(x', z'', a, a_h, k, k_h, (\tilde{x}_w, z'), (\tilde{x}_h'', \tilde{z}_h''), \gamma'')\} \times \\
&\times d\Theta_2(z'', a_h, k_h, (\tilde{x}_h, \tilde{z}_h)) d\Gamma(\gamma'') \\
&+ (1-p) \int_{\gamma'', \Theta_1} \max\{G_2(x', a, k, (\tilde{x}'_w, z')), W_{2,1}^n(x', z'', a, k, (\tilde{x}'_w, z'), \gamma'')\} \\
&\times d\Theta_1(z'') d\Gamma(\gamma'')
\end{aligned}$$

The problem for the husband is similar. If he matches with an old woman with probability  $p$  from the distribution  $\Omega_2(x'', a_w, k_w, (\tilde{x}_w, \tilde{z}_w))$ , the value of their marriage for the man,  $H_2^n(x'', z', a_w, a, k_w, k, (\tilde{x}_w, \tilde{z}_w), (x', \tilde{z}'_h), \gamma'')$  will depend on her child custody arrangements,  $a_w$ . If she has joint custody, it will also depend on her ex-husband's household income,  $(\tilde{x}_w, \tilde{z}_w)$ . Again, the value of remarriage also depends on the custody arrangements of the man,  $a$ . If he has joint custody,  $a = 2$ , his ex-wife's type,  $x'$  and her new partner's if she remarries,  $\tilde{z}_h$  will be taken into account. He has to decide whether to marry to this old woman or remain single and get utility  $B_2(z', a, k, (x', \tilde{z}'_h))$ . If he matches to a young woman, he will only observe her type  $x''$  and the value of marrying to her will be  $H_{2,1}^n(x'', z', a, k, (x', \tilde{z}'_h), \gamma'')$ . The value of divorcing for a young husband is given by

$$\begin{aligned}
H_2^d(z', a, k) &= p \max \int_{\gamma'', \Omega_2} \{B_2(z', a, k, (x', \tilde{z}'_h)), \\
&H_2^n(x'', z', a_w, a, k_w, k, (\tilde{x}_w, \tilde{z}_w), (x', \tilde{z}'_h), \gamma'')\} \times \\
&\times d\Omega_2(x'', a_w, k_w, (\tilde{x}_w, \tilde{z}_w)) d\Gamma(\gamma'') \\
&+ (1-p) \max \int_{\gamma'', \Omega_1} \{B_2(z', a, k, (x', \tilde{z}'_h)), H_{2,1}^n(x'', z', a, k, (x', \tilde{z}'_h), \gamma'')\} \\
&\times d\Omega_1(x'') d\Gamma(\gamma'').
\end{aligned}$$

### 3 Equilibrium

Given the child custody sharing rule  $\{\tau\}$ , and a initial distribution of single young women  $\Omega_1(x)$  and single young men  $\Theta_1(z)$ , a stationary equilibrium is a decision rule on child custody arrangement,  $a^*(x, z, \gamma)$ , and the distributions of singles in the old period  $\Omega_2(x, a, k, (\tilde{x}, \tilde{z}))$  and  $\Theta_2(z, a, k, (\tilde{x}, \tilde{z}))$  such that

- The child custody rule is the solution to the value functions described above
- The old age distributions  $\Omega_2(x, a, k, (\tilde{x}, \tilde{z}))$  and  $\Theta_2(z, a, k, (\tilde{x}, \tilde{z}))$  are stationary distributions that are consistent with the decision rules.
- The probability of remarrying for women and men with joint custody is consistent with the decision rules and the stationary distributions of individuals

### 4 Simulations

I present some simulations to see how the model performs in terms of fitting the data. The following parameters correspond to the benchmark case. There are initial distributions of single young women,  $\Omega_1(x)$  and men,  $\Theta_1(z)$ . I assume a log normal distribution over types. In the benchmark, there are 4 different types of individuals where the type refers to the productivity of the individual.<sup>2</sup> The individual productivities come from a log normal distribution with mean  $\mu_x$  and standard deviation  $\sigma_x$  for women and mean  $\mu_z$  and standard deviation  $\sigma_z$  for men. These productivities do not change over time. The mean and standard distribution of the initial productivities comes for the American Community Survey (ACS), 2009. The women's productivity is distributed with mean  $\mu_x = 2.717$  and standard deviation  $\sigma_x = 0.717$ . For men, the mean  $\mu_z$  equals 2.983 and the standard deviation  $\sigma_z$  equals 0.729.

There are two match qualities, high  $\gamma_h = 0.6$  and low  $\gamma_l = -3.0$ , and the probability of getting the high match quality is equal to 0.3. One of the key parameters of the model is the probability of matching with someone from the same cohort,  $p$ . For the benchmark economy,  $p$  is set to be equal to 0.7. These 4 parameters are used to match some of the marriage statistics of the model.

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<sup>2</sup>The number of grid points is small since solving the model is computationally quite time-consuming.

There are two parameters related to children. The first is the share of education of children in the children’s production function,  $\lambda$ . This parameter is set to 0.5.<sup>3</sup> The second parameter related to children is the cost of living with non-biological children,  $\varphi$ , which is equal to 3 in the benchmark economy. There are two utility parameters. The first utility parameter corresponds to the curvature of the utility function of consumption,  $\sigma$ , and it is set to 0.22. The other utility parameter is the weight of children in the utility function,  $\phi$ , which is set to 1.8. These two parameters,  $\sigma$  and  $\phi$ , and the fixed cost of non biological children,  $\varphi$ , play an important role in matching the share of couples choosing joint custody, the remarriage probability of women and the remarriage probability of men.

The child custody policy parameter  $\tau$  represents the share of time that the child spends in the mother’s household. I take the share of time spent with the mother in case of joint custody to be 0.8 as it is the most common arrangement according to Brown and Flinn (2011). The parameters  $\epsilon_1$  and  $\epsilon_2$  correspond to the economies of scale in consumption,  $\epsilon_1$  takes the value of 0.3 which is an intermediate value from the range that Browning (1992) provides and  $\epsilon_2$  takes the value of 0.8 which is within the range of values provided by Cutler and Katz (1992). Finally, the weight of the wife in the couples utility is given by  $\mu$  and it is set to 0.5 and  $\beta$  is the discount factor and it is consistent with a period of 10 years and 4% yearly interest rate.

Table III shows the parameters that are set based on a priori information. Table IV shows 7 parameter that are calibrated to match 7 data moments. There are further marriage statistics that the model replicates and they are not used to match the model to the data. These are used to check how well the model does in representing the economy.

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<sup>3</sup>I take this value from Greenwood, Guner and Knowles (2003).

Table III : Parameters based on a prior information

$\beta$	discount factor	0.916
$\mu_x$	mean productivity of women	2.717
$\sigma_x$	standard deviation of women's productivity	0.717
$\mu_z$	mean productivity of men	2.983
$\sigma_z$	standard deviation of men's productivity	0.729
$\mu$	weight of wife in couple's utility	0.5
$\lambda$	share of goods in the education function	0.5
$\epsilon_1$	economies of scale	0.8
$\epsilon_2$	economies of scale	0.3
$\tau$	share of time children spend with mother	0.8

Table IV: Parameters for Calibration

Marriage parameters		
$\gamma_h$	high match quality	0.6
$\gamma_l$	low match quality	-3.0
$prob(\gamma_h)$	probability of $\gamma_h$	0.3
$p$	probability of meeting an agent from same cohort	0.7
Utility parameters		
$\sigma$	curvature of utility function for consumption	0.22
$\phi$	utility weight of children	1.8
$\varphi$	fixed cost of non-biological children	3

Given the parameters in Tables III and IV, I introduce the benchmark case and perform some simulations to check how child custody changes when the possibility of having more children with younger women changes. Then, I discuss how the model works and provide further robustness checks.

## 4.1 The Benchmark case

Tables V and VI shows the performance of the benchmark economy. I show some moments related to the marriage market and the levels of sole and child custody in my economy. The demographic structure comes from the American Community Survey (ACS), 2009, and the Current Population Survey (CPS), 1995 Marital History Supplement. The marital status corresponds to individuals between ages 25 and 47. I consider young women to be between 25 and 34 and old women to be between 35 and 45. As there exists a gap between age at first marriage for women and men, I consider young men to be between 27 and 36 and old men between 37 and 47.<sup>4</sup> I only consider those ages when fertility is the highest.<sup>5</sup>

Table V: Benchmark Economy: Calibrated moment versus data moments

	Data	Model
% Marriage	54.12	56.21
% divorced women	11.3	10.62
% divorced men	9.1	9.82
% Never married	33.36	33.17
Remarriage of women as % of ever divorced,1995	44.10	37.40
Remarriage of men as % of ever divorced,1995	53.09	49.56
% of divorce choosing joint custody	20	18.19

The model does well in replicating the marriage statistics of the U.S. economy. The aggregate numbers for the share of married, divorced and never-married population are very close to the data. The model underestimates the remarriage probability, especially for women but it does well in terms of the remarriage of men. In terms of child custody, the average joint custody in the US is around 20%. The model does a good job in replicating this fact. In the model, around 18% of divorced couples choose to share custody of the children . The model also provides information on other statistics that are not used to match the model to the data which are summarized in Table VI. These statistics are marriages among individuals from the same cohort and marriages from different cohorts and the percentage of divorce men who have children in 2 households. In

<sup>4</sup>The median age gap at first marriage between man and woman is 2.3 years, see Díaz-Gimenez and Giolito, 2008.

<sup>5</sup>The median age for having a child is 25. If the ages considered are between 20 and 45, the share of individuals in each category is very similar.

the data 38% of men have remarried and have children in 2 households while in the model it is close to 30. The model overestimates marriages among individuals of the same generation but on the whole, it does quite well in replicating these statistics.

Table VI: Additional moments not used for calibration

	Data	Model
Marriage among young	34	44.67
Marriage Young woman-Old man	9	8.76
Marriage Young man-Old woman	5	6.13
Marriage among old	50	56.83
% of remarried men with children in 2 households	38	29.19

## 5 Discussion

### 5.1 Why choose joint custody?

When deciding whether to choose joint or shared custody in case of divorce, couples face a trade off between enjoying the child and affecting their remarriage probability. For women both sole and joint custody imply a cost in terms of their remarriage probabilities. Under both arrangements, the child remains in the mother's household and potential partners will have to pay a fixed cost  $\varphi$  if they marry, thus the child affects negatively the probability of remarriage. In terms of utility, joint custody implies that the utility she receives from the child is decreased to  $\tau$ 100 per cent of what she would enjoy him under sole custody. For men, under sole custody, there is no link between the father and the child. He does not get any utility from the child as they have no contact and the father does not have to pay any child support. Under joint custody the father enjoys  $(1 - \tau)$ 100 per cent of what he enjoyed the child under marriage. Now, the child is also present in the father's household and so the father's potential partners would pay the same fixed cost  $\varphi$  in case of remarriage.

The main advantage of joint custody is the fact that children might receive more education than under sole custody. The education that a child receives depends on both the mother's household income and the father's household income. Women would always prefer sole custody to joint custody if child custody arrangements had no effect on children's education. The importance of the father's income is determined by the share of time the child spends in his

household,  $(1 - \tau)$ . Thus if the ex-husband’s income is high relative to the woman’s, then joint custody is more likely. This is consistent with evidence presented in Cancian and Meyer (1998). They look at a sample of Wisconsin divorcees with physical custody arrangements and they find, among other things, that shared custody is more likely the higher the proportion of the couple’s income is generated by the father. On the other hand, couples where the woman is of relative higher income prefer sole custody. Sharing children’s custody implies a utility loss for the mother that is not compensated by the education the child would receive under joint custody.

## 5.2 Effects of Fecundity Differentials

In order to explore the effect of fecundity differentials on child custody arrangements, I vary the probability of meeting someone young,  $p$ . I look at the impact of changing this probability on the fraction of divorced couples choosing joint custody. Men who meet a young woman have the chance of having more children after a divorce. As having children from a previous marriage is costly for the new partner, the chances of marrying if the man has joint custody decrease. Therefore, if it becomes more likely to meet someone young, men will prefer not to have joint custody. In Table VII, there are several statistics for the benchmark case and for different values of the probability of matching with someone from the same cohort.

Table VII: Changing probability of meeting own cohort,  $p$

	$p = 0.6$	$p = 0.7$ (benchmark)	$p = 1$
% Marriage	43.22	56.21	80.45
% divorced women	16.04	10.62	4.88
% divorced men	14.21	9.82	4.58
% Never married	40.74	33.17	14.67
Remarriage of women as % of ever divorced	23.85	37.40	10
Remarriage of men as % of ever divorced	43.91	49.56	21.42
% of divorce choosing joint custody	11.18	18.19	50.84
Marriage among young	31.27	44.67	78.45
Marriage Young woman-Old man	8.55	8.76	0
Marriage Young man-Old woman	14.77	6.13	0
Marriage among old	42.61	56.83	82.46

First, I decrease the probability of meeting someone from your own cohort,  $p$  from 0.7 to 0.6. This implies that there is a higher probability of meeting someone young. When there is a higher probability of meeting someone young, the share of joint custody decreases from 18% in the benchmark case to around 11%.<sup>6</sup> There are more individuals divorcing in the hope of getting a better match and those who do divorce, prefer less joint custody to be able to remarry in the second period. Men's chances of having children are higher, thus divorce increases. As there are more divorcees, women are choosier and they will only marry the highest types. Thus in equilibrium it leads to lower remarriage rates. Now, I consider the extreme case where you can only meet with individuals from your own cohort. Therefore,  $p$  is equal to 1. This means that the probability of meeting a person from a different cohort is zero. In this case, the share of divorced parents agreeing on joint custody increases to 50%. When deciding child custody arrangements, couples decide by maximizing the couple's present value. Whether joint or sole custody is chosen depends on the husband's weight in the couple's utility with respect to that of the wife's. If there is a higher probability of meeting someone young, men prefer sole custody. Leaving sole custody to the mother increases men's chances of meeting a young woman and having more children, however, women do not gain anything from this increase in the probability of meeting someone young. When there is no possibility of meeting someone to have children with, couples choose shared custody more often. Men would like to keep this bond with children as they get utility from them. Divorce decreases as the marriage market opportunities are worse than before, as there is no possibility of remarrying and having more children.

### 5.3 Changing $\tau$

Now, I change the policy parameter,  $\tau$ . This parameter represents the time that a child spends in the mother's household under joint custody. In the benchmark economy, the time the child spent with the mother was equal to 80% of the total time. Now, I make it such that the time the child spends in each household is equal, therefore,  $\tau$  equals 0.5. Men have more utility from spending time with their children, thus they would prefer more joint custody. This increase in the share of time that children spend with their fathers affects women negatively. Thus women prefer less joint custody. This results in a small increase in the share of divorced couples choosing joint custody from 18% in the benchmark economy to almost 19% when  $\tau$  decreases to 0.5.

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<sup>6</sup>I have tried with different lower values of  $p$  than in the benchmark and the share of custody is lower than in the benchmark case.

However, if the share of time a child spends in the father’s household is 80 percent, joint custody decreases to 15.27%. The reason is that the woman gets much less utility than before and she still pays the cost of having children, therefore, she prefers sole custody rather than joint custody. Thus it seems that making the time split more equal between partners has small effect or even negative effects on the share of divorced couples with joint custody.

Table VIII: Changing  $\tau$

	$\tau = 0.2$	$\tau = 0.8$ (benchmark)	$\tau = 0.5$
% Marriage	46.86	56.21	47.85
% divorced women	11.81	10.62	12.19
% divorced men	9.74	9.82	10.21
% Never married	41.33	33.17	39.96
Remarriage of women as % of ever divorced	2.58	37.40	5.17
Remarriage of men as % of ever divorced	37.19	49.56	36.78
% of divorce choosing joint custody	15.27	18.19	18.98

## 5.4 Changing $\varphi$

The cost of having non-biological children in the household,  $\varphi$  is an important parameter. If it is too high, no individual would be willing to marry someone with children. This leads to low remarriages rates both for men and women and for higher share of joint custody among divorced couples. When  $\varphi$  equals 6, twice the amount in the benchmark economy, joint custody increases to 66%. Individuals with joint custody face a lower probability of remarrying and thus they prefer to keep the children.<sup>7</sup> When the cost associated with children for non biological parents is set to zero, the share of joint custody among divorced couples decreases to 8%. Women lose utility if they share custody, therefore, as the cost of bringing children into the marriage is zero, they prefer sole custody. However, in equilibrium, the remarriage rate of women decreases. They get enough utility from their children if they have sole custody so that they do not have to marry low type men. They become choosier than if they had to share custody.

<sup>7</sup>Fertility is exogenous in the model. This might change if people are allowed to choose how many children to have and they might decide on having no children.

Table IX: Changing  $\varphi$ 

	$\varphi=0$	$\varphi=3$ (benchmark)	$\varphi=6$
% Marriage	48.96	56.21	59.11
% divorced women	18.33	10.62	3.35
% divorced men	16.21	9.82	3.14
% Never married	32.72	33.17	37.54
Remarriage of women as % of ever divorced	29.41	37.40	13.38
Remarriage of men as % of ever divorced	49.09	49.56	25.14
% of divorce choosing joint custody	8.50	18.19	66.09

## 5.5 Further Robustness Checks

I also checked how sensitive the results are to changes in other parameters. I check how the benchmark statistics react to small changes in the weight of children  $\phi$  and to changes in the curvature of the utility from consumption,  $\sigma$ . The benchmark value of  $\phi$  is 1.8 and I consider  $\phi = 1.6$  and  $\phi = 2$ . The results do not differ significantly when the weight of children decreases. However, when the weight increases joint custody increases from 18% to around 21%. If the weight of children increases, men will prefer to have his children at home, thus I observe this increase in joint custody even if the increase in the weight is small. The results are more sensitive to changes in the curvature of the utility from consumption,  $\sigma$ . I try a higher value so that  $\sigma$  equals 0.24. The share of joint custody increases to 21%. Divorce and marriage are also affected but changes are not large. I also try a lower value,  $\sigma = 0.20$ . The share of joint custody decreases significantly to 13%. Thus this parameter seems to play a key role in matching the share of joint custody in the economy.<sup>8</sup>

## 5.6 Other mechanisms

I do not claim that fecundity differentials can account for the whole process of deciding on child custody arrangement. The decision is complicated and other factors play a role in accounting for this as well. I briefly discuss other factors that might favor women when deciding on child custody arrangements.

<sup>8</sup>More moments referring to the robustness checks can be found in the Appendix.

**Women are better at raising children.** Another explanation might be that women have a comparative advantage in raising children. Women still are the primary care givers of children, thus upon divorce, they would want to keep the children as they have made a large investment. However, we observe men spending more time with their children, thus this trend should have changed. Moreover, this behavior might be triggered by fecundity differentials. Siow (1998) proposes that the fact that women invest more time in raising children is an outcome of fecundity differentials. If women know they will not be able to have more children in the future, they will invest in their current children so that in case of divorce they are the ones who keep the child, while men do not see the need of investing on children as they can have more children in the future.

**Distribution of marital property.** Upon divorce, marital property has to be split between the members of the marriage. In the U.S., there are two types of distribution of property: Common property distribution and Equitable property distribution. Up to the 1970s, the majority of states had Common property distribution, which entitled each member to what they owned prior to the marriage, or fault was to play a role in the division of assets, or some states had explicit “two thirds” rules for property division. By the end of the 1970s the majority of states had moved to an equitable property distribution regime. Marital property is shared in a more equitable way under this regime (Rasul, 2003). If women were to receive a larger share of the marital property in case of sole custody, the share of joint custody should be affected by distributional regimes. Under this regime, women would like to remain sole custodians, however men would like to share custody. Thus, this mechanism has ambiguous effects on the share of joint custody.<sup>9</sup>

## 6 Conclusion

Even though U.S. child custody law moved towards a gender-neutral law in the mid-70s, still most of the children of divorced couples are under the custody of their mothers as children spend most of their time with the divorced mothers. The average split of custody is 80 % of time is spent with mother and 20% is spent with the father. Overall, 5 in 6 custodial parents

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<sup>9</sup>Several papers have analyzed the effects of different regimes on divorce, marriage and marriage-specific investments such as children and homeownership, Gray, 1998; Rasul, 2003; Stevenson, 2007, among others. However, they do not seem to suggest a link between child custody and a larger share of marital property nor any effect of marital property regimes on child custody.

are mothers, i.e., either the mother has sole custody or parents have joint custody but children spend more time with their mother. It is interesting to ask why this is the case and if this is the best arrangement for the children. In this paper I ask how biological differences between women and men affect child custody arrangements. I explore how the fact that men are fertile for a longer amount of time than woman interacts with the share of divorced couples choosing joint custody. Men have to marry a young fertile woman in order to have children. If a couple decides to divorce, they can remarry next period but their choice of child custody arrangement will affect their remarriage opportunities as non biological children are costly. Divorced men can have more children with a young woman, however, this is not an option for the divorced woman as she is not fertile anymore. Thus, they might decide on leaving sole custody to the mother. By changing the probability of meeting young women after a divorce, I have checked whether the possibility of remarrying a young fertile woman affects child custody. When this probability increases, there is less child custody. Thus, to some degree men prefer to give up their children for a chance of forming a new family. If the probability of meeting a young woman decreases, the share of joint custody increases. Men cannot form new families so they want to be linked to their previous children.

A key policy question is what happens if fathers were to spend more time with the child under joint custody. Increasing the time that the children spend with the father leads to a decrease in the share of joint custody. Women still bear the cost of children and they cannot have new children. The woman's loss of utility from spending less time with their children makes couples choose mother's sole custody. Even when children are costless in terms of remarriage, non-biological parents do not mind raising someone else's children, the share of joint custody decreases. Women become more picky as they enjoy their children and they do not have to marry low type men. Therefore, biological differences in terms of fecundity between women and men might play a role when couples decide on how to allocate children after a divorce. From a public policy perspective it is important to be aware of this as changes in public policy and law aiming at increasing joint custody might not have the desired effects on individuals' decisions.

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## 8 Appendix

### 8.1 Robustness checks

1. Changing the curvature of the utility function for consumption,  $\sigma$

Table X: Robustness check 1,  $\sigma$  changed

	$\sigma = 0.20$	$\sigma = 0.22$ (benchmark)	$\sigma = 0.24$
% Marriage	55.69	56.21	58.09
% divorced women	10.80	10.62	8.83
% divorced men	9.87	9.82	8.44
% Never married	33.52	33.17	33.08
Remarriage of women as % of ever divorced	37.62	37.40	42.77
Remarriage of men as % of ever divorced	51.54	49.56	49.81
% of divorce choosing joint custody	13.74	18.19	21.14

2. Changing the weight of children in the utility function,  $\phi$

Table XI: Robustness check,  $\phi$  changed

	$\phi= 1.6$	$\phi= 1.8$ (benchmark)	$\phi= 2$
% Marriage	55.54	56.21	58.14
% divorced women	10.64	10.62	8.83
% divorced men	9.82	9.82	8.38
% Never married	33.82	33.17	33.03
Remarriage of women as % of ever divorced	37.04	37.40	42.77
Remarriage of men as % of ever divorced	49.68	49.56	50.78
% of divorce choosing joint custody	18.19	18.19	21.14