Cohabitation and Child Development*

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Abstract

In the U.S., college-educated couples with small children cohabit less and marry at higher rates than other couples. What explains the differences in cohabitation rates by education and presence of children 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, wealth, and child development. Parents are altruistic towards their children and invest time and money into their development. This, in turn, increases the probability that a child completes college. Married couples in the model have lower separation probabilities and more equal asset division but higher utility costs upon divorce. In the model, college-educated couples marry at higher rates for two reasons. First, college-educated women face higher depreciation human capital depreciation if they reduce hours worked compared to non-college women. Second, the complementarity between time and money investments increase the returns from time investments relatively more for high income (college-educated) couples, who can match high time investments early in the in child's life with high money investments later on.

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1. Introduction

Over the past 50 years, the proportion of people's lives spent in marriage has fallen in the United States (U.S.). At the same time, the incidence and the average duration of cohabiting relationships has increased as couples delay or even forgo marriage. In fact, couples who cohabit during the year their first child is born are more likely to either be cohabiting or separated five years later than to have transitioned into marriage. Hence, cohabitation cannot be simply considered a precursor to marriage.

While the growth in cohabitation has been similar for college and non-college couples without kids, for couples with young children, cohabitation rates have increased much faster among those without a college degree. In 2015, the cohabitation rate was 18.2% among high-school-educated couples with small children. By contrast, the cohabitation rate among college-educated couples with small children was only 3.4%. What accounts for the differences in cohabitation rates by education and presence of young children? And what do these family formation patterns imply for parental child investments and child outcomes?

We begin by documenting three stylized facts on marital arrangements (marriage or cohabitation), child investments and outcomes. First, using an event study design, we show that cohabiting mothers in the U.S. experience lower and less persistent child penalties in labor earnings than married mothers. This finding is robust if we control for maternal education. In addition, it only applies to cohabiting mothers in states that do not recognize Common Law marriage, i.e., states in which cohabiting couples are treated differently by law than married couples in the event of separation. Second, we employ data from the American Time Use Survey and the Consumer Expenditure Survey to show that, conditional on education, cohabiting couples invest less time and money in their children relative to married partners. Third, to understand the potential implications for child outcomes, we explore the implications of parental education and marital arrangements when a child is in high school on the child's long run educational outcomes (college completion) using the Panel Study of Income Dynamics . We find that growing up with married as opposed to cohabiting parents, coupled with wealth, is a key determinant of a child's likelihood to complete college. Again, this is true only in states without Common Law marriage.

These findings are robust to controlling for the child's innate ability and school quality. Importantly, by controlling for relationship stability, we also show that the effects of growing up with cohabiting parents go beyond those of growing up in an unstable family .

Motivated by these facts, we develop an overlapping generations model with stochastic aging in which parents 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 four stages. Parents start their lives as new couples with young children. They draw a marriage preference shock and decide whether to marry or cohabit. Over the first two stages of the life cycle, parents choose their labor supply, savings and how much to invest in their children. Parental investment is time in period one and money in period two. In this way, we capture that parental time spent with children is particularly important when the children are young, whereas older children mainly benefit from money spent on tutors, private school, high quality college or other goods (see Del Bono et al. (2016) for empirical evidence on this). Time and money investments in children increase their human capital, but time spent with children by a mother reduces her own human capital. Thus, mothers in the model face a trade-off between "investing" in their own human capital and that of their children. During the third stage of the life cycle, parents are middle-aged and work and during the last stage they are retired. Retired parents value the expected lifetime utility of their children. Children's expected lifetime utility depends on the probability they complete college which is a function of their human capital.

Marriage differs from cohabitation in three ways in the model. First, married couples incur a utility cost of divorce while cohabiting couples do not. Second, married partners split assets equally upon divorce. In contrast, the woman, as the lower-earning partner, gets a smaller share of a couple's wealth upon separation from cohabitation. Third, cohabiting couples have higher risk of separation as compared to married couples. In separation, both parents continue to care about the children. However, the children stay with the mother who makes all decisions going forward regarding child investments. Separation is costly for couples as separated mothers must now provide time and money investments in children with reduced household income. Since in marriage separation rates are lower and asset division upon separation is equal, marriage provides insurance to couples that induces time investments by mothers in young children.

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. 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 cohabiting couples invest less into their children compared to married couples, which is consistent with our stylized facts.

To understand what determines education-specific marriage rates in the model, we explore the quantitative importance of children and child investments. When we remove time and money investments in children, marriage rates drop, particularly for college-educated couples. That is, absent the opportunity to invest in children, the relative marriage rates of college-educated and non-college-educated couples flip. If we allow for goods investments only, but remove time investments, the model again predicts higher marriage rates for non-college-educated couples. Thus, the model only generates higher marriage rates for college-educated couples when child outcomes and the return from money investments in children later in life depend on time investments by mothers when children are young. This shows that children are an important motive for marriage among college-educated couples.

The calibrated model captures our motivational fact that cohabitation for couples with children is common among less educated couples but not among college educated couples. We show both empirically and theoretically that these differences in marital arrangements 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.

Instead, marriage increases child investments by providing insurance to women. In the model, college-educated couples marry at higher rates for two reasons. First, college-educated women face higher depreciation rates of their human capital if they reduce hours worked on the labor market. Second, complementarity between time investments in children early in life and money investments later in life increase the returns from time investments more for college-educated couples who tend to have higher income and wealth.

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 as 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 this issue.

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 married women making larger couple specific investments in the form of more time spent on children 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 their setup, higher savings lead to more specialization in marriage as they insure the lower earnings spouse for against future earnings losses. We contribute by explicitly modelling children and their human capital production function.

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 (2021) 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 couples. 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. Caucutt and Lochner (2020) emphasize the importance of financial constraints in a dynastic framework of human capital investment with dynamic complementarity between time and money investment in children. The latter is a key feature also in in our setup although we abstract from borrowing. Finally, our paper speaks to Fuchs-Schündeln et al. (2020) who study the role of public investment through schooling using a human capital production function with complementarity between inputs.

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.[1] 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. Finally, Section 6 concludes.

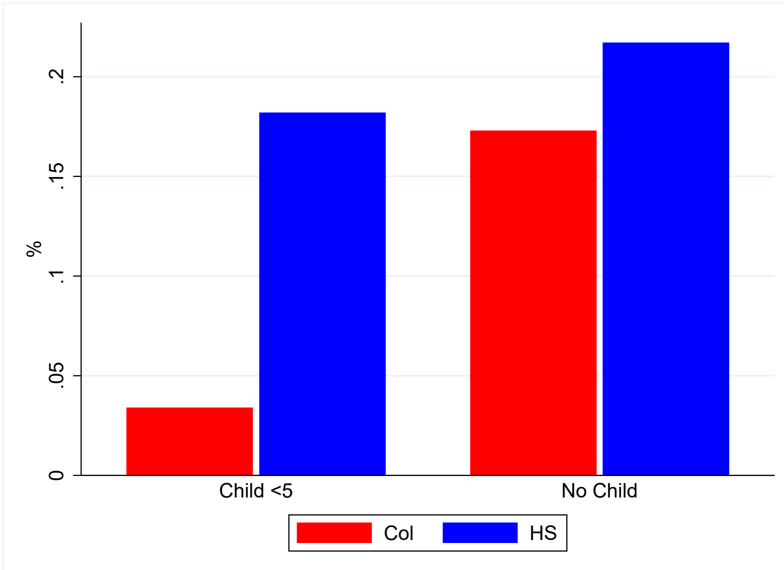
2. Stylized Facts

In the U.S., around 12% of all couples were cohabiting in 2019 rather than being formally married (UNECE). Moreover, the share of adults aged 18-44 that had ever cohabited was above 59% in 2013-2017 (PEW, 2019). Data from the 2015 Current Population Survey-Annual Social and Economic Supplement (CPS-ASEC) reveals large differences in cohabitation rates by education and presence of children. As Figure 1 shows, cohabitation rates of high-school educated couples with young children are similar to those of couples without children. In contrast, cohabitation rates of college-educated couples with young children are substantially lower. In particular, in 2015, the cohabitation rates of college-educated couples with young children were 15 percentage points lower than those of couples with only a high school degree.

From a time series perspective, all groups except college-educated couples with small children experienced a drastic increase in cohabitation rates since 1968 (See Figure 1 in the

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

Figure 1: Cohabitation Rates by Education and Presence of Children among Individuals Living in Couples, 2015



Notes: Data from CPS-ASEC 2015. See Data Appendix for details.

Appendix). Furthermore, the duration of cohabiting relationships increased from about 12 months in 1983-1988 to 18 months in 2006-2013, at the same time that more and more couples choose to delay or forgo marriage all together (Lamidi et al., 2019).

Data from the National Survey of Family Growth (NSFG) in 2006-2013 show that out of all couples who were cohabiting when their first child was born, only 23% ended up married five years later (Lichter et al., 2016). Instead, 32% kept on cohabiting and the majority of them (45%) separated. Not only are transitions into marriage the least likely scenario, but our analysis focuses on the implications of cohabitation when children are young. Thus, in Section 3, for simplicity, we focus on the risk cohabiting couples face of separating as compared to staying together and do not explicitly model later transitions from cohabitation to marriage.

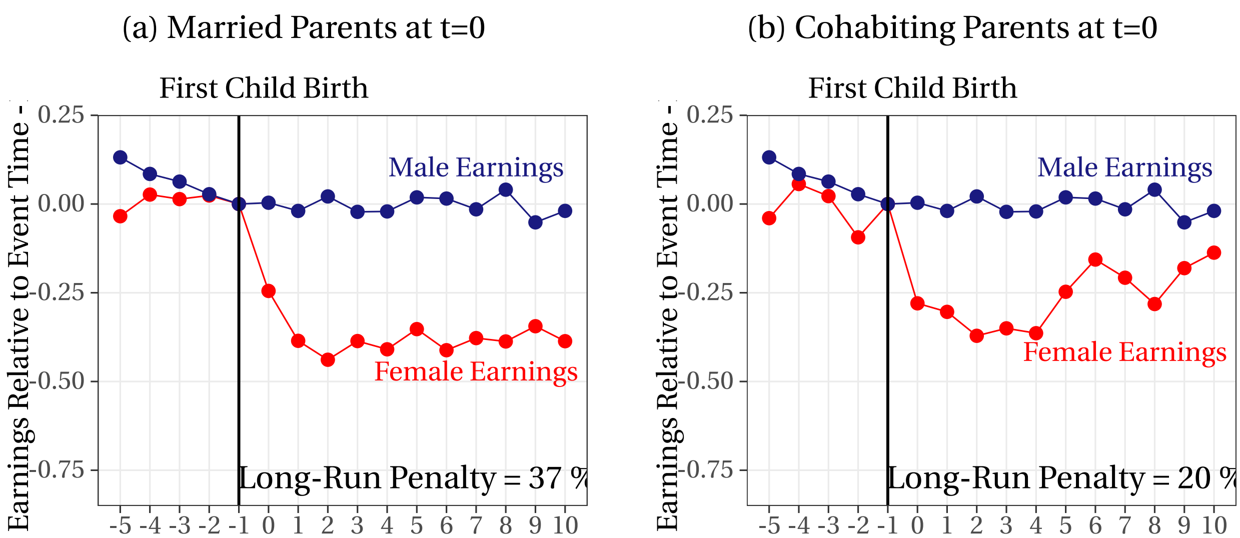
2.1 Child Penalties for Cohabiting and Married Mothers

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, it is often immediately after childbirth when couples decide which parent is going to be the primary caregiver (Bailey et al., 2019). This has direct consequences on labor market outcomes, which may persist for several years e.g., due to human capital depreciation.

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).[2] 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: 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.

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 and 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 higher risk of and unequal division of assets during separation, as we demonstrate in Section 3.

2.1.1 Common-Law Marriage

One possibility is that the results of the event study reported above are due purely to selection. Perhaps, there is unobserved heterogeneity in couples preference for marriage

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

that is correlated with their preference for mothers to have reduced labor market participation when children are young. Given this concern, we next explore whether or not there is evidence of a casual effect of marriage on mother's labor market behavior by studying child penalties among women residing in states with and without Common Law Marriage (CLM).

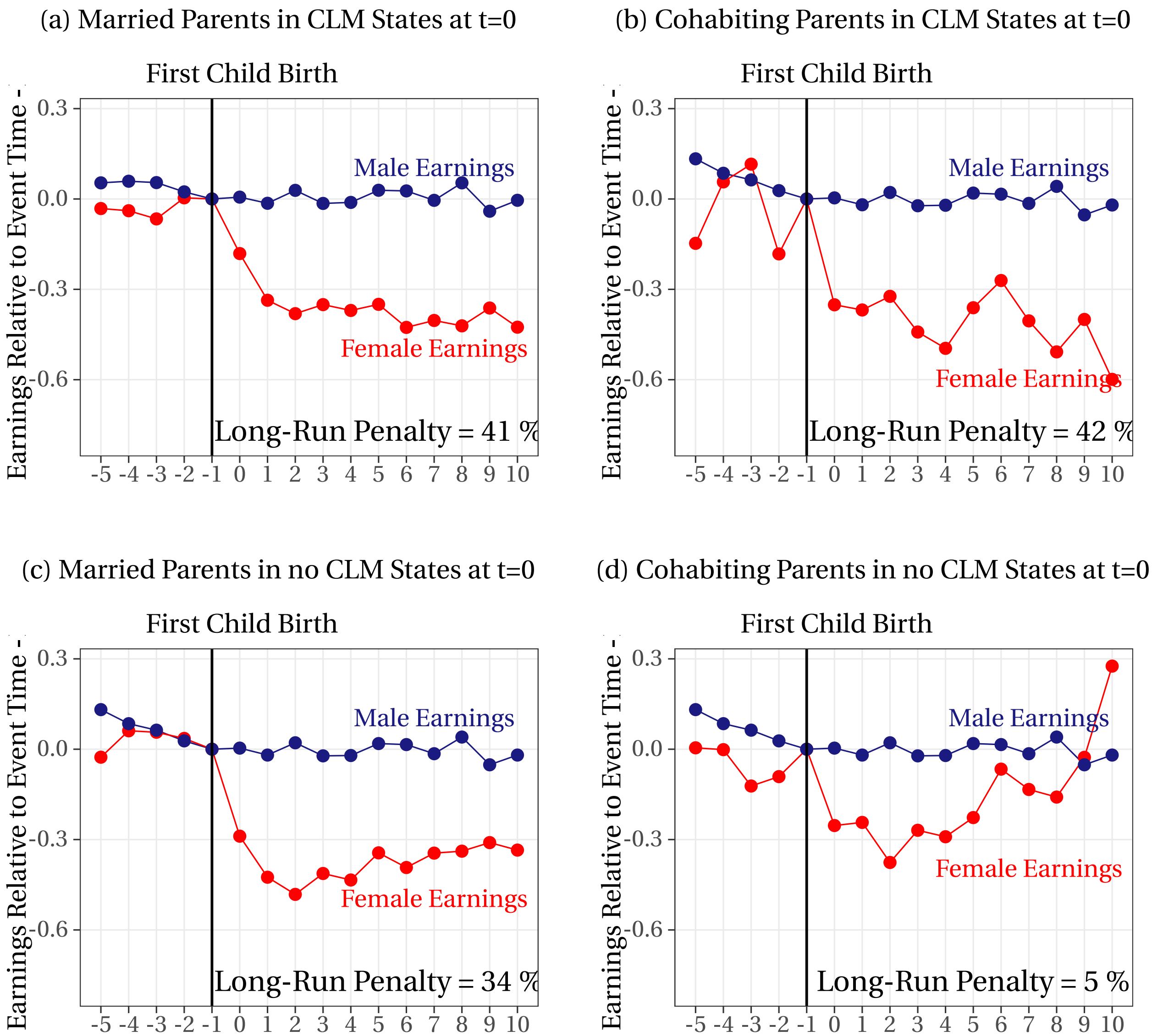
CLM does not require a marriage certificate or ceremony and can be established when couples cohabit and hold themselves out as spouses by i) calling each other husband and wife in public, ii) using the same last name, iii) filing joint tax returns, or iv) declaring their marriage on applications, leases, birth certificates and other documents (Grossbard and Vernon, 2014). Cohabiting couples who have a child are almost certainly considered "married" in a CLM state. As such, they need to go through a regular divorce in order to separate. Once established, CLM is no different from marriage, including its acceptance by all other states and government institutions even if the couple moves to another state. Moreover, in CLM states cohabitation and marriage are similar in terms of asset division upon separation.

We thus repeat the event study analysis distinguishing between CLM and no-CLM states. Similarly to the definition of the marital/cohabitating status, the CLM/no-CLM state classification is based on the year of child birth.[3]

Figure 3, panels (a) and (b) show that in CLM states, married and cohabiting women experience very similar child penalties in earnings (41 and 42% respectively). This indicates that since, in CLM states, there is little meaningful distinction between marriage and cohabitation, their is no statistical signficant impact of formal marriage on intra-household specialization and mother's labor market behavior after childbirth. By contrast, major differences emerge between cohabiting and married women in states that do not recognize CLM (Figure 3, panels (c) and (d)). In those states, cohabiting women experience rather short-lived child penalties in earnings compared to married women. This is consistent with the notion, that in no CLM states cohabitation does not provide women with enough insurance to stay detached from the labor market. This is unlikely to be driven by state-

[3]As of 2014, common-law marriage remains legal in Alabama, Colorado, Iowa, Kansas, Montana, New Hampshire, Oklahoma, Rhode Island, South Carolina, Texas, Utah as well as in the Navajo Nation and in the District of Columbia. More recently, CLM was repealed by Ohio (1991), Idaho (1996), Georgia (1997), and Pennsylvania (2005).

Figure 3: Child Penalties in States with and without Common-Law Marriage



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.

level characteristics since married women experience similar child penalties both in CLM and no-CLM states.

2.2 Time and Money Investments in Children

We have shown that, relative to cohabiting women, married women (and cohabiting women in CLM states) experience higher earnings penalties from childbirth suggesting that marriage induces reduced labor market participation of mothers with young children. We now show that the differences in labor market attachment between cohabiting and married women translate into differences in child investment. Indeed, using data from the American Time Use Survey (ATUS) we document that cohabiting and married mothers invest different amounts of time into their children. To do so, the data from the ATUS is 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. Column (1) shows that, conditional on education, cohabiting mothers with young children work more hours on average, while column (2) shows that they spend less times with their children. The differences in time spent with children are much more pronounced among mothers with a college degree compared to those without. This is in part because, as column (3) shows, college-educated married mothers spend less time, on average, on non-market work and leisure as compared to other 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.

In our analysis, we focus on mothers with children aged 0-9 as the amount of time spent with children at this age is high (around 15 hours per week in our data) compared to when children are aged 10-17 (around 5 hours per week). Moreover, recent evidence suggests that maternal time is a key determinant of skill formation but its effect decreases with child age (Del Bono et al., 2016). Note that cohabiting men do not compensate for the lower amount of time spent on children by cohabiting women. As Table 1 in the Appendix shows the main difference in time allocation of men by marital status consists of a trade-off between hours of work and hours of non market work and leisure. Conditional on education, married men work more hours and spend less time in non market work and leisure compared to cohabiting men. By contrast, the amount of time spent with children is similar by marital status and substantially lower in levels compared to that of women.

Table 1: Time Allocations of Women 25-44 with Children 0 to 9

Education		Children 0 to 9		
		Hours Work	Child Time	Non Mkt +Leis
		(1)	(2)	(3)
College	Married	24.04	18.46	59.32
	Cohabiting	25.72	13.69	61.47
	Δ	*-1.67*	*4.78*	*-2.15*
High School	Married	18.45	15.10	65.67
	Cohabiting	20.30	14.18	64.86
	Δ	*-1.85*	*0.93*	*0.82*

Notes: ATUS data, 2003–2018. The sample is restricted to women 25-44 years old who have at least one child aged less than 10 in the household. 'Hours Work' is hours worked per week, 'Child Time' is total weekly hours spent on childcare, and 'Non Mkt + Leis' is the sum of weekly hours spent on home production and leisure.

An important aspect of the technology of children's skill formation is the *dynamic complementarity* between early and late human capital investments (Agostinelli and Wiswall, 2020; Caucutt and Lochner, 2020; Fuchs-Schündeln et al., 2020). Parental investments in older children can take the form of high-quality education and other monetary expenses. To explore the cross-sectional variation in these "goods" investments, we rely on data on household expenditures from the 2013 Consumer Expenditure Survey (CEX) and adopt a similar methodology to identify married and cohabiting couples. We focus on couples with children aged 6 or older.[4] Table 2 reports averages of annual expenditures on children by education and marital arrangement of both partners.[5] It shows that money spent on children increases in parents' education. Moreover, conditional on education, mar-

[4]Ideally, we would like to restrict the sample to couples with children aged 10 or older but the way age groups are aggregated in the CEX data does not permit it.

[5]We restrict the sample to couples with both partners either college or high school graduates.

ried couples spend more on children than cohabiting couples. This is suggestive evidence of complementarity between time investments in children when they are very young and goods investments in them when they are older. We model this complementarity explicitly in Section 3.[6]

Table 2: Money Investment on Children of Couples 25-44 with Children aged ≥ 6

Education		Expenditures on Children (in $)
College	Married	10,402
	Cohabiting	8,174
	Δ	*2,228*
High School	Married	6,914
	Cohabiting	5,837
	Δ	*1,077*

Notes: CEX data, 2013. The sample is restricted to couples 25-44 years old who have at least one child aged 5 or more in the household. 'Expenditures on Children' includes infant's furniture and equipment, clothes and shoes, bicycles, toys, musical instruments, computers, school bus, school books, elementary/high school/college tuition, housing, food, transportation and health.

2.3 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. Given that cohabiting mothers tend to invest less time and money into their children, this may have direct implications on children's development (probability of college 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 up until adulthood. We fill this gap using data from the PSID. While for the event study analysis we follow mothers over time before and after childbirth, we now construct our sample so as to follow children from early

[6]For simplicity and for tractability of the model, we abstract from money investments when children are small. However, we do account for daycare expenses.

teenage years (11-13 years old) to college graduation (23-25 years old). An additional advantage of PSID is that it contains information on parental wealth, and in particular home ownership. This allows us to study the role of wealth in conjunction with marriage in determining child outcomes. Moreover, by analyzing separately child outcomes in States that recognize Common Law Marriage or not, we can get a sense of whether differences in asset division rules between marriage and cohabitation play any role.

Table 2 in the Appendix reports descriptive statistics on average college completion rates by parental education and marital status. Conditional on education, there are stark differences in college completion rates between children who grew up with married or cohabiting parents. To better account for various other factors that may affect child outcomes, we then run a linear probability model where the dependent variable is whether the child completed college or not by age 23-25. The main regressors are defined when the child was 11-13 years old and refer to parental marital status (married vs cohabiting), home ownership and education of the household head (college graduate or not). We include as additional controls race, gender, total number of children in the household and household income as well as state fixed effects. Table 3, column 1 presents the results. As expected, having a college-educated parent is positively associated with own college completion. Moreover, growing up with married parents and with parents who own a house also increases the probability of college completion. In column 2 we run the same regression adding also the interaction between parental marriage and home ownership. By doing so, the coefficients of parental marriage and home ownership become statistically insignificant and only their interaction term matters (on top of parental education). This suggests that parental marriage or home ownership/wealth alone are not sufficient but the combination of the two is a key determinant of long term educational outcomes.

In the last two columns of Table 3 we estimate the same regression distinguishing between children born in CLM/no CLM States. We see that the coefficient of the interaction term is not statistically significant in CLM States and is half in size compared to that in no CLM States. This is because cohabiting and married couples in CLM States are treated similarly in terms of asset division and both have to undergo through a regular divorce to separate if they have children. Instead, in no CLM States, cohabiting couples are less insured in the event of separation compared to married couples and thus have less in-

Table 3: Marital Status, Wealth and Child Outcomes

	$(\text{College Completion})_{age23-25}$			
	All States	All States	CLM	Non CLM
	(1)	(2)	(3)	(4)
$(\text{Parents married})_{age11-13}$	0.13***	0.02	0.07	0.00
	(0.04)	(0.05)	(0.09)	(0.06)
$(\text{Parents home owners})_{age11-13}$	0.09***	-0.10	-0.03	-0.13
	(0.02)	(0.07)	(0.14)	(0.08)
$(\text{Parents married*home owners})_{age11-13}$		0.20***	**0.11**	0.22***
		(0.07)	(0.14)	(0.08)
$(\text{Parent (HH) college grad})_{age11-13}$	0.29***	0.29***	0.30***	0.28***
	(0.02)	(0.02)	(0.03)	(0.02)
Fixed Effects	State	State	State	State
N	4,893	4,893	1,565	3,328
adj. R^2	0.19	0.20	0.23	0.20

Notes: PSID data, 1968-2018. Sample is restricted to individuals aged 23-25 whose parents were either married or cohabiting when the individuals aged 11-13. Additional controls: race, gender, total number of children in the household, household income. CLM/No CLM indicates whether Common Law Marriage was valid when the child was born (age 0).

centives to accumulate wealth and stay detached from the labor market as we showed in Section 2.1. This translates into a lower probability of college completion for their child.

We then perform a series of robustness checks using data from AddHealth, a longitudinal survey of a representative sample of high school students (aged 13-19) in the US, who are followed up to their adulthood (ages 26-32). Although AddHealth contains no information on parental wealth and the reported States are anonymized, it does provides rich information about schools.[7] This allows us to control for school quality by including school fixed effects. Moreover, the data contain a proxy of child's "innate" ability, namely the Peabody Picture Vocabulary Test. As both school quality and innate ability are likely to affect college completion, it is worth checking whether the positive coefficient associated with parental marriage is robust to the inclusion of these extra controls. We use information from the in-home surveys in Wave I and Wave IV. The Wave I survey took place in 1994

[7]Due to these features of the AddHealth dataset, we are unable to verify the role of parental wealth on college completion and to conduct a separate analysis by CLM/no CLM States.

while children were at high school and also includes demographic information about the child (gender, age, race). The Wave IV survey took place in 2008 and allows us to observe the long run educational outcomes of these children, including whether they completed college.

In Wave I, also a parent, who in the vast majority was the mother, filled-in a detailed questionaire. In this way, we can obtain information not only about her educational attainment and current marital status but also about her history of romantic relationships in the previous 18 years. The latter can serve as a measure of family instability, which is known to hinder child outcomes (Tartari, 2015). Similarly to the PSID, there is also information on household income. By controlling for family instability, we are able to understand whether the decrease in the probability of college completion among children of cohabiting parents is merely capturing the effect of growing up in non-intact families.

We first run a linear probability model of college completion in the spirit of the benchmark regression in column 1 of Table 2. The main regressors are whether the mother was married or cohabiting when the child was attending high school and whether the mother was college-educated. We stick to the benchmark controls of the PSID regression (gender, age, race and household income) and include state fixed effects. Table 3, column 1 reports the results. The coefficient of growing up with married parents is positive and statistically significant and remarkably similar in size to that of the benchmark regression. The coefficient of college educated mother also resembles that of college educated household head in the benchmark specification.

Given that the two datasets produce very similar results, we can exploit the richness of the AddHealth data and conduct some robustness checks. In Table 3 column 2, we include a proxy of child's innate ability and school instead of state fixed effects. Both coefficients of interest decrease somewhat in size but remain positive and statistically significant. In Column 3, we include a measure of family instability as an additional control, i.e. the number of romantic relationships of the mother since her child was born. On the one hand, the coefficient of family instability is negative and statistically significant, as expected. On the other hand, the coefficient of growing up with married parents decreases in size but remains positive and statistically significant. This result suggests that the negative association between parental cohabitation and child outcomes goes beyond parental separation.

Our empirical findings based on multiple different datasets imply that parents' marital arrangements and assets are almost as important as their education in determining child outcomes. This is true only in States where cohabiting and married couples are treated differently by the law in terms of asset division rules and divorce costs. In the next section, we build a model that illustrates the underlying mechanisms and is able to replicate these stylized facts.

3. The Model

In this section, we develop an overlapping generations model of marriage, cohabitation, and child investment. Individuals move stochastically through four adult stages of life: parents with young children, parents with older children, middle-age, and retirement. All young individuals start out in couples and choose to either marry or cohabit. Marriage and cohabitation differ in three ways. First, married couples have lower probabilities of separating (divorcing) as compared to cohabiting couples. Second, married couples incur a higher utility cost from separation than cohabiting couples. Third, marriage guarantees that assets will be split equally upon divorce while there is no such guarantee in cohabitation. Instead, when cohabiting couples separate we assume that the man as the primary earner takes a larger share of the assets.

Each adult has a gender (male or female) and an education level (college or non-college). New young adults sort into heterosexual couples. Matching by education is perfectly assortative. Each couple has two children: a boy and girl. Children are identical aside from gender and treated identically. Parents are altruistic towards their children and can increase the probability they earn a college degree by investing in their human capital. A child's human capital, k, is determined by a combination of initial ability, time investments of the mother when the child is young, and goods investments of the couple when the child is older. For women, time spent with kids comes at the cost of reduced time spent in the labor market which lowers their own human capital, h. Thus, couples in the model face a trade-off between investing in the human capital of their children and "investing" in the human capital of the mother.

3.1 Parents with young children

Young parent's state consists of their martial status $j \in \{M, C\}$, assets a, mother's human capital h, children's human capital k, and the couple's education $e \in \{col, hs\}$. They face a probability p_j of separating each period that depends on marital status. They choose the private consumption of both parents, $\{c_m, c_f\}$, assets, a', and the fraction of time that the mother spends with the children, τ_f. Time mothers do not spend with children is spent on market work and requires childcare costs λ. Children's human capital next period k' depends on the amount of time the mother spends with them, τ_f and their current level of human capital k. The child human capital production function is denoted by $F(k, \tau_f)$. The mother's human capital next period h' depends on her current human capital h, time spent on market work, $1 - \tau_f$, and her education e. The mother's human capital production function is denoted by $H(h, 1 - \tau_f; e)$. Men's human capital and time spent working is normalized to one.

The couple solves

$$\begin{aligned} V_1^j(a, h, k; e) = \max_{c_m, c_f, a', \tau_f} \quad & \theta^m u(c_m) + \theta^f u(c_f) \\ & + \beta(1 - \psi_1)\Big\{p^j \left[S_1^j(a', h', k'; e) - \nu^j\right] + (1 - p^j)V_1^j(a', h', k'; e)\Big\} \\ & + \beta\psi_1\Big\{p^j \left[S_2^j(a', h', k'; e) - \nu^j\right] + (1 - p^j)V_2^j(a', h', k'; e)\Big\}, \end{aligned} \tag{1}$$

subject to

$$c_m + c_f + a' = (1 + r)a + w_e + [w_e h - \lambda](1 - \tau_f),$$

where $k' = F(k, \tau_f)$ and $h' = H(h, 1 - \tau_f; e)$. The parameter ψ_1 is the probability young parents transition to the older parents stage next period and ν^j is a utility cost of separation which depends on marital status j. w_e is the wage per an efficiency unit of labor which depends on education e.

If the couple separates at the beginning of the next period they split assets according to an asset-splitting rule which depends on their marital status j and designates share α_g^j of total assets a' to the gender g spouse. In married couples assets are split equally upon divorce, i.e., $\alpha_m^M = \alpha_f^M$. In cohabiting couples, the man always takes a larger share of assets upon separation so that $\alpha_m^C > \alpha_f^C$. Given the couple's decision rules, the value being a young parent of marital status $j \in \{M, C\}$ and gender $g \in \{m, f\}$ is given by[8]

$$\begin{aligned}\tilde{V}_1^j(a,h,k;e,g) &= u(c_g) \\ &+ \beta(1-\psi_1)\Big\{p^j\big[\tilde{S}_1^j(\alpha_g^j a', h', k'; e, g) - \nu^j\big] + (1-p^j)\tilde{V}_1^j(a', h', k'; e, g)\Big\} \\ &+ \beta\psi_1\Big\{p^j\big[\tilde{S}_2^j(\alpha_g^j a', h', k'; e, g) - \nu^j\big] + (1-p^j)\tilde{V}_2^j(a', h', k'; e, g)\Big\}.\end{aligned} \quad (2)$$

In separation, children always stay with the mother but both parents still care about the children. For simplicity, we assume that no transfers are made between separated parents. Thus, separation is risky for both men and women but for different reasons. For women, separation leads to relatively larger declines in income and wealth, as compared to men, as well as, the continued burden of providing the time investments in the children. For men separation leads to loss of the ability to impact child investments.

Separated individuals remain single for the rest of their lives. The problem of a separated woman with young children is

$$\begin{aligned}\tilde{S}_1^j(a,h,k;e,f) = \max_{c_f, a', \tau_f} &\; u(c_f) + \beta(1-\psi_1)\tilde{S}_1^j(a', h', k'; e, f) \\ &+ \beta\psi_1\tilde{S}_2^j(a', h', k'; e, f),\end{aligned} \quad (3)$$

subject to

$$c_f + a' = (1+r)a + [w_e h - \lambda](1-\tau_f).$$

Since separated men continue to care about their children, their expected lifetime utility depends on the children's current human capital. The problem of a separated man with

[8]Individuals' value functions are distinguished from couples' value functions by a tilde.

young children is

$$\tilde{S}_1^j(a,k;e,m) = \max_{c_m,a'} u(c_m) + \beta(1-\psi_1)\tilde{S}_1^j(a',k';e,m) + \beta\psi_1\tilde{S}_2^j(a',k';e,m), \tag{4}$$

subject to

$$c_m + a' = (1+r)a + w_e.$$

3.1.1 New parents with young children

New young couples are endowed with an initial asset level a_0^e, an initial human capital level of the mother h_0^e and an initial human capital (ability) level of the children k_0^e which depend on their education e. They draw a marriage preference shock ω. Given their initial state vector, $x_0 = (a_0^e, h_0^e, k_0^e)$ and realized preference shock value, the couple decides to marry (wed) or cohabit. The decision is given by $W(\omega, x_0; e)$ which is equal to 1 if the value of being a young married couple, $V_1^M(x_0;e) + \omega$, is greater than the value of being a young cohabiting couple, $V_1^C(x_0;e)$.

The expected lifetime utility of a young individual with education $e \in \{col, hs\}$ and gender $g \in \{m, f\}$ who has yet to match with a partner and draw a marriage preference shock is

$$\tilde{V}_1(e,g) = \int_\omega \Big\{ W(\omega, x_0; e)\tilde{V}_1^M(x_0;e,g) + [1 - W(\omega, x_0; e)]\tilde{V}_1^C(x_0;e,g) \Big\} d\Omega(\omega), \tag{5}$$

where $\tilde{V}_1^M(x_0;e,g)$ and $\tilde{V}_1^C(x_0;e,g)$ are the lifetime utilities of newly young married and cohabiting individuals with gender g, education e and initial state $x_0 = (a_0^e, h_0^e, k_0^e)$ and $\Omega(\cdot)$ denotes the distribution of marriage preference shocks.

3.2 Parents with older children

Consistent with findings on the relative importance of expenditures at later ages as compared to parental time investments, older children's human capital depends on investments of goods, d, instead of mother's time. Denote the older child's human capital production function by $G(k, d)$. Mothers of older children spend all their time on market work and their human capital no longer evolves.

Parents with older children of marital status $j \in \{M, C\}$ choose the consumption of both parents, $\{c^m, c^f\}$, assets, a', and expenditures on goods investments for children, d, by solving

$$\begin{aligned} V_2^j(a, h, k; e) = \max_{c_m, c_f, a', d} \quad & \theta^m u(c_m) + \theta^f u(c_f) \\ & + \beta(1-\psi_2)\Big\{p^j\left[S_2^j(a', h, k'; e) - \nu^j\right] + (1-p^j)V_2^j(a', h, k'; e)\Big\} \\ & + \beta\psi_2\Big\{p^j\left[S_3^j(a', h, k'; e) - \nu^j\right] + (1-p^j)V_3^j(a', h, k'; e)\Big\}, \end{aligned} \tag{6}$$

subject to

$$c^m + c^f + a' = (1+r)a + w_e + w_e h - d,$$

and $k' = G(k, d)$. Here, ψ_2 is the probability that the couple transitions to middle-age next period.

Separation of parents with older children works similarly to that of parents with younger children. Upon separation, they split assets according to the marital-status-specific asset-splitting rule and children stay with the mother who now must finance child investments on her own. Given the couple's decision rules, the value of being an older parent of gender $g \in \{m, f\}$ is given by

$$\begin{aligned} \tilde{V}_2^j(a, h, k; e, g) = u(c_g) + \beta(1-\psi_2)\Big\{ & p^j\left[\tilde{S}_2^j(\alpha_g^j a', h, k'; e, g) - \nu^j\right] \\ & + (1-p_j)\tilde{V}_2^j(a', h, k'; e, g)\Big\} + \beta\psi_2\Big\{p^j\left[\tilde{S}_3^j(\alpha_g^j a', h, k'; e, g) - \nu^j\right] \\ & + (1-p_j)\tilde{V}_3^j(a', h, k'; e, g)\Big\}. \end{aligned} \tag{7}$$

The problem of a separated woman with older children is

$$\tilde{S}_2^j(a,h,k;e,f) = \max_{c_f,a',d} u(c_f) + \beta(1-\psi_2)\tilde{S}_2^j(a',h,k';e,f) + \beta\psi_2\tilde{S}_3^j(a',h,k';e,f), \tag{8}$$

subject to

$$c_f + a' = (1+r)a + w_e h - d,$$

and the problem of a separated man with older children is

$$\tilde{S}_2^j(a,k;e,m) = \max_{c_m,a'} u(c_m) + \beta(1-\psi_2)\tilde{S}_2^j(a',k';e,m) + \beta\psi_2\tilde{S}_3^j(a',k';e,m), \tag{9}$$

subject to

$$c_m + a' = (1+r)a + w_e.$$

3.3 Middle-age

When parents are middle-age, children are fully grown and there is no longer an opportunity to invest in their human capital. For simplicity, we also assume that middle-age couples no longer face a risk of separating next period. Thus, middle-age parents choose only consumption, $\{c^m, c^f\}$, and assets, a', by solving

$$V_3^j(a,h,k;e) = \max_{c_m,c_f,a'} \quad \theta^m u(c_m) + \theta^f u(c_f) + \beta(1-\psi_3)V_3^j(a',h,k;e) + \beta\psi_3 V_4^j(a',h,k;e) \tag{10}$$

subject to

$$c_m + c_f + a' = (1+r)a + w_e + w_e h,$$

and the value of being a middle-age married or cohabiting individual is

$$\tilde{V}_3^j(a,h,k;e,g) = u(c_g) + \beta(1-\psi_3)\tilde{V}_3^j(a',h,k;e,g) + \beta\psi_3\tilde{V}_4^j(a',h,k;e,g).$$

Similarly, divorced/separated individuals solve

$$\tilde{S}_3^j(a,h,k;e,g) = \max_{c_g,a'} \quad u(c_g) + \beta(1-\psi_3)\tilde{S}_3^j(a',h,k;e,g) + \beta\psi_3\tilde{S}_4^j(a',h,k;e,g)$$

subject to

$$c_m + c_f + a' = (1+r)a + w_e h I(g=f) + w_e I(g=m).$$

3.4 Retirement

In the final stage of life, everyone is retired. They receive pension income b_e that depends on their education. Both spouses die at the same time. Death occurs with probability ψ_4. Upon death, the couple values the expected lifetime utility of their children discounted at rate β^K. The problem of a retired couple with marital status $j \in \{M, C\}$ is

$$\begin{aligned} V_4^j(a,h,k;e) = \max_{c_m,c_f,a'} \; & \theta^m u(c_m) + \theta^f u(c_f) \\ & + \beta(1-\psi_4)V_4^j(a',h,k;e) \\ & + \beta^K\psi_4\Big\{P(k)[0.5\tilde{V}_1(col,m) + 0.5\tilde{V}_1(col,f)] \\ & + [1-P(k)][0.5\tilde{V}_1(hs,m) + 0.5\tilde{V}_1(hs,f)]\Big\}, \end{aligned} \tag{11}$$

subject to

$$c^m + c^f + a' = b_e + (1+r)a,$$

where $P(k)$ is the probability that the couple's children complete college given the children's human capital upon entering adulthood k. The value functions of the children $\tilde{V}_1(e,g)$ for $e \in \{col, hs\}$ and $g \in \{m, f\}$ are given by equation (5) above.

Finally, the value of being a retired individual with marital status j and gender g is

$$\begin{aligned}\tilde{V}_4^j(a,h,k;e,g) =& u(c_g) \\ &+ \beta(1-\psi_4)\tilde{V}_4^j(a',h,k;e,g) \\ &+ \beta^K\psi_4\Big\{P(k)[0.5\tilde{V}_1(col,m)+0.5\tilde{V}_1(col,f)] \\ &+ [1-P(k)][0.5\tilde{V}_1(hs,m)+0.5\tilde{V}_1(hs,f)]\Big\}.\end{aligned} \tag{12}$$

and the problem of a divorced/separated retiree is

$$\begin{aligned}\tilde{S}_4^j(a,h,k;e,g) =& \max_{c_g,a'} u(c_g) \\ &+ \beta(1-\psi_4)\tilde{S}_4^j(a',h,k;e,g) \\ &+ \beta^K\psi_4\Big\{P(k)[0.5\tilde{V}_1(col,m)+0.5\tilde{V}_1(col,f)] \\ &+ [1-P(k)][0.5\tilde{V}_1(hs,m)+0.5\tilde{V}_1(hs,f)]\Big\}.\end{aligned} \tag{13}$$

subject to

$$c_g + a' = b_e + (1+r)a.$$

4. Calibration

We calibrate the model to the U.S. economy in 2015. Some parameters are set directly in a first stage based on data estimates or values in the literature. The remaining parameters are chosen in second stage to minimize the distance between targeted data moments and their model counterparts. While, in general, all parameters impact all moments, some moments are more directly related to some parameters than others. In the description of the calibration below, we discuss parameters and the moments that we target to identify them together even though the minimization procedure jointly determines all second stage parameters by simultaneously targeting all the moments. Table 4 summarizes the model calibration.

Preferences Utility weights are exogenous with $\theta^m = \theta^f = 0.5$. Individuals have utility over consumption, c, and the momentary utility function is a given by

$$u(c) = \log(c).$$

The annual discount factor, β is set to 0.98. New couples draw a marriage preference shock ω from distribution $\Omega(\cdot)$ which is set to a mean-zero normal distribution with variance σ^2. The variance, σ^2, and the utility cost of divorce nu^m are chosen such that the fraction of college and non-college who are married in the model matches the fractions in the data. This results in $\sigma^2 = 0.45$ and $\beta^K = 2.0$.

The weight on children in the final stage of life, β^K, is a free parameter right now that does not have a data target.

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

$$h' = H(h, \tau_f; e) = \exp\left[\ln h + \delta^e \mathbb{1}(\tau_f > 0)\right],$$

where hours worked are given by $1 - \tau_f$. The functional form of endogenous female human capital goes back to Attanasio et al. (2008). The rate of human capital depreciation, δ^e, is education-specific as in Guner et al. (2020). The rates are chosen such that the gender wage gaps of college and non-college individuals ages 40–55 in the model are consistent with those estimated from the data. Based on the CPS-ASEC, for college-educated 40–55 year-olds, women's average hourly wage was 0.68 of men's over the period 2010–2018 while, for non-college, it was 0.74. Targeting these ratios results in depreciation rates of $\delta^{hs} = -0.010$ and $\delta^{col} = -0.025$.

To capture the fact that high school women spend more time on leisure than college women we set the total available time for market work and child investment to 0.7 for high school women and 1 for college women. In the data, the ratio is 0.77.

Child Development Denote the average initial human capital of children as k_0 and let the initial human capital of a child with parents of education e be given by ${k_0}^e = \kappa_e k_0$. Starting from it's initial level, young children's human capital evolves according to

$$k\prime = F(k, \tau_f) = \pi_0(\pi_1 k^{\pi_2} + (1 - \pi_1)(\tau_f/\bar{\tau_f})^{\pi_2})^{\frac{1}{\pi_2}},$$

where $\bar{\tau_f}$ is the average amount of time mothers with young children spend with them. Notice that the production function of young children's human capital does not depend directly on parents' education. In particular, 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. Thus, differences in the human capital of children in the model by education will be due to a combination of differences in their initial human capital levels, k_0^e, and differences in their mother's time investments in them.

Older children's human capital depends on parents expenditures on them, d, instead of mothers' time investments. This is a simple way to account for the finding that parental time investments are relatively more important when children are young, whereas goods investments are relatively more important when they are older. An older child's human capital evolves according to

$$k\prime = G(k, d) = \psi_0(\psi_1 k^{\psi_2} + (1 - \psi_1)(d/\bar{d})^{\psi_2})^{\frac{1}{\psi_2}},$$

where $\bar{d}$ is average expenditures on older children by parents.

Notice that both the human capital production function for young children and the one for older children exhibit dynamic complementarity in that, as the human capital of a child increases, so does the marginal product of either time or good investments in the child. 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), Aizer and Cunha (2012) and more recently, Caucutt and Lochner (2020) and Fuchs-Schündeln et al. (2020)

The parameter k_0 is set such that the model generates a reasonable rate of growth of the human capital of young children with age. Specifically, it is chosen such that the ratio of the average human capital of kids aged 9–11 to kids aged 3–5 in the model matches the counterpart in the data. Given that k_0 determines the growth rate of young children's human capital, π_0 is set such that average level of human capital of young children is normalized to one. The parameters π_1 and ψ_1 are chosen by targeting the average share of time mother's with young children spend with them and the average expenditures on older children by parents.

κ_e is set to 0.02 for high school and 0.02 for college parents. Both are set to 0.02 (which corresponds to the first grid point of the child's human capital grid). Setting the grid point higher for college educated parents lowers time investments.

π_2 is ratio of time spent with young children between college and non-college mothers. Do we have this moment? We can compute this from Notebook: In the data time hours with young children for college are 18.33 and 15 for college, suggesting a ratio of 1.22. In the model, the ratio of hours with young children of college and high school is 1.12 (22.606 divided by 20.205).

ψ_0 is set such that the ratio of the human capital of kids ages 15-17 matches the ratio for ages 9-11.

ψ_2 is set so that the ratio of goods expenditures on kids by college relative to non-college parents matches the data. Money investment for college couples is 13,103 in the data and 7,431 for high school. This yields a ratio of 1.76. In the model investments for college are 14,615 and for high school 9,670, resulting in a ratio of 1.51.

Probability of College Completion The probability that a child completes college is given by a logistic function as in Blandin and Herrington (2020),

$$P(k) = \frac{\chi_2^e}{1 + \exp(-\chi_0 + \chi_1 k)},$$

where χ_2^e is maximum probability level. 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. What are we doing here exactly? I know there is a problem that we need to fix. Efi estimated a logistic regression for college completion probabilities using the PSID Child Supplements. The estimated coefficients are in Table 4.

We currently set χ_2^e for college and non-college to 1 and 0.5. This was done so that the probability that non-college kids complete college is able to match the rates in the data. We exogenously set χ_2^e to 0.5 for hs parents since college completion rates for high school children were counterfactually high in the model compared to the data. We still overshoot on the college completion rates for children of high school parents in the model. College completion rates for hs cohabitors are 23.3% compared to 9% in the data and for hs married 25.6% in the model compared to 19% in the data.

Asset Splitting rules and Separation Probabilities Based on U.S. marital laws (what is the source exactly? - this is a simplification and we need to justify/check this.) the asset splitting rule for married couples is set to 0.5. For cohabiting couples, we calibrate the asset shares upon separation to be the same as the average earnings shares of cohabiting couples. This implies that 0.65 of the assets go to the man.

We calibrate the separation probabilities for cohabitors (p^{cohab}) and married couples (p^{married}) based on Kennedy and Bumpass (2000). They use data from 2002 National Survey on Family Growth (NSFG) on whether a parental separation has occurred prior to the survey conditional on the age of the child. Since we approximate that children in the first stage of the life cycle are 0-9 years old, we take the proportion of children at age 9 with separated or divorced parents and convert this into an annual separation probability in the model.The fractions of children age 9 with separated and divorced parents are 0.58 and 0.22, respectively? Assuming a constant rate of separation over time the annual separation rate of cohabiting couples over a period of 15 years (why are we using 15, shouldn't it be 10? Because this is what we did previously and since all periods are of different length now (10,8,23) it is not clear what the best way to go about this is) is 0.58/15=0.39 and the married couples the divorce rates is 0.22/15=0.15.

Retirement benefits etc. We set the social security replacement rate, b, to the average replacement in the US of 45%. We set the annual rate of return on assets to 0.03.

Wages of college men are normalized to 1. HS men's initial wages are set to 0.478 since they earn on average 47.8% of college men in the data (what is the data exactly). Isn't this the ratio and not the difference as the table indicates?

The initial wages of college women are set to 0.805. Isn't $w_f^{col} = 0.805 w_m^{col}$? Why does it say that this is the difference (as opposed to the ratio) in the table ? It is a typo. What are the data targets for these initial gender wage gaps? The initial gender wage gaps are computed from the CPS March Supplement and set exactly to their data values. The initial wage of HS women is 0.785 that of HS men.

Initial assets of HS couples are 0 and of college couples are 0.3. We use the first and the second grid point of the coarse asset grid for this... We only have data on homeownership rates from the CPS March Supplement. We could use the PSID to calculate initial asset differentials.

Since the young parent age lasts on average 10 years, the probability of transitioning from the young parent stage to the old parent stage is 1/10=0.9. Since the old parents stage lasts on average 8 years, the probability of transitioning from the old parent stage to the retirement stage is 1/8=0.125. The retirement stage lasts 23 years so the probability of transitioning to death is 1/23= 0.0435.

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 differential separation probabilities.

5.1 Benchmark Economy

The benchmark economy replicates several key data facts. First, as shown in Figure 4, the model predicts that the gender wage gap is on average larger for college educated than for high school educated couples. At the same time, the marriage rate among college educated couples is 20 percentage points higher than for high school educated couples in the data. The marriage rate differential in the model is 13 percentage points.

Figure 5 summarizes the time allocations of women by education and by marriage versus cohabitation and compares the results to the American Time Use Survey reported in

Table 4: Calibration

Parameter	Description	Value
A. Preferences		
β	Discount factor	0.98
β^k	Discount factor child lifetime utility	2.00
θ^m	Weight on male in household utility	0.5
θ^f	Weight on female in household utility	0.5
σ^2	Marriage preference shock variance	0.45
B. Female Human Capital		
δ^{hs}	Non-college human capital depreciation rate	-0.010
δ^{col}	College human capital depreciation rate	-0.025
C. Child Development		
π_0	TFP of Time Investments in $t = 1$	1.25
π_1	Weight on initial human capital	0.75
π_2	Degree of Complementarity	0.10
ψ_0	TFP of Money Investments in $t = 2$	1.05
ψ_1	Share Parameter	0.75
ψ_2	Degree of Complementarity	0
χ_0	Midpoint of College Completion Probability	-9.707
χ_1	Growth Rate College Completion Probability	0.1733
χ_2^{hs}	Maximum Value for College Compl. Prob. of High School	0.50
χ_2^{col}	Maximum Value for College Compl. Prob. of College	1.00
D. Cohabitation vs. Marriage: Divorce Costs and Asset Splits		
ν^m	Divorce Costs	3.25
α^{married}	Asset Split in Divorce	0.50
α^{cohab}	Asset Split in Cohabitation	0.65
p^{married}	Separation Probability in Divorce	0.015
p^{cohab}	Separation Probability in Cohabitation	0.038
E. Retirement Benefits		
b	Replacement Rate	0.45
F. Initial Gender Wage Gaps and College Premia		
$w_m^{\text{hs}} - w_f^{\text{hs}}$	Gender Wage Gap High School	0.7849
$w_m^{\text{col}} - w_f^{\text{col}}$	Gender Wage Gap College	0.805
$w_m^{\text{col}} - w_m^{\text{hs}}$	College Premium Men	0.522

(a) Model (b) Data

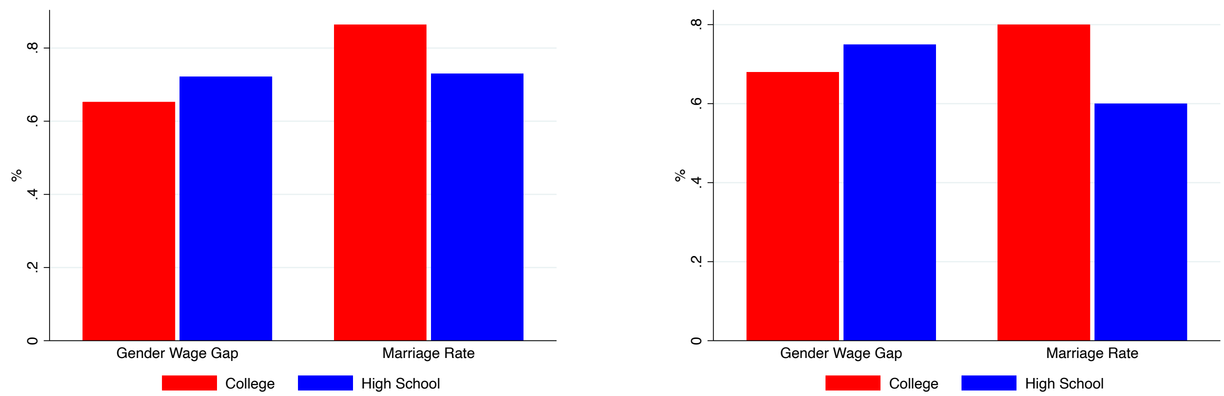


Figure 4: Gender Wage Gaps and Marriage Rates: Model vs. Data

section 2.2. Consistent with the data, the model accounts for the fact that conditional on education, married couples invest more time in children. In addition, college educated couples spend more time with children compared to high school educated couples. This is consistent with the trends documented by Ramey and Ramey (2010) who show that time spent with children started increasing dramatically in the 1990s, but relatively more for highly educated couples. The model also replicates that, conditional on education, married mothers specialize more than cohabiting mothers.

(a) Model (b) Data

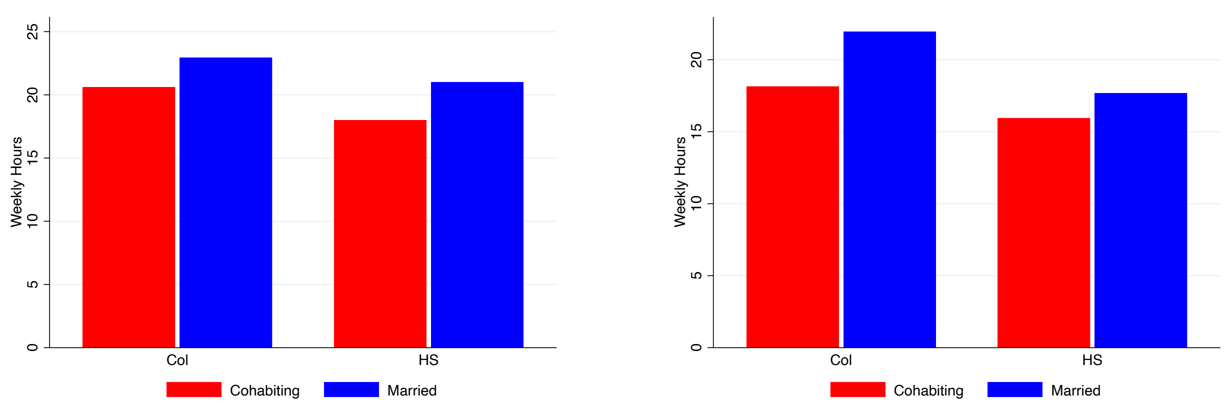


Figure 5: Time Investments in Children: Model vs. Data

A key feature of the model that generates higher time investments for children of college educated mothers is that mothers trade off investing in their child's human capital versus accumulating their own human capital. Figure 6 plots the human capital evolution of mothers and children in the model. Whereas college educated mothers face higher human capital depreciation, their time investments also lead to a higher likelihood of their children completing college relative to high school educated mothers. In addition, time and money investments in children are dynamic complements. Since college couples are richer, they can match high time investments when children are young with larger money investments when children are older. Due to dynamic complementarity between both investments, college educated couples invest more time but also more money into children and hence their children are much more likely to complete college compared to children of high school educated parents. Since marriage facilitates specialization, married college educated mothers invest most time in children and these children are the most likely to complete college.

(a) Mother's Human Capital

(b) Child's Human Capital

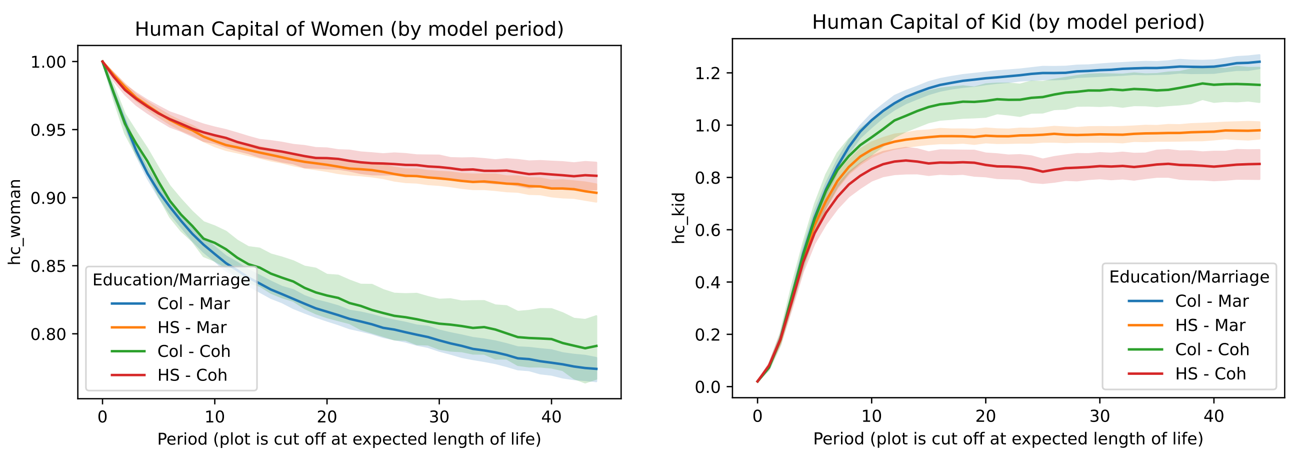


Figure 6: Human Capital Evolution of Mothers and Children

Finally, we compare the gender wage gap in the model to the gender wage gap in the CPS data. Figure 7 plots the gender wage gap by education in the model and in the data. The data comes from the CPS March Supplement and is pooled between 2010 and 2018. We restrict the sample to full-time full-year workers. In addition, we only include households with children (of any age) in the sample. In the data, the gender wage gap for high school educated individuals is higher initially at age 20-24 relative to college educated individuals. However, between ages 24-49, the college gender wage gap opens up and drops below the high school gender wage gap after age 39. After age 45, the gender gaps remain relatively stable for both education groups with a college gender wage gap around 0.65 and a high school gender wage gap around 0.75. The model replicates these basic features of the data. In particular, while the gender wage gap for college is smaller at the start of the life cycle, it soon drops below the gender wage gap of high school individuals and remains relatively stable towards the end of the life cycle.

(a) Model (b) Data

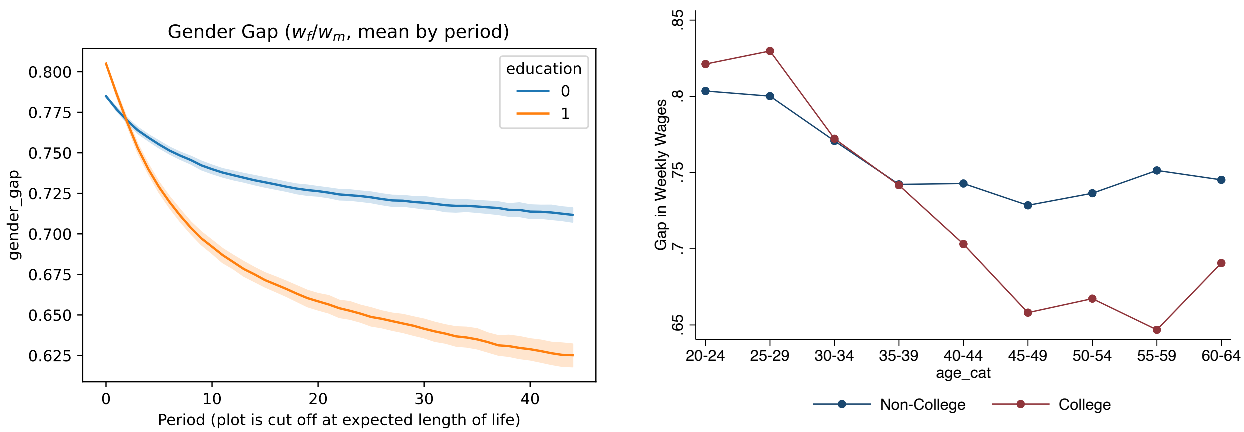


Figure 7: Gender Wage Gap over the Lifecycle: Model vs. Data

Table 5 summarizes the key moments for time and money investments in children, the implied college completion probabilities, marriage rates and gender wage gaps. Data moments for time investments are computed from the American Time Survey between 2013 and 2018. Money investment statistics come from the Consumer Expenditure Survey in 2013. College completion probabilities are computed in the PSID data and marriage rates and gender wage gaps come from the CPS March Supplement 2010 to 2018.

The model slightly understates the differences in time with children between married and cohabiting college women and slightly overstates the time differences for high school educated married and cohabiting women. Money investments are generally too high in the model, but they replicate an important feature of the data: married couples invest more money in children compared to cohabiting couples, conditional on education. In addition, conditional on marital status, college educated couples always invest more money in children than high school educated couples. However, the differences are more pronounced in the data than in the model.

Both money and time investments translate into higher college completion probabilities. The model implies that the probability of a child completing college increases by 9 percentage points if a mother is college educated. The college completion probability increases by 2 percentage points if a mother is high school educated. Both predictions are roughly in line with the data facts we document in section 2.3 using PSID data between 1968–2018. In our economy the cohabitation versus marriage choice is therefore closely connected to investments in children and their human capital development.

The model correctly successfully predicts that the marriage rate among college educated is higher than among high school educated. The data suggests that the marriage rate among college educated women is 20 percentage points higher than for high school educated women whereas the model suggests a 13 percentage point difference.

Table 5: Allocations in the Benchmark Economy

		College Couples		High School Couples	
		Model	Data	Model	Data
Time with Children	h_f^{married}	22.94	21.95	20.99	17.67
	h_f^{cohab}	20.62	18.15	18.00	15.93
	$h_f^{\text{married}} - h_f^{\text{cohab}}$ (in %)	0.11	0.24	0.16	0.13
Money Investments Children	d^{married}	14,747	10,402	13,777	6,914
	d^{cohab}	9,736	8,174	9,483	5,837
	$d^{\text{married}} - d^{\text{cohab}}$	5,011	2,228	4,294	1,077
College Completion Prob.	$p^{col,\text{married}}$	0.61	0.57	0.25	0.19
	$p^{col,\text{cohab}}$	0.54	0.18	0.23	0.09
	$p^{col,\text{married}} - p^{col,\text{cohab}}$	0.07	0.39	0.02	0.10
Marriage Rates	σ^m	0.86	0.80	0.73	0.60
Gender Wage Gaps	w_f/w_m	0.65	0.68	0.72	0.74

5.2 The Role of Dynamic Complementarity

To understand the role of time and money investments in children for household specialization and marriage rates, we conduct two counterfactual experiments. First, we remove time and money investments from the economy. We refer to this economy as the 'No Kids' - economy. Marriage rates of college educated couples are now less than 6 percent and the marriage rate of high school educated couples also drops significantly relative to the baseline. This implies that marriage in the model provides insurance against separation, which allows couples to specialize and invest in their children as they derive utility from child quality. Therefore, having high quality children is an important motive for marriage in the model. Without time and money investments, couples cannot alter child quality and therefore do not have an incentive to marry and specialize. However, high school educated couples marry at higher rates in the 'No Kids'- economy than college educated couples. Since marriage provides insurance in the event of separation and high school educated couples earn less, they have a higher incentive to get married in this economy relative to college educated couples.

In the second experiment, if we do not allow for time investments when children are young, but only allow for goods investments during middle age, marriage rates remain almost as low as in 'No Kids'- economy (1). This result underlines the importance of dynamic complementarity between time investments when children are young and money investments when children are older. Without time investments early in life, money investments later on are not productive. Thus both time and money investments are crucial for the model to generate higher marriage rates for college couples. In the absence of the dynamic complementarity between time and money investments, as in economy (2), the value of marriage drops relatively more for college educated couples relative to the baseline economy (3). Since college educated mothers experience larger human capital losses when specializing and investing in children, the insurance value of marriage is particularly important for them.

Table 6: Experiments with Time and Money Investments

	(1) No Kids	(2) With Kids No Time Inv.	(3) With Kids Baseline (Time & Goods)
Marriage Rate College	0.058	0.109	0.864
Marriage Rate High School	0.489	0.494	0.730
Δ_{Col-HS}	-0.431	-0.385	0.134

Table 7: Experiments with Separation Probabilities and Asset Division Rules

	(1) Equal Separation Prob.	(2) Equal Asset Division	(3) Baseline
Marriage Rate College	0.000	0.780	0.864
Marriage Rate High School	0.000	0.665	0.730
Δ_{Col-HS}	0.000	0.115	0.134

5.3 Importance of Asset Division and Separation Probabilities

To understand the relative importance of the two model ingredients that make the decision problem of a cohabiting woman different from that of a married woman, we conduct two counterfactual experiments in Table 7. In the first one, we increase the separation rates of married couples to those of cohabitors. In this case, even though marriage still provides some insurance through equal asset splits, all marriage rates drop to zero. On the other hand, if we assume that assets are split unequally in marriage, just like they are in cohabitation, marriage rates drop. But the marriage rate differential between college and high school couples remains roughly constant. As a result, differential asset division rules in marriage and cohabitation are important for matching the level of marriage rates for high school and college educated couples. However, lower separation probabilities in marriage are key for the model to generate higher investment in children among married couples as well as higher marriage rates.

6. Conclusion

We document that cohabitation rates are much higher among high school educated couples with young children compared to college couples. We explain the differential cohabitation rates in an overlapping generations model of cohabitation, marriage, wealth, and child investments. The model can explain why college educated couples marry at higher rates than high school educated couples. When parents care about the future lifetime utility of their children, marriage is an important insurance mechanism which allows for increased time investments in children. However, since highly educated women face higher specialization costs, it is key that time invested in young children and money invested in older children are dynamic complements. Since college educated couples earn more and accumulate more savings, high time investments can be met with high money investments later in the child's life. This creates an incentive for college educated women to invest more time in children early in life compared to high school educated women and marriage provides insurance for this specialization and its associated human capital depreciation.

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 main 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.As a result, children of cohabiting relationships are more likely to grow up with a mother, who has less time and money to invest in her children because she faces a higher separation probability and less insurance since assets are not split equally upon separation.

These results have important implications for policy. According to the model, the lack of insurance in cohabitation prevents time investments in children, thereby reducing human capital accumulation and college completion probabilities of children growing up in cohabiting households relative to those growing up in married households. One policy implication therefore would be to increase the insurance of the primary caregiver in the event of separation. An example would be the enforcement of child support payments in the U.S. Grall (2018) documents that 69.3% of custodial parents who were supposed to receive child support in 2015 received some child support payments, but 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 are planning to study the role of child support for child investments and marriage rates in an extension of this model in which we will introduce child support payments and differential compliance among previously cohabiting and married couples.

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Appendix

Table 1: Time Allocations of Men 25-44 with Children 0 to 9

Education		Children 0 to 9 Hours Work (1)	Child Time (2)	Non Mkt +Leis (3)
College	Married	44.29	10.06	51.67
	Cohabiting	36.00	10.34	57.31
	Δ	*8.30*	*-0.27*	*-5.65*
High School	Married	42.12	7.43	55.12
	Cohabiting	35.68	8.51	57.84
	Δ	*6.44*	*-1.08*	*-2.73*

Notes: ATUS data, 2003–2018. The sample is restricted to men 25-44 years old who have at least one child aged less than 10 in the household. 'Hours Work' is hours worked per week, 'Child Time' is total weekly hours spent on childcare, and 'Non Mkt + Leis' is the sum of weekly hours spent on home production and leisure.

Table 2: College completion prob. by marital status and education of the household head

Parental Education and Marital Status		College Completion Prob.
College	Married	0.57
	Cohabiting	0.18
	Δ	*0.39*
High-School	Married	0.19
	Cohabiting	0.09
	Δ	*0.10*

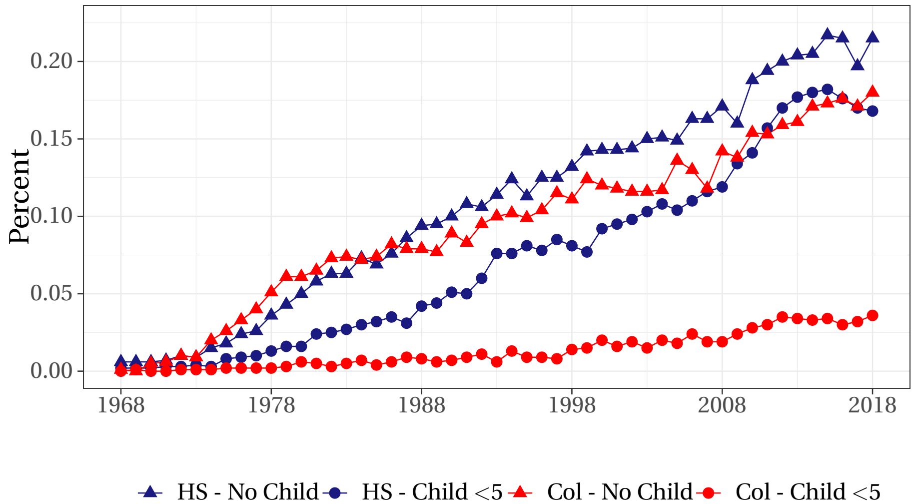
Notes: PSID data, 1968-2018. Sample is restricted to individuals aged 23-25 whose parents were either married or cohabiting when the individuals aged 11-13. Parental education and marital status refer to the household head and are measured when the child was 11-13 years old.

Table 3: Parental Marital Status and Child Development - Couples Only

	(College Completion)$_{age26-32}$			
	(1)	(2)	(3)	(4)
(Mother married)$_{age13-19}$	0.16***	0.13***	0.06**	**0.03**
	(0.03)	(0.02)	(0.03)	(0.03)
(Family instability)$_{age13-19}$			-0.06***	-0.03**
			(0.01)	(0.01)
(GPA)$_{age13-19}$				0.26***
				(0.01)
(Mother college grad)$_{age13-19}$	0.24***	0.21***	0.21***	0.15***
	(0.02)	(0.02)	(0.02)	(0.02)
Fixed Effects	State	School	School	School
N	5,160	5,177	5,154	5,154
adj. R^2	0.16	0.22	0.22	0.35

Notes: Add Health Data, Waves I and IV. Standard errors in parenthesis clustered at the school level, survey weights used. 'College Compl.' is a dummy=1 if the child completed college or more by Wave IV (average age 30); 'Mother Married' is a dummy=1 if the mother was married (without previous cohabitation history) when the child was attending high school (Wave I) and 0 if cohabiting; 'Family instability' is the number of romantic relationships of the mother in the last 18 years; 'GPA' is the Grade Point Average in English, Math, History and Science. Additional controls: gender, age, race, and household income in column 1; gender, age, race, household income, and ability (Peabody Picture Vocabulary Test) in columns 2 and 3.

Figure 1: Cohabitation rates by education and presence of chidren, 1968-2018



Notes: CPS-ASEC data, 1968-2018. See Data Appendix for details.

Data Appendix

A. Identifying cohabiting couples in the CPS-ASEC

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 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.