Rising Cohabitation and Child Development*

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VERY PRELIMINARY

Abstract

Cohabitation rates of couples without children have steadily increased in the U.S. over the past 50 years. Yet, cohabitation rates of couples with small children have only increased for the less educated. What explains this differential rise in cohabitation rates by education and what are the implications for child investment and child outcomes? We show empirically that cohabiting women experience smaller childbirth penalties, work more in the labor market, and spend less time with their children as compared to married women. Subsequently, their children are less likely to obtain a college degree. To rationalize these facts, we build an overlapping generations model of marriage, cohabitation, and child development. Parents are altruistic towards their children and invest time and goods into their development. This, in turn, increases the probability that a child completes college. Couples can choose to separate in every period but married couples pay a divorce cost. Assets are split equally between spouses if couples were married prior to separation, but not if spouses previously cohabited. The model matches differences in hours worked, time, and money invested in children between married and cohabiting women. A comparison of the 1975 and 2015 steady states reveals that changes in the gender wage gap and the college premium are important drivers of the rise in cohabitation among less educated women with children over this period.

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1. Introduction

Over the past 50 years, in the United States (U.S.), the proportion of people's lives spent in marriage has fallen. At the same time, cohabitation rates have increased. While the rate of increase has been similar for college and non-college couples without kids, we document that for couples with young children, cohabitation rates have increased much faster among those without a college degree. What accounts for the differential rise in cohabitation by education and the presence of young children? Do these diverging family formation trends imply growing differences in parental child investments and child outcomes?

We begin by empirically documenting three stylized facts on marital arrangements (marriage or cohabitation), and child investments and outcomes. First, using an event study design, we show that cohabiting mothers in the U.S. experience lower and less persistent long-run child penalties than married mothers. This finding is robust if we control for maternal education. Next, we employ data from the American Time Use Survey and the Consumer Expenditure Survey to show that cohabiting couples invest less in their children relative to married partners. In particular, conditional on education, cohabiting mothers work longer hours and spent less time on primary childcare activities. In addition, they spend less money on activities and goods related to children. Third, to understand the potential implications for child outcomes, we analyze data from the Add Health survey that enable us to observe the cohabitation history of the mother and child outcomes during high school years up to adulthood. We show that maternal involvement in child's education is lower if the mother has ever cohabited or has at most a high school diploma. Moreover, controlling for school quality, children's ability and socioeconomic characteristics, children of mothers with a cohabitation history have a lower GPA on average and a lower probability of completing college. Therefore, the marital arrangements of the mother are an important determinant of child development.

Motivated by these facts, we develop an overlapping generations model in which partners choose whether to cohabit or marry and how much to invest in their children. Parents are altruistic towards their children and care about their children's lifetime utility. The life cycle is characterized by three periods. The last period is retirement. Partners start their life as a couple with children, draw a love shock and decide whether to marry or cohabit. Over the first two periods, parents choose their labor supply, savings and how much to invest in their children. Parental investment in children is time in period one and money in period two. This way, we capture that parental time with children is particularly important when children are young, whereas older children mainly benefit from money spent on tutors, private school or a good college. In every

period, couples can choose to separate. Married couples pay a divorce cost whereas cohabiters do not. In addition, married partners split assets equally upon divorce, while the lower earning cohabiting partner takes a smaller fraction of the accumulated assets.

We calibrate the model to the U.S. in 2015. The model matches educational differences in the time allocation of married and cohabiting women. In particular, it replicates the fact that college educated women work more and spend more time with their children conditional on being married or cohabiting. In turn, they supply less hours to produce home goods. College educated couples also invest more money in their children. Similarly, the model shows that conditional on education, married women work less and spend more time with children compared to cohabiting couples. The model therefore predicts that cohabitation reduces investments in children, which is consistent with our stylized facts. This implies that the probability of a child completing college is 11% lower in the model if a couple is high school educated. In addition, the probability of college completion is on average 13% lower if a mother has ever cohabited.

Finally, we ask whether the model can explain the rise in cohabitation among low educated couples with children between 1975 and 2015, but the absence of such a rise among college educated couples. We focus on three exogenous driving forces which may have changed couples' incentives to marry or cohabit over time. First, we allow for a decline in the gender wage gap. We focus on a decline in the gender fixed effect in the earnings equation.[1] This decline captures factors which have improved women's earnings potential over time, such as a reduction in discrimination or changes in occupational choice. The decline in the gender wage gap is likely to have reduced the gains from specialization, and thereby decreased the need to get married as opposed to staying in cohabitation. In addition, the decline in the gender wage gap decreases the consumption risk that results from separation, since it increases the living standard of single mothers. Therefore, marriage becomes less valuable as an insurance device which provides an equal asset division in separation. Second, we allow for a decline in the price of home appliances, which has been argued to have an important effect on women's time allocations by reducing the time needed for day-to-day chores in the home (e.g. Greenwood et al. (2005), Greenwood et al. (2016), Chiappori et al. (2017)). Our model captures how this could have affected the incentives to marry or cohabit. In particular, the declining price of home appliances pushes towards higher labor supply of women and decreasing specialization, both of which reduces the gain from marriage. Finally, our third driving force is the increase in the college premium. This is an income effect for college educated couples that makes specialization more affordable, whereas

[1]Note that our model also allows for returns to experience. As a result, there is an exogenous part of the gender wage gap, which we can vary through the gender fixed effect, and an endogenous part because of human capital accumulation.

the opposite is the case for high-school educated couples. In addition, the increasing college premium also leads to an increase in the returns from investing in children, since the returns from having a child which completes college rise.

We calibrate the 1975 steady state by adjusting the college premium for men and women and the initial gender wage gap for high school and college educated individuals as observed in the data. In addition, we account for the fact that the quality-adjusted price of market inputs in the production of home goods was roughly three times as large in 1975 than in 2015. The model predicts that cohabitation rates for college educated couples with children are pretty much unchanged in the two steady states. However, the effect on cohabitation rates of high school educated couples is large. Both the initial gender wage gaps and the college premium increase the differences in labor market returns for men and women relative to 2015. As a result, it becomes optimal for some high school women to marry in 1975, but not in 2015. Higher gender differences in labor market returns imply that the added value of an equal asset split from marriage is much higher for women in 1975 compared to 2015.

The stylized model presented in this paper captures our motivational fact that cohabitation for couples with children has only increased among less educated couples and not for college educated couples. We show both empirically and theoretically that these changes in marriage versus cohabitation decisions have implications for child investments and child outcomes. In particular, cohabiting couples invest less in children since an unequal asset division and lower separation costs lead to less stable relationships. As a result, cohabiting women are less likely to stay out of the labor force and forego labor market experience. This, in turn, leads to lower investment in children.

Related Literature This paper belongs to a rapidly growing literature that goes back to Brien et al. (2006), Adamopoulou (2010), Gemici and Laufer (2012) and Wong (2016) and studies the decision of spouses to cohabit or marry. More recently, Blasutto (2020) analyzes the rise of cohabitation among less educated individuals in the United States. He shows that income volatility and the college premium contribute to the rise in cohabitation among non-college couples. Blasutto and Kozlov (2020) argue that unilateral divorce laws also contributed to rising cohabitation since it decreases marriage gains from risk sharing.

Our framework differs from these papers by focusing on the role of child investments and their implications for children's college attainment. Studying child investments is important for two reasons. First, changes in the returns to child investment - for example because of the rising college premium - may have been an important driving force which changed the incentives to

marry or cohabit. Second, there have been concerns that increased cohabitation rates might have adverse consequences on children. Since we explicitly model child investments, our model can speak to these issues.

Our work is also related to a literature that studies the effect of divorce laws on savings and labor supply during marriage. Voena (2015) first studied the impact of U.S. divorce laws that change the way assets are split upon divorce on married couples. Bayot and Voena (2014) study the effect of prenuptial agreements in Italy where couples can choose between a community property and a separate property regime upon getting married. In our framework, there are two key differences between marriage and cohabitation. First, married couples pay divorce costs. Second, assets are split equally in divorce, but unequally if a cohabiting couple splits, which captures that cohabiting couples cannot commit to an equal asset division due to the lack of legal arrangements. Therefore, assets in marriage provide insurance for lower earnings spouses and lead to the fact that married women make larger couple specific investments in the form of more time spent on children and the production of the home good compared to cohabiting women. This mechanism was recently proposed by Lafortune and Low (2020) who develop a stylized model in which spouses can invest in a public good during marriage at the cost of future earning. In this setup, higher savings lead to more specialization in marriage as they insure the lower earnings spouse for against future earnings losses.

Our paper relates to a large literature that studies the career costs of children (Adda et al. (2017)) as well. In particular, Kleven et al. (2019a) and Kleven et al. (2019b) document that childbirth is accompanied by large and persistent reductions in earnings for women using an event study design. Kuziemko et al. (2018) show that these earnings penalties exist for both college and non-college women and that earnings losses are larger for less educated women. Berniell et al. (2020b) extend the results to 29 European countries and show that women take up more part-time work and flexible work arrangements after childbirth and that these effects are also present for highly educated women. We contribute to this literature by documenting that long-run earnings penalties for married women in the U.S. are almost twice as large as those of cohabiting women.

We also connect to a vast literature studying parental investments in children and their implications for child outcomes that is not yet fully acknowledged in this preliminary version of our working paper. However, we want to point to a few important studies that relate to our quantitative model. Abbott et al. (2019), Bolt et al. (2019), Yum (2019) and Daruich (2020) study parental investments and the effects on child development in an overlapping generations framework. We build on their work by explicitly modeling the difference between cohabiting and married cou-

ples. Blandin and Herrington (2020) show that the probability of college completion depends on parental investment into kids and that low educated and low resource households invest less into their children, which increases the college completion gap between children from low and high resource families. In our framework low resource and less educated couples are more likely to cohabit which, in turn, leads to lower investments in children. Finally, Caucutt and Lochner (2020) emphasize the importance of financial constraints in a dynastic framework of human capital investment. We abstract from borrowing in our setup and thus both the gender wage gap and the college premium will drive differences in child investments.

More generally, this paper belongs to a macroeconomic literature that studies the departs from modeling one-earner households and studies marriage, labor supply choices, and the impact of children from the perspective of a dual-earner household.[2] Our framework is an important extension of these macroeconomic studies as it develops a framework that does not only match labor supply over the life cycle, but also investments in children. These investments determine the wages, marriage and labor supply choices for the next generation.

The paper is organized as follows: Section 2 documents the rise in cohabitation by education and important facts that motivate the mechanism of our model. Section 3 describes a stylized overlapping generations model of marriage, cohabitation, and child investment. Section 4 provides details about the model calibration and section 5 summarizes the results of the benchmark economy and the steady state comparison. We provide an outlook for the next steps for this project in section 6. Finally, Section 7 concludes.

2. Stylized Facts

Marriage rates have declined since the 1970s, yet couples continue to form unions at about the same rate as in previous decades. Now, however, more of these first unions are cohabiting relationships rather than formal marriages (Bumpass and Sweet, 1989). Over half of first unions formed in the early 1990s began with cohabitation (Bumpass and Lu, 2020).

2.1 Rising Cohabitation

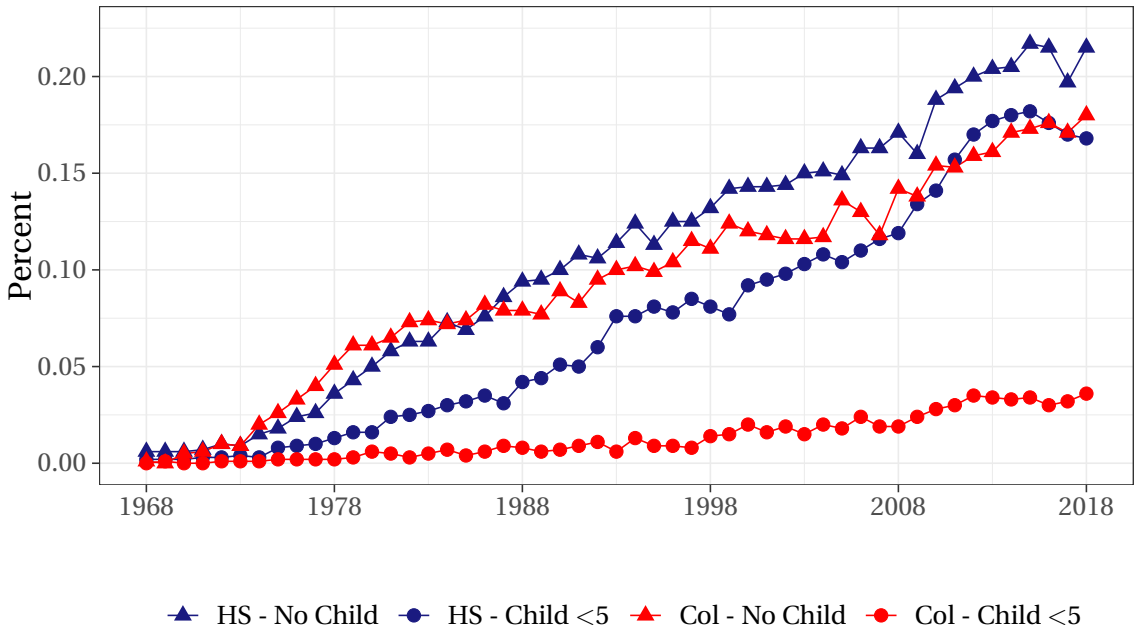
We use data from the CPS March Supplement (CPS-ASEC) to identify cohabitation trends over time. Cohabiting couples cannot be directly identified from the CPS data prior to 2007. In 2007, the CPS introduced a question asking unmarried respondents in households with unrelated

[2] Guner et al. (2012), Bick and Fuchs-Schündeln (2018), Alon et al. (2019), Obermeier (2019), Guner et al. (2020), and Hannusch (2020).

adults: "Do you have a boyfriend, girlfriend or partner in this household?" The same question was posed about all other unmarried adults in the household except persons identified as the unmarried partner of the household head.

To identify cohabiting couples prior to 2007, we employ a simple two step identification strategy. First, we identify households in which the marital status of the household head is *not* 'married with a spouse present'. We restrict this sample to households with one additional opposite sex adult whose age is within 15 years of the age of the household head and who is not identified as a relative of the household head. This restriction identifies 98.35% of all cohabiting couples. Between 1995 and 2007, we use the variable 'relate' to cross-check that we have indeed identified all cohabiting couples where one member of the couple is the household head. In a second step, we identify couples in households where neither spouse is reported to be the household head. To do so, we consider households in which the household head has the martial status 'married with a spouse present' (excluded in the previous step). We then check whether two opposite-sex adults are present in the household and whether at least one of them is a non-relative to the household head. The most typical type of household we identify this way is a son or daughter living with their parents and their cohabiting romantic partner.

Figure 1: Cohabitation Rates Among Individuals Living in Couples, 1968-2018



Notes: Data from CPS-ASEC 1968-2018.

Figure 1 summarizes the results. Our sample consists of all men and women ages 25-44 who

are living in a couple (married or cohabiting). We consider four types of individuals: high school and college educated individuals, both without small children (less than the age of five) and those with small children. Prior to 1970, cohabitation was virtually non-existent, that is, the number of households with an unmarried household head and an unrelated adult living in the household is virtually zero. Between 1968 and 2018, the fraction of individuals living in cohabiting couples has increased to roughly 20% for all couples except for college educated couples with small children. Even in 2018, less than 5% of college educated individuals with a small child cohabited. The data suggests that the presence of small children in the household reduces cohabitation among college educated couples, but not high school educated ones. On the other hand, without small children in the household, there are no educational differences in cohabitation rates. We therefore focus on couples with small children to try and understand educational differences in cohabitation rates.

2.2 Child Penalties for Cohabiting Mothers

A well established stylized fact in the economics literature is the high career cost that children entail for women but not for men (Adda et al. (2017)). Child penalties in earnings are widespread among women all around the world, both in developed (Kleven et al. (2019b), Berniell et al. (2020b)) and developing countries (Berniell et al. (2020a)). This is the case also among women in the US, even those with high educational attainment (Kuziemko et al. (2018)). However, less is known on whether child penalties for women differ according to their marital arrangement, i.e. whether the birth of the first child affects the earnings of cohabiting and married women in the same way. Cohabiting couples face a higher risk of relationship breakdowns as separation is less costly for them. Moreover, unlike married women, they are not legally ensured an equal division of assets upon separation. As a result, cohabiting women may be less willing to forego valuable labor market experience after child birth.

To investigate this possibility, we adopt the quasi-experimental approach of Kleven et al. (2019a) and estimate event studies around the birth of the first child using data from the PSID in the period 1976–2018. PSID is an ideal dataset for this purpose as it allows us to follow people over time and to precisely identify cohabiting couples (as opposed to roommates) in order to perform the event study separately for married and cohabiting women. Given that marital status is endogenous (couples may decide to get married after childbirth) we use the marital status at childbirth (t=0) to define married/cohabiting women. Moreover, the PSID contains detailed information on individual's labor earnings. Earnings are defined as total labor income before taxes and transfers, including farm income, business income, wages, bonuses, overtime pay,

commissions, as well as income from professional practice and roamers and boarders. Reported earnings refer to the year prior to the interview. Therefore, in our sample we assign earnings of each individual to the previous period. Following Kleven et al. (2019b) we set earnings equal to zero for those who do not work, i.e. we consider in our analysis both the intensive (work less or earn lower wage) and the extensive margin (become unemployed or exit the labor force). We restrict our sample to men and women who had their first child at age 20–45 and that we are able to observe both before and after child birth, for at least eight times over the entire event-study horizon. We follow closely the specification of Kleven et al. (2019b) and include event-time dummies, age dummies (to control for life cycle trends), and year dummies (to control for time trends).[3] Variation in the age at which each individual has the first child allows us to identify all three sets of dummies. We estimate the effect of children on earnings relative to the year before the first childbirth (t=-1 is the reference year).

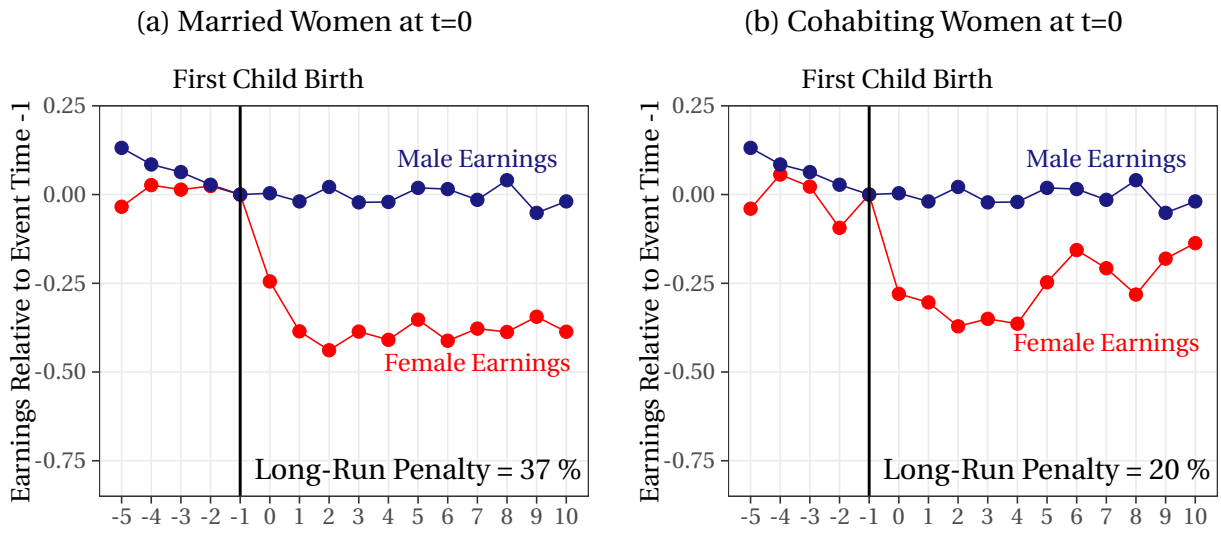
Figure 2 shows the results for married and cohabiting men and women. In line with the literature, we do not detect any child penalty in men's earnings while there is a negative, statistically significant effect on women's earnings. However, child penalties of cohabiting women are smaller and less persistent than those of married women (20% versus 37%). In other words, cohabitation leads to lower intra-household specialization due to the high risk of separation and the unequal division of assets, as we demonstrate in Section 3.

2.3 Child Investments

Differences in the labor market attachment between cohabiting and married women may be translated into differences in child investement. Indeed, using data from the American Time Use Survey (ATUS) we document that cohabiting and married couples invest different amounts of time into their children. Data from the ATUS can be combined with CPS-ASEC data, so that we can use the same definition to identify cohabiting couples as outlined above. Table 1 reports time use averages from the ATUS between 2003 and 2018 for cohabiting and married women by education. It shows that conditional on education, mothers with small children (less than 5 years old) work more hours and spend less time with children. In addition, they spend slightly more time on Non-Market Work and Leisure. Note that the time allocation differences are more pronounced among mothers with a college degree compared to high school educated mothers. Our results relate to Guryan et al. (2008) who document that time investments in children are increasing in education. We complement their findings by documenting that time spent with children is higher when women are married rather than cohabiting.

[3] We thank Kleven et al. (2019b) for sharing their code with us.

Figure 2: Child Penalties



Notes: PSID data 1976–2018. Percentage effects of parenthood on earnings across event time t. Long-run child penalties defined as the average penalty from event time five to ten. Earnings=0 if not working.

		College	High School
Hours Worked	Cohabiting	25.54	17.73
	Married	22.45	16.41
	Δ	*3.09*	*1.32*
Time With Children	Cohabiting	17.67	15.93
	Married	21.95	18.15
	Δ	*-4.28*	*-2.22*
Non Mkt + Leisure	Cohabiting	59.38	65.68
	Married	57.90	64.82
	Δ	*1.48*	*0.86*

Table 1: Time Allocations of Women 25-44 with Children < 5

Notes: ATUS data 2003–2018. The sample is restricted to women ages 25-44 who have a child less than the age of 5 in the household. 'Non Mkt + Leisure' is the sum of weekly hours spent on home production and leisure time.

2.4 Child Outcomes

A large strand of the human capital formation literature has emphasized the role of early life investments in children for their success later on (Heckman (2000), Cunha and Heckman (2007)). More recently, Carneiro et al. (2020) have showed that investments during teenage years also matter and as a result, a balanced stream of investments throughout children's life may be optimal. Similarly, Caucutt and Lochner (2020) emphasize the complementarity between early and late human capital investments. Given that cohabiting mothers tend to spend less time with their children, this may have direct implications on children's development (grades at school, probability of college enrollment and completion). Empirical evidence on this aspect is scarce due to the demanding requirements in terms of data, i.e. the need to observe the cohabitation history of the mother as well as children's development at various stages of their life up until adulthood. We fill this gap using data from AddHealth, a longitudinal survey of a representative sample of high school students (average age 16) in the US who are followed up to their adulthood (average age 30). We use information from the in-home surveys in Wave I and Wave IV. The Wave I survey took place in 1994 while children were at high school and contains rich information on their GPA, a proxy of ability (Peabody Picture Vocabulary Test) as well as parental education and parental involvement (work together on a school project) as reported by the child. The Wave IV survey took place in 2008 and allows us to observe the educational and labor market outcomes of these children at age 30, including whether they completed college. In Wave I, also a parent, who in the vast majority was the mother, filled-in a questionaire. In this way we obtain information on the cohabitation history of the mother (considering her three most recent partners) as well as on household income.

The analysis of the time use survey data showed that cohabiting mothers with children less than 5 years old spend on average less time with their children than married mothers. However, mothers may trade quantity for better quality of time (Hsin and Felfe (2014)). We use information on maternal involvement from Add Health to examine (i) whether the difference between cohabiting and married mothers in the amount of time spent on children persists when the children go to high school and (ii) whether the difference reflects less "quality" rather than just quantity of time. More specifically, children in wave I reported whether they had worked with their mother on a school project in the past 4 weeks (13.5% on average answered "yes"). We use this variable as a measure of mother's involvement in the education of the child and run a regression (linear probability model) on her cohabitation history (a dummy variable that equals 1 if the

mother cohabited with any of her three most recent partners) and education (a dummy variable that equals 1 if the mother completed at most high school) including school fixed effects. We also control for the child's gender, age, race, a proxy of ability (Peabody Picture Vocabulary Test) as well as father's education and household income. Table 2, column (1) presents the results. Indeed, the probability that the child works with the mother on a school project is lower if the mother has cohabited or has at most a high school diploma. Moreover, the child's GPA at high school, measured as the average grade in English, Math, History and Science, decreases (column 2). Consequently, the child's probability of college completion by age 30 decreases by more than 10% if the mother has cohabited or has at most a high school diploma (column 3). This is substantial, as the average college completion rate in our sample is around 40%.

These findings suggest that mother's marital arrangements are as important as her education in determining child outcomes. In the next section we build a model that illustrates the underlying mechanisms and is able to replicate these stylized facts.

	Maternal Involvement	GPA	College Completion
	(1)	(2)	(3)
Mother Ever Cohabited	-0.05**	-0.20***	-0.10***
	(0.02)	(0.06)	(0.03)
Mother High School or Less	-0.05***	-0.11***	-0.13***
	(0.01)	(0.03)	(0.02)
School FE	✓	✓	✓
N	5,374	5,374	5,374
adj. R^2	0.05	0.23	0.26

Table 2: Child Development

Notes: Add Health Data, Waves I and IV. Standard errors in parenthesis clustered at the school level, survey weights used. Maternal involvement is a dummy=1 if the mother worked with the child on a school project in the past 4 weeks and is reported by the child in Wave I (while at high school); GPA is the child's average grade in English, Math, History and Science in Wave I as reported by the child; College completion is a dummy=1 if the child completed college or more by Wave IV (average age 30). Regressions include school fixed effects. Additional controls: gender, age, race, ability (Peabody Picture Vocabulary Test), father's education, household income.

3. A Stylized OLG Model

In this section, we develop a three-period overlapping generations model of marriage, cohabitation, and child investment. Individuals' value functions are distinguished from couples' value functions by a tilde.

3.1 Decision of Young Couples

Assume that individuals are born with a gender $g \in \{m, f\}$ and an education $e \in \{col, hs\}$. At the beginning of period 1, they each draw a productivity shock z from a distribution $F_0(z|e)$. Then everyone is coupled according to a matching function $\Omega(z^*, e^*, g^*|z, e, g)$ which gives the probability an individual with productivity shock z, education e and gender g is matched to an opposite gender individual with productivity shock z^* and education e^*. The couple draws a love shock γ from the distribution $\Gamma_0(\cdot)$.

All couples have two kids: a boy and girl. Children are identical aside from gender and treated identically. A young couple's state consists of their assets, a, mother's human capital, h, children's human capital, h^k, labor productivity shock vector, $\mathbf{z}$, love shock, γ, and permanent education vector, $\mathbf{e}$. Let $x \equiv (a, h, h^k, \mathbf{z})$. The productivity of the mother depends on her human capital h and her labor productivity draw z^f. Assume that at the beginning of period 1 couples start with zero assets, the human capital of the mother is given by $h = \omega_f^Y(e^f)$ and the human capital of the children is set at zero.

After learning their state vector, couples decide to marry or cohabit. The decision to marry or cohabit is given by $M(x, \gamma; \mathbf{e})$ which is equal to 1 if the value of being a young married couple, $V_1^M(x, \gamma; \mathbf{e})$, is greater than the value of being a young cohabiting couple, $V_1^C(x, \gamma; \mathbf{e})$.

The expected lifetime utility of a young individual with education e and gender g is

$$\tilde{V}_1(e, g) = \int_z \int_{(z^*, e^*)} \int_\gamma \Big\{ M(0, h, 0, \mathbf{z}, \gamma; \mathbf{e}) \tilde{V}_1^M(0, h, 0, \mathbf{z}, \gamma; \mathbf{e}, g) + [1 - M(0, h, 0, \mathbf{z}, \gamma; \mathbf{e})] \tilde{V}_1^C(0, h, 0, \mathbf{z}, \gamma; \mathbf{e}, g) \Big\} dF_0(z|e) d\Omega(z^*, e^*, g^*|z, e, g) d\Gamma_0(\gamma) \quad (1)$$

where $\tilde{V}_1^M(0, h, 0, \mathbf{z}, \gamma; \mathbf{e}, g)$ and $\tilde{V}_1^C(0, h, 0, \mathbf{z}, \gamma; \mathbf{e}, g)$ are the utilities of a young married and cohabiting individual with state $(a = 0, h = \omega_f^Y(e^f), h^k = 0, \mathbf{z}, \gamma; \mathbf{e}, g)$ and are defined below.

Young married couple with children A young married couple with children chooses the private consumption of both parents, $\{c^m\ c^f\}$, home goods, d, assets, a', and time that the mother spends with the children and on home production, $\{\tau_k^f, \tau_n^f\}$. Each parent has one unit of time. The time spent on children and home production by the father, $\{\tau_k^m, \tau_n^m\}$, are exogenous. Time

not spent on home production or children is spent on market work. Time spent on home production includes leisure time.

Time spent with children increases their human capital next period $h^{k\prime}$. The child human capital production function is given by $H^{k1}(h^k, \tau_k^f, \tau_k^m, \mathbf{e})$ and is increasing in all it's arguments. The women's human capital next period h' depends on her current human capital h, time spent on market work $1-\tau_n^f-\tau_k^f$ and her education e^f. It is increasing in all three arguments. Thus, holding all else equal, women's time spent with children reduces their future labor market capital. In this sense women can sacrifice their own future human capital, h', to increase that of their children's, $h^{k\prime}$.

If the couple decides to divorce at the beginning of period 2 they incur utility cost ν and split assets according to the asset-splitting rule during divorce from marriage which designates $s^M(a', g)$ of total assets a' to the gender g spouse. In divorce, children always go with the woman. After deciding to divorce the couple draws a child support transfer amount o that must be paid by the man to the woman from the distribution $O^M(\cdot|\mathbf{e})$. The couple solves

$$
\begin{aligned}
V_1^M(x,\gamma;\mathbf{e}) = \max_{c^m\, c^f, d, a' \geq 0, \tau_k^f, \tau_n^f} & \theta^m u(c^m, n) + \theta^f u(c^f, n) + \gamma \\
& + \beta \int_{\mathbf{z}'} \int_{\gamma'} \Big\{ D_2(x', \gamma'; \mathbf{e}) \int_{o'} \big[\theta^m \tilde{V}_2^{DS}(s^M(a', m), h', h^{k\prime}, \mathbf{z}', o'; \mathbf{e}, m) \\
& + \theta^f \tilde{V}_2^{DS}(s^M(a', f), h', h^{k\prime}, \mathbf{z}', o'; \mathbf{e}, f) - \nu \big] dO^M(o'|\mathbf{e}) \\
& + \big[1 - D_2(x', \gamma'; \mathbf{e})\big] V_2^M(x', \gamma'; \mathbf{e}) \Big\} d\Gamma(\gamma'|\gamma) dF(\mathbf{z}'|\mathbf{z}; \mathbf{e}),
\end{aligned} \tag{2}
$$

subject to

$$
\begin{aligned}
c^m + c^f + pd + a' &= w\omega_Y^m(e^m)\exp(z^m)(1-\tau_n^m-\tau_k^m) + wh\exp(z^f)(1-\tau_n^f-\tau_k^f) + (1+r)a, \\
n &= [\kappa d^\xi + (1-\kappa)(\tau_n^m + \tau_n^f)^\xi]^{1/\xi}, \\
h^{k\prime} &= H^{k1}(h^k, \tau_k^f, \tau_k^m, \mathbf{e}), \\
h' &= H(h, 1-\tau_n^f-\tau_k^f; e^f),
\end{aligned}
$$

where $D_2(x', \gamma'; \mathbf{e})$ equals 1 if the couple divorces at the beginning of period 2 and zero otherwise. $\tilde{V}_2^{DS}(s^M(a', f), h', h^{k\prime}, \mathbf{z}', o'; \mathbf{e}, g)$ is the value of being a divorced or separated individual in period 2 (net of the utility cost of divorce) and having assets $s^M(a', g)$. Notice that the couples weight their individuals utilities with the same weights, $\{\theta^m, \theta^f\}$, in marriage as in divorce. Here, p is the price of home goods d. Home goods are combined with time to produce non-market goods n. The man and woman's time are perfect substitutes in home good production.

The value of being a young married individual of gender $g \in \{m, f\}$ is denoted by $\tilde{V}_1^M(x, \gamma; \mathbf{e}, g)$ and given by

$$\begin{aligned}\tilde{V}_1^M(x,\gamma;\mathbf{e},g) =& u(c^g, n) + \gamma \\ &+ \beta \int_{\mathbf{z}'} \int_{\gamma'} \Big\{ D_2(x', \gamma'; \mathbf{e}) \int_{o'} [\tilde{V}_2^{DS}(s^M(a', g), h', h^{k\prime}, \mathbf{z}, o'; \mathbf{e}, g) - \nu] dO^M(o'|\mathbf{e}) \\ &+ \big[1 - D_2(x', \gamma'; \mathbf{e})\big] \tilde{V}_2^M(x', \gamma'; \mathbf{e}, g) \Big\} d\Gamma(\gamma'|\gamma) dF(\mathbf{z}'|\mathbf{z}; \mathbf{e})\end{aligned} \tag{3}$$

where the decision rules are determined by the couple problems and $\tilde{V}_2^M(x', \gamma'; \mathbf{e}, g)$ is the value of being a middle-aged married individual with state $(x', \gamma'; \mathbf{e}, g)$.

Young cohabiting couple with a child Young cohabiting couples differ from young married couples in three ways. They do not incur a utility cost from separation. They have a different asset splitting rule in separation, $s^C(a', g)$. The asset splitting rules are such that, compared to asset splitting in divorce from marriage, asset splitting in separation from cohabitation favors relatively more the higher income (male) partner. They have a different child support rule such that child support transfers are drawn from distribution $O^C(\cdot|\mathbf{e})$.

A young cohabiting couple with a child chooses the private consumption of both parents, $\{c^m\, c^f\}$, home goods, d, assets, a', and time that the mother spends on the child and on home production, $\{\tau_k^f, \tau_n^f\}$, by solving

$$\begin{aligned}V_1^C(x,\gamma;\mathbf{e}) =& \max_{c^m\, c^f, d, a' \geq 0, \tau_k^f, \tau_n^f} \theta^m u(c^m, n) + \theta^f u(c^f, n) + \gamma \\ &+ \beta \int_{\mathbf{z}'} \int_{\gamma'} \Big\{ S_2(x', \gamma'; \mathbf{e}) \int_{o'} \big[\theta^m \tilde{V}_2^{DS}(s^C(a', m), h', h^{k\prime}, \mathbf{z}', o'; \mathbf{e}, m) \\ &+ \theta^f \tilde{V}_2^{DS}(s^C(a', f), h', h^{k\prime}, \mathbf{z}', o'; \mathbf{e}, f)\big] dO^C(o'|\mathbf{e}) \\ &+ \big[1 - S_2(x', \gamma'; \mathbf{e})\big] V_2^C(x', \gamma'; \mathbf{e}) \Big\} d\Gamma(\gamma'|\gamma) dF(\mathbf{z}'|\mathbf{z}; \mathbf{e})\end{aligned} \tag{4}$$

subject to

$$\begin{aligned}c^m + c^f + pd + a' &= w\omega_Y^m(e^m)\exp(z^m)(1 - \tau_n^m - \tau_k^m) + wh\exp(z^f)(1 - \tau_n^f - \tau_k^f) + (1 + r)a \\ n &= [\kappa d^\xi + (1 - \kappa)(\tau_n^m + \tau_n^f)^\xi]^{1/\xi} \\ h^{k\prime} &= H^{k1}(h^k, \tau_k^f, \tau_k^m, \mathbf{e}) \\ h' &= H(h, 1 - \tau_n^f - \tau_k^f; e^f)\end{aligned}$$

where $S_2(x', \gamma'; \mathbf{e})$ equals 1 if the couple separates at the beginning of period 2 and zero other-

wise.

The value of being a young cohabiting single of gender $g \in \{m, f\}$ is denoted by $\tilde{V}_1^C(x, \gamma; \mathbf{e}, g)$ and given by

$$\begin{aligned}\tilde{V}_1^C(x,\gamma;\mathbf{e},g) =& u(c^g, n) + \gamma \\ &+ \beta \int_{\mathbf{z}'} \int_{\gamma'} \Big\{ S_2(x', \gamma'; \mathbf{e}) \int_{o'} [\tilde{V}_2^{DS}(s^C(a', g), h', h^{k\prime}, \mathbf{z}, o', \gamma; \mathbf{e}, g)] dO^C(o'|\mathbf{e}) \\ &+ \big[1 - S_2(x', \gamma'; \mathbf{e})\big] \tilde{V}_2^C(x', \gamma'; \mathbf{e}, g) \Big\} d\Gamma(\gamma'|\gamma) dF^M(\mathbf{z}'|\mathbf{z}; \mathbf{e})\end{aligned} \tag{5}$$

where the decision rules are determined by the couple problems and $\tilde{V}_2^C(x', \gamma'; \mathbf{e}, g)$ is the value of being a middle-aged cohabiting individual with state $(x', \gamma'; \mathbf{e}, g)$.

3.2 Decision of Middle-Aged Couples

At the beginning of period 2, married and cohabiting couples observe their period values of (x, γ) (they do not observe child support transfers in the event of divorce/separation, o) then decide whether to remain married/cohabiting or divorce/separate. The decision to divorce is denoted by $D_2(x, \gamma; \mathbf{e})$ and the decision to separate is denoted by $S_2(x, \gamma; \mathbf{e})$. These decision rules equal 1 if the couple divorces/separates and 0 if they stay together. The decision is determined by comparing the value of staying married/cohabiting for an individual $\tilde{V}_2^X(x, \gamma, \mathbf{e}, g)$ with $X \in \{M, C\}$, with the expected values of being divorce/separated. The expected value of being divorced for an individual with gender g who is in a marriage with $x = (a, h, h^k, \mathbf{z})$ is given by

$$\int_o \tilde{V}_2^{DS}(s^M(a, g), h, h^k, \mathbf{z}, o; \mathbf{e}, g) dO^M(o|\mathbf{e}) - \nu$$

and the expected value of being separated for an individual with gender g in a cohabiting union with $x = (a, h, h^k, \mathbf{z})$ is given by

$$\int_o \tilde{V}_2^{DS}(s^C(a, g), h, h^k, \mathbf{z}, o; \mathbf{e}, g) dO^C(o|\mathbf{e}).$$

If either spouse prefers to divorce/separate the couple divorces/separates (unilateral divorce).

Middle-aged married/cohabiting couple with children Like young couples, middle-aged married/cohabiting couples may decide to divorce/separate at the beginning of the next period. Middle-aged married and cohabiting couples' are similar to young couples except for two differences. First, their child human capital technology, $H^{k2}(h^k, d^k, \mathbf{e})$, depends on goods, d^k, instead of parents' time. Second, there is no expectation over child support payments in period 3 in the event of divorce/separation. This is because in period 3 children have become adults. As when

young, cohabiting and married couples have different asset splitting rules and utility costs from separation.

The problem of a middle-aged couple with marital status $X \in \{M, C\}$ is given by

$$V_2^X(x,\gamma;\mathbf{e}) = \max_{c^m\, c^f, d, a' \geq 0, d^k, \tau_n^f} \theta^m u(c^m, n) + \theta^f u(c^f, n) + \gamma \tag{6}$$

$$+ \beta \int_{\gamma'} \Big\{ D_3(a', h^{k\prime}; \mathbf{e}) [\theta^m \tilde{V}_3^{DS}(s^X(a', m), h^k; \mathbf{e}, m) \tag{7}$$

$$+ \theta^f \tilde{V}_3^{DS}(s^X(a', f), h^k; \mathbf{e}, f) - \nu \mathbb{1}_{X=M}] \tag{8}$$

$$+ [1 - D_3(a', h^{k\prime}; \mathbf{e})] V_3^X(a', h^{k\prime}; \mathbf{e}) \Big\}\, d\Gamma(\gamma'|\gamma) \tag{9}$$

subject to

$$\begin{aligned} c^m + c^f + pd + p^k d^k + a' &= w\omega_G^m(e^m)\exp(z^m)(1-\tau_n^m) + wh\exp(z^f)(1-\tau_n^f) + (1+r)a \\ n &= [\kappa d^\xi + (1-\kappa)(\tau_n^m + \tau_n^f)^\xi]^{1/\xi} \\ h^{k\prime} &= H^{k2}(h^k, d^k, \mathbf{e}) \\ h' &= H(h, 1-\tau_n^f; e^f) \end{aligned}$$

where $X = M$ if the couple is currently married and C if the couple is currently cohabiting. The function $D_3(a', h^{k\prime}; \mathbf{e})$ equals 1 if the couple decides to divorce/separate at the beginning of period 3 and zero otherwise. $\mathbb{1}_{X=M}$ is an indicator function at that equals 1 if $X = M$ and zero otherwise. $\tilde{V}_3^{DS}(s^X(a', g), h^k; \mathbf{e}, g)$ is the value of being an individual with marital status X in period 2 (net of the utility cost of divorce) and having assets $s^X(a', g)$.

The value of being a middle-aged individual with marital status $X \in \{M, C\}$ and gender $g \in \{m, f\}$ is

$$\tilde{V}_2^X(x,\gamma;\mathbf{e}) = u(c^g, n) + \gamma \tag{10}$$

$$+ \beta \int_{\gamma'} \Big\{ D_3(a', h^{k\prime}; \mathbf{e}) [\tilde{V}_3^{DS}(s^X(a', g), h^k; \mathbf{e}, g) - \nu \mathbb{1}_{X=M}] \tag{11}$$

$$+ [1 - D_3(a', h^{k\prime}; \mathbf{e})] \tilde{V}_3^X(a', h^{k\prime}; \mathbf{e}, g) \Big\}\, d\Gamma(\gamma'|\gamma) \tag{12}$$

where $\tilde{V}_3^X(a', h^{k\prime}; \mathbf{e}, g)$ is the value of being a retired individual with marital status X and state $(a', h^{k\prime}; \mathbf{e}, g)$.

Middle-aged divorced/separated couple with children When a couple is divorce/separated the assumption is that that children live with the mother and she makes all the decisions about the amount of goods invested in them, d^k. Even though the couple is divorced/separated, they

are still connected in that both parents still care about the child. However, for simplicity, it is assumed that no transfers are made between the parents except the exogenous amount o transferred from the father to the mother. Divorce/separated individuals remain single for the rest of their lives.

The problem of a middle-aged divorced/separated woman with children is

$$\tilde{V}_2^{DS}(x,o;\mathbf{e},f) = \max_{c^f,d,a'\geq 0,d^k,\tau_n^f} u(c^f,n) + \beta V_3^{DS}(a',h^{k\prime};\mathbf{e},f) \tag{13}$$

subject to

$$\begin{aligned} c^f + pd + p^k d^k + a' &= wh\exp(z^f)(1-\tau_n^f) + (1+r)a + o \\ n &= [\kappa d^\xi + (1-\kappa)(\tau_n^f)^\xi]^{1/\xi} \\ h^{k\prime} &= H^{k2}(h^k, d^k, \mathbf{e}) \\ h' &= H(h, 1-\tau_n^f; e^f) \end{aligned}$$

The problem of a middle-aged divorced/separated man who had children in his marriage is

$$\tilde{V}_2^{DS}(x,o;\mathbf{e},m) = \max_{c^m,d,a'\geq 0} u(c^m,n) + \beta V_3^{DS}(a',h^{k\prime};\mathbf{e},m) \tag{14}$$

subject to

$$\begin{aligned} c^m + pd + a' + o &= w\omega_G^m(e^m)\exp(z^m)(1-\tau_n^m) + (1+r)a \\ n &= [\kappa d^\xi + (1-\kappa)(\tau_n^m)^\xi]^{1/\xi} \end{aligned}$$

3.3 Decision of Retired Couples

Retired married/cohabiting couple with children In period 3, everyone is retired. They receive pension income $b(\mathbf{e})$ that depends on their education. For simplicity, we abstract from home production in retirement. The problem of a retired couple with marital status $X \in \{M, C\}$ is

$$\begin{aligned} V_3^X(a,h^k,\gamma;\mathbf{e}) = \max_{c^m,c^f} &\theta^m u(c^m) + \theta^f u(c^f) + \gamma \\ &+ \beta^K P(h^k)[0.5\tilde{V}_1(col,m) + 0.5\tilde{V}_1(col,f)] \\ &+ \beta^K [1-P(h^k)][0.5\tilde{V}_1(hs,m) + 0.5\tilde{V}_1(hs,f)] \end{aligned} \tag{15}$$

subject to

$$c^m + c^f = b(\mathbf{e}) + (1+r)a$$

The value of being a retired married/cohabiting individual with marital status X and gender $g \in \{m, f\}$ is

$$\begin{aligned}\tilde{V}_3^X(a, h^k, \gamma; \mathbf{e}, g) =& u(c^g) + \gamma \\ &+ \beta^K P(h^k)[0.5\tilde{V}_1(col, m) + 0.5\tilde{V}_1(col, f)] \\ &+ \beta^K [1 - P(h^k)][0.5\tilde{V}_1(hs, m) + 0.5\tilde{V}_1(hs, f)] \end{aligned} \tag{16}$$

Retired divorced/separated couple with children The problem of a divorced/separated individual of gender g with children is

$$\begin{aligned}\tilde{V}_3^{DS}(a, h^k; \mathbf{e}, g) =& \max_{c^g} u(c^g) \\ &+ \beta^K(g) P(h^k)[0.5\tilde{V}_1(col, m) + 0.5\tilde{V}_1(col, f)] \\ &+ \beta^K(g)[1 - P(h^k)][0.5\tilde{V}_1(hs, m) + 0.5\tilde{V}_1(hs, f)] \end{aligned} \tag{17}$$

subject to

$$c^g = b(\mathbf{e}) + (1+r)a$$

4. Calibration

We calibrate the model to the U.S. economy in 2015. This section provides details about how we take the model to the data.

Preferences Utility weights are exogenous and $\theta^m = \theta^f = 0.5$. Individuals derive utility from private consumption c and the home good n. We specify individual utility as a CRRA function:

$$u(c, n) = \zeta_c \frac{c^{1-\eta_c}}{1-\eta_c} + \zeta_n \frac{n^{1-\eta_n}}{1-\eta_n}.$$

ζ_c is the weight of private consumption and ζ_n the weight of the home good. η_c and η_n govern the curvature of the utility function. At the beginning of their life, couples draw a love shock γ from a uniform distribution Γ_0. The love shock follows an AR(1) process with persistence ρ.

Female Human Capital and Hours Worked Female human capital evolves endogenously according to the following process:

$$h' = H(h, 1 - \tau_n^f - \tau_k^f; e^f) = \exp\left[\ln h + \lambda_f^e \mathbb{1}(\tau_l^f \geq \bar{\tau}_l) - \delta^e \mathbb{1}(\tau_l^f < \bar{\tau}_l)\right],$$

where hours worked, τ_l^f, is defined as $\tau_l^f = 1 - \tau_n^f - \tau_k^f$. The functional form of endogenous female human capital goes back to Attanasio et al. (2008). We modify the function by assuming that human capital only depreciates if a woman works less than $\bar{\tau}_l$ and only appreciates if she works at least $\bar{\tau}_l$. Note that human capital appreciation, λ_f^e, and depreciation, δ_e, is education specific as in Guner et al. (2020). Our baseline calibration distinguishes two education groups: $e = \{\text{hs, col}\}$.

The choice of hours worked is discrete in the model and can take one of three values $\tau_l^f \in \{40, 20, 0\}$, corresponding to full-time, part-time, and no work. We set $\bar{\tau}_l = 40$, which means that women experience human capital appreciation if they work full-time and depreciation of they work part-time or not at all.

Child Development The human capital of children evolves endogenously. For simplicity, we assume that all children are born with the same amount of human capital which implies that h^k is normalized to one. In the first period, parents choose how much time to invest into their children τ_k^f and τ_k^m, which determines a child's human capital accumulation in period 1, H^{k1}:

$$h^{k\prime} = H^{k1}(h^k, \tau_k^f, \tau_k^m, \mathbf{e}) = h^k + \pi^e(\tau_k^f + \tau_k^m)^\iota.$$

In our current calibration, we assume that $\tau_l^m = 1$, which implies that $\tau_k^m = 0$. Hence, a child's human capital development is determined by female time investments in period 1. The productivity parameter π^e determines how productive time investments of women are. In the baseline calibration, we assume that $\pi^{\text{hs}} = \pi^{\text{col}} = \pi$. Hence, we assume that a unit of time spent with a college or a high school educated mother has the same effect on the child's human capital development. Even if π is constant across education groups, the model predicts education differences in the amount of time invested in children by mothers that match the data.

In period 2, parents choose how much money to invest into their children, d^k.

$$h^{k\prime} = H^{k2}(h^k, d^k) = h^k + \psi_0[\psi_1(h^k)^\phi + (1 - \psi_1)(d^k)^\phi]^{1/\phi}.$$

The idea is that a child's human capital mainly depends on time investments when young and money investments when older. We also capture the notion that high investments in the first period will be reinforced by dynamic complementarities in the production of children's skills

in period two. It has been empirically documented that child investments and existing human capital are complements in the production of later human capital, see for example Heckman (2000), Todd and Wolpin (2007), and Aizer and Cunha (2012).

Probability of College Completion The probability that a child completes college is given by

$$P(h^k) = \frac{1}{1 + \exp(-\chi_0 + \chi_1 h^k)}$$

following Blandin and Herrington (2020). We calibrate χ_0 and χ_1 such that the implied college completion rates of children of high school and college educated couples matches the data.

Child Support The calibration currently abstracts from child support payments and also does not consider that the data shows that divorced women are more likely to receive child support payments compared to separated women. They are also more likely to receive the full amount of support the child is eligible for compared to women who previously cohabited. We provide further details about the data facts and how we plan to implement them in a future version of the model in section6.

Exogenous Male Labor Supply For the time being, we fix male labor supply to $\tau_l^m = 40$, that is, all men are working full-time in period 1 and 2 and retire in the last period. In addition, male age-earnings profiles are given exogenously. This also implies that male time investment into children in period 1, τ_k^m, is zero. Earnings profiles for high school and college educated men are defined by

$$w_{m,t}^e = \exp\{\lambda_m^e \times \log(t+1)\}.$$

We set $\lambda_m^{\text{col}} = 1.225$ and $\lambda_m^{\text{hs}} = 1.01$ in the baseline.

Summary Table 3 summarizes the model calibration. There are three sets of parameters that are key for the results below. First, $\phi = -0.50$ in the period 2 child production function captures that time investments in period 1 and money investments in period 2 are dynamic complements. Hence, higher time investments in period 1 can be complemented by more money investments in period 2 and lead to the fact that college educated couples invest both more time and more money into their children.

Second, divorce costs ν and asset splitting rules α^j, where $j \in \{\text{married, cohabiting}\}$ differentiate marriage from cohabitation in the model. If married couples divorce, they face a utility costs that cohabiting couples do not pay when they split. In addition, married couples split as-

Parameter	Description	Value
A. Preferences		
β	Discount Factor	0.988
β^k	Discount Factor Child Lifetime Utility	0.984
ζ_c	Utility Weight Private Consumption	0.30
ζ_n	Utility Weight Home Good	0.10
η_c	Curvature Consumption	1.50
η_n	Curvature Home Production	1.50
Γ_0	Love Shock Distribution	$\mathcal{U}(-0.6, 0.6)$
ρ	Love Shock Persistence	0.55
B. Home Production		
κ	Weight Good Inputs	0.50
ξ	Complementarity Time and Goods	0.50
p	Price of Good Inputs for Home Production	1.00
C. Female Human Capital		
λ_f^{hs}	Human Capital Appreciation of High School Individuals	0.20
λ_f^{col}	Human Capital Appreciation of College Individuals	0.50
δ^{hs}	Human Capital Depreciation of High School Individuals	-0.025
δ^{col}	Human Capital Depreciation of College Individuals	-0.100
$\bar{\tau}_l$	Threshold Number of Hours Worked	40
D. Child Development		
π	TFP of Time Investments in $t = 1$	8.25
ι	Exponent of Home Time in $t = 1$	1.25
ψ_0	TFP of Money Investments in $t = 2$	1.25
ψ_1	Weight on Child Quality in $t = 2$	0.50
ϕ	Complementarity Time and Goods	-0.50
p^k	Price of Market Investments in Children	2.00
χ_0	College Completion Probability	3.50
χ_1	College Completion Probability	0.75
E. Cohabitation vs. Marriage: Divorce Costs and Asset Splits		
ν	Divorce Costs	0.10
α^{married}	Asset Split in Divorce	0.50
α^{cohab}	Asset Split in Cohabitation	0.80
F. Retirement Benefits		
b^{hs}	Replacement Rate High School Individuals	0.35
b^{col}	Replacement Rate College Individuals	0.20
G. Initial Gender Wage Gaps and College Premia		
$w_m^{\text{hs}} - w_f^{\text{hs}}$	Gender Wage Gap High School	0.75
$w_m^{\text{col}} - w_f^{\text{col}}$	Gender Wage Gap College	0.70
$w_m^{\text{col}} - w_m^{\text{hs}}$	College Premium Men	0.40
$w_f^{\text{col}} - w_f^{\text{hs}}$	College Premium Women	0.43

Table 3: Calibration

sets equally in divorce, whereas cohabiting women receive 20% of assets when they decide to separate.

Third, while the gender wage gap evolves endogenously in the model, gender wage gaps for both high school and college educated individuals are takes as given. Note that in 2015, the gender wage gap for college educated women is slightly higher than for high school educated men. This is mainly due to the fact that real earnings of high school men have been constant or declining over the past 50 years, while high school women had some positive wage growth. A larger gender wage gap increases the returns from specialization in marriage for college educated women. We also take the college premium for men and women as given. The premium is only slightly higher for women.

5. Results

We now turn to the results of the benchmark economy. First, we show that the model generates the differences in time allocations between married and cohabiting women and between high school and married women that are consistent with the data. These allocations have implications for the quality of children their probability to complete college. We then assess the importance of the two model assumptions that make marriage different from cohabitation: asset division rules and divorce costs. Finally, we calibrate the model to 1975 and document that changes in the gender wage gaps and the college premium are important drivers for changes in cohabitation rates among low educated couples in our stylized setup.

5.1 Benchmark Economy

Table 4 summarizes the time allocations of women by education and by marriage versus cohabitation and compare the results to the data facts from the American Time Use Survey reported in section 2.3. The upper part of the table distinguishes time allocations by education conditional on whether mothers are married or cohabiting. We see that more educated mothers work longer hours, but also spend more time with their children. At the same time, their time investment in home production is significantly lower. The model slightly understates the differences in hours worked between college and high school educated cohabiting women and slightly overstates the differences in time investments in children for this group. The model correctly implies that the marriage rates among college educated is higher than among high school educated. The data suggests that the marriage rate among college educated women is 15 percentage points higher than for high school educated women. The model suggests a 21 percentage point difference. The lower part of the table repeats the time allocation differences when we condition on educa-

tion and compute the differences in hours worked and time investments in children for married versus cohabiting women conditional on education. The simple model also matches time allocation differences in hours worked and time with children conditional on education. It slightly overstates the time allocation differences between married and cohabiting mothers with high school education. However, the results are qualitatively consistent with our data facts.

The time allocation differences in the model have important implications for the probability that a child completes college. The stylized model implies that the probability of a child completing college increases by 11% if a mother is college educated. Conditional on maternal education, however, the probability of college completion drops by 13% a mother has ever cohabited. Both predictions are roughly in line with the data facts we document in section 2.4 using Add Health data between 1994–2008. In our simple economy the cohabitation versus marriage choice is therefore closely connected to investments in children and their human capital development.

		Married Couples		Cohabiting Couples	
		Model	Data	Model	Data
Hours Worked	$h_f^{\text{col}} - h_f^{\text{hs}}$	5.64	6.04	3.14	7.81
Time with Children	$\tau_f^{\text{col}} - \tau_f^{\text{hs}}$	2.75	3.80	6.16	1.74
Home Production	$n_f^{\text{col}} - n_f^{\text{hs}}$	-7.81	-6.30	-8.56	- 6.92
Money Investments Children	$d^{k,\text{col}} - d^{k,\text{hs}}$	1.04	1.50	0.97	1.10
Marriage Rates	$\sigma^{\text{col}} - \sigma^{\text{hs}}$	0.21	0.15	–	–
		College Couples		High School Couples	
		Model	Data	Model	Data
Hours Worked	$h_f^{\text{mar}} - h_f^{\text{coh}}$	-5.72	-3.09	-8.22	-1.32
Time with Children	$\tau_f^{\text{mar}} - \tau_f^{\text{coh}}$	4.45	4.28	8.22	2.22

Table 4: Allocations in the Benchmark Economy

5.2 Importance of Asset Division and Divorce Costs

To understand the quantitative role of the two model ingredients that make the decision problem of a cohabiting woman different from the one of a married woman, we conduct two coun-

terfactual experiments. In the first one, we impose that cohabitors split their assets equally upon separation (just like married couples). In this case, marriage rates decline for both college and non-college couples since cohabitation provides the same amount of insurance for lower earnings spouses without any costs upon separation. On the other hand, if divorce costs for married couples are reduced to zero (just like in cohabitation), marriage rates for both college and non-college couples increase substantially and the educational gradient in marriage rates vanishes. This means that differences in asset division rules and divorce costs are key for our stylized model to generate cohabitation rates that differ by education in the model. This, in turn, affects the amount of time and goods invested in children.

5.3 Steady State Comparison

We test whether the model can generate the increase in cohabitation among low educated couples with children by calibrating the model to 1975 and compare the steady state to our benchmark results. In particular, we adjust the initial gender wage gaps by education and the gender college premium. We rely on data moments from the March Supplement of the CPS in 1975. Table 5 summarizes the calibration changes for the 1975 steady state. To approximate changes in the price of home appliances, we rely on CPI data for the price of appliances from the Bureau of Labor Statistics.

	2015	1975
Initial Gender Wage Gap		
Highschool	0.75	0.55
College	0.70	0.70
College Premium		
Women	0.40	0.33
Men	0.43	0.20
Price of Home Goods	1.00	3.00

Table 5: Steady States

Table 6 reports the model implied cohabitation rates in 2015 and in 1975. Cohabitation rates are reported relative to the cohabitation rate of high school educated couples in 2015. In the 2015

steady state, cohabitation rates of college educated couples are 30% lower than those of high school educated couples. This is qualitatively in line with the data, even though educational differences in cohabitation rates by education are even more pronounced in the data.

We calibrate the economy to 1975 by changing the gender wage gap by education, the college premium for men and women, as well as the price of home goods. Cohabitation rates for college educated couples barely change between 1975 and 2015, which is in line with the data. On the other hand, we see a significant increase in cohabitation rates for high school educated couples with children between 1975 and 2015.

	College		High School
	Steady States		
2015	0.74	$<$	1.00
1975	0.70	$\gtrsim$	0.63

Table 6: Steady State Comparison and Experiments

Why does cohabitation increase for low educated couples with children between 1975 and 2015? In an initial exploration, we find that changes in the gender wage gap are the primary driver of the result. Note that the gender wage gap evolves endogenously in the model from period 1 onwards. Yet, changes in the initial gender wage gaps have large effects on cohabitation rates. Since initial gender wage gaps declined for high school educated women, the returns from marriage for these women are much lower in 2015 than they were in 1975.

6. Outlook

Given the qualitative success of the stylized framework presented in this paper, we are currently working on three extensions that will allow us to study the quantitative importance of the link between cohabitation versus marriage and child development in more depth.

An OLG Model with Stochastic Aging We plan on implementing the stylized there period model in an overlapping generations model with stochastic aging. This way, we do not have to keep track of the age of both spouses and are able to model the problem in a more parsimonious way. This model structure will allow us to take the model closer to the data and to capture hours

worked as well as time and money investments in children over the life cycle in a more realistic way.

Child Support The presence of child support payments after separation significantly alters the decision problem of couples. Foerster (2020) shows in a dynamic model that child support payments alter the labor market behavior of spouses both before and after separation. In addition, the enforcement of child support payments has changed dramatically over time. While in 1975, mainly divorced women with children were eligible for child support, the laws governing child support changed substantially over the past decades (Lundberg et al. (2016)). The legal distinction between marriage and cohabitation in terms of parental rights and obligations has declined, meaning that previously cohabiting parents are responsible for paying child support to their former spouse as well.

The stylized model already includes child support payments after separation (divorce). However, in the current calibration, such payments are set to zero and therefore have no influence on the parental decision problem. In the future, we plan to calibrate this variable using data on child support payments from the Consumer Expenditure Survey. In addition, we want to capture that the probability of receiving child support has changed both over time and differs between previously married and cohabiting couples. Grall (2018) documents that 69.3% of custodial parents who were supposed to receive child support in 2015 received some child support payments, not necessarily the entire amount they were entitled to. The fraction of women who received full payments was significantly larger among married women (51%) than for never married women (35.9%). We aim to calibrate child support payments using data from the Child Support Supplement (CSS) of the Current Population Survey.

Costs of Going to College Our Steady State comparison between 1975 and 2015 currently ignores the changing cost of education and the changing quality of colleges in the U.S. Donovan and Herrington (2019) study long-run changes in college completion and the relative ability of college versus non-college students. They construct a historical time series on real college costs from printed government documents dating to 1916. Using a dynamic life cycle model, they show that time varying costs of going to college are critical to capture the increase in educational attainment and ability sorting between college attendees and those who do not obtain a college degree. While they focus on birth cohorts between 1900 to 1950, this project focuses on the costs of college between 1975 and 2015. We therefore plan to build on their data work and construct a similar time series for the real costs of college attendance for this later period.

7. Conclusion

We document that cohabitation rates have been rising among less educated couples with small children, but not among college educated ones. We explain this differential rise in cohabitation through an overlapping generations model of cohabitation, marriage, and child investments. A calibrated version of the model shows that differential trends in the gender wage gap for college and high school educated women as well as changes in the college premium between 1975 and 2015 can explain the rise in cohabitation among less educated women with children over this period. In particular, the wider gender wage gap makes specialization less costly for college women and college couples have higher returns from investing in children due to higher income and the dynamic complementarity in child investment. Therefore, the returns from marriage are higher for college couples.

Cohabitation has implications for child development. We show that children of cohabiting couples have a lower probability of completing college than children of married couples. The key underlying mechanism is lower intra-household specialization and higher relationship instability. Cohabitation entails no divorce costs and an unequal asset division in case of separation. Therefore, cohabiting women are less willing to forego labor market experience to spend time investing in their children's human capital. Moreover, the absence of divorce costs makes cohabiting relationships less stable than marriage. As a result, children of cohabiting relationships are more likely to grow up with a single mother, who has less time and money to invest in her children.

We are currently developing an overlapping generations model with stochastic aging that contains the same features as the stylized three-period model version presented in this paper. We further plan to implement two features that are currently unaccounted for. First, the calibration in this paper ignores the presence of child support payments after separation or divorce. In addition, the data suggests that women are more likely to receive such payments if they were previously married. Hence, the next calibration will include these two features of child support that we observe in the data. In addition, we do not adjust the costs of going to college.

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