Cohabitation, Marriage, and Fertility: Divergent Patterns for Different Skill Groups *

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Abstract

The United States has been experiencing a long-term decline in the rates of marriage and fertility and a steady rise in cohabitation. Contradicting the prediction of standard theory emphasizing the opportunity cost of childrearing from labor market and gender specialization, we document that skilled females have experienced a less pronounced drop in marriage and fertility, while unskilled females have experienced a more evident increase in cohabitation. We propose following mechanisms to understand this puzzle: the higher implicit return of investment in children's human capital compensates for the growing opportunity cost of childrearing; a significant income effect from positive assortative matching dominates the conventional wage channel; and as childrearing resource cost increases, a strong selection effect exists whereby those with strong fertility motives shift into marriage. To quantitatively discipline the relative importance of different factors, we theorize the trade-off between market work and childrearing activities by examining decisions about consumption, marital status, and fertility. Quantitative exercises show that 34.81% of the rise in cohabitation and 42.42% of the drop in marriage for the skilled can be explained by the rising returns of children, and 38.06% and 40.07%, respectively, for the unskilled; rising childrearing cost plays a significant role in explaining the declining fertility rates, contributing to 90.96% and 50.79% of the drop in fertility for the two skill groups. Most of the shrinking cohabitation gap and widening marriage gap between the two skill groups can be attributed to the rising wage and skill premium, increasing childrearing costs, and the growing returns of children.

Keywords: differential fertility, cohabitation, marital choice, quantity-quality trade-off

JEL Codes: I20, J13, J24

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1 Introduction

The United States has experienced significant behavioral changes that affect the family structures over the past few decades: the rates of marriage and fertility have dropped dramatically, accompanied by a pronounced increase in cohabitation. This paper documents the puzzle in divergent marital and fertility patterns between skill groups, finding that the decline in marriage and fertility is less dramatic for high-skilled females while the rise in cohabitation is more evident for low-skilled females. To understand the underlying driving forces leading to such differences, we build a model that features trade-offs between private consumption, public good consumption, and utility from children in which marital choices and fertility decisions are determined jointly.

Many early discussions have been focused on the increase in the age at first marriage, greater instability leading to "retreat from marriage" and delay in childrearing decisions. However, one striking fact that is often ignored is the rising trend of cohabitation.[1] Table 1.1 shows that skilled females with at least a bachelor's degree have experienced a less pronounced drop in marriage and fertility rates, while unskilled females have experienced a more significant increase in cohabitation. These facts challenge the standard theories that emphasize the opportunity cost of childrearing from labor market and gender specialization.

Table 1.1: Changes in Marriage Share, Cohabitation Share, and Fertility Rate

	Marriage (1980-2008)	Cohabitation (1995-2008)	Fertility (1980-2008)
High-skilled	-6.39%	94.81%	-15.59%
Low-skilled	-19.46%	100.06%	-23.50%

Note: This table shows the changes in marriage share, cohabitation share, and fertility rate for two skill groups of females. High-skilled females are those with bachelor's degree or above, and low-skilled females are high-school graduates.

The traditional theory, stemming from Becker's sequences of work[2], emphasizes the sources of gains of marriage from specialization and posits that marriage is rationalized as a lifetime contract between a man and a woman, in which the man performs market work

[1] Fitch et al. (2005) documents that the number of cohabiting households nearly doubled from 1960 to 1970, and now, cohabitation has become a common living arrangement.

[2] See Becker (1973), Becker (1974), Becker (1981).

while the woman performs home production. As an increasing number of women is able to get access to higher education and participate in the labor market and the gender gap narrows,[3], marital surplus falls with reduced specialization. In response to these underlying changes in the economy, the divorce rate has also been increasing, along with the declining marriage rate and fertility rate (Lundberg et al., 2016). However, although the standard theories can explain the aggregate trends of declining marriage and fertility and rising cohabitation, they cannot fully explain the puzzle in divergent marital and fertility decisions between skill groups.

The rising income inequality between college-educated individuals and non-college-educated ones implies that high-skilled females not only face a higher opportunity cost of childrearing and a lower gender specialization gain from marriage, but they also experience a growing opportunity cost and a decreasing benefit from marriage. In this case, singlehood and cohabitation should have become more desirable for the skilled. Not only the wage gap is widened, but the income volatility also increases, especially for the less-educated households.[4] Facing a more volatile income stream, the unskilled should have found it more attractive to live with a partner for risk-sharing purposes than the skilled. Hence, it is often taken for granted that there should be more educated females who are less likely to get married or have children, which is contradictory to the divergent patterns found in the data.

To understand the puzzle of the divergence of marital shares and fertility rate between skill groups, we propose the following four important mechanisms. First, a higher return of investment in children's human capital partly compensates for the high opportunity cost of childrearing for the skilled, and thus the skilled face a trade-off between external return from the labor market and implicit return from investment in children's quality. Data from the American Time Use Survey support this claim that educated women not only spend more time working in the outside labor market, but also invest more time in their children. Over the 2003 to 2006 period, the growth rate of time spent on childcare also increases with educational attainment. Second, the income effect from posi-

[3] Blau and Kahn (2017) provides a thorough review of the trends and explanations of evolution of gender wage gap.

[4] Dynan et al. (2012) claim that households including individuals who do not a college degree have consistently experienced more volatile incomes than households with members who have a college degree. More importantly, increases in income volatility are somewhat greater among less-educated households.

tive assortative matching dominates the conventional gender specialization effect for the skilled. Unlike low-skilled females, who retreat from marriage to cohabitation when facing a higher wage rate that is predicted by the conventional wage channel, high-skilled females benefit more from assortative mating because of income effect, and this increases the attractiveness of marriage when wages rise. Third, as childrearing cost goes up, the low-skilled group shifts from marriage to cohabitation and has fewer children. Nevertheless, selection effect is strong for the high-skilled group that those who have really strong fertility motives deviate from singlehood or cohabitation to marriage because the benefit associated with childrearing activities in marriage status will offset part of the increase in the cost. Last, marital and fertility decisions will also be affected by the level of the potential partner's commitment and people's preference toward different living arrangements. How much the partner contributes to the household will affect a female's choice on family formation. Skilled females and unskilled females may react differently to a change in the partner's commitment level because of different utility associated with public good consumption.[5]

To disentangle the importance of these driving forces, a quantitative model is constructed. In the model, female agents are heterogenous in their skill type, human capital, and type of potential partner they will meet. They choose their marital status and the number of children and allocate their time and resources to labor work, public good production, and educating children. The matching market is exogenous that a positive assortative matching process is assumed. The efficiency of investment in children's human capital will depend not only on the female's own human capital and effort invested, but also on choices of marital status.

Turning to the quantitative analysis, we first calibrate the benchmark model to the U.S. economy by targeting average marital shares and fertility rate for two skill groups from 1995 to 2008. The model can well capture the within-skill-group fertility rates in different marital statuses and between-skill-group fertility differentials. Then we conduct a set of counterfactual experiments in a dynamic setting where we divide the sample into two sub-periods and restore the value of parameters of interest in the second sub-period to its value in the first sub-period. Decomposition exercise shows that rising childrearing

[5]Changes in legal treatments aiming to protect vulnerable parties in cohabiting relationships also tend to levy a positive impact on the acceptance of cohabitation; however, discussion on regulations and policies is beyond the scope of this research.

cost and return in children play a significant role in explaining the declining fertility rates for two skill groups. In terms of changes in marital shares, return in children contributes to 34.81% of the rise in cohabitation and 42.42% of the drop in marriage, and 38.06% and 40.07%, respectively, for the unskilled. In addition, high-skilled females are more sensitive to rises in their partners' commitment and cohabitation preference, while low-skilled females are more vulnerable to rises in wage and childrearing cost. Because of the higher return of investment in children's quality, higher benefit from positive assortative matching, and stronger selection effect faced by the skilled, rising skill premium and childrearing costs have opposing effects on the two skill groups. The shrinking cohabitation gap and widened marriage gap between the two skill groups are largely explained by the rising wage and skill premium, increasing childrearing costs, and growing return in children. Three channels together contribute to around 165.8% of the increasing marriage differentials between skill groups, and partners' commitment together with cohabitation preference attributes to negative 65.8%.

This paper aims at understanding the divergence in marital choices and fertility decisions across skill groups. In this regard, the paper is related to several themes of research. The first is a vast literature that investigate the interactions of economic growth, labor market and family formations. Galor and Weil (2000), Doepke (2004), Murphy et al. (2008) all develop models that feature economic growth and endogenous demographic transitions, while in Galor and Weil (1993) changes in gender roles drive fertility decline. Following De La Croix and Doepke (2003) and Doepke (2004), this paper takes changes in labor market, such as rising skill premium as given, and develops a theory to quantitatively discipline the driving forces that lead to differential fertility and marriage choices.

Our work also relates to studies on the evolution of living arrangements. Back in the 1970s, Gary Becker (Becker (1973), Becker (1974)) developed the economic model of marriage, where the expected source of gains of marriage stemmed from specialization and exchange (Becker, 1981). Later work has recognized gains from joint consumption of public good such as children and housing (Lam, 1988). Empirically, Lundberg and Pollak (2015) investigated the evolving role of marriage in the United States. This paper takes matching market as exogenously given and emphasizes the return of investment in children associated with various marital decisions.

The third related strand of literature studies cohabitation. In most early works, cohabitation is not explicitly considered a possible living arrangement. Empirically, it is also hard to measure cohabitation due to data limitations. Researchers at the Census Bureau started developing national representative estimates of the number of cohabiting couples in the late 1970s (Glick and Norton (1977), Glick and Spanier (1980), Glick (1984), Bumpass and Sweet (1989b)). The measure known as Partners of the Opposite Sex Sharing Living Quarters (POSSLQ) was developed to infer cohabiting couples indirectly from the data, which was further refined by Casper and Cohen (2000).[6] Another stream of literature that studies cohabitation investigates the wealth accumulation (Vespa and Painter, 2011), happiness, and influence of different family structures on children (Thornton (1988), Bumpass and Sweet (1989a), Bumpass and Lu (2000)). We utilize data from the Current Population Survey (CPS) to identify cohabitors, which provides a more precise measure, and contributes to the literature by theorizing cohabitation, in contrast to other marriage choices.

Lastly, this paper is related to research on the economics of fertility. Advanced by Becker (1960), Becker (1973), and Willis (1973), economists who study modern economic demography concentrate on parental trade-offs between the number and quality of children. Later research extends to study fertility and educational investment in children, such as Galor and Weil (2000) and De La Croix and Doepke (2003). This paper highlights the role of the return of investment in children's human capital in explaining different behaviors across skill groups.

There are several recent papers examining marital and fertility patterns among different groups. Greenwood et al. (2016) document that the drop in marriage and the increase in divorce are greater for non-college-educated individuals versus college-educated ones. Bar et al. (2018) study the flattened relationship between income and fertility, proposing the marketization of parental time costs as the driving force. The most closely related paper is by Lundberg et al. (2016), where they use data from 1960-2000 U.S. censuses and 2010 American Community Survey to document divergent patterns in marriage, cohabitation, and childbearing. In contrast to the empirical analysis in their work, a quantitative model is developed in this paper to decompose the mechanisms at work.

An outline of the paper follows. Section 2 details the empirical findings. Section 3

[6] Manning (2013) provides a detailed review of the related empirical literature.

presents the benchmark model. Section 4 calibrates the model and discusses model fitness. Section 5 studies counterfactual experiments. Section 6 concludes.

2 Empirical Findings

This section first presents empirical findings on divergent marital choices and fertility decisions between low-skilled and high-skilled groups, and then provides supportive evidence on the implicit return of investment in children.[7]

2.1 Divergence in Marital Status and Fertility Rates

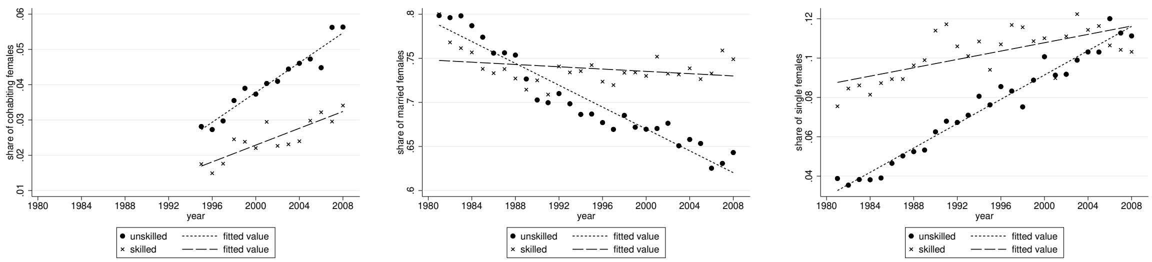
Evolution of Marital Status Figure 2.1 illustrates the evolution of marital choices by education groups. In the 1980s, 79.85% percent of unskilled females aged between 40 to 45 years old were currently married; in 2008, this number dropped by 19.46% to 64.31%; for the skilled, the marriage share declined by 6.39% from 80.01% in 1980 to 74.90% in 2008. The cohabitation share rose from 2.82% and 1.75% in 1995 to 5.63% and 3.41% in 2008 for the unskilled and the skilled, and the increase was 99.65% and 94.86%, respectively. The single share rose from 3.89% to 11.13% for the unskilled and from 7.55% to 10.32% for the skilled.[8] Despite the fact that both skill groups have experienced a sharp drop in marriage and a steady rise in cohabitation and singlehood, the changes are more dramatic for the unskilled.

Evolution of Fertility Figure 2.2 displays fertility rates by education groups over time. The fertility rate dropped by 23.5% from 3 to 2.3 and 15.6% from 2.6 to 2.2 for the two skill groups conditional on having children. Again, despite the common declining rates in fertility experienced by two skill groups, the drop is more dramatic among the low-skilled.

[7] Appendix A.1 illustrates data sources and sample restriction, and Appendix A.2 details variable construction process.

[8] The full analysis sample can be categorized into four marital status: currently cohabiting, currently married, separated, divorced, or widowed, and single (never marry), with the latter two called unparterned. Since we abstract from divorce behaviors, we focus on singlehood instead of being unpartnered. Details can be found Figure B.1 in Appendix B.1.

Figure 2.1: Marital Status for Females by Education Groups



(a) currently cohabiting (b) currently married (c) single

Note: This figure shows the share of cohabiting females (panel [a]), the share of married females (panel [b]) and the share of single females (panel [c]) by education groups.

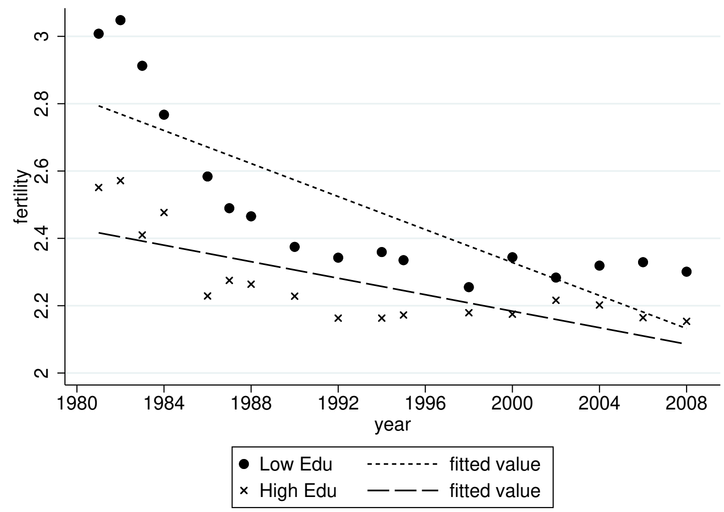
2.2 Fertility Choice versus Marital Decision

Decisions on living arrangements and childrearing are closely related. Table 2.1 shows the results regressing whether to have a child (column [1]-[2]) and the number of children (column [3]-[4]) on marital status, with age, industry fixed effect, state fixed effect, and race fixed effect controlled and standard errors robust. It can be seen that compared to single females, females who choose cohabitation are more likely to have at least one child, and married females have the highest probability of having children. Conditional on having children, married females tend to have the highest number of children among the three marital groups, and cohabitation group comes second. Despite that a strict casual relationship cannot be achieved, the results imply that fertility decisions and marital choice are interrelated. Therefore, it is of great essence to study childrearing decisions and choices of different marital status together as a joint decision process, which is a key feature in the model.

There are three takeaways from the empirical exercises: (1) on average, regardless of marital status, unskilled females tend to have more children than skilled females; (2) the fertility rate has dropped much less for skilled females; (3) divergence also appears in marital choices between two skill groups in that both the drop in marriage and the rise in cohabitation are more prominent for unskilled females.[9] The first observation is consistent with quantity-quality trade-off theory that high-skilled females with higher incomes are more likely to invest in the quality of their children rather than the quantity. However,

[9] These findings are robust to demographic characteristics such as age and race, as discussed in Appendix B.2.

Figure 2.2: Completed Fertility Rates by Education Groups



Note: This figure shows the completed fertility rates by education groups over time.

the puzzle comes from the second and the third observations, namely the divergence between the two skill groups.

2.3 Time Spent on Children

In order to understand the divergence puzzle documented above, we use the American Time Use Surveys from 2003 to 2008 to examine parental time allocated to childbearing activities.[10] As Table 2.2 shows, both the time spent on market work and childcare increases with years of schooling.[11] Given the fact that the higher-educated parents tend to spend more time working in the labor market, it is more striking to see that they are also more likely to allocate a larger amount of time with their children. What is more, over this period, high school graduates decrease both time spent in market work and time in child-

[10] Childcare activities include physical care for children, reading to/with children, playing with children (not sports), arts and crafts with children, talking with/listening to children, organization and planning for children, looking after children, attending children's events, waiting for/with children, picking up/dropping off children, and caring for/helping children. Activities related to household children's education include homework, meetings and school conferences, home schooling, and waiting associated with children's education. Activities related to household children's health include providing medical care, obtaining medical care, and waiting associated with children's health. See BLS website for more information.

[11] This is also supported by Guryan et al. (2008), who claims the relationship still holds even when controlling for employment status. He found that mothers with at least a bachelor's degree spend approximately 4.5 hours more per week on childcare than mothers with a high school degree or less.

Table 2.1: Marital Status and Fertility Decisions

	Birth		Fertility	
	(1)	(2)	(3)	(4)
cohabiting	0.0834***	0.0800***	0.192	0.194
	(2.78)	(2.67)	(1.28)	(1.29)
married	0.562***	0.562***	0.356***	0.357***
	(57.81)	(57.95)	(7.30)	(7.33)
skilled	-0.0832***	-0.0836***	-0.112***	-0.112***
	(-13.71)	(-13.74)	(-6.01)	(-5.99)
R^2	0.239	0.241	0.025	0.025
Year F.E.	No	Yes	No	Yes
Observations	22115	22115	17449	17449

t statistics in parentheses

Age, industry fixed effect, state fixed effect, and race fixed effect are controlled.

Standard errors robust.

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Note: This table reports the results regressing whether to have a child (column [1]-[2]) and the number of children (column [3]-[4]) on marital status, with age, industry fixed effect, state fixed effect, and race fixed effect controlled and standard errors robust.

care; on the contrary, females with at least some college experience devote more time into labor work and invest more in their children. As can be seen from the last row in Table 2.3, the growth rate of time spent on childcare also increases with educational attainment.

Return of investment in children could take multiple forms: spending time with kids might give direct utility to parents, or some parents just love to be with their children; parents may care about the future income/future job/education of their children; and parents may directly get monetary support from their children. Hence, it is not easy to directly measure such intangible implicit return of investment in children. Instead, here we take the these facts of time allocation as supportive evidence that implies how parents value time invested in different activities, thus reflecting the higher implicit return from investing time in children for the skilled parents.

Table 2.2: Time Spent in Market Work and Child Care for Women in the United States by Educational Attainment

	Marital Status			Market Work, hours/week		Childcare, minutes/day			
Education	Unpartnered	Cohabiting	Married	total hours	main job	caring	education	health	total
high school	27.47%	4.46%	68.06%	25.512	23.229	29.757	8.942	1.092	39.794
some college	30.18%	3.88%	65.94%	29.288	25.893	39.036	12.743	2.690	54.586
BA and above	23.14%	2.92%	73.94%	30.017	26.591	62.158	15.303	2.141	79.648

Note: This table shows the time spent in market work and child care for females by educational attainment.

Table 2.3: Time Spent in Market Work and Child Care for Women in the United States by Educational Attainment over Time

	total hours usually worked per week			total minutes spent on childcare per day		
year	high school	some college	BA and above	high school	some college	BA and above
2003	26.15	28.25	28.54	53.62	52.43	79.33
2004	26.63	29.57	29.30	32.74	53.21	74.97
2005	26.79	28.91	30.43	33.92	54.38	84.42
2006	24.36	30.06	31.83	38.89	55.34	69.25
2007	24.30	29.01	29.27	41.95	58.06	82.20
2008	24.23	30.10	30.53	37.27	54.60	87.40
change	-7.35%	6.52%	6.96%	-30.48%	4.15%	10.18%

Note: This table shows the time spent in market work and child care for females by educational attainment over time.

3 Benchmark Model

Female agents in the model are assumed to be heterogenous in three aspects: skill type, human capital, and type of potential partner. There are two skill groups in the economy, high-skilled (college-educated) or low-skilled (non-college-educated).

$$\mathbb{1}^{col} = \begin{cases} 1 & \text{high skill group denoted by } H \\ 0 & \text{low skill group denoted by } L \end{cases}$$

Within each skill group, agents are endowed with human capital h, following the distribution of human capital denoted by $F^H(h)$ and $F^L(h)$, respectively. In addition to the skill type and human capital, an agent is also endowed with an exogenous θ that governs the income of her potential partner, exogenously drawn from distributions $G^H(\theta)$, and $G^L(\theta)$. We abstract from the double-sided marriage market and assume the positive assortative matching process. Hence, the exogenous state of a female agent in the model can be described by $(\mathbb{1}^{col}, h, \theta)$.

In the model, each agent is endowed with one unit of time, and she values utility from private good consumption, utility over her children's human capital discounted by total number of children, and utility from public good consumption if she is in cohabitation or marriage status. She allocates the one unit of time to childrearing activities and working in labor market, and part of her labor income will be used for public good production if she chooses to cohabit or marry a partner. To summarize, she makes decisions about consumption (c), the lifetime quantity of children (n), effort invested in children's human capital (q), resources allocated to public good production (s), and public good consumption (X) with a subsistence level of consumption ($\underline{X}$). All these choices are continuous.

As raising a kid takes time and money, we model both the resource cost and time cost, denoted by π_0 and π_n, respectively. Educating a kid is a time-intensive activity. Denote the time cost by π_q. There would be a trade-off between quantity and quality of children. The human capital accumulation process for children depends on the parents' own human capital and the effort they invest in educating their children. Production of public good requires labor income contribution both from the female agent and her partner.

At the same time, the agent makes a discrete choice on marital status, including singlehood, cohabitation, and marriage, denoted by $M \in \{s, c, m\}$. To simplify notations, we also use three indictor functions to capture the endogenous marital decision: $\mathbb{1}^s = 1$ represents being single, $\mathbb{1}^c = 1$ cohabiting with a partner, and $\mathbb{1}^m = 1$ being married. The model is static in the sense that there is no breakup or divorce[12].

3.1 Household Utility

Omitting the subscript for individual i, the utility function of a female agent endowed with $(\mathbb{1}^{col}, h, \theta)$ is defined as follows:

$$\begin{aligned} U = \{ \quad & \frac{c^{1-\sigma_c}}{1-\sigma_c} + (\mathbb{1}^M \cdot \alpha_n^M) n^\gamma \left[\frac{(nh')^{1-\sigma_n}}{1-\sigma_n} + \mathbb{1}^M \delta_n^M \right] \\ & + \mathbb{1}^c \cdot \alpha_X \frac{(X-\underline{X})^{1-\sigma_X}}{1-\sigma_X} + \mathbb{1}^m \cdot \alpha_X \frac{(X-\underline{X})^{1-\sigma_X}}{1-\sigma_X} \} \cdot (1 + \mathbb{1}^c \delta^c + \mathbb{1}^m \delta^m) \end{aligned} \tag{1}$$

The utility function is assumed to take CRRA functional form, and the intertermporal preference parameters in the CRRA utility function are assumed to vary for private con-

[12] Note that variables or parameters with superscript $\{s, c, m\}$ imply that they are specific to marital groups, while those with superscript $\{H, L\}$ are skill-group specific.

sumption (σ_c), children (σ_n), and public good (σ_X).

All female agents in the model can choose to have kids. They decide how many children to have, and they care about the quality of their children. Hence, utility over children contains two parts: total human capital from children (nh') and a fertility utility premium (δ_n^M). Following Becker et al. (1990), we assume both will be discounted by the total quantity of children that is governed by the parameter γ. The fertility utility premium is modeled to capture the fact that even if a parent does not invest any effort into children's human capital development, the presence of children will bring her happiness, although such happiness decreases with the number of children. Both fertility preference parameter α_n^M and fertility premium δ_n^M are assumed to vary across different marital statuses such that $\alpha_n^s < \alpha_n^c \leq \alpha_n^m$ and $\delta_n^s < \delta_n^c \leq \delta_n^m$, which is supported by the empirical evidence shown in section 2.2 that females who choose different living arrangements are associated with different fertility motives.

Cohabiting and married females are assumed to face the same public good preference parameter α_X, while single women do not have the choice of enjoying public good. The subsistence level of public good consumption captures the idea of necessary joint expenditure for two partners, such as housing. Although there is no breakup or divorce in the model, direct utility cost/premium parameters δ_c and δ_m capture the net direct utility from cohabitation and marriage. For example, a negative δ_m implies that the cost associated with marriage, such as wedding cost or divorce cost, outweighs the benefit from marriage. The important point is that we do not impose any parametric restrictions on these two parameters, and in the calibration part, we will let the model tell.

3.2 Budget Constraint

A skilled female worker gets a unit wage of ω^H while an unskilled worker gets a unit wage of ω^L. The total wage a female agent gets is proportional to her own human capital.

$$\begin{aligned} w &= \omega h \\ &= [\mathbb{1}^{col}\omega^H + (1 - \mathbb{1}^{col})\omega^L]h \end{aligned}$$

The exogenous assortative matching process implies that if a female gets wage w, then she will meet a partner who earns θw. The budget constraints are written as follows:

$$c = w(1-s) \cdot \left[1 - (\mathbb{1}^s \pi_q^s + \mathbb{1}^c \pi_q^c + \mathbb{1}^m \pi_q^m) qn - \pi_n n\right] - \pi_0 n \tag{2}$$

where

$$\pi_n = \mathbb{1}^{col} \pi_n^H + (1 - \mathbb{1}^{col}) \pi_n^L$$
$$\pi_0 = \mathbb{1}^{col} \pi_0^H + (1 - \mathbb{1}^{col}) \pi_0^L$$

3.3 Human Capital Accumulation Process

Children's human capital partially depends on how smart their parents are and partially on how much effort their parents invest. Parameters τ and η capture the relative importance nature versus nurture plays in shaping a person's human capital. Efficiency in educating children depends on family structures, which contention is supported by a vast of empirical literature[13]. Hence, we assume $\kappa^s < \kappa^c \leq \kappa^m$.

$$h' = H(q,h) = B \cdot h^\tau \cdot (\kappa^M + q)^\eta \tag{3}$$

where

$$B = \mathbb{1}^{col} B^H + (1 - \mathbb{1}^{col}) B^L$$
$$1 > \tau, \quad \eta > 0, \quad \tau + \eta \leq 1$$

3.4 Public Good Production

If a female agent decides to cohabit with or marry a partner, she can enjoy a public good with her partner, but she needs to allocate fraction s of her market work value to public good production. Simultaneously, her partner contributes s_{man}^M portion of his income

[13]There is a considerable amount of empirical literature that documents the benefits of marriage for the well-being of children. On average, children living with two biological married parents tend to experience better educational, cognitive, and social outcomes not only in the short-term but also through adulthood (Artis (2007), Broman et al. (2008), Brown (2004), Carlson and Corcoran (2001), Manning and Lamb (2003), Teachman (2008), Videon (2002), Amato (2005)). Several works have also been conducted to use theories to explain the relationship between family structures and the well-being of children. Potential theoretical explanations include economic resources, parental socialization, family stress or turbulence, and selection (Amato (2005), Carlson and Corcoran (2001), Huston and Melz (2004)). See Brown (2010) for a detailed literature review.

$w_{man} = \theta \cdot w$ to public good production. Nevertheless, if a female agent chooses singlehood, she does not have the option to consume public good. Production of public good takes the following form:

$$\begin{cases} X^c = \left\{[ws(1-\pi_q^c qn - \pi_n n)]^{\rho^c} + (w_{man} s_{man}^c)^{\rho^c}\right\}^{\frac{1}{\rho^c}} / \xi \\ X^m = \left\{[ws(1-\pi_q^m qn - \pi_n n)]^{\rho^m} + (w_{man} s_{man}^m)^{\rho^m}\right\}^{\frac{1}{\rho^m}} / \xi \end{cases} \tag{4}$$

Notice that ξ captures the possibility for a female to meet a partner with negative asset (positive debt or liability) even if the partner has a positive income value. We assume $\xi^H = \xi^L = 2$ for the benchmark case.

3.5 Maximization Problem

The maximization problem can be solved in two steps. First, conditional on marital status, a female agent chooses private consumption c, number of children n, effort invested in children's human capital q, fraction devoted to public good production s, and public good consumption X to maximize utility (equation 1) subject to the budget constraint (equation 2), facing human capital accumulation process of their children (equation 3), and public good production (equation 4). Then she compares the total utility when choosing different marital status including singlehood, cohabitation, and marriage, and then she will choose the one that gives her the highest utility (M^*). The formal maximization problem is written as follows:

step1: $V(M) = \max_{c\geq 0, n\geq 0, q\geq 0, 1\geq s\geq 0, X\geq \underline{X}} U$

subject to

budget constraint (2)

human capital accumulation process for children (3)

public good production (4)

step2: $M^* = \underset{M\in\{s,c,m\}}{\operatorname{argmax}} \ V(M)$

4 Calibration and Results

4.1 Calibration Strategies

Since data on cohabitation in the CPS did not become available until year 1995 and the emphasis of this paper is not on the Great Recession, we only consider the time period from year 1995 to year 2008.

For potential partner's income and contribution to the production of public good, we assume the following functional forms that the time a partner contributes to the public good will be proportional to the time the female agent contributes:

$$w_{man} = \omega h \cdot \theta = \omega h \cdot [\mathbb{1}^{col}\theta^{H} + (1-\mathbb{1}^{col})\theta^{L}]$$

$$s^{c}_{man} = s(1-\pi^{c}_{q}qn - \pi_{n}n) \cdot \overline{s^{c}_{man}}$$

$$s^{m}_{man} = s(1-\pi^{m}_{q}qn - \pi_{n}n) \cdot \overline{s^{m}_{man}}$$

There are thirty-seven parameters in total, out of which two parameters will be taken from the existing literature, six parameters are chosen arbitrarily, and the remaining are either estimated from the data or calibrated jointly from the model. All the parameters are presented in Table 4.1.

The intertermporal preference parameters in the CRRA utility function are assumed to vary for private consumption, children, and public good, but all lie within the range from zero to one. However, there is no consensus on what the value should be for different consumption good or utility for children. The parameters σ in the CRRA utility function that governs the intertemporal preference on overall consumption are set to be 0.68 in Hanushek et al. (2014). Greenwood et al. (2003) set the value to be 0.5 for public good, 0.325 for utility on quantity of children, and 0.2 for utility on quality of children. In the benchmark model, we set the intertemporal preference parameter toward private consumption, public good, and utility over children to be 0.6, $\frac{2}{3}$, and $\frac{3}{4}$, respectively. To have a valid utility function, we should have $\sigma_n - 1 < \gamma$ and $\gamma < \sigma_n$, and hence we arbitrarily set $\gamma = 0.6$. The parameters, ρ^{c} and ρ^{m}, that govern the substitutability between female's and male's contribution to public good production are assumed to be 0.5. Two parameters that shape the human capital accumulation process are taken from De La Croix and

Doepke (2003). τ measures the intergeneration human capital transmission, while η governs the transmission of parents' investment into children's human capital.

Twelve parameters are estimated from data. From Expenditures on Children by Families (CRC), we estimate the childrearing resource cost for the median income family and subtract 25% to adjust for families with more than two children. Subsistence level of public good, $\underline{X}$, is estimated using housing consumption out of total consumption, which ranges from 30% to 35%. we choose 30% for the benchmark model. The ratio of time contribution between partners is estimated from Time Use Survey for married and cohabited couples. Partners in cohabitation relationships on average contribute more to household work than those in marriage, which supports the existence of the story of specialization[14].

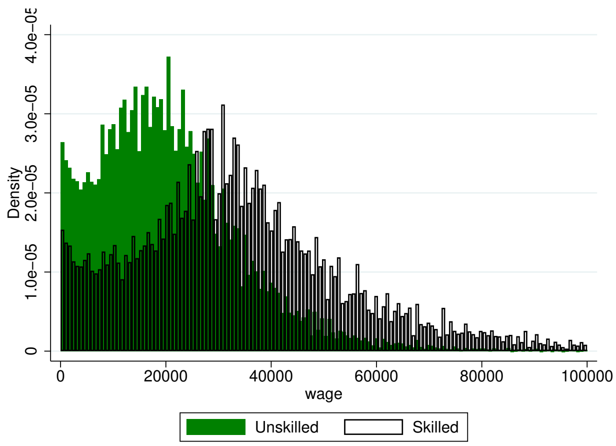
Both the skill premium and the share of different human capital groups are estimated directly from the pooled Current Population Survey (CPS). The high-skilled group is defined as individuals with at least a bachelor's degree, and the low-skilled group is defined as those with high school degrees. High school dropouts are not included in the sample to be consistent with the fertility and marital shares data described in the previous paragraphs. We follow Acemoglu (2002) in constructing the skill premium.

For the distributions of human capital and types of potential partners, we use wage data from CPS to estimate distributions for low- and high-skilled groups separately. Analogously, we restrict the sample of females aged from 40 to 44. Wage is constructed using the IPUMS variable INCWAGE, and the lowest 1 percent of earners is trimmed off. Top-coded incomes are assumed to be 1.5 times the top-code. Using the IPUMS variable SPLOC, we am able to link family members within a household, and that is how we estimate the husband-to-wife income ratio, which corresponds to its counterpart in the model-parameter θ. We assume the functional form for human capital distribution and partner type distribution to be log-normal. For illustration purpose, Panel (a) in Figure 4.1 is restricted to those with incomes less than $100,000, and Panel (b) is restricted to the families in which husband-to-wife income ratio is less than 10. For estimating distributions,

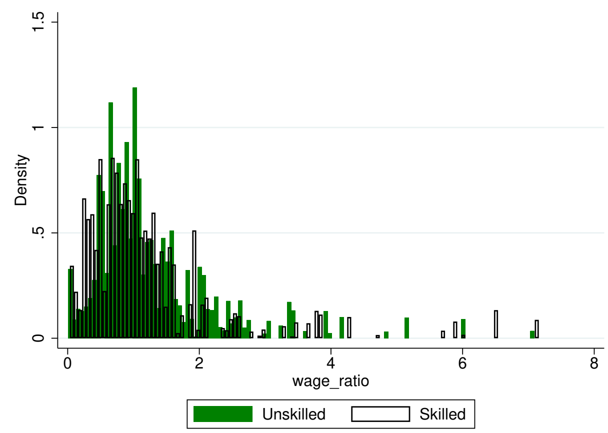
[14]Household activities include 9 categories: (1) housework (interior cleaning, laundry, sewing, storing items, other housework), (2) food and drink preparation, presentation, and cleanup, (3) interior maintenance, repair, and decoration, (4) exterior maintenance, repair, and redecoration, (5) household activities related to lawn, garden, and houseplants, (6) household activities related to animals and pets, (7) household activities related to vehicles, (8) household activities related to appliances, tools, and toys, and (9) household management.

the full sample is used. As Panel (a) shows, high-skilled females enjoy a higher wage on average, but they also face a higher dispersion. For the partner's type, it is clear that the positive assortative matching exists, though an evident distinction is not observed here.

Figure 4.1: Distributions of h and θ by Education Groups



(a) human capital h



(b) partners' types θ

Note: This figure shows distribution of human capital and partners' types in the data.

The remaining parameters are jointly calibrated from the model, targeting skill-group specific marital shares, fertility rates, and human capital growth rates. For the human capital growth rate, we first get the average years of schooling for the two skill groups in each year, and we calculate the annual growth rate. Then we average the growth rates across the data periods. The value of the high skill group is 1.000482279, and it is 1.001031772 for the low-skilled group. The third step is to take these two numbers to the power of 25 to get the human capital growth rates between two generations.[15]

The calibration results are reported in table 4.2. The targets include marital shares, fertility rates and human capital growth rates for the two skill groups. The model fits the targets quite well: not only the levels but also the differences between two skill groups. This can be seen from the last two rows that all the signs are consistent with the data. Compared to the low-skill group, skilled females are more likely to get married and less

[15]Notice here the growth rate is higher for the low-skilled group, and partly it is because we use years of schooling as the measure of human capital. If instead we use wage data to capture human capital, the growth rate is expected to be higher for the high-skilled group.

likely to cohabit with a partner.

4.2 Model Fitness

Based on the model parameterization discussed in the previous section, we now illustrate the performance of the benchmark model. The model gives two groups of predictions that we can observe in the data: Table 4.3 reports marital-group fertility rates, and Table 4.4 reports the ratio of contribution to public good between partners within a household. Conditional on having at least one child, women are predicted to have the highest fertility rate in the marriage group, then women in the cohabitation group, and single females have the lowest fertility rate, which is aligned with what is observed in the data. The model also does a fairly good job of predicting between-group fertility differences in that in general, females in the low-skilled group are more likely to have more children than those with more years of schooling, which is consistent with quantity-quality trade-off theory. Additionally, such a between-group fertility difference is most evident for cohabiting females. The predicted differential fertility rate between unskilled females and skilled females is 0.4075 for those engaging in cohabitation relationships; the counterpart in data is 0.3360.

Although contribution to public good is not directly observed, we use the reported time allocated to household activities from the Time Use Survey as the data counterpart. The model predicted ratio of time allocated to public good production between two skill groups is 1.0648, which is close to its data counterpart of 1.0213.

Table 4.1: Calibration parameters

Parameters	Values	Description	Source/Target
σ_c	0.6000	Intertemporal preference (private consumption)	Assumption
σ_X	0.6667	Intertemporal preference (public good)	Assumption
σ_n	0.7500	Intertemporal preference (children)	Assumption
γ	0.6000	Fertility discounting factor	Assumption
ρ^c	0.5000	Elasticity of substitution for public good (cohabited)	Assumption
ρ^m	0.5000	Elasticity of substitution for public good (married)	Assumption
τ	0.200	Intergeneration human capital transmission	La Croix and Doepke (2003)
η	0.620	Parents' investment in human capital transmission	La Croix and Doepke (2003)
π_0^H	825.2445	Childrearing resource cost	CRC
π_0^L	492.6095	Childrearing resource cost	CRC
$\overline{s^c_{man}}$	0.4595	Husband income contribution (cohabited)	Time Use Survey
$\overline{s^m_{man}}$	0.4595	Husband income contribution (married)	Time Use Survey
W_H/W_L	1.6260	Skill premium	CPS(Pooling)
$\underline{X}$	0.300	Subsistence level of public good	CRC
h^H	(1.04, 9.78)	Human capital distribution: log normal(μ,σ)	CPS(Pooling)
h^L	(0.94, 9.64)	Human capital distribution: log normal(μ,σ)	CPS(Pooling)
θ_H	(0.81, 1.25)	Husband income distribution: log normal(μ,σ)	CPS(Pooling)
θ_L	(0.84, 1.15)	Husband income distribution: log normal(μ,σ)	CPS(Pooling)
B^H	1760	Human Capital Accumulation	Joint Targets
B^L	1505	Human Capital Accumulation	Joint Targets
κ^s	0.5500	Return of investment in children's human capital (single)	Joint Targets
κ^c	0.8600	Return of investment in children's human capital (cohabiting)	Joint Targets
κ^m	0.8800	Return of investment in children's human capital (married)	Joint Targets
α_n^s	0.6500	Utility parameter for kids (single)	Joint Targets
α_n^c	1.3400	Utility parameter for kids (cohabiting)	Joint Targets
α_n^m	1.3500	Utility parameter for kids (married)	Joint Targets
α_X	1.1500	Utility parameter for public good	Joint Targets
δ_n^s	8	Fertility premium (single)	Joint Targets
δ_n^s	10	Fertility premium (cohabiting)	Joint Targets
δ_n^m	10	Fertility premium (married)	Joint Targets
δ^c	0.2350	Cohabitation premium	Joint Targets
δ^m	0.9000	Marriage premium	Joint Targets
π_q^s	0.0240	Time cost investing in children human capital	Joint Targets
π_q^c	0.0220	Time cost investing in children human capital	Joint Targets
π_q^m	0.0170	Time cost investing in children human capital	Joint Targets
π_n^H	0.1967	Time cost investing in children	Joint Targets
π_n^L	0.1865	Time cost investing in children	Joint Targets

Note: This table summarizes parameters internally and externally calibrated.

Table 4.2: Calibration Target: Marital Shares (Percent), Fertility, and Human Capital Growth Rate for Two Skill Groups

	Single	Cohabiting	Married	Fertility	HC Growth
H-Model	13.0800	2.6400	84.2800	2.4659	1.0157
H-Data	12.7239	2.9099	84.3662	2.2090	1.0121
L-Model	9.1600	8.5200	82.3200	2.8378	1.0276
L-Data	12.1059	5.0680	82.8261	2.3220	1.0261
Diff-Model	3.9200	-5.8800	1.9600	-0.3719	-0.0119
Diff-Data	0.6180	-2.1581	1.5401	-0.1130	-0.0140

Note: This table shows calibration targets.

Table 4.3: Predicted Marital-Group Fertility for Females

	Single	Cohabiting	Married
H-Model	1.8307	1.8567	2.6303
H-Data	1.8545	1.9391	2.2217
L-Model	2.0778	2.2643	3.0450
L-Data	2.1252	2.2752	2.3394
Diff-Model	-0.2472	-0.4075	-0.4147
Diff-Data	-0.2706	-0.3360	-0.1176

Note: This table compares model-generated marital-group fertility rates and data counterparts.

Table 4.4: Predicted Contribution to Public Good Production (s)

	High Group	Low Group	Ratio
Model	0.5747	0.5397	1.0648
Data	113.1577	110.7969	1.0213

Note: This table compares model-generated contribution to public good production and data counterparts where the data report the minutes females devoted to household activities per day.

5 Quantitative Experiments

In this section, we quantitatively decompose mechanisms at work.[16] We divide the sample the sample period into two sub-periods and recalibrate the model. The first sub-period refers to year 1995 to year 2002, and the second sub-period refers year 2003 to year 2008. The targets are skill-group specific marital shares, fertility rate, and human capital growth rate.[17]

5.1 Recalibration

To understand changes in the trends of marriage, cohabitation, and fertility rate for two skill groups, we consider two regimes. Wage rates, childrearing costs, return of investment in children, partner's commitment, and direct cohabitation premium are assumed to change over time, among which wage (ω), resource cost of childrearing (π_0), and partner's commitment (s) will be directly estimated from data, and the rest of parameters ($B, \kappa, \pi_q, \pi_n, \delta^c$) will be backed out by calibrating the model for two sub-periods.[18]

Table 5.1 summarizes the newly recalibrated parameters for the two sub-periods, and Table 5.2 displays model targets. The re-calibrated model performance can be seen from Table 5.3. The model is able to well capture (1) fertility rates for different marital status in two sub-periods and (2) the changes of both marital shares and fertility rates for the two skill groups over time.

In the first regime, consistent with data, high-skilled agents are more likely to choose singlehood and less likely to choose cohabitation or marriage than low-skilled agents;

[16] We provide a detailed discussion on relative importance of different margins by shutting down skill-group or marital-group specific parameters in Appendix C.1, including skill premium, childrearing costs, return of investment in children, partner's commitment, and cohabitation preferences.

[17] As discussed, to calculate human capital growth rate, we use years of schooling as the measure instead of wage rates.

[18] The marriage market is assumed to be exogenous and fixed, which is governed by the fixed distribution of types of partners (θ). There is a debate about how assortative matching changes over time. Several papers in the literature claim that positive assortative matching has been increasing in the United States. For example, Greenwood et al. (2014) and Greenwood et al. (2016) document the rise of positive assortative matching from 1960 to 2005; Schwartz and Mare (2005) record the increase in educational homogamy from 1960 to 2003. Nevertheless, Schwartz and Mare (2005) use both CPS and ACS data to dispute the argument, claiming that the increase of assortative matching and educational homogamy is sensitive to the choice of educational categories. The distribution of θ is not recalibrated for the dynamics counterfactual experiments because the marriage market is exogenously given and this is not the main focus of this paper, so we choose not to get into the debate.

Table 5.1: Calibrated Parameters for Two Sub-Periods

	Benchmark	First Period	Second Period
B_H ($\uparrow$)	1765	1760	1780
B_L ($\uparrow$)	1505	1500	1525
κ^s ($\uparrow$)	0.5500	0.4800	0.5900
κ^c ($\uparrow$)	0.8600	0.7200	0.8700
κ^m ($\uparrow$)	0.8800	0.7500	0.8900
π_q^s ($\uparrow$)	0.0240	0.0237	0.0245
π_q^c ($\uparrow$)	0.0220	0.0218	0.0225
π_q^m ($\uparrow$)	0.0170	0.0168	0.0172
π_n^H ($\uparrow$)	0.1967	0.1963	0.1970
π_n^L ($\uparrow$)	0.1865	0.1864	0.1869
δ^c ($\uparrow$)	0.235	0.165	0.315
π_0^H ($\uparrow$)	827.8038 (2.214%)	506.2731 (1.390%)	992.1032 (2.602%)
π_0^L ($\uparrow$)	493.0942 (2.789%)	341.8998 (2.014%)	597.6564 (3.251%)
$\overline{s_{man}^c}$ ($\uparrow$)	0.5901	0.5680	0.6122
$\overline{s_{man}^m}$ ($\uparrow$)	0.4595	0.4555	0.4635

Note: This table reports calibrated parameters for the two sub-periods.

however, in the second regime, more high-skilled female agents choose marriage, which is aligned with data observations. Between the two regimes, the model predicts that females in both skill groups experience a drop in marriage and rate of fertility, accompanied by an increase in cohabitation, which is in line with data. The only exception that the model fails to target is that the model-generated single rate decreases for both skill groups, but in the data, more low-skilled females actually have chosen singlehood. The model predicts a drop in fertility rate for females in all marital groups. However, one issue to point out is that the high-skilled married females actually have experienced a rise in fertility, although the 0.0079 increase is not significant. For between-skill-group differentials, both the singlehood and cohabitation gaps have narrowed, while the marriage gap has expanded. The fertility gap also has shrunk.

5.2 Counterfactual Experiments

For counterfactual experiments, we restore the value of parameters of interest in the second sub-period to be the same as the value in the first period to study the dynamics. Experiment 1 refers to wage and skill premium channel by changing the value of wage rates ($\uparrow$) for the two skill groups; Experiment 2 focuses on childrearing costs, which con-

Table 5.2: Dynamics Calibration Targets

		Single	Cohabiting	Married	Fertility	HC Growth
Data	High	12.6721	3.2389	84.0890	2.2083	1.0121
	Low	13.2161	5.6485	81.1354	2.3158	1.0260
Model	High	12.5200	3.8400	83.6400	2.2560	1.0667
	Low	9.0400	8.8400	82.1200	2.8123	1.0327

(a) second sub-period

		Single	Cohabiting	Married	Fertility	HC Growth
Data	High	12.8043	2.3995	84.7962	2.2101	1.0121
	Low	10.6154	4.2887	85.0959	2.3301	1.0262
Model	High	13.2400	3.0800	83.6800	2.7935	0.9468
	Low	9.6800	5.8400	84.4800	3.0151	1.0110

(b) first sub-period

		Single	Cohabiting	Married	Fertility	HC Growth
Data	High	-0.1322	0.8394	-0.7072	-0.0018	0.0000
	Low	2.6008	1.3598	-3.9605	-0.0143	-0.0002
Model	High	-0.7200	0.7600	-0.0400	-0.5374	0.1200
	Low	-0.6400	3.0000	-2.3600	-0.2028	0.0216

(c) difference between sub-periods

Note: This table shows calibration targets for the two sub-periods.

sist of effort cost (↑), time cost (↑), and resource cost of childrearing (↑); Experiment 3 examines the return of investment in children's human capital (↑); Experiment 4 studies the importance of commitment level of potential partners (↑); and Experiment 5 emphasizes the importance of cohabitation preference (↑).[19]

Decomposition Results are summarized in Table 5.4, in which the first row shows the model-predicted change of cohabitation share, marriage share, and fertility rates, and the rest report normalized change and relative contribution for each experiment. Panel [a] and Panel [b] report the results for the two skill groups, and Panel [c] reports the changes of between-skill-group differences.

[19]See Table C.11 to Table C.18 in Appendix C.2 for detailed model predictions of each counterfactual experiment.

Table 5.3: Dynamics Model Predictions

		S Fertility	C Fertility	M Fertility
Data	High	1.8094	1.9336	2.2248
	Low	2.1201	2.2699	2.3358
Model	High	1.6524	2.0206	2.3858
	Low	1.9887	2.4340	2.9978

(a) second sub-period

		S Fertility	C Fertility	M Fertility
Data	High	1.9723	1.9553	2.2169
	Low	2.1201	2.2699	2.3358
Model	High	2.2888	2.1507	2.9480
	Low	2.4515	2.9586	3.1161

(b) first sub-period

		S Fertility	C Fertility	M Fertility
Data	High	-0.1629	-0.0217	0.0079
	Low	-0.0145	-0.0138	-0.0081
Model	High	-0.6364	-0.1301	-0.5622
	Low	-0.4628	-0.5247	-0.1183

(c) difference between sub-periods

Note: This table compares model-generated moments and data counterparts for the two sub-periods.

Discussion Three important messages are delivered. First, return of investment in children's quality plays an influential role in determining marital and fertility choices. This novel channel explains one-third of the rise in cohabitation and almost half of the drop in marriage for the skilled. For the low-skilled group, changes of return in children explains about 40% of marital changes and 34% of the decrease in the rate of fertility. As documented in the empirical section, high-skilled females not only experience a higher return in children, but also this return increases faster compared to the low-skilled group. Consequently, we observe a negative contribution of return in children to the drop in fertility for the skilled since they would like to have more kids together with a higher investment in children's education. Nevertheless, for the unskilled, the change in return of investment in children is not strong enough to compensate for the influence from the quantity-quality trade-off, and thus they decrease the fertility rate while increasing the investment into children's human capital. Because of this opposing force that the return in children plays on fertility choices for two skill groups, about 9% the shrinking fertility gap could be explained by this channel. For changes in marital shares, different return of investment in children helps explain 44.08% of the narrower gap of cohabitation share and 35.75% of widened gap of marriage share.

Second, it is important to see that the wage channel affects the two skill groups in a different way. In the data, the unit wage rate for the unskilled has increased by 8.29% from 0.9602 to 1.0398, and the wage rate for the skilled rose from 1.6030 to 1.6080 over two subperiods. For the low education group, income effect on fertility dominates so that they can afford to have more children. At the same time, rising income weakens the gains of marriage from gender specialization. Consistent with the conventional theory, this contributes to 44.52% of the decrease in marriage and 42.90% of the increase in cohabitation. However, for the high education group, higher income implies higher opportunity cost of raising children, thus leading to the positive contribution of 4.22% to the decreasing fertility rate. Meanwhile, a rising wage rate enables the skilled females to enjoy a higher return from the positive assortative matching process. As documented by Greenwood et al. (2014) and Greenwood et al. (2016), there exists a positive assortative matching, and it increases over time in the United States. Because of the rising skill premium, the high-skilled females benefit more from positive assortative matching, and this explains the negative effect that the wage channel contributes to the changes in cohabitation and marriage. Such a novel positive assortative matching effect for the skilled, together with the conventional wage effect for the unskilled, help explain most of the divergence of marital choices between skill groups.

Third, the skilled are more sensitive to increasing commitment from partners and cohabitation preference, while the unskilled are more vulnerable to the rising childrearing costs when making marital decisions. The drop in the rate of fertility for two skill groups can be largely explained by the rising costs of childrearing. In all, 90.96% of the drop in fertility rate for the skilled and over half of the drop for the unskilled can be attributed to the rising childrearing costs. One thing to notice is the different influences that rising childrearing cost has on marital decisions for two skill groups, which mainly comes from effects of rising resource cost.[20] The resource cost (π_0) calibrated with data show that females in two skill groups have been bearing a higher childrearing cost over time and the increase in the cost is faster for the high-skilled females: the resource cost has increased by 95.96% for

[20]See Table C.14 for detailed result.

the skilled and 74.80% for the unskilled. When the unskilled face a higher resource cost, they deviate from marriage and have fewer kids. However, for the high-skilled group, as overall it becomes more pricy to raise a kid, marriage becomes relatively more attractive because of the additional benefit associated with childrearing activities. The strong selection effect is observed in that a group of females who strongly like kids will choose marriage. This explains the two negative numbers for Experiment 2 in Panel (a). Similar to the wage channel that posits different effects for the skill groups, rising resource cost plays a crucial role in understanding the divergence. This channel contributes 63.16% of the shrinking cohabitation gap, 56.48% of the widened marriage gap, and 48.14% of the narrower fertility gap.

Partner's commitment ($\overline{s_{man}}$), measured by the fraction of time devoted to household-related activities between partners, increases for both cohabiting and married couples, which contributes 34.81% of the rise in cohabitation and 42.42% of the drop in marriage for the skilled. However, for low-skilled females, this channel plays an insignificant role and works in the opposite direction because of different responses on public good consumption. For example, in the experiment in which the value of commitment for cohabiting agents is restored to the initial value, instead of retreating from cohabitation, low-skilled females shift from marriage to cohabitation, decrease fertility rate, increase the fraction devoted to public good production, and enjoy a higher utility from public good. Due to these opposing forces on two skill groups, a rising partner's commitment explains over one-quarter of the shrinking fertility gap and posits a huge negative effect on marital differentials. Another important factor to understand the rising cohabitation is people's preference. In all, 60.13% of the rise in cohabitation and 82.83% of the drop in marriage can be explained by the increasing cohabitation preference for the skilled; for the unskilled, the effect is less pronounced but still significant. Such rising utility toward cohabitation can be supported by the changes in social norms and people's attitudes toward unmarried couples, and changes in legal treatment in the United States. In a recent survey conducted by the Pew Research Center, Taylor (2010) found that members of the older generation (adults age 65 and older) are critical of unmarried couples, regardless whether they are opposite-sex or same-sex couples, but members of the younger generation (age 18 to 29 years old) are not. In addition to the growing acceptance of unmarried couples living together in society, cohabitants are getting more protection from the legal system. Although to some extent from a legal standpoint cohabitation can be beneficial because unmarried partners are not bound by marriage laws, unmarried partners do not enjoy the same rights that are usually granted to married couples automatically, such as marriage property laws. The law concerning cohabitants' rights varies immensely from state to state in the United States. According to Bowman (2004), a substantial history of attempts by the courts has been observed to protect vulnerable parties in cohabiting relationships. Many states and localities offer variegated bundles of rights to cohabitants. For example, Vermont, Massachusetts, and California have extended all the benefits of marriage under state law to same-sex cohabitants. With more protection extended from traditional marriage to cohabitation, both economic and noneconomic, cohabitation becomes a desirable living arrangement.

Table 5.4: Dynamics Counterfactual Experiments: Decomposition

	Cohabitation		Married		Fertility	
	change	contribution	change	contribution	change	contribution
Model	0.7600		-0.0400		-0.5374	
Exp1: skill premium	-0.0385	-5.06%	0.0048	-12.12%	-0.0227	4.22%
Exp2: childrearing cost	-0.1684	-22.15%	0.0246	-61.62%	-0.4889	**90.96%**
Exp3: return in children	0.2453	**32.28%**	-0.0194	**48.48%**	0.0317	-5.89%
Exp4: partner's commitment	0.2646	**34.81%**	-0.0170	**42.42%**	-0.0518	9.64%
Exp5: cohabitation preference	0.4570	**60.13%**	-0.0331	**82.83%**	-0.0057	1.07%
SUM		100%		100%		100%

(a) high-skilled group

	Cohabitation		Married		Fertility	
	change	contribution	change	contribution	change	contribution
Model	3.0000		-2.3600		-0.4628	
Exp1: skill premium	1.2871	**42.90%**	-1.0507	**44.52%**	0.0075	-1.63%
Exp2: childrearing cost	0.5903	19.68%	-0.3879	16.44%	-0.2350	**50.79%**
Exp3: return in children	1.1419	**38.06%**	-0.9456	**40.07%**	-0.1580	**34.14%**
Exp4: partner's commitment	-0.5516	-18.39%	0.4688	-19.86%	-0.0781	16.89%
Exp5: cohabitation preference	0.5323	17.74%	-0.4445	18.84%	0.0009	-0.19%
SUM		100%		100%		100%

(b) low-skilled group

	Cohabitation		Married		Fertility	
	change	contribution	change	contribution	change	contribution
Model	-2.2400		2.3200		-0.3347	
Exp1: skill premium	-2.0779	**92.76%**	1.7069	**73.58%**	-0.0446	13.33%
Exp2: childrearing cost	-1.4147	**63.16%**	1.3103	**56.48%**	-0.1611	**48.14%**
Exp3: return in children	-0.9874	**44.08%**	0.8294	**35.75%**	-0.0305	9.12%
Exp4: partner's commitment	1.6505	-73.68%	-1.2021	-51.81%	-0.0819	**24.47%**
Exp5: cohabitation preference	0.5895	-26.32%	-0.3246	-13.99%	-0.0166	4.95%
SUM		100%		100%		100%

(c) difference between skill groups

Note: This table summarizes decomposition results for the dynamic counterfactual experiments.

6 Conclusion

This paper documents the puzzle in divergence of marital choices and fertility decision between skill groups in that low-skilled females have experienced a more dramatic drop in marriage and fertility along with a more evident increase in cohabitation compared with high-skilled females, which challenges the conventional wage story and gender specialization theory. We argue that the following channels would help explain this puzzle. For skilled females, higher implicit return of investment in children's human capital compensates for part of the growing opportunity cost of childrearing, a significant income effect from positive assortative matching dominates the conventional wage channel, and when childrearing resource cost increases, a selection effect exists so that those with strong fertility motives shift into marriage.

Building on the trade-off between private consumption, public good consumption, and utility from children, we use the model to quantitatively decompose mechanisms at work. Counterfactual exercises show that the drop in marriage and the increase in cohabitation can be largely explained by the rising implicit return in children, and rising childrearing cost plays a significant role in explaining the declining fertility rates. Most of the shrinking cohabitation gap and widened marriage gap between the two skill groups can be explained by the rising wage and skill premium, increasing childrearing costs, and growing return in children. This paper has shed light on understanding the heterogeneous responses of females with different education background to changes in labor market and return of educational investment in children.

One natural extension is to further study distribution within each skill group in order to better understand the impact of inequalities on family structures. Besides, the current static model does not feature divorce or breakup[21] as only females are modeled. Adding male agents into the model to endogenize the matching market is quantitatively complicated and we leave these to future research.

[21] Utility premium/loss parameters δ^c and δ^m capture some flavor of costs associated with cohabitation and marriage such as wedding cost, divorce cost or reputation cost. The calibrated positive values imply that the overall benefit outweighs the cost in cohabitation and marriage relationships.

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Online Appendix of "Cohabitation, Marriage, and Fertility: Divergent Patterns for Different Skill Groups" (Not for Publication)

A DATA APPENDIX

A.1 Data Source

A.1.1 Current Population Survey

The Current Population Survey (CPS) is a monthly survey of about 60,000 U.S. households conducted by the United States Census Bureau for the Bureau of Labor Statistics (BLS). Since 1948, the CPS has included supplemental questions (at first, in April; later, in March) on income received in the previous calendar year, which are used to estimate the data on income and work experience. These data are the source of the annual Census Bureau report on income, poverty, and health insurance coverage - CPS Annual Social and Economic Supplement (ASEC). Similar to the March Supplement, the fertility supplement of the Current Population Survey asks women (either by self-response of proxy) questions about childbirth. Several fertility supplement samples also contain marital history information.

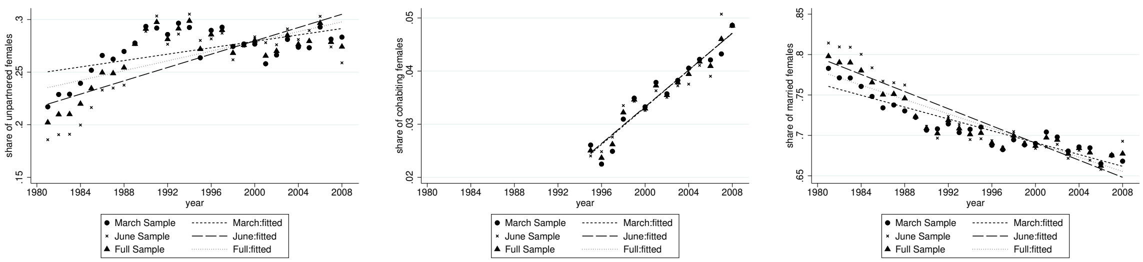
Sample Restrictions This paper focuses on the time periods between 1980 to 2008. Year 1980 is the earliest year for reliable data are available, and year 2008 is chosen as the ending period because the Great Recession is not the focus of this paper. Since not until year 1995 did cohabitation data become available in CPS, any analysis using cohabitation data starts from year 1995. Following Lundberg et al. (2016), only high school graduates are kept in the sample as high-school dropouts or households with even less education tend to behave differently than those with high-school degrees or above, as they are much less affected by the labor market. The sample is further restricted to females aged between 40 to 44 since this age group is close to the end of females' fecundity cycle, thus providing a more precise measure for completed fertility rate.

Comparison using March data, June data, and Full sample This paper uses both the March Supplement and the June supplement. The following figure A.1 shows that though there exists minimal differences in levels, trends are similar if using the March sample, the June sample, or the full sample.

A.1.2 American Time Use Survey

The American Time Use Survey (ATUS) provides measurement of the amount of time people spend doing various activities, such as paid work, childcare, volunteering, and socializing. We follow the sample procedure mentioned above to restrict the sample to females age between 40 to 44.

Figure A.1: CPS Data Comparison: March Sample, June Sample, Full Sample



(a) Unpartnered (b) Cohabiting (c) Married

Note: This figure compares marital shares by using the March sample, the June sample, and the full sample.

A.2 Variable Construction

Marital Status CPS starts providing the relationship of an individual to the head within the same household in 1995, which provides a more precise measurement for cohabitors than using POSSLQ. For instance, now it is possible to differentiate cohabiting couples from roommates sharing a space. Cohabitors are labeled as females who are currently cohabiting; married females are those who are currently married; unpartnered females are consist of those are who currently separated, divorced or widowed and those who are single. Note that single females are women who never get married.

Skill Groups The low-skilled group is defined as the sample of females with high school degrees, including individuals with some college experience but no bachelor's diploma. The high education group is defined as women with at least a bachelor's degree.

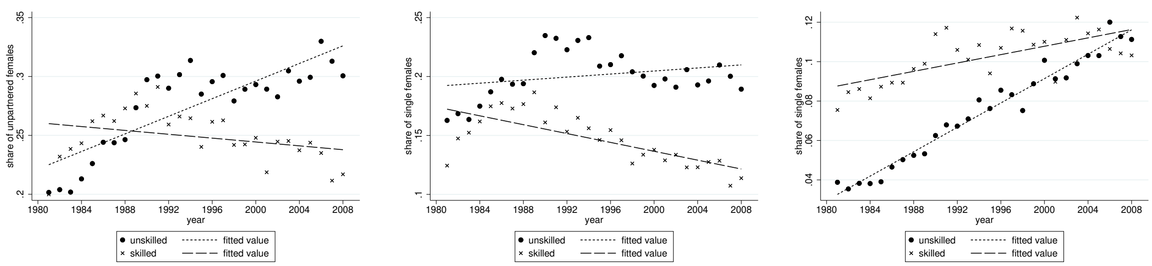
Fertility Rates Fertility rate is defined as the average number of children ever born over the female sample aged between 40 and 44 years old conditional on having at least one child. There are multiple ways to calculate fertility rates. Completed fertility is the average number of children born to women belonging to the same cohort once they have reached the end of their reproductive life. General fertility is defined as births per 1000 women aged over the total female sample. Total fertility is the hypothetical lifetime births per woman. Fertility rate is constructed for females age between 40 and 45 conditional on having at least one child, following the completed fertility rate definition. Completed fertility is chosen here because (1) this age group is toward the end of a female's fecundity cycle, (2) fertility questions in the CPS June Supplement are asked of females aged 15-44 years old in most sample periods of interest, (3) childrearing timing decision or marital status transition is not the main interest, and (4) the zero-mass issue is not a major emphasis in this paper.

B Additional Figures and Tables

B.1 Evolution of Marital Status and Fertility Rates

The group “unpartnered” is defined as the union of females who are currently separated, divorced, or widowed and single females who never marry before. As shown by Figure B.1, the declining rate of being unpartnered for the highly educated females is mostly driven by the declining rate of being separated, divorced, or widowed because the single share posits a positive trend.

Figure B.1: Marital Status for Females by Education Groups



(a) unpartnered

(b) separated, divorced, widowed

(c) single

Note: This figure shows the share of unpartnered females (panel [a]), the share of currently separated, divorced, and widowed females (panel [b]), and the share of single females (panel [c]) by education groups.

B.2 Robustness Checks

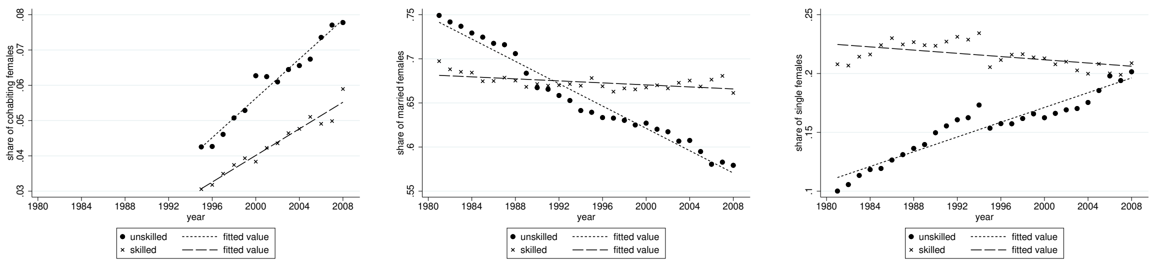
B.2.1 Full Sample without Age Restriction

Figure B.2 and Figure B.3 show the evolution of marital status and fertility rates by education groups, respectively. Instead of restricting the sample to females age between 40-45, we take the full sample of females age between 25 and 45. We still choose age 45 as the upper bound as it is close to the end of fecundity cycle. Similar divergence can be observed.

B.2.2 Race Groups

Figure B.4 and Figure B.5 show the marital status and fertility rates for females by education and race groups. Though there exists differences in the levels and magnitude, the divergent trend between the unskilled and the skilled still prevail.

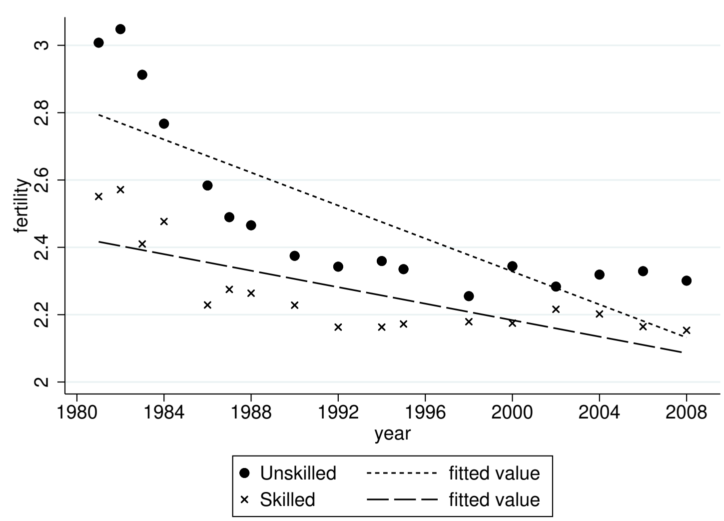
Figure B.2: Marital Status for Females by Education Groups



(a) currently cohabiting (b) currently married (c) single

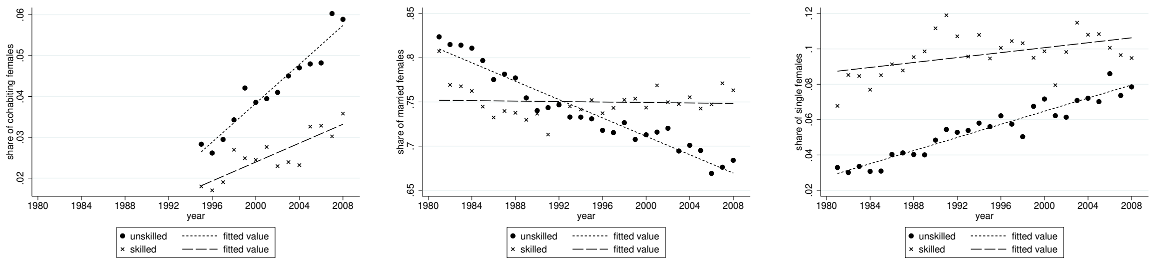
Note: This figure shows the share of cohabiting females (panel [a]), the share of married females (panel [b]) and the share of single females (panel [c]) by education groups for females age between 25 and 45.

Figure B.3: Completed Fertility Rates by Education Groups

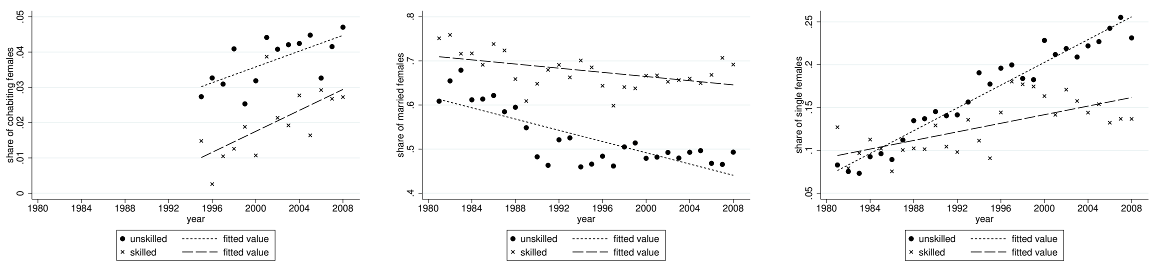


Note: This figure shows the completed fertility rates by education groups over time for females age between 25 and 45.

Figure B.4: Marital Status for Females by Education and Race Groups



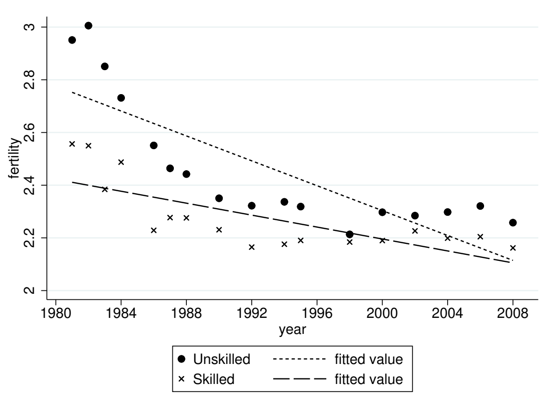
(a) white: cohabiting (b) white: married (c) white: single



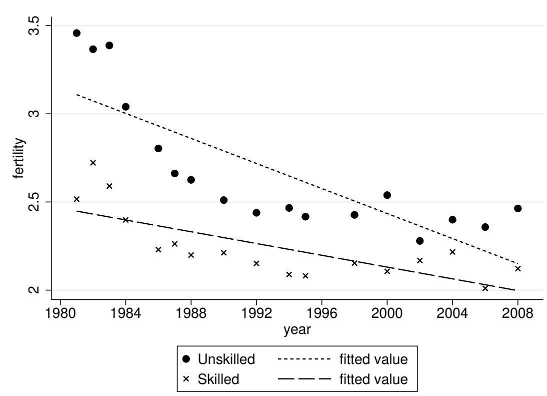
(d) non-white: cohabiting (e) non-white: married (f) non-white: single

Note: This figure shows the share of cohabiting females, the share of married females and the share of single females by education and race groups.

Figure B.5: Completed Fertility Rates by Education and Race Groups



(a) white females



(b) non-white females

Note: This figure shows the completed fertility rates by education and race groups over time.

C Quantitative Appendix

C.1 Static Counterfactual Experiments

In this section, five groups of key parameters are studied to understand the driving forces behind differential marital decisions and fertility choices, including skill premium, childrearing costs, return of investment in children, partner's commitment, and cohabitation preferences. For each experiment, we present the table with the results on marital shares, total fertility rate, human capital growth rate, and marital-group specific fertility rates. The uparrow (↑) and downarrow (↓) imply the parameter increases or decreases to a certain value. It is essential to understand how income effect, substitution effect, quality and quantity trade-off, and compositional effect take place together to shape marital decisions and fertility choices for agents from two skill groups differently. Table C.1 summarizes the results from all counterfactual experiments.

Table C.1: Summary of Counterfactual Experiments

	High-skilled			Low-skilled		
	Cohabiting	Married	Fertility	Cohabiting	Married	Fertility
Exp1: ω^H	0.5600	-0.8000	-0.1985	—	—	—
Exp1: ω^L	—	—	—	-1.9200	2.2400	0.1626
Exp2.1: π_q^c	0.8800	-0.8400	-0.0243	2.7200	-2.8400	-0.0805
Exp2.1: π_q^m	0.8800	-0.9600	-2.1181	1.0800	-1.2800	0.0124
Exp2.2: π_n^H	1.1600	-1.0000	0.1020	—	—	—
Exp2.2: π_n^L	0.0000	0.0000	0.0000	-0.8000	0.8000	-0.1339
Exp2.3: π_0^H	4.1600	-4.2800	0.4007	—	—	—
Exp2.3: π_0^L	—	—	—	-3.8800	4.3200	-0.4945
Exp3.1: κ^c	0.0000	0.0000	0.0006	1.4400	-1.6000	-0.0571
Exp3.1: κ^m	-0.0400	0.0400	-0.0038	-0.0400	0.0400	-0.0019
Exp3.2: B^H	-0.7600	0.8400	0.0071	—	—	—
Exp3.2: B^L	—	—	—	0.3200	-0.6800	-0.0589
Exp4: s^c	-2.4000	2.1600	0.0166	-4.4400	4.2800	0.0302
Exp4: s^m	-2.2800	4.0800	0.0679	-4.0000	5.5200	-0.0867
Exp5.1: δ^c	74.2800	-72.5200	0.0931	66.5600	-65.1200	0.1090
Exp5.1: δ^m	66.4000	-69.3600	0.0713	59.9200	-65.1200	0.0684
Exp5.2: α_n^c	0.2800	-0.2800	-0.0009	-0.0800	0.0000	0.0098
Exp5.2: α_n^m	0.4800	-0.4000	0.0007	2.1200	-2.0000	-0.0285

C.1.1 Wage and Skill Premium

Panel (a) in Table C.2 reports the result if we decrease the unit wage rate for the skilled to be the same as that of the unskilled, and Panel (b) shows the reverse. Since the wage rate for the unskilled is normalized to be 1 in the benchmark model, this exercise also demonstrates the effect of the skill premium channel. As the wage rate for high-skilled group decreases, the income effect leads them to have fewer children, and such weaker fertility desire shifts people from marriage to being single or engaging in cohabitation relationships. The same story holds for the unskilled when they face a higher wage.

Then, they increase the number of children, and more females prefer marriage to being single or cohabitation.

Table C.2: Static Counterfactual Experiment 1: Wage and Skill Premium

Edu Group	Single	Cohabiting	Married	Fertility	HC Growth	S Fertility	C Fertility	M Fertility
Total	10.5288	6.7695	82.7017	2.6501	1.0465	1.8983	2.0840	2.8515
High	13.3200	3.2000	83.4800	2.2674	1.0852	1.5321	1.7164	2.4568
Low	9.1600	8.5200	82.3200	2.8378	1.0276	2.0778	2.2643	3.0450
Diff	4.1600	-5.3200	1.1600	-0.5705	0.0576	-0.5458	-0.5479	-0.5881
Diff wrt model (High)	0.2400	0.5600	**-0.8000**	**-0.1985**	0.0695	-0.2986	-0.1404	-0.1735
Diff wrt model (Low)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

(a) $\omega_H \downarrow = \omega_L$

Edu Group	Single	Cohabiting	Married	Fertility	HC Growth	S Fertility	C Fertility	M Fertility
Total	10.2351	5.2970	84.4679	2.8246	0.9993	2.2067	1.9456	3.0192
High	13.0800	2.6400	84.2800	2.4659	1.0157	1.8307	1.8567	2.6303
Low	8.8400	6.6000	84.5600	3.0005	0.9913	2.3911	1.9891	3.2099
Diff	4.2400	-3.9600	-0.2800	-0.5346	0.0244	-0.5605	-0.1324	-0.5796
Diff wrt model (High)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Diff wrt model (Low)	-0.3200	-1.9200	**2.2400**	**0.1626**	-0.0363	0.3133	-0.2752	0.1649

(b) $\omega_L \uparrow = \omega_H$

C.1.2 Childrearing Cost

Table C.3 tells the effects from equating effort cost of educating children for females in cohabitation and marriage status, and it is interesting to see how different tensions play in these two experiments. A lower effort cost would have two opposing effects on fertility rates: the quantity-quality trade-off channel leads to more effort invested in human capital and less in the number of children, while income effect leads to a rise in the fertility rate. When effort cost for females in cohabitation status is reduced to be the same as that faced by married females, cohabitation becomes more attractive, and hence, there is an increase in the cohabitation share. Second, it becomes cheaper to invest in the quality of children rather than the quantity, and hence, the fertility rates for cohabiting females drop for the two skill groups. The same pattern holds when effort cost faced by married females is raised to be the same as that in cohabitation status; then, an increase in marriage is observed. However, in this experiment, the income effect dominates the substitution effect for the skilled, while it is the other way around for the unskilled, which explains why the fertility rate drops for the skilled but increases for the unskilled.

In the experiment shown by Table C.4, we change the time cost of childrearing (π_n) for the two skill groups separately. Thus, a lower (higher) cost leads to higher (lower) fertility rates. Another important matter to notice is the selection effect for the married females. In Panel (a), although there is a decrease in the marriage share, the fertility rate for married females increases, which implies that only females with strong fertility motives will stay in marriages.

Similar to the previous experiment, Table C.5 shows that as the resource cost drops (rises) for the skilled (unskilled), the fertility rate increases (decreases) due to income effect. Since overall it becomes less pricy to raise a kid, relatively speaking, marriage becomes less attractive, which explains the decreasing marriage share in Panel (a). The same reasoning holds for Panel (b).

Table C.3: Static Counterfactual Experiment 2.1: Effort Cost of Childrearing

Edu Group	Single	Cohabiting	Married	Fertility	HC Growth	S Fertility	C Fertility	M Fertility
Total	10.5172	8.6998	80.7830	2.6534	1.0473	2.0003	1.7271	2.9085
High	13.0400	3.5200	83.4400	2.4416	1.0225	1.8285	1.4785	2.6303
Low	9.2800	11.2400	79.4800	2.7573	1.0595	2.0845	1.8491	3.0450
Diff	3.7600	-7.7200	3.9600	-0.3158	-0.0370	-0.2561	-0.3706	-0.4147
Diff wrt model (High)	-0.0400	**0.8800**	-0.8400	-0.0243	0.0068	-0.0022	**-0.3783**	0.0000
Diff wrt model (Low)	0.1200	**2.7200**	-2.8400	-0.0805	0.0319	0.0067	**-0.4152**	0.0000

(a) $\pi_q^c \downarrow = \pi_q^m$

Edu Group	Single	Cohabiting	Married	Fertility	HC Growth	S Fertility	C Fertility	M Fertility
Total	10.6103	7.5995	81.7902	2.0269	5.6976	2.0043	1.7851	2.0905
High	13.1600	3.5200	83.3200	0.3478	15.4505	1.8330	1.1237	0.0397
Low	9.3600	9.6000	81.0400	2.8503	0.9149	2.0883	2.1094	3.0962
Diff	3.8000	-6.0800	2.2800	-2.5024	14.5356	-0.2553	-0.9858	-3.0565
Diff wrt model (High)	0.0800	0.8800	**-0.9600**	-2.1181	14.4348	0.0023	-0.7330	**-2.5907**
Diff wrt model (Low)	0.2000	1.0800	**-1.2800**	0.0124	-0.1127	0.0104	-0.1548	**0.0512**

(b) $\pi_q^m \uparrow = \pi_q^c$

C.1.3 Return of investment in Children

Both κ and B determine the human capital accumulation process of children given parents' human capital and effort invested; Table C.6 and Table C.7 illustrate the results, respectively. Similar to the analysis for childrearing cost associated with children's human capital, changes in return of investment in children would have two potential opposing effects on fertility rate depending on whether income effect dominates or substitution effect dominates.

In the top panel in Table C.6, as the benefit of investing effort in improving human capital for children rises for females in cohabitation status, the high-skilled cohabiting agents choose to have more children and invest less because of the rising benefit. However, for the unskilled, the substitution effect plays such an influential role that they decide to have fewer children. It is also interesting to see that in the bottom panel, the drop in κ^m is so significant that agents from two skill groups experience a decrease in fertility rate due to the lower return.

Table C.4: Static Counterfactual Experiment 2.2: Time Cost of Childrearing

Edu Group	Single	Cohabiting	Married	Fertility	HC Growth	S Fertility	C Fertility	M Fertility
Total	10.3972	6.9669	82.6359	2.7490	1.0156	2.0262	2.1000	2.9493
High	12.9200	3.8000	83.2800	2.5679	0.9912	1.9210	1.7651	2.7543
Low	9.1600	8.5200	82.3200	2.8378	1.0276	2.0778	2.2643	3.0450
Diff	3.7600	-4.7200	0.9600	-0.2699	-0.0364	-0.1568	-0.4991	-0.2907
Diff wrt model (High)	-0.1600	1.1600	**-1.0000**	**0.1020**	-0.0245	0.0903	-0.0916	**0.1240**
Diff wrt model (Low)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

(a) $\pi_n^H \downarrow = \pi_n^L$

Edu Group	Single	Cohabiting	Married	Fertility	HC Growth	S Fertility	C Fertility	M Fertility
Total	10.4498	6.0485	83.5017	2.6256	1.0394	1.9340	2.0588	2.8051
High	13.0800	2.6400	84.2800	2.4659	1.0157	1.8307	1.8567	2.6303
Low	9.1600	7.7200	83.1200	2.7039	1.0510	1.9847	2.1579	2.8909
Diff	3.9200	-5.0800	1.1600	-0.2380	-0.0353	-0.1540	-0.3011	-0.2606
Diff wrt model (High)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Diff wrt model (Low)	0.0000	-0.8000	0.8000	**-0.1339**	0.0235	-0.0932	-0.1064	-0.1541

(b) $\pi_n^L \uparrow = \pi_n^H$

Compared to κ that is closely related to effort invested, B captures the total return of investment in children in which not only effort from parents matter, but also the parents' own human capital levels matter. When the overall human capital accumulation process becomes less efficient for the high-skilled group, agents shift from investing in children's quality to quantity, and such a quality-quantity trade-off leads to a rise in the fertility rate along with a drop in human capital growth rate. Moreover, because of the lower return from children, the additional childrearing-related benefits from marriage turn out to be more attractive for females who want to have a child, which explains the rise in marriage share. The same story holds for the second experiment, in which the total return from investing in children's human capital increases for the unskilled.

C.1.4 Commitment of Partner

Recall that from the calibration section, the ratio of fraction contributed to public good production is measured by the ratio of the time devoted to household activities using data from the U.S. Time Use Survey between a female and her partner. The data show $\overline{s^c_{man}} = 0.5901$ and $\overline{s^m_{man}} = 0.4595$. Such a fraction of time also captures the commitment level of partners. Table C.8 summarizes the effects. Setting $\overline{s^c_{man}} = \overline{s^m_{man}}$ means the commitment level of partners decreases for cohabiting females, and it follows that the share of females and fertility rate in cohabitation status drop for both skill groups. However, the reason why the overall fertility rates increase for the two skill groups is compositional change. Because on average women in marriage tend to have a larger number of children than females in the other two marital groups, it is natural to observe a rising overall fertility rate because the effect of the decrease in fertility rate for cohabiting females is completely offset by the increase in marriage share. When commitment from partners for

Table C.5: Static Counterfactual Experiment 2.3: Resource Cost of Childrearing

Edu Group	Single	Cohabiting	Married	Fertility	HC Growth	S Fertility	C Fertility	M Fertility
Total	10.4893	7.9541	81.5566	2.8473	0.9914	2.1626	2.1971	3.0615
High	13.2000	6.8000	80.0000	2.8666	0.9178	2.3355	2.0601	3.0952
Low	9.1600	8.5200	82.3200	2.8378	1.0276	2.0778	2.2643	3.0450
Diff	4.0400	-1.7200	-2.3200	0.0287	-0.1098	0.2577	-0.2042	0.0503
Diff wrt model (High)	0.1200	4.1600	**-4.2800**	**0.4007**	-0.0979	0.5048	0.2033	0.4649
Diff wrt model (Low)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

(a) $\pi_0^H \downarrow = \pi_0^L$

Edu Group	Single	Cohabiting	Married	Fertility	HC Growth	S Fertility	C Fertility	M Fertility
Total	10.1546	3.9819	85.8635	2.3836	1.1188	1.5895	1.9944	2.5295
High	13.0800	2.6400	84.2800	2.4659	1.0157	1.8307	1.8567	2.6303
Low	8.7200	4.6400	86.6400	2.3433	1.1694	1.4712	2.0619	2.4800
Diff	4.3600	-2.0000	-2.3600	0.1226	-0.1537	0.3594	-0.2052	0.1503
Diff wrt model (High)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Diff wrt model (Low)	-0.4400	-3.8800	**4.3200**	**-0.4945**	0.1418	-0.6066	-0.2024	-0.5649

(b) $\pi_0^L \uparrow = \pi_0^H$

married females increases, marriage becomes more attractive, and hence, females deviate from singlehood and cohabitation to marriage for both higher value of public good consumption and higher utility from childrearing activities. However, we see a drop in the fertility rate for unskilled married females due to a trade-off between quantity versus quality of children and trade-off between utility from children versus public good consumption.

C.1.5 Cohabitation and Marriage Preference

In this section, we examine the effects from preference toward cohabitation versus marriage: Table C.9 reports the results from changing direct premium parameters, and Table C.10 shows the results from changing fertility preference. Direct cohabitation and marriage premium play an important role in shaping marital decisions, as can be seen from the large magnitude changes of shares in Experiment 5.1. In the two panels, if there is no extra utility premium associated with marriage, agents retreat from marriage and shift into cohabitation, but the difference between two experiments is the extra utility premium relative to singlehood status. This explains why in Panel (a) single share decreases, while in Panel (b), single share rises. The tensions behind the overall fertility rates are also different. In Panel (a), the drop in the rate of fertility in singlehood is dominated by the increase of fertility rate in cohabitation. Nevertheless, in Panel (b), the increase in the share of singlehood and cohabitation together with the rise of fertility rates in these two groups outweigh the decreasing marriage share.

Lastly, we want to study the role of fertility preference. Notice that when the value of preference parameter α_n changes, agents would re-evaluate the value from childrearing

Table C.6: Static Counterfactual Experiment 3.1: Return of Effort Invested in Children

Edu Group	Single	Cohabiting	Married	Fertility	HC Growth	S Fertility	C Fertility	M Fertility
Total	10.5572	7.5514	81.8914	2.6773	1.0288	2.0018	1.9005	2.9085
High	13.0800	2.6400	84.2800	2.4665	1.0156	1.8307	1.8735	2.6303
Low	9.3200	9.9600	80.7200	2.7808	1.0352	2.0857	1.9137	3.0450
Diff	3.7600	-7.3200	3.5600	-0.3143	-0.0196	-0.2550	-0.0402	-0.4147
Diff wrt model (High)	0.0000	0.0000	0.0000	0.0006	**-0.0001**	0.0000	**0.0168**	0.0000
Diff wrt model (Low)	0.1600	1.4400	-1.6000	-0.0571	**0.0077**	0.0078	**-0.3505**	0.0000

(a) $\kappa^c \uparrow = \kappa^m$

Edu Group	Single	Cohabiting	Married	Fertility	HC Growth	S Fertility	C Fertility	M Fertility
Total	10.4498	6.5453	83.0049	2.7129	1.0227	1.9965	2.1360	2.9047
High	13.0800	2.6000	84.3200	2.4621	1.0147	1.8307	1.8724	2.6243
Low	9.1600	8.4800	82.3600	2.8359	1.0267	2.0778	2.2653	3.0422
Diff	3.9200	-5.8800	1.9600	-0.3738	-0.0120	-0.2472	-0.3928	-0.4179
Diff wrt model (High)	0.0000	-0.0400	0.0400	-0.0038	**-0.0010**	0.0000	0.0157	**-0.0060**
Diff wrt model (Low)	0.0000	-0.0400	0.0400	-0.0019	**-0.0009**	0.0000	0.0010	**-0.0028**

(b) $\kappa^m \downarrow = \kappa^c$

activities, which is comprised of utility from quantity of children and quality; therefore, its effect on fertility rate is ambiguous. In the top panel, when agents engaging in cohabitation relationship are assumed to value children as much as those in marriage, they would choose to have more children. The difference between skill groups is that part of the high-skilled females would shift out of marriage to cohabitation, while some low-skilled females would shift out of cohabitation to singlehood. Such compositional change explains the opposing directions of the changes in the overall fertility rates in the first experiment. For the skilled, the decrease in marriage share dominates the increase in fertility rate in the cohabitation group, while for the unskilled, the increase in fertility rates in both singlehood and cohabitation groups dominates the decrease in cohabitation share. In the bottom panel, if preference toward fertility for the married agents is reduced to be the same as that for cohabiting agents, females in the two skill groups experience a retreat from marriage and an increase in fertility rate for married women, which corresponds to a strong selection effect that only those who strongly desire children would remain in marriage status.

Table C.7: Static Counterfactual Experiment 3.2: Total Return of Investment in Children

Edu Group	Single	Cohabiting	Married	Fertility	HC Growth	S Fertility	C Fertility	M Fertility
Total	10.4235	6.3352	83.2413	2.7178	0.9715	1.9821	1.8709	2.9207
High	13.0000	1.8800	85.1200	2.4730	0.8572	1.7869	1.0687	2.6672
Low	9.1600	8.5200	82.3200	2.8378	1.0276	2.0778	2.2643	3.0450
Diff	3.8400	-6.6400	2.8000	-0.3649	-0.1704	-0.2910	-1.1955	-0.3778
Diff wrt model (High)	-0.0800	-0.7600	**0.8400**	**0.0071**	**-0.1585**	-0.0438	-0.7880	0.0369
Diff wrt model (Low)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

(a) $B^H \downarrow = B^L$

Edu Group	Single	Cohabiting	Married	Fertility	HC Growth	S Fertility	C Fertility	M Fertility
Total	10.6914	6.8000	82.5087	2.6759	1.1589	2.0287	1.8937	2.8915
High	13.0800	2.6400	84.2800	2.4659	1.0157	1.8307	1.8567	2.6303
Low	9.5200	8.8400	81.6400	2.7789	1.2291	2.1258	1.9118	3.0196
Diff	3.5600	-6.2000	2.6400	-0.3130	-0.2134	-0.2952	-0.0551	-0.3893
Diff wrt model (High)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Diff wrt model (Low)	0.3600	0.3200	**-0.6800**	**-0.0589**	**0.2015**	0.0480	-0.3525	-0.0254

(b) $B^L \uparrow = B^H$

Table C.8: Static Counterfactual Experiment 4: Commitment of Partner

Edu Group	Single	Cohabiting	Married	Fertility	HC Growth	S Fertility	C Fertility	M Fertility
Total	10.6362	2.8165	86.5474	2.7412	1.0494	1.9997	1.8901	2.9085
High	13.3200	0.2400	86.4400	2.4825	1.0278	1.8349	1.2873	2.6303
Low	9.3200	4.0800	86.6000	2.8680	1.0600	2.0806	2.1857	3.0450
Diff	4.0000	-3.8400	-0.1600	-0.3855	-0.0322	-0.2457	-0.8984	-0.4147
Diff wrt model (High)	0.2400	**-2.4000**	**2.1600**	**0.0166**	0.0121	0.0042	**-0.5695**	0.0000
Diff wrt model (Low)	0.1600	**-4.4400**	**4.2800**	**0.0302**	0.0325	0.0027	**-0.0786**	0.0000

(a) $s^c \downarrow = s^m$

Edu Group	Single	Cohabiting	Married	Fertility	HC Growth	S Fertility	C Fertility	M Fertility
Total	8.8377	3.1512	88.0111	2.6797	1.0634	1.9676	2.1317	2.7949
High	11.2800	0.3600	88.3600	2.5338	1.0241	1.8050	1.5774	2.6698
Low	7.6400	4.5200	87.8400	2.7512	1.0826	2.0474	2.4035	2.8562
Diff	3.6400	-4.1600	0.5200	-0.2174	-0.0585	-0.2424	-0.8261	-0.1864
Diff wrt model (High)	-1.8000	-2.2800	**4.0800**	0.0679	0.0085	-0.0257	-0.2793	**0.0395**
Diff wrt model (Low)	-1.5200	-4.0000	**5.5200**	-0.0867	0.0551	-0.0305	0.1393	**-0.1888**

(b) $s^m \uparrow = s^c$

Table C.9: Static Counterfactual Experiment 5.1: Direct Cohabitation and Marriage Premium

Edu Group	Single	Cohabiting	Married	Fertility	HC Growth	S Fertility	C Fertility	M Fertility
Total	8.9045	75.6854	15.4100	2.8192	0.9102	1.9703	2.9811	2.8139
High	11.3200	76.9200	11.7600	2.5590	0.8698	1.8061	2.6191	2.9914
Low	7.7200	75.0800	17.2000	2.9469	0.9301	2.0508	3.1585	2.7269
Diff	3.6000	1.8400	-5.4400	-0.3879	-0.0603	-0.2447	-0.5394	0.2645
Diff wrt model (High)	-1.7600	**74.2800**	-72.5200	0.0931	-0.1459	-0.0245	0.7624	0.3610
Diff wrt model (Low)	-1.4400	**66.5600**	-65.1200	0.1090	-0.0975	-0.0270	0.8943	-0.3181

(a) $\delta^c \uparrow= \delta^m$

Edu Group	Single	Cohabiting	Married	Fertility	HC Growth	S Fertility	C Fertility	M Fertility
Total	14.9128	68.6374	16.4498	2.7848	0.8630	2.1200	3.0036	2.7147
High	16.0400	69.0400	14.9200	2.5372	0.8385	1.8898	2.6876	2.6898
Low	14.3600	68.4400	17.2000	2.9063	0.8750	2.2328	3.1585	2.7269
Diff	1.6800	0.6000	-2.2800	-0.3690	-0.0365	-0.3430	-0.4709	-0.0371
Diff wrt model (High)	2.9600	66.4000	**-69.3600**	0.0713	-0.1772	0.0592	0.8309	0.0595
Diff wrt model (Low)	5.2000	59.9200	**-65.1200**	0.0684	-0.1526	0.1550	0.8943	-0.3181

(b) $\delta^m \downarrow= \delta^c$

Table C.10: Static Counterfactual Experiment 5.2: Cohabitation and Marriage Fertility Preference

Edu Group	Single	Cohabiting	Married	Fertility	HC Growth	S Fertility	C Fertility	M Fertility
Total	10.5035	6.6237	82.8728	2.7217	1.0204	1.9972	2.2001	2.9085
High	13.0800	2.9200	84.0000	2.4650	1.0140	1.8307	1.8914	2.6303
Low	9.2400	8.4400	82.3200	2.8476	1.0236	2.0788	2.3516	3.0450
Diff	3.8400	-5.5200	1.6800	-0.3826	-0.0096	-0.2482	-0.4602	-0.4147
Diff wrt model (High)	0.0000	0.2800	-0.2800	**-0.0009**	-0.0017	0.0000	**0.0347**	0.0000
Diff wrt model (Low)	0.0800	-0.0800	0.0000	**0.0098**	-0.0040	0.0010	**0.0873**	0.0000

(a) $\alpha_n^c \uparrow= \alpha_n^m$

Edu Group	Single	Cohabiting	Married	Fertility	HC Growth	S Fertility	C Fertility	M Fertility
Total	10.3430	8.1656	81.4914	2.6965	1.0205	1.9923	1.9673	2.9259
High	13.0000	3.1200	83.8800	2.4666	1.0217	1.8282	1.7511	2.6455
Low	9.0400	10.6400	80.3200	2.8093	1.0200	2.0728	2.0732	3.0633
Diff	3.9600	-7.5200	3.5600	-0.3427	0.0018	-0.2445	-0.3221	-0.4178
Diff wrt model (High)	-0.0800	0.4800	**-0.4000**	0.0007	0.0060	-0.0024	-0.1056	**0.0152**
Diff wrt model (Low)	-0.1200	2.1200	**-2.0000**	-0.0285	-0.0076	-0.0051	-0.1910	**0.0183**

(b) $\alpha_n^m \downarrow= \alpha_n^c$

C.2 Dynamic Counterfactual Experiments

Table C.11: Dynamics Counterfactual Experiment 1: Wage and Skill Premium

Edu Group	Single	Cohabiting	Married	Fertility	HC Growth	S Fertility	C Fertility	M Fertility
Total	10.3970	7.0953	82.5077	2.6164	1.8552	2.1651	2.7963	1.0459
High	12.6800	4.1600	83.1600	2.2869	1.6306	1.7129	2.4572	1.0683
Low	9.0400	8.8400	82.1200	2.8123	1.9887	2.4340	2.9978	1.0327
Diff	3.6400	-4.6800	1.0400	-0.5254	-0.3582	-0.7211	-0.5406	0.0356
Diff wrt model (High)	0.1600	0.3200	-0.4800	0.0308	-0.0218	-0.3078	0.0713	0.0016
Diff wrt model (Low)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

(a) $\omega_H \downarrow$

Edu Group	Single	Cohabiting	Married	Fertility	HC Growth	S Fertility	C Fertility	M Fertility
Total	10.4126	3.6393	85.9481	2.5565	1.8296	1.3817	2.7498	1.0911
High	12.5200	3.8400	83.6400	2.2560	1.6524	2.0206	2.3858	1.0667
Low	9.1600	3.5200	87.3200	2.7350	1.9350	1.0020	2.9662	1.1056
Diff	3.3600	0.3200	-3.6800	-0.4790	-0.2826	1.0186	-0.5803	-0.0389
Diff wrt model (High)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Diff wrt model (Low)	0.1200	-5.3200	5.2000	-0.0773	-0.0538	-1.4320	-0.0316	0.0729

(b) $\omega_L \downarrow$

Table C.12: Dynamics Counterfactual Experiment 2.1: Effort Cost of Childrearing

Edu Group	Single	Cohabiting	Married	Fertility	HC Growth	S Fertility	C Fertility	M Fertility
Total	10.4220	6.7211	82.8568	2.6092	1.8664	2.3210	2.7697	1.0468
High	12.6800	3.5600	83.7600	2.2582	1.6571	2.0638	2.3858	1.0671
Low	9.0800	8.6000	82.3200	2.8178	1.9907	2.4738	2.9978	1.0348
Diff	3.6000	-5.0400	1.4400	-0.5596	-0.3337	-0.4100	-0.6120	0.0323
Diff wrt model (High)	0.1600	-0.2800	0.1200	0.0022	0.0047	0.0432	0.0000	0.0004
Diff wrt model (Low)	0.0400	-0.2400	0.2000	0.0055	0.0020	0.0398	0.0000	0.0021

(a) $\pi_q^c \downarrow$

Edu Group	Single	Cohabiting	Married	Fertility	HC Growth	S Fertility	C Fertility	M Fertility
Total	10.4370	7.4927	82.0703	2.6103	1.8665	2.2511	2.7874	1.0436
High	12.7200	3.8800	83.4000	2.3282	1.6563	2.0905	2.4780	1.0423
Low	9.0800	9.6400	81.2800	2.7780	1.9914	2.3466	2.9713	1.0444
Diff	3.6400	-5.7600	2.1200	-0.4498	-0.3351	-0.2561	-0.4933	-0.0021
Diff wrt model (High)	0.2000	0.0400	-0.2400	0.0721	0.0039	0.0699	0.0922	-0.0245
Diff wrt model (Low)	0.0400	0.8000	-0.8400	-0.0343	0.0026	-0.0874	-0.0265	0.0117

(b) $\pi_q^m \downarrow$

Table C.13: Dynamics Counterfactual Experiment 2.2: Time Cost of Childrearing

Edu Group	Single	Cohabiting	Married	Fertility	HC Growth	S Fertility	C Fertility	M Fertility
Total	10.3373	6.9760	82.6866	2.6077	1.8654	2.2819	2.7726	1.0451
High	12.5200	3.8400	83.6400	2.2635	1.6580	2.0260	2.3937	1.0660
Low	9.0400	8.8400	82.1200	2.8123	1.9887	2.4340	2.9978	1.0327
Diff	3.4800	-5.0000	1.5200	-0.5488	-0.3308	-0.4080	-0.6041	0.0334
Diff wrt model (High)	0.0000	0.0000	0.0000	0.0074	0.0056	0.0054	0.0079	-0.0007
Diff wrt model (Low)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

(a) $\pi_n^H \downarrow$

Edu Group	Single	Cohabiting	Married	Fertility	HC Growth	S Fertility	C Fertility	M Fertility
Total	10.3122	5.6213	84.0665	2.5688	1.8649	2.5946	2.6760	1.0690
High	12.5200	3.8400	83.6400	2.2560	1.6524	2.0206	2.3858	1.0667
Low	9.0000	6.6800	84.3200	2.7548	1.9912	2.9358	2.8485	1.0703
Diff	3.5200	-2.8400	-0.6800	-0.4987	-0.3389	-0.9151	-0.4627	-0.0036
Diff wrt model (High)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Diff wrt model (Low)	-0.0400	-2.1600	2.2000	-0.0575	0.0025	0.5018	-0.1493	0.0376

(b) $\pi_n^L \downarrow$

Table C.14: Dynamics Counterfactual Experiment 2.3: Resource Cost of Childrearing

Edu Group	Single	Cohabiting	Married	Fertility	HC Growth	S Fertility	C Fertility	M Fertility
Total	10.5908	7.5874	81.8218	2.8225	2.1175	2.2922	3.0128	0.9962
High	13.2000	5.4800	81.3200	2.8396	2.3341	2.0538	3.0381	0.9350
Low	9.0400	8.8400	82.1200	2.8123	1.9887	2.4340	2.9978	1.0327
Diff	4.1600	-3.3600	-0.8000	0.0273	0.3454	-0.3802	0.0403	-0.0977
Diff wrt model (High)	0.6800	1.6400	-2.3200	0.5835	0.6818	0.0332	0.6523	-0.1318
Diff wrt model (Low)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

(a) $\pi_0^H \downarrow$

Edu Group	Single	Cohabiting	Married	Fertility	HC Growth	S Fertility	C Fertility	M Fertility
Total	10.6384	6.4492	82.9124	2.8314	2.2023	2.7246	2.9515	1.0139
High	12.5200	3.8400	83.6400	2.2560	1.6524	2.0206	2.3858	1.0667
Low	9.5200	8.0000	82.4800	3.1733	2.5291	3.1430	3.2877	0.9825
Diff	3.0000	-4.1600	1.1600	-0.9173	-0.8767	-1.1224	-0.9019	0.0843
Diff wrt model (High)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Diff wrt model (Low)	0.4800	-0.8400	0.3600	0.3610	0.5404	0.7090	0.2899	-0.0502

(b) $\pi_0^L \downarrow$

Table C.15: Dynamics Counterfactual Experiment 3.1: Return of Investment in Children

Edu Group	Single	Cohabiting	Married	Fertility	HC Growth	S Fertility	C Fertility	M Fertility
Total	10.3820	6.4229	83.1950	2.5984	1.8647	2.1123	2.7697	1.0501
High	12.6400	2.7600	84.6000	2.2475	1.6560	1.6693	2.3858	1.0746
Low	9.0400	8.6000	82.3600	2.8069	1.9887	2.3756	2.9978	1.0355
Diff	3.6000	-5.8400	2.2400	-0.5594	-0.3327	-0.7063	-0.6120	0.0391
Diff wrt model (High)	0.1200	-1.0800	0.9600	-0.0086	0.0036	-0.3513	0.0000	0.0079
Diff wrt model (Low)	0.0000	-0.2400	0.2400	-0.0054	0.0000	-0.0584	0.0000	0.0028

(a) $\kappa^c \downarrow$

Edu Group	Single	Cohabiting	Married	Fertility	HC Growth	S Fertility	C Fertility	M Fertility
Total	10.3624	7.2840	82.3536	2.5587	1.8650	2.1563	2.7231	1.0381
High	12.5200	3.3200	84.1600	2.2290	1.6524	1.8276	2.3592	1.0627
Low	9.0800	9.6400	81.2800	2.7546	1.9914	2.3517	2.9394	1.0235
Diff	3.4400	-6.3200	2.8800	-0.5256	-0.3390	-0.5242	-0.5802	0.0392
Diff wrt model (High)	0.0000	-0.5200	0.5200	-0.0271	0.0000	-0.1931	-0.0266	-0.0041
Diff wrt model (Low)	0.0400	0.8000	-0.8400	-0.0577	0.0026	-0.0822	-0.0584	-0.0092

(b) $\kappa^m \downarrow$

Table C.16: Dynamics Counterfactual Experiment 3.2: Return of Investment in Children

Edu Group	Single	Cohabiting	Married	Fertility	HC Growth	S Fertility	C Fertility	M Fertility
Total	10.3373	6.8120	82.8507	2.6021	1.8622	2.2132	2.7691	1.0423
High	12.5200	3.4000	84.0800	2.2486	1.6492	1.8418	2.3844	1.0585
Low	9.0400	8.8400	82.1200	2.8123	1.9887	2.4340	2.9978	1.0327
Diff	3.4800	-5.4400	1.9600	-0.5637	-0.3395	-0.5921	-0.6134	0.0258
Diff wrt model (High)	0.0000	-0.4400	0.4400	-0.0075	-0.0031	-0.1788	-0.0014	-0.0083
Diff wrt model (Low)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

(a) $B^H \downarrow$

Edu Group	Single	Cohabiting	Married	Fertility	HC Growth	S Fertility	C Fertility	M Fertility
Total	10.3373	3.6644	85.9983	2.5711	1.8610	1.4647	2.7561	1.0715
High	12.5200	3.8400	83.6400	2.2560	1.6524	2.0206	2.3858	1.0667
Low	9.0400	3.5600	87.4000	2.7583	1.9851	1.1342	2.9762	1.0744
Diff	3.4800	0.2800	-3.7600	-0.5023	-0.3327	0.8864	-0.5904	-0.0077
Diff wrt model (High)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Diff wrt model (Low)	0.0000	-5.2800	5.2800	-0.0540	-0.0036	-1.2997	-0.0216	0.0417

(b) $B^L \downarrow$

Table C.17: Dynamics Counterfactual Experiment 4: Commitment of Partner

Edu Group	Single	Cohabiting	Married	Fertility	HC Growth	S Fertility	C Fertility	M Fertility
Total	10.3820	7.5630	82.0550	2.5525	1.8600	1.7071	2.7697	1.0548
High	12.6400	1.0400	86.3200	2.2540	1.6542	1.2806	2.3858	1.0852
Low	9.0400	11.4400	79.5200	2.7299	1.9824	1.9606	2.9978	1.0368
Diff	3.6000	-10.4000	6.8000	-0.4759	-0.3281	-0.6799	-0.6120	0.0484
Diff wrt model (High)	0.1200	-2.8000	2.6800	-0.0020	0.0019	-0.7400	0.0000	0.0185
Diff wrt model (Low)	0.0000	2.6000	-2.6000	-0.0824	-0.0063	-0.4734	0.0000	0.0041

(a) $s^c \downarrow$

Edu Group	Single	Cohabiting	Married	Fertility	HC Growth	S Fertility	C Fertility	M Fertility
Total	10.5115	6.9990	82.4895	2.6033	1.8663	2.4101	2.7488	1.0439
High	12.9200	4.4400	82.6400	2.3286	1.6607	1.9957	2.4891	1.0230
Low	9.0800	8.5200	82.4000	2.7667	1.9885	2.6564	2.9031	1.0563
Diff	3.8400	-4.0800	0.2400	-0.4381	-0.3277	-0.6607	-0.4140	-0.0333
Diff wrt model (High)	0.4000	0.6000	-1.0000	0.0725	0.0084	-0.0250	0.1033	-0.0437
Diff wrt model (Low)	0.0400	-0.3200	0.2800	-0.0456	-0.0002	0.2224	-0.0947	0.0237

(b) $s^m \downarrow$

Table C.18: Dynamics Counterfactual Experiment 5: Direct Cohabitation Preference

Edu Group	Single	Cohabiting	Married	Fertility	HC Growth	S Fertility	C Fertility	M Fertility
Total	10.5312	4.1796	85.2893	2.5876	1.8626	1.5510	2.7697	1.0687
High	13.0400	0.0400	86.9200	2.2639	1.6610	0.8618	2.3858	1.0856
Low	9.0400	6.6400	84.3200	2.7800	1.9824	1.9606	2.9978	1.0586
Diff	4.0000	-6.6000	2.6000	-0.5161	-0.3214	-1.0988	-0.6120	0.0269
Diff wrt model (High)	0.5200	-3.8000	3.2800	0.0078	0.0087	-1.1588	0.0000	0.0189
Diff wrt model (Low)	0.0000	-2.2000	2.2000	-0.0323	-0.0063	-0.4734	0.0000	0.0260

(a) $\delta^c \downarrow$